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SPECIFICATIONS 2801 W. Durango
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for
DREAMY DRAW DAM

PHOENIX, ARIZONA

Gila River Basin, Arizona and New Mexico

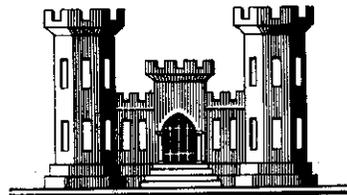
Authority: Flood Control Act of 1965, Public Law 89-298
Approved 27 October 1965

REVIEW COPY

PS-12

February 1972

**U S Army Engineer District
Los Angeles
Corps of Engineers**



A203.504

DACW09-72-B-

INVITATION FOR BIDS
(CONSTRUCTION CONTRACT)

DATE

NAME AND LOCATION OF PROJECT

DREAMY DRAW 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,

at 300 North Los Angeles Street, Los Angeles, California,

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 a zoned earth filled dam, detached unlined spillway, outlet works, saddle dike, paved access road and appurtenant work.

4/15/71

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 and/or drawings 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. Copies of such amendments as may be issued will be furnished to all prospective bidders. 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. **SERVICING AND MAINTENANCE.** Each bidder shall, upon request of the Contracting Officer, furnish evidence that there is an efficient service organization which regularly carries a stock of repair parts for the proposed equipment to be furnished and installed in the work by the Contractor and that the organization is conveniently located for prompt service.

4. **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.

5. **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.

6. **APPLICABLE PUBLICATIONS** listed in various sections of the Technical Provisions of the contract specification will not be furnished with this Invitation for Bids but are available for inspection in the U. S. Army Engineer District, Los Angeles, 300 North Los Angeles Street, Los Angeles, California.

6.1 **Federal and Military Specifications.** Unclassified Federal and Military Specifications and Standards required for bidding purposes may be obtained without charge by submitting request on DD Form 1425 (Specifications and Standards Requisition) to COMMANDING OFFICER, U. S. Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, Pennsylvania 19120. DD Form 1425 shall be completed to indicate the specification title, number, date, and any applicable amendment thereto by number and date. An initial request, where the prospective Contractor does not have DD Form 1425 may be submitted in letter form giving the same information as listed above and the IFB or contract number involved.

6.2 **Commercial Specifications and Standards.** These specifications and standards are not available from Government sources. They may be obtained from the publishers.

6.3 **Corps of Engineers Manual EM 385-1-1,** dated 1 March 1967, entitled: "General Safety Requirements," as amended, may be obtained from the Safety Office, Room 6106, 300 North Los Angeles Street, Los Angeles, California.

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 limitations; 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."

4/15/71 2/3/69 3/9/66 7/15/69 10/11/65 12/1/70 1/13/65 3/22/65 10/11/65

4/15/71

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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 limitations; 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 \$1.90 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 6201B, 300 North Los Angeles Street, Los Angeles, California, prior to the time and date set for opening of bids or bids may be delivered to Room 6048 immediately prior to bid opening time.

11. **TELEGRAPHIC MODIFICATIONS TO BIDS** should be addressed to:

U. S. Army Engineer District, Los Angeles
CENTRAL MAIL ROOM - ROOM NO. 6542
300 North Los Angeles Street
Los Angeles, California 90053

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 NONSEGREGATED 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. (1969 JAN)

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. S. Perkins or Mr. R. N. Hewitt, P. O. Box 2711, Los Angeles, California 90053. Telephone 213 688-5493.

15. **NOTICE OF TOTAL SMALL BUSINESS SET-ASIDE.** (1970 JUN)

15.1 **Restriction.** Bids or proposals under this procurement are solicited from small business concerns only and this procurement is to be awarded only to one or more small business concerns. This action is based on a determination by the Contracting Officer, alone or in conjunction with a representative of the Small Business Administration that it is in the interest of maintaining or mobilizing the Nation's full productive capacity, in the interest of war or national defense programs, or in the interest of assuring that a fair proportion of Government procurement is placed with small business concerns. Bids or proposals received from firms which are not small business concerns shall be considered nonresponsive and shall be rejected.

15.2 **Definition.** A "Small Business Concern" is a concern, including its affiliates, which is independently owned and operated, is not dominant in the field of operation in which it is bidding on Government contracts, and can further qualify under the criteria set forth in regulations of the Small Business Administration (Code of Federal Regulations, Title 13, Section 121.3-8). For the purpose of this Invitation for Bids, in order to qualify as a "Small Business Concern" the average annual receipts of the concern and its affiliates for its preceding three fiscal years must not exceed \$7,500,000, except that if the concern has 50% or more of its annual sales or receipts attributable to business activity within Alaska, such average annual receipts must not exceed \$9,375,000.

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. Attention of bidders is invited to the Special Provisions paragraph entitled "General Safety Requirements" which contains requirements for rollover protective structures for construction equipment.

18. *Listing of Employment * * * * * Openings For Veterans (1971 NOV)
Will be added in final*

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, cer-

tain 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 and Modifications or Withdrawals.** (This paragraph applies to all advertised solicitations. In the case of Department of Defense negotiated solicitations, it shall also apply to late offers and modifications (other than the normal revisions of offers by selected offerors during the usual conduct of negotiations with such offerors) but not to withdrawal of offers. Unless otherwise provided, this paragraph does not apply to negotiated solicitations issued by civilian agencies.)

(a) Bids and modifications or withdrawals thereof received at the office designated in the invitation for bids after the exact time set for opening of bids will not be considered unless: (1) They are received before award is made; and either (2) they are sent by registered mail, or by certified mail for which an official dated post office stamp (postmark) on the original Receipt for Certified Mail has been obtained and it is determined by the Government that the late receipt was due solely to delay in the mails for which the bidder was not responsible; or (3) if submitted by mail (or by telegram if authorized), it is determined by the Government that the late receipt was due solely to mishandling by the Government after receipt at the Government installation: *Provided*, That timely receipt at such installation is established upon examination of an appropriate date or time stamp (if any) of such installation, or of other documentary evidence of receipt (if readily available) within the control of such installation or of the post office serving it. However, a modification which makes the terms of the otherwise successful bid more favorable to the Government will be considered at any time it is received and may thereafter be accepted.

(b) Bidders using certified mail are cautioned to obtain a Receipt for Certified Mail showing a legible, dated postmark and to retain such receipt against the chance that it will be required as evidence that a late bid was timely mailed.

(c) The time of mailing of late bids submitted by registered or certified mail shall be deemed to be the last minute of the date shown in the postmark on the registered mail receipt or registered mail wrapper or on

the Receipt for Certified Mail unless the bidder furnishes evidence from the post office station of mailing which establishes an earlier time. In the case of certified mail, the only acceptable evidence is as follows: (1) Where the Receipt for Certified Mail identifies the post office station of mailing, evidence furnished by the bidder which establishes that the business day of that station ended at an earlier time, in which case the time of mailing shall be deemed to be the last minute of the business day of that station; or (2) an entry in ink on the Receipt for Certified Mail showing the time of mailing and the initials of the postal employee receiving the item and making the entry, with appropriate written verification of such entry from the post office station of mailing, in which case the time of mailing shall be the time shown in the entry. If the postmark on the original Receipt for Certified Mail does not show a date, the bid shall not be considered.

8. **Withdrawal of Bids.** Bids may be withdrawn by written or telegraphic request received from bidders prior to the time set for opening of bids.

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.

BID FORM
(CONSTRUCTION CONTRACT)

REFERENCE

DACW09-72-B-

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

DATE OF INVITATION

NAME AND LOCATION OF PROJECT

NAME OF BIDDER (Type or print)

DREAMY DRAW DAM
PHOENIX
ARIZONA

(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 the Dreamy Draw Dam, complete,

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

CERTIFICATION OF EQUAL EMPLOYMENT COMPLIANCE (1971 APR) By submission of this offer, the offeror certifies 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 known 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 certified and agreed that should there be any change in the status of circumstances certified to above between this date and the date of expiration of this offer or any extension thereof, the Government Contracting Officer cognizant of this procurement will be notified forthwith promptly. (ASPR 12-806(b)(1)(B)(3).

The undersigned agrees that, upon written acceptance of this bid, mailed or otherwise furnished within calendar days (30 calendar days unless a different period be inserted by the bidder) 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.

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 10-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.
 DACW09-72-B-

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.

BIDDING SCHEDULE

<u>Item No.</u>	<u>Description</u>	<u>Estimated Quantity</u>	<u>Unit</u>	<u>Unit Price</u>	<u>Estimated Amount</u>
1.	DIVERSION AND CONTROL OF WATER	1	Job	L.S.	_____
2.	CLEARING AND GRUBBING	1	Job	L.S.	_____
3.	STRIPPING	6,500	Cu. Yd.	_____	_____
4.	EXCAVATION, DAM FOUNDATION	3,700	Cu. Yd.	_____	_____
5.	EXCAVATION, SPILLWAY	57,000	Cu. Yd.	_____	_____
6.	EXCAVATION, ACCESS ROAD	2,700	Cu. Yd.	_____	_____
7.	EMBANKMENT, CORE	12,000	Cu. Yd.	_____	_____
8.	EMBANKMENT, RANDOM	65,000	Cu. Yd.	_____	_____
9.	EMBANKMENT, SELECT RANDOM	4,600	Cu. Yd.	_____	_____
10.	ADDITIONAL ROLLING	40	Hour	_____	_____
11.	CONCRETE, SPILLWAY SILL	1	Job	L.S.	_____
12.	OUTLET STRUCTURE	1	Job	L.S.	_____
13.	DOWNSTREAM SLOPE PROTECTION	900	Cu. Yd.	_____	_____
14.	UPSTREAM SLOPE PROTECTION	6,000	Ton	_____	_____
15.	SUBDRAINAGE SYSTEM	1	Job	L.S.	_____
16.	PIPE FOR GROUT HOLES	40	Lin. Ft.	_____	_____
17.	DRILL SET-UPS	30	Each	_____	_____
18.	DRILLING GROUT HOLES	500	Lin. Ft.	_____	_____
19.	WASHING AND PRESSURE TESTING	30	Hour	_____	_____
20.	GROUT PUMP CONNECTION	50	Each	_____	_____
21.	PLACING FOUNDATION GROUT	750	Cu. Ft.	_____	_____
22.	DELETED				

BIDDING SCHEDULE (Continued)

<u>Item No.</u>	<u>Description</u>	<u>Estimated Quantity</u>	<u>Unit</u>	<u>Unit Price</u>	<u>Estimated Amount</u>
23.	STABILIZED AGGREGATE BASE COURSE	410	Cu. Yd.	_____	_____
24.	ASPHALT CONCRETE PAVEMENT	250	Ton	_____	_____
25.	TRAFFIC CONTROL DEVICES	1	Job	L.S.	_____
26.	INSTRUMENTATION	1	Job	L.S.	_____
27.	WATER SURFACE RECORDING FACILITY	1	Job	L.S.	_____
28.	PLANTING	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.

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

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

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 \$7,500,000. For additional information see governing regulations of the Small Business Administration.)

2. CONTINGENT FEE

(a) He has, has not, employed or retained any company or person (other than a full-time bona fide employee working solely for the bidder) 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 bidder) 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.)

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.

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.)

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.

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
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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.

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

CONSTRUCTION CONTRACT

(See instructions on reverse)

CONTRACT NO.

DATE OF CONTRACT

Rev. LAD Nov. 70

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.

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(Construction Contract)**

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**GENERAL PROVISIONS
(Construction Contract)**

Issued By: Department of the Army, Corps of Engineers

(General Provisions 1 through 23 and 24 through 31 are those prescribed by the General Services Administration in Standard Form 23-A, Oct 1969 edition, and Standard Form 19-A, Apr 1965 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 and ECI 7-070)

(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)

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;

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 and 8-709(b))

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 (1964 JUN)

(The last two sentences of paragraph (c) of the following clause are applicable only where the contract amount exceeds \$1,000,000 and the time of performance exceeds one year)

(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, at any time after 50 percent of the work has been completed, finds that satisfactory progress is being made, he may authorize any of the remaining progress payments to be made in full. Also, whenever the work is substantially complete, the Contracting Officer, if he considers the amount retained to be in excess of the amount adequate for the protection of the Government, at his discretion, may release to the Contractor all or a portion of such 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. Where the time originally specified for completion of this contract exceeds one year, the Contracting Officer, at any time after 50 percent of the work has been completed, if he finds that satisfactory progress is being made, may reduce the total amount retained from progress payments to an amount not less than 10 percent of the estimated value of the work remaining to be done under the contract or 1-1/2 percent of the total contract amount, whichever is the higher. In computing the total contract amount, for the purposes of the preceding sentence, the contract amount for any separate building, public work, or other division of the contract on which the price is stated separately in the contract and on which payment has been made in full, including retained percentage thereon under this clause shall be excluded.

(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, if required, 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(a) and (b))

8. ASSIGNMENT OF CLAIMS (1964 JUN)

(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 Atomic Energy Commission, the National Aeronautics and Space Administration, the Federal Aviation Agency, 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; or 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 (1964 JUN)

(a) Except as otherwise provided in this contract, inspection and test by the Government of material and workmanship required by this contract shall be made at reasonable times and at the site of the work, unless the Contracting Officer determines that such inspection or test of material which is to be incorporated in the work shall be made at the place of production, manufacture, or shipment of such material. To the extent specified by the Contracting Officer at the time of determining to make off-site inspection or test, such inspection or test shall be conclusive as to whether the material involved conforms to the contract requirements. Such off-site 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 "Termination for Default - Damages for Delay - Time Extensions" clause of this contract.

(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 Contractor shall be charged with any additional cost of inspection when material and workmanship are not ready at the time specified by the Contractor for its inspection.

(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. 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 (1964 JUN)

The Contractor shall give his personal superintendence to the work or have a competent foreman or superintendent, satisfactory to the Contracting Officer, on the work at all times during progress, with authority to act for him. (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. 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)

16. ADDITIONAL BOND SECURITY (1949 JUL)

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, 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 7-103.9)

17. 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)

18. OFFICIALS NOT TO BENEFIT (1964 JUN)

No Member of 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 7-602.19)

19. 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)

20. CONVICT LABOR (1949 MAR)

In connection with the performance of work under this contract, the Contractor agrees not to employ any person undergoing sentence of imprisonment at hard labor. (ASPR 7-104.17)

21. EQUAL OPPORTUNITY (1971 APR)

(The following clause is applicable unless this contract is exempt under the rules, regulations and relevant orders of the Secretary of Labor (41 CFR, Chapter 60). Exemptions include contracts and subcontracts (i) not exceeding \$10,000, and (ii) under which work is performed outside the United States and no recruitment of workers within the United States is involved.)

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

(a) 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.

(b) 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.

(c) 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.

(d) The Contractor will comply with all provisions of Executive Order No. 11246 of September 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.

(e) The Contractor will furnish all information and reports required by Executive Order No. 11246 of September 24, 1965, 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.

(f) 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, and such other sanctions may be imposed and remedies invoked as provided in Executive Order No. 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

(g) The Contractor will include the provisions of paragraphs (a) through (g) 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, 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))

22. UTILIZATION OF SMALL BUSINESS CONCERNS (1958 JAN)

(The following clause is applicable if this contract is in excess of \$5,000)

(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))

23. 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)

24. DAVIS-BACON ACT (40 U.S.C. 276a to a-7) (1965 APR)

(a) All mechanics and laborers 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 Regulation (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 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.

(e) In the event it is found by the Contracting Officer that any laborer or mechanic 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 (i) 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 (ii) prosecute the work to completion by contract or otherwise, whereupon such Contractor 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 (i) a prime contract with the Government subject to the Davis-Bacon Act or (ii) a subcontract also subject to the Davis-Bacon Act under such prime contract. (ASPR 7-602.23(a)(i))

25. 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 in any workweek in which he is employed on any work under this contract to work in excess of eight (8) hours in any calendar day or in excess of forty (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 receives compensation at a rate not less than one and one-half times his basic rate of pay for all such hours worked in excess of eight (8) hours in any calendar day or in excess of forty (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 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 eight (8) hours or in excess of the standard workweek of forty (40) hours without payment of the overtime wages required by paragraph (a). (ASPR 7-602.23(a)(ii))

26. APPRENTICES (1965 APR)

(a) Apprentices shall be permitted to work as such only when they are registered, individually, under a bona fide apprenticeship program registered with a State apprenticeship agency which is recognized by the Bureau of Apprenticeship and Training, United States Department of Labor; or, if no such recognized agency exists in a State, under a program registered with the aforesaid Bureau of Apprenticeship and Training. The allowable ratio of apprentices to journeymen in any craft classification 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 registered as above, shall be paid the wage rate determined by the Secretary of Labor for the classification of work he actually performed.

(b) The Contractor shall furnish written evidence of the registration of his program and apprentices as well as of the ratios allowed and the wage rates required to be paid thereunder for the area of construction, prior to using any apprentices in the contract work. (ASPR 7-602.23(a)(iii))

27. PAYROLLS AND BASIC RECORDS (1969 JUN)

(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 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 conform with the work he performed. Weekly submission of the "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. (ASPR 7-602.23(a)(iv))

28. COMPLIANCE WITH COPELAND REGULATIONS (1964 JUN)

The Contractor shall comply with the Copeland Regulations of the Secretary of Labor (29 CFR, Part 3) which are incorporated herein by reference. (ASPR 7-602.23(a)(v))

29. 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 (i) to pay laborers and mechanics employed by the Contractor or any subcontractor on the work the full amount of wages required by the contract, and (ii) to satisfy any liability of any Contractor for liquidated damages under the clause hereof entitled "Contract Work Hours and Safety Standards Act - - Overtime Compensation."

(b) If any Contractor fails to pay any laborer or mechanic employed or working on the site of the 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. (ASPR 7-602.23(a)(vi))

30. SUBCONTRACTS

The Contractor agrees to insert the clauses hereof entitled "Davis-Bacon Act," "Contract Work Hours and Safety Standards Act-Overtime Compensation," "Apprentices," "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))

31. CONTRACT TERMINATION - DEBARMENT

A breach of the clauses hereof entitled "Davis-Bacon Act," "Contract Work Hours and Safety Standards Act-Overtime Compensation," "Apprentices," "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))

32. 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))

33. 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)

34. SMALL BUSINESS SUBCONTRACTING PROGRAM (MAINTENANCE, REPAIR AND CONSTRUCTION) (1967 JUN)

(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) Notwithstanding the instructions on DD Form 1140-1, prior to completion of the contract and as soon as the final information is available, the Contractor shall submit a one-time completed DD Form 1140-1 to the Government addressees prescribed thereon. The DD Form 1140-1 shall show the prime contract number in lieu of identifying a quarterly report period. This subparagraph (b) is not applicable if the Contractor is a small business concern.

(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))

35. FEDERAL, STATE, AND LOCAL TAXES (1961 AUG)

(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.

(3) This paragraph (b) shall not be applicable to social security taxes or to any other employment tax. (71-DEV-11)

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

(d) 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.

(e) 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.

(f) 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))

36. 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))

37. TERMINATION FOR CONVENIENCE OF THE GOVERNMENT (1970 JUL)

(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, subject to any Settlement Review Board approvals required by Section VIII of the Armed Services Procurement Regulation in effect as of the date of execution of this contract, 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), and subject to any Settlement Review Board approvals required by Section VIII of the Armed Services Procurement Regulation in effect as of the date of execution of this contract, 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 Officer 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, subject to any Settlement Review Board approvals required by Section VIII of the Armed Services Procurement Regulation in effect as of the date of execution of this contract, 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), and (e) 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) or (e) above, except that if the Contractor has failed to submit his claim within the time provided in paragraph (c) above 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) or

(e) above, 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, prior to the settlement of the terminated portion of this contract, the Contractor may file with the Contracting Officer a request in writing 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.

(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 of 6 percent per annum, 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, from the effective date of termination and for a period of three years after final settlement under this contract, shall 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, micro-photographs, or other authentic reproductions thereof. (ASPR 7-103.21(c) & 7-602.29(a))

38. 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)

39. 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)

40. 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)

41. 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)

42. 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)

43. 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 curbs or sidewalks, protection against damage shall be provided by the Contractor and any damaged roads, curbs, or sidewalks shall be repaired by, or at the expense of the Contractor. (ASPR 7-602.35)

44. 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)

45. SUBCONTRACTORS

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," "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)

46. USE AND POSSESSION PRIOR TO COMPLETION (1965 JAN)

The Government shall have the right to take possession of or use any completed or partially completed part of the work. Such possession or use shall not be deemed an acceptance of any work not completed in accordance with the contract. While the Government is in such possession, the Contractor, notwithstanding the provisions of the clause of this contract entitled "Permits and Responsibilities," shall be relieved of the responsibility for loss or damage to the work other than that resulting from the Contractor's fault or negligence. 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)

47. 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)

48. 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 7-602.41)

49. ACCIDENT PREVENTION (1967 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 March 1967, 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 article 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))

50. 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)

51. 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)

52. 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 Officer.

(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)

53. 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)

54. EXAMINATION OF RECORDS BY COMPTROLLER GENERAL (1971 MAR)

(a) This clause is applicable if the amount of this contract exceeds \$2,500 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 \$2,500 (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)

55. PRIORITIES, ALLOCATIONS, AND ALLOTMENTS (1971 APR)

(The following clause is applicable to rateable contracts)

The Contractor shall follow the provisions of DMS 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)

56. PRICE REDUCTION FOR DEFECTIVE COST OR PRICING DATA -- PRICE ADJUSTMENTS (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))

57. INTEREST (1968 MAY)

Notwithstanding any other provision of this contract, unless paid within 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 at the rate of six percent per annum 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. 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)

58. AUDIT BY DEPARTMENT OF DEFENSE (1971 APR)

(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 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)

59. 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))

60.1 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))

60.2 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))

61. 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 the 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)

62. VARIATIONS IN ESTIMATED QUANTITIES (1968 APR)

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 Officer 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)

63. 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)

64. VALUE ENGINEERING INCENTIVE (1971 MAY)

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

(a) (1) This clause applies to those cost reduction proposals initiated and developed by the Contractor for changing the drawings, designs, specifications, or other requirements of this contract. This clause does not, however, apply to any such proposal unless it is identified by the Contractor, at the time of its submission to the Contracting Officer, as a proposal submitted pursuant to this clause. Furthermore, if this contract also contains a "Value Engineering Program Requirement" clause, this clause applies to any given value engineering change proposal only to the extent the Contracting Officer affirmatively determines that it resulted from value engineering efforts clearly outside the scope of the program requirement; to the extent the Contracting Officer does not affirmatively so determine, the proposal shall be considered for all purposes as having been submitted pursuant to the Value Engineering Program Requirement clause, even if it was purportedly submitted pursuant to this clause.

(2) The cost reduction proposals contemplated are those that:

- (i) would require, in order to be applied to this contract, a change to this contract; and
- (ii) would result in savings to the Government by providing a decrease in the cost of performance of this contract, without impairing any of the items' essential functions and characteristics such as service life, reliability, economy of operation, ease of maintenance, and necessary standardized features.

(b) As a minimum, the following information shall be submitted by the Contractor with each proposal:

- (i) a description of the difference between the existing contract requirement and the proposed change, and the comparative advantages and disadvantages of each;
- (ii) an itemization of the requirements of the contract which must be changed if the proposal is adopted, and a recommendation as to how to make each such change (e.g., a suggested revision);
- (iii) an estimate of the reduction in performance costs, if any, that will result from adoption of the proposal, taking into account the costs of development and implementation by the Contractor (including any amount attributable to subcontracts in accordance with paragraph (e) below) and the basis for the estimate;
- (iv) a prediction of any effects the proposed change would have on collateral costs to the Government such as Government-furnished property costs, costs of related items, and costs of maintenance and operation;
- (v) a statement of the time by which a change order adopting the proposal 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) the dates of any previous submissions of the proposal, the numbers of the Government contracts under which submitted, and the previous actions by the Government, if known.

(c) (1) Cost reduction proposals shall be submitted to the Procuring Contracting Officer (PCO). When the contract is administered by other than the procuring activity, a copy of the proposal shall also be submitted to the Administrative Contracting Officer (ACO). Cost reduction 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 does have the right to withdraw, in whole or in part, any value engineering change proposal not accepted by the Government within the period specified in the proposal. The decision of the Contracting Officer as to

the acceptance of any such proposal under this contract (including the decision as to which clause is applicable to the proposal if this contract contains both a "Value Engineering Incentive" and a "Value Engineering Program Requirement" clause) shall be final and shall not be subject to the "Disputes" clause of this contract.

(2) The Contracting Officer may accept, in whole or in part, either before or within a reasonable time after performance has been completed under this contract, any cost reduction proposal submitted pursuant to this clause by giving the Contractor written notice thereof reciting acceptance under this clause. Where performance under this contract has not yet been completed, this written notice may be given by issuance of a change order to this contract. Unless and until a change order applies a value engineering change proposal to this contract, the Contractor shall remain obligated to perform in accordance with the terms of the existing contract. If a proposal is accepted after performance under this contract has been completed, the adjustment required shall be effected by contract modification in accordance with this clause.

(3) If a cost reduction proposal submitted pursuant to this clause is accepted by the Government, the Contractor is entitled to share in instant contract savings, collateral savings, and future acquisition savings not as alternatives, but rather to the full extent provided for in this clause.

(4) Contract modification made as a result of this clause will state that they are made pursuant to it.

(d) If a cost reduction proposal submitted pursuant to this clause is accepted and applied to this contract, an equitable adjustment in the contract price and in any other affected provisions of this contract shall be made in accordance with this clause and the "Termination for Convenience," "Changes," or other applicable clause of this contract. The equitable adjustment shall be established by determining the effect of the proposal on the Contractor's cost of performance, taking into account the Contractor's cost of developing the proposal, insofar as such is properly a direct charge not otherwise reimbursed under this contract, and the Contractor's cost of implementing the change (including any amount attributable to subcontracts in accordance with paragraph (e) below). When the cost of performance of this contract is decreased as a result of the change, the contract price shall be reduced by the following amount: the total estimated decrease in the Contractor's cost of performance less * percent (*%) of the difference between the amount of such total estimated decrease and any net increase in ascertainable collateral costs to the Government which must reasonably be incurred as a result of application of the cost reduction proposal to this contract. When the cost of performance of this contract is increased as a result of the change, the equitable adjustment increasing the contract price shall be in accordance with the "Changes" clause rather than under this clause, but the resulting contract modification shall state that it is made pursuant to this clause. (1967 JUN)

(e) The Contractor will use his best efforts to include appropriate value engineering arrangements in any subcontract which, in the judgment of the Contractor, is of such a size and nature as to offer reasonable likelihood of value engineering cost reductions. For the purpose of computing any equitable adjustment in the contract price

*Fifty percent (50%) for the first two approved proposals, fifty-five percent (55%) for the next two approved proposals, and sixty percent (60%) for all other approved proposals.

under paragraph (d) above, the Contractor's cost of development and implementation of a cost reduction proposal which is accepted under this contract shall be deemed to include any development and implementation costs of a subcontractor and any value engineering incentive payments to a subcontractor, or cost reduction shares accruing to a subcontractor, which clearly pertain to such proposal and which are incurred, paid, or accrued in the performance of a subcontract under this contract.

(f) Omitted pursuant to ASPR 7-104.44(f).

(g) (1) A cost reduction proposal identical to one submitted under any other contract with the Contractor or another contractor may also be submitted under this contract.

(2) If the Contractor submits under this clause a proposal which is identical to one previously received by the Contracting Officer under a different contract with the Contractor or another contractor for substantially the same items and both proposals are accepted by the Government, the Contractor shall share instant contract savings realized under this contract, pursuant to paragraph (d) of this clause, but he shall not share collateral or future savings pursuant to paragraphs (f) and (j) (if included) of this clause.

(h) The Contractor may restrict the Government's right to use any sheet of a value engineering proposal 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 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 value engineering proposal 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 proposal 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 proposal as accepted, in any manner and for any purpose whatsoever, and have others so do.

In the event of acceptance of a value engineering proposal, 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 proposal.

(i) (1) For purposes of sharing under paragraph (d) above, the term "instant contract" shall not include any supplemental agreements to or other modifications of the instant contract, executed subsequent to acceptance of the particular value engineering change proposal, by which the Government increases the quantity of any item or adds any item, nor shall it include any extension of the instant contract through exercise of an option (if any) provided under this contract after acceptance of the proposal. Such supplemental agreements, modifications, and extensions shall be considered "future contracts" within paragraph (j) (if included) of this clause.

(2) If this contract is an estimated requirements or other indefinite quantity type contract, the term "instant contract" for purposes of sharing under

paragraph (d) above shall include only those orders actually placed by the Government up to the time the particular value engineering change proposal is accepted. All orders placed subsequent to the acceptance of the particular change proposal shall be considered "future contracts" within paragraph (j) (if included) of this clause.

(3) If this clause is included in a basic ordering agreement, the "instant contract" for purposes of sharing under paragraph (d) above shall be the order under which the particular value engineering change proposal is submitted. Other orders under the same agreement shall be considered either "existing contracts" (if awarded prior to acceptance of the proposal) or "future contracts" (if awarded after acceptance of the proposal), within paragraph (j) (if included) of this clause.

(4) If this contract is a multi-year contract, the "instant contract" shall be the entire contract for the total multi-year quantity.

(j) Omitted pursuant to ASPR 1-1703.3(a)(1). (ASPR 7-104.44(a), (c), (e)(i) and (f))

65. 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)

66. LISTING OF EMPLOYMENT OPENINGS FOR VETERANS (1971 NOV)

(This clause is applicable pursuant to 41 CFR 50-250 if this contract is for \$10,000 or more and will generate 400 or more man-days of employment.)

(1) The Contractor agrees that all 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, to the maximum extent feasible, be offered for listing at an appropriate local office of the State employment service system wherein the opening occurs and to provide such periodic reports to such local office regarding employment openings and hires as may be required.

(2) 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 of effort and shall involve only the normal obligations which attach to the placing of a bona fide job order but does not require the hiring of any job applicant referred by the employment service system.

(3) The periodic reports required by paragraph (1) above shall be filed at least quarterly with the appropriate local office or, where the Contractor has more than one establishment in a State, with the central office of that State employment service. Such reports shall indicate for each establishment the number of individuals who were hired during the reporting period and the number of hires who were veterans who served in the Armed Forces on or after August 5, 1964, and who received other than a dishonorable discharge. The Contractor shall maintain copies of the reports submitted until the expiration of one year after final payment under the contract, during which time they shall be made available, upon request, for examination by any authorized representatives of the Contracting Officer or of the Secretary of Labor.

(4) Whenever the Contractor becomes

contractually bound to the listing provisions of this clause, it shall advise the employment service system in each State wherein it has establishments of the name and location of each such establishment in the State. As long as the Contractor is contractually bound to these provisions and has so advised the State employment service system, there is no need to advise the State system of subsequent contracts. The Contractor may advise the State systems when it is no longer bound by this contract clause.

(5) This clause does not apply (i) to the listing of employment openings which occur outside of the 50 States, the District of Columbia, Guam, Puerto Rico, and the Virgin Islands; and (ii) contracts with state and local governments.

(6) This clause does 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.

(7) As used in this clause:

(i) "All employment openings" include, but are 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 which are compensated on a salary basis of less than \$18,000 per year. This term includes full-time employment, temporary employment of more than three (3) days' duration, and part-time employment.

(ii) "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 of the establishment where the employment opening is to be filled, including the District of Columbia, Guam, Puerto Rico, and the Virgin Islands.

(iii) "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," means employment openings for which no consideration will be given to persons outside the Contractor's organization (including any affiliates, subsidiaries, and parent companies) or outside of a special hiring arrangement which is part of the customary and traditional employment relationship which exists between the Contractor and representative of its employees and includes any openings which the Contractor proposes to fill from regularly established "recall" or "rehire" lists or from union hiring halls.

(iv) "Man-day of employment" means any day during which an employee performs more than one hour of work.

(8) The Contractor agrees to place this clause (excluding this paragraph (8)) in any subcontract directly under this contract *provided*, such subcontract is for \$10,000 or more and will generate 400 or more man-days of employment. (ASPR 7-103.27)

NOTE: Rates of wages will be inserted in final specifications.

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PART I
SPECIAL PROVISIONS

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1. **COMMENCEMENT, PROSECUTION, AND COMPLETION OF WORK.** (JAN.1965) The Contractor will be required to commence work under this contract within 5 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 180 calendar days after the date of receipt of notice to proceed except planting. 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.

1.1 **Outlet Works.** The outlet works shall be completed not later than . The work completed shall include the intake structure, conduit, and outlet channel, including compacted fill behind the outlet channel walls.

2. **LIQUIDATED DAMAGES.** 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 following sums separately for each day of delay.

2.1 Completion of outlet works as specified in subparagraph 1.2.1. \$

2.2 Completion of remaining work including clean-up. \$

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

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
223/95	Project Location
223/96	General Plan
223/97	Geology and Foundation Exploration Plan
223/98	Geology and Foundation Exploration Plan
223/99	Geology and Foundation Exploration - Logs and Seismic Survey
223/100	Geology and Foundation Exploration - Geologic Profiles and Foundation Treatment
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223/103	Saddle Dike and Access Road - Plan, Profile and Sections
223/104	Spillway - Plan, Profile and Sections
223/105	Outlet Works - Plan, Profile, Sections and Structural Details
223/106	Intake Structure - Plans, Elevations and Sections
223/107	Reservoir Water-Surface Recording Facilities and Crest Gage
223/108	Fencing, Cable Barricade and Staff Gages
223/109	Subdrainage System, Monument and Miscellaneous Details
223/110	Landscape Planting Plan
223/111	Planting Area 1
223/112	Planting Area 2
223/113	Landscape Details

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. 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 similar to the attached sample register and 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 (JAN. 1965). 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. These drawings shall be complete and detailed. If approved by the Contracting Officer, each copy of the drawings 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. If the Contractor considers any correction indicated on the drawings to constitute a change to the contract drawings or specifications, notice as required under the clause entitled "Changes" will be given to the Contracting Officer. Eight sets of all shop drawings will be retained by the Contracting Officer and one set will be returned to the Contractor. The approval of the drawings by the Contracting Officer shall not be construed as a complete check, but will indicate only that the general method of construction and detailing is satisfactory. Approval of such drawings will not relieve the Contractor of the responsibility for any error which may exist as the Contractor shall be responsible for the dimensions and design of adequate connections, details, and satisfactory construction of all work.

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 Material and Equipment Schedules. As soon as practicable and before any material or equipment is purchased, the Contractor shall submit to the Contracting Officer for approval a complete list in sextuplicate of materials, fixtures and equipment to be incorporated in the work. With the material and equipment lists the Contractor shall submit 6 sets of applicable brochures, technical data, catalogs, cuts, diagrams, drawings, samples when required, and such other descriptive data as will give a complete description, including trade name, model number, type, size, rating and auxiliary equipment to be included.

4.6 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. (JAN. 1965).

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 investigation by surveys, test trenches, auger and core 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.

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.

Month	1951		1952		1953		1954		1955	
	No. of Rainy Days	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		1957		1958		1959		1960	
	No. of Rainy Days	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	.31	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		1962		1963		1964		1965	
	No. of Rainy Days	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

Month	1966		1967		1968		1969		1970	
	No. of Rainy Days	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

Month	1951 - 1970		1951 - 1970	
	Total for Period of Record	Mean for Period of Record	Total for Period of Record	Mean for Period of Record
	No. Rainy Days	Rainfall	No. Rainy Days	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 at 300 North Los Angeles Street, Los Angeles, California.

6. GENERAL SAFETY REQUIREMENTS.

a. Paragraph 18.A.20 of EM 385-1-1, dated 1 March 1967, entitled "General Safety Requirements," is deleted in its entirety and the following is substituted in its place:

18.A.20. Bulldozers, push-and-pull tractors, winch tractors, mowers, front-end loaders, backhoes, front-end loader and backhoe combinations, highlift tractors and fork lifts; self-propelled pneumatic-tired earthmovers, including pans, scrapers, bottom dumps, end dumps, side dumps; motor graders and water tank trucks, shall be equipped with rollover protective structures (ROPS) and quick release seat belts for the protection of operators from hazards of rollover. ROPS shall not be required on highway type trucks designed for hauling on established public highways and self-propelled rubber-tired lawn and garden tractors under 20 h.p. This provision shall be in addition to the provisions of 18.A.18 and 18.A.19.

b. ROPS shall be designed, fabricated, and attached to the equipment frame in a manner to support not less than two times the gross weight of the prime mover, based on the ultimate strength of the metal and integrated loading of supporting members with the resultant load applied at the point of impact. There shall be a vertical clearance of 52 inches from the deck to the canopy where the operator enters or leaves the seat.

c. Certification for each ROPS shall be based on one of the following and submitted to the Contracting Officer for approval:

(1) Certification by a Registered Professional Engineer that the ROPS meet the minimum design and performance requirements. Installation shall be in accordance with the manufacturer's recommendations.

(2) Rollover protective structures built in compliance with the applicable Society of Automotive Engineers (SAE) Recommended Practices and certified by the manufacturer as fully meeting the applicable performance standard. Installation will be in accordance with the ROPS manufacturer's recommendations.

(3) Rollover protective structures that have been accepted by the State of California, Division of Industrial Safety. The Contractor will be responsible to furnish evidence of such acceptance.

8. LAYOUT OF WORK. (1965 Apr OCE)

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

- a. Base Line. Center line of embankment and spillway or offset line thereto.
- b. Boundaries of the working area.
- c. All necessary information relating to lines and grades will be made available to the Contractor.
- d. Bench Marks.

9. QUANTITY SURVEYS (APR. 1968)

9.1 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.

9.2 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.

10. 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.

11. PERFORMANCE OF WORK BY CONTRACTOR. (JAN. 1965). The Contractor shall perform on the site, and with his own organization, work equivalent to at least 35% 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.

12. CONTRACTOR QUALITY CONTROL. The Contractor shall provide and maintain an effective quality control program that complies with General Provision 32 of the contract entitled "Contractor Inspection System."

12.1 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.

12.2 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.

12.3 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.

12.4 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.

12.5 The Contractor shall submit for approval within 15 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.

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

12.7 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 entitled "General Requirements." This form, to include records of corrective action taken, will be furnished to the Government as required by the Contracting Officer.

12.8 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.

12.9 In the event the Contractor fails to satisfactorily perform required inspections and tests; to submit timely, complete, and factual reports and tests 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.

16. TIME EXTENSION. (JAN.1965). 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.

17. APPROVED AGGREGATE SOURCES. (1965 Apr OCE)

17.1 Concrete Aggregates meeting the requirements of these specifications can be produced from approved commercial plants along the Salt River near Phoenix, Arizona.

17.2 Concrete Aggregates may be furnished from any of 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 an approved source listed above at no additional cost to the Government.

17.4 Approval 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 an approved source shall meet all the requirements of Section CONCRETE CONSTRUCTION of the "Technical Provisions" of these specifications.

18. ^{*****}Stabilization of Prices, Rents, Wages and Salaries (1971 Oct)
will be added in final.

PART II
TECHNICAL PROVISIONS
SECTION 1 A
GENERAL REQUIREMENTS

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| 2. Project Facilities | 10. Public Utilities, Notices, and Restrictions |
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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
FF-N-105a & Int. Am-2
FF-N-836C & Am-1

MM-L-751H
TT-E-529C
TT-P-25c

Bolts, Hexagon and Square
Nails, Wire, Brads, and Staples
Nut: Square, Hexagon, Cap, Slotted,
Castellated, Clinch, Knurled, Welding
and Single Ball Seat
Lumber; Softwood
Enamel, Alkyd, Semi-Gloss
Primer Coating, Exterior (Undercoat for Wood,
Ready-Mixed, White and Tints)

1.2 U.S. Department of Commerce Commercial Standards

PS 1-66 & Ams. 1, 2, 3, 4, 5, & 6 Softwood Plywood, Construction and Industrial

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

2.1 Construction Signs.

2.1.1 One Project Sign and 1 Safety Sign 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.

2.2 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 (WCLIB).

3.1.2 Plywood shall conform to Product Standard PS 1, Grade AC, 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 Sign and Safety Sign shall be constructed as detailed on Figures 1, 2, and 3. Decals of the Corps of Engineers' Castle 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. 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 an adequately sized air conditioner, 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 40 feet in length.

4.3 Laboratory Building shall be weathertight and shall have a 6-inch concrete slab floor and contain not less than 300 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 recommendation. Painting of the wooden pole shall conform to the applicable requirements for the safety 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 not 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. The Contractor shall maintain all above specified facilities in good condition throughout the life of the project. Upon completion of work under this contract, all 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 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.

9. ARCHAEOLOGICAL FINDINGS DURING CONSTRUCTION. There are no known archaeological remains at the project site. Should any skeletons, artifacts, or other archaeological remains be uncovered, the Contractor shall suspend operations at the site of discovery and continue operations in other areas. The Contractor shall notify the Project Engineer immediately of the finding. Included with the notification shall be a brief statement to the Contracting Officer of the location and the findings. 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 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 shall be subject to the provisions of paragraph: PROTECTION OF EXISTING STRUCTURES, UTILITIES, WORK AND VEGETATION of the General Provisions and other contract provisions. The Contractor, without cost to the Government, 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.

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 owners 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.

10.5.2 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, separately 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.

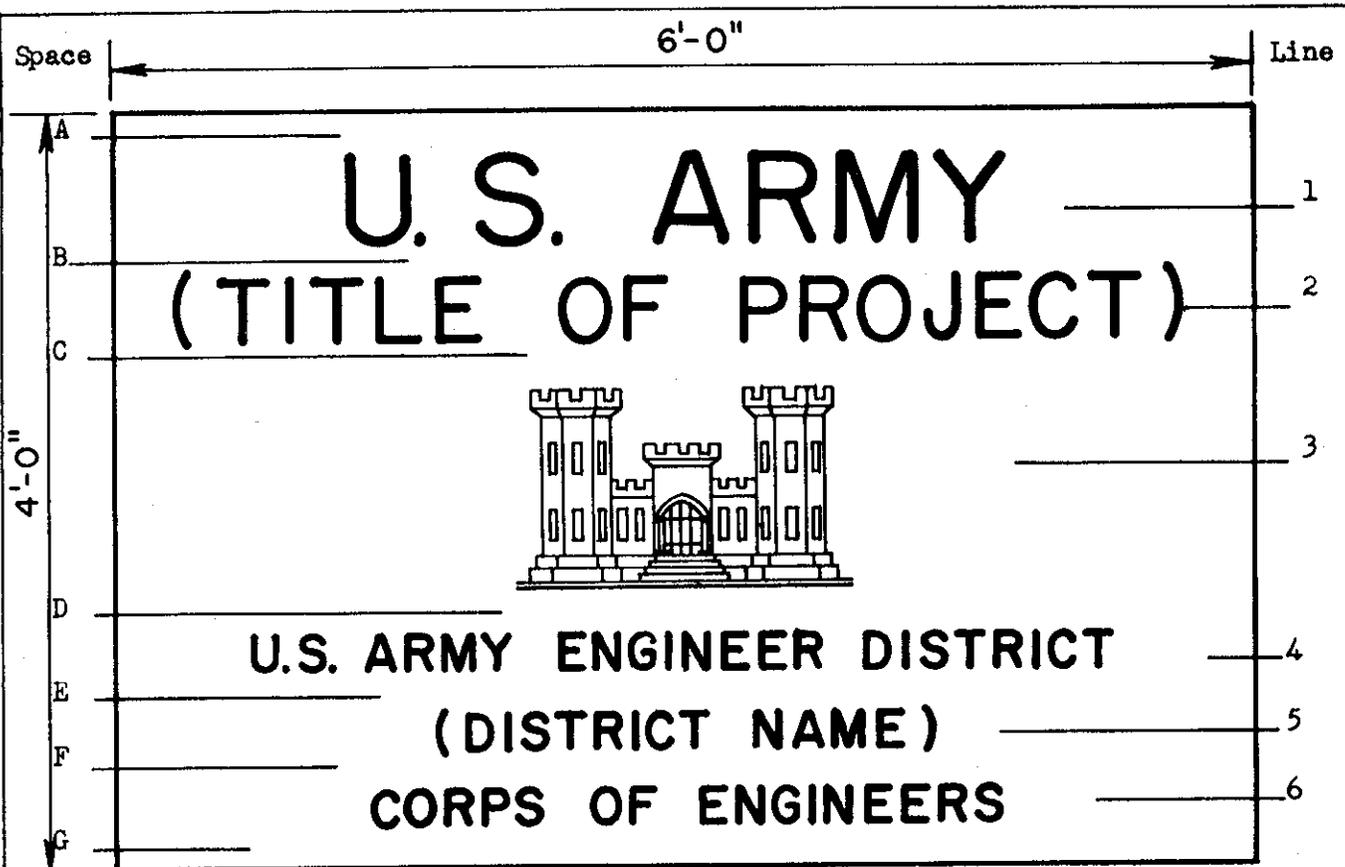
11. PUBLIC SAFETY. Attention is invited to the General Provision entitled "Permits and Responsibilities." The Contractor shall provide temporary fencing, barricades, and/or guards, as required, to provide protection in the interest of public safety. Whenever the Contractor's operations create a condition 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 to the public that the project is under construction and of any dangerous conditions to be encountered as a result thereof, shall be equipped with red wearing apparel and a red flag. Signs, flags, lights, and other 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.

14. PERMITS.

14.1 General. Reference is made to the article of the contract entitled "Permits and Responsibilities," which obligates the Contractor to obtain all required licenses and permits.

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. The inspections shall include all materials and equipment delivered to the site as well as work accomplished. 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. A sample form of a minimum "Daily Construction Quality Control Report" is attached at the end of this section. The daily inspections shall include the terms shown on the attached form and such other items as required to assure adequate quality control. Results of all tests and validations performed by the Contractor in accordance with the Technical Provisions shall be submitted on appropriate forms attached to daily construction quality control report.

16 Work Safety Incentive *will* be added in final.*

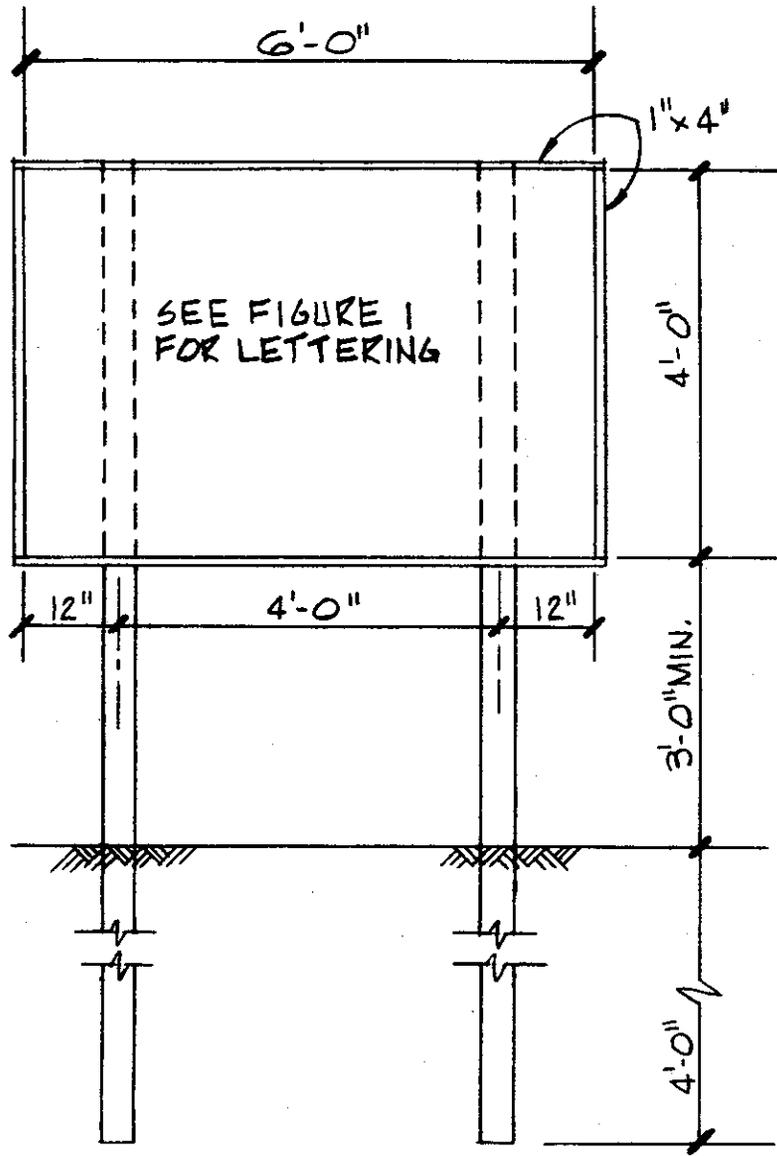


SCHEDULE

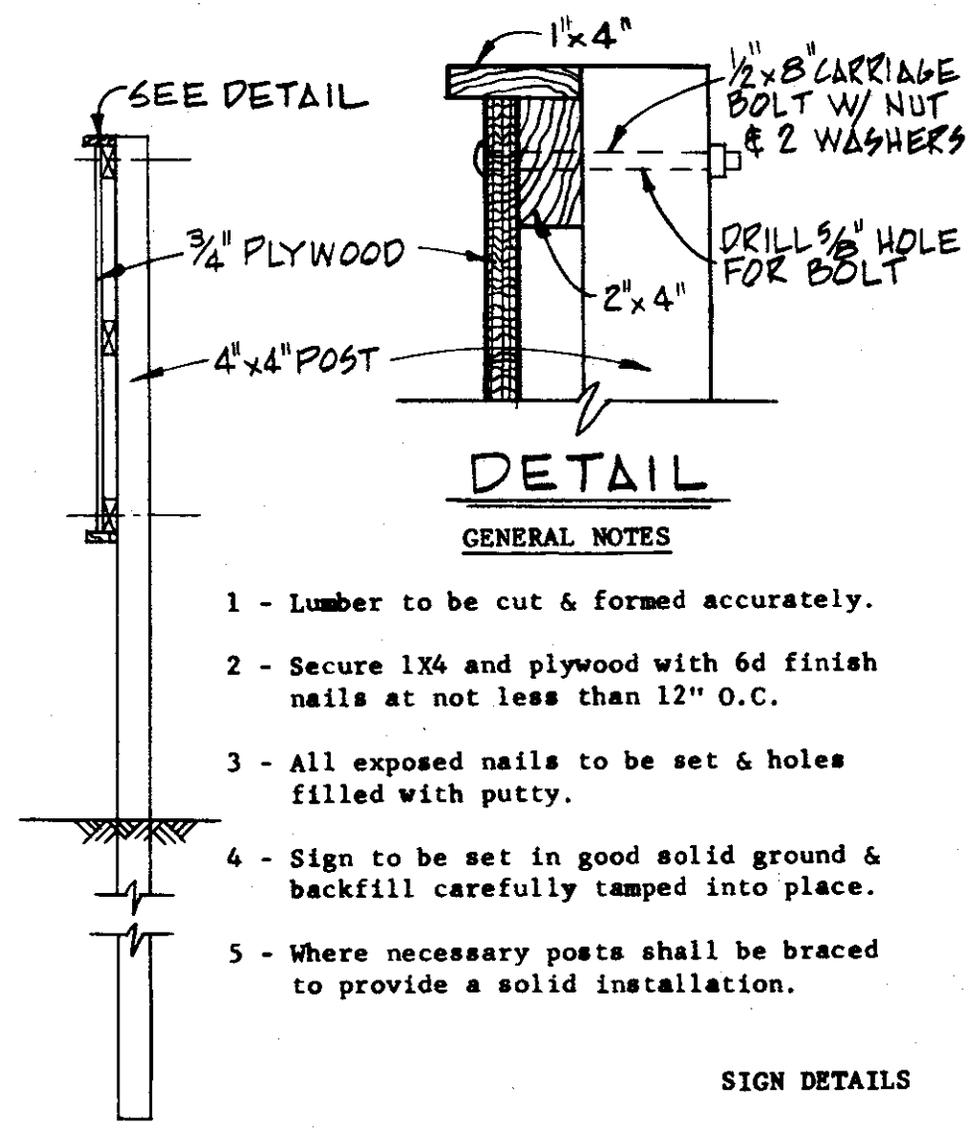
<u>Space</u>	<u>Height</u>	<u>Line</u>	<u>Description</u>	<u>Letter Height</u>
A	3"	1	U. S. ARMY	5 1/2"
B	2"	2	PROJECT NOMENCLATURE	4"
C	2"	3	CORPS OF ENGINEERS CASTLE (DECAL)	14"
D	3"	4	U. S. ARMY ENGINEER DISTRICT	2 3/4"
E	2"	5	DISTRICT NAME	2 1/4"
F	2"	6	CORPS OF ENGINEERS	2 1/2"
G	3"			

PROJECT SIGN
(Army-Civil Works)

Figure 1
1 Oct 1968



ELEVATION



DETAIL

GENERAL NOTES

- 1 - Lumber to be cut & formed accurately.
- 2 - Secure 1x4 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
1 Oct 1968

SECTION

DAILY CONSTRUCTION QUALITY CONTROL REPORT

REPORT NO.

PROJECT

DREAMY DRAW DAM

LOCATION

Phoenix, Arizona

DATE

CONTRACTOR

ADDRESS

CONTRACT NO.

	(1)	(2)	(3)		(4)		(5)
ITEM	IN PROCESS	LOCATION/DESCRIPTION	CONFORMS TO CONTR RQRMT		TEST REPORTS		REMARKS
			YES	NO	ATCH'D	TO FOL	
GENERAL CONDITIONS (REPORT DAILY) Manpower Adequacy							
Layout of Work							
Suitability of Construction Equipment							
Safety Condition Diversion and Control of Water							
Clearing Site and Removing Obstruction							
Weather Conditions							
Quantity of Water Flowing in Channel							
Environment Protection							

INSTRUCTIONS

- (1) Enter check in column (1) to indicate (i) delivery of materials and equipment for installation in the work; (ii) delivery or use of construction equipment; and (iii) items of construction in process.
- (2) Identify location and/or description of each activity checked in column (1).
- (3) Enter check under either Yes or No for each activity checked in column (1).
- (4) Check if appropriate.
- (5) Enter appropriate comment and explain each "NO" checked in column (3). Attach additional pages if more space is required.

DAILY CONSTRUCTION QUALITY CONTROL REPORT (Cont'd)						REPORT NO.	
ITEM	(1)	(2)	(3)		(4)		(5)
		LOCATION/DESCRIPTION	CONFORMS TO CONTR RQRMT		TEST REPORTS		REMARKS
			YES	NO	ATCH'D	TO FOL	
3A EXCAVATION AND STRIPPING Grade Control Disposal of Materials							
3AA DRILLING AND GROUTING Drilling Holes Washing and Pressure Testing Grout Mixing Placement of Grout							
3B and 3C FILLS AND SUBGRADE PREPARATION AND EMBANKMENT Materials Foundation & Subgrade Preparation, Placement Grade Control Compaction							
4A CONCRETE Materials Certificates Storage Aggregate Tests Mix Control							
Rebar Design & Shop Dwg Use Rebar Spacing & Support Subgrade Preparation Formwork Joints, Mix Time, Vibration Bonding Finishing, Curing							

DAILY CONSTRUCTION QUALITY CONTROL REPORT (Cont'd)						REPORT NO.	
ITEM	(1)	(2)	(3)		(4)		(5)
		LOCATION/DESCRIPTION	CONFORMS TO CONTR RQRMT		TEST REPORTS		REMARKS
			YES	NO	ATCH'D	TO FOL	
5B REINFORCED MASONRY Reinforcement Erection							
Painting and Cleaning							
5D STONE PROTECTION Materials Foundation Preparation							
Placement Grades							
6A MISCELLANEOUS METALWORK Submittal Use Materials							
Fasteners							
6D FENCING AND BARRICADE Materials Installation, alignment							
8B & 8E REINFORCED CONCRETE PIPE CONDUIT AND SUBDRAINAGE SYSTEM							
Submittal Use Certificates of Compliance Alignment							
Trenching, Bedding, Placing, Jointing, Testing Embedment							

DAILY CONSTRUCTION QUALITY CONTROL REPORT (Cont'd)					REPORT NO.		
ITEM	(1)	(2)	(3)		(4)		REMARKS
		LOCATION/DESCRIPTION	CONFORMS TO CONTR RQRMT		TEST REPORTS		
			YES	NO	ATCH'D	TO FOL	
9A STABILIZED AGGREGATE BASE COURSE							
Source Sample Approved							
Stock Pile Agg. Tests							
Equipment, Plant, Production and Compaction Tests							
Moisture Content, Grade Control							
Thickness Control,							
Smoothness Tests							
9D PRIME COAT							
Bitumen, Surface Condition							
Surface Moisture							
Application Rate Control,							
Cure Time, Protection							
9G ASPHALT CONCRETE PAVEMENT							
Aggregates, Bitumen							
Equipment Type & Condition							
Mix Design & Control							
Temperature Tests & Control							
Temperature Tests & Control							
Weather Conditions							
Joints							
Thickness Tests & Control							
Surface Smoothness Tests							
Density Tests							

DAILY CONSTRUCTION QUALITY CONTROL REPORT (Cont'd)						REPORT NO.		
ITEM	(1)	(2)	(3)		(4)		(5)	
		LOCATION/DESCRIPTION	CONFORMS TO CONTR RQRMT		TEST REPORTS			REMARKS
			YES	NO	ATCH'D	TO FOL		
10B PLANTING OF TREES AND SHRUBS Certificates of Inspection Materials and Plants Planting Methods Maintenance and Replacement								
11A GAGES AND MONUMENTS Materials Installation								
14A PAINTING Submittal use, certificates Sampling and storage Surface preparation, pretreatment Application, number of coats Touch-up and clean-up								
14B STEEL DOOR AND FRAME Submittal Use, Field measurement, templates Hardware preparation, Hardware application, storage, handling Installation, clearances, operation								

SECTION 1B

MEASUREMENT AND PAYMENT

Index

- | | |
|---|--------------------------------------|
| 1. Payment for Diversion and Control of Water | 9. Downstream Slope Protection |
| 2. Payment for Clearing and Grubbing | 10. Upstream Slope Protection |
| 3. Stripping | 11. Drilling and Grouting |
| 4. Payment | 12. Stabilized Aggregate Base Course |
| 5. Embankment | 13. Asphalt Concrete Pavement |
| 6. Payment for Concrete, Spillway Sill | 14. Traffic Control Devices |
| 7. Payment for Outlet Structure | 15. Instrumentation |
| 8. Payment for Subdrainage System | 16. Water Surface Recording Facility |

1. PAYMENT FOR DIVERSION AND CONTROL OF WATER will be made at the applicable contract price which payment shall constitute full compensation for diversion and control of water, complete.

2. PAYMENT FOR CLEARING AND GRUBBING will be made at the applicable contract price, which payment shall constitute full compensation for clearing and grubbing, complete.

3. STRIPPING.

3.1 Measurement of 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.

3.2 Payment for Stripping will be made at the applicable contract price, which payment shall constitute full compensation for stripping the dam and dike areas and disposing of excavated material.

4. EXCAVATION.

4.1 Measurement. A survey of the site shall be made prior to commencement of work, and all measurement will be based on this survey without regard to any changes in the site that may occur during the prosecution of the work. Measurement for excavation will be made between the excavation lines and grades indicated on the drawings or as directed and the ground surfaces as indicated by the above mentioned survey. The temporary slopes as excavated may vary from those indicated or staked, depending on the materials excavated and methods used in performing the work, but such alterations will not change the measurement for payment from the original lines as specified herein. Quantities will be computed by the average end area method and the planimeter will be considered a precise instrument for measuring plotted cross sections. All excavation outside of excavation lines shown on the drawings will be considered as being for the convenience of the Contractor and such will not be measured for payment.

4.2 Payment.

4.2.1 Payment for excavation will be made at the applicable contract prices, which payment shall constitute full compensation for excavating, hauling and disposing of excavated materials. Payment for excavation, access road will include all costs for grading and subgrade preparation where applicable.

4.2.2 Trenches. No separate payment will be made for excavation of pipe trenches. All cost in connection therewith shall be included in the contract price for the item to which the work applies.

4.2.3 Unsuitable Soils. No separate payment will be made for the excavation and disposing of unsuitable soils. When such excavation is directed, payment therefor will be included in the applicable contract price for the items of work under which the unsuitable soils are encountered. When there is no applicable contract item an adjustment will be made.

5. EMBANKMENT.

5.1 Measurement of embankment will be made between the stripping and excavation and structure lines and the fill limit lines, or between the ground lines determined by the survey prior to commencement of work, and fill lines, as indicated or directed. Quantities will be computed by the average end area method and the planimeter will be considered a precise instrument for measuring plotted cross sections.

5.2 Payment.

5.2.1 Payment for embankment will be made at the applicable contract prices which payments shall constitute full compensation for obtaining, placing and compacting the embankments, complete. Payment for embankment will include all costs for foundation preparation where applicable.

5.2.2 Backfill for directed overcut will be measured and paid for at the applicable contract price for the type of fill placed therein. When there is no applicable contract item an adjustment in the contract price will be made.

5.3 Additional Rolling.

5.3.1 Measurement. Embankment compaction required in addition to the compaction specified will be measured on the basis of the number of hours during which the compaction equipment approved for this job is operated in making the additional required passes. In computing the number of hours worked by the compaction 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.

5.3.2 Payment for Additional Rolling will be made at the applicable contract price, which payment shall constitute full compensation for additional rolling, complete.

6. PAYMENT FOR CONCRETE, SPILLWAY SILL will be made at the applicable contract price which payment shall constitute full compensation for the concrete sill, complete, including excavation and backfill.

7. PAYMENT FOR OUTLET STRUCTURE will be made at the applicable contract price, which payment shall constitute full compensation for the intake structure, outlet channel and RCP conduit including excavation and backfill, waterstops, grating assembly and outlet channel fencing.

8. PAYMENT FOR SUBDRAINAGE SYSTEM will be made at the applicable contract price, which payment shall constitute full compensation for the toe subdrain system, complete, including necessary earthwork.

9. DOWNSTREAM SLOPE PROTECTION.

9.1 Measurement of downstream slope protection will be based on the quantity of stone for the downstream slope protection measured in cubic yards of stone placed within the lines and grades indicated on the drawings or as directed.

9.2 Payment for downstream slope protection will be made at the applicable contract price, which payment shall constitute full compensation for obtaining and placing the stone in the downstream slope protection, complete.

10. UPSTREAM SLOPE PROTECTION.

10.1 Measurement of upstream slope protection will be based on the quantity of stone for the upstream slope protection measured in tons, determined by scale weights, placed within the lines and grades indicated.

10.2 Payment for upstream slope protection will be made at the applicable contract price, which payment shall constitute full compensation for obtaining and placing the stone in the upstream slope protection, complete.

11. DRILLING AND GROUTING.

11.1 Measurement.

11.1.1 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.

11.1.2 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.

11.1.3 Drilling of 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.

11.1.4 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.

11.1.5 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.

11.1.6 Placing Grout will be measured for payment on the basis of the number of cubic feet of materials, exclusive of water and regardless of the proportions of the grout mixes, satisfactorily placed in the dame foundation and surface treatment.

11.2 Payment.

11.2.1 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.

11.2.2 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.

11.2.3 Payment for drilling grout holes will be made at the applicable contract price, which payment shall constitute full compensation for drilling grout 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% of the applicable contract price.

11.2.4 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.

11.2.5 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.

11.2.6 Payment for placing grout will be made at the applicable contract price, which payment shall constitute full compensation for 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.

12. STABILIZED AGGREGATE BASE COURSE.

12.1 Measurement. The quantity of stabilized aggregate base course completed and accepted by the Contracting Officer will be measured in cubic yard to the lines indicated.

12.2 Payment for stabilized aggregate base course will be made at the applicable contract price which payment shall constitute full compensation for the aggregate base, complete, in place, including subgrade preparation.

13. ASPHALT CONCRETE PAVEMENT.

13.1 Measurement. The unit of measurement for the asphalt concrete will be the ton (2,000 lbs.). The Contractor shall weigh each load on a certified platform scale and shall furnish the Contracting Officer with duplicate Weighmaster's 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. Asphalt concrete used for convenience of the Contractor will not be measured for payment.

13.2 Payment for Asphalt Concrete Pavement will be made at the applicable contract price which payment shall constitute full compensation for furnishing, spreading, and compacting the asphalt concrete pavement complete in place, including bituminous material prime coat and preparation for placing.

14. TRAFFIC CONTROL DEVICES. Payment for traffic control devices will be made at the applicable contract price, which payment shall constitute full compensation for guardrail, guide posts, and cable barricade complete in place.

15. INSTRUMENTATION. Payment for instrumentation will be made at the applicable contract price, which payment shall constitute full compensation for staff gages and settlement and reference monuments, complete in place.

16. WATER SURFACE RECORDING FACILITY. Payment for water surface recording facility will be made at the contract price, which payment shall constitute full compensation for the outflow staff, and crest gage, the recorder house, conduit and pull boxes, and gage well, complete in place.

17. PAYMENT FOR PLANTING will be made at the applicable contract price which payment shall constitute full compensation for planting of trees and shrubs, complete, including maintenance. Payment shall include cost of project sign.

* * * * *

SECTION 1D
ENVIRONMENT PROTECTION

Index

- | | |
|---------------------------------|--|
| 1. Scope | 7. Protection of Water Resources |
| 2. Applicable Regulations | 8. Disposal of Cleared Material |
| 3. Notification | 9. Dust Control |
| 4. Subcontractors | 10. Maintenance of Pollution Control Facilities
During Construction |
| 5. Implementation | |
| 6. Protection of Land Resources | |

1. **SCOPE.** The work covered by this section consists of furnishing all labor, materials and equipment and performing all work required for the prevention of environmental pollution during and as the result of construction operations under this contract except for those measures set forth in other Technical Provisions of these specifications. For the purpose of this specification environmental pollution is defined as the presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances of importance to human life; affect other species of importance to man; or degrade the utility of the environment for aesthetic and recreational purposes. The control of environmental pollution 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.

2. **APPLICABLE REGULATIONS.** In order to prevent, and to provide for abatement and control of, any environmental pollution arising from the construction activities of the Contractor and his subcontractors in the performance of this contract, they 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," in effect on the date of solicitation, as well as the specific requirements stated elsewhere in the contract specifications.

3. **NOTIFICATION.** The Contracting Officer will notify the Contractor in writing of any non-compliance with the foregoing provisions, the proposed plan 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 authorized representative at the site of the work shall be deemed sufficient for the purpose. If the Contractor fails or refuses to comply promptly the 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 extension of time or for excess costs or damages by the Contractor unless it was later determined that the Contractor was in compliance.

4. **SUBCONTRACTORS.** Compliance with the provisions of this section by subcontractors will be the responsibility of the Contractor.

5. **IMPLEMENTATION.** Prior to commencement of the work the Contractor will:

- (1) submit in writing his proposals for implementing this section for environmental pollution control;
- (2) meet with representatives of the Contracting Officer to develop mutual understandings relative to compliance with this provision and administration of the environmental pollution control program.

6. **PROTECTION OF LAND RESOURCES.**

6.1 **General.** It is intended that the land resources within the project boundaries and outside the limits of permanent work performed under this contract 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. Insofar as possible, the Contractor shall confine his construction activities to areas defined by the plans or specifications and to areas to be cleared. The following additional requirements are intended to supplement and clarify the requirements of General Provision Articles 33, 34 and 38.

6.2 **Prevention of Landscape Defacement.** Except in areas specified to be cleared, the Contractor shall not deface, injure, or destroy trees or shrubs, nor remove or cut them without special authority. A preconstruction survey including photographs shall be accomplished by the Contractor and a report of survey furnished with the daily quality control report.

6.4 **Location of Storage and Temporary Construction Facilities.** The location on Government property of the Contractor's storage and other construction buildings, required temporarily in the performance of the work, shall be 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 storage and temporary construction facilities shall be submitted for approval of the Contracting Officer. Where buildings or platforms are constructed on sidehills, the Contracting Officer may require cribbing to be used to obtain level foundations. Benching or leveling of earth may not be allowed, depending on the location of the proposed facility.

6.5 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 at least thirty (30) days prior to scheduled start of such temporary work.

6.5.1 A layout of all temporary roads, excavations and embankments to be constructed within the work area.

6.5.2 Details of road construction.

6.5.3 Plans and cross sections of proposed embankments and their foundations, including a description of proposed materials.

6.5.4 A landscaping plan prepared by a competent landscape architect showing the proposed restoration of the area. Removal of any necessary trees and shrubs outside the limits of existing clearing shall be indicated. The plan shall also indicate location of required guard posts or barriers required to control vehicular traffic passing close to trees and shrubs to be maintained undamaged. 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. Modification of the Contractor's plans shall be made only with the written approval of the Contracting Officer. No unauthorized road construction, excavation or embankment construction (including disposal areas) will be permitted.

6.6 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, stockpiles of excess or waste materials, or any other vestiges of construction as directed by the Contracting Officer. It is anticipated that excavation, filling and plowing of roadways will be required to restore the area to near natural conditions which will permit the growth of vegetation thereon. The disturbed areas shall be graded and filled as required, and soil amendments, humus, topsoil, or combination thereof shall be spread to a depth of approximately 6 inches over the entire area and the entire area seeded. Restoration to original contours is not required.

7. PROTECTION OF WATER RESOURCES.

7.1 General. The Contractor shall not pollute waterways with fuels, oils, bitumens, calcium chloride, acids or harmful materials. It is the responsibility of the Contractor to investigate and comply with all applicable Federal, State, County and Municipal laws concerning pollution of rivers and streams. All work under this contract shall be performed in such a manner that objectionable conditions will not be created in streams through or adjacent to the project area.

7.2 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.

7.3 Spillages. At all times of the year, special measures shall be taken to prevent chemicals, fuels, oils, greases, bituminous materials, waste washings, herbicides and insecticides, and cement and surface drainage from entering waterways.

7.4 Disposal. Disposal of any materials, wastes, effluents, trash, garbage, oil, grease, chemicals, etc., in areas adjacent to waterways shall be subject to the approval of the Contracting Officer for reasons similar to those stated above. If any waste material is dumped in unauthorized areas the Contractor shall remove the material and restore the area to the condition of the adjacent undisturbed area. If necessary, contaminated ground shall be excavated, disposed of as directed by the Contracting Officer, and replaced with suitable fill material and compacted all at the expense of the Contractor.

8. DISPOSAL OF CLEARED MATERIAL. No material shall be burned at the site of the project. Materials shall be disposed of by burying or by removal. Materials disposed of by burying shall be buried at locations approved by the Contracting Officer and shall be covered with not less than 2 feet of earth material. Approved locations will be natural or excavated depressions in the project area which are not subject to erosion from wind or streamflow.

9. 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 if sprinkling is used. 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.

10. 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 should conduct frequent training courses for his maintenance personnel. The curricula should include methods of detection of pollution, familiarity with pollution standards, and installation and care of vegetation covers, plants and other facilities to prevent and correct environmental pollution.

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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. As the foundation materials are fine grained, dewatering will be slow and special consideration must be given to early accomplishment of dewatering. 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 By-Pass Capacities.

1.2.1 General. The Contractor shall provide for diversion of stream flows hereinafter specified. The stream 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 flood flows.

1.2.2 Runoff Quantities During Periods 1 April to 30 June and 1 to 31 October - a stream flow of 10 c.f.s.

1.2.3 Runoff Quantities During Other Periods - a stream flow of 450 c.f.s.

1.3 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 invert subgrade shall be refilled with compacted fill in accordance with section: FILLS AND SUBGRADE PREPARATION by and at the expense of the Contractor.

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SECTION 2B

CLEARING AND GRUBBING

1. GENERAL.

1.1 Clearing shall consist of removal of trees, brush, cacti, stumps, trash, dumps, vegetable matter, 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 flush or slightly below the ground surface.

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 Reservoir Area. The reservoir area behind the dam shall be cleared of trash and dumps as indicated on the drawings.

2.2 The following areas shall be cleared and grubbed: The areas under main dam, saddle dike, intake structure, and outlet channel, areas for a distance of 10 feet outside embankments, areas for a distance of 10 feet outside structures, and areas for borrow of fill materials.

2.3 Removal of Improvements and Stored Man-Made Items. All improvements and stored man-made items within the construction areas shown on the drawings shall become the property of the Contractor and removed from the site.

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 CLEARED AND GRUBBED MATERIAL. All timber to be wasted, logs, brush, stumps, roots, rotten wood, and other refuse shall be removed from job site unless other methods of disposal are authorized by the Contracting Officer.

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SECTION 3A

EXCAVATION AND STRIPPING

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| 1. Requirement | 4. Disposal of Excavated Materials |
| 2. Removal of Unsuitable Soils | 5. Borrow |
| 3. Stripping | 6. Overcut |

1. REQUIREMENT.

1.1 General. Excavation shall consist of the removal of any class of material encountered, except materials covered by the provisions of the section: CLEARING AND GRUBBING, in the designated areas or from areas staked in the field. The material to be removed may include but is not limited to earth, hardpan, sand, gravel, cemented sand and gravel, rock, adobe, detached pieces of stone and concrete, bedrock, rockfills, existing fills of debris and rubbish, and other unsuitable material. Slope lines indicated on the drawings or staked in the field for temporary cuts do not necessarily represent the actual slope to which the excavation must be made to safely perform the work. Excavation for permanent cuts shall be made to the slope lines indicated. Excavation shall be performed in a manner which will not impair the subgrade.

1.2 Use of Explosives. The use of explosives will not be permitted.

1.3 Excavation for surfaces which will form the foundation for roads, outlet structure, spillway and for dam embankment shall be performed to the lines and grades indicated on the drawings. The actual depth will be determined by the Contracting Officer. The finish surface of the subgrade for the spillway shall be smooth and shall not vary more than plus or minus 3 inches from the indicated grade. The finish surface for the access road shall not vary more than plus or minus one inch from the indicated grade.

1.4 Excavation for Pipe Lines will include excavation of all materials required for the placing of the pipe lines. All excavations 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 the 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. Excavation for outlet conduit shall be as indicated. The bottom of the trench for the outlet conduit shall vary not more than plus 0 inches minus 3 inches from the indicated grade.

2. REMOVAL OF UNSUITABLE SOILS. The removal of soils which are unsuitable for foundations of the spillway, outlet, structures, ramps, drains, etc. may be required in certain areas. The Contractor will be required to excavate any such areas to the depth authorized and backfill the areas with compacted fill conforming to the requirements of the section: EMBANKMENT FOR DETENTION BASIN AND DIKE.

3. STRIPPING. The foundation for the detention basin embankment shall be stripped of unsuitable materials not meeting the requirements for embankment or foundations. Materials stripped from the required locations as defined herein shall be disposed of as required for material not suitable for fills in the paragraph: DISPOSAL OF EXCAVATED MATERIALS.

4. DISPOSAL OF EXCAVATED MATERIALS. Excavated materials suitable for embankments and other required fills, shall be placed in temporary stockpiles or used directly in the work. Excavated material not suitable for fills shall become the property of the Contractor and shall be removed from the site. No excavated material or waste of any kind shall be disposed of at any place in the basin beyond the limits of the work under this contract without express authority.

5. BORROW. Excavation for borrow shall consist of excavation from the designated borrow area shown on the drawings. Suitable material from required excavation shall be exhausted before using borrow excavation for random and select random material. Material for the core shall be obtained from the indicated borrow area. Material obtained from the borrow area will require processing to meet the requirements for the applicable fill. Upon completion of the excavation in the borrow areas all excavated areas shall be rough graded and sloped to drain.

6. OVERCUT. Except as otherwise specified or as may be ordered in writing, any overcut or excavation made outside the lines indicated on the drawings or staked in the field shall be backfilled with concrete. Overcut or excavation made outside the lines indicated in the abutment or embankment area shall be backfilled and compacted with material conforming to the applicable fill placed thereon. All excavating, backfilling, compacting of backfill, and concreting occasioned thereby shall be by and at the expense of the Contractor.

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SECTION 3B

FILLS AND SUBGRADE PREPARATION

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| 1. Applicable Publications | 4. Outlet Channel |
| 2. Equipment | 5. Backfills |
| 3. General Requirements for Compacted
Fills and Compacted Backfills | 6. Subgrade Preparation |

1. **APPLICABLE PUBLICATIONS.** The following publications listed below are referred to thereafter by basic designation only and form a part of this specification to the extent indicated by the references.

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-Inch Drop |
| D 1556-64 | Density of Soil In-Place by the Sand-Cone Method |

1.2 American Association of State Highway Officials (AASHO) Standards.

- | | |
|----------|--|
| T99-61 | Moisture-Density Relations of Soils Using a
5.5-Lb. Rammer and a 12-Inch Drop |
| T-191-61 | Density of Soil In-Place by the Sand-Cone Method |

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 (OTHER THAN EMBANKMENT AND SADDLE DIKE).**

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 AASHO Standard T 99 or ASTM Specification D 698.

3.1.2 Field Control. Field in-place density shall be determined in accordance with AASHO Standard T 191 or ASTM Specification 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 compacted material. At least one test shall be made for each 2 feet or less of compacted material in any area and at least one test shall be made in each fill 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.

3.3 Material shall be obtained from the required excavations and/or indicated borrow areas and shall be free from sod, roots, brush, debris, trash or other objectionable material, and shall contain no stone whose greatest dimension is more than 3/4 of the layer thickness.

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 3% 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 BEHIND OUTLET CHANNEL WALLS.

4.1 Limitations on Equipment. The gross weight of any piece of equipment, or the combined weight of any combinations of equipment couples together, used to place, moisten and/or compact fill behind channel walls shall not exceed 35,000 pounds, including dynamic forces produced by vibratory equipment. Equipment used to compact the fill behind the channel 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 channel wall at any point 2 feet above the top of the heel of wall footings. Fills shall be placed uniformly behind opposite channel walls during construction.

4.2 Compaction. Each layer of fill behind channel walls shall be compacted to not less than 90% of maximum density.

4.3 Trimming. The top of fill adjacent to open channel 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.

5. BACKFILLS.

5.1 Backfill and Fill About Structures.

5.1.1 Location. Backfill and fill shall consist of all fill against and/or around structures, except backfill for outlet channel.

5.1.2 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.

5.1.3 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.

5.1.4 Compaction shall be not less than 95% of maximum density.

6. SUBGRADE PREPARATION.

6.1 Subgrade for Channel Invert and Outlet Conduit. After required excavation in bedrock to rough grade, the entire subgrade for the outlet conduit and channel invert shall be cleared of all loose rock and spalls to prepare the subgrade ready to receive concrete. The finished surface of the subgrade shall have a tolerance of plus 0 inches minus 3 inches for the indicated grade.

6.2 Subgrade Preparation for Access Road. Except where bedrock is encountered, the subgrade shall be alternately watered and scarified until the material is uniformly moistened throughout for a depth of not less than 6 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 97% 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.

SECTION 3C

EMBANKMENT FOR DETENTION BASIN AND DIKE

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| 3. Foundation Preparation | 7. Deleted |
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1. GENERAL.

1.1 Grade Control. The embankment 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 or the embankment slopes or to make such other changes in the embankment sections as may be deemed necessary to produce a safe structure.

1.2 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 surface shears, excessive rutting or pumping of the fill he shall limit the hauling equipment as to type, load size or travel speed 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 placed outside of prescribed slope lines.

1.3 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: FOUNDATION PREPARATION.

1.4 Stockpiling from Approved Borrow Sources. When the excavation from approved 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.

2. MATERIALS.

2.1 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 will 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. Mixing of materials during the excavating process at the borrow area may be required.

2.2 Core Fill. Material for the compacted core fill shall consist of clayey gravelly sands or silty gravelly sands obtained from the designated core borrow area. Material placed within the core zone shall contain no stone larger than 6 inches and shall have at least 5%, by weight, passing the No. 200 sieve.

2.3 Random Fill. Material for compacted random fill shall consist of material obtained from required excavation and designated borrow. Soft weathered rock, which breaks up under rolling to form essentially a soil and which compacts without excessive voids, may be used for random fill. Material shall contain no stone whose greatest dimension is more than 3/4 of the layer thickness and shall have at least 15%, by weight passing the 1/2-inch sieve. Oversize stone may be placed on the upstream face of the embankment.

2.4 Select Random Fill. Material for select random fill shall consist of unweathered bedrock obtained from required excavation. Material shall contain no stone larger than 12 inches and shall have not more than 30%, by weight, passing the No. 4 sieve.

3. FOUNDATION PREPARATION.

3.1 General. Clearing, grubbing, removal of obstructions, stripping, and removal of unsuitable soil and rock shall be completed within the entire foundation area of the streambed and abutments before commencing foundation preparation. The sides of abutment excavations and other cut slopes in soil shall be broken down, where so directed, and the sides of the excavations shall be scarified to provide bond between the foundation material and the fill.

3.2 Bedrock Foundation to Receive Core Fill. All bedrock surfaces to receive compacted core fill shall be cleaned by air blasting of all loose rock fragments, sand, gravel, and other objectionable material as directed. The use of water for cleaning 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 cracks, joints and faults shall be cleaned of all filling materials, as directed. Prior to placement of embankment material upon or against the bedrock surface, all open joints and cracks in that surface shall be filled with mortar to the depths cleaned. Mortar shall be composed of various mixtures of cement, water and sand. Those portions of bedrock surfaces where, in the opinion of the Contracting Officer, the compaction of the embankment materials cannot be accomplished satisfactorily with the specified compaction equipment shall be filled with mortar or concrete as directed to the extent necessary to permit satisfactory use of the compaction equipment. In no case shall a thin coat of mortar be left on smooth, intact rock surfaces. Rock overhangs and rock protrusions shall be removed by the use of pre-splitting, line drilling or close drilling techniques in such a manner as to minimize damage to the underlying rock, or the space beneath overhangs and around protrusions shall be filled with tamped concrete so that satisfactory compaction of embankment materials can be accomplished. Mortar and concrete shall conform with the applicable provisions of section: CONCRETE CONSTRUCTION. The surfaces shall be kept clean and free of loose material until the embankment is placed.

3.3 Bedrock Foundation to Receive Embankment other than Core Fill will not require mortar or concrete treatment. For the bedrock foundation, all earth and rock materials shall be removed from depressions and detached and loose rock shall be removed. ~~and loose rock shall be removed from depressions and detached and loose rock shall also be removed.~~ Prior to placement of fill upon or against the bedrock surface, all cleaned depressions shall be refilled with the designated zone material and compacted with mechanical tampers.

3.4 Soil Foundation to receive embankment shall be scarified 6 inches, moistened to optimum moisture content, and rolled by 8 passes of a rubber-tire roller.

4. PLACEMENT.

4.1 General. No fill shall be placed on any part of the embankment foundation until such areas have been inspected and approved. The gradation and distribution of materials throughout the fill 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.

4.2 Core and Random fill shall be placed with suitable equipment in uniform horizontal layers which, before compaction, shall not exceed 8 inches in depth if a tamping roller is used, 12 inches in depth if a rubber-tired roller is used, or 4 inches in depth where mechanical tampers are used. All stones greater than the maximum specified size shall be removed and may be placed on the upstream slope of the embankment. As soon as practicable after commencement of construction of the embankment, the central portion shall be raised or crowned with grades not to exceed 2% so that the surface of the fill will drain freely. If the compacted surface of any layer of 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 spreading processes, the Contractor shall maintain at all times a force of men adequate to remove all roots and debris from the embankment materials. Heavy equipment shall not be operated over the outlet conduit and buried drain pipe until at least 2 feet of fill material has been placed and compacted over pipes and structures in conformance with the requirements of the section: FILLS AND SUBGRADE PREPARATION.

4.3 Select Random shall be placed with suitable equipment in uniform horizontal layers which before compaction shall not exceed 24 inches in depth.

5. MOISTURE CONTROL.

5.1 General. 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. The moisture content after compaction shall be as uniform as practicable throughout any one layer of materials. Material that is too wet shall be 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 add water to 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 it is impracticable to obtain the specified moisture content by wetting or drying the material on the fill, the Contractor may be required to prewet or dry back the material at the source of excavation. 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 layer. 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 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 layer. 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 recompact. No limits for moisture content will be placed on select random fill. Embankment core fill and random fill shall have a maximum moisture content of not more than 3 percent above optimum and a minimum moisture content of not more than 2 percent below optimum.

6. COMPACTION.

6.1 Equipment. Compaction equipment shall conform to the following requirements and shall be used as prescribed in subsequent paragraphs.

6.1.1 Tamping Rollers shall consist of two or more roller drums mounted side by side in a suitable frame. Rollers operated in tandem sets shall be towed in a manner such that the prints of the tamping feet produced by the tandem units do not overlap. Each drum of a roller shall have an outside diameter of not less than 5 feet and shall be not less than 5 feet nor more than 6 feet in length. The space between two adjacent drums, when on a level surface, shall be not less than 12 inches nor more than 15 inches. Each drum shall be free to pivot about an axis parallel to the direction of travel. Each drum ballasted with fluid shall be equipped with at least one pressure-relief valve and with at least one safety head. The safety head shall be equal to Union Type Safety Heads as manufactured by Black, Sivalls and Bryson, Inc., Kansas City, Missouri, with rupture discs suitable for between 50 and 75 pounds-per-square-inch rupturing pressure. The pressure-relief valve is a manually operated valve and shall be opened periodically. Personnel responsible for opening pressure-relief valves shall be instructed ascertain that valve openings are free from plugging to assure that any pressure developed in roller drums is released at each inspection. At least one tamping foot shall be provided for each 100 square inches of drum surface. The space measured on the surface of the drum, between the centers of any two adjacent tamping feet, shall be not less than 9 inches. The length of each tamping foot from the outside surface of the drum shall be not more than 11 inches and shall be maintained at not less than 9 inches. The cross-section area of each tamping foot shall be not more than 10 square inches at a plane normal to the axis of the shank 6 inches from the drum surface, and shall be maintained at not less than 7 square inches nor more than 10 square inches at a plane normal to the axis of the shank 8 inches from the drum surface. During the operation of rolling, the spaces between the tamping feet shall be maintained clear of materials which would impair the effectiveness of the tamping rollers. The weight of a roller when fully loaded shall be not less than 4,000 pounds per foot of length of drum. The weight of a roller empty shall be not more than 1,500 pounds per foot of length of drum. The loading used in the roller drums and operation of the rollers shall be as required to obtain the desired compaction. If more than one roller is used on any one layer of fill, all rollers so used shall be of the same type and essentially of the same dimensions. Rollers shall be drawn by crawler-type or rubber-tired tractors at a speed not to exceed 5.0 miles per hour. The use of rubber-tired tractors shall be discontinued if the tires leave ruts that prevent uniform compaction by the tamping roller. Tractors used for pulling rollers shall have sufficient power to pull the roller satisfactorily when drums are fully loaded with sand and water. At the option of the Contractor, self-propelled tamping rollers conforming with the above requirements may be used in lieu of tractor-drawn tamping rollers. Self-propelled rollers exceeding the empty weight requirements may be used, provided that when the Contracting Officer determines self-propelled roller performance is unsatisfactory, the nominal foot pressure on the tamping feet of the self-propelled roller can be adjusted to approximate the nominal foot pressure of the specified towed rollers for the particular working condition required by the substitution of tamping feet having a face area not exceeding 14 square inches. If the self-propelled rollers cause shearing of the fill or laminations in the fill, the Contracting Officer may direct that the rollers be removed from the fill and that tractor-drawn tamping rollers conforming with these specifications be used. For self-propelled rollers, in which steering is accomplished through the use of rubber-tired wheels, the tire pressure shall not exceed 40 pound per square inch. Self-propelled rollers shall be operated at a speed not to exceed 5.0 miles per hour. The design and operation of the tamping roller shall be subject to the approval of the Contracting Officer who shall have the right at any time during the prosecution of the work to direct such repairs to the tamping feet, minor alterations in the roller, and variations in the weight as may be found necessary to secure optimum compaction of the earth-fill materials.

6.1.2 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 pound 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. If the rubber-tired rollers cause shearing of the fill or laminations in the fill, the Contracting Officer may direct that the rollers be removed from the fill and that tractor-drawn tamping rollers hereinbefore specified be used.

6.1.3 Mechanical Tampers. Compaction of material, in areas where it is impracticable to use a roller, shall be performed by the use of approved mechanical tampers.

6.2 Core and Random Fill. Fill material shall be compacted with tamping or rubber-tired rollers of the type specified to the extent that each layer of fill is traversed with 8 passes of a tamping roller or a rubber-tired roller. A pass shall consist of one movement of specified equipment over the area to be compacted. No layer shall be rolled before the practicable uniform moisture content has been obtained. Scarified areas are considered as a layer of fill and shall be compacted. Where a tamping roller is used for mixing, the number of passes made therefore shall not constitute any part of the passes required for compaction. Rolling shall be done in such manner that the rollers overlap at least one foot over the fill strip previously rolled. 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. Mechanical tampers shall be used for compaction of fill material

where rolling equipment is impracticable for use in compaction; the density of such material shall be equivalent to that obtained by roller equipment. 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.

6.3 Select Random Fill. Compaction shall conform to the requirements as specified for core and random fill except that each layer of fill shall be compacted with 6 passes of a rubber-tired roller.

8. BACKFILL AND FILL ABOUT STRUCTURES shall be as specified in Section: FILLS AND SUBGRADE PREPARATION.

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SECTION 3AA
DRILLING AND GROUTING

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| 1. Applicable Publications | 4. Grouting Material |
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| 3. Equipment | 6. Quality Control |

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

1.1 U.S. Army, Corps of Engineers, Handbook for Concrete and Cement (CRD)

CRD-C 262-63

Pozzolan for Use in Portland Cement Concrete

1.2 Federal Specifications.

WW-P-406C

Pipe, Steel (Seamless and Welded)
(For Ordinary Use)

WW-P-521F

Pipe Fittings, Flange Fittings, and
Flanges, Steel and Malleable Iron
(Threaded and Butt-Welding) 150 Pound

2. **GENERAL.**

2.1 Program. The work contemplated consists of drilling and grouting the bedrock at the approximate locations, limits, and details as indicated on the drawings. 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 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 in quantity, type, capacity and condition suitable for doing the work, as approved by the Contracting Officer. The power and equipment and the layout thereof shall meet all applicable requirements of local 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. Percussion, standard rotary core and grout hole drilling equipment shall be used. The drill rigs used for percussion drilling shall be either jackhammer, crawler type or rotary percussive drills. 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. Water shall be furnished in sufficient quantity to insure that the 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 or slurry, to the satisfaction of the Contracting Officer. Each plant shall have a capacity of 30 to 50 g.p.m. and develop a pressure not greater than 100 p.s.i. 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 equipment.

3.3.1 Specially equipped, air-driven, double-acting, duplex slush pumps having large valve openings with removable valve seats and removable liquid end liners, progressive cavity type or single screw type pumps of the same capacity or other approved types.

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, with a capacity of not less than one-half the capacity of the sump. 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 Mechanically agitated sumps so designed as to be capable of effectively stirring and holding in suspension all solid matter contained in the grout, with a minimum capacity of 16 cubic feet and a means of measuring the quantity contained to 0.1 cubic feet.

3.3.4 Tanks 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. Inside diameter of the delivery lines shall not be less than 1-1/2-inches and have a length not more than 200 feet from the sump to the header.

3.3.6 1/4-inch Vibrating screens with a minimum of 300 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 holes.

3.3.8 Water meters graduated in cubic feet for use in pressure testing operations.

3.3.9 Pressure gages graduated to read 0 to 100 p.s.i. for use in pressure testing and grouting operations. Accurately calibrated, high precision pressure gages shall be furnished for periodically checking the accuracy of all gages.

3.3.10 Pressure gages graduated to read 0 to 50 p.s.i. with no greater than 2 p.s.i. divisions on the dial for use in grouting operations at shallow depths.

3.3.11 Sufficient stop cocks and screw caps for all grout holes within 50 feet of grouting.

3.3.12 A variety of calking tools with a supply of mortar, quick setting agent, oakum, lead wool and other such materials to be used in sealing grout leaks through open fractures and joints. Also recommend use of jet-type (propane) heating unit for sealing smaller leaks not conducive to calking.

3.4 Arrangement of the grouting equipment shall be such as to provide a continuous circulation of grout and to permit accurate pressure control by operation of a valve on the grout return line, regardless of how small the grout may be. Holes being grouted shall be no farther than 200 feet from a grout pump. The equipment and lines shall be prevented from becoming fouled by the constant circulation 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. Any of the following three distinct arrangements of connecting and operating equipment may be required according to the nature of the holes and the direction of the Contracting Officer.

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 supply shall be used on clean holes which pressure tests indicate may take a significant amount of grout.

3.4.2 Circuit grouting shall be done by lowering a 1/2-inch pipe to the bottom of the grout hole and washing, if necessary, to get through cavings. At the Contractor's option, "E" drill rod may be substituted for 1/2-inch pipe. The "circuit grouting header" shall then be connected so that grout is forced down the 1/2-inch pipe, returning up the hole outside the pipe and back to the sump. The return grout shall be discharged on the 1/4-inch mesh vibrating screen to remove rock fragments and lumps. This method may be used in caving holes to insure that the hole is grouted all the way to the bottom. It may also be used with relatively tight holes to prevent grout from settling in the hole and plugging the lower part prematurely.

3.4.3 Packer grouting shall be done by setting a packer in the hole at the depth directed and connecting the packer pipe to a direct grouting header. Several packer settings may be used during one grouting operation, particularly in exploratory grouting.

3.5 Records. The Contracting Officer will keep records of all drilling and grouting operations, such as a log of the 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. Also upon completion of the grouting, the Contractor shall remove all grout supply connections from pipe embedded in concrete to a minimum depth of 2 inches, measured from the face of the concrete. All holes or depressions thus formed shall be patched with a mortar composed of one part portland cement, 2 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 and organic materials. 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 conform to the requirements of section: CONCRETE CONSTRUCTION. Only cement furnished in moistureproof bags will be accepted for use in the work. 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 amount 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 Pozzolan. Pozzolan shall meet the following requirements of Corps of Engineers Specification CRD-C-262, Class N or F. Written certification will be required.

4.4 Pipe. All pipe required for grout holes and grout hole connections shall conform to Federal Specification WW-P-406, Weight A, Class 1. All fittings shall conform to Federal Specification WW-P-521, type 1. Pipe and fittings shall be 2-inch I.D. for grout hole drilling.

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 50 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 three types of pipe for drilling and grouting as directed. These would be (1) surface grout pipe (2) shallow depth grout pipe and (3) deep grout pipe. 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 calking it in place with some suitable material to preserve alignment, 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 embedment. 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. In the grout hole drilling operation, where the shallow depth grout pipe will not adequately anchor the drill rig, the Contractor will provide an alternate means of anchorage. For the alternate type, percussive drills shall be used to install grout pipe in bedrock which is not firm enough to adequately anchor the grout pipe. In general the grout-hole shall be drilled to not more than 10 foot depth, and immediately grouted by inserting a suitable grout packer near the surface and grouting the hole with low pressured, (5 p.s.i.). The grout injection pipe shall be inserted through the packer into the hole with a stop-cock to prevent leakage from the pipe at the ground surface. After the grout hole will not take any more grout, the stop-cock shall be closed and the injection pipe removed. When the grout has partially set up, the stop-cock and packer shall be removed and the grout allowed to set-up. The hole shall then be redrilled and the grout pipe set at a sufficient depth to adequately anchor.

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 drilling equipment as herein before 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 Grout. The drilling and the grouting shall be done in sections using staggered split spacing, stage grouting arrangement as described herein.

5.4.1 Zone. A zone is a predetermined partial depth of grouting. The first zone extends 20 feet downward from the bottom of the grout pipe. The second zone extends 20 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 20 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. Normally, the spacing for the secondary holes will be 10 feet. 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 and subsequent 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 2 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 shall 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 grout consisting of cement and water. Pozzolan shall be mixed with the grout as directed.

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 50 p.s.i. but in no event will pressure in excess of 50 p.s.i. 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, calking, 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 plug or 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 hole shall be kept 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.

6. QUALITY CONTROL. 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.

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SECTION 4 A
CONCRETE CONSTRUCTION

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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-A-00701a	Asphalt Petroleum (Primer, Roofing, and Waterproofing)
SS-C-00153A	Cement, Bituminous, Plastic
SS-C-192g & Am-1	Cement, Portland
SS-C-618a	Concrete, Ready-Mixed

1.2 Concrete Plant Manufacturers' Bureau.

Concrete Plant Standards, Third Revision (March 1, 1967)

1.3 U. S. Army, Corps of Engineers, Handbook for Concrete and Cement (CRD).

CRD-C 13-66	Air-Entraining Admixtures for Concrete
CRD-C 41-67	Air Content of Freshly Mixed Concrete
CRD-C 55-65	Concrete Mixer Performance
CRD-C 100-64	Concrete Aggregate and Aggregate Sources and Selection of Material for Testing
CRD-C 119-53 (Rev. 63)	Flat and Elongated Particles in Coarse Aggregate
CRD-C 143-62	Meters for Automatic Indication of Moisture in Fine Aggregate
CRD-C 300-70	Membrane-Forming Compounds for Curing Concrete
CRD-C 400-63	Water for Use in Mixing or Curing Concrete
CRD-C 513-65	Rubber Waterstops
CRD-C 572-66	Polyvinylchloride Waterstops

1.4 American Society for Testing and Materials (ASTM) Publications.

A 185-69	Welded Steel Wire Fabric for Concrete Reinforcement
A 615-68	Deformed Billet-Steel Bars for Concrete Reinforcement

1.5 American Concrete Institute Standards (ACI).

ACI 315-65	Manual of Standard Practice for Detailing Reinforced Concrete Structures
ACI 318-63	Building Code Requirements for Reinforced Concrete

2. COMPOSITION.

2.1 Concrete shall be composed of portland cement, water, fine and coarse aggregate, and an air-entraining admixture.

3. **QUALITY.** The concrete mixtures will be designed by the Contracting Officer. The mix design will specify the minimum compressive strength at 28 days resulting from batching, placing and curing in conformance with these specifications.

3A. **SAMPLES AND TESTING.** Testing except as otherwise specified herein shall be performed by an approved testing agency and at no additional cost to the Government. Samples of concrete for strength tests shall be provided, stored and tested by the Contractor. Slump and air content tests will be required in addition to those specified.

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-192, 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-192, 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 Cement shall be sampled either at the mill or at the site of the work and tested by an approved independent commercial testing laboratory at no additional cost to the Government. Certified copies of laboratory test reports shall be furnished for each lot of cement and shall include all test data, results, and certification that the sampling and testing procedures are in conformance with the specifications. No cement shall be used until notice has been given by the Contracting Officer that the test results are satisfactory. Cement that has been stored, other than in bins at the mills, for more than 4 months after being tested shall be retested before use. Cement delivered at the site of the work and later found under test to be unsuitable shall be removed from the vicinity.

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 Corps of Engineers Specification CRD-C 13. The air-entraining admixture shall be added to the batch in solution in a portion of the mixing water. This solution shall be batched by means of a mechanical batcher capable of accurate measurement and in such a manner as will insure uniform distribution of the admixture throughout the batch during the specified mixing period.

5.1.2 Tests. Air-entraining admixture shall be tested by the Contractor for conformance to the referenced specification. Calcium chloride shall be certified for compliance with specification requirements. Other admixtures shall be tested for conformance to the reference specification under which furnished.

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, blast-furnace slag, or a combination thereof.

6.2 Sources and Evaluation Testing. Aggregates shall be produced from the approved 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 previously approved, the Contractor shall 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 shall be subjected shall include specific gravity, absorption, Los Angeles abrasion, soundness to 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 shall be conducted in accordance with the applicable Corps of Engineers methods of test given in Handbook for Concrete and Cement. Certified copies of the test results shall be submitted to the Contracting Officer for approval and quality evaluation of the aggregates.

6.3 Samples for Mix Designs. Samples of the aggregates, representative of the materials approved for use in the work, shall be taken under the supervision of the Contracting Officer in accordance with Corps of Engineers Specification CRD-C 100 and delivered transportation prepaid to U. S. Army Engineer Division, South Pacific, Sausalito, California, by the Contractor at his expense at least 45 days in advance of the time when the placing of concrete is expected to begin. Mix design studies and tests will be made by the Government and at its expense. The size of samples to be submitted shall be as follows:

Cement	5 sacks
Sand	1,000 pounds
No. 4 to 3/4 inch	800 pounds
3/4 inch to 1-1/2 inch	1,200 pounds
Air-entraining admixture	1 quart

6.4 Production Sampling and Testing. During construction, aggregates shall be sampled 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 from the weigh batcher. Production testing for gradation using appropriate Corps of Engineers and ASTM Test methods shall be performed at regular intervals with at least one test being made for each 500 cubic yards or fraction thereof of material used and results shall be submitted on a daily basis. Deviation from specification requirements shall be corrected immediately upon discovery. 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.

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	Retained on	Permissible Limits Percent by Weight	
		Minimum	Maximum
Passing			
No. 4	No. 4	0	5
No. 8	No. 8	5	20
No. 16	No. 16	5	35
No. 30	No. 30	5	35
No. 50	No. 50	3	45
No. 100	No. 100	2	28
		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 than 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 month's operation 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 month of operation.

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:

Sieve Size U.S. Standard	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 Corps of Engineers Specification CRD-C 119, shall not exceed 25 percent in any size group.

6.6 Storage. Aggregates shall be stored in the size groups specified above 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. 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 as determined by Corps of Engineers Specification CRD-C 400.

8. PROPORTIONING OF CONCRETE.

8.1 Control. The proportions of all material entering into the concrete shall be as directed. The proportions will be changed as necessary.

8.2 Cement Content. The cement content of the concrete for the various parts of the structure will range from an approximate minimum of 5.0 to an approximate maximum of 7.0 bags per cubic yard. The cement content of the concrete for lump sum items will be 6 bags per cubic yard.

8.3 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.

8.4 Air Content. The total calculated air content of that portion of air-entrained concrete containing aggregate smaller than the 1-1/2 inch square mesh sieve shall be between 4 and 7 percent of the volume of the concrete based on measurements made on concrete immediately after discharge from the mixer (CRD-C 41). The quantity of air within this range shall be as directed.

9. BATCHING AND MIXING.

9.1 Capacity. The Contractor shall provide a batching plant and concrete mixing equipment having a capacity of at least 800 cubic yards per hour.

9.2 Batching Plant.

9.2.1 Location. The batching plant may be located "on site" or "off-site."

9.2.2 Arrangement. Separate bins or compartments shall be provided for each size or classification of aggregate and for bulk portland cement when used. The compartments shall be of ample size and so constructed that the materials will be maintained separated under working conditions. The batching plant shall be equipped so that the flow of each material into its batcher is stopped automatically when the designated weight has been reached. Aggregates may be weighed in separate weigh batchers with individual scales, or cumulatively in one weigh batcher on one scale. Bulk cement shall be weighed on a separate scale in a separate weigh batcher. Water may be measured by weight or by volume. If measured by weight, it shall not be weighed cumulatively with another ingredient. Batching controls shall be so interlocked that the charging mechanism cannot be opened until the scales have returned to zero. These requirements can be satisfied by a semi-automatic batching system as defined in the Concrete Plant Standards of the Concrete Plant Manufacturers Bureau with interlocking as described above. The plant shall be arranged so as to facilitate the inspection of all operations at all times. Suitable facilities shall be provided for obtaining representative samples of aggregate from each of the bins or compartments for test purposes. Delivery of materials from the batching equipment shall be within the following limits of accuracy:

Material	Percent
Cement	1
Water	1
Aggregate	2
Admixtures	3

When aggregates are weighed cumulatively, the limit for aggregate applies to the total weight in the batcher after each aggregate size has been batched.

9.2.3 Water Batchers and Dispenser for Admixture. Equipment for batching water and the air-entraining admixture shall be provided at the batching plant (or included with the paving mixers or truck mixers as required for the type of plant used).

9.2.3.1 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.

9.2.3.2 Dispenser. A suitable device for measuring and dispensing the air-entraining admixture shall be provided. The device shall be capable of ready adjustment to permit varying the quantity of admixture to be batched. The dispenser for air-entraining admixtures shall be interlocked with the batching and discharging operations of the water so that the batching and discharging of the admixture will be automatic. (When use of truck mixers makes this requirement impracticable, the air-entraining admixture dispenser shall be interlocked with the sand batcher.)

9.2.4 Moisture Control. The plant shall be capable of ready adjustment to compensate for the varying moisture contents of the aggregate, and to change the weights of the materials being batched. An electric moisture meter complying with the provisions of CRD-C 143 shall be provided for measurement of moisture in the fine aggregate. The sensing element shall be arranged so that the measurement is made near the batcher charging gate of the sand bin or in the sand batcher.

9.2.5 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 National Bureau of Standards Handbook 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 of the indicating, recording or control devices, 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 percent of the capacity of the beam. The weighing equipment shall be arranged so that the plant operator can conveniently observe all dials or indicators.

9.2.6 Recorders.

9.2.6.1 An accurate recorder or recorders shall produce a graphical or digital record of the scale reading after each of the aggregates and cementitious materials has been batched prior to delivery to the mixer and after the batchers have been discharged (return to zero reference). The weight or volume of water shall also be recorded if batched at a central batching plant.

9.2.6.2 Each recorder shall be housed in a cabinet which shall be capable of being locked.

9.2.6.3 The charts or tapes shall clearly indicate the different types of mixes used by stamped letter, numerals, colored ink or by other suitable means. The charts or tapes shall be so marked that variations in batch weights of each type of mix can be readily observed.

9.2.6.4 The charts or tapes shall show time of day (stamped or pre-printed) at intervals of not more than 15 minutes.

9.2.6.5 The recorded charts or tapes shall become the property of the Government.

9.2.6.6 The recorders shall be placed in a position convenient for observation by the plant operator and Government inspector.

9.2.6.7 Protection. All weighing, indicating, recording, and control equipment shall be sufficiently protected against exposure to dust, moisture, and vibration so that there is no interference with proper operation of the equipment.

9.3 Concrete Mixers. Mixers may be stationary 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. Stationary and paving mixers shall be provided with an acceptable device to lock the discharge mechanism until the required mixing time has elapsed. The mixers or mixing plant shall include a device for automatically counting the total number of batches of concrete mixed. The mixers shall be operated at the drum or mixing blade speed designated by the manufacturer on the name plate. The mixing periods specified herein are predicted on proper control of the speed of rotation of the mixer drum or 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 and consistency of the concrete, or when test 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 by the Contracting Officer, the mixing time may be reduced to the minimum time required to meet all the following requirements.

Test	Maximum Allowable Variation of Any One Test Value From the Average of Three
Water content of mortar, by weight	5.0%
Coarse aggregate content of concrete, by weight	5.0%
Unit weight of air-free mortar	0.8%
Cement content of dried mortar, by weight	10.0%

Uniformity tests shall be made by and at the expense of the Contractor 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, uniformity tests at reduced mixing time shall be made by and at the expense of the Contractor 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.

9.3.1 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 1/2 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).

x 9.3.2 Truck Mixers. Truck mixers shall conform to the requirements of Federal Specification SS-C-618. 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 of 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 Federal Specification SS-C-618. 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.

9.3.3 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 one cubic yard; for mixers of larger capacities, the minimum mixing times shall be increased 15 seconds for each additional 1/2 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.

9.4 Sampling. Suitable facilities and labor shall be provided for readily obtaining representative samples of each size aggregate in the batch plant. Suitable facilities and labor 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.

9A. TESTS FOR COMPRESSIVE STRENGTH. The Contractor shall provide for test purposes 3 sets of test specimens taken under the supervision of the Contracting Officer, from each 150 cubic yards or fraction thereof and each mix design of concrete placed. At least one set of test specimens shall be provided for concrete of each mix design placed in each 8-hour shift. Each set shall consist of 4 test specimens, and shall be made from a separate batch. Samples shall be secured in conformance with ASTM Method C 172. Test specimens shall be made, cured, and packed for shipment in accordance with ASTM Method C 31. A slump test and an air test is required with each set of specimens. Additional slump and air tests shall be made at anytime there is a change in the appearance or consistency of the concrete. Specimens shall be cured under laboratory conditions except that the Contracting Officer may require curing under field conditions when he considers that there is a possibility of the air temperature's falling below 40 degrees F. Specimens shall be cured, stored and tested by and at the expense of the Contractor. Cylinders shall be tested in accordance with ASTM Test Method C 39. Each test result shall be the average of the strengths of the 2 test specimens of a set except that if one specimen in a set of 2 shows evidence, other than low strength, of improper sampling, molding, handling, or curing, the remaining specimen shall be considered the test result. The average of any 6 consecutive 28-day strength tests of specimens representing each mix design shall be equal to or greater than the specified strength, and not more than 20% of the strength tests shall have values less than the specified strength. Two cylinders from each set of specimens shall be broken at age 7 days and 28 days, respectively. When laboratory-cured specimens fail to conform to the requirements for strength, the Contracting Officer shall have the right to order a change in the proportions or in the water content of the concrete, or both, for the remaining portions of the work at no additional cost to the Government. If the average strength of the specimens cured under actual field conditions falls below the minimum allowable strength, the Contracting Officer may require changes in the conditions of curing temperature and moisture so as to secure the required strength. One additional set of 4 test specimens shall be made for every 6th set, cured and delivered to the Contracting Officer.

10. CONVEYING. Concrete shall be conveyed from the mixer to forms as rapidly as practicable, by methods which will prevent segregation or loss of ingredients. Any wet batch hopper through which the concrete passes shall be conical in shape. There shall be no vertical drop greater than 5 feet except where suitable equipment is provided to prevent segregation and where specifically authorized. Buckets used for conveying concrete shall conform to the requirements of paragraph 11.2. Chutes and other similar equipment will not be permitted for conveying concrete except when specifically approved. Belt conveyors with a speed of travel in excess of 500 feet per minute, and with positive means for preventing segregation of the concrete at transfer points and the point of placing, may be used when approved. Other belt conveyors shall not be used. Truck mixers or agitators used for transporting central-mixed concrete shall conform to the applicable requirements of Federal Specification SS-C-618. Non-agitating equipment for transporting central-mixed concrete may be used when authorized in writing by the Contracting Officer. Methods and equipment for handling and depositing the concrete in the form shall be subject to the approval of the Contracting Officer.

11. PLACING.

11.1 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 11.2. 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 galleries and 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 approximately horizontal surfaces of concrete on which new concrete is to be placed shall be covered by a layer of mortar of the composition directed. Concrete shall then be placed immediately upon the fresh mortar. 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.

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 bucket shall provide means for positive regulation of the amount and rate of deposit of concrete in each dumping position.

11.3 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, 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 90 degrees F. the time shall be reduced to 45 minutes. The concrete shall be placed within 15 minutes after it has been discharged.

11.4 Placing Temperature.

11.4.1 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.

11.4.2 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 95 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. Proposed methods shall be approved in writing by the Contracting Officer.

11.5 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.

11.6 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 and starter walls shall be placed in one lift unless otherwise authorized or directed.

11.7 Vibration of Concrete. Concrete shall be compacted with mechanical vibrating equipment supplemented by handspading and tamping. In no case shall vibrators be used to transport concrete inside the forms. The vibrating equipment shall be of the internal type and shall at all times be adequate in number of units and power of each unit to properly consolidate all concrete. Form or surface vibrators shall not be used unless specifically approved. Internal vibrators shall maintain a frequency when submerged in the concrete of not less than 6,000 impulses per minute for spuds with diameters greater than 5 inches and 7,000 impulses for smaller spuds. The intensity (amplitude) of vibration shall be sufficient to produce satisfactory consolidation. The duration of vibration shall be that necessary to produce satisfactory consolidation. The manipulation of the concrete adjacent to the surface of a lift in connection with completing lift placement shall be the minimum necessary to produce the required consolidation. Excessive surface working will not be permitted. Cobbles and coarse gravel protruding from the surface of the lift shall be "walked down" into the mass during the initial vibrating operations.

11.8 Placing Concrete Through Reinforcement. In placing concrete through reinforcement, care shall be taken that no segregation of the coarse aggregate occurs.

12. CONSTRUCTION JOINT TREATMENT.

12.1 General. As a lift is completed, the top surface shall be immediately and carefully protected from any condition that will damage the concrete.

12.2 Cleaning. 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 means of air-water jets will not be permitted and the use of wet sandblasting or high pressure water jet will be required.

12.2.1 Air-Water Cutting. Air-water cutting of a construction joint shall be performed at the proper time. The surface shall be cut with a high-pressure 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.

12.2.2 High-Pressure Water Jet. A stream of water under a pressure of not less than 1500 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.

12.2.3 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.

12.2.4 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. Methods of disposal shall be subject to approval.

13. EXPANSION, CONTRACTION AND VERTICAL CONSTRUCTION JOINTS.

13.1 General. Joints shall be provided at the location indicated on the drawings and according to the details shown or as otherwise approved. Type "J" construction joints shall be provided in the invert slab of open channel whenever concrete pouring is stopped for periods exceeding 45 minutes. In no case shall any fixed metal, embedded in concrete, be continuous through a contraction joint.

13.2 Asphaltic Paint conforming to Federal Specification SS-A-701 shall be applied to concrete surfaces, by brushing, at the locations shown on the drawings.

13.3 Troweled Bituminous Joint Material shall be asbestos fibered bituminous cement conforming to Federal Specification SS-C-153, Type I and shall be troweled in place at least 24 hours prior to placing adjacent concrete.

13.4 Waterstops. Waterstops of suitable synthetic rubber, a blend of natural and synthetic rubber, or of polyvinylchloride (PVC) shall be installed in joints as shown on the drawings or as otherwise directed. The type, location, dimensions, and method of installation shall be as shown on the drawings. Rubber waterstops shall comply with the requirements of CRD-C 513. Polyvinylchloride waterstops shall conform to the requirements of CRD-C 572. 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 during periods of low temperature when concrete placement has been discontinued. Joints and splices shall be as follows:

13.4.1 Rubber. Joints in rubber waterstops shall be vulcanized.

13.4.2 Polyvinylchloride. Splices in the continuity or at the intersections of runs of PVC waterstops shall be performed by heat sealing the adjacent surfaces in accordance with the supplier'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. 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. After splicing, a remolding iron with ribs and corrugations to match the pattern of the waterstop shall be used to re-form the ribs at the splice. The continuity of the characteristic members of the cross sections of the waterstop design (ribs, tubular center axis, protrusions, and the like) shall be maintained across the splice.

14. FINISHING.

14.1 General. Immediately after removal of forms, all unsightly 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. 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 repair of permanently exposed surfaces 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. 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, without additional mortar and shall be true to elevation as shown in the drawings. Care shall be taken to see that all free water has disappeared before making any finish. Other surfaces shall be brought to the specified elevation and left true and regular. Unless otherwise indicated on the drawings, joints shall be carefully made with a jointing tool. Every precaution shall be taken by the Contractor to protect finished surfaces from stains or abrasions. Surfaces or edges likely to be injured during the construction period shall be properly protected.

14.2 Unformed Surfaces. Wood floating shall be started as soon as the screeded surface has stiffened sufficiently to permit floating and shall be the minimum necessary to produce a surface that is free from screed marks and is uniform in texture. Floating may be performed by use of hand or power-driven equipment.

14.3 Surface Irregularities. Surface irregularities of either a floated or troweled finish shall not exceed 1/4-inch as measured with a 10 foot template.

15. CURING AND PROTECTION.

15.1 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, and flowing water for 14 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.

→ 15.2 missing + at the option of the contractor
15.3 Membrane Curing. ~~Concrete~~ in all structures or portions of structures except test sections, cut-off walls, surfaces to which concrete is to be bonded, and surfaces to receive joint material shall be cured with an approved clear nonpigmented compound of the surface membrane type. The curing compound shall conform to Corps of Engineers Specification CRD-C 300. 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 in a 2-coat continuous operation by approved

power-spraying equipment and at a uniform coverage of not more than 400 sq. ft. per gallon for each coat. Concrete surfaces which have been subjected to rainfall within 3 hours after curing compound has been applied shall be resprayed by the method and at the coverage herein specified. All concrete surfaces on which the 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.

15.4 Cold Weather. The air and forms in contact with concrete sections having 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.

16. FORMS AND FORMED SURFACES.

16.1 General. Forms shall be mortartight and shall be structurally adequate, properly aligned and adequately supported to produce concrete surfaces meeting the surface requirements of paragraph 16.2 and conforming to the positions shown on the drawings within the tolerances given in paragraph 16.3. That portion of the form in contact with the concrete shall not be of 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 subject to specific approval. Bolts and rods used for internal ties shall be so arranged, that when the forms are removed, metal will by 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.

16.2 Surface Finish Requirements. The class of finish required for the various surfaces of the structures shall be as specified on the drawings. Allowable irregularities are designated "abrupt" and "gradual" for purposes 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 straightedge for plane surfaces, or a "shaped" template for curved or warped surfaces. The requirements for the classes of finish specified on the drawings and for the types of form materials permitted for each class shall be as indicated below:

16.2.1 Class "B" Finish. All formed surfaces of concrete that will be permanently exposed shall have a Class "B" finish. The sheathing shall be composed of 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.

16.2.2 Class "D" Finish. All formed surfaces of concrete upon or against which concrete or earth fill will be placed shall have a Class "D" finish. The sheathing may be of wood, or steel, or may be steel lined. "Gradual" and/or "abrupt" irregularities shall not exceed 1-inch.

16.3 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 table:

TABLE I

CONSTRUCTION TOLERANCES FOR MASS CONCRETE STRUCTURES

(1) All structures:			
a.	Variation of the constructed linear outline from established position in plan	In buried construction	1 inch 2 inches
b.	Variations of dimensions to individual structure features from established positions	In buried construction and bulkhead faces	1 inch 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, arch sections, vertical joint grooves, and visible arrises	In 10 feet In 20 feet In 40 feet or more In buried construction, twice the above amounts	1/2 inch 3/4 inch 1-1/4 inch
b.			
	Variation from the level or from the grades indicated on the drawings in slabs, beams, soffits, lintels, sills, horizontal joint grooves, and visible arrises	In 10 feet In 30 feet or more In buried construction, twice the above amounts	1/4 inch 1/2 inch
(3) a.			
	Variation in cross sectional dimensions of columns, beams, buttresses, piers, and similar members	Minus Plus	1/4 inch 1/2 inch
b.			
	Variation in the thickness of slabs, walls, arch sections, and similar members	Minus Plus	1/4 inch 1/2 inch
(4) Footings for columns, piers, walls, buttresses, and similar members:			
a.			
	Variation of dimension in plan	Minus Plus	1/2 inch 2 inches
b.			
	Misplacement or 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	
(5) Variation in the sizes and locations of sleeves, floor openings, and wall openings			1/4 inch

16.4 Coating. Forms for exposed surfaces shall be coated with an approved nonstaining form coating. The coating and any filler used for filling cracks shall not interfere with the set of the concrete nor be otherwise deleterious. After coating, surplus coating on the form surfaces and any coating on the reinforcing steel or other surfaces requiring bond with the concrete shall be removed. Forms for unexposed surfaces may be thoroughly wetted immediately before the placing of concrete, except that in freezing weather coating shall be used.

16.5 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 otherwise directed or specifically authorized.

Beams and deck-type slabs	144 hr
Walls	48 hr

When conditions on the work are such as to justify the requirement, forms will be required to remain in place for longer periods.

17. FURNISHING AND PLACING STEEL REINFORCEMENT.

17.1 General. The Contractor shall furnish, cut, bend and place all steel reinforcement including rods, fabric, and structural shapes as indicated on the approved drawings or otherwise required. At the time of concrete placement, all reinforcement shall be free from loose flaky rust, scale (except tight mill scale), 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 of reinforcement shall be in accordance with ACI 315 or ACI 318 as applicable.

17.2 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 typical supports for reinforcing steel shall be submitted and approval received prior to placing any concrete.

17.3 Hooks and Bends. Steel reinforcement may be mill or field bent. All hooks and bends shall be in accordance with ACI 318.

17.4 Quality. The steel reinforcement shall conform to the requirements of ASTM Specification A 615, grade 40. Welded wire fabric shall conform to the requirements of ASTM Specification A 185.

17.5 Spacing of Bars. The spacing of bars shall be as shown on the contract drawings or as directed. Maximum variation from the indicated position shall be 1-inch as measured along the row of bars.

17.6 Concrete Protection for Reinforcement. The minimum cover for main reinforcement shall conform to the dimensions shown on the drawings and shall be within the tolerances specified in Table II. The dimensions indicate the clear distance from the edge of the main reinforcement to the concrete surface. The concrete covering of stirrups, spacer bars and tie bars may be reduced by the diameter of such bars. All reinforcement shall be secured in place by use of steel or concrete supports, spacers or ties, as approved. Such supports shall be of sufficient strength to maintain the reinforcement in place throughout the concreting operation. The supports shall be used in such manner that they will not be exposed or contribute in any way to the discoloration or deterioration of the concrete. Metal spreaders will not be permitted within 2 inches of concrete surfaces. All reinforcement shall be securely tied with No. 18 gage black annealed wire at alternate intersections.

TABLE II
TOLERANCES FOR REINFORCING STEEL COVER

CLEAR COVER	MAX. VARIATION
4"	3/8"
3"	3/8"
2"	1/4"
1-1/2"	1/4"
1"	1/8"
3/4"	1/8"

17.7 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.

17.7.1 Lapped Splices. Lapped splices only shall be used 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 apart 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.

18. 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.

19. FORMED 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.

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SECTION 5B
REINFORCED MASONRY
(CONCRETE BLOCK)

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| 1. Applicable Publications | 6. Air-Dry Condition |
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| 4. Samples | 9. 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 Federal Specifications.

QQ-W-461g & Am-1	Wire, Steel, Carbon, (Round, Bare and Coated)
SS-C-621b & Int. Am-1 (GSA-FSS)	Concrete Masonry Units, Hollow (and Solid, Prefaced and Unglazed)

1.2 American Society for Testing and Materials Standards.

A 153-67	Zinc Coating (Hot-Dip) on Iron and Steel Hardware
A 615-68	Deformed Billet-Steel Bars for Concrete Reinforcement
C 33-67	Concrete Aggregates
C 90-66T	Hollow Load-Bearing Concrete Masonry Units
C 144-66T	Aggregate for Masonry Mortar
C 266-65	Time of Setting of Hydraulic Cement by Gillmore Needles
C 331-64T	Lightweight Aggregate for Concrete Masonry Units
C 404-61	Aggregates for Masonry Grout
C 426-66T	Drying Shrinkage of Concrete Block
C 427-64	Moisture Condition of Hardened Concrete by the Relative Humidity Method
C 476-63	Mortar and Grout for Reinforced Masonry
E 84-68	Surface Burning Characteristics of Building Materials

1.3 Corps of Engineers Publications.

CRD-C 566-64	Specification for Grout Fluidifier
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1.4 American Concrete Institute.

ACI 315-65	Manual of Standard Practice for Detailing Reinforced Concrete Structures
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2. MATERIALS.

2.1 Anchors and Ties shall be of approved design and, except as otherwise specified herein, shall be zinc-coated ferrous metal of the types noted below. Zinc coating of anchors and ties shall conform to ASTM Standard A 153, Class B-1, B-2, or B-3, as required.

2.1.1 Supports and Fastenings for Equipment are specified in section: MISCELLANEOUS METAL WORK AND MATERIALS.

2.1.2 Centering-Clips and Caging-Devices for positive positioning reinforcing bars shall conform to Federal Specification QQ-W-461, AISI 1006, 1010 or 1015, Finish 5, Class 1, hard, and shall be of standard manufacture of a design as approved.

2.2 Aggregates.

2.2.1 Aggregate for Masonry Units. Aggregates used in making concrete masonry units shall conform to ASTM Standard C 33 or C 331, except as modified hereinafter. Grading of aggregates as stipulated in Section 7 in ASTM Standard C 33 and testing of lightweight aggregates for drying shrinkage as stipulated in Section 6(a) in ASTM Standard C 331 will not be required. Lightweight aggregates shall comply with the following requirements when tested for stain-producing iron compounds: (a) When determined by visual classification method, the iron stain

deposited on the filter paper shall not exceed the "light-stain" classification, and (b) when determined by chemical-analysis method and reported as Fe_2O_3 , the iron stain deposited on the filter paper from a 200-gram sample shall not exceed 1.2 mg. Fe_2O_3 .

2.2.2 Aggregate for Mortar shall conform to ASTM Standard C 144.

2.2.3 Aggregate for Fine Grout shall conform to ASTM Standard C 404, Table 1, fine aggregate, size No. 2.

2.2.4 Aggregate for Low-Lift and High-Lift Grout shall conform to ASTM Standard C 404, Table 1, coarse aggregate, size No. 8, except that the coarse aggregate shall be graded with 100% passing the 3/8-inch sieve and not more than 5% passing the No. 8 sieve.

2.3 Concrete Masonry Units shall be 2-core units of modular dimensions and shall include all closers, jamb units, headers, and special shapes and sizes required to complete the work as indicated. Units shall conform to ASTM Standard C 90, Type I, Grade UI, except that maximum linear drying-shrinkage shall be 0.04 percent as determined in consonance with ASTM Standard C 426, and units shall be delivered to the jobsite in an air-dry condition as specified in paragraph: AIR-DRY CONDITION. Exposed-to-view units shall be of the same appearance, and shall be cured by the same process. Units shall be free of any deleterious matter that will stain plaster or corrode metal, and shall weigh not more than 115 pounds per cubic foot.

2.4 Grout shall conform to ASTM Standard C 476 except as modified hereinafter. Grout shall be classified as fine, low-lift or high-lift type. The aggregate shall be as specified in paragraph: AGGREGATES for applicable type. Grout shall attain a minimum compressive strength at 28 days of 2,000 pounds per square inch. When used in the work, grout shall be mixed in the laboratory-established proportions which shall include the water content necessary to obtain the consistency required for use in the work. The fine and low-lift grout mixtures shall be designed to have water content which shall give a pouring consistency with a slump of approximately 5 inches, without segregation of the constituents. When used in the work and placement is by high-lift methods, the grout shall be mixed in the laboratory-established proportions which shall include fluidifier and water content necessary to obtain a slump of approximately 11 inches, suitable for pumping, without segregation of the constituents. One pound of fluidifier shall be added for each sack of cement with a maximum of 6 pounds per cubic yard. The fluidifier shall comply with Corps of Engineers Specification, CRD-C 566. Adjustment in the cement content shall be made to insure that the grout meets the structural properties. The Contractor shall furnish a certified copy of laboratory-established proportions and tests as evidence that the grout used in the work meets the requirements specified herein. No change in the laboratory-established proportions shall be made nor shall materials with different physical or chemical characteristics be utilized in grout used in the work unless the Contractor furnishes additional evidence that such grout meets the requirements specified herein.

2.5 Mortar shall conform to ASTM Standard C 476 except as modified hereinafter. The aggregate shall be as specified in paragraph: AGGREGATE FOR MORTAR. When tested for compressive strength, the water-retention requirements for mortar stipulated in ASTM C 476 shall apply. The mortar shall obtain a minimum compressive strength at 28 days of 2,000 pounds per square inch. When used in the work, mortar shall be mixed in the laboratory-established proportions with as much water as may be necessary to produce the workability desired regardless of initial flow. The Contractor shall furnish a certified copy of laboratory-established proportions and tests as evidence that the mortar used in the work meets the requirements as specified herein. No change in the laboratory-established proportions shall be made nor shall materials with different physical or chemical characteristics be utilized in mortar used in the work unless the Contractor furnished additional evidence that such mortar meets the requirements as specified herein.

3. HANDLING AND STORAGE. Masonry materials shall be stored in an approved manner that will protect them from contact with soil and exposure to the elements.

4. SAMPLES. The following samples of materials proposed for use shall be submitted to the Contracting Officer and his approval thereof received before materials represented by the samples are delivered to the project site.

4.1 Anchors, Centering Clips, and Caging Devices. Two of each type propose for use.

4.2 Concrete Masonry Units. All shapes, sizes, and kinds, in sufficient numbers to show full range of color and texture.

5. CERTIFICATES. The Contractor shall furnish certificates in accordance with the requirements of the Special Provisions prior to delivery of the certified material to the project site. 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 location, and the quantity and date or dates of shipment or delivery of the material to which the certificate applies. Concrete masonry units, shall be certified for compliance with all specification requirements. Aggregate for concrete masonry units shall be certified for compliance with specification requirements for nonstaining and popout properties. Mill certificates of test on bar steel shall be provided.

6. AIR-DRY CONDITION. Upon delivery of concrete masonry units to the project site, samples will be selected at random from stockpiles and tested for air-dry condition. Sampling and testing will be by and at the expense of the Government and will be in accordance with ASTM Specification C 427. Air-Dry condition is defined as the moisture condition of a concrete masonry unit in a state of equilibrium with a relative humidity of not greater than 15% higher than the average relative humidity at the project site, except that the relative humidity of the unit at equilibrium shall not exceed 85% and shall not be required to be less than 50%. The average relative humidity at the project site shall be as determined by the nearest U.S. Weather Bureau station from the Total of Annual observations recorded for the month in which the unit is delivered.

7. TESTS.

7.1 Concrete Masonry Units.

7.1.1 For Drying-Shrinkage. Sampling and testing to determine the linear shrinkage potential of concrete masonry units shall be done at the expense of the Contractor by an approved commercial testing laboratory not more than 3 months nor less than 2 weeks before delivery of units to the project site. Three copies of such test shall be signed by the testing laboratory and countersigned by the Contractor and shall be submitted to the Contracting Officer at least 10 days before delivery of units to the project site. No change in manufacturing processes and techniques or in drying and curing procedures shall be made nor shall materials with different physical or chemical characteristics be used in units delivered to the project site unless the Contractor verifies the linear shrinkage potential by additional signed test reports.

7.1.1.1 Samples for Testing. A sample of 5 individual and whole units representative of the manufacturer's product whose units are proposed for use shall be selected after cooling and/or curing at the point of manufacture. Sample units shall prove under test to be free from cracks or other structural defects, and to have been manufactured with the same type and quality of aggregate, and cured and dried by the same procedures as those to be employed in producing units for use in the work. Units previously subjected to tests involving temperatures exceeding 150 degrees F. shall not be used in drying-shrinkage tests.

7.1.1.2 Testing shall be done in accordance with ASTM Standard C 426.

7.2 Tests for Mortar and Grout and establishing their proportions to be used in the work shall be done by an approved commercial testing laboratory at the expense of the contractor.

8. ERECTION.

8.1 General. Masonry shall not be erected when the ambient temperature is below 35 degrees F. except by written permission of the Contracting Officer. No frozen work shall be built upon. No unit having a film of water or frost on its surface shall be laid in the walls. Masonry shall be protected from freezing for 48 hours after being laid. Masonry erected during arid weather when the ambient air has a temperature of more than 99 degrees F. in the shade and a relative humidity of less than 50% shall be protected from direct exposure to wind and sun for 48 hours after installation. Masonry shall be laid plumb, true to line, with level courses accurately spaced with the course next below. Vertical cells to be filled with grout shall have vertical alignment sufficient to maintain a clear, unobstructed continuous vertical core of dimensions stipulated in Table II. Each unit may be adjusted to its final position in the wall while mortar is still soft and plastic. Any unit which is disturbed after mortar has stiffened shall be removed and relaid with fresh mortar. Bond pattern shall be kept plumb throughout. Corners and reveals shall be plumb and true. Vertical joints shall be of the same width except for inconspicuous variations required to maintain the bond pattern. The sizes of any 2 adjacent units shall be selected within permitted tolerances so that the difference between the vertical faces of such units in exposed-to-view or painted walls or partitions as installed in habitable rooms and spaces shall not exceed 1/8 inch. The controlling alignment shall be on the exterior side of exterior walls and on the corridor side of corridor walls. Units in exposed-to-view walls shall be free from chipped edges or other imperfection detracting from the appearance of the finished work.

8.1.1 Wetting Materials.

8.1.1.1 Concrete Masonry Units, shall not be wetted before laying.

8.1.2 Protection.

8.1.2.1 General. Surfaces of masonry not being worked on shall be properly protected at all times during construction operations. At such time as rain is imminent and the work is discontinued, the tops of exposed masonry walls shall be covered with a strong waterproof membrane well secured in place. Adequate provisions shall be made during construction to prevent damage from wind.

8.1.3 Mortar that has stiffened because of chemical reaction of hydration, shall not be used. Except as specified below, mortar shall be used and placed in final position within 2-1/2 hours after mixing where air temperature is 80 degrees F. or higher and within 3-1/2 hours after mixing where air temperature is less than 80 degrees F. Mortar not used within these time intervals shall be discarded. When cement or cements used in the mortar have been tested and the observed time of initial set has been determined in accordance with ASTM Standard C 266, an option method of determining the time interval during which the mortar must be placed in final position may be used as follows:

Air Temperature in Degrees F.	Time Interval After Mixing
80 or higher	Time of initial set minus 1 hour
Less than 80	Time of initial set minus 1/2 hour

Mortars that have stiffened within the time interval, as determined above, because of evaporation of moisture from the mortar, may be retempered to restore workability by adding water as frequently as needed. As much water may be added as is practicable without impairing the workability of the mortar.

8.1.4 Unfinished Work shall be stepped back for joining with new work; toothing may be resorted to only when specifically approved. Before new work is started, all loose mortar shall be removed and the exposed joint shall be thoroughly cleaned.

8.1.5 Embedded Items. Spaced around metal door frames and other built-in-items shall be solidly filled with grout or mortar. Anchors, accessories, and other items required to be built-in with masonry shall be built-in as the masonry work progresses. Cutting and fitting of masonry required to accommodate the work of others shall be done by masonry mechanics with masonry saws. Anchor bolts, bearing plates, and other anchors shall be built into the walls at all point and in the manner indicated. Cells which receive anchor bolts or support bearing plates shall be filled, solidly with grout.

8.1.6 Motor Joints on the weather side of exterior walls and on all exposed-to-view interior wall surfaces, shall be tooled slightly concave with a device of as long a length as practicable and so that the mortar will be thoroughly compacted and pressed against the edges of the units. Tooling shall not be done until after the mortar has taken its initial set. All other face joints shall be cut off flush and not tooled. Chases and raked out joints shall be kept free from mortar or other debris. The following joints on the weather side of exterior masonry walls shall be raked out 3/4 inch and left ready for sealing: joints between metal frames and masonry. Exposed mortar head and bed joints in masonry work shall have a thickness equal to the difference between the actual and nominal dimensions of the masonry in either height or length; but in no case shall the average width of any 3 adjacent joints vary by more than 1/8 inch. The width of all exposed mortar joints shall be approximately 3/8 inch for concrete-masonry-units.

8.1.7 Placement of Reinforcing Steel. Bars, fabricated to shapes and dimensions shown, shall be placed where indicated on the drawings or where required to carry out the intent of the drawings and these specifications. All reinforcement shall be, when surrounding grout is placed, free from loose, flaky rust, and scale, and free from oil, grease mortar or other coating which might destroy or reduce its bond with the grout. Unless otherwise indicated, the details of reinforcing steel shall conform to ACI 315. Reinforcing steel shall not be bent or straightened in a manner injurious to the steel. Bars with kinks or bends not shown on drawings shall not be used. The use of heat to bend or straighten reinforcing steel or welding or bars will be permitted only if the entire operation is approved. Placement of reinforcement shall be inspected and approval received from the Contracting Officer prior to placing grout. Unless otherwise indicated, construction shall conform to the following requirements.

8.1.7.1 Splicing Bars. Bars shall be lapped a minimum of 40 diameters or 2 feet, whichever is greater. Lapped ends of bars shall be placed in contact and securely wired together with No. 18-Gage black annealed wire. Splices shall be located as shown on approved shop drawings. Reinforcing steel shall not be spliced at points of maximum stress. At points of critical stress, splices in adjacent bars shall be staggered.

8.1.7.1 Positioning Bars. Reinforcing steel shall be accurately located in the masonry and securely held in place by means of metal or concrete supports, centering-clips, spacers, ties or caging-devices adequate to prevent displacement during the course of construction. Such supports shall be of sufficient strength to maintain the reinforcement in place throughout the grouting operation. Dowels or bars extending from concrete shall be positioned to located vertical wall reinforcement on center-line of wall, unless otherwise indicated. Vertical bars shall be fixed in position at the top and bottom, and when the grout pour exceeds 6 feet, at intermediate intervals not exceeding 160 diameters of the bar. The minimum clearance distance between parallel bars shall be not less than 1-1/2 times the diameter of the bar. The minimum clear distance between masonry-unit and reinforcing bars shall be 1/2 inch. The position of bars shall be as shown on the drawings within tolerances shown in Table I.

TABLE I

CONSTRUCTION TOLERANCE FOR PLACING WALL REINFORCEMENT

(1) Variation in transverse position	1/2 inch
(2) Variation from longitudinal position	2 inch
(3) Variation from vertical position	1 inch

8.1.7.3 Bond-Beam Bars. Minimum bond beam reinforcement shall be as specified on drawings. Bars shall be continuous in exterior wall bond beam at roof level; bar splices shall be staggered. Bond beams at roof level shall be anchored to roof construction as indicated.

8.1.7.4 Basic Wall Reinforcement. All walls shall be reinforced with vertical bars as detailed.

8.1.8 Bond and Anchorage. Unless otherwise indicated, each tier of masonry units shall be laid in straight even courses using a running bond pattern with the joints in the successive course above breaking halfway between the joints of the course next below. Each course shall be masonry bonded at corners.

8.1.9 Bond Beams in grouted-core hollow unit masonry construction shall consist of bond-beam units filled with grout and reinforced as indicated. When open bottom bond-beam units are used, wire mesh, small mesh expanded metal lath or other approved material shall be placed in the mortar joint immediately under each bond-beam course, except at vertical cores which are to be grouted in order to cover and prevent filling of the unreinforced vertical cores below.

8.1.10 Concrete Surfaces which are to receive or to be in contact with masonry shall be clean and damp, the laitance removed by sandblasting if necessary, and the aggregate exposed.

8.1.11 Cleanout Holes shall be provided at bottom of grout pours when in-place masonry exceeds 24 inches in height. Spacing of openings shall not exceed spacing of vertical reinforcement. Cleanout openings shall be of sufficient size and located to allow flushing away mortar droppings and debris, and for wiring bars lapped with dowels when vertical bars are placed after masonry is laid. In hollow-masonry construction, cleanout opening shall be a 4 x 4-inch cut from 1 face shell of each reinforced vertical core, or at option of Contractor, an approved manufacturer's standard cleanout unit. Cleanout holes shall not be plugged until the masonry work, reinforcement, and final cleaning of grout spaces have been approved. Cleanout holes shall be plugged with material to match the surrounding masonry. A new series of cleanouts shall be established if grouting operations are stopped for a period longer than 4 hours.

8.1.12 Placement of Grout. Before commencing grouting operations, the Contractor shall notify the Contracting Officer. Reinforcing bars shall be secured in position, inspected, and approved before grouting. Grout shall be poured by hand-bucket, concrete hopper, or through a grout pump in such a manner as to completely fill the grout spaces without segregation of the ingredients. Immediately after deposit, the grout shall be thoroughly compacted by agitating in an approved manner. Tapping or other external vibration of the masonry or reinforcement will not be permitted.

8.1.12.1 Use of Equipment. The use of belt conveyers, chutes, or other similar equipment will not be permitted without written approval. Grout shall be handled from mixer to transport vehicle to place of final deposit in a continuous manner, as rapidly as practicable, and without segregation or loss of ingredients until the approved unit of operation is completed. Where grout is conveyed and placed by pumping, the plant and equipment shall be approved by the Contracting Officer. Operation of pump shall be such that a continuous stream of grout without air pockets is produced. When pumping is completed, grout to be used remaining in pipeline shall be ejected without contamination of grout or separation of ingredients. Each lift or pour shall be compacted by hand-spading and rodding with 1 x 2-inch wood tamping poles supplemented by 3/4-inch flexible-cable, immersion-type, mechanical vibrators as directed. Vibrators shall not be used to transport grout inside walls. Internal vibrators shall maintain a speed of not less than 5,000 impulses per minute when submerged in the grout. Vibrators shall be applied at uniformly spaced points not further apart than the visible effectiveness of the machine. Duration of vibration shall be limited to time necessary to produce satisfactory consolidation without causing objectionable segregation. The vibrators shall not be inserted into lower pours that are not still in a plastic state. Before each run, hardened grout, debris, and foreign materials shall be removed from inner surfaces of mixing and conveying equipment. After each run, equipment shall be thoroughly cleaned and waste material, debris and flushing water shall be discharged outside the masonry.

8.1.12.2 Low-Lift Method. Grout placed as laying of masonry progresses is classified as low-lift grouting. Height of any ungrouted masonry shall not exceed 24 inches. Grout shall be placed while mortar joints are still soft and plastic or the grout spaces shall be cleaned of mortar droppings and protruding mortar joints removed. The type of grout and maximum pour height shall be governed by dimensions of grout spaces as stipulated in Table II.

8.1.12.3 High-Lift Method. Grout placed after wall is laid, higher than 24 inches, is classified as high-lift grouting. Cleanout holes shall be provided at bottom of each grout pour. For purpose of this paragraph, a grout pour is considered to be the entire height of grout placed in a single work day. Placement of a grout pour shall be made at such rate that successive lifts (layers) in an individual pour unit shall be placed and consolidated while the preceding lift is still soft and plastic. The type of grout and maximum pour heights shall be governed by dimensions of grout spaced as stipulated in Table II.

8.1.12.4 Maximum Height of Grout Pours. The height of grout pours and the type of grout used will be limited by dimensions of grout spaces; height of grout pours shall not exceed the dimensions shown in Table II.

TABLE II POUR HEIGHT AND TYPE OF GROUT FOR GROUT SPACE DIMENSION

GROUT SPACE DIMENSIONS		TYPE OF GROUT MAXIMUM HEIGHT OF GROUT POUR	
Minimum Horizontal Dimensions of Core (Inches)	Minimum Width of Collar Joint (Inches)	(As Specified in PARAGRAPH: GROUT)	(Inches)
Less than 2 x 4	Less than 2	Fine or Mortar	8
2 x 4	1	Fine or Mortar	16
2-1/2 x 4	2-1/2	Fine or Low-Lift	25
3 x 4	3	High-Lift (1)	72 (2)
3-1/2 x 4	3-1/2	High-Lift (1)	180 (2)

(1) High-Lift pours shall be placed in lifts (layers) not to exceed 3 feet in height.

(2) For Grouted-Core (concrete-stud) construction, the maximum height of pour shall not exceed the distance between bond beams.

8.1.12.5 Time Interval for Placement of Grout. The grout shall be handled from the mixer to the final place of deposit as rapidly as practicable. Grout shall be placed and consolidated before it has stiffened because of chemical reaction of hydration. Grout not used within time interval stipulated in Table III shall be discarded.

TABLE III TIME INTERVAL FOR PLACEMENT OF GROUT

AIR TEMPERATURE in Degrees F.	TIME INTERVAL Not Tested for Initial Set		TIME INTERVAL (At Option of Contractor) Tested for Initial Set	
	Low-Lift	High-Lift	TIME OF INITIAL SET MINUS	
	Low-Lift	High-Lift	Low-Lift	High-Lift
80 or higher	2-1/2 Hours	1-1/2 Hours	1 Hour	2 Hours
Less than 80	3-1/2 Hours	2-1/2 Hours	1/2 Hour	1-1/2 Hours

(1) Time interval shall be measured from time water is first added to batch until grout is placed in final position.

(2) "Time of Initial Set" for cement or cements used shall be determined in accordance with ASTM Standard C 266.

8.1.12.6 Grouting Procedures. Before depositing grout on concrete, the contact surfaces of the concrete shall be clean and damp, the laitance removed, and the aggregate exposed. High-lift grouting shall not be poured until the mortar of the masonry-work has been allowed to set a minimum of 3 days in hot weather or 5 days in cold damp weather. Grout shall first be poured to a height of 1 lift and rodded or vibrated to thoroughly fill all voids, spaced and interstices. After a waiting period a second lift shall be poured to the same depth and all spaces again rodden. When consolidating the upper lift, permit the tamping poles or vibrator to penetrate into the preceding lift, 1/3 to 1/2 its depth, to reconsolidate and to make the 2 lifts monolithic. The waiting period between placement of lifts, 15 to 60 minutes, will depend upon type of construction, type of units, spacing of wall ties, height of lifts and weather conditions. The rate of lift placement shall be controlled within limits which will avoid either hydrostatic blowouts or formation of cold joints. Repeat the waiting, pouring and rodding steps until the top of the wall is reached. The top lift shall also be reconsolidated after a waiting period. At end of each workday, the grout shall be stopped 1-1/2 inch (plus or minus 1/2 inch) below top of uppermost in-place masonry unit, except lift at top of wall shall be carried to top of masonry units. Vertical members shall be poured at least 2 hours before any horizontal overhead work is placed thereon. Grout in bond beams shall be placed continuously so that pour of the member will be monolithic. Reinforcing bars splashed with grout shall be recleaned in advance of placing subsequent grout pours. Placement of grout will not be permitted when, in the opinion of the Contracting Officer, the sun, heat, wind, or limitations of facilities furnished by the Contractor prevent proper placement and curing of the grout.

8.1.12.7 Blowouts. Walls shall be braced against wind and other forces during construction. If blowouts, misalignment or cracking of face-shells should occur during construction the wall shall be torn down and rebuilt at no additional cost to the Government. The high-lift grouting of any section of wall between lateral flow barriers shall be completed to the top in 1 working day unless a new series of cleanout holes are established and the resulting horizontal construction joint cleaned. Should a breakdown in equipment or any other emergency cease the grouting operation an alternate procedure shall be used only with approval of the Contracting Officer.

8.1.12.8 Cleaning Wall Surfaces. Immediately after the grout work is completed, the exposed masonry faces shall be washed down thoroughly with a pressure stream of water through a jet nozzle to remove any scum or stains. Subsequent cleaning may be necessary as the curing takes place and before final acceptance, and as directed by the Contracting Officer.

8.1.13 Forms and Shores. Forms shall conform to the shape, lines, and dimensions of the members as called for on the drawings, and shall be substantial and sufficiently tight to prevent leakage of mortar and grout. They shall be properly braced or tied together so as to maintain position and shape. Supporting forms and shores shall not be removed 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 elapse after building masonry walls before constructing roof.

8.2 Reinforced Hollow Unit Masonry is that type of construction made with hollow masonry units, reinforced vertically and horizontally with steel bars, and certain cells and spaces filled solidly with grout as indicated on the drawings and as specified hereinafter. The masonry units shall be limited to concrete masonry units.

8.2.1 Laying Hollow Masonry Units. The units shall be laid in straight even courses using a running bond pattern with the joints in the successive course above breaking halfway between the joints of the course next below. All head and bed joints shall be filled solidly with mortar for a distance in from the face of the unit of not less than the thickness of the face shell. Mortar shall not extend through the unit on the web edges, except for cross webs forming a barrier to confine horizontal flow of grout. Webs forming vertical barriers shall be full bedded in mortar. Joints in walls supporting shelf frame, voids at door jambs, and other spaces requiring grout fill shall be full bedded in mortar to prevent grout leakage, and all cells filled solidly with grout or mortar. Jamb units shall be of shape and size required to bond with wall units and shall be built in where shown or required. No cells shall be left open in face surfaces. Sections of solid units shall be incorporated in the masonry work where necessary to fill out all corners, and elsewhere as required.

8.2.2 Grouted-Core (Concrete-Stud) Construction. Cores and voids containing reinforcing bars or embedded items shall be filled solidly with grout as the work progresses. The height of any ungrouted masonry shall not exceed the height limit for grout pours as stipulated in Table III. Each sequence of grout pours shall extend from bottom of reinforced cores, or previous grouted increment, to within 2 inches of top of the last masonry course laid, except at top of wall the pour shall be carried to top of mason units. The bond-beam pour shall completely fill the bond-beam pour unit and the remaining top 2-inches of the studs previously filled. Top surface of any grout pour which has hardened shall be thoroughly roughened and cleaned of laitance, foreign matter and loose particles before placing additional masonry or grout. The high-lift grout method may, at option of Contractor, be used for grouting reinforced studs between floor and bond beam. Unreinforced cores shall not be filled.

9. POINTING AND CLEANING. Mortar daubs or splashings, before setting or hardening, shall be completely removed from masonry-unit surfaces that will be exposed. Before completion of the work, all defects in joints of masonry to be exposed shall be raked out as necessary, filled with mortar, and tooled to match existing joints. Masonry surfaces shall not be cleaned, other than removing excess surface mortar, until mortar in joints has hardened. Masonry 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.

9.1 Concrete-Masonry-Unit Surfaces shall be dry-brushed at the end of each day's work and after any required pointing.

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SECTION 5D

STONE PROTECTION

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|----------------------------|----------------------------------|
| 1. Applicable Publications | 4. Placement |
| 2. Material | 5. Scales |
| 3. Foundation Preparation | 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 127-68	Specific Gravity and Absorption of Coarse Aggregate
C 535-69	Resistance to Abrasion of Large Size Coarse Aggregate by Use of the Los Angeles Machine
C 136-67	Sieve or Screen Analysis of Fine and Coarse Aggregates

2. MATERIAL.

2.1 General. All stone shall be sound, durable, hard, free from laminations, weak cleavages, and undesirable weathering, and of such character that it will not disintegrate from the action of air, water, or the conditions to be met in handling and placing. All stone shall be clean and free from earth, clay, refuse, and adherent coating. Suitable 1,000 pound samples of materials from each source which the Contractor proposes to use in the work shall be taken by the Contractor under the supervision of the Contracting Officer and delivered at the Contractor's expense to the Division Laboratory, U. S. Army Engineer Division, South Pacific, Sausalito, California, at least 60 days in advance of the time when stonework is expected to begin. If the quality of materials varies from the approved test samples, additional samples of materials shall be taken by the Contractor under the supervision of the Contracting Officer and delivered to the Project Engineer's Office. The Contractor shall not deliver any of the proposed material to the site of the work until approval of the test samples by the Contracting Officer has been received.

2.2 Quality. Suitable tests and service records will be used to determine the acceptability of the stone protection materials. Tests to which the materials may be subjected include petrographic analysis, specific gravity, abrasion, absorption, wetting and drying, freezing and thawing, and such other tests as may be considered necessary to demonstrate to the Contracting Officer that the materials are acceptable for use in the work. All tests except gradation tests will be made by the Government at its expense. Approval of the 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. Stone shall have the greatest dimension not greater than 3 times the least dimension. Material shall conform to the following:

	Requirement	ASTM Designation
Apparent specific gravity, minimum	2.65	C 127
Abrasion, Maximum percentage	45	C 535

2.3 Gradation Tests. Tests shall be performed by an approved testing laboratory on samples selected by the Contracting Officer. Certified test results shall be submitted with the daily quality control report. One gradation test will be required at the beginning of production and one additional test at the approximate half-way point of the total amount of stone produced for the upstream slope production. In the event gradation test results do not indicate conformance with specified gradations, the Contractor shall modify his operations as required to obtain specified gradation.

2.4 Gradation. All points on individual grading curves obtained from representative samples shall lie between the boundary limits as defined by smooth curves drawn through the tabulated grading limits plotted on a mechanical analysis diagram. The individual grading curves within these limits shall not exhibit abrupt changes in slope denoting skip grading, scalping of certain sizes or other irregularities which would be detrimental to the proper functioning of the filter or stone. All material shall be made to the required grading at the source, and individual loads as delivered to the project shall meet the required grading.

2.4.1 Downstream slope protection of the embankment shall consist of cobble, rock spalls, gravel or crushed stone obtained from required excavation, quarry waste, or from any other source approved by the Contracting Officer. The materials shall be reasonably well-graded between a maximum size of 6 and 1/2 inch.

2.4.2 Upstream slope protection of the embankment and dike shall be stone reasonably well graded within the limits specified below:

Weight of Pieces in pounds

Percent Smaller by Weight

150	100
100	50-100
50	30-70
25	15-50
5	0-15
1	0-5

3. **FOUNDATION PREPARATION.** Areas on which filter material or stone is to be placed shall be trimmed and dressed to conform to cross sections shown on the drawings within an allowable tolerance of plus or minus two inches 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, and no additional payment will be made for any material thus required. Immediately prior to placing the stone, the prepared base will be inspected by the Contracting Officer and no material shall be placed thereon until that area has been approved.

4. **PLACEMENT.**

4.1 Downstream slope protection shall be spread uniformly on the prepared base, in a satisfactory manner, to the neat lines indicated on the drawings or as directed. Placing of material by methods which will tend to segregate particle sizes will not be permitted. Any damage to the surface of the base during placing of the material shall be repaired before proceeding with the work. Compaction of the 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 two inches from the slope lines and grades when measured with a 10-foot straightedge will be allowed in each finished filter course, except that either extreme of such tolerance shall not be continuous over an area greater than 200 square feet.

4.2 Upstream Stone Protection shall be placed on the prepared foundation 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 shown on the drawings or as staked in the field. 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 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 plus 6 inches or minus 2 inches 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 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 certified waybills and/or certified delivery tickets for all stone actually used in the construction covered by the contract.

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SECTION 6A

MISCELLANEOUS METALWORK AND MATERIALS

Index

1. Applicable Publications
2. Materials
3. Workmanship
4. Welding
5. Finishing
6. Zinc Coating (Galvanizing)
7. Pull Box
8. Permanent Project Sign

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.

FF-B-571a & Am-1	Bolts; Nuts; Studs; and Tap Rivets (and Materials for Same)
FF-B-575C	Bolts, Hexagon and Square
FF-N-836C & Am-1	Nut: Square, Hexagon, Cap, Slotted, Castellated, Clinch, Knurled and Welding
FF-W-84a	Washers, Lock (Spring)
FF-W-92a & Am-1	Washers, Metal, Flat (Plain)
QQ-B-750 & Am-2	Bronze, Phosphor; Bar, Plate, Rod, Sheet, Strip, Flat Wire, and Structural and Special Shaped Sections
QQ-S-763c & Int. Am-2	Steel Bars, Shapes, and Forgings, Corrosion Resisting
WW-P-405A & Int. Am-1	Pipe, Corrugated (Iron or Steel, Zinc Coated)
WW-1-406b & Am-1	Pipe; Steel (Seamless and Welded) (for Ordinary Use)

1.2 American Society for Testing and Materials Publication.

A 36-70	Structural Steel
A 48-64	Gray Iron Castings
A120-68a	Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Pipe for Ordinary Use
A 123-68	Zinc (Hot Galvanized) Coatings on Products Fabricated From Rolled, Pressed, and Forged Steel Shapes, Plates, Bars and Strip
B 32-66T	Solder Metal

1.3 American Welding Society Codes.

B3.0-41T	Standard Qualification Procedure (Reprinted September 1967)
D1.0-69	Code for Welding in Building Construction - Ninth Edition

2. MATERIALS.

2.1 General. Materials indicated on the drawings or required in the work and not covered elsewhere by detailed requirements shall conform to the requirements of this section. In all cases not specifically covered in these specifications, the Contractor shall furnish approved highest grade commercial materials or products.

2.2 Structural Steel. Structural Steel shall conform to ASTM Standard A 36.

2.3 Corrosion-Resisting Steel shall conform to Federal Specification QQ-S-763, Class 304, Condition A.

2.4 Bronze shall conform to Federal Specification QQ-B-750, hard temper of either composition.

2.5 Washers.

2.5.1 Plain Washers shall conform to Federal Specification FF-W-92, Type A, Grade 1, Class A.

2.5.2 Lock Washers shall conform to Federal Specification FF-W-84, Class A, Style 2.

2.6 Bolts shall conform to Federal Specification FF-B-575 and FF-B-571.

2.7 Nuts shall conform to Federal Specification FF-N-836.

2.8 Cast Iron shall conform to ASTM Standard A 48.

2.9 Corrugated Metal Pipe shall conform to Federal Specification WW-P-405, Class I, Shape 1, gage as indicated.

2.10 Pipe for Ordinary Use shall conform to the applicable requirements of Federal Specification WW-P-406, or ASTM Standard A 120.

3. WORKMANSHIP. Steel with welds will not be accepted, except where welding is definitely specified or called for on the drawings. All bolts, nuts, and screws shall be tight. All exposed ferrous metalwork (except corrosion-resistant steel and items to be completely embedded in concrete) shall be galvanized unless other protective coatings are specified. Metalwork shall be galvanized after fabrication. Complete shop drawings for fabrication of all miscellaneous metalwork shall be submitted for approval, in accordance with the requirements for shop drawings of Part I, Special Provisions.

4. WELDING shall conform to the provisions of the American Welding Society Standard D1.0. Welders who have not been certified within 2 years of the date of commencement of work under this contract shall be required to pass successfully the qualification tests as prescribed by the American Welding Society Standard B3.0.

5. FINISHING. In general, tolerances for machine-finished surfaces designated by nondecimal dimensions shall be within 1/64 inch. Sufficient machining stock shall be allowed on placing pads to insure true surfaces of solid material. Finished contact or bearing surfaces shall be true and exact to secure full contact. All drilled holes for bolts shall be accurately located and drilled from templates.

6. ZINC COATING (GALVANIZING). Zinc coatings shall be applied in a manner and of a thickness and quality conforming to ASTM Standard A 123. In the event that any portion of galvanized metalwork 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 Standard B 32.

7. PULL BOX shall be of the type indicated.

8. PERMANENT PROJECT SIGN.

8.1 Materials.

8.1.1 Lumber for the project sign shall be rough-sawn redwood or red cedar.

8.1.2 Nails shall conform to Federal Specification FF-N-105. All nails shall be galvanized.

8.1.3 Reflective Paint Binder (white) shall conform to the requirements of Federal Specification TT-P-856 & Int. Am-3.

8.1.4 Reflectorizing materials shall conform to the requirements of Federal Specification TT-P-85, Type I or Type II, as applicable. At the option of the Contractor, either glass spheres or reflectorized granules may be used.

8.1.5 Concrete and Reinforcing Steel shall conform to applicable requirements of section entitled CONCRETE CONSTRUCTION.

8.1.6 Facing Stones. 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. All stone necessary for the project sign shall be gathered from the Cave Creek Dam area or authorized areas in the vicinity. Stone size shall vary from 3 to 6-inch in thickness and from 36 to 144-square inches in area.

8.2 Sign shall be constructed to meet definite dimensions shown on the drawings.

8.3 Routed Lettering. Letters shall be block type and accurately routed from the redwood boards of the sign in accordance with the size and depth of groove shown on the drawings. Letters shall be carefully spaced, accurately cut in line horizontally and vertically as required and the overall inscription or wording shall be arranged to give the best possible composition. The routed surfaces of all letters shall be painted as specified. Letters shall conform to approved sample and shall be executed by craftsmen skilled in this type of work.

8.4 Painting. Routed letters shall be painted 2 coats of reflectorized paint applied at the following rates:

8.4.1 Reflective Paint (Using Glass Spheres) shall be applied at a rate of one gallon of pigmented binder and 10 pounds of glass spheres evenly spread over an area of 105 plus or minus 5 square feet. Spheres shall be dropped on the surface of the pigmented binder before the binder dries or sets up.

8.4.2 Reflective Paint (Using Granules) shall be applied at a rate of one gallon of pigmented binder spread evenly over an area of 115 plus or minus 5 square feet and 0.115-0.005 pounds of reflectorized granules per square foot of painted area. Granules shall be dropped on the surface of the pigmented binder immediately after application of the binder.

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3.3 Post Tops shall be of the type shown and shall be installed as shown.

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 top wire 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 channel or enclosed opening. Fabric shall be secured to posts using stretcher bars and ties or clips or by integrally weaving to integral fastening loops of end and corner, and for the full length of each post. 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 Barbed Wire shall be installed on the posts above the fabric. Each strand shall be pulled taut and securely fastened to each member. The method of securing wires shall be positive and complete.

3.7 Repair. In the event that any portion of the fence is abraded or otherwise damaged to the extent that the base metal is exposed, such damaged or abrded portions shall be neatly covered with Grade 50B solder conforming to the requirements of ASTM Specification B 32.

4. CABLE BARRICADE shall be installed as shown. Concrete for posts shall be thoroughly compacted so as to be free of voids and finished in a dome.

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SECTION 8B
SUBDRAINAGE SYSTEM

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| 1. Applicable Publications | 4. Deleted |
| 2. Materials | 5. Tests |
| 3. 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 Federal Specifications.

SS-P-331c	Pipe, Asbestos and Cement; Sewer, Nonpressure
SS-P-356	Pipe, Bituminized-Fiber, Sewer, and Fittings for Same
SS-P-358a	Pipe, Bituminized Fiber, (Perforated Drainage) and Fittings for Same
SS-P-359b	Pipe, Clay, (Perforated)
SS-P-361d	Pipe and Fittings, Clay Sewer
SS-S-168 & am-2	Sealing Compound, Sewer, Bituminous, Two-Component, Mineral-Filled, Cold-Applied
SS-S-001 69a	Sealing Compound, Sewer Joint, Mineral-Filled, Hot Pour
WW-P-401D	Pipe and Pipe Fittings, Cast-Iron, Soil

1.2 American Association of State Highway Officials (AASHO) Standards.

M 65-61	Clay Pipe
M 86-65	Concrete Sewer, Storm Drain, and Culvert Pipe
M 177-60	Perforated Bituminized-Fiber Drainage Pipe and Fittings
M 189-65	Asbestos Cement Perforated Underdrainage Pipe

1.3 American Society for Testing and Materials (ASTM) Publications.

C 13-69	Standard Strength Clay Sewer Pipe
C 14-68	Concrete Sewer, Storm Drain, and Culvert Pipe
C 118-69	Concrete Pipe for Irrigation or Drainage
C131-69	Resistance to Abrasion of Small Size Coarse Aggregate by Use of the Los Angeles Machine
C 136-67	Sieve or Screen Analysis of Fine and Coarse Aggregates
C 211-68	Standard and Extra Strength Perforated Clay Pipe
C 425-66T	Compression Joints for Vitrified Clay Bell and Spigot Pipe
C 428-69a	Asbestos-Cement Nonpressure Sewer Pipe
C 443-67	Joints for Circular Concrete Sewer and Culvert Pipe, Using Flexible, Watertight, Rubber Gaskets
D 75-59	Sampling Stone, Slag, Gravel, Sand, and Stone Block for Use as Highway Materials
D 1869-66	Rubber Rings for Asbestos-Cement Pipe

Commercial Standard.

CS 188-66

Cast Iron Soil Pipe and Fittings

2. MATERIALS.

2.1 Drain Material shall consist of gravel or crushed stone, shall show a loss in weight of not more than 50% when tested in accordance with ASTM Specification C 131, and shall be reasonably well graded within the following limits:

Sieve Size	Percent by Weight Passing
1 inch	100
3/4-inch	90-100
3/8-inch	30-55
No. 4	0-5

2.2 Points on the individual grading curves obtained from representative samples of the drain material shall lie between the boundary limits as defined by smooth curves drawn through the tabulated grading limits plotted on a mechanical-analysis diagram. The individual grading curves within these limits shall exhibit no abrupt changes in slope denoting skip grading, scalping of certain sizes, or other irregularities which would be detrimental to the proper functioning of the drain.

2.3 Sampling and Testing of the drain materials shall be performed by the Contractor to determine compliance of the installed materials with specified requirements in conformance with ASTM Specifications C 131, C136, and D75. Sampling and Testing shall be performed at regular intervals with at least one test being made at the start of production and at the half-way point of production.

2.4 Subdrain Pipe may be concrete, clay, asbestos-cement, or bituminized-fiber pipe, except that only one type shall be used for the entire project. Fittings shall be cast-iron, clay, concrete, or bituminized fiber, as applicable.

2.4.1 Non-Perforated Pipe.

2.4.1.1 Non-Perforated Concrete Pipe shall conform to ASTM Specification C14 or AASHTO Standard Specification M 86.

2.4.1.2 Non-Perforated Asbestos-Cement Pipe shall conform to Federal Specification SS-P-331 or ASTM Specification C 428.

2.4.1.3 Non-Perforated Clay Pipe shall conform to Federal Specification SS-P-361, AASHTO Standard Specification M 65, ASTM Specification C-13, or ASTM Specification C 211.

2.4.1.4 Non-Perforated Bituminized-Fiber Pipe shall conform to Federal Specification SS-P-356.

2.4.2 Perforated Pipe. Perforations for pipe 6 inches in diameter shall have a combined area of at least 0.3 square inch per linear foot of pipe and shall be located within an arc of 120 degrees along the top of the pipe. Perforations may be either holes or slots with at least one perforation located in each linear foot of pipe excluding joint areas. The diameters of holes shall be not less than 3/16 inch nor more than 3/8 inch. The slots shall be not less than 3/16 inch nor more than 5/16 inch wide and not more than 4 inches long. Perforations shall be made by the pipe fabricator by a method which will eliminate spalling insofar as practicable. Pipes having spalls extending more than 1/2 inch outside the perforation or more than 1/2 the wall thickness into the perforation shall be rejected.

2.4.2.1 Perforated Concrete Pipe shall conform to ASTM Specification C118, perforated as specified above.

2.4.2.2 Perforated Asbestos-Cement Pipe and Couplings shall conform to AASHTO Standard Specification M189 except that at the option of the Contractor, perforations may be as specified above.

2.4.2.3 Perforated Clay Pipe shall conform to Federal Specification SS-P-359, AASHTO Standard Specification M 65, or ASTM Specification C 211, except that at the option of the Contractor, perforations may be as specified above.

2.4.2.4 Perforated Bituminized-Fiber Pipe shall conform to Federal Specification SS-P-358, or AASHTO Standard Specification M 177, except that at the option of the Contractor perforations may be as specified above.

2.5 Pipe Fittings shall be cast-iron, asbestos-cement, concrete, vitrified clay, or bituminized fiber. Fittings shall be furnished with such adaptors as are recommended by the manufacturers of the pipe.

2.5 Pipe Plugs shall be standard clay sewer disks calked with oakum and mortared in place. For asbestos-cement fittings tapered caps may be used for pipe plugs.

2.7 Cast-Iron Fittings shall be service weight. The plug and ferrule shall conform to the requirements of Federal Specification WW-P-401, and shall be similar to that shown in Table 53, page 43, of Commercial Standard CS188, except that the brass screw plug shall have a recessed socket head.

3. INSTALLATION.

3.1 Drain Material shall be placed in layers, the first layer shall be to pipe bed elevation. Each layer shall be moistened, and spread in a uniform layer to the lines and grades indicated. Placing and spreading equipment shall be operated in such a manner as to not disturb the underlying material. Water shall be added and the material manipulated with spreading equipment until a uniform density is achieved. After installation of the collector pipe, the trench shall be filled with drain material to the elevations indicated. Any pipe displaced or damaged during placement of the drain material shall be replaced or realigned by the Contractor at no additional cost to the Government. Any material contaminated or rutted by equipment shall be removed and replaced with fresh material.

3.2 Smoothness Test. The surface of the completed drain material shall not vary more than 1/2 inch from the established grade and in addition every area shall show no deviation greater than 1/2 inch when tested with a 10-foot straightedge applied both parallel with, and at right angles to, the center line of the channel.

3.3 Pipe Laying. Each pipe shall be carefully inspected immediately before it is laid, and all damaged or defective pipe will be rejected. The exterior of the pipe for not less than 1/4 of its circumference shall be firmly bedded to hold the pipe in alignment. Perforated pipe shall be laid with the perforated side uppermost. Pipe shall be laid to the grades and alignment shown on the drawings or as directed. The laying shall proceed upgrade from the lower end of the pipe line. Pipe grade shall be maintained with 1/4 inch in 10 feet of that shown on the drawings.

3.3.1 Joints. The joints between sections of perforated pipe shall be of a type that will hold the pipe securely in alignment and maintain the inner surfaces of abutting pipes flush and even. Except as otherwise specified, joints for non-perforated pipe shall be filled with mortar in an approved manner for concrete or clay pipe and shall be of the type recommended by the manufacturer for asbestos-cement and bituminized-fiber pipe. If mortar joints are used, sufficient mortar to completely fill the joint shall be applied to the pipe prior to joining and excess mortar shall be removed from the inside of the pipe by wiping or by dragging an approved swab through the pipe as applicable.

3.3.2 Mortar for joints shall be composed of cement, sand, and water proportioned at the approximate ratio of one part cement to not less than 2 parts nor more than 2-1/2 parts sand. The materials shall conform to the applicable requirements of the section: CONCRETE CONSTRUCTION. The mortar shall be mixed in a concrete mixer in the manner specified for concrete, or in a water-tight 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 required amount of cement shall then be added and the material dry mixed by turning at least 3 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 not be used after visible signs of setting. No retempering will be permitted.

3.3.3 Optional types of joints for Non-Perforated Pipe. The following types of joints may be used for non-perforated pipe at the option of the Contractor, as approved, and within the limitations specified.

3.3.3.1 Plastic conforming to ASTM Specification C425 may be used with clay pipe. Plastic shall be moulded in the annular space or on the spigot of the pipe, or both, in a plant especially equipped for the purpose.

3.3.3.2 Rubber Gaskets conforming to the chemical and physical requirements of ASTM Specifications C443 or D 1869. The configuration of the gasket shall be as recommended by the pipe manufacturer for the particular type of pipe joint. The gasket shall be so installed as to provide a tight fit. Rubber gaskets may be used with asbestos-cement, clay and concrete pipe.

3.3.3 Bituminous Sealers conforming to Federal Specification SS-S-169, class 1 or 2 and Federal Specification SS-S-168 may be used in the joints of bell and spigot pipe or joints having similar annular space. Before jointing with bituminous compound the inside of the bells and outside of the spigots shall be dry and clean and shall be primed if and as recommended by the manufacturer of the compound. The joint shall be made according to the approved method for the type and class of material.

5. TESTS.

5.1 General. The Contractor shall flush the drain lines with sufficient water to develop a flow of at least 5 cubic feet per minute out of the end of the length of pipe being tested, as measured by approved measuring equipment furnished by the Contractor. Tests shall be conducted in the presence of the Contracting Officer.

5.2 New Drain Lines. Two separate tests to demonstrate proper functioning of the new drain lines shall be made by the Contractor. The first test of each completed section of the new subdrain system shall be made immediately upon completion of the subdrain system. The second test (acceptance test) shall be made after completion of the work including channel and fill behind walls. Both tests shall conform to the requirements specified above in paragraph: GENERAL. Final acceptance will be made only if the discharge is free and of adequate quantity. Any necessary clearing of drain lines shall be performed at no additional cost to the Government.

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SECTION 8E

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 76-70

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 AND 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 2 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 3 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 misalignment 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.

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SECTION 9C

STABILIZED-AGGREGATE BASE COURSE

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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 Military Standard.

MIL-STD-621A & Notices 1 & 2

Test Method for Pavement Subgrade,
Subbase, and Base-Course Materials

1.3 American Society for Testing and Materials (ASTM) Publications.

C 117-69

Materials Finer than No. 200 Sieve
in Mineral Aggregates by Washing

C 127-68

Specific Gravity and Absorption of
Coarse Aggregate

C 128-68

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 138-67

Sieve or Screen Analysis of Fine
and Coarse Aggregates

D 75-59

Sampling Stone, Slag, Gravel, Sand,
and Stone Block for Use as Highway Materials

D 422-63

Particle-Size Analysis of Soils

E 11-70

Wire-Cloth Sieves for Testing Purposes

2. **DEFINITION.**

2.1 Degree of Compaction required is expressed as a percentage of the maximum density obtained by the test procedure presented in Military Standard MIL-STD-621, Method 100, compaction effort designation CE 55. This will be abbreviated hereinafter as a percent CE 55 maximum density.

3. **MATERIALS.** Aggregates shall consist of crushed stone, crushed gravel, angular sand, soil, or other approved materials processed and blended or naturally combined. Aggregates shall be free from lumps and balls of clay, organic matter, objectionable coatings, and other foreign material and shall be durable and sound. 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.

3.1 Coarse Aggregate conforming to the requirements specified above shall have a percentage of wear not to exceed 50 percent after 500 revolutions. Coarse aggregate 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. 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.

3.2 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.

3.3 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 No. B
1 inch	100
3/4 inch	90-100
1/4 inch	45-75
No. 200	0-8

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.

4. 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.

4.1 Samples for determination of the acceptability of the source and production run samples shall be obtained 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 Standard Methods D 75. After the material has been placed and compacted, samples for density tests shall be taken as specified in Military Standard MIL-STD-621. Other samples for gradation, liquid-limit, and plasticity-index tests shall be taken by an appropriate method. The minimum size sample hole for the density tests shall be 0.075 cu. ft. for 1-inch maximum particle size, and 0.100 cu. ft. for 2-inch maximum particle size. Where deemed necessary, the sampling will be supervised by the Contracting Officer.

4.2 Tests. 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 200 cubic yards 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 density test for each 3000 square yards of finished base course and one additional gradation, liquid-limit, and plasticity index test for each 1000 square yards of base course shall be performed. The location of the after-placement tests shall be as directed. Deficiencies in the base course shall be corrected and the tests repeated in the affected area prior to testing for smoothness. Results of all tests made after placement of the base course shall be submitted for approval on a daily basis and subsequent paving operations shall not commence until final approval has been obtained.

4.2.1 Aggregate Gradation. Aggregate gradation shall be determined in accordance with ASTM Test Methods C 117, C 127, C 128, C 136, and Standard Method D 422. Sieves will conform to ASTM Standard Specification E 11.

4.2.2 Liquid Limit and Plasticity Index shall be determined in accordance with Military Standard MIL-STD-621, Method 103.

4.2.3 Determination of Density. Moisture-density relations and field densities shall be reported on forms similar to the suggested forms in the referenced Military Standard.

4.2.3.1 Laboratory Control. The moisture-density relations shall be determined in a laboratory in accordance with Military Standard MIL-STD-621, Method 100, compactive effort designation CE 55.

4.2.3.2 Field Control. Field in-place density shall be determined in accordance with MIL-STD-621, Method 106.

4.2.4 Weat Test shall be made in conformance with ASTM Test Method C 131.

5. EQUIPMENT. All plant equipment, tools, and machines used in the performance of the work covered by this section shall be approved prior to commencement of work. This equipment shall be maintained in satisfactory working condition at all times.

5.1 Aggregate Spreader shall be of the hopper type and shall be equipped with an adjustable screed capable of laying material to uniform thicknesses ranging from 1 to 8 inches or more over a minimum lane width of 8 feet. The hopper shall be a shape that minimizes segregation, and shall be carried on pneumatic-tired trucks or on drum-type steel rollers that will not dig into or scuff the subgrade or subbase. The spreader may be either the towed type for attaching directly to the dump truck or the self-propelled type with sufficient power to propel the dump truck. An asphaltic-concrete paver may be used at the option of the Contractor.

5.2 Blade Graders shall have a wheelbase of not less than 15 feet, a blade of not less than 10 feet in length, and shall be self-propelled.

5.3 Compaction Equipment.

5.3.1 Steel-Wheeled Rollers shall be the self-propelled three-wheel type weighing not less than 10 tons, and shall have a minimum weight of 300 pounds per inch width of rear wheel. The wheels shall be equipped with adjustable scrapers. The use of vibrating roller is optional.

5.3.2 Light Pneumatic-Tired Rollers shall consist of two axles on which are mounted not less than nine rubber-tired wheels, five wheels on one axle and four on the other, mounted in such a manner that the rear group of tires will not follow in the tracks of the forward group. The axles shall be mounted in a rigid frame provided with a loading platform or body suitable for ballast loading. The tires shall be uniformly inflated. The rollers shall be weighted as directed. The tractor or other towing equipment shall also be rubber-tired.

5.3.3 Tampers shall be of an approved mechanical type operated by either pneumatic pressure or internal combustion. They shall have sufficient weight and striking power to produce the compaction required in paragraph COMPACTION hereinafter.

5.4 Hauling Equipment shall consist of pneumatic-tired vehicles having dump bodies suitable for dumping materials in windrows or into spreading machines.

5.5 Mixing Plants, if used, shall be so designed and constructed as to thoroughly mix the coarse aggregate, binder material, and water without excessive degradation of the aggregates. Each plant shall have a capacity of not less than 100 tons of mixed material per hour.

5.6 Scales shall be standard truck scales of the beam type and of sufficient size and capacity to accommodate all trucks used in hauling 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, or by the Contracting Officer if the services of an official inspection bureau of the state are not available. Scales shall be recalibrated and resealed as often as necessary to insure continuous accuracy. The number of standard weights necessary for testing the scales shall be on hand at all times.

5.7 Sprinkling Equipment shall consist of tank trucks, pressure distributors, or other equipment designed to apply controlled quantities of water uniformly over variable widths of surface.

5.8 Miscellaneous Equipment. Other equipment used on the job shall be approved types suitable for constructing stabilized-aggregate base course.

6. 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 without adjustments in the contract unit prices when such action is necessary to obtain material conforming to the specified requirements. Upon completion of the work, the quarries on private lands shall be conditioned in agreement with the local laws or authorities.

7. WEATHER LIMITATIONS. Stabilized-aggregate courses shall not be constructed when the atmospheric temperature is below 35 degrees F. When the temperature falls below 35 degrees F., it shall be the responsibility of the Contractor to protect, by approved method or methods, all areas of the completed stabilized-aggregate base course against any detrimental effects of freezing. Any areas of completed stabilized-aggregate base course that are damaged by freezing, rainfall, or other weather conditions shall be brought to a satisfactory condition by the Contractor in conformance with this specification without additional cost to the Government.

8. PREPARATION OF SUBGRADE. Prior to constructing the stabilized-aggregate base course, the previously constructed subgrade shall be cleaned of all foreign substances. The surface of the subgrade shall meet the specified 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.

9. **GRADE CONTROL.** During construction the lines and grades including crown and cross slope indicated for the stabilized-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.

10. **MIXING AND PLACING MATERIALS.** The placing procedures apply to each layer of this stabilized-aggregate base course. The Contractor shall, as directed, make such adjustments in mixing or placing procedures or in equipment as are necessary to obtain grades within the allowable tolerance, to minimize segregation and degradation, to reduce or accelerate loss or gain of water, and to insure a satisfactory stabilized-aggregate base Cours.

10.1 **Stationary-Plant Method.** The coarse aggregates and binder materials shall be proportioned by weight or by volume in quantities so that the specified gradation, liquid-limit, and plasticity-index requirements will be met. Adjustments of percentages of coarse aggregates and binder material shall be made by the Contractor when required to comply with these specifications, subject to the approval of the Contracting Officer. Water in approved quantities, measured by weight or volume, shall be added during mixing. Mixing operations shall produce an approved uniform blend. The finished mixture shall be hauled to the area to be paved in approved pneumatic-tired vehicles. The material shall be placed in a uniform layer to the required contour and grades, and to a loose depth that, when compacted, will produce a layer of the designated thickness. The material shall be placed uniformly on the subgrade or subbase course from moving vehicles, spreader boxes, or mechanical spreaders and brought to the required contour and grades with blade graders. Unsatisfactory areas shall be removed and replaced with satisfactory mixture, or the material shall be mixed in the area, as directed.

11. **LAYER THICKNESS.** The compacted thickness of the stabilized-aggregate base course shall be as indicated. The material shall be placed in a single layer.

12. **COMPACTION.** Each layer of the stabilized-aggregate base course (including shoulders) shall be compacted with steel-wheeled rollers, light pneumatic-tired rollers, or other equipment as approved. 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 CE 55 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 stabilized-aggregate base course. Unsatisfactory materials shall be reworked to produce a satisfactory material.

13. **EDGES OF BASE COURSE.** Approved material shall be placed along the edges of the stabilized-aggregate base course in such quantities as will compact to the thickness of the course being considered, allowing in each operation at least a 10-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.

14. **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. The Contractor shall perform such straightedge testing as required to demonstrate compliance with the smoothness requirements.

15. **THICKNESS CONTROL.** The completed thicknesses of the base course shall be within 1/4 inch, plus or minus, of the thickness indicated. The thickness of the base course shall be measured at intervals in such manner that there shall 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 1/4 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 1/4 inch thicker than that indicated, it shall be considered as conforming with the specified thickness requirements plus 1/4 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. Thickness testing and reporting shall be by the Contractor.

16. **MAINTENANCE.** The Contractor shall maintain the stabilized-aggregate base course in a satisfactory condition until the completed work is accepted.

17. **WAYBILLS AND DELIVERY TICKETS.** Copies of waybills or delivery tickets shall be submitted to the Contracting Officer during the progress of the work attached to the Daily Contractor Quality Control Report on 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.

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SECTION 9D

PRIME COAT

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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	Petroleum Measurement Tables
D 2027-68	Liquid Asphalt (Medium-Curing Type)

1.2 American Association of State Highway Officials (AASHO) Standard.

T 102-57	Spot Test of Asphaltic Materials
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2. **BITUMINOUS MATERIAL.** The bituminous material used for the prime coat shall be liquid asphalt, conforming to ASTM Specifications 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 AASHO Standard Method T 102, using the standard naphtha specified therein.

3. **QUANTITY TO BE APPLIED.** Bituminous material for the prime coat shall be applied in quantities of not less than .15 gallon nor more than 0.4 gallon per square yard of the surface to be primed. Any prescribed 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.

4. **CERTIFICATES OF COMPLIANCE.** A manufacturer's certificate of compliance with the specification requirements for asphaltic material shall be submitted in accordance with the Special Provisions.

5. **WEATHER LIMITATIONS.** The prime coat shall be applied only when the prepared surface is dry, and the temperature shall not have been below 35 degrees F. for 12 hours prior to application. It 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 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. It shall be so designed and equipped as to distribute the bituminous material uniformly at even heat on variable widths of surface at readily determined and controlled rates from 0.02 to 2.0 gallons per square yard, with a pressure range of 25 to 75 pounds per square inch and with an allowable variation from any specified rate not to exceed 5%. Distributor equipment shall include an independently operated bitumen pump, tachometer, pressure gages, volume measuring devices, a thermometer for reading the temperature of the tank contents, and a hose attachment suitable for applying bituminous material to spots unavoidably missed by the distributor. The distributor shall be equipped for circulation and agitation of the bituminous material during the heating process.

6.3 Heating Equipment for heating bituminous material shall consist of steam coils and equipment for producing steam, so designed that steam will not be introduced into the material. In the event storage tanks are used, an armored thermometer with a range from 40 to 200 degrees F. shall be fixed to the tank so that the temperature of the bituminous material may be determined 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.**

7.1 General. Immediately before applying the weed killer and prime coat, dirt, clay and other objectionable material shall be removed from the surface to be primed, by means of a power broom or blower supplemented with 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 24 hours in advance of 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.

7.2 Weed Killer Treatment. A chemical weed killer shall be applied to subgrade surfaces of top of dike and embankment designated as access road prior to application of the prime coat. The weed killer may be either a fire retardant non-corrosive, water soluble mixture of sodium chlorates and sodium borates, or dry, free flowing borax. The sodium chlorate-sodium borate mixture shall be applied in a water solution at a rate that will yield a minimum of one pound of sodium chlorate per 100 square feet of treated surface. The equipment used for application of the solution shall mechanically agitate and circulate the solution at all times application is in process. Borax shall be applied dry on a previously dampened subgrade at a rate to yield the equivalent of 3 pounds of boron trioxide (B₂O₃) per 100 square feet of treated surface. After application of the borax, the area shall be uniformly sprinkled with water. The quantity of water applied in the solutions or after application of dry borax shall be at least 4 gallons per 100 square feet of treated surface.

8. APPLICATION OF BITUMINOUS MATERIAL. Immediately following the preparation of the surface, the bituminous material shall be applied by means of a bituminous distributor at a temperature within the range of 105 to 180 degrees F. The bituminous material shall be applied at the pressure 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 so as to obtain satisfactory results at the junction of the previous and subsequent applications, building paper shall be spread on the surface for a sufficient distance back from the ends of each application so that flow through the sprays may be started and stopped on the paper, and that all sprays will be operating at full force on the surface to be treated. Immediately after the application, the building paper shall be removed and destroyed. All 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 for a period of not less than 48 hours without being disturbed, or for each additional period of time as may be 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 up and cure any excess bituminous material. The Contractor shall maintain the primed surface until the succeeding layer of pavement is placed by protecting the surfaces against damages and by repairing and repriming deficient areas at no additional cost to the Government. No smoking, fires, or flames other than heaters that are a part of the equipment shall be permitted within heating, distributing, or transferring operations of bituminous material.

9. 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 bituminous material actually used in the construction covered by the contract. 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.

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SECTION 9G

ASPHALT CONCRETE PAVEMENT

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

1.1 American Association of State Highway Officials (AASHO) Standard.

T 179-60 Thin-Film Oven Test

1.2 American Society for Testing and Materials:

C 117-69 Materials Finer Than No. 200 Sieve in Mineral Aggregates by Washing

C 127-68 Specific Gravity and Absorption of Coarse Aggregate

C 128-68 Specific Gravity and Absorption of Fine Aggregate

C136-67 Sieve or Screen Analysis of Fine and Coarse Aggregates

D 113-44 Ductility of Bituminous Materials

D 242-64 Mineral Filler for Bituminous Paving Mixtures

D 946-68T Asphalt Cement for Use in Pavement Construction

D 1559-65 Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus

1.3 Military Standard:

MIL-STD-620 A & Notice 1 Test Methods for Bituminous Paving Materials

2. **DESCRIPTION.** Asphalt concrete shall consist of a bituminous course composed 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. Surfacing indicated on the drawings as P.M.S. or A.C. shall conform to the requirements of this section.

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 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 ASTM Specification D 946, penetration range 60-70. In addition, asphalt cement shall conform to the following requirements:

4.1 After exposure in thin films in accordance with AASHO Standard T 179, the penetration shall be not less than 50% of the original penetration.

4.2 After exposure in thin films in accordance with AASHO Standard T 179, the ductility of the asphalt residue, when tested in accordance with D 113, shall be not less than 100 centimeters.

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	c
1 inch	100	-	-
3/4 inch	90	100	-
1/2	-	90-100	100
3/8 inch	70-85	80-95	80-95
No. 4	50-65	55-72	55-73
No. 8	38-53	40-55	45-60
No. 50	12-26	14-27	17-30
No. 200	4-8	4-8	4-9

6. COMPOSITION OF MIXTURE.

6.1 Job-Mix Formula shall be submitted by the Contractor, 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 5.0% and 8.5%. 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 Standard 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 Standard 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

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 Military Standard 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. A sufficient number shall be available at all times. The lutes shall be constructed of metal and shall consist of a plate or sheet 36 x 4 inches attached to a handle properly braced. Hand tampers shall weigh not less than 25 pounds and have a tamping face not larger than 50 square inches.

8.5 Steel-Wheel Rollers shall be self-propelled, 3-wheel (tricycle) and/or tandem type, weighing not less than 10 tons. The rollers shall have adjustable wheel scrapers, water tanks, and sprinkling apparatus to keep the wheel sufficiently wet to prevent the bituminous mixture from sticking to the wheels. The rollers shall be capable of reversing without backlash and shall be free from worn parts. The roller wheels shall not have flat or pitted areas or projections that will leave marks in the pavement.

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 to be paved shall receive a prime coat.

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 F, mixtures having temperatures less than 235 degrees F, or mixtures which foam or show indications of moisture will be rejected. Hauling over freshly laid material will not be permitted.

11. PLACING. Contact surfaces of previously constructed pavement, curbs, manholes, and other structures shall be sprayed with a thin coat of asphalt. The mechanical spreader shall be adjusted and its speed regulated so that the course being placed will be smooth and continuous without tears and pulling. The course will be of such depth that after compaction, the cross section, grade, and contour will be as shown on the drawings. In areas where the use of machine spreading is impractical, the mixture shall be spread by hand. Unless otherwise directed, placing shall begin on the high side of areas with a one-way slope or along the centerline of areas with a crowned section and shall be in the direction of the main traffic flow. Placing of the mixture shall be as continuous as possible, and the speed of placing shall be adjusted, as directed, to permit proper rolling.

12. COMPACTION OF MIXTURE shall be accomplished by steel-wheel 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% 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 has been obtained. The speed of the rollers shall not exceed 2 miles per hour and at all times be slow enough to avoid displacement of the hot mixture. In areas not accessible to the roller, the mixture shall be compacted with hot hand tampers.

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 shall be cut to straight, vertical surfaces. All contact surfaces of existing pavement shall be painted with a thin, uniform coat of asphalt.

14. PROTECTION OF PAVEMENT. After final rolling, no vehicular traffic shall be permitted on the pavement for at least 6 hours after rolling.

15. SURFACE REQUIREMENTS. The finished surface shall not vary more than 1/4 inch from a 10-foot straightedge. The straightedge shall be furnished by the Contractor. Defective areas shall be corrected by and at the expense of the Contractor.

16. SAMPLING PAVEMENTS AND MIXTURES. Samples of the finished pavement, including samples that span the longitudinal joint, shall be removed by the contractor at his expense. The sizes of the samples shall be suitable to determine conformance to density, thickness, and other specified requirements. Tests shall be performed without cost to the Government. The Contractor shall furnish an approved power saw or core drill and labor for cutting samples and shall replace the pavement to the satisfaction of the Contracting Officer. The samples shall be taken at the start of the paving operations and at intervals throughout the paving operations as directed. One test shall be made in each 1,000 lineal feet of paving strip. Samples of plant mixtures shall be taken and tested, without cost to the Government, to determine conformance to the specified pavement test properties, bitumen content, and gradation requirements. No payment will be made for areas deficient in density, thickness, or other specified requirements until such areas are removed and replaced as directed.

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SECTION 10 B

PLANTING OF TREES AND SHRUBS

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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 Joint Committee on Horticultural Nomenclature Standard.

Standardized Plant Names, 1942 Edition.

1.2 American Association of Nurserymen, Inc., Standard.

USA Standard for Nursery Stock January 1969 (USA z 60.1-1960)

2. **CERTIFICATES OF INSPECTION** All shipments or orders of plant material shall be properly inspected at the nursery or at the growing site by the authorized Federal and State authorities. All necessary inspection certificates shall accompany the invoice for each shipment or order of stock, and may be required by law for the necessary transportation, and such certificates shall be filed with the Contracting Officer prior to acceptance of the materials.

3. **MATERIALS OTHER THAN PLANTS.**

3.1 Commercial fertilizer shall be 6-10-4 grade, uniform in composition, and shall be delivered to the site in unopened original containers, each fully labeled, conforming to the applicable State fertilizer laws and bearing the trade name or trademark and warranty of the producer.

3.2 Material for and staking.

3.2.1 Stakes for supporting trees shall be straight, sound, rough-sawn, not less than 2 inches by 2 inches if square, or 2-1/2 inches in diameter if round, and 9 feet long or as otherwise indicated.

3.2.2 Wires for guying trees shall be annealed galvanized steel or steel of gages indicated.

3.3 Mulch shall consist of forest litter, or Redwood shavings of fine grade. Mulches shall not contain sticks larger than 1/4 inch in diameter, stones, clay, or other foreign material that will prevent the eventual decay of the mulch necessary for its complete effectiveness. Forest-litter mulch shall consist of not less than 50 percent decomposed leaf litter, including 1/2 to 1 inch of the soil lying under the leaves or occurring in the natural woodland location of the leaves. When Redwood shavings are used, 7.5 pounds of ammonium sulphate or the equivalent shall be added uniformly to each cubic yard of shavings.

3.4 Humus shall be processed composted sewage sludge. Humus shall be free from lumps, roots, and stones or other foreign matter, and of such physical condition that the peat can be passed through a 1/2-inch screen and can be readily incorporated with the topsoil.

3.5 Prepared soil mixture for use in backfilling plant pits, shall be mixed in a central location on the jobsite and transported to locations where soil mixture is to be used. Native topsoil shall be thoroughly mixed with mulch and humus in the following proportions by volume: 2 parts of topsoil, 1 part of mulch and 1 part humus. Mixing shall be done in a thorough manner to insure uniform distribution of materials throughout the mixture by blade mixing, by use of a soil shredder, by hand, or by other methods approved by the Contracting Officer.

3.6 Native topsoil Shall be fertile, friable, natural surface soil obtained from well drained areas and possessing characteristics of representative soils in the project vicinity that produce heavy growths of crops, grass, or other vegetation. Native topsoil shall be free of subsoil, brush, organic litter, objectionable weeds, clods, shale, large stones, stumps, roots, or other material that might be harmful to plant growth or hindrances to planting or maintenance operations.

3.7 Water Water shall be kept free from oil, acids, alkali, salt, and other substances harmful to the growth of plants. The source of water and service outlets used shall be subject to approval of the Contracting Officer.

4. **PLANT MATERIALS.** Unless otherwise indicated, all plant material furnished shall be nursery-grown, well branched, and well proportioned, particularly with respect to the width-height relationship, and shall have a fibrous root system. The Government may inspect plants at place of growth, but such inspection shall not preclude the right of rejection at the site.

4.1 Nomenclature The scientific and common names of plants herein specified or shown on the drawings conform with the approved names given in Standardized Plant Names prepared by the American Joint Committee on Horticultural Nomenclature, except that where local usage does not follow this standard, the accepted local names are given in parentheses.

4.2 Quality and size of plants shall be in accordance with rules and grading adopted by the American Association of Nurserymen, Inc., and included in USA Standard for Nursery Stock. All plants shall have a normal habit of growth and shall be sound, healthy, vigorous, and free from disease and insect infestations. Trees shall have single straight trunks unless otherwise specified. Any tree with weak thin trunk not capable of supporting itself when planted in the open will not be accepted. The minimum acceptable sizes of all plants, measured before pruning, with branches in normal position, shall conform to the measurements indicated in the list of required plants. Plants larger in size than indicated may be used with the approval of the Contracting Officer, but the use of larger plants will make no change in contract price. If the use of larger plants is approved, the ball of earth or spread of roots shall be increased proportionately.

4.3 Digging up, wrapping, and handling Plants shall be dug and prepared for shipment in a manner that will not cause any damage to the branches, shape, and future development of the plants after replanting.

4.3.1 Container-grown plants, shall have been grown in pots, cans tubs, or boxes for a minimum of 6 months and a maximum of 2 years. Plants shall have sufficient roots to hold earth together intact after removal from containers without being rootbound.

4.3.2 Protection against drying out All plants shall be handled so that roots are adequately protected at all times from drying out and from other injury.

4.3.3 Plant-material labels For the purpose of inspection and plant identification, durable, legible labels stating in weather-resistant ink the correct plant name and size, as shown in the list of required plants, shall be securely attached to all plants, bundles, and containers of plant material delivered at the planting site.

5. PLANTS REQUIRED The species (scientific and common names), size, manner in which to be furnished, and an indication of the approximate number required to complete the planting as shown on the planting plan, are shown in the plant list on the drawings. Plant quantities on the list are indicated only for the convenience of the contractor. The contractor shall furnish and plant all plant materials required by the plans. Surpluses or shortages on the plant list shall not be used for claims for additional compensation.

5.1 Substitutions Plants of kinds other than those named in plant list will not be accepted unless specifically approved in writing by the Contracting Officer. Proposed substitutes in each case must possess the same essential characteristics as the kind of plant actually specified in regard to appearance, ultimate height, shape, habit of growth, general soil, and other requirements. In no case shall the average cost and value of substituted plants be less than the cost and value of plants actually specified. Plants of greater value may be accepted without additional cost to the Government.

5.2 Shipment and delivery The contractor shall promptly notify the Contracting Officer, in advance, when the plant material will be delivered and the manner of shipment. The contractor shall furnish an itemized list, in duplicate, of the actual quantity of plant material in each delivery, in order to insure satisfactory coordination of delivery and to expedite the required inspection at the point of delivery. The itemized list of the plant material for each delivery shall include the pertinent data as specified in the list of required plants. This list and the necessary inspection certificates to accompany each plant or shipment shall be delivered to the Contracting Officer, prior to acceptance and planting of the plant material. When shipment is made by truck, all plant material shall be packed to provide adequate protection against climatic, seasonal, and breakage injuries during transit. The tops shall be securely covered with tarpaulin or canvas to minimize wind-whipping and drying. When shipment is made by rail, box cars shall be carefully packed and adequately ventilated to prevent sweating of the plants during transit. Shipments made by rail to local or nearby freight yards shall be given special attention to insure prompt delivery and careful handling therefrom to the point of final delivery at the planting jobsite. A suitable method of handling shall be employed to preclude cracked or mushroomed plant balls at the point of delivery.

6. PLANTING SEASON The planting dates for plant materials shall be from October thru December. Actual planting shall be performed during above periods only when weather and soil conditions are suitable and in accordance with locally accepted practice, as approved by the Contracting Officer. Deviation from the above planting dates will be permitted only when approved in writing by the Contracting Officer.

7. OBSTRUCTIONS BELOW GROUND Any rock or other underground obstruction shall be removed to the depth necessary to permit proper planting, according to plans and specifications. If underground construction, obstructions, or rock are encountered in excavation of planting areas, other locations for the planting may be selected by the Contracting Officer. Explosives may be used for removal of rock or old foundation structures only where and as expressly approved by the Contracting Officer. When the location of utility lines is shown on the plans, or has otherwise been made known to the contractor, any damage to these lines during planting operations will be repaired by the contractor in a manner approved by the Contracting Officer and at no additional cost to the Government.

8. PLANTING OPERATIONS

8.1 Layout of major planting Locations for plants and outlines of areas to be planted shall be marked on the ground by the contractor and approved by the Contracting Officer before any excavation is made.

8.2 Protection of planting areas Before excavations are made, precautionary measures shall be taken to protect all vegetated areas that are to be trucked over and upon which soil(s) to be temporarily stacked pending removal or reuse of the soil for the filling of holes, pits, and beds. Existing trees, shrubbery, and cacti that are to be preserved shall be barricaded in a manner to afford effective protection during planting operations.

8.3 Excavation for planting shall include the stripping and stacking of all acceptable topsoil encountered within the areas to be excavated for plant pits. Except as otherwise indicated, excavation of trenches and plant pits, shall extend to the required subgrades as indicated on the drawings but in no case shall be less than as specified hereinafter. Plant pits shall be circular in outline or square if machine dug and shall have vertical sides and flat bottoms. The minimum depths of plant pits shown on the drawings shall be measured from finished grade.

8.4 Size of pits Minimum depth of pits for trees shall be 2 feet, measured from finished grade; this depth shall be increased as necessary to accommodate the ball or roots and a minimum of 6 inches of prepared soil mixture below the ball or roots. Diameter or minimum width of pits for trees shall be at least 2 feet greater than the diameter of container. Diameter or minimum width of pits for all shrubs shall be at least 1 foot greater than the diameter of the ball, if bare-rooted. Minimum depth of pits for all shrubs shall be 16 inches, measured from finished grade, and this depth shall be increased as much as may be necessary to accommodate the ball and a minimum of 6 inches of compacted topsoil below the ball.

8.5 Disposal of excess soil Acceptable excess excavated topsoil shall be used to form saucers around plants where shown on the drawings, wasted uniformly over nearby low or rough areas, or otherwise disposed of as approved by the Contracting Officer. Excess soils not required or not suitable for above usage shall be disposed of on or off the site as directed by the Contracting Officer, within 24 hours following excavation.

8.6 Setting plants Except as otherwise specified, plants shall be planted in pits and shall be set at such level that, after settlement, plants will bear the same relation to the finished grade of the surrounding ground as to the grade of the ground from which plants were dug. Trees shall be set plumb and rigidly braced in position until the soil has been tamped solidly around the ball. Plants shall be planted in a prepared soil mixture which shall be thoroughly settled by watering and tamping. To compensate for shrinkage, the finished grade of topsoil prior to watering shall be fixed at an elevation 10 percent of the fill depth higher than the desired finished grade, unless otherwise directed by the Contracting Officer. To facilitate watering, a shallow saucer approximately 3 inches deep shall be formed around each plant by placing a ridge of topsoil around the edge of each filled-in pit. Containers shall be opened, and the plants carefully removed so that the earth around the roots of the plants remain unbroken. Plants shall be placed on a minimum of 6 inches of prepared soil mixture that has been hand tamped prior to placing plants. Plants shall then be placed in the plant pit, and the prepared soil mixture shall be tamped to fill all voids under the base and around the ball.

8.7 Guying and staking

8.7.1 All trees in the plant list shall be staked with a single stake, as hereinbefore specified. Stake shall be set on that side of the tree facing the prevailing wind, at approximately 6 to 12 inches from the trunk. Stake shall be fastened to tree with double 12-gage wire run through a suitable length of rubber hose, crossed once between the stake and tree to prevent direct contact between the tree and the stake.

8.8 Pruning shall be limited to the minimum necessary to remove injured twigs and branches, and to compensate for the loss of roots during transplanting, but never to exceed one-half of the branching structure. With the approval of the Contracting Officer, pruning may be done before delivery of plants, but not before plants have been inspected and approved. All cuts shall be made flush leaving no stubs. Cuts over 3/4 inch in diameter shall be painted with an approved treewound paint. Evergreens shall not be pruned except to remove injured branches.

8.9 Mulching Within 2 days after planting, plants shall be mulched with a layer of mulch material covering the entire saucer area around each plant to a depth of 2 to 3 inches.

9. MAINTENANCE operations shall begin immediately after each plant is planted and shall be continued as required for a period of 60 days. Plants shall be kept in a healthy growing condition by watering, pruning, spraying, weeding, cultivating, and by any other necessary operations of maintenance. Plant saucers shall be kept free of weeds, grass, and other undesired vegetative growth. Plants shall be inspected at least weekly by the contractor during the maintenance period and necessary work shall be promptly performed. Watering will be required when, in the opinion of the Contracting Officer, the soil moisture is below optimum level for best plant growth. Bi-weekly watering will normally be required during dry weather.

10 REPLACEMENT During the maintenance period, plants that die or are, in the opinion of the Contracting Officer, in an unhealthy, unsightly, or badly impaired condition, shall be replaced by the contractor as soon as is reasonably possible after the unsatisfactory condition has become evident. No replacements shall be made in any season definitely unfavorable for planting. At the conclusion of the maintenance period, the Contracting Officer will make an inspection of the work to determine condition of all plants. All plants then not in a healthy growing condition, as determined by the Contracting Officer, will be noted. As soon as seasonal conditions permit, all plants noted to be unhealthy, unsightly, or damaged, shall be removed from the site and replaced with healthy plants of the

same kinds and sizes as originally specified. Such replacements shall be made in the same manner as specified for the original planting, and at no extra cost to the Government after the original maintenance period.

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SECTION 11A
GAGES AND MONUMENTS

Index

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|----------------------------|---------------------------------------|
| 1. Applicable Publications | 3. Settlement and Reference Monuments |
| 2. Gages | 4. Painting |

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 Specifications.

QQ-B-750 & Am-1	Bronze, Phosphor; Bar, Plate, Rod, Sheet, Strip, Flat Wire, and Structural and Special Shapes Sections
TT-P-25c	Primer Coating, Exterior (Undercoat for Wood, Ready-Mixed, White and Tints)
TT-P-1046	Paint (White Lead and Oil, Exterior, Ready-Mixed, White and Tints)
WW-P-406b & Am-1	Pipe; Steel (Seamless and Welded)(for Ordinary Use)
WW-P-471a & Am-2	Pipe Fittings; Bushings, Locknuts, and Plugs; Brass or Bronze, Iron or Steel, and Aluminum; (Screwed); 125- and 150-Pound

1.2 West Coast Lumber Inspection Bureau.

No. 15	Grading and Dressing Rules (Revised Feb. 1, 1968 w/Supplement XVII)
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1.3 Redwood Inspection Service.

Grades of California Redwood Lumber - (May 1968)

2. GAGES.

2.1 Staff Gages.

2.1.1 General. The Contractor shall furnish all material, equipment, and labor, and construct and install the staff gages as shown on the drawings. The Contractor shall submit complete shop drawings for the porcelain enameled gages, including numeral plates, and receive approval of design before construction shall be initiated. Workmanship shall be of the highest grade throughout and in accordance with the standard practice for the type of work being performed.

2.1.2 Hardware. Structural steel, screws, washers, and bolts and nuts shall conform to the applicable requirements of section: MISCELLANEOUS METALWORK AND MATERIALS. Screws for fastening staff gage sections to Douglas Fir lumber backing shall have "Phillips" type heads and shall be made of nickel plated brass or of stainless steel. Non corrosive soft metal eyelets shall be installed permanently in each screw hole of the metal staff gage, and number plates. All ferrous materials shall be galvanized except where other finish is specified.

2.1.3 Lumber for the staff gage backing shall be Douglas fir, B & Better, graded in accordance with current West Coast Lumber Inspection Bureau. All lumber shall be painted before assembly, and all lumber shall be S4S.

2.1.4 Staff Gages. Metal plates for the staff gages shall be manufactured of low carbon steel or iron. Each staff gage face section and plate shall be etched and the finish and numerals applied in accordance with the requirements contained in the "Specification of the Porcelain Enamel Institute." Edges shall be ground and screw holes shall be burred before applying finish. The lumber backing shall be secured firmly in position on the steel channel supports by means of galvanized bolts mounted through slotted holes, and the metal sheet and plated shall be attached to the 2 x 10-inch members as shown. The Contractor shall use adequate care to mount each staff gage face section and each numeral accurately to the exact elevation corresponding to the numeral and the gradations. Screws shall be tightened, but not to the extent that will crack the enamel. Damaged sections of any staff gage shall be replaced at no additional cost to the Government.

2.1.4 Concrete Footings. The steel channel support of each staff gage shall be mounted in concrete. Each channel shall be set plumb and to the depth as shown. Concrete shall conform to the applicable requirements of section: CONCRETE CONSTRUCTION. All concrete used shall have a compressive strength of not less than 2,000 pounds per square inch in 28 days.

2.2 Crest Gage.

2.2.1 Crest Gage shall be furnished and installed as shown, as specified herein, and/or as directed by the Contracting Officer.

2.2.2 Pipe fittings shall conform to Federal specification WW-P-471.

2.2.3 Brass wood screws shall be used for fastening bronze tabs to redwood backing.

2.2.4 Bronze tabs shall conform to Federal Specification QQ-B-750.

2.2.5 All ferrous materials shall be galvanized.

2.2.6 Rod shall be redwood select heart grade, graded in accordance with Redwood Inspection Service.

3. SETTLEMENT AND REFERENCE MONUMENTS.

3.1 General. Facilities for determination of earth settlement shall be of the type shown on the drawings. Carriage bolts, and other miscellaneous metal work not otherwise specified shall conform to the applicable provisions of the section: MISCELLANEOUS METALWORK AND MATERIALS. Installation of settlement monuments and timber posts shall not be performed until all pavement and related work has been completed on the top of the dam. Surveys to determine settlement elevations of monuments will be made by the Government.

3.2 Pipe fittings shall conform to the requirements of Federal Specification WW-P-471.

3.3 Monuments. Concrete monument blocks shall be precast with threaded end of carriage bolt and the pipe embedded as shown on the drawings. Concrete shall be protected from moisture loss while curing, and carriage bolt shall be galvanized. Monuments shall be installed as shown on the drawings. Concrete shall conform to the requirements of the section: CONCRETE CONSTRUCTION.

3.4 Timber Posts shall be 3 x 8-inch redwood, select heart grade, graded in accordance with Redwood Inspection Service. All lumber shall be S4S.

4. PAINTING. Exposed portion of staff gage posts and settlement and reference monument posts shall be painted with one prime coat and 2 finish coats of white paint. Primer paint shall conform to Federal Specification TT-P-25. Finish paint shall conform to Federal Specification TT-P-104.

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SECTION 11J

METAL GUARDRAIL AND GUIDE POSTS

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|----------------------------|--------------------|
| 1. Applicable Publications | 4. Metal Guardrail |
| 2. Materials | 5. Guide Posts |
| 3. Preservative Treatment | |

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.

QQ-5-634	Steel Bar, Carbon, Cold Finished (Standard Quality)
TT-P-25c	Primer Coating, Exterior (Undercoat for Wood, Ready-Mixed, White and Tints)
TT-P-104b	Paint (White Lead and Oil, Exterior, Ready-Mixed, White and Light Tints)
TT-P-00641e	Primer Coating: Zinc Dust-Zinc Oxide (For Galvanized Surfaces)
TT-W-00571h & Am-1	Wood Preservation: Treating Practices

1.2 Military Specification.

MIL-C-15328C	Primer Wash, Pretreatment, Blue (Formula No. 117-B for Metals)
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1.3 American Society for Testing and Materials.

A 123-67	Zinc (Hot-Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars, and Strip
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1.4 West Coast Lumber Inspection Bureau.

No. 15	Grading and Dressing Rules (Revised Feb 1, 1968 w/Supplement XVII)
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2. MATERIALS.

2.1 Lumber.

2.1.1 Douglas Fir shall be construction grade, Posts and Timbers, S4S, Graded in accordance with the current West Coast Lumber Inspection Bureau.

2.2 Metal Guardrail. Steel for guardrail shall be open hearth, oxygen furnace or electric furnace steel having an elongation of not less than 12% in 2 inches and 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. At the option of the Contractor, the rail element may consist of either a curved beam symmetrical about the horizontal axis or a corrugated beam with corrugations symmetrical about the horizontal axis. Terminal section, bolts, nuts, washers, and other fittings shall be standard with the manufacturer of the guardrail. Guardrail shall be galvanized. Rail element joints shall have a tensile strength of not less than 80,000 pounds.

2.2.1 Curved Beam Guardrail. The rail element shall be not less than No. 10 gage U. S. Standard. Brackets for mounting the rail element shall be standard with the manufacturer of the guardrail. When bolted in a fixed position the bracket shall be capable of supporting a 2,300-pound vertical load applied at the rail position with a permanent set resulting therefrom of not more than 1/8 inch measured at the point of loading. The rail element shall not deflect more than 3 inches when more than 3 inches when tested as a simple beam with the traffic face up and with a 2,000-pound load applied at the center of a 10-foot span through a 3-inch wide bearing curved to fit the rail. When the radius of curvature is 100 feet or less, the rail element shall be shaped in the shop.

2.2.2 Corrugated Beam Guardrail. The rail element shall be not less than No. 12 gage U. S. Standard. Rail elements shall be fabricated to provide a lap of at least 12-1/2 inches when bolted in place. The rail element shall not deflect more than 5-1/2 inches when tested as a simple beam with the traffic face up and with a 2,000-pound load applied at the center of a 12-foot span through a 3-inch wide, flat bearing. When the radius of curvature is 150 feet or less, the rail element shall be shaped in the shop. 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.

2.3 Paint.

2.3.1 Exterior Finish Pain for wood and metal shall conform to Federal Specifications TT-P-104.

2.3.2 Metal Primer Pain shall conform to Federal Specification TT-P-641.

2.3.2 Vinyl-Type Wash Coat shall conform to Military Specification MIL-C-15328.

2.3.3 Wood Primer Paint shall conform to Federal Specification TT-P-25.

2.4 Galvanizing shall conform to ASTM Standard A 123. All metal portions of guardrail shall be galvanized. Guardrail may be galvanized before or after fabrication and the weight of zinc coating shall be not less than 1-1/2 ounces per square foot of sheet based upon the total weight of coating on both sides of sheet. Guardrail brackets and other items shall be galvanized after fabrication and the weight of zinc coating shall be not less than 2 ounces per square foot of actual surface.

3. PRESERVATIVE TREATMENT shall conform to Federal Specification TT-W-571, and the minimum net retention of preservative shall be as specified below. At the option of the Contractor any of the following preservatives will be acceptable.

Preservative	Minimum Net Retention Pound Per Cubic Foot
Pentachlorophenol solution	Solution 6.0
Copper Naphthenate solution	Solution 6.0
Wolman salts (Tanalith)	Dry salt .35
Chromated zinc Chloride	Dry salt .75
Celcure (Acid cupric chromate)	Dry salt .50
Chemonite (Ammoniacal copper arsenite)	Dry salt .30

After using a salt treatment, the moisture content of the lumber shall be reduced to not over 19%.

4. METAL GUARDRAIL.

4.1 Posts shall be treated Douglas fir 8 x 8 inches, 4 feet 8 inches long. Top shall be chamfered and treated with the same type of preservative used in the original treatment. Posts shall be embedded 2 feet 7 inches in the ground and set in such a position that the top of the guardrail shall be level with 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 in accordance with the manufacturers standards.

4.2 Rail shall be installed so that the bottom of the rail shall be 13 inches above the ground. Brackets shall be the manufacturer's standard for the type of guardrail installed and shall be attached to rail posts in accordance with the instructions of the manufacturer. Ends of all rails shall be turned away from the roadway and shall be fitted with manufacturer's standard curved end sections or provided with end wings. Joint design shall be in accordance with the manufacturer's standards. The rail at joints shall have full bearing. Where corrugated beam guardrail is used, rail element joints shall be lapped not less than 12-1/2 inches.

4.3 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 was 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 was coat shall be used within 8 hours. If additional thinning is required to maintain a wet spray, treatment the guardrail shall receive 2 prime coats and one finish coat of white paint.

5. GUIDE POSTS shall be unpainted galvanized steel, fabricated from one piece (without welds) of low carbon steel, conforming to Federal Specification 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 and 5 feet long. Posts shall be galvanized after fabrication by the hot-dipped process, conforming to ASTM Standard A 123. Posts shall be imbedded 2 feet in the ground. Reflectors shall be a wide angle silver reflective tape, or 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-inch diameter plastic or glass reflectors may be used.

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SECTION 14B

STEEL DOORS AND FRAMES

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|--|-------------------------|
| 1. Applicable Publications | 6. Delivery and Storage |
| 2. Shop Drawings | 7. Installation |
| 3. General Requirements for Doors and Frames | 8. Hardware |
| 4. Construction of Frames | 9. Calking |
| 5. Construction of Doors | |

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-H-1166 & Int. Am-5
HH-P-117
TT-C-00598C

TT-P-38D

Hinges, Hardware, Builders'
Packing; Jute, Twisted
Calking Compound, Oil and Resin Base Type
(for Building Construction)
Paint, Aluminum, Ready-Mixed

1.2 American National Standards Institute, Inc. (ANSI) Standards.

A123.1-1967

Nomenclature for Steel Doors and Steel Door Frames

1.3 American Society for Testing and Materials (ASTM) Publications.

A 366-68
A-569-66T
D-1692-68

Cold-Rolled Carbon Steel Sheets, Commercial Quality
Hot-Rolled Carbon Steel Sheets and Strip, Commercial Quality
Flammability of Plastic Sheeting and Cellular Plastics

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 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.

3. GENERAL REQUIREMENTS FOR DOORS AND FRAMES.

3.1 Steel. Doors and frames 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, doors and frames 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 appearance, 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. Doors and frames shall be prepared for hardware in conformance with the templates provided under paragraph: HARDWARE; the requirements of American National Standards A123.1; and the application locations specified in paragraph: HARDWARE. Cutting, reinforcing, drilling, and tapping of doors and frames shall be done at the factory, except drilling and tapping for surface applied hardware will be done in the field when the hardware is applied. In addition to the plaster guards required for strike reinforcement, plaster guards shall be provided on the door frames for the hinge reinforcements. Door frames shall be prepared for silencers, and rubber silencers shall be provided with the frames. Reinforcement of doors and frames for hardware shall be as specified in Table I at the end of this section.

⁵
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.

⁶
3.6 Thresholds 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 doors 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. Frames shall be knockdown type or welded unit type.

4.1 Welded Unit Type Frames shall have headers 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. Frames 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.

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 heads and 3/4 inch at bottom measured from finished floorline. Exterior doors shall have top and bottom edges closed flush and sealed against water penetration.

5.1 Flush Doors shall be of full flush or flush panel 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 p.s.f., and the lamination shall withstand not less than 1,500 p.s.f., surface shear. Foam insulation core material shall have a compressive strength of not less than 1,500 p.s.f. and a shear strength of not less than 18 p.s.i., 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.

5.1.2 Flush Panel Construction shall have panel face sheets of not less than 18-gage steel and shall have no seams or joints on the face of the panel. For stile and panel construction, stiles shall be fabricated of not less than 18-gage steel; and for stile and rail construction, stiles and rails shall be fabricated of not less than 16-gage steel. Surfaces of panels and stiles shall lie in parallel planes after being jointed together, except panels may be recessed an amount no greater than the thickness of the stile facing material. The top and bottom of the door shall be closed with a recessed channel or a flush end closure treatment.

6. DELIVERY AND STORAGE. To provide protection during shipment, welded unit type frames shall be strapped together in pairs with heads at opposite ends or provided with temporary steel spreaders at the bottom of each frame; and knockdown type frames shall be securely strapped in bundles. Materials shall be delivered to the site in undamaged condition, stores 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. Frames shall be plumbed, leveled, and rigidly secured in place. Temporary spreaders 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 threshold shall be installed at exterior door openings to provide a weathertight installation.

8. HARDWARE.

8.1 Butts and Hinges shall conform to Federal Specification FF-H-116, Type T2107, finish USP. At the option of the Contractor hinges with nylon or oil-impregnated bearings may be furnished in lieu of the ball bearing hinges.

8.2 Application of Hardware.

8.2.1 Top hinge shall be installed with center of hinge not more than 11 inches below the top of door.

8.2.2 Bottom hinge shall be installed with the center of hinge not more than 13 inches above the finish floor.

8.2.3 Intermediate hinge shall be installed equidistant between the top and bottom hinges.

8.2.4 Latch shall be centered 40-5/16 inches above the finish floor.

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.

9.2.3 Rope Yarn shall conform to Federal Specification HH-P-117, type 1.

9.3 Preparation. Grooves in concrete and masonry shall be cut and cleaned out to a minimum depth of 1/2 inch and ground to a minimum width of 1/4 inch without damage to adjoining work. Where necessary to provide a suitable backstop, the back of grooves shall be packed tightly with rope yard. All particles of mortar, dust, and other foreign matter shall be brushed out just prior to calking, and grooves shall be given a uniform coating of sealer.

9.4 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 uniformly 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.

9.5 Cleaning. The surfaces adjoining calked joints shall be cleaned of smears or other soiling resulting from the calking application.

TABLE I. REINFORCEMENT

Hardware Item	Minimum Gage	Minimum Size, Inches
Hinges	Door 10	8 x 1-5/8
	Frame 10	8 x 1-5/8

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.

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U. S. ARMY ENGINEER DISTRICT, LOS ANGELES
300 North Los Angeles Street
Los Angeles, California

ARMY - C. of E. - Los Angeles