

Reference

DACW09-76-B-0007

SPECIFICATIONS

for

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

INDIAN BEND WASH

OUTLET CHANNEL

LIBRARY

and

RECREATION FACILITIES

MARICOPA COUNTY, ARIZONA

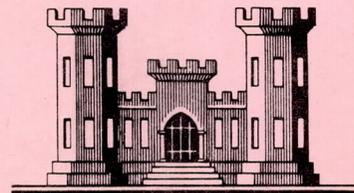
Gila River Basin, Arizona

Appropriation: 96x3122 Construction General
Corps of Engineers, Civil
96x8862 Contributed Funds, Required
Contributed Funds, Other

Authority: Public Law 93-393

LIBRARY

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



A111.503

DACW09-76-B-0007

INVITATION FOR BIDS
(CONSTRUCTION CONTRACT)

DATE

15 October 1975

NAME AND LOCATION OF PROJECT

INDIAN BEND WASH
OUTLET CHANNEL AND RECREATION
FACILITIES
MARICOPA COUNTY
ARIZONA

DEPARTMENT OR AGENCY

DEPARTMENT OF THE ARMY

BY (Issuing office)

U. S. ARMY ENGINEER DISTRICT, LOS ANGELES

Scaled bids in duplicate for the work described herein will be received until
1 p.m. local time at the place of bid opening, 2 December 1975,

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

and at that time publicly opened.

Information regarding bidding material, bid guarantee, and bonds

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

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

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

(b) Payment Bond.

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

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

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

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

Description of work

The work consists of construction of outlet channel and recreational facilities at Indian Bend Wash, complete.

READ THE FOLLOWING IN CONJUNCTION WITH INSTRUCTIONS TO BIDDERS (U. S. STANDARD FORM 2)

1. **PLANT AND EQUIPMENT.** Each bidder shall, upon request of the Contracting Officer, furnish a list of the plant available to the bidder and proposed for use on the work.
2. **MODIFICATIONS PRIOR TO DATE SET FOR OPENING BIDS.** The right is reserved, as the interest of the Government may require, to revise or amend the specifications or drawings, or both prior to the date set for opening bids. Such revisions and amendments, if any, will be announced by an amendment or amendments to this Invitation for Bids. If the revisions and amendments are of a nature which requires material changes in quantities or prices bid or both, the date set for opening bids may be postponed by such number of days as in the opinion of the District Engineer will enable bidders to revise their bids. In such cases, the amendment will include an announcement of the new date for opening bids.
3. **BIDDERS** are required to acknowledge receipt of all amendments to this Invitation on the Bid Form (Standard Form 21) in the space provided, or by separate letter or telegram prior to opening of Bids. Failure to acknowledge all amendments may cause the rejection of the bid.
4. **NOTICE REGARDING BUY AMERICAN ACT (1970 SEP).** The Buy American Act (41 U.S.C. 10a-10d) generally requires that only domestic construction material be used in the performance of this contract. Exception from the Buy American Act shall be permitted only in the case of nonavailability of domestic construction materials. A bid or proposal offering nondomestic construction material will not be accepted unless specifically approved by the Government. When a bidder or offeror proposes to furnish nondomestic construction material, his bid or proposal must set forth an itemization of the quantity, unit price, and intended use of each item of such nondomestic construction material. When offering nondomestic construction material pursuant to this paragraph, bids or proposals may also offer, at stated prices, any available comparable domestic construction material, so as to avoid the possibility that failure of a nondomestic construction material to be acceptable under this paragraph will cause rejection of the entire bid.
5. **AVAILABILITY OF SPECIFICATIONS, STANDARDS AND DESCRIPTIONS (1974 APR)** Specifications, standards and descriptions cited in this solicitation are available as indicated below:
 - 5.1 **Unclassified Federal, Military and Other Specifications and Standards (Excluding Commercial), and Data Item Descriptions.** Submit required on DD Form 1425 (Specifications and Standards Requisition) to:

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

The Department of Defense Index of Data Item Descriptions (TD-3) may be ordered on the DD Form 1425. The Department of Defense Index of Specifications and Standards (DODISS) may be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C., 20402. When requesting a specification or standard, the request shall indicate the title, number, date and any applicable amendment thereto by number and date. When requesting a data item description, the request shall cite the applicable data item number set forth in the solicitation. When DD Form 1425 is not available, the request may be submitted in letter form, giving the same information as listed above, and the solicitation or contract number involved. Such requests may also be made to the activity by telegram or telephone (Area Code 215, 697-3321) in case of urgency.

 - 5.2 **Commercial Specifications, Standards and Descriptions.** These specifications, standards and descriptions are not available from Government sources. They may be obtained from the publishers.
6. **AVAILABILITY FOR EXAMINATION OF SPECIFICATIONS, STANDARDS, DRAWINGS, AND OTHER PERTINENT DOCUMENTS.** The specifications, standards, drawings, and other pertinent documents cited in this solicitation may be examined at the following location:

U.S. Army Engineer District, Los Angeles
300 No. Los Angeles Street
Los Angeles, California 90053
7. In addition to the immediate site of construction, the Department of Labor has stated that the Davis-Bacon Act applies to Contractor's operations connected with temporary facilities located off the immediate site of construction such as batch plants, sand pits, rock quarries and similar operations which have been set up exclusively to furnish materials for the contract. Therefore, employees related to these temporary facilities are considered on-site employees, and the Contractor shall maintain complete records as set out in the Labor Standards Provisions of the contract.
8. The Government further reserves the right to make award of any or all schedules of any bid, unless the bidder qualifies such bid by specific limitation; also to make award to the bidder whose aggregate bid on any combination of bid schedules is low. For the purpose of this Invitation for Bids, the word "item" as used in paragraph 10(c) of Standard Form 22, shall be considered to mean "schedule."

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

9. **DRAWINGS.** Sets of drawings, half-size, and of specifications will be furnished upon receipt of payment of \$6.70 per set. If individual plan sheets are requested, they will be furnished at the rate of \$0.10 for half-size, for each sheet requested, but with a minimum charge of \$1.00. The maximum charge shall not exceed the charge for a full set of plans. No refund of the payment for drawings will be made and the drawings need not be returned to the District Engineer. Additional copies of the specifications alone will be furnished an applicant at the rate of \$1.00 per copy. Payments will be made by cash, check or money order and delivered to the U. S. Army Engineer District, Los Angeles, 300 North Los Angeles Street, Los Angeles, California. Checks and money orders should be made payable to "Treasurer of the United States."

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

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

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

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

13. **NOTE THE CERTIFICATION OF 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. (1972 JUL)**

15.1 **Restriction.** Offers 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. Offers 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 offering 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 \$12,000,000, except that if the concern has 50 percent or more of its annual sales or receipts attributable to business activity within Alaska, such average annual receipts must not exceed \$15,000,000.

16. **ARITHMETIC DISCREPANCIES.**

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

- (1) Obviously misplaced decimal points will be corrected;
- (2) In case of discrepancy between unit price and extended price, the unit price will govern;
- (3) Apparent errors in extension of unit prices will be corrected; and
- (4) Apparent errors in addition of lump-sum and extended prices will be corrected.

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

17. ADDITIVE ITEMS. The low bidder for purposes of award shall be the conforming responsible bidder offering the low aggregate amount for the base bid plus (in the order of priority listed in the schedule) those additive bid items providing the most features of work within the funds available for the work covered by the additive items. If addition of another bid item in the listed order of priority would make the award exceed such funds for all bidders, it shall be skipped and the next subsequent additive bid item in a lower amount shall be added if award thereon can be made within such funds. For example, when the amount available for the work covered by the additive items is \$100,000; and the bidders' bid for four successive additives are \$85,000, \$10,000, \$8,000 and \$4,000, the aggregate amount of the bid for purposes of award would be \$99,000 for first, second and fourth additives, the third additive being skipped because it would cause the aggregate bid for the additives to exceed \$100,000. In any case all bids shall be evaluated on the basis of the same additive bid items as above provided. The listed order of priority need be followed only for determining the low bidder. After determination of the low bidder as stated, award in the best interests of the Government may be made to him on his base bid and any combination of his additive bid for which funds are determined to be available at the time of the award, provided that award on such combination of bid items does not exceed the amount offered by any other conforming responsible bidder for the same combination of bid items.

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

* * * * *

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, MODIFICATIONS OF BIDS OR WITHDRAWAL OF BIDS (1974 SEP)

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

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

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

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

(c) The only acceptable evidence to establish:

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

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

(d) Notwithstanding the above, a late modification of an otherwise successful bid which makes its terms more favorable to the Government will be considered at any time it is received and may be accepted. (ASPR 7-2002.2)

8. Deleted

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

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

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

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

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

BID FORM
(CONSTRUCTION CONTRACT)

REFERENCE

DACW09-76-B-0007

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

DATE OF INVITATION

15 October 1975

NAME AND LOCATION OF PROJECT

INDIAN BEND WASH
OUTLET CHANNEL AND
RECREATION FACILITIES
MARICOPA COUNTY
ARIZONA

NAME OF BIDDER (*Type or print*)

(Date)

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

In compliance with the above-dated invitation for bids, the undersigned hereby proposes to perform all work for construction of outlet channel and recreational facilities, at Indian Bend Wash, complete.

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

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

The undersigned agrees that, upon written acceptance of this bid, mailed or otherwise furnished within _____ 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 19-B are made a part of this bid.

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

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.
 DACW09-76-B- 0007

Envelopes shall be addressed:
 U. S. ARMY ENGINEER DISTRICT
 LOS ANGELES
 PHOENIX RESIDENT OFFICE
 2721 North Central Avenue
 Phoenix, Arizona 85004

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

BIDDING SCHEDULE

BASE BID

Item No.	Description	Estimated Quantity	Unit	Unit Price	Estimated Amount
1.	DIVERSION AND CONTROL OF WATER	1	Job	L.S.	_____
2.	CLEAR SITE AND REMOVE OBSTRUCTIONS	1	Job	L.S.	_____
3.	EXCAVATION, CHANNEL	1,059,000	Cu. Yd.	_____	_____
4.	EXCAVATION, McKELLIPS LAKE	117,000	Cu. Yd.	_____	_____
5.	COMPACTED FILL, LEVEE	78,100	Cu. Yd.	_____	_____
6.	COMPACTED FILL, INVERT	21,200	Cu. Yd.	_____	_____
7.	BACKFILL, TOE	50,800	Cu. Yd.	_____	_____
8.	TOPSOILING	84,500	Cu. Yd.	_____	_____
9.	LANDSCAPE FILL	54,900	Cu. Yd.	_____	_____
10.	LAKE LINING	21,000	Cu. Yd.	_____	_____
11.	RETAINING WALL STA. 112+97 TO STA. 111+37	1	Job	L.S.	_____
12.	DROP STRUCTURE, MAIN CHANNEL AND GROUTED STONE ACCESS RAMPS, MCKELLIPS LAKE	1	Job	L.S.	_____
13.	DROP STRUCTURE, STA. 48+10	1	Job	L.S.	_____
14.	DROP STRUCTURE, STA. 39+70	1	Job	L.S.	_____
15.	MCKELLIPS LAKE OUTLET	1	Job	L.S.	_____
16.	STONE PROTECTION MCKELLIPS ROAD BRIDGE STA. 77+65 TO STA. 70+34.82	1	Job	L.S.	_____
17.	STONE PROTECTION PRINCESS DRIVE BRIDGE	1	Job	L.S.	_____

BIDDING SCHEDULE (CONTINUED)

BASE BID (CONTINUED)

Item No.	Description	Estimated Quantity	Unit	Unit Price	Estimated Amount
18.	FACING STONE, LEVEE	38,300	Ton	_____	_____
19.	FILTER MATERIAL, LEVEE	13,700	Cu. Yd.	_____	_____
20.	SIDE DRAIN STA. 113+50	1	Job	L.S.	_____
21.	SIDE DRAIN STA. 108+50	1	Job	L.S.	_____
22.	SIDE DRAIN STA. 99+77	1	Job	L.S.	_____
23.	SIDE DRAIN STA. 99+75	1	Job	L.S.	_____
24.	SIDE DRAIN STA. 73+50	1	Job	L.S.	_____
25.	SIDE DRAIN STA. 73+45	1	Job	L.S.	_____
26.	SIDE DRAIN STA. 87+90	1	Job	L.S.	_____
27.	SIDE DRAIN STA. 83+00	1	Job	L.S.	_____
28.	SIDE DRAIN STA. 78+50	1	Job	L.S.	_____
29.	SIDE DRAIN STA. 70+55	1	Job	L.S.	_____
30.	SIDE DRAIN STA. 70+15	1	Job	L.S.	_____
31.	SIDE DRAIN STA. 59+00	1	Job	L.S.	_____
32.	SIDE DRAIN STA. 35+70	1	Job	L.S.	_____
33.	SIDE DRAIN STA. 33+20	1	Job	L.S.	_____
34.	SIDE DRAIN STA. 52+00	1	Job	L.S.	_____

BIDDING SCHEDULE (CONTINUED)

BASE BID (CONTINUED)

Item No.	Description	Estimated Quantity	Unit	Unit Price	Estimated Amount
35.	SIDE DRAIN STA. 40+50	1	Job	L.S.	_____
36.	SIDE DRAIN STA. 24+65	1	Job	L.S.	_____
37.	SIDE DRAIN STA. 11+50	1	Job	L.S.	_____
38.	BRIDGE APPROACHES, McKELLIPS ROAD	1	Job	L.S.	_____
39.	BRIDGE APPROACHES, PRINCESS DRIVE	1	Job	L.S.	_____
40.	STORM DRAIN, McKELLIPS ROAD	1	Job	L.S.	_____
41.	STORM DRAIN, PRINCESS DRIVE	1	Job	L.S.	_____
42.	ASPHALT CONCRETE PAVEMENT, LEVEE	2,170	Ton	_____	_____
43.	LANDSCAPING	1	Job	L.S.	_____
44.	SEEDING, UNMOWED TURF	103	Acre	_____	_____
45.	SEEDING, MOWED TURF	15	Acre	_____	_____
46.	RIDING AND HIKING TRAIL DOWNSTREAM FROM McKELLIPS ROAD	1	Job	L.S.	_____
47.	TRAIL UNDERPASS	1	Job	L.S.	_____
48.	FILLING LAKE	1	Job	L.S.	_____
49.	IRRIGATION SYSTEM	1	Job	L.S.	_____
50.	STATION MARKING	1	Job	L.S.	_____
51.	PIPE GATE	11	Each	_____	_____

TOTAL AMOUNT BASE BID

\$ _____

BIDDING SCHEDULE (CONTINUED)

ADDITIVE ITEMS

(McKELLIPS LAKE RECREATION AREA)

Item No.	Description	Estimated Quantity	Unit	Unit Price	Estimated Amount
52.	PARKING AREA, ACCESS ROAD, AND ENTRANCE SIGN	1	Job	L.S.	_____
53.	REST ROOM	1	Job	L.S.	_____
54.	DOMESTIC WATER LINES	1	Job	L.S.	_____
55.	SANITARY SEWER LINE	1	Job	L.S.	_____
56.	RIDING AND HIKING TRAIL UPSTREAM FROM McKELLIPS ROAD	1	Job	L.S.	_____
57.	GROUP PICNIC RAMADA	1	Job	L.S.	_____
58.	SMALL PICNIC RAMADA NO. 4	1	Job	L.S.	_____
59.	SMALL PICNIC RAMADA NO. 2	1	Job	L.S.	_____
60.	SMALL PICNIC RAMADA NO. 1	1	Job	L.S.	_____
61.	SMALL PICNIC RAMADA NO. 3	1	Job	L.S.	_____
62.	SMALL PICNIC RAMADA NO. 5	1	Job	L.S.	_____

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

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

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

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

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 (1974 APR)

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

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

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

3. TYPE OF ORGANIZATION

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

4. INDEPENDENT PRICE DETERMINATION

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

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

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

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

(b) Each person signing this bid certifies that:

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

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

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

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

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

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

5. EQUAL OPPORTUNITY

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

6. PARENT COMPANY AND EMPLOYER IDENTIFICATION NUMBER

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

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

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

NAME OF PARENT COMPANY

MAIN OFFICE ADDRESS (No., Street, City, State, and ZIP Code)

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

EMPLOYER IDENTIFICATION NUMBER OF



PARENT COMPANY

BIDDER

7. CERTIFICATION OF NONSEGREGATED FACILITIES

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

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

NOTICE TO PROSPECTIVE SUBCONTRACTORS OF REQUIREMENT FOR CERTIFICATIONS OF NONSEGREGATED FACILITIES

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

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

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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GENERAL PROVISIONS

(Construction Contract)

Issued By: Department of the Army, Corps of Engineers

(General Provisions 1 through 23, 24 through 31 and 61 are those prescribed by the General Services Administration in Standard Form 23-A, Oct 1969 edition, and Standard Form 19-A, Nov 1972 edition, respectively, as amended pursuant to the latest revisions of the Armed Services Procurement Regulation and Engineer Contract Instructions, ER 1180-1-1.)

1.1 DEFINITIONS

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

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

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

1.2 DEFINITIONS (1964 JUN)

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

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

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

2. SPECIFICATIONS AND DRAWINGS (1964 JUN)

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

3. CHANGES (1968 FEB)

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

- (i) in the specifications (including drawings and designs);
- (ii) in the method or manner of performance of the work;

- (iii) in the Government-furnished facilities, equipment, materials, services, or site; or
- (iv) directing acceleration in the performance of the work.

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

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

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

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

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

4. DIFFERING SITE CONDITIONS (1968 FEB)

(a) The Contractor shall promptly, and before such conditions are disturbed, notify the Contracting Officer in writing of: (1) subsurface or latent physical conditions at the site differing materially from those indicated in this contract, or (2) unknown physical conditions at the site, of an unusual nature, differing materially from those ordinarily encountered and generally recognized as inhering in work of the character provided for in this contract. The Contracting Officer shall promptly investigate the conditions, and if he finds that such conditions do materially so differ and cause an increase or decrease in the Contractor's cost of, or the time required for, performance of any part of the work under this contract, whether or not changed as a result of such conditions, an equitable

adjustment shall be made and the contract modified in writing accordingly.

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

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

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

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

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

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

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

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

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

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

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

(g) As used in paragraph (d)(1) of this clause, the term "subcontractors or suppliers" means subcontractors or suppliers at any tier. (ASPR 7-602.5 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, to such assignee upon the prior written authorization of the Contracting Officer. (ASPR 7-602.8)

9. MATERIAL AND WORKMANSHIP (1964 JUN)

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

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

10. INSPECTION AND ACCEPTANCE (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 (1975 OCT)

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

21. EQUAL OPPORTUNITY (1972 AUG)

(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 nondiscrimination 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, as amended by Executive Order No. 11375 of October 13, 1967, 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, as amended by Executive Order No. 11375 of October 13, 1967, and by the rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records, and accounts by the contracting agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

(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, as amended by Executive Order No. 11375 of October 13, 1967, and such other sanctions may be imposed and remedies invoked as provided in Executive Order No. 11246 of September 24, 1965, as amended by Executive Order No. 11375 of October 13, 1967, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

(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, as amended by Executive Order No. 11375 of October 13, 1967, so that such provisions will be binding upon each subcontractor or vendor. The Contractor will take such action with respect to any subcontract or purchase order as the contracting agency may direct as a means of enforcing such provisions, including sanctions for noncompliance: *Provided, however*, that in the event the Contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the contracting agency, the Contractor may request the United States to enter into such litigation to protect the interests of the United States. (ASPR 7-103.18(a))

22. UTILIZATION OF SMALL BUSINESS CONCERNS (1958 JAN)

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

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

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-276a-7)

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

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

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

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

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

(d) The Contracting Officer shall require that any class of laborers or mechanics, including apprentices and trainees, which is not listed in the wage determination decision and which is to be employed under the contract shall be classified or reclassified conformably to the wage determination decision, and shall report the action taken to the Secretary of Labor. If the interested parties cannot agree on the proper classification or reclassification of a

particular class of laborers or mechanics to be used, the Contracting Officer shall submit the question, together with his recommendation, to the Secretary of Labor for final determination. Apprentices and trainees may be added under this clause only where they are employed pursuant to an apprenticeship or trainee program meeting the requirements of the Apprentices and Trainees clause below.

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

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

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

(b) In the event of any violation of the provisions of paragraph (a), the Contractor shall be liable to any affected employee for any amounts due, and to the United States for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including an apprentice, trainee, watchman, or guard, employed in violation of the provisions of paragraph (a) in the sum of \$10 for each calendar day on which such employee was required or permitted to be employed on such work in excess of 8 hours or in excess of the standard workweek of 40 hours without payment of the overtime wages required by paragraph (a).

26. APPRENTICES AND TRAINEES

(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, U.S. 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 a trainee as defined in paragraph (b) of this clause, and 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. The Contractor shall furnish to the Contracting Officer written evidence of the registration of his program and apprentices, as well as of the appropriate 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. The term "apprentice" means (1) a person employed and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Bureau of Apprenticeship and Training, or with a State apprenticeship agency recognized by the Bureau, or (2) a person in his first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Bureau of Apprenticeship and Training, or a State Apprenticeship Council (where appropriate) to be eligible for probationary employment as an apprentice.

(b) Trainees shall be permitted to work as such when they are bona fide trainees employed pursuant to a program approved by the U.S. Department of Labor, Manpower Administration, Bureau of Apprenticeship and Training. The term "trainee" means a person receiving on-the-job training in a construction occupation under a program which is approved (but not necessarily sponsored) by the U.S. Department of Labor, Manpower Administration, Bureau of Apprenticeship and Training and which is reviewed from time to time by the Manpower Administration to insure that the training meets adequate standards.

(c) In connection with contracts in excess of \$10,000, the Contractor agrees as follows:

(1) The Contractor shall make a diligent effort to hire for performance of work under this contract a number of apprentices or trainees, or both, in each occupation, which bears to the average number of the journeymen in that occupation to be employed in the performance of the contract the applicable ratio as set forth in paragraph (c)(7) of this clause.

(2) The Contractor shall insure that 25 percent of such apprentices or trainees in each occupation are in their first year of training, where feasible. Feasibility here involves a consideration of (i) the availability of training opportunities for first year apprentices, (ii) the hazardous nature of the work for beginning workers, and (iii) excessive unemployment of apprentices in their second and subsequent years of training.

(3) The Contractor shall, during the performance of the contract, to the greatest extent possible, employ the number of apprentices or trainees necessary to meet currently the requirements of paragraph (c)(1) and (c)(2) of this clause.

(4) The Contractor shall maintain records of employment on this contract by trade of the number of apprentices and trainees, apprentices and trainees in first year of training, and of journeymen, and wages paid and hours of work of such apprentices, trainees, and journeymen. In addition, the Contractor who claims compliance based on the criterion set forth in paragraph (c)(6)(ii) of this clause shall maintain such records of

employment on all his construction work in the same labor market area, both public and private, during the performance of this contract. In each of the above cases the Contractor shall make such records available for inspection upon request of the Department of Labor or the Contracting Officer.

(5) The Contractor shall supply one copy of each of the written notices required in accordance with paragraph (c)(6)(iii) of this clause at the request of the Contracting Officer. The Contractor also agrees to supply at 3-month intervals during the performance of the contract and after completion of contract performance a statement describing steps taken toward making a diligent effort and containing a breakdown by craft, of hours worked and wages paid for first year apprentices and trainees, other apprentices and trainees, and journeymen. One copy of the statement will be sent to the Contracting Officer and one copy to the Secretary of Labor.

(6) The Contractor will be deemed to have made a "diligent effort" as required by paragraph (c)(1) if during the performance of this contract, he accomplishes at least one of the following three objectives: (i) The Contractor employs under this contract a number of apprentices and trainees by craft, at least equal to the ratios established in accordance with paragraph (c)(7) of this clause, or (ii) the Contractor employs, on all his construction work, both public and private, in the same labor market area, an average number of apprentices and trainees by craft at least equal to the ratios established in accordance with paragraph (c)(7) of this clause, or (iii) the Contractor (A) if covered by a collective bargaining agreement, before commencement of any work on the project, has given written notice to all joint apprenticeship committees, the local U.S. Employment Security Office, local chapter of the Urban League, Workers Defense League, or other local organizations concerned with minority employment, and the Bureau of Apprenticeship and Training Representative, U.S. Department of Labor, for the locality of the work; (B) if not covered by a collective bargaining agreement, has given written notice to all of the groups stated above, except joint apprenticeship committees, and will in addition notify all non-joint apprenticeship sponsors in the labor market area; (C) has employed all qualified applicants referred to him through normal channels (such as the Employment Service, the Joint Apprenticeship Committees and where applicable, minority organizations and apprentice outreach programs who have been delegated this function) at least up to the number of such apprentices and trainees required by paragraph (c)(7) of this clause. The notice, as referred to herein, will include at least the Contractor's name and address, the agency designation, the contract number, job site address, value of the contract, expected starting and completion dates, the estimated average number of employees in each occupation to be employed over the duration of the contract work, and a statement of his willingness to employ a number of apprentices and trainees at least equal to the ratios established in accordance with paragraph (c)(7) of this clause.

(7) The Contractor recognizes that the Secretary of Labor has determined that the applicable ratios of apprentices and trainees to journeymen in any occupation for the purpose of this clause shall be as follows: (i) In any occupation the applicable ratio of apprentices and trainees to journeymen shall be equal to the predominant ratio for the occupation in the area where the construction is being undertaken, set forth in collective bargaining agreements, or other employment agreements, and available through the Bureau of Apprenticeship and Training Representative, U.S. Department of Labor, for the

applicable area; (ii) for any occupation for which no ratio is found, the ratio of apprentices and trainees to journeymen shall be determined by the Contractor in accordance with the recommendations set forth in the Standards of the National Joint Apprentice Committee for the occupation, which are on file at offices of the U.S. Department of Labor's Bureau of Apprenticeship and Training; and (iii) for any occupation for which no such recommendations are found, the ratio of apprentices and trainees to journeymen shall be at least one apprentice or trainee for every five journeymen.

27. PAYROLLS AND BASIC RECORDS

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

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

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

28. COMPLIANCE WITH COPELAND REGULATIONS

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

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 (1) to pay laborers and mechanics, including apprentices, trainees, watchmen, and guards employed by the Contractor or any subcontractor on the work the full amount of wages required by the contract, and (2) to satisfy any liability of any Contractor and

Subcontractor for liquidated damages under paragraph (b) of the clause entitled "Contract Work Hours and Safety Standards Act—Overtime Compensation."

(b) If any Contractor or subcontractor fails to pay any laborer, mechanic, apprentice, trainee, watchman, or guard employed or working on the site of work, all or part of the wages required by the contract, the Contracting Officer may, after written notice to the Government Prime Contractor, take such action as may be necessary to cause suspension of any further payments or advances until such violations have ceased.

30. SUBCONTRACTS

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

31. CONTRACT TERMINATION—DEBARMENT

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

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 (1971 NOV)

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

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

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

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

burden of, or does not obtain a refund or drawback of, any such Federal excise tax or duty.

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

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

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

(f) Unless there does not exist any reasonable basis to sustain an exemption, the Government upon the request of the Contractor shall, without further liability, furnish evidence appropriate to establish exemption from any Federal, State, or local tax; *provided* that, evidence appropriate to establish exemption from any Federal excise tax or duty which may give rise to either an increase or decrease in the contract price will be furnished only at the discretion of the Government.

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

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-CONSTRUCTION (1974 APR)

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

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

- (i) stop work under the contract on the date and to the extent specified in the Notice of Termination;
- (ii) place no further orders or subcontracts for materials, services or facilities, except as may be necessary for completion of such portion of the work under the

- (iii) contract as is not terminated;
- (iii) terminate all orders and subcontracts to the extent that they relate to the performance of work terminated by the Notice of Termination;
- (iv) assign to the Government, in the manner, at the times, and to the extent directed by the Contracting Officer, all of the right, title, and interest of the Contractor under the orders and subcontracts so terminated, in which case the Government shall have the right, in its discretion, to settle or pay any or all claims arising out of the termination of such orders and subcontracts;
- (v) settle all outstanding liabilities and all claims arising out of such termination of orders and subcontracts, with the approval or ratification of the Contracting Officer, to the extent he may require, which approval or ratification shall be final for all the purposes of this clause;
- (vi) transfer title and deliver to the Government, in the manner, at the times, and to the extent, if any, directed by the Contracting Officer, (A) the fabricated or unfabricated parts, work in process, completed work, supplies, and other material produced as a part of, or acquired in connection with the performance of, the work terminated by the Notice of Termination, and (B) the completed or partially completed plans, drawings, information, and other property which, if the contract had been completed, would have been required to be furnished to the Government;
- (vii) use his best efforts to sell, in the manner, at the times, to the extent, and at the price or prices directed or authorized by the Contracting Officer, any property of the types referred to in (vi) above; *provided*, however, that the Contractor (A) shall not be required to extend credit to any purchaser, and (B) may acquire any such property under the conditions prescribed by and at a price or prices approved by the Contracting Officer; and *provided further* that the proceeds of any such transfer or disposition shall be applied in reduction of any payments to be made by the Government to the Contractor under this contract or shall otherwise be credited to the price or cost of the work covered by this contract or paid in such other manner as the Contracting Officer may direct;
- (viii) complete performance of such part of the work as shall not have been terminated by the Notice of Termination; and
- (ix) take such action as may be necessary, or as the Contracting Officer may direct, for the protection and preservation of the property related to this contract which is in the possession of the Contractor and in which the Government has or may acquire an interest.

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

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

(d) Subject to the provisions of paragraph (c), the Contractor and the Contracting Officer may agree upon the whole or any part of the amount or amounts to be paid to the Contractor by reason of the total or partial termination of work pursuant to this clause, which amount or amounts may include a reasonable allowance for profit on work done; *provided*, that such agreed amount or amounts, exclusive of settlement costs, shall not exceed the total contract price as reduced by the amount of payments otherwise made and as further reduced by the contract price of work not terminated. The contract shall be amended accordingly, and the Contractor shall be paid the agreed amount. Nothing in paragraph (e) of this clause, prescribing the amount to be paid to the Contractor in the event of failure of the Contractor and the Contracting 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 pay to the Contractor the amounts determined by the Contracting Officer as follows, but without duplication of any amounts agreed upon in accordance with paragraph (d):

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

- (A) the cost of such work;
- (B) the cost of settling and paying claims arising out of the termination of work under subcontracts or orders as provided in paragraph (b)(v) above, exclusive of the amounts paid or payable on account of supplies or materials delivered or services furnished by the subcontractor prior to the effective date of the Notice of Termination of Work under this contract, which amounts shall be included in the cost on account of which payment is made under (A) above; and
- (C) a sum, as profit on (A) above, determined by the Contracting Officer pursuant to 8-303 of the Armed Services Procurement Regulation, in effect as of the date of execution of this contract, to be fair and reasonable; *provided*, however, that if it appears that the Contractor would have sustained a loss on the entire contract had it been completed, no profit shall be included or allowed under this subdivision (C) and an appropriate adjustment shall be made reducing the amount of the settlement to reflect the indicated rate of loss; and

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

The total sum to be paid to the Contractor under (i) above shall not exceed the total contract price as reduced by the amount of payments otherwise made and as further reduced by the contract price of work not terminated. Except for normal spoilage, and except to the extent that the Government shall have otherwise expressly assumed the risk of loss, there shall be excluded from the amounts payable to the Contractor under (i) above, the fair value, as determined by the Contracting Officer, of property which is destroyed, lost, stolen, or damaged so as to become undeliverable to the Government, or to a buyer pursuant to paragraph (b)(vii).

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

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

hereunder or if no timely appeal has been taken, the amount so determined by the Contracting Officer, or (ii) if an appeal has been taken, the amount finally determined on such appeal.

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

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

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

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

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 curbsings or sidewalks, protection against damage shall be provided by the Contractor and any damaged roads, curbsings, 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 (1972 FEB)

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

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 (1953 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 (1975 JUN)

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

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

(c) The Contractor further agrees to include in all his subcontracts hereunder a provision to the effect that the subcontractor agrees that the Comptroller General of the United States or any of his duly authorized representatives shall, until the expiration of three years after final payment under the subcontract or such lesser time specified in either Appendix M of the Armed Services Procurement Regulation or the Federal Procurement Regulations Part 1-20, as appropriate, have access to and

the right to examine any directly pertinent books, documents, papers, and records of such subcontractor, involving transactions related to the subcontract. The term "subcontract" as used in this clause excludes (i) purchase orders not exceeding \$10,000 (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 (1975 OCT)

(The following clause is applicable to rateable contracts)

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

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

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

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

(b) If any price, including profit, or fee, negotiated in connection with any price adjustment under this contract was increased by any significant sums because:

- (i) the Contractor furnished cost or pricing data which was not complete, accurate and current as certified in the Contractor's Certificate of Current Cost or Pricing Data;
- (ii) a subcontractor, pursuant to the clause of this contract entitled "Subcontractor Cost or Pricing Data" or "Subcontractor Cost or Pricing Data - Price Adjustments" or any subcontract clause therein required, furnished cost or pricing data which was not complete, accurate and current as certified in the subcontractor's Certificate of Current Cost or Pricing Data;
- (iii) a subcontractor or prospective subcontractor furnished cost or pricing data which was required to be complete, accurate and current and to be submitted to support a subcontract cost estimate furnished by the Contractor but which was not complete, accurate and current as of the date certified in the Contractor's Certificate of Current Cost or Pricing Data; or
- (iv) the Contractor or a subcontractor or prospective subcontractor furnished any data,

not within (i), (ii) or (iii) above, which was not accurate, as submitted;

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

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

57. INTEREST (1972 MAY)

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

58. AUDIT BY DEPARTMENT OF DEFENSE (1975 JUN)

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

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

(b) *Examination of Costs.* If this is a cost reimbursement type, incentive, time and materials, labor hour, or price redeterminable contract, or any combination thereof, the Contractor shall maintain, and the Contracting

Officer or his representatives shall have the right to examine books, records, documents, and other evidence and accounting procedures and practices, sufficient to reflect properly all direct and indirect costs of whatever nature claimed to have been incurred and anticipated to be incurred for the performance of this contract. Such right of examination shall include inspection at all reasonable times of the Contractor's plants, or such parts thereof, as may be engaged in the performance of this contract.

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

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

(e) *Availability.* The materials described in (b), (c) and (d) above shall be made available at the office of the Contractor, at all reasonable times, for inspection, audit, or reproduction, until the expiration of three years from the date of final payment under this contract or such lesser time specified in Appendix M of the Armed Services Procurement Regulation, and for such longer period, if any, as is required by applicable statute, or by other clauses of this contract, or by (1) and (2) below:

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

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

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

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 this contract which questions shall be referred to the Secretary of Labor in accordance with the procedures of the Department of Labor. (ASPR 7-603.26)

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 (1974 APR)

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

- (i) requires a change to this contract to implement the VECP; and
- (ii) reduces the contract price without impairing essential function or characteristics, provided that it is not

based solely on a change in deliverable end item quantities.

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

- (i) a description of the difference between the existing contract requirement and the proposed change, and the comparative advantages and disadvantages of each; justification where function or characteristics of a work item is being altered; and the effect of the change on the performance of the end item;
- (ii) an analysis and itemization of the requirements of the contract which must be changed if the VECP is accepted and a recommendation as to how to make each such change (e.g., a suggested specification revision);
- (iii) a separate detailed cost estimate for both the existing contract requirement and the proposed change to provide an estimate of the reduction in costs, if any, that will result from acceptance of the VECP, taking into account the costs of development and implementation by the Contractor (including any amount attributable to subcontracts in accordance with paragraph (f) below);
- (iv) a prediction of any effects the proposed change would have on related costs to the Military Department such as Government furnished property costs, and costs of maintenance and operation;
- (v) a statement of the time by which a change order adopting the VECP must be issued so as to obtain the maximum cost reduction during the remainder of this contract, noting any effect on the contract completion time or delivery schedule; and
- (vi) identification of any previous submission of the VECP, including the dates submitted, the agencies involved, the numbers of the Government contracts involved, and the previous actions by the Government, if known.

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

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

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

(i) Definition:

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

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

(ii) Calculations and Actions.

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

(f) Subcontracts. The Contractor shall include appropriate VE arrangements in any subcontract of \$50,000 or greater, and may include such arrangements in contracts of lesser value. To compute any adjustment in the contract price under paragraph (e) above, the Contractor's cost of development and implementation of a VECP which is accepted under this contract shall include any development and implementation costs of a subcontractor, and any VE incentive payments to a subcontractor, which clearly pertain to such VECP. However, no such payment or accrual to a subcontractor will be permitted, either as a part of the Contractor's development or implementation costs or otherwise, to reduce the Government's share.

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

"This data furnished pursuant to the Value Engineering Incentive clause of contract shall not be disclosed outside the Government, or duplicated, used, or disclosed, in whole or in part, for any purpose other than to evaluate a VECP submitted under said clause. This restriction does not limit the Government's right to use information contained in this data if it is or has been obtained, or is otherwise available, from the Contractor or from another source, without limitations. If such

a VECP is accepted by the Government under said contract after the use of this data in such an evaluation, the Government shall have the right to duplicate, use, and disclose any data reasonably necessary to the full utilization of such VECP as accepted, in any manner and for any purpose whatsoever, and have others so do."

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

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 (1975 JUN)

(This clause is applicable pursuant to 41 CFR 50-250 if this contract is for \$10,000 or more.)

(a) The Contractor, to provide special emphasis to the employment of qualified disabled veterans and veterans of the Vietnam era, agrees that all suitable employment openings of the Contractor which exist at the time of the execution of this contract and those which occur during the performance of this contract, including those not generated by this contract and including those occurring at an establishment of the Contractor other than the one wherein the contract is being performed but excluding those of independently operated corporate affiliates, shall be offered for listing at the appropriate office of the State employment service system wherein the opening occurs and to provide reports to such office regarding employment openings and hires as may be required.

(b) 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 service or effort and shall involve the normal obligations which attach to the placing of a bona fide job order, including the acceptance of referrals of veterans and non-veterans. Listing of employment openings does not require the hiring of any particular job applicant or from any particular group of job applicants referred by the employment service system. Nothing contained herein is intended to relieve the Contractor from any requirements in any Executive Order or regulation regarding nondiscrimination in employment.

(c) (1) Reports required shall include, but not be limited to, periodic reports which shall be filed at least quarterly with the appropriate local State employment service 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 (i) the number of individuals who were hired during the reporting period, (ii) the number of those hired who were disabled veterans, and (iii) the number of those hired who were non-disabled veterans of the Vietnam era. 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 the Secretary of Labor.

(2) Whenever the Contractor becomes contractually bound to the listing provisions of this clause, he shall advise the employment service system in each state wherein he 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 system when he is no longer bound by this contract clause.

(3) If the contract is with a State or local government, the procedures set forth in subparagraphs (1) and (2) of this paragraph (c) are not required.

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

(e) 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 arrangements for that opening.

(f) As used in this clause:

(1) "All suitable employment openings" includes, but is not limited to, openings which occur in the following job categories: production and nonproduction; plant and office; laborers and mechanics; supervisory and nonsupervisory; technical; and executive, administrative, and professional openings which are compensated on a 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.

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

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

(4) "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 of a special hiring arrangement, including openings which the Contractor proposes to fill from union hiring halls, which is part of the customary and traditional employment relationship existing between the Contractor and representatives of his employees.

(5) "Disabled veteran" means a person entitled to disability compensation under laws administered by the Veterans Administration for disability rated at thirty percent (30%) or more, or a person whose discharge or release from active duty was for a disability incurred or aggravated in line of duty.

(6) "Veteran of the Vietnam era" means a person who was discharged or released within the 48 months preceding his application for employment covered under this part and who (i) served on active duty for a period of more than 180 days, any part of which occurred after August 5, 1964, and was discharged or released therefrom with other than a dishonorable discharge, or (ii) was discharged or released from active duty for service-connected disability if any part of such duty was performed after August 5, 1964.

(g) The Contractor agrees to place this clause (excluding this paragraph (g)) in any subcontract directly under this contract provided, such subcontract is for \$10,000 or more. (Subcontracts for personal services are exempted from this requirement.)

(h) Failure of the Contractor to comply with the requirements of this clause may result in termination for default of the contract concerned. (ASPR 7-103.27)

67. UTILIZATION OF MINORITY BUSINESS ENTERPRISES (1971 NOV)

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

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

68. MINORITY BUSINESS ENTERPRISES SUBCONTRACTING PROGRAM (1971 NOV)

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

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

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

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

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

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

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

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

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

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

69. PAYMENT OF INTEREST ON CONTRACTORS' CLAIMS (1972 MAY)

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

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

70. CLEAN AIR AND WATER (1975 JUL)

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

(a) The Contractor agrees as follows:

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

(ii) That no portion of the work required by this prime contract will be performed in a facility listed on

the Environmental Protection Agency List of Violating Facilities on the date when this contract was awarded unless and until the EPA eliminates the name of such facility or facilities from such listing.

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

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

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

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

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

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

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

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

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

(vii) The term "nonexempt contract or subcontract" means a contract or subcontract of more than \$100,000 which is not otherwise exempted pursuant to the EPA regulations implementing the Air Act and Water Act (40 CFR 15.5), as further implemented in ASPR 1-2302.4 or in FPR 1-1.2303-4 (whichever is applicable) and the procedures of the Department awarding the contract. (ASPR 7-103.29)

71. ENVIRONMENTAL LITIGATION (1974 NOV)(OCE)

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

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

STATE: Arizona COUNTY: Statewide
 DECISION NUMBER: AZ75-5076 DATE: Date of Publication
 Supersedes Decision No. AZ75-5034 dated March 14, 1975, in 40 FR 12920.
 DESCRIPTION OF WORK: Building Construction (excluding single family homes and garden type apartments up to and including 4 stories), heavy and highway construction.

DECISION NO. AZ75-5076

RM-1

	Basic Hourly Rates	Fringe Benefits Payments			
		H & W	Pensions	Vacation	App. Tr.
ASBESTOS WORKERS	\$9.89	.50	.82	.02	
BOILERMAKERS	10.85	.65	1.00	.50	.02
BRICKLAYERS: (Phoenix Area) Bricklayers; Manhole Builders; Stonemasons:					
Zone A (0-25 miles from the City Hall of Phoenix; Flagstaff and Yuma)	9.07	.50	.45		.03
Zone B (25-40 miles from the City Hall of Phoenix; and Williams AFB)	9.52	.50	.45		.03
Zone C (40-70 miles from the City Hall in Phoenix)	10.43	.50	.45		.03
Zone D (70-100 miles from the City Hall of Phoenix)	10.88	.50	.45		.03
Zone E (100-200 miles and over from the City Hall of Phoenix)	11.34	.50	.45		.03
Zone F (200 miles and over from the City Hall of Phoenix)	11.79	.50	.45		.03
BRICKLAYERS: (Tucson Area) Bricklayers; Stonemasons:					
Zone A (0-15 miles from Tucson City Limits)	9.395	.60	.60		.06
Zone B (Over 15 miles to 30 miles from Tucson City limits)	9.77	.60	.60		.06
Zone C (Over 30 miles to 40 miles from Tucson City limits)	10.145	.60	.60		.06
Zone D (Over 40 miles from Tucson City limits)	10.895	.60	.60		.06
Manhole Builders:					
Zone A (0-15 miles from Tucson City limits)	9.64	.60	.60		.06
Zone B (Over 15 miles to 30 miles from Tucson City limits)	10.01	.60	.60		.06
Zone C (Over 30 miles to 40 miles from Tucson City limits)	10.395	.60	.60		.06
Zone D (Over 40 miles from Tucson City limits)	11.14	.60	.60		.06

CARPENTERS:
 (Central and Southern Areas):
 Carpenters; Drywall Applicator;
 Saw Filer; Shingler
 Floorlayers (finish); Pile-drivermen
 Millwright:
 (Northern Area)
 Carpenters; Drywall Applicator;
 Saw Filer; Shingler)
 Floorlayers (finish); Pile-drivermen
 Millwrights
 CEMENT MASONS:
 (Apache, Coconino, Gila, Mohave, Navajo, Yavapai, Yuma and the Northern portions of Graham, Greenlee, Maricopa and Pinal Counties)
 (Central and Southern Areas)
 Cement Masons
 Concrete troweling machine;
 Sawing and scoring machine;
 Curb and gutter machine
 (Northern Area)
 Cement Masons
 Concrete troweling machine;
 Sawing and scoring machine;
 Curb and gutter machine
 CEMENT MASONS:
 (Cochise, Pima, Santa Cruz and the southern portions of Graham, Greenlee, Maricopa and Pinal Counties)
 (Central and Southern Areas)
 Cement Masons
 Concrete troweling machine;
 Sawing and scoring machine;
 Curb and gutter machine
 DRYWALL:
 (From Court House in Phoenix, Mesa, including Luke and Williams Air Force Bases)
 Tapers:
 Zone A (0-40 miles)
 Zone B (41-60 miles)

Basic Hourly Rates	Fringe Benefits Payments			
	H & W	Pensions	Vacation	App. Tr.
\$9.085	.845	.955		.05
9.37	.845	.955		.05
9.50	.845	.955		.05
10.96	.845	.955		.05
11.245	.845	.955		.05
11.375	.845	.955		.05
9.01	.75	1.00		.05
9.17	.75	1.00		.05
10.885	.75	1.00		.05
11.045	.75	1.00		.05
9.32	.70	.75		.05
9.485	.70	.75		.05
8.90	.49		.50	.07
10.40	.49		.50	.07

NOTICES

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DECISION NO. AZ75-5076

	Basic Hourly Rates	Fringe Benefits Payments			
		H & W	Pensions	Vacation	App. Tr.
DRYWALL: Tapers (Cont'd)					
Zone C (61 miles and over)	\$11.15	.49		.50	.07
Texture Spraysmen:					
Zone A (0-40 miles)	9.99	.49		.50	.07
Zone B (41-60 miles)	10.50	.49		.50	.07
Zone C (61 miles and over)	11.25	.49		.50	.07
ELECTRICIANS: (Flagstaff Area)					
Zone A (In the City of Flagstaff, that area lying in a square extending 20 miles North-South, East and West of the Post Office) (Williams, Winslow and Sedona covering a square extending 5 miles North-South, East and West of the Post Office in each town)					
Electricians	11.05	.80	1%+.70		1/2%
Cable Splicers	11.25	.80	1%+.70		1/2%
Zone B (All territorial jurisdiction allotted outside of Zone A)					
Electricians	13.05	.80	1%+.70		1/2%
Cable Splicers	13.25	.80	1%+.70		1/2%
ELECTRICIANS: (Gallup Area-Northern Apache County)					
Electricians	10.98	.30	1%		1/2%
Cable Splicers	11.90	.30	1%		1/2%
ELECTRICIANS: (Globe-Miami Area)					
Zone A (The area within 16 road miles beginning where the Southern Pacific Railroad intersects Highway 60-70 at Kaiser Crossing)					
Electricians	11.13	.45	7%		1/2%
Cable Splicers	11.38	.45	7%		1/2%
Zone B (16-28 miles)					
Electricians	11.83	.45	7%		1/2%
Cable Splicers	12.08	.45	7%		1/2%
Zone C (28-46 miles)					
Electricians	12.43	.45	7%		1/2%
Cable Splicers	12.68	.45	7%		1/2%
Zone D (46 miles and over)					
Electricians	13.13	.45	7%		1/2%
Cable Splicers	13.38	.45	7%		1/2%

RM-2

DECISION NO. AZ75-5076

	Basic Hourly Rates	Fringe Benefits Payments			
		H & W	Pensions	Vacation	App. Tr.
ELECTRICIANS: (Phoenix-Kingman-Prescott Area)					
Zone A (Beginning at the northeast corner, a line extending southward on Bush Highway to McKellips Road; a line extending east on McKellips Road to a point one mile east of the intersection of State Highway 88 and U. S. 60 and 70 near Apache Junction; southward to Baseline Road; west on Baseline Road to the intersection of Baseline Road and Ellsworth Road; south on Ellsworth Road to Hunt Highway; west on Hunt Highway to Powers Road; a line extending south on Powers Road five miles, then extending straight west to a point five miles west of Interstate 10, then northwest on a line parallel with Interstate 10 to intersect with Pecos Road, west on Pecos Road to intersect with Cotton Lane, North on Cotton Lane to Beloit Road. West on Beloit Road to Airport Road, North on Airport Road in a straight line to intersect Waddell Road. East on Waddell Road to intersect with Cotton Lane, North on Cotton Lane to Deer Valley Drive and east on Deer Valley Drive to intersect with Bush Highway including Luke and Williams Air Force Bases.)					
Electricians	\$10.45	.60	1%+.70		3/4%
Cable Splicers	10.97	.60	1%+.70		3/4%

28314

NOTICES

DECISION NO. A275-5076

GLAZIERS:

(Statewide except the Northern and Central parts of Apache, Coconino, Mohave and Navajo and the Northern half of Yavapai County)

TRIMMERS:

(Central and Southern Area) (Northern Area)

PAINTERS: (Flagstaff Area)

Zone A (From Flagstaff Court House to 20 miles)

Brush; Glaziers; Soft Floor Layers

Brush, steel and bridge

Spray

Spray, steel and bridge

Zone B (20-35 miles from Court House in Flagstaff)

Brush; Glaziers; Soft Floor Layers

Brush, steel and bridge

Spray

Spray, steel and bridge

Zone C (35-80 miles from Court House in Flagstaff)

Brush; Glaziers; Soft Floor Layers

Brush, steel and bridge

Spray

Spray, steel and bridge

Zone D (80 miles and over from Court House in Flagstaff)

Brush; Glaziers; Soft Floor Layers

Brush, steel and bridge

Spray

Spray, steel and bridge

PAINTERS: (Phoenix Area)

Zone A (0-40 miles from Court House in Phoenix, Mesa and including Luke and Williams Air Force Bases):

Brush

Spray

Basic Hourly Rates	Fringe Benefits Payments			
	H & W	Pensions	Vacation	App. Tr.
\$8.15	.35	.30	.56	.01
10.08	.88	1.325		.08
11.96	.88	1.325		.08
8.56	.60	.50	.50	.14
9.06	.60	.50	.50	.14
9.01	.60	.50	.50	.14
9.56	.60	.50	.50	.14
9.31	.60	.50	.50	.14
9.81	.60	.50	.50	.14
9.76	.60	.50	.50	.14
10.31	.60	.50	.50	.14
10.31	.60	.50	.50	.14
10.81	.60	.50	.50	.14
10.76	.60	.50	.50	.14
11.31	.60	.50	.50	.14
10.56	.60	.50	.50	.14
11.06	.60	.50	.50	.14
11.01	.60	.50	.50	.14
11.56	.60	.50	.50	.14
8.10	.57	.38	.50	.05
8.35	.57	.38	.50	.05

RW-4

DECISION NO. A275-5076

PAINTERS: (Phoenix Area)(Cont'd)

Steel and bridge, brush

Steel and bridge, spray

Zone B (41-60 miles from Court House in Phoenix):

Brush

Spray

Steel and bridge, brush

Steel and bridge, spray

Zone C (60 miles and over from Court House in Phoenix):

Brush

Spray

Steel and bridge, brush

Steel and bridge, spray

PAINTERS: (Tucson and Yuma Areas)

Zone A (0-30 miles from Stone and Congress in Tucson and from the County Courthouse in Yuma)

Brush

Spray

Steel and bridge, brush

Steel and bridge, spray

Zone B (31-40 miles from Stone and Congress in Tucson and from the County Courthouse in Yuma)

Brush

Spray

Steel and bridge, brush

Steel and bridge, spray

Zone C (41-50 miles from Stone and Congress in Tucson and from the County Courthouse in Yuma)

Brush

Spray

Steel and bridge, brush

Steel and bridge, spray

Basic Hourly Rates	Fringe Benefits Payments			
	H & W	Pensions	Vacation	App. Tr.
\$8.45	.57	.38	.50	.05
8.65	.57	.38	.50	.05
9.10	.57	.38	.50	.05
9.35	.57	.38	.50	.05
9.65	.57	.38	.50	.05
9.65	.57	.38	.50	.05
9.60	.57	.38	.50	.05
9.85	.57	.38	.50	.05
9.95	.57	.38	.50	.05
10.15	.57	.38	.50	.05
7.43	.47	.35		.04
7.93	.47	.35		.04
8.43	.47	.35		.04
8.93	.47	.35		.04
8.18	.47	.35		.04
8.93	.47	.35		.04
9.18	.47	.35		.04
9.68	.47	.35		.04
8.93	.47	.35		.04
9.43	.47	.35		.04
9.93	.47	.35		.04
10.43	.47	.35		.04

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NOTICES

DECISION NO. 2279-5070

PAINTERS: (Cont'd)

Zone D (51 miles and over from Stone and Congress in Tucson and from the County Courthouse in Yuma)

Brush \$9.43
Spray 9.93
Steel and bridge, brush 10.43
Steel and bridge, spray 10.93

PLASTERERS (Phoenix Area):

Zone A (0-35 miles from Phoenix) 9.045
Zone B (35-60 miles from Phoenix) 9.795
Zone C (60 miles and over from Phoenix) 10.67

PLASTERERS (Tucson Area):

Zone A (0-30 miles from Tucson) 8.57
Zone B (30-60 miles from Tucson) 9.07
Zone C (40-50 miles from Tucson) 9.32
Zone D (Over 50 miles from Tucson) 10.07

PLUMBERS; Steamfitters:

FREE ZONE 0-15 miles

The "Free Zone" (Zone I) shall be 15 road miles from the stated base points in Flagstaff, Yuma, Tucson and Douglas. The "Free Zone" from Phoenix shall be 15 miles radius from the stated base point. In addition, all areas within the city limits of Phoenix, Chandler, Scottsdale, Tempe, Glendale, Mesa, Kingman, Havasu City, Prescott, Winslow, and Holbrook will be included as Free Zones. Any work contracted for outside of these Zones will be determined from the Phoenix and Tucson basing points.

Zone I (0-15 miles) 8.30
Zone II (15-30 miles) 9.74
Zone III (30-40 miles) 10.16
Zone IV (40 miles and over) 10.40

Basic Hourly Rates	Fringe Benefits Payments			
	H & W	Pensions	Vacation	App. Tr.
\$9.43	.47	.35		.04
9.93	.47	.35		.04
10.43	.47	.35		.04
10.93	.47	.35		.04
9.045	.60	.85		.035
9.795	.60	.85		.035
10.67	.60	.85		.035
8.57	.35	.60		
9.07	.35	.60		
9.32	.35	.60		
10.07	.35	.60		
8.30	.65	1.24	1.25	.10
9.74	.65	1.24	1.25	.10
10.16	.65	1.24	1.25	.10
10.40	.65	1.24	1.25	.10

DECISION NO. 2279-5070

ROOFERS (Tucson Area):

Asbestos; Shinglers; Tile and Waterproofing:

Zone A (0-44 miles from Tucson) \$7.47
Zone B (Over 44 miles from Tucson) 9.22

ROOFERS (Phoenix Area):

Roofers and Waterproofers 7.80

SHEET METAL WORKERS:

Zone Bases - from the Administration Building or City Hall in Flagstaff, Holbrook, Phoenix, Prescott and Yuma:
Zone I (0-25 miles) 9.43
Zone II (25-50 miles) 10.08
Zone III (50 miles and over) 11.93

SHEET METAL WORKERS:

Zone Bases - from the Administration Building or City Hall in Douglas and Tucson:
Zone A (1-17 miles) 9.04
Zone B (18-28 miles) 9.54
Zone C (29-40 miles) 10.54
Zone D (41 miles and over) 11.54

SOFT FLOOR LAYERS (Phoenix Area):

Zone A (0-40 miles from Court House in Phoenix and Flagstaff including Luke and Williams Air Force Bases) 7.85
Zone B (41-60 miles from Court House in Phoenix and Flagstaff) 8.85
Zone C (61 miles and over from Court House in Phoenix and Flagstaff) 9.85

SOFT FLOOR LAYERS (Tucson Area):

7.25
11.15

SPRINKLER FITTERS

7.25
8.77
6.51

HELPERS (Tucson Area)

Basic Hourly Rates	Fringe Benefits Payments			
	H & W	Pensions	Vacation	App. Tr.
\$7.47	.65	.20		.03
9.22	.65	.20		.02
7.80	.45	.20		.02
9.43	.40	.56		.02
10.08	.40	.56		.02
11.93	.40	.56		.02
9.04	.63	1.30		.01
9.54	.63	1.30		.01
10.54	.63	1.30		.01
11.54	.63	1.30		.01
7.85	.49	.12		.12
8.85	.49	.12		.12
9.85	.49	.12		.12
7.25	.38			
11.15	.50	.80		.06
8.77	.60	.60		
6.51	.70			

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NOTICES

23017

DECISION NO. AZ75-5076

LINE CONSTRUCTION:

Zone I (Phoenix and Tucson 30 mile radius from center of town):

	Basic Hourly Rates	Fringe Benefits Payments			
		H & W	Pensions	Vacation	App. Tr.
Groundmen	\$7.60	.42	7%		1/2%
Equipment Operators; Powdermen; Mechanics	8.78	.42	7%		1/2%
Linemen; Technicians; Crane Operators; Linemen Welder	9.33	.42	7%		1/2%
Cable Splicers	9.65	.42	7%		1/2%
Zone I-A (Douglas, Flagstaff, Globe, Kingman, Prescott and Yuma 10 mile radius from center of town):					
Groundmen	8.25	.42	7%		1/2%
Equipment Operators; Powdermen; Mechanics	9.38	.42	7%		1/2%
Linemen; Technicians; Crane Operators; Linemen Welder	9.93	.42	7%		1/2%
Cable Splicers	10.30	.42	7%		1/2%
Zone II (Other Areas):					
Groundmen	8.87	.42	7%		1/2%
Equipment Operators; Powdermen; Mechanics	10.00	.42	7%		1/2%
Linemen; Technicians; Crane Operators; Linemen Welder	10.53	.42	7%		1/2%
Cable Splicers	10.85	.42	7%		1/2%

FOOTNOTES:

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

PAID HOLIDAYS:

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

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DECISION NO. AZ75-5076

LABORERS

	Basic Hourly Rates	Basic Hourly Rates	Fringe Benefits Payments			
			H & W	Pensions	Vacation	App. Tr.
		C&S AREAS				
Group 1:	\$7.13	N AREA \$8.775	.70	.75		.08
Group 2:	7.26	8.885	.70	.75		.08
Group 3:	7.40	9.025	.70	.75		.08
Group 4:	7.51	9.135	.70	.75		.08
Group 5:	7.68	9.305	.70	.75		.08
Group 6:	8.055	9.68	.70	.75		.08
Group 7:	8.685	10.31	.70	.75		.08
Group 8:	7.875		.70	.75		.08
Group 8A:	8.28		.70	.75		.08
		LABORERS (Tunnel and Shaft Work)				
Group 1:	7.375	9.00	.70	.75		.08
Group 2:	7.54	9.165	.70	.75		.08
Group 3:	7.67	9.295	.70	.75		.08
Group 4:	7.80	9.425	.70	.75		.08
Group 4A:	8.03	9.655	.70	.75		.08
Group 5:	8.205	9.83	.70	.75		.08
Group 5A:	8.455	10.08	.70	.75		.08
		POWER EQUIPMENT OPERATORS (Except Piledriving and Steel Erection)				
Group 1:	7.77	9.395	.75	.80		.04
Group 2:	8.14	9.765	.75	.80		.04
Group 3:	8.60	10.225	.75	.80		.04
Group 4:	9.13	10.755	.75	.80		.04
Group 5:	9.66	11.285	.75	.80		.04
Group 5A:	9.97	11.595	.75	.80		.04
Group 6:	10.30	11.925	.75	.80		.04
Group 7:	10.90	12.525	.75	.80		.04
		TRUCK DRIVERS				
Group 1:	7.31	8.935	.70	.75		.04
Group 2:	7.44	9.065	.70	.75		.04
Group 3:	7.66	9.285	.70	.75		.04
Group 4:	8.01	9.635	.70	.75		.04
Group 5:	8.17	9.795	.70	.75		.04
Group 5A:	8.35	9.975	.70	.75		.04
Group 6:	8.49	10.115	.70	.75		.04
Group 7:	8.90	10.525	.70	.75		.04
Group 8:	9.415	11.04	.70	.75		.04
Group 8A:	10.07	11.695	.70	.75		.04
Group 8B:	7.87	9.495	.70	.75		.04
Group 8C:	9.76	11.285	.70	.75		.04

NOTICES

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LABORERS

- Group 1: All helpers Not Herein Separately Classified; Cesspool diggers and installers; Chat box man; Checker, tool dispatcher; Concrete dump manboit; pipe and/or hoseman; Dumpman and/or spotter; Fence builder, guard rail builder highway; Form strippers; Labor, general or construction; Landscape gardener and nurseryman; Packing rod steel and pans; Rip rap stoneman; Astro turf layer
- Group 2: Cement Finisher Tender; Concrete curer (impervious membrane); Cutting torch operator; Fine grader (highway, engineering and sewer work only); Kettleman - Tarman; Power type concrete buggy; Lazer beam operator
- Group 3: Bander; Chucktender (except tunnel); Creosote tieman; Guinea chaser; Powderman helper; Rip-rap stone paver; Sandblaster (pot tender); Spikers and wrenchers
- Group 4: Cement Dumpers (Skip-type mixer or handling bulk cement); Chain saw machines (on clearing and grubbing); Concrete vibrating machines; Cribber and shorer (except tunnel); Floor sanders - concrete; Hydraulic jacks, and similar mechanical tools not separately herein classified; Operators and tenders of pneumatic and electric tools; Pipe caulker and/or backup man (pipeline); Pipe wrapper; Pneumatic gopher; Rigger/Signalman (pipeline)
- Group 5: Air and Water Wash-Out Nozzleman; Asphalt rakers and ironers; Driller; Grade setter (pipeline); Hand guided trencher and similar operated equipment; Jackhammer and/or pavement breakers; Pipelayers (including but not limited to non-metallic, transite and plastic pipe, water pipe, sewer pipe, drain pipe, underground tile and conduit); Rock slinger; Scaler (using Bos'ns chair or safety belt); Tampers (mechanical - all types); Precast manhole erector
- Group 6: Concrete Cutting Torch; Concrete saw (hand guided); Driller (core, diamond, wagon or air track); Drill doctor and/or air tool repairman; Gunman and mixerman (gunite); Sandblaster (nozzleman)
- Group 7: Concrete Road Form Setter; Gunite nozzleman or rodman; Drillers, Joy Mustang, PR 143, 2200 Gardner-Denver, Hydrasonic; Powderman; Scaler (drillers); Welders and/or pipelayers installing process piping
- Group 8: Mason Tenders
- Group 8A: Plaster Tenders

LABORERS (Cont'd)
(TUNNEL and TUNNEL WORKERS)

- Group 1: (not) Aug, Muckers, Trackman; Dumpmen; Concrete crew (including sanders and spreaders); Grout crew; Swamper (brakeman and swamper on tunnel work)
- Group 2: Ripper; Chucktender; Cabletender; Vibratorman; Jackhammer; Pneumatic tools (except driller)
- Group 3: Grout Gunman
- Group 4: Timberman, Retimberman - wood or steel blaster, driller powderman; Cherry pickerman; Powderman - primer house; Steel form raiser and setter; Kemper and other pneumatic concrete placer operator; Miner - finisher
- Group 4A: Miners - Tunnel (hand or machine)
- Group 5: Diamond Drill
- Group 5A: Shaft and Raise Miner Welder

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NOTICES

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POWER EQUIPMENT OPERATORS
(Except Pile-driving and Steel Erection)

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

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

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

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

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

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

POWER EQUIPMENT OPERATORS (Cont'd)
(Except Pile-driving and Steel Erection)

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

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

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

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NOTICES

TRUCK DRIVERS

Group 1: Pickup; Station wagon; Teamsters; Man Haul Driver

Group 2: Buggymobile, 1 C.Y. or less; Bulk cement spreader (2 or 3 axle); Bus driver; Dump (2 or 3 axle); Flatrack (2 or 3 axle); Water (under 2500 gal.); Warehousemen

Group 3: Bulk cement spreader (4 axle); Dump (4 axle); Dumptor or dumpster, less than 7 c.y.; Flatrack (4 axle); Water (2500 gal. but less than 4000 gal.)

Group 4: Bulk Cement Spreader (5 axle); Dump (5 axle); Dumptor or dumpster, 7 c.y. but less than 16 c.y.; Flaherty spreader or similar type equipment or leverman; Flatrack (5 axle); Slurry type equipment or leverman; Transit mix, 8 c.y. or less mixer capacity

Group 5: Bulk Cement Spreader (6 axle); Dump (6 axle); Flatrack (6 axle); Rock truck (Dart, Euclid and other similar type end dumps, single unit) less than 16 c.y.

Group 5-A: Oil Tanker or Spreader Truck Driver and/or bootman, retortman or leverman

Group 6: Bulk Cement Spreader (7 axle); Concrete pump truck driver, (when integral part of transit mix truck); Dump (7 axle); Flatrack (7 axle); Hydro lift, Swedish crane, Iowa 300 and similar types; Ross carrier fork lift or lift truck; Transit mix, over 10.5 c.y. but less than 14 c.y. mixer

Group 7: Bulk Cement Spreader (8 axle); Dump (8 axle); Flatrack (8 axle)

Group 8: Off-Highway Equipment Driver (2 or 4 wheel power unit, i.e. Cat DW series, Euclid, International, and similar type equipment, transporting material when top loaded or by external means, incl. pulling water tanks, fuel tank, or other teamsters classifications; Bulk Cement spreader (9 axle); Dumptor or dumpster, 16 c.y. and over; Eject-alls; Flatrack (9 axle); Rock truck (dart, euclid, or other similar end dump types) 16 c.y. and over

Group 8-A: Heavy Duty Mechanic/Welder; Body and Fender man

Group 8-B: Field Equipment Serviceman or Fuel Truck Driver

Group 8-C: Heavy Duty Mechanic/Welder Helper

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NOTICES

DECISION #A275-5076 - Mod. #1
 (40 FR 28313 - July 3, 1975)
 Statewide, Arizona

Change:

Bricklayers; Stonemasons
 (Tucson Area):

Zone A
 Zone B
 Zone C
 Zone D

Manhole Builders:

Zone A
 Zone B
 Zone C
 Zone D

Drywall: (From Court House in
 Phoenix, Mesa, including Luke
 and Williams AFE)

Tapers:

Zone A
 Zone B
 Zone C

Texture Spraymen:

Zone A
 Zone B
 Zone C

Painters (Tucson and Yuma Areas)

Zone A

Brush
 Spray
 Steel and bridge, brush
 Steel and bridge, spray

Zone B

Brush
 Spray
 Steel and bridge, brush
 Steel and bridge, spray

Zone C

Brush
 Spray
 Steel and bridge, brush
 Steel and bridge, spray

Basic Hourly Rates	Fringe Benefits Payments			
	H & W	Pensions	Vacation	App. Tr.
\$9.505	.70	.75		.06
9.88	.70	.75		.06
10.255	.70	.75		.06
11.005	.70	.75		.06
9.755	.70	.75		.06
10.13	.70	.75		.06
10.505	.70	.75		.06
11.255	.70	.75		.06
9.51	.49	.50		.07
11.01	.49	.50		.07
11.76	.49	.50		.07
9.61	.49	.50		.07
11.11	.49	.50		.07
11.86	.49	.50		.07
7.73	.57	.35		.04
8.23	.57	.35		.04
8.73	.57	.35		.04
9.23	.57	.35		.04
8.46	.57	.35		.04
8.98	.57	.35		.04
9.48	.57	.35		.04
9.98	.57	.35		.04
9.23	.57	.35		.04
9.73	.57	.35		.04
10.25	.57	.35		.04
10.73	.57	.35		.04

DECISION NO. A275-5076 (Cont'd)

Zone D

Brush
 Spray
 Steel and bridge, brush
 Steel and bridge, spray

Line Construction:

Zone I (Phoenix and Tucson
 30 mile radius from
 center of town):

Groundmen
 Equipment Operators; Powder-
 men; Mechanics
 Linemen; Technicians; Crane
 Operators; Linemen Welder
 Cable Splicers

Zone I-A (Douglas, Flagstaff,
 Globe, Kingman,
 Prescott and Yuma 10
 mile radius from
 center of town):

Groundmen
 Equipment Operators; Powder-
 men; Mechanics
 Linemen; Technicians; Crane
 Operators; Linemen Welder
 Cable Splicers

Zone II (Other Areas):

Groundmen
 Equipment Operators; Powder-
 men; Mechanics
 Linemen; Technicians; Crane
 Operators; Linemen Welder
 Cable Splicers

Plumbers; Steamfitters:

Zone I
 Zone II
 Zone III
 Zone IV

Sheet Metal Workers:

(Zone Bases - From the
 Administration Building or
 City Hall in Douglas and
 Tucson):

Zone A
 Zone B
 Zone C
 Zone D

Basic Hourly Rates	Fringe Benefits Payments			
	H & W	Pensions	Vacation	App. Tr.
\$9.73	.57	.35		.04
10.23	.57	.35		.04
10.73	.57	.35		.04
11.23	.57	.35		.04
8.13	.42	7%		1/2%
9.39	.42	7%		1/2%
10.59	.42	7%		1/2%
10.93	.42	7%		1/2%
8.83	.42	7%		1/2%
10.04	.42	7%		1/2%
11.28	.42	7%		1/2%
11.69	.42	7%		1/2%
9.49	.42	7%		1/2%
10.70	.42	7%		1/2%
11.96	.42	7%		1/2%
12.32	.42	7%		1/2%
10.64	.75	1.35		.10
10.99	.75	1.35		.10
11.41	.75	1.35		.10
12.71	.75	1.35		.10
9.17	.83	1.60		.01
\$9.67	.83	1.60		.01
10.67	.83	1.60		.01
11.67	.83	1.60		.01

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NOTICES

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DECISION #A275-5076 - Mod. #2
 (40 FR 28313 - July 3, 1975)
 Statewide, Arizona

Change:

Bricklayers; Manhole Builders;
 Stonemasons (Phoenix Area)

	Basic Hourly Rates	Fringe Benefits Payments			
		H & V	Pensions	Vacation	App. Tr.
Zone A	\$9.75	.65	.60		.06
Zone B	10.24	.65	.60		.06
Zone C	11.21	.65	.60		.06
Zone D	11.70	.65	.60		.06
Zone E	12.19	.65	.60		.06
Zone F	12.68	.65	.60		.06
Bricklayers; Stonemasons (Tucson Area):					
Zone A	9.965	.70	.75		.06
Zone B	10.34	.70	.75		.06
Zone C	10.715	.70	.75		.06
Zone D	11.465	.70	.75		.06
Manhole Builders (Tucson Area):					
Zone A	10.215	.70	.75		.06
Zone B	10.59	.70	.75		.06
Zone C	10.965	.70	.75		.06
Zone D	11.715	.70	.75		.06
Electricians (Phoenix-Kingman- Prescott Areas):					
Zone A					
Electricians	11.05	.80	1%+.70		1/2%
Cable Splicers	11.60	.80	1%+.70		1/2%
Zone B					
Electricians	12.98	.80	1%+.70		1/2%
Cable Splicers	13.63	.80	1%+.70		1/2%
Zone C					
Electricians	13.98	.80	1%+.70		1/2%
Cable Splicers	14.67	.80	1%+.70		1/2%
Ironworkers: (Central and Southern Areas)	10.23	.93	1.60		.08
(Northern Area)	12.23	.93	1.60		.08

Reference

DACW09-76-B-0007

SPECIFICATIONS

for

INDIAN BEND WASH

OUTLET CHANNEL

and

RECREATION FACILITIES

MARICOPA COUNTY, ARIZONA

Gila River Basin, Arizona

Appropriation: 96x3122 Construction General
Corps of Engineers, Civil
96x8862 Contributed Funds, Required
Contributed Funds, Other

Authority: Public Law 93-393

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



PART I SPECIAL PROVISIONS

PART II TECHNICAL PROVISIONS

Section	Title
1A	General Requirements
1B	Measurement and Payment
1D	Environment Protection
2A	Diversion and Control of Water
2B	Clearing Site and Removing Existing Obstructions
2C	Water Lines
2E	Sewers; Sanitary, Gravity
2F	Detours and Traffic Control Facilities
3A	Excavation
3B	Fills and Subgrade Preparation
3C	Excavation, Trenching and Backfilling for Utilities Systems
3D	Lake Lining
4A	Concrete
4E	Concrete Curb, Gutter, Combination Curb and Gutter, and Driveway
4F	Concrete Sidewalk
4H	Grouting Stone Protection
4K	Reinforced Masonry (Concrete Block)
5D	Stone Protection
6A	Miscellaneous Metal Work and Materials
8A	Side Drains and Storm Drains
9A	Select-Material Subbase Course
9B	Aggregate Base
9D	Prime Coat and Weed Killer
9E	Tack Coat
9G	Asphalt Concrete (Central Plant-Hot Mix)
9L	Pavement Markings
10A	Establishment of Turf
10B	Planting of Trees and Ground Cover
10C	Irrigation System
11A	Station Marking
11K	Miscellaneous Items of Work
14A	Rough Carpentry
14B	Finish Carpentry
14E	Steel Doors and Frames
14F	Toilet Stall Doors
14G	Clay Tile Roofing
14M	Ceramic Tile
14P	Toilet Accessories
14Q	Hardware; Builders'
14R	Painting, General
15D	Plumbing, General Purpose
16A	Electrical Work, Interior
16B	Electrical-Distribution and Lighting Systems; Underground

PART I
SPECIAL PROVISIONS

Index

- | | |
|---|--|
| <ol style="list-style-type: none"> 1. Commencement, Prosecution, and Completion of Work 2. Liquidated Damages 3. Contract Drawings, Maps and Specifications 4. Contractor Submittals 5. Physical Data 6. Salvage Materials and Equipment 7. Layout of Work | <ol style="list-style-type: none"> 8. Quantity Surveys 9. Damage to Work 10. Performance of Work by Contractor 11. Contractor Quality Control 12. Los Angeles City License Taxes 13. Progress Schedule 14. Funds Available for Payments |
|---|--|

1. **COMMENCEMENT, PROSECUTION, AND COMPLETION OF WORK.** (1965 JAN.) 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 450 calendar days after the date of receipt of notice to proceed except seeding and planting. Seeding and planting shall be accomplished as soon as practicable and within time limits stated in the Technical Provisions or directed by the Contracting Officer. The time stated for completion shall include final clean-up of the premises.

2. **LIQUIDATED DAMAGES.** (1965 JAN.) In case of failure on the part of the Contractor to complete the work within the time fixed in the contract or any extensions thereof, the Contractor shall pay the Government as liquidated damages, pursuant to the clause of this contract entitled "Terminations for Default-Damages for Delay-Time Extensions," the sum of \$150.00 for each day of delay.

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

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

Drawing No.
(District File No.)

Title

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Index to Contract Drawings.
Project Location

CIVIL

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Foundation Investigation No. 1
Foundation Investigation No. 2
General Plan No. 1 - Sta. 119+99.17 to Sta. 88+00
General Plan No. 2 - Sta. 88+00 to Sta. 60+00
General Plan No. 3 - Sta. 60+00 to Sta. 34+00
General Plan No. 4 - Sta. 34+00 to Sta. 10+00

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Channel Cross Sections No. 1
Channel Cross Sections No. 2
Main Channel Drop Structure - Plan,
Sections and Details
Low Flow Channel Drop Structures - Plan,
Sections and Details

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McKellips Road - Miscellaneous Details
Princess Drive - Miscellaneous Details
Retaining Wall - Plan, Elevation and
Structural Details

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Side Drains - Details and Tabulation
Side Drains - Outlet Structures and Details
Side Drains - Inlet Structures and Protection
Barrier Details

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Side Drains - Gate Structures and Details

PRINCESS DRIVE

238/169	Typical Sections and Details
238/170	Plan and Profile – Sta. 46+00 to Sta. 52+00
238/171	Plan and Profile – Sta. 52+00 to Sta. 58+50
238/172	Plan and Profile – Sta. 58+50 to Sta. 65+00
238/173	Plan and Profile – Sta. 65+00 to Sta. 68+80
238/174	Plans and Profiles – Miller Road – Sta. 0+00 to Sta. 2+07.50, Access Road – Sta. 0+00 to Sta. 3+40.62
238/175	78th. Street – Plan, Profile and Section – Sta. 0+00 to Sta. 2+25
238/176	Trail Underpass – Plans and Sections
238/177	Trail Underpass – Wing Wall Details
238/178	Trail Underpass – Lighting and Structural Details
238/179	Storm Drain – Sta. 60+59.50 to Sta. 65+00
238/180	Storm Drain – Sta. 65+00 to Sta. 67+50.78, Sta. 0+00 to Sta. 2+14.65

STANDARD DETAILS

513/78.5	Water Distribution
486/59.8	Sanitary Sewers

X

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"

TEMPERATURE DATA (IN DEGREES FAHRENHEIT)

Month	Average Daily Maximum*	Average Daily Minimum*	Average*	Maximum**	Minimum**
January	65	38	52	88	16
February	69	42	56	89	22
March	75	46	61	97	25
April	83	53	68	104	32
May	92	60	76	113	40
June	102	69	85	117	50
July	104	78	91	118	61
August	102	76	89	117	60
September	98	69	84	118	47
October	87	57	72	105	34
November	75	45	60	92	25
December	66	39	52	88	22

* Taken from Local Climatological Data – Annual Summary for Phoenix 1974.

** Taken from Local Climatological Data – Annual Summary for Phoenix 1974 and from Climatology of the United States No. 80-2 supplement for 1951-1960.

5.3.1 Streamflow Conditions. Discharge frequency and flood hydrograph information are available for inspection in the office of the District Engineer at 300 North Los Angeles Street, Los Angeles, California.

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 the construction operations.

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

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

7. LAYOUT OF WORK. (1965 APR OCE)

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

- a. Base Line. Center line control points of the main channel or offset line thereto.
- b. Bench Marks.

<p>On the E side of Miller Rd. 500 ± S from c/l of McKellips Rd. In top of the curb, 14 ft north of south end of concrete sidewalk, a std. U.S.C.E. Bronze Disk, Flush, stamped, 1B-118, 1971, LA Dist.</p>	<p>1187.777 Ft.</p>
<p>On the c/l of Miller Rd., 130 feet ± north from the c/l of Susan Ln. approx. c/l of an alleyway, a 3 inch Bronze Disk, set in concrete, flush with pave- ment, stamped, CITY OF TEMPE.</p>	<p>1184.318 Ft.</p>
<p>At the c/l intersection of Miller Rd. & E. Weber Dr., a 3 inch Bronze Dist set in concrete, flush with the pavement and stamped CITY OF TEMPE.</p>	<p>1180.481 Ft.</p>
<p>At the N.E. corner of intersection of Miller Rd. & Princess Dr. In top of the S.E. corner of a concrete box manhole cover, a std. U.S.C.E. Bronze disk, flush, stamped 1B-119, LA Dist.</p>	<p>1175.355 Ft.</p>
<p>At the intersection of E. Princess Rd. and Miller Rd., a 3 inch Brass Disk, set in concrete, flush with the pavement and stamped CITY OF TEMPE.</p>	<p>1171.969 Ft.</p>
<p>At the intersection of Scottsdale Rd. & E. Princess Dr., an iron pin with 4 PK straddlers.</p>	<p>1174.803 Ft.</p>
<p>At the intersection of Scottsdale Rd. & Gilbert Dr., a 4 inch Bronze Disk in a well, stamped MARICOPA CO. ENG. DEPT.</p>	<p>1161.608 Ft.</p>
<p>In the c/l of Rural Rd., 63 ft ± from a powerline crossing Rural Rd., 0.5 mi. S from Gilbert Dr., a 4 inch Bronze Disk in a well, stamped MARICOPA COUNTY ENGR.</p>	<p>1149.304 Ft.</p>
<p>On the west side of Rural Rd. 0.4 mi. N from University Ave. In top of the west curb, 9-1/2 ft. south of the north end of the curb, a std. U.S.C.E. Bronze Disk, flush, stamped 1B-120, 1971, LA. DIST.</p>	<p>1161.323 Ft.</p>

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

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

11.5 The Contractor shall submit for approval within 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.

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

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

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

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

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

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

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

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

14.9 The progress schedule prepared in accordance with paragraph (a) of the contract clause entitled "PROGRESS CHARTS AND REQUIREMENTS FOR OVERTIME WORK" shall be consistent with the amount of funds stated in 14.2 above as being currently available for the period of time from the date of contract award to the end of the fiscal year in which the contract was awarded. Any portion of the progress schedule that applies to a fiscal year for which funds are not currently available will be prepared on the basis of a rate of progress that the Contractor considers to be practicable for completion of the work within the time provided by the contract. The progress schedule shall be revised each time the Contractor is notified that additional funds are made available and shall be consistent with the amount of additional funds so made available. The approval of a progress schedule is not a funding action and shall in no event be considered as making funds available or as obligating the Government to make funds available.

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

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PART II
TECHNICAL PROVISIONS
SECTION 1 A
GENERAL REQUIREMENTS

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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-105B & Am-3
FF-N-836D & Am-1

MM-L-751H
TT-E-529C & Am-1
TT-P-25E

Bolts, Hexagon and Square
Nails, Brads, Staples and Spikes:
Wire, Cut and Wrought
Nut: Square, Hexagon, Cap, Slotted,
Castle, 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 National Bureau of Standards, Product Standard.

PS 1-74

Construction
and Industrial Plywood

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

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

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

2.1.2 Warning Signs facing approaching traffic on all haul roads crossing under overhead power transmission lines.

2.1.3 Six hard hat signs at locations directed.

2.2 Project Engineer's Office and Laboratory, including a fenced parking area and a flagpole.

2.3 Bulletin Board at the Contractor's office.

2.4 Sanitary Facilities.

3. CONSTRUCTION SIGNS.

3.1 Materials.

3.1.1 Lumber shall conform to Federal Specification MM-L-751, and shall be seasoned Douglas Fir, S4S, Grade D or better except that posts, braces and spacers shall be construction Grade (WCLB).

3.1.2 Plywood shall conform to Product Standard PS 1, grade A-C, Group 1, exterior type.

3.1.3 Bolts, Nuts and Nails. Bolts shall conform to Federal Specification FF-B-575, nuts shall conform to Federal Specification FF-N-836, and nails shall conform to Federal Specification FF-N-105.

3.1.4 Paints and Oils. Paints shall conform to Federal Specifications TT-P-25 for primer and TT-E-529 for finish paint and lettering.

3.2 Construction.

3.2.1 Project and hard hat signs shall be constructed as detailed on Figures 1, 1A, 2 and 3. Decals and safety signs will be furnished by the Contracting Officer.

3.2.2 Warning Signs shall be constructed of plywood not less than 1/2 inch thick and shall be securely bolted to the supports with the bottom of the sign face 3 feet above the ground. The sign face shall be 2 x 4 feet, all letters shall be 4 inches in height, and the wording shall be: "WARNING: OVERHEAD TRANSMISSION LINES."

3.3 Painting. All exposed surfaces and edges of plywood shall be given one coat of linseed oil and be wiped prior to applying primer. All exposed surfaces of signs and supports shall be given one coat of primer and 2 finish coats of white paint. Except as otherwise indicated, lettering on all signs shall be black and sized as indicated.

4. PROJECT ENGINEER'S OFFICE AND LABORATORY.

4.1 General. The Contractor shall provide a suitable office trailer and a laboratory building for the Project Engineer. The exact site will require the Contracting Officer's approval. Both the trailer and the building shall be adequately heated, well lighted, suitably ventilated, and cooled with an exterior mounted, 1,000 cubic feet per minute minimum size, pad-type evaporative cooler, 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 400 square feet of floor area. The laboratory shall be equipped with water supply, a sink approximately 20 x 35 x 8 inches, and the usual utilities.

4.4 Flagpole. The Contractor shall furnish and erect a flagpole at the Project Engineer's Office. The flagpole shall be either wood or sectional steel type, a product of a reputable manufacturer who has been regularly engaged in the manufacture of flagpoles. The flagpole shall be complete with standard fittings and equipment, including pulley, cleats, ground protector, halyards, and snap hooks. The pole shall have 20 feet exposed height and be set in concrete foundation in conformance with the manufacturer's recommendations. Painting of the wooden pole shall conform to the applicable requirements for the project sign. Steel pole shall be galvanized.

4.5 Janitorial Service. The Contractor shall furnish janitor service for the office and laboratory. Refuse containers shall be provided for each building. Buildings shall be swept and dust at least twice weekly and trash picked up weekly.

5. BULLETIN BOARD. A weatherproof bulletin board, approximately 36 inches wide and 30 inches high, with hinged glass door shall be provided adjacent to or mounted on the Contractor's project office. If adjacent to the office, the bulletin board shall be securely mounted on no less than 2 posts. Bulletin board and posts shall be painted or have other approved factory finish. The bulletin board shall be easily accessible at all times and shall contain wage rates, equal opportunity notice, and such other items required to be posted.

6. MAINTENANCE AND DISPOSAL OF PROJECT FACILITIES. The Contractor shall maintain the project facilities in good condition throughout the life of the project. Upon completion of work under this contract, the facilities covered under this section will remain the property of the Contractor and shall be removed from the site at his expense.

7. SCRAP MATERIALS. Materials indicated to be removed and not indicated to be salvaged, stored or reinstalled are designated as scrap and shall become the property of the Contractor and be removed from the site of the work. The Contractor by signing this contract hereby acknowledges that he made due allowance for value, if any, of such scrap in the contract price.

8. SALVAGE MATERIALS. All materials and/or equipment removed and indicated to be either stored or reinstalled are designated as salvaged materials and/or equipment. Any salvaged materials and equipment which are excess upon completion of the work and are not indicated to be stored shall become the property of the Contractor.

9. **ARCHAEOLOGICAL FINDINGS DURING CONSTRUCTION.** 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 findings. Included with the notifications 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 railroads, pipe lines, power and communication lines, and other utilities known to exist within the limits of the work are indicated on the drawings. The sizes, locations, and names of owners of such utilities are given from available information, but their accuracy is not guaranteed. Except as otherwise indicated on the drawings, all existing utilities will be left in place and the Contractor shall conduct his operations in such a manner that the utilities will be protected from damage at all times, or arrangements shall be made by the Contractor for their relocation at the Contractor's own expense. The Contractor shall be responsible for any damage to utilities known to exist and shall reimburse the owners for such damage caused by his operations.

10.2 **Relocation or Removal.** Utilities to be relocated or removed not as part of this contract are designated "To be Relocated by Others" or "To be Removed by Others," respectively. Utilities shown on the plans and not so designated will be left in place and be subject to the provisions of the clause: PROTECTION OF EXISTING VEGETATION, STRUCTURES, UTILITIES, AND IMPROVEMENTS of the General Provisions. The Contractor may make arrangements with the owner for the temporary relocation and restoration of utilities not designated to be relocated, or for additional work in excess of the work needed to relocate utilities designated for relocation at no additional cost to the Government.

10.3 **Utilities Not Shown.** If the Contractor encounters, within the construction limits of the entire project, utilities not shown on the plans and not visible as of the date of this contract and if such utilities will interfere with construction operations, he shall immediately notify the Contracting Officer in writing to enable a determination by the Contracting Officer as to the necessity for removal or relocation. If such utilities are left in place, removed or relocated, as directed by the Contracting Officer, the Contractor shall be entitled to an equitable adjustment for any additional work or delay.

10.4 **Coordination.** The Contractor shall consult and cooperate with the owner of utilities that are to be relocated or removed by others to establish a mutual performance schedule and to enable coordination of such work with the construction work. These consultations shall be held as soon as possible after award of the contract or sufficiently in advance of anticipated interference with construction operations to provide required time for the removal or relocation of affected utilities.

10.5 **Service Connections.** The Contractor shall make all necessary arrangements with the applicable utility companies for installation of meters and connection of the utilities and shall pay all costs in connection therewith, including all costs for service until final acceptance of the project. The utility owners and their representatives are as listed below.

10.6 **Notices.**

10.6.1 **Traffic Routing.** The Contractor shall notify the Contracting Officer 7 days in advance of the time work will be started in areas requiring the rerouting of traffic, traffic lane striping, and removal of street signs. The foregoing shall apply to progressive modifications of traffic routings within an area in which work is in progress. Additional requirements regarding traffic are included in section: DETOURS AND TRAFFIC CONTROL FACILITIES.

10.6.2 **City Engineers, County Road Departments, Police, Highway Patrol, and Fire Departments** shall be notified by the Contractor whenever a street is to be closed to traffic. If the closing is to be of long duration, a single notification to each department on the last working day before closing will be sufficient. A single notification shall then be made at the time the street is again opened to traffic. If the closing is to be of short duration or if different sections of the street are to be closed at different times, notifications shall be made on a day-to-day basis.

10.6.2.1 **McKellips Road.** The Contractor shall notify in writing the Contracting Officer and Mr. George Iannella, City of Scottsdale, Engineering Department, Scottsdale, Arizona, 85251, telephone (602) 994-2351, at least 30 days prior to closing McKellips Road.

10.6.2.2 **Princess Drive.** The Contractor shall notify in writing the Contracting Officer and Mr. Don Pierson, City of Tempe, Engineering Department, P.O. Box 5002, Tempe, Arizona, 85281, telephone (602) 967-2001, at least 30 days prior to closing Princess Drive.

10.6.3 Utilities to be Relocated or Protected. The Contractor shall notify the Contracting Officer, in writing, 14 calendar days prior to starting work on any utility to be relocated or protected. On each relocation, notification shall include dates on which the Contractor plans excavation, by-pass work, removal work and/or installation work, as applicable. The Contractor shall also notify the following representatives of utility owners not less than 7 days prior to start of work in vicinity of their respective utilities.

CITY OF SCOTTSDALE
3939 Civic Center Plaza
Scottsdale, Arizona 85251

Engineering:
Mr. George Iannella
phone: (602) 994-2351
Parks and Maintenance:
Mr. Bill Ensign
phone: (602) 994-2408
Sewer:
Mr. Bill English
phone: (602) 994-2552

CITY OF PHOENIX
215 E. McDowell Road
Phoenix, Arizona 85004

Water:
Mr. Eddie Acededo
phone: (602) 262-6551

CITY OF TEMPE
31 East Fifth Street
P.O. Box 5002
Tempe, Arizona 85281

Engineering:
Mr. Donald Pierson
phone: (602) 968-8200

MOUNTAIN BELL TELEPHONE CO.

North of Weber Drive:
Mr. Ron Peters
24 West 5th Street
Tempe, Arizona 85281
phone: (602) 994-7259
South of Weber Drive:
Mr. Frank Cooke
460 North Mesa Drive
Mesa, Arizona 85201
phone: (602) 834-2748

ARIZONA PUBLIC SERVICE
501 South 3rd Avenue
Phoenix, Arizona 85004
phone: (602) 271-7076
Mr. Dale Martin

SALT RIVER PROJECT
1521 Project Drive
P.O. Box 1980
Phoenix, Arizona 85001
phone: (602) 273-5900

Irrigation Facilities:
Mr. Clarence Whalin
Electrical:
Mr. John M. Evans

10.6.4 Existing Beach 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.

10.7 Restrictions.

10.7.1 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.

10.7.2 Access to Private Property. The Contractor shall provide convenient passage through the work or along temporary access at all times to all driveways, parking lots, houses, mobile home parks, city maintenance yards, and buildings in the vicinity of the work.

10.7.3 Street Closings. McKellips Road and Princess Drive shall not be closed to traffic concurrently.

10.7.3.1 McKellips Road may be closed to thru traffic for a period of 60 days to perform the necessary work. Utility relocations shall be coordinated with the applicable utility companies so that the work will be done during this period.

10.7.3.2 Princess Drive may be closed to thru traffic for a period of 90 days to perform the necessary work. The initial 30 days of the closure period shall be for relocation of existing utilities by the applicable utility companies or owners. Utility companies will flag the facilities installed with less than 2 feet of cover. The Contractor shall not perform any work on Princess Drive, Miller Road extension or 78th Street extension during the initial 30 day period.

11. PUBLIC SAFETY. Attention is invited to the general provision: PERMITS AND RESPONSIBILITIES. The Contractor shall provide temporary fencing, barricades, and/or guards, as required, to provide protection in the interest of public safety. Whenever the Contractor's operations create a condition hazardous to the public, he shall furnish at his own expense and without cost to the Government, such flagmen and guards as are necessary to give adequate warning to the public of any dangerous conditions to be encountered and he shall furnish, erect, or maintain such fences, barricades, lights, signs and other devices as are necessary to prevent accidents and avoid damage or injury to the public. Flagmen and guards, while on duty and assigned to give warning and safety devices shall conform to applicable city, county, and state requirements. Should the Contractor appear to be neglectful or negligent in furnishing adequate warning and protection measures, the Contracting Officer may direct attention to the existence of a hazard and the necessary warning and protective measures shall be furnished and installed by the Contractor without additional cost to the Government. Should the Contracting Officer point out the inadequacy of warning and protective measures, such action of the Contracting Officer shall not relieve the Contractor from any responsibility for public safety or abrogate his obligation to furnish and pay for those devices. The installation of any general illumination shall not relieve the Contractor of his responsibility for furnishing and maintaining any protective facility.

12. PERSONAL CLOTHING STANDARDS.

12.1 Each employee shall be required to wear clothing suitable for the weather and job conditions of the work. At a minimum, the following personal clothing requirements shall be enforced:

12.1.1 Short sleeve shirts.

12.1.2 Long trousers.

12.1.3 Leather work shoes or other appropriate protective shoes or boots. Canvas shoes, tennis or deck shoes are not acceptable.

13. WORK SAFELY INCENTIVE. The Contractor shall provide within his "Proposal for Accident Prevention" a plan to encourage all employees to work safely. This plan shall be directed at the individual employee and shall be designed to motivate all employees toward a safe work attitude.

14. OCCUPATION SAFETY AND HEALTH ACT (OSHA) STANDARDS. The OCCUPATIONAL SAFETY and HEALTH ACT (OSHA) STANDARDS for CONSTRUCTION (Title 29, Code of Federal Regulations Part 1926 as revised from time to time) and the Corps of Engineers General Safety Requirements Manual, EM 385-1-1, are both applicable to this contract. The most stringent requirement of the two standards will be applicable.

14.1 EM 385-1-1, Change 1, 27 March 1972 is modified as follows: Boom Angle Indicator and Load Angle Indicator Device, paragraph 18.c.14 is deleted.

15. QUALITY CONTROL. The Contractor shall inspect the work of his own forces and the work of all subcontractors for compliance with the contract requirements and record the results of the inspections. Legible copies of the daily inspection reports shall be maintained by the Contractor at the project site at all times and the original copies of the "Construction Quality Control Report" shall be delivered to the Contracting Officer on the work day following the date of the report.

15.1 Control of on-site construction. The Contractor's control shall include three phases of inspection for all definable features of work, as follows:

15.1.1 Preparatory inspection shall be performed prior to beginning any work on any definable feature of work. It shall include a review of contract requirements; a check to assure that all materials and/or equipment have been tested, submitted, and approved; a check to assure that provisions have been made to provide required control testing; examination of the work area to ascertain that all preliminary work has been completed; and a physical examination of material and equipment to assure that they conform to approved shop drawings or submittal data and that all material and/or equipment are on hand.

15.1.2 Initial inspection shall be performed as soon as work begins on a representative portion of the particular feature of work and shall include examination of the quality of workmanship as well as a review of control testing for compliance with contract requirements.

15.1.3 Follow-up inspections shall be performed daily to assure continuing compliance with contract requirements, including control testing, until completion of the particular feature of work.

15.2 The specified reports must be factual records of the Contractor's daily quality control activities and resulting actions. As such, they shall stress as major components of the report, the following:

(a) Phase(s) of construction underway during the time frame of the report. (i.e. earthwork, concrete work, structural steel erection, etc.)

(b) Phase (preparatory, initial, or follow-up), and locations of inspections and/or check tests that were made.

(c) Results of inspection, including nature of deficiencies observed and corrective actions taken or to be taken. If no inspections are listed on the report, it must be assumed that no inspections were made and that CQC is not being implemented.

(d) Report of tests performed, including those specified, with the results of the tests, including failures and remedial action to be taken. Test results, including all computations should be attached to the report form. Where test results cannot be completed by the time the report is submitted, a notation should be made that the test was performed and the approximate date test results will be available. Delayed test results should be submitted with the report form on the date received.

(e) Monitoring of materials and equipment upon arrival at the jobsite and prior to incorporation into the work for compliance with submittal approvals, damage and proper storage.

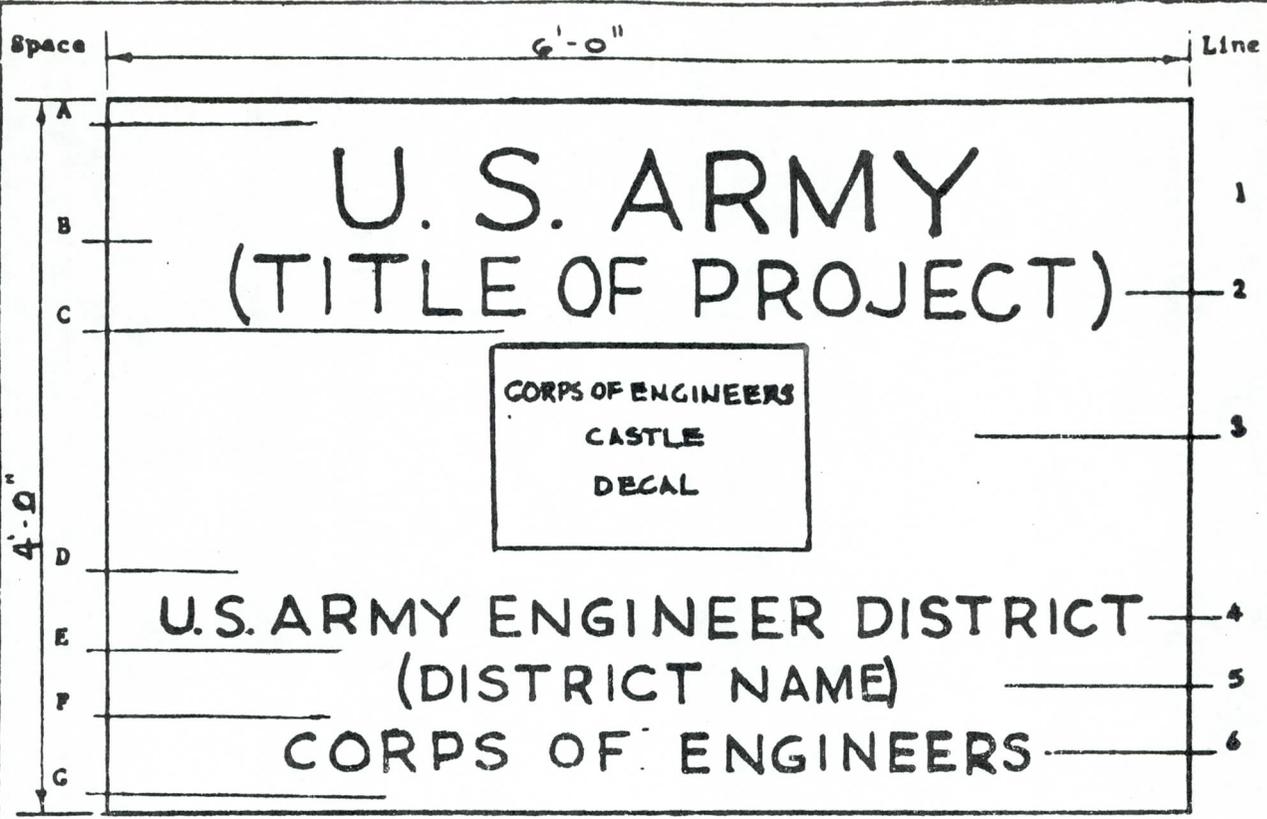
(f) Offsite surveillance activities.

(g) Job safety.

15.3 The report must contain a record of inspections and tests for all work accomplished subsequent to the previous report. Separate reports in different phases of the work may be submitted by the responsible CQC inspectors or they may be combined into one consolidated report if all CQC activities and results are covered and the responsible CQC inspectors are identified.

15.4 In all cases, the report or reports must be verified and signed by the one person delegated this responsibility by the Contractor. The verification should contain the statement that all supplies and materials incorporated in the work are in compliance with the terms of the contract except as noted.

* * * * *



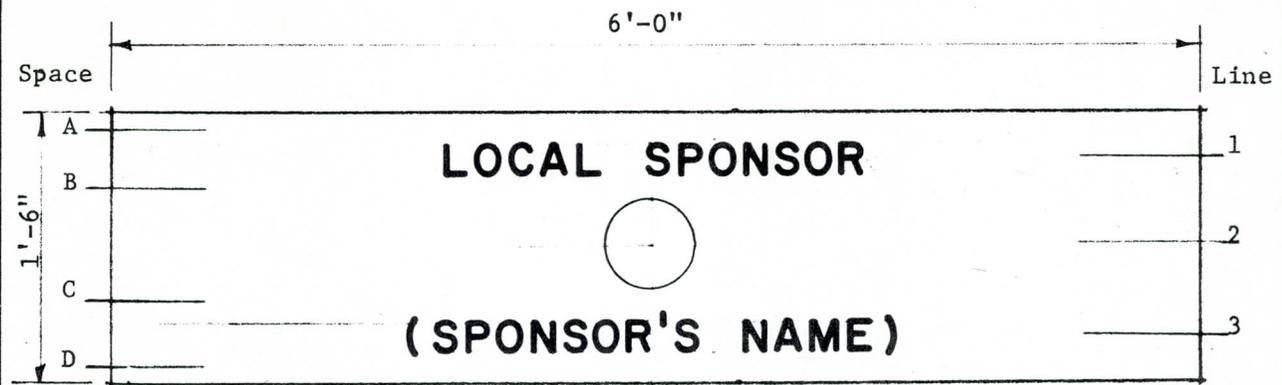
SCHEDULE

<u>Space</u>	<u>Height</u>	<u>Line</u>	<u>Description</u>	<u>Letter Height</u>	<u>Stroke</u>
A	3"	1	U. S. ARMY	5 1/2"	7/8"
B	2"	2	PROJECT NOMENCLATURE	4"	5/8"
C	2"	3	CORPS OF ENGINEERS CASTLE (DECAL)	1 1/2"	--
D	3"	4	U. S. ARMY ENGINEER DISTRICT	2 3/4"	3/8"
E	2"	5	DISTRICT NAME	2 1/4"	1/4"
F	2"	6	CORPS OF ENGINEERS	2 1/2"	3/8"
G	3"				

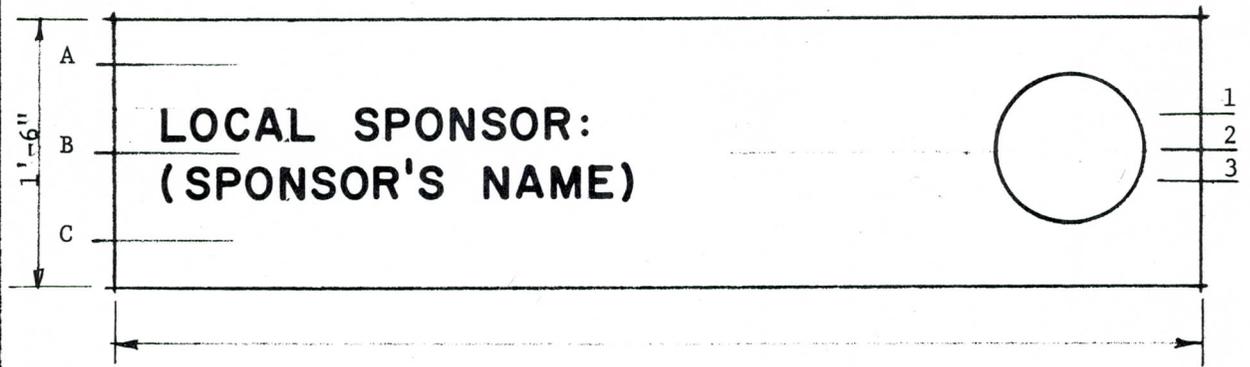
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PROJECT SIGN
(Army-Civil Works)

Figure 1
14 August 1972



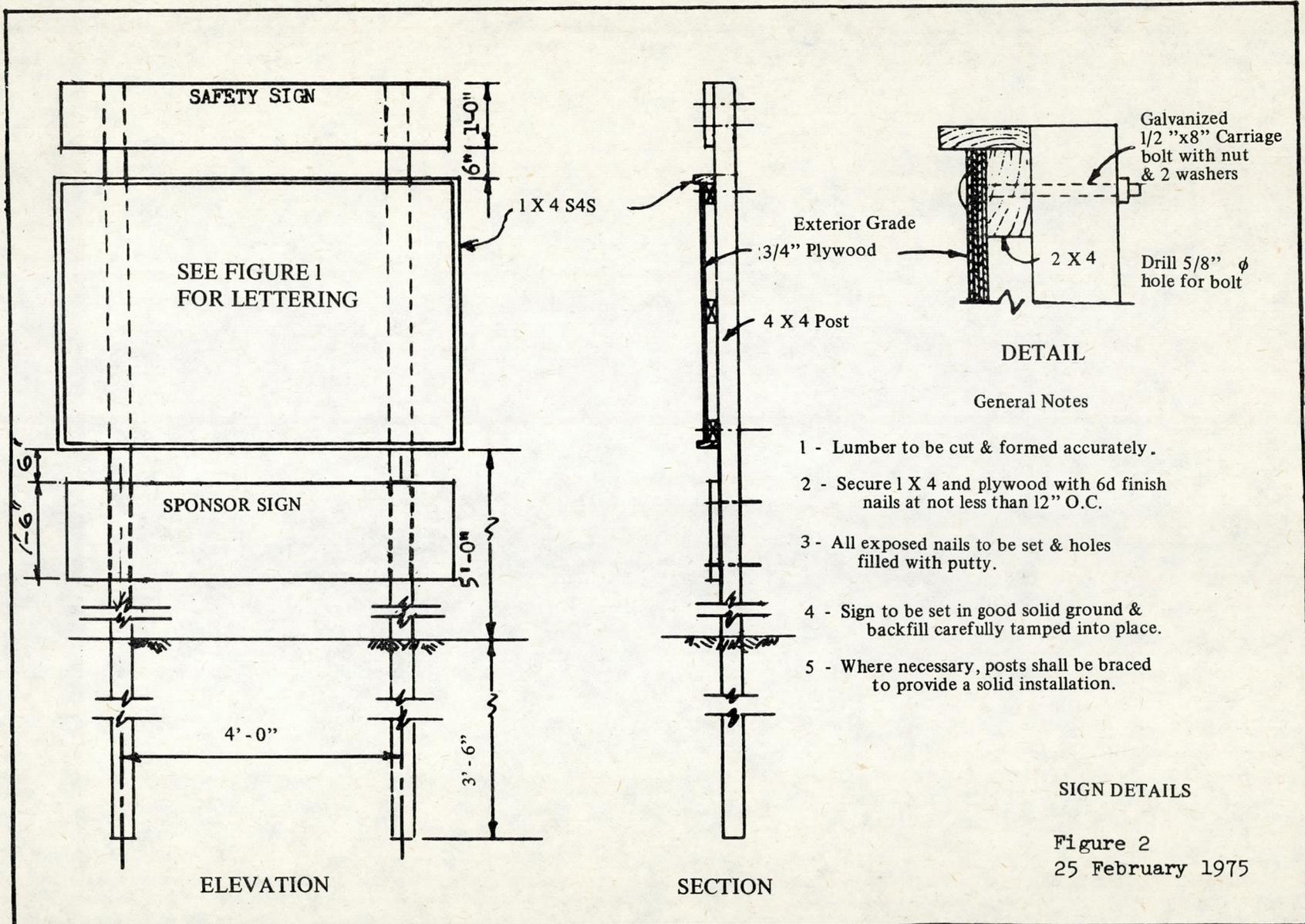
<u>Space</u>	<u>Height</u>	<u>Line</u>	<u>Description</u>	<u>Letter Height</u>	<u>Stroke</u>
A	2"	1	LOCAL SPONSOR	2"	3/8"
B	2" Min.	2	SPONSOR'S EMBLEM (DECAL)		
C	2" Min.	3	SPONSOR'S NAME	2"	3/8"
D	2"				



<u>Space</u>	<u>Height</u>	<u>Line</u>	<u>Description</u>	<u>Letter Height</u>	<u>Stroke</u>
A	6"	1	LOCAL SPONSOR	2"	3/8"
B	2"	2	SPONSOR'S EMBLEM (DECAL)		
C	6"	3	SPONSOR'S NAME	2"	3/8"

Lettering Color -- Black

Figure 1A
21 February 1975



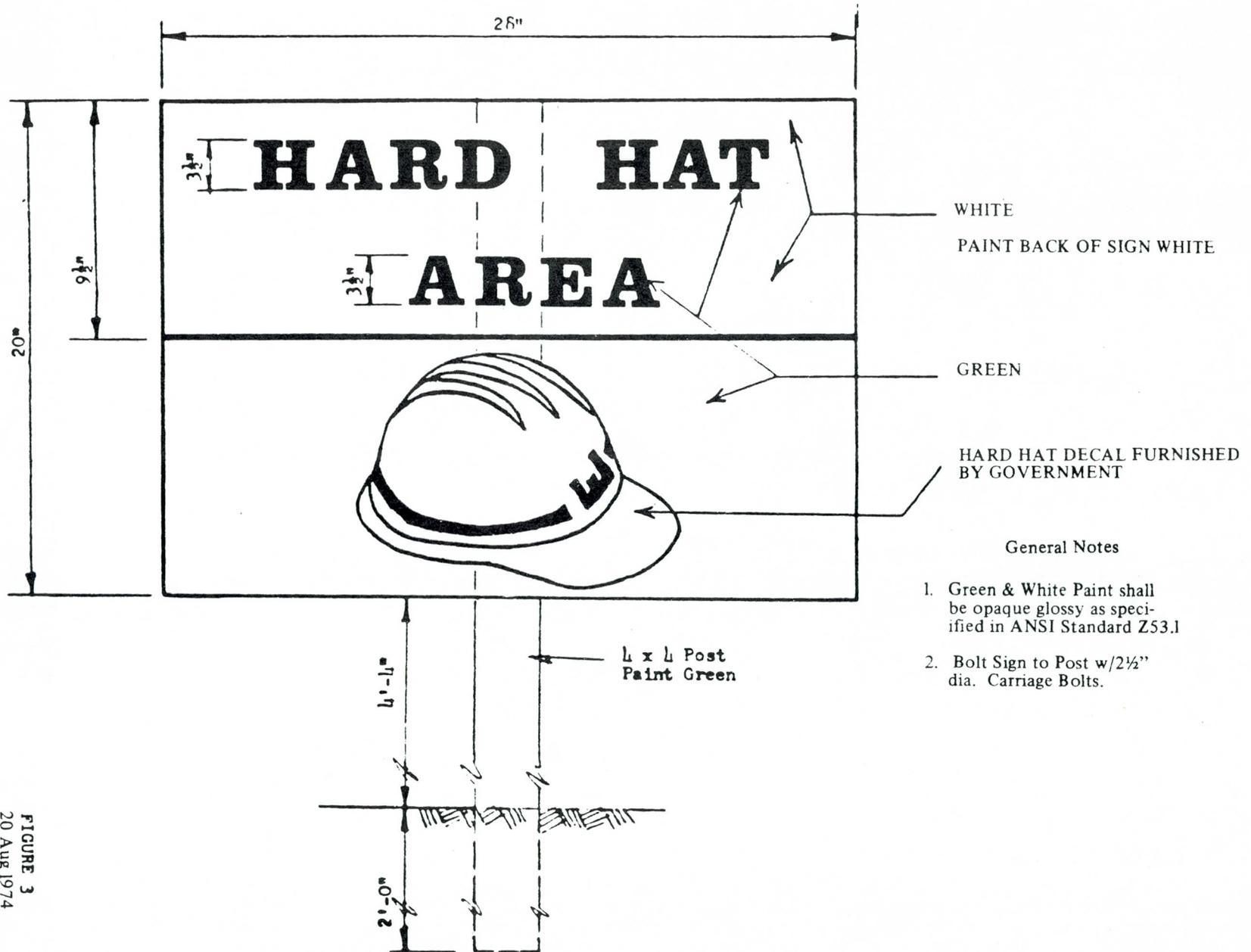


FIGURE 3
20 Aug 1974

SECTION 1B
MEASUREMENT AND PAYMENT

Index

- | | |
|---|--|
| 1. Diversion and Control of Water | 13. Asphalt Concrete Pavement, Levee |
| 2. Clearing, Grubbing, Removing
Obstructions and Protecting
Utilities | 14. Irrigation System |
| 3. Excavation | 15. Landscaping |
| 4. Fills | 16. Seeding |
| 5. Topsoiling | 17. Station Marking |
| 6. Retaining Wall | 18. Payment For Riding and Hiking Trails |
| 7. Drop Structures, McKellips Lake
Outlet, and Stone Protection | 19. Trail Underpass |
| 8. Facing Stone, Levee | 20. Filling Lake |
| 9. Filter Material, Levee | 21. Parking Area, Access Road and
Entrance Sign |
| 10. Side Drains | 22. Restroom |
| 11. Bridge Approaches | 23. Sanitary Sewerline |
| 12. Storm Drain Systems | 24. Domestic Waterlines |
| | 25. Picnic Ramadas |

1. DIVERSION AND CONTROL OF WATER. Payment for Diversion and Control of Water will be made at the applicable contract price, which payment shall constitute full compensation for maintaining the work areas in a dry condition.

2. CLEARING, GRUBBING, REMOVING OBSTRUCTIONS AND PROTECTING UTILITIES.

2.1 General. Payment shall include all costs for clearing and removal work (except work by others) including all existing obstructions within the channel rights-of-way and fill sites, lake area and the obstructions indicated for removal outside of the rights-of-way and inside the construction easement. Except as otherwise specified, payment for clearing and removal work includes applicable earthwork; removing and plugging abandoned lines; removal of materials for salvage; protection of utilities, fences, walls, and features indicated to remain; and the disposal of all materials.

2.2 Payment for Clear Site and Remove Obstructions will be made at the applicable contract price which payment shall constitute full compensation for clearing, obstruction removal and protection work. Excluded from this item are clearing, grubbing and removal of obstructions located outside of the limits of channel excavation and fill areas within the bridge approaches for which separate payments are provided.

3. EXCAVATION.

3.1 Measurement. A survey of the site shall be made prior to commencement of work, and all measurements will be based on this survey without regard to any changes in the site that may be made between the excavation lines and grades indicated on the drawings or staked in the field and the ground surfaces as indicated by the above mentioned survey. The actual slopes as excavated may be greater or less than those indicated or staked, depending on the materials excavated and methods used in performing the work, but such alterations shall not change the measurement for payment from the original lines as specified herein. The quantity of directed excavation necessary for the removal of unsuitable foundation material as specified shall be included in the measurement of the excavation where the unsuitable soils are encountered. Quantities will be computed in cubic yards by the average end area method and the planimeter will be considered a precise instrument for measurement of plotted cross sections. All excavation outside of excavation lines shown on the drawings will be considered as being for the convenience of the Contractor.

3.2 Payment.

3.2.1 Payment for Excavation, Channel will be made at the applicable contract price, which payment shall constitute full compensation for excavation and disposal of excavated materials. This item includes the excavation for invert, side slopes, levee toe, and access ramps.

3.2.2 Payment for Excavation, McKellips Lake will be made at the applicable contract price which payment shall constitute full compensation for excavation and disposal of excavated material for the lake outside the limits of channel excavation.

3.2.3 Unsuitable Soils. No separate payment will be made for the excavation and disposal of unsuitable soils. When such excavation is directed, payment therefore 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.

3.2.4 Trenches. No separate payment will be made for excavation of utility and pipe trenches. All costs in connection therewith shall be included in the applicable contract prices for the items to which the work applies.

3.2.5 Excavation for Structures. Except as otherwise specified, no separate payments will be made for excavation for structures. All costs therefor shall be included in the applicable contract prices for the items to which the work applies.

3.2.6 Excavation for Bridge Approaches. No separate payment will be made for excavation for bridge approaches. All such costs shall be included in the applicable contract prices for the items to which the work applies.

3.2.7 Excavation for Trails. No separate payment will be made for excavation for riding and hiking trails. All costs therefore shall be included in the applicable contract price for the item to which the work applies.

4. FILLS.

4.1 Measurement for payment for fills will be made between the 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 staked in the field. Quantities will be computed in cubic yards by the average end area method and the planimeter will be considered a precise instrument for measuring plotted cross sections.

4.2 Payment.

4.2.1 Payment for Compacted Fills and Backfill, Toe will be made at the applicable contract prices, which payments shall constitute full compensation for placing and compacting the fills, complete including fills for access ramps.

4.2.2 Fill for Structures. No separate payment will be made for fill or backfill about structures. All such costs shall be included in the applicable contract prices for the items to which the work applies.

4.2.3 Landscape Fill. Payment for landscape fill will be made at the applicable contract price, which payment shall constitute full compensation for placing and compacting the fill.

4.2.4 Trenches. No separate payment will be made for backfilling for utility and pipe lines. All costs in connection therewith shall be included in the applicable contract prices for the items to which the work applies.

4.2.5 Subgrade Preparation. No separate payment will be made for subgrade preparation and all costs in connection therewith shall be included in the contract prices for the items to which the work applies.

4.2.6 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.

4.2.7 Fill for Bridge Approaches. No separate payment will be made for fill or backfill for street and bridge approaches. All such costs shall be included in the applicable contract prices for the items to which the work applies.

4.2.8 Lake Lining. Payment for Lake Lining will be made at the applicable contract price which payment shall constitute full compensation for the lake lining complete, including sodium chloride. Payment will include mixing, placing, compaction and protection of the lining.

4.2.9 No separate payment will be made for the disposal of excess excavation. All such costs shall be included with the contract price for the excavation to which the work applies.

5. TOPSOILING.

5.1 Measurement of topsoil will be the actual number of cubic yards acceptably placed in the work within the limits indicated based upon the specified average depth in place.

5.2 Payment for Topsoiling will be made at the applicable contract price which payment shall constitute full compensation for placing the material.

6. RETAINING WALL, Sta 112+97 to Sta 111+37. Payment for Retaining Wall, Sta. 112+97 to Sta. 111+37 will be made at the applicable contract price which payment shall constitute full compensation for the retaining wall complete, including excavation and backfill outside the limits of other required excavation and fencing.

7. DROP STRUCTURES, MCKELLIPS LAKE OUTLET, AND STONE PROTECTION. Payment for channel drop structures, McKellips Lake outlet, and stone protection at bridges will be made at the applicable contract prices which payments shall constitute full compensation for the drop structures, McKellips Lake outlet, and stone protection complete, including filter material, stonework and grouting, and excavation outside the limits of channel excavation.

8. FACING STONE, LEVEE.

8.1 Measurement. The quantity of facing stone on levees to be paid for will be the number of tons determined by scale weights acceptably placed within the lines and grades indicated on the drawings or directed by the Contracting Officer.

8.2 Payment for Facing Stone Levee will be made at the applicable contract price, which payment shall constitute full compensation for the stone, complete in place.

9. FILTER MATERIAL, LEVEE.

9.1 Measurement. The quantity of filter material on levees to be paid for will be the number of cubic yards of material acceptably placed within the lines and grades indicated or directed.

9.2 Payment for Fill Material Levee will be made at the applicable contract price which payment shall constitute full compensation for the filter material, complete in place.

10. SIDE DRAINS. Payment for Side Drains will be made at the applicable contract prices, which payments shall constitute full compensation for the side drains, complete including connections and earthwork. The earthwork included shall be only that earthwork which is located outside the lines of earthwork for which other payment is provided.

11. BRIDGE APPROACHES. Payment for Bridge Approaches will be made at the applicable contract prices, which payments shall constitute full compensation for the bridge approaches, complete, including clearing and removal of obstructions outside of channel limits, earthwork, curb and gutter, sidewalks, driveways, base course, prime coat, tack coat, asphalt concrete pavement, retaining wall, traffic facilities, adjusting manholes and valves to grade. Payment for bridge approaches, Princess Drive will include road construction for Miller Road, Access Road and 78th Street. Payments will not include trail underpass and storm drain facilities for which separate payments are provided.

12. STORM DRAIN SYSTEMS. Payment for storm drainage facilities, Princess Drive and McKellips Road, will be made at the applicable contract prices, which payments shall constitute full compensation for constructing the storm drainage facilities complete, including catch basins, manholes, alteration of existing structures, connection, storm drain pipe, protective covering of crossing utilities, and earthwork. The earthwork included shall be only that located outside the limits shown for which other payment is provided. Payment for storm drain, Princess Drive will include storm drain facilities for Miller Road, Access Road and 78th Street.

13. ASPHALT CONCRETE PAVEMENT, LEVEE.

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 Weighmasters' Certificates showing the actual net weights. One ticket shall be furnished to the plant inspector and one ticket to the street inspector. 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 or included in lump sum pay items will not be measured for payment.

13.2 Payment for Asphalt Concrete Pavement, Levee will be made at the applicable contract price, which payment shall constitute full compensation for asphalt concrete surfacing complete in place, including weed killer, prime coat, tack coat, subgrade preparation and all incidentals. Excluded from payment under the item is asphalt concrete pavement required for bridge approaches, road extensions, parking areas and parking area access road for which other payments are provided.

14. IRRIGATION SYSTEM. Payment for irrigation system will be made at the applicable contract price which payment shall constitute full compensation for the irrigation system complete in place including trenching, bedding, backfilling, and connection to well. Payment will include all costs for power post electrical service for controllers in McKellips Lake area in event restroom is not constructed.

15. LANDSCAPING. Payment for landscaping will be made at the applicable contract price which payment shall constitute full compensation for the planting of trees and ground cover complete, including maintenance.

16. SEEDING.

16.1 Measurement. The unit of measurement for seeding shall be the acre. The quantity of seeding to be paid for will be the acreage actually seeded as specified, computed to the nearest 1/10 of an acre.

16.2 Payment for seeding of the various types, will be made at the applicable contract prices which payment, shall constitute full compensation for seeding, complete, including maintenance.

17. STATION MARKING. Payment for station marking will be made at the applicable contract price, which payment shall constitute full compensation for obtaining materials, fabrication and installation necessary for the work, complete in place.

18. PAYMENT FOR RIDING AND HIKING TRAILS will be made at the applicable contract prices which payments shall constitute full compensation for the trails, complete, including earthwork, concrete paving, trail lighting, bike racks, and signs. Payment will not include underpass structure for which separate payment is provided.

19. TRAIL UNDERPASS. Payment for riding and hiking trail underpass will be made at the applicable contract price, which payment shall constitute full compensation for the underpass complete, including earthwork outside the limits for other excavation and fill, railing and lighting.

20. FILLING LAKE. Payment for filling lake with water will be made at the applicable contract price which payment shall constitute full compensation for filling lake including all costs for water.

21. PARKING AREA, ACCESS ROAD, AND ENTRANCE SIGN. Payment for parking area, access road and entrance sign will be made at the applicable contract price which payment shall constitute full compensation for the parking area, access road and entrance sign complete, including earthwork outside the limits of channel and lake excavation and fill, base course, prime coat, asphalt concrete pavement, wheel stops, mow strip, lighting, and pavement striping.

22. RESTROOM. Payment for restroom will be made at the applicable contract price which payment shall constitute full compensation for the restroom, complete, including excavation and backfilling for the restroom, 5 foot access paths, electrical service, and utilities to a point 5 feet outside the foundation line. Payment will include credit for power post electrical service in McKellips Lake area.

23. SANITARY SEWERLINE. Payment for sanitary sewerline will be made at the applicable contract price which payment shall constitute full compensation for the sewerline complete, from a point 5 feet outside the building foundation line to point of connection to existing sewerline including excavation, trenching and backfilling and appurtenances.

24. DOMESTIC WATERLINES. Payment for domestic waterlines will be made at the applicable contract price, which payment shall constitute full compensation for the waterline complete from point of connection with existing waterline to point of connection to restroom and to points of connection with drinking fountains and/or hose bibbs at ramadas, including excavation, trenching and backfilling. Payment will not include irrigation system for which separate payment is provided. Payment will include capping of waterlines at points of connection with drinking fountains and hose bibbs at ramadas.

25. PICNIC RAMADAS. Payment for group and small picnic ramadas will be made at the applicable contract prices which payments shall constitute full compensation for the ramadas, complete, including excavation and backfill, barbecues, drinking fountains, lighting, and tables and benches. Payment will include credit for capping of waterlines.

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SECTION 1D
ENVIRONMENT PROTECTION

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- | | |
|---------------------------------|--|
| 1. Scope | 7. Protection of Water Resources |
| 2. Applicable Regulations | 8. Disposal of Cleared Material |
| 3. Notification | 9. Protection of Wildlife |
| 4. Subcontractors | 10. Dust Control |
| 5. Implementation | 11. Maintenance of Pollution Control
Facilities During Construction |
| 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 sections 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 esthetic 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 the representatives of the Contracting Officer to develop mutual understanding 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. The following additional requirements are intended to supplement and clarify the requirements of General Provision Articles 42, 43 and 47.

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.

6.3 Restoration of Landscape Damage. Any trees or other landscape feature scarred or damaged by the Contractor's equipment or operations shall be restored as nearly as possible to its original condition at the Contractor's expense. The Contracting Officer will decide what method of restoration shall be used.

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 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 plan showing the proposed restoration of the area. 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.

6.5.5 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. 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 areas.

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 washing, herbicides and insecticides, and cement and surface drainage from entering waterways or public waters.

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 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 or wave action.

9. PROTECTION OF WILDLIFE. The Contractor shall at all times perform all work and take such steps required to prevent any interference or disturbance to wildlife. The Contractor will not be permitted to alter water flows or otherwise disturb native habitat adjacent to the project area which, in the opinion of the Contracting Officer, are critical to wildlife. Fouling or polluting of water will not be permitted. Wash waters and wastes shall be processed, filtered, ponded, or otherwise treated prior to their release into the waterways.

10. 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 embankment.

11. 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 of 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.

* * * * *

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 channel 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: DAMAGE TO WORK of the SPECIAL PROVISIONS. At all locations where construction work is at a lower elevation than the elevation of the stream or ground water at the time of doing the work, suitable cofferdams or dikes, if necessary, shall be constructed, the construction area shall be dewatered prior to commencement of the work, and all subgrades, whether for earth fill, filter, stone, or concrete, shall be kept drained and free of water throughout the working period. Within 10 days after award of contract, the Contractor shall submit plans showing the methods he proposes to use to dewater each working area and control the water from rain, sheet flow and other surface water. The plans shall show the scheme of operations and a complete layout of drainage pipes, pumps, diversion channels, cofferdams, etc. The plans shall also take into consideration the following specific requirements.

1.2 By-Pass Capacities.

1.2.1 General. The Contractor shall provide for diversion of channel flows as hereinafter specified. The channel 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 4,000 cfs will be regarded as floodflows.

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 at no additional cost to the Government.

2. SALT RIVER PROJECT IRRIGATION FACILITIES UPSTREAM MCKELLIPS ROAD. Water flowing in existing SRP irrigation ditches shall be diverted around the lake area to the diversion structure until completion and acceptance of the lake. Upon completion and acceptance of the lake, temporary diversion facilities shall be removed.

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SECTION 2B

CLEARING SITE AND REMOVING EXISTING OBSTRUCTIONS

Index

1. Requirements
2. Disposal of Cleared and Grubbed Material

3. Adjusting Frames, Covers and Valve Boxes

1. REQUIREMENTS.

1.1 General. Except as otherwise specified, and/or indicated areas to be cleared and grubbed will be limited to actual excavation area or areas on which fills and/or structures are to be placed. The removal of trees, shrubs, turf, and other vegetation outside of these areas shall be held to a minimum and care shall be exercised not to damage any trees, shrubs, turf, or vegetation which can be left in place.

1.2 Existing Structures and Obstructions. The Contractor shall clear the site, including all fill and excavation areas, and remove and dispose of all existing structures and obstructions for channel and embankment construction, except as otherwise noted on the drawings. Obstructions which are designated or specified to be removed but which are not designated or specified to be removed by others shall be removed by the Contractor. Except as otherwise specified, obstructions designated to be removed by others will be removed in sufficient time to preclude interference with the Contractor's operations. Utility relocations are not considered obstructions. Except as otherwise specified and/or indicated, materials to be removed are scrap, the property of the Contractor, and shall be removed from the site. Except as otherwise specified, incombustible waste material, such as broken concrete, pavement, and other like materials shall be considered scrap and shall not be used in fills.

1.3 Clearing. Trees less than 1-1/2 inches in diameter and other vegetation, except as specified, shall be cut off 6 inches below the indicated channel subgrade or ground level whichever is lower. Other vegetation shall be cut off flush or slightly below the original ground surface. Clearing operations shall be conducted so as to prevent damage to trees, structures, and installations under construction, or to remain in place, and to provide for the safety of employees and others. All rubbish, waste dumps, and debris areas shall be cleared.

1.4 Grubbing shall consist of removing all trees, stumps, roots, logs, and other objectionable vegetable matter in the required fills, foundation areas, and all excavation areas. In grubbing out stumps and roots, all roots or other timber more than 1-1/2 inches in diameter shall be removed to 3 feet below the depth of the required excavation or existing ground level, whichever is lower. Trees and stumps shall be pulled, not cut off.

1.5 Obstructions to construction, except as indicated, shall be removed within limits of work.

1.6 Filling of Holes. Holes made by removal of obstructions and grubbing operations shall be refilled to subgrade with compacted fill material as specified in the section: FILLS AND SUBGRADE PREPARATION.

1.8 Concrete in existing construction, which will join new concrete or new construction, shall be saw cut to a depth of 2 inches and the concrete shall be removed in a manner to provide plane surfaces to which new concrete shall be bonded, unless otherwise specified.

1.9 Paving within the limits of the work shall be removed to the neat lines indicated, to the full section depth of the surfacing and existing base, and shall be removed to a vertical plane. Paving shall be removed to a distance of 2 feet beyond the lines of actual excavation. All excess pavement removed shall be replaced at the expense of the Contractor.

1.10 Street Improvements. Existing curb, gutter, driveways, sidewalks, and other obstructions interfering with the street improvement work shall be removed to the limits of new construction and as indicated, and shall be replaced in kind.

1.11 Pipe. Each abandoned pipe shall be plugged or capped at the limit of removal.

1.11.1 Plugs or caps shall be leakproof. Caps shall be used for small steel lines (one-inch I.D. or smaller). Plugs shall be standard clay sewer disks calked with oakum and mortared in place or shall be constructed of masonry as approved by the Contracting Officer.

1.12 Utilities. Prior to removing an obstruction, all applicable utility relocations shall have been coordinated.

1.13 The removal of materials for salvage shall be performed in a manner to avoid damage to such materials and to portions of existing work to remain in place. The Contractor has the option of furnishing new fastenings and fittings in lieu of salvaging such material. Such new materials shall be the equivalent of existing material.

1.14 Existing Structures within the rights-of-way and to remain shall be protected and supported as necessary during removal and construction operations.

1.15 Concrete Walks in street right-of-way which interferes with construction and/or pedestrian walkways shall be removed unless otherwise indicated. Any obstructions indicated to be replaced in kind shall match existing conditions prior to removal.

2. DISPOSAL OF CLEARED AND GRUBBED MATERIAL. All material removed, except material specified and/or indicated to be salvaged, is designated as scrap, shall become the property of the Contractor, and shall be removed from the site. Trash, organic material, stone, broken concrete, pavement and similar materials may be wasted in the disposal areas in accordance with the requirements of the section: EXCAVATION. Unsuitable materials from clearing operations may be temporarily used for diversion and control of water.

3. ADJUSTING FRAMES, COVERS AND VALVE BOXES. Frames, covers and valve boxes shall be adjusted to grade with materials similar in character to those in the original structure. Where reconstruction requires partial removal of concrete, sufficient concrete shall be removed to permit splicing of new reinforcement to existing reinforcement. Concrete removal shall be performed in a manner to avoid damage to that portion to remain in place. All damage to concrete to remain in place shall be repaired by and at the expense of the Contractor. At the option of the Contractor raising devices may be used for adjusting manholes to grade. Raising devices shall match existing frame and shall provide a stable and non-rocking support.

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SECTION 2C
WATER LINES

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1. EXCAVATION, TRENCHING, AND BACKFILLING FOR WATER LINES. Excavation, trenching, and backfilling shall be in section: EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS.

2. 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.

2.1 Federal Specifications.

WW-P-325a	Pipe, Bends and Traps; Lead (for Plumbing and Water-Distribution
WW-P-421c	Pipe, Cast Gray and Ductile Iron, Pressure (for Water and Other Liquids)
WW-V-54D	Valve, Gate, Bronze (125, 150 and 200 Pound, Screwed, Flanged, Soldered Ends, Brazed Ends, for Land Use)

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

A 21.4-1971	Cement-Mortar Lining for Cast-Iron Pipe and Fittings for Water
A 21.6-1970	Cast-Iron Pipe Centrifugally Cast in Metal Molds, for Water or Other Liquids
A 21.8-1970	Cast-Iron Pipe Centrifugally Cast in Sand-Lined Molds, for Water or Other Liquids
A 21.10-1971 & A 21.10a-1972	Cast-Iron Fittings, 2 in. Through 48 in., for Water and Other Liquids
A 21.11-1972	Rubber Gasket Joints for Cast-Iron Pressure pipe and Fittings
A 21.51-1971	Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or Other Liquids
B 16.1-1967	Cast Iron Pipe Flanges and Flanged Fittings 25, 125, 250 and 800 lb.
B 16.3-1971	Malleable-Iron Screwed Fittings, 150 and 300 lb.
B 16.26-1967	Cast Bronze Fittings for Flared Copper Tubes

2.3 American Society for Testing and Materials (ASTM) Standards.

A 120-73	Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Ordinary Uses
B 88-72	Seamless Copper Water Tube
D 1527-73	Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe, Schedules 40 and 80
D 1785-73	Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
D 1869-66	Rubber Rings for Asbestos-Cement Pipe
D 2241-73	Poly (Vinyl Chloride)(PVC) Plastic Pipe (SDR-PR)
D 2282-73	Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe (SDR-PR)

D 2464-73	Threaded Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80
D 2465-73	Threaded Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe Fittings, Schedule 80
D 2774-72	Recommended Practice for Underground Installation of Thermoplastic Pressure Pipe

2.4 American Water Works Association (AWWA) Standards.

B 300-64	Hypochlorites
B 301-59	Liquid Chlorine
C 203-66	Coal-Tar Enamel Protective Coatings for Steel Water Pipe
C 207-55	Steel Pipe Flanges
C 400-72	Asbestos-Cement Water Pressure Pipe For Water and Other Liquids
C 500-71	Gate Valves - 3 in. Through 48-in. - for Water and Other Liquids
C 502-64	Fire Hydrants for Ordinary Water Works Service
C 600-64	Installation of Cast-Iron Water Mains
C 602-68	Disinfecting Water Mains
C 603-65	Installation of Asbestos-Cement Water Pipe
C 800-66	Threads for Underground Service Line Fittings

3. GENERAL. This section covers water distribution lines and water service lines, and connections to building services at a point approximately 5 feet outside all buildings and structures to which service is required, complete. Pipe and accessories shall be new and unused unless otherwise approved.

3.1 Piping for Water Service Lines Less Than 3 Inches in Diameter shall be plastic, galvanized steel, or copper tubing, unless otherwise shown or specified.

3.2 Piping for Water Distribution Lines shall be cast iron, ductile iron, and asbestos cement, unless otherwise shown or specified, except that plastic pipe may be used for lines 4 inches and smaller.

3.3 Recommendations of the Manufacturer. The Contractor shall, as a part of the shop drawings, submit to the Contracting Officer the manufacturer's recommendations for each material or procedure to be utilized which is required to be in accordance with such recommendations. The Contractor shall have a copy of the manufacturer's instructions available at the construction site at all times.

4. MATERIALS shall conform to the respective specifications and other requirements specified below:

4.1 Pipe.

4.1.1 Asbestos Cement Pipe. AWWA Standard C400, class 150, unless otherwise shown or specified. Uncombined calcium hydroxide content shall not exceed 1.0 percent.

4.1.2 Cast Iron Pipe. Federal Specification WW-P-421, class 150, type II or III, unless otherwise shown or specified, or ANSI Standard A 21.6 or A 21.8, working pressure not less than 150 pounds per square inch with mechanical or push on joints, unless otherwise shown or specified. Pipe shall be cement mortar lined.

4.1.2.1 Cement Mortar Lining. ANSI Standard A 21.4. Linings shall be standard thickness.

4.1.3 Copper Tubing. ASTM Standard B 88, type K, annealed.

4.1.4 Ductile Iron Pipe. ANSI Standard A 21.51, working pressure not less than 150 pounds per square inch unless otherwise shown or specified. Pipe shall be cement mortar lined.

4.1.4.1 Cement Mortar Lining. ANSI Standard A 21.4. Linings shall be standard thickness.

4.1.5 Plastic Pipe. ASTM D 1785 or D 1527, schedule 40 for pipe with solvent welded joints schedule 80 for pipe with threaded joints or may be ASTM D 2241, type I, grade 1, or D 2282, 160 p.s.i. for pipe with solvent welded joints. Pipe and fittings shall bear the seal of approval (nsf mark) of the National Sanitation Foundations standard for plastic pipe and fittings for potable water service.

4.1.7 Galvanized Steel Pipe, Less Than 3 Inches. ASTM Standard A 120, standard weight.

4.1.8 Protective Materials For Steel Pipe, except as hereinafter specified, shall be mechanically applied in a factory or plant especially equipped for the purpose. The materials shall, unless otherwise indicated on the drawings, consist of the following for the indicated pipe material and size.

4.1.8.1 Galvanized Steel Pipe Less Than 3 Inches. Steel pipe and fittings less than 3 inches in diameter shall be thoroughly cleaned of foreign material by wire brushing and solvent cleaning, and then given one coat of coal tar primer and 2 coats of coal tar enamel conforming to AWWA Standard C 203. Threaded ends of pipe and fittings shall be adequately protected prior to coating.

4.2 Joints.

4.2.1 Asbestos Cement Pipe. Rubber rings for joints shall conform to ASTM Standard D 1869.

4.2.2 Cast Iron Pipe.

4.2.2.1 Mechanical Joints shall be of the stuffing box type and shall conform to ANSI Standard A 21.11.

4.2.2.2 Push-on Joints shall conform to ANSI Standard A 21.11.

4.2.2.3 Rubber Gaskets and Lubricant shall conform to the applicable requirements of ANSI Standard A 21.11.

4.2.3 Copper Tubing. Joints shall be compression-pattern flared and shall be made with fittings hereinafter specified.

4.2.4 Ductile Iron Pipe.

4.2.4.1 Mechanical Joints shall be of the stuffing box type and shall conform to ANSI Standard A 21.11 as modified by ANSI Standard A 21.51.

4.2.4.2 Push-On Joints shall conform to ANSI Standard A 21.51.

4.2.4.3 Rubber Gaskets and Lubricant shall conform to the applicable requirements of ANSI Standard A 21.11.

4.2.5 Mechanical Couplings shall be as hereinafter specified.

4.2.6 Bonded Joints. Where indicated, a metallic bond shall be provided at each joint, including joints made with flexible couplings or rubber gaskets, or ferrous metallic piping to effect continuous conductivity. The bond wire shall be type RHW-USE, size 1/0 neoprene-jacketed copper conductor shaped to stand clear of the joint. The bond shall be of the thermal weld type.

4.2.7 Insulating Joints shall be installed between nonthreaded ferrous and nonferrous metallic pipe, fittings and valves. Insulating joints shall consist of a sandwich-type flange insulating gasket of the dielectric type, insulating washers, and insulating sleeves for flange bolts. Insulating gaskets shall be full faced with outside diameter equal to the flange outside diameter. Bolt insulating sleeves shall be full length. Units shall be of a shape to prevent metal-to-metal contact of dissimilar metallic piping elements.

4.2.8 Connections between asbestos cement pipe and cast iron fittings, valves or hydrants shall be made with jointing materials conforming to AWWA Standard C 603.

4.3 Fittings and Specials.

4.3.1 For Asbestos Cement Pipes. Fittings and specials shall be cast iron, bell-end in accordance with ANSI Standard A 21.10, 150 psi pressure rating, except that profile of bell may have special dimensions as required by the pipe manufacturer. Cast iron fittings and specials shall be cement mortar lined in accordance with ANSI Standard A 21.4. Linings shall be standard thickness.

4.3.2 For Cast Iron Pipe. Fittings and specials shall be suitable for 150 psi pressure rating, unless otherwise specified. Fittings and specials for mechanical joint pipe shall conform to ANSI Standard A 21.10. Fittings and specials for use with push-on joint pipe shall conform to ANSI Standards A 21.10 and A 21.11. Cast iron fittings and specials shall be cement mortar lined in accordance with ANSI Standard A 21.4. Linings shall be standard thickness.

4.3.3 For Copper Tubing. Fittings and specials shall be flared and shall conform to ANSI Standard B 16.26.

4.3.4 For Ductile Iron Pipe. Fittings and specials shall be suitable for 150 psi pressure rating, unless otherwise specified. Fittings and specials for mechanical joint pipe shall conform to ANSI Standard A 21.10. Fittings and specials for use with push-on joint pipe shall conform to ANSI Standards A 21.10 and A 21.11. Fittings and specials shall be cement mortar lined in accordance with ANSI Standard A 21.4. Linings shall be standard thickness.

4.3.5 For Plastic Pipe. For solvent welded joints, fittings shall conform to the requirements specified for the pipe. For threaded joints, ASTM D 2464 or D 2465 as applicable.

4.3.6 For Galvanized Steel Pipe Less Than 3 Inches. Steel fittings shall be galvanized. Screwed fittings shall conform to ANSI Standard B 16.3. Flanged fittings shall conform to AWWA Standard C 207. Dresser-type fittings shall be suitable for use with type of pipe furnished.

4.4 Couplings.

4.4.1 Mechanical Couplings for Steel Pipe shall be the sleeve type, or when approved, the split sleeve type and shall provide a tight flexible joint under all reasonable conditions, such as pipe movements caused by expansion, contraction, slight settling or shifting in the ground, minor variations in trench gradients, and traffic vibrations. Couplings shall be of strength not less than the adjoining pipeline.

4.4.1.1 Sleeve-Type Couplings shall be used for joining plain end pipe sections. The couplings shall consist of one steel middle ring, 2 steel followers, 2 gaskets, and the necessary steel bolts and nuts to compress the gaskets.

4.4.1.2 Split-Sleeve-Type Couplings may be used when approved in special situations and shall consist of side- and end-gaskets and a housing in 2 or more sections with the necessary bolts and nuts to compress the gaskets.

4.4.2 Dielectric Fittings shall be installed between threaded ferrous and nonferrous metallic pipe, fittings and valves, except where corporation stops join mains. Dielectric fittings shall prevent metal-to-metal contact of dissimilar metallic piping elements and shall be suitable for the required working pressure.

4.5 Valves.

4.5.1 Gate Valves shall be designed for a working pressure of not less than 150 pounds per square inch. Valve connections shall be as required for the piping in which they are installed. Valves shall have a clear waterway equal to the full nominal diameter of the valve, and shall be opened by turning counterclockwise. The operating nut or wheel shall have an arrow, cast in the metal, indicating the direction of opening.

4.5.1.1 Valves Smaller Than 3 Inches shall be all bronze and shall conform to Federal Specification WW-V-54, type I, class B.

4.5.1.2 Valves 3 Inches and Larger shall be iron body, bronze mounted, and shall conform to AWWA Standard C 500.

4.5.2 Vacuum and Air Relief Valve shall be of the size shown and shall be a type that will release air and prevent the formation of a vacuum. The valves shall automatically release air from the lines when the lines are being filled with water, and shall admit air into the lines when water is being withdrawn in excess of the inflow. Valves shall be iron body, with bronze trim. Floats shall be stainless steel.

4.6 Valve Boxes shall be cast iron or concrete, except that concrete boxes may be installed only in locations not subjected to vehicular traffic. Cast iron boxes shall be extension type with slide-type adjustment and with flared base. The minimum thickness of cast iron shall be 3/16 inch. The word "WATER" shall be cast in the cover. The boxes shall be of such length as will be adapted, without full extension, to the depth of cover required over the pipe at the valve location. Concrete boxes shall be the standard product of a manufacturer of precast concrete equipment.

4.7 Fire hydrants shall conform to American Water Works Association Standards C 502. Hydrants shall have a 6-inch bell connection, 2 2-1/2-inch hose connections and one 4-1/2-inch pumper connection. Outlets shall have American National Standard fire-hose coupling threads. Working parts shall be bronze. Design, material, and workmanship shall be similar and equal to the latest stock pattern ordinarily produced by the manufacturer. Hydrants shall be painted with one coat of red lead paint and 2 finish coats of approved paint of the color directed. Hydrants shall be dry-barrel type conforming to AWWA Standard C 502 with valve opening at least 5 inches in diameter.

4.8 Miscellaneous Items.

4.8.1 Service Clamps shall have a pressure rating not less than that of the pipe to be connected and shall be either the single or double flattened strap type. Clamps shall have a galvanized malleable iron body with cadmium plated straps and nuts. Clamps shall have rubber gasket cemented to the body.

4.8.2 Corporation Stops shall have standard corporation stop thread conforming to AWWA Standard C 800 on the inlet end, with flanged joints, compression pattern flared tube couplings, or wiped joints for connections to gooseneck.

4.8.3 Goosenecks. Lead pipe for gooseneck connections shall conform to the applicable requirements of Federal Specification WW-P-325, Class 100. Copper tubing for gooseneck connections shall conform to the applicable requirements of ASTM Standard B 88, type K annealed. Length of connections shall be in accordance with standard practice.

4.8.4 Service Stops shall be water-works inverted-ground-key type, oval or round flow way, tee handle, without drain. Pipe connections shall be suitable for the type of service pipe used. All parts shall be of bronze with female iron-pipe-size connections or compression-pattern flared tube couplings, and shall be designed for a hydrostatic test pressure not less than 200 pounds per square inch.

4.8.5 Service Boxes shall be cast iron or concrete. Extension service boxes of the required length and having either screw or slide-type adjustment shall be installed at all service box locations. The boxes shall have housings of sufficient size to completely cover the service stop and shall be complete with identifying covers.

4.8.6 Disinfection. Chlorinating materials shall conform to the following:

Chlorine, liquid. AWWA Standard B 301.

Hypochlorite, Calcium and Sodium. AWWA Standard B 300.

5. INSTALLATION.

5.1 Handling. Pipe and accessories shall be handled so as to insure delivery to the trench in sound, undamaged condition. Particular care shall be taken not to injure the pipe coating. If the coating or lining of any pipe or fitting is damaged, the repair shall be made by the Contractor at his expense in a satisfactory manner. No other pipe or material of any kind shall be placed inside a pipe or fitting after the coating has been applied. Pipe shall be carried into position and not dragged. Use of pinch bars and tongs for alining or turning pipe will be permitted only on the bare ends of the pipe. The interior of pipe and accessories shall be thoroughly cleaned of foreign matter before being lowered into the trench and shall be kept clean during laying operations by plugging or other approved method. Before installation, the pipe shall be inspected for defects. Material found to be defective before or after laying shall be replaced with sound material without additional expense to the Government. Rubber gaskets that are not to be installed immediately shall be stored in a cool and dark place.

5.2 Cutting of Pipe shall be done in a neat and workmanlike manner without damage to the pipe. Unless otherwise recommended by the manufacturer and authorized by the Contracting Officer, cutting shall be done with an approved type mechanical type mechanical cutter. Wheel cutters shall be used when practicable.

5.2.1 Copper Tubing shall be cut square and all burrs shall be removed.

5.3 Locating. Where the location of the water pipe is not clearly defined in dimensions on the drawings, the water pipe shall not be laid closer horizontally than 10 feet from a sewer except where the bottom of the water pipe will be at least 12 inches above the top of the sewer pipe, in which case the water pipe shall not be laid closer horizontally than 6 feet from the sewer. Where water lines cross under gravity-flow sewer lines, the sewer pipe for a distance of at least 10 feet each side of the crossing shall be fully encased in concrete or shall be made of pressure pipe with no joint located within 3 feet horizontally of the crossing. Water lines shall in all cases cross above sewage force mains or inverted siphons and shall be not less than 2 feet above the sewer main. Joints in the sewer main, closer horizontally than 3 feet to the crossing, shall be encased in concrete.

5.3.1 Water Lines shall not be laid in the same trench with sewer lines, gas lines, fuel lines, or electric wiring.

5.3.2 Copper Tubing shall not be installed in the same trench with ferrous piping materials.

5.3.4 Nonferrous Metallic Pipe. Where nonferrous metallic pipe, e.g., copper tubing, crosses any ferrous piping material, a minimum vertical separation of 12 inches must be maintained between pipes.

5.4 Joint Deflection.

5.4.1 Asbestos Cement Pipe. Maximum allowable deflections from a straight line or grade, as required by vertical curves, horizontal curves, or offsets, will be 5 degrees unless a lesser amount is recommended by the manufacturer.

5.4.2 Cast Iron Pipe and Ductile Iron Pipe. The maximum allowable deflection will be as given in AWWA Standard C 600. Table I shows maximum deflection for 18 foot lengths of pipe. For other lengths the deflection will vary proportionately.

TABLE I
DEFLECTION IN INCHES

Diameter in Inches	Push-On Joint Pipe	Mechanical- Joint Pipe
6	19	27

If the alinement requires deflection in excess of the above limitations, special bends or a sufficient number of shorter lengths of pipe shall be furnished to provide angular deflections within the limit set forth.

5.5 Placing and Laying. Pipe and accessories shall be carefully lowered into the trench by means of derrick, ropes, belt slings, or other authorized equipment. Under no circumstances shall any of the water-line materials be dropped or dumped into the trench. Care shall be taken to avoid abrasion of the pipe coating. Except where necessary in making connections with other lines or as authorized by the Contracting Officer, pipe shall be laid with the bells facing in the direction of laying. The full length of each section of pipe shall rest solidly upon the pipe bed, with recesses excavated to accommodate bells, couplings, and joints. Pipe that has the grade or joint disturbed after laying shall be taken up and relaid. Pipe shall not be laid in water or when trench conditions are unsuitable for the work. Water shall be kept out of the trench until jointing is completed. When work is not in progress, open ends of pipe, fittings, and valves shall be securely closed so that no trench water, earth, or other substance will enter the pipes or fittings. Where any part of the coating or lining is damaged, the repair shall be made by the Contractor at his expense in a satisfactory manner. Pipe ends left for future connections shall be valved, plugged, or capped, and anchored, as shown.

5.5.1 Asbestos Cement Pipe shall be installed in accordance with AWWA Standard C 603, except as otherwise specified. Short lengths of pipe machined at each end or overall shall be used at fittings and rigid structures and for tying-in and closures.

5.5.2 Plastic Pipe shall be installed in accordance with the recommendations specified in ASTM Standard D 2774.

5.5.3 Connections. Where connections are made between new work and existing mains, the connections shall be made by using specials and fittings to suite the actual conditions. Standard methods are available for making connections to various types of pipe, either under pressure or in the dewatered condition. Where made under pressure, these connections shall be installed as approved by the Contracting Officer.

5.5.4 Pipe passing through walls of valve pits and structures shall be provided with cast iron wall sleeves. Annular space between walls and sleeves shall be filled with rich cement mortar. Annular space between pipe and sleeves shall be filled with mastic.

5.6 Jointing.

5.6.1 Asbestos Cement Pipe. Couplings shall be installed in accordance with AWWA Standard C 603. Heavy couplings for service line connections, as hereinafter specified, shall be installed in accordance with the recommendations of the manufacturer.

5.6.2 Cast Iron Pipe.

5.6.2.1 Mechanical and Push-On Type Joints shall be installed in accordance with AWWA Standard C 600.

5.6.3 Copper Tubing. Joints shall be made with flared fittings. The flared end tube shall be pulled tightly against the tapered part of the fitting by a nut which is part of the fitting, so there is metal-to-metal contact.

5.6.4 Ductile Iron Pipe. Mechanical push-on type joints shall be installed in accordance with AWWA Standard C 600, modified as necessary by the recommendations of the manufacturer to provide for special requirements of ductile iron pipe.

5.6.5 Galvanized Steel Pipe. Screw joints shall be made tight with a stiff mixture of graphite and oil, inert filler and oil, or with an approved graphite compound, applied with a brush to the male threads only. Compounds shall not contain lead.

5.6.6 Bonded Joints shall be installed in accordance with details specified in subparagraph Joints under paragraph MATERIALS.

5.6.7 Insulating Joints and Dielectric Fittings shall be installed in accordance with details specified in subparagraph Joints under paragraph MATERIALS. Dielectric unions shall be encapsulated in a field poured coal tar covering, with at least 1/8-inch thickness of coal tar over all fitting surfaces.

5.6.8 Connections between different types of pipe and accessories shall be made with transition fittings approved by the Contracting Officer.

5.7 Service Lines. Service lines shall include the lines to and connections with the building service at a point approximately 5 feet outside the building where such building service exists. Where building services are not installed, the Contractor shall terminate the service lines approximately 5 feet from the site of the proposed building at a point designated by the Contracting Officer. Such service lines shall be closed with plugs or caps. All service stops and gate valves shall be provided with extension service boxes of the lengths required by the depth of service-line stops or valves. Service lines shall be constructed in accordance with the following requirements.

5.7.1 Service Lines 2 Inches and Smaller shall be connected to the main by a directly-tapped corporation stop or by a service clamp. A corporation stop and a lead or copper gooseneck shall be provided with either type of connection. Maximum sizes for directly-tapped corporation stops and for outlets with service clamps shall be as in table II:

TABLE II
SIZE OF CORPORATION STOPS AND OUTLETS

Pipe Size Inches	Corporation Stops, Inches		Outlet w/Service Single & Double Straps
	For cast iron pipe	For Asbestos cement pipe	
6	1-1/4	3/4	1-1/2

Where 2 or more gooseneck connections to the main are required for an individual service, such connections shall be made with standard branch connections. The total clear area of the branches shall be at least equal to the clear area of the service which they are to supply.

5.7.1.1 Connections To Asbestos Cement Mains. Heavy asbestos cement couplings may be utilized for connecting service lines smaller than 2 inches to new asbestos cement water mains. Couplings shall have factory threaded outlets. Threads may be either iron pipe thread or AWWA type. A corporation stop and a gooseneck shall be provided with the connection. Maximum sizes for outlets shall be as follows.

Pipe Size Inches	Outlet Sizes Inches
6 and larger	3/4, 1, 1-1/4, 1-1/2

5.7.1.2 Service Lines 1-1/2 Inches and Smaller shall have a service stop.

5.7.1.3 Service Lines 2 Inches in size shall have a gate valve.

5.7.2 Service Lines Larger Than 2 Inches shall be connected to the main by a rigid connection and shall have a gate valve.

5.8 Field Coating and Lining of Pipe.

5.8.1 Galvanized Steel Pipe. Field joints shall be given one coat of coal tar primer and 2 coats of coal tar enamel conforming to AWWA Standard C 203. The tests of the coating shall conform to AWWA Standard C 203, and any flaws or holidays found in the coating of pipe and joints shall be repaired by patching or other approved means such that the repaired areas will be at least equal in thickness to the minimum coating required for the pipe.

5.9 Setting of Fire Hydrants and Valves and Valve Boxes.

5.9.1 Fire Hydrants shall be located where and installed as shown. Each hydrant shall be connected to the main with a 6-inch branch line having at least as much cover as the distribution main. Hydrants shall be set plumb with the pumper nozzle facing the roadway and with the center of the lowest outlet not less than 18 inches above the finished surrounding grade, and the operating nut not more than 48 inches above the finished surrounding grade. Except where approved otherwise, the backfill around hydrants shall be thoroughly compacted to the finished gradeline immediately after installation to obtain beneficial use of the hydrant as soon as practicable. The hydrant shall be set upon a slab of concrete not less than 4 inches thick and 15 inches square. Not less than 7 cubic feet of free draining broken stone or gravel shall be placed around and beneath the waste opening of dry barrel hydrants to insure drainage.

5.9.2 Valves and Valve Boxes shall be installed where shown or specified, and shall be set plumb. Valve boxes shall be centered on the valves. Boxes shall be installed over each outside gate valve unless otherwise shown. Where feasible, valves shall be located outside the area of roads. Earth fill shall be carefully tamped around each valve box to a distance of 4 feet on all sides of the box, or to the undisturbed trench face if less than 4 feet.

5.9.3 Hydrants and Valves after delivery shall be drained and shall have the interiors cleaned of all foreign matter before installation. Stuffing boxes shall be tightened and the hydrant or valve shall be fully opened and fully closed to insure that all parts are in working condition.

5.9.4 Service Boxes. Service boxes shall be installed in accessible locations, beyond the limits of road surfacing, walks and driveways.

5.9.5 Vacuum and Air Relief Valves shall be installed in valve pits as shown.

5.10 Tapped Tees and Crosses for future connections shall be installed where shown.

5.11 Thrust Blocks. Plugs, caps, tees, and bends deflecting 22-1/2 degrees or more, either vertically or horizontally, on water lines 6 inches in diameter or larger, and fire hydrants shall be provided with thrust blocking, or metal tie rods and clamps or lugs, as directed. Thrust blocking shall be concrete of a mix not leaner than 1 cement : 2-1/2 sand : 5 gravel, and having a compressive strength of not less than 2,000 psi after 28 days. Blocking shall be placed between solid ground and the hydrant or fitting to be anchored. Unless otherwise indicated or directed the base and thrust bearing sides of thrust blocks shall be poured directly against undisturbed earth. The sides of thrust blocks not subject to thrust may be poured against forms. The area of bearing shall be as shown or as directed. Blocking shall be placed so that the fitting joints will be accessible for repair. Steel rods and clamps shall be protected by galvanizing or by coating with bituminous paint.

6. HYDROSTATIC TESTS. Where any section of a water line is provided with concrete thrust blocking for fittings or hydrants, the hydrostatic tests shall not be made until at least 5 days after installation of the concrete thrust blocking unless otherwise approved. The method proposed for disposal of waste water from hydrostatic tests and disinfection shall be submitted to the Contracting Officer for approval prior to performing hydrostatic tests.

6.1 Pressure Test. After the pipe is laid, the joints completed, fire hydrants permanently installed, and the trench partially backfilled leaving the joints exposed for examination, the newly laid piping or any valved section of water distribution and water service piping shall, unless otherwise specified, be subjected for one hour to a hydrostatic pressure test of 200 pounds per square inch. Water supply lines designated on the drawings shall be subjected for one hour to a hydrostatic pressure test of 200 pounds per square inch. Each valve shall be opened and closed several times during the test. Exposed pipe, joints, fittings, valves, and hydrants shall be carefully examined during the partially open trench test. Joints showing visible leakage shall be replaced or remade as necessary. Cracked or defective pipe, joints, fittings valves, or hydrants discovered in consequence of this pressure test shall be removed and replaced with sound material, and the test shall be repeated until the test results are satisfactory. All replacement and repair shall be without additional expense to the Government.

6.2 Leakage Test shall be conducted after the pressure test has been satisfactorily completed. The duration of each leakage test shall be at least 2 hours, and during the test the water line shall be subjected to 200 pounds per square inch pressure. Leakage is defined as the quantity of water to be supplied into the newly laid pipe, or any valved or approved section thereof, necessary to maintain the specified leakage test pressure after the pipe has been filled with water and the air expelled. No piping installation will be accepted until the leakage is less than the number of gallons per hour as determined by the formula.

$$L = 0.00054 \text{ ND} \sqrt{P}$$

in which L equals the allowable leakage in gallons per hour; N is the number of joints in the length of pipeline tested; D is the nominal diameter of the pipe in inches; and P is the average test pressure during the leakage test, in pounds per square inch gage. The allowable leakage in gallons per hour, per joint at 200 pounds per square inch average test pressure shall be as in table III.

TABLE III

ALLOWABLE LEAKAGE, LIMITS

Pipe diameter (inches)	Gallons per hour	Pipe diameter (inches)	Gallons per hour
2	0.0153	12	0.0915
6	0.0458	18	0.1375

Should any test of pipe disclose leakage greater than that specified in the foregoing table, the defective joints shall be located and repaired until the leakage is within the specified allowance, without additional cost to the Government.

6.3 Time For Making Test. Except for joint material setting or where concrete reaction backing necessitates a 5-day delay, pipelines jointed with rubber gaskets, mechanical or push-on joints, or couplings may be subjected to hydrostatic pressure, inspected, and tested for leakage at any time after partial completion of backfill. Asbestos cement pipe and cement mortar lined pipe may be filled with water as recommended by the manufacturer before being subjected to the pressure test and subsequent leakage test.

6.4 Concurrent Hydrostatic Tests. The Contractor may elect to conduct the hydrostatic tests using either or both of the following procedures. Regardless of the sequence of tests employed, the results of pressure tests, leakage tests, and disinfection shall be satisfactory as specified. All replacement, repair, or retesting required shall be accomplished by the Contractor at no additional cost to the Government.

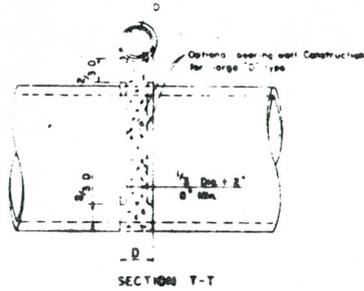
6.4.1 Pressure Test and Leakage Test may be conducted concurrently.

6.4.2 Hydrostatic Tests and Disinfection may be conducted concurrently, using the water treated for disinfection to accomplish the hydrostatic tests. If water is lost when treated for disinfection and air is admitted to the unit being tested, or if any repair procedure results in contamination of the unit, disinfection shall be reaccomplished.

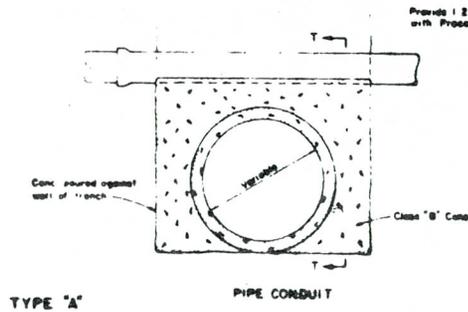
7. DISINFECTION. Before acceptance of potable water operation, each unit of completed water distribution line and water service line shall be disinfected as prescribed by AWWA Standard C 601. as specified herein. After pressure tests have been made, the unit to be disinfected shall be thoroughly flushed with water until all entrained dirt and mud have been removed before introducing the chlorinating material. The chlorinating material shall be either liquid chlorine, calcium hypochlorite, or sodium hypochlorite, conforming to paragraph MATERIALS. The chlorinating material shall provide a dosage of not less than 50 parts per million and shall be introduced into the water lines in an approved manner. The treated water shall be retained in the pipe long enough to destroy all non-spore-forming bacteria. Except where a shorter period is approved, the retention time shall be at least 24 hours and shall produce not less than 10 p.p.m. of chlorine throughout the line at the end of the retention period. All valves on the lines being disinfected shall be opened and closed several times during the contact period. The line shall then be flushed with clean water until the residual chlorine is reduced to less than 1.0 p.p.m. During the flushing period, each fire hydrant on the line shall be opened and closed several times. From several points in the unit, the Contracting Officer will take samples of water in properly sterilized containers for bacterial examination. The disinfection shall be repeated until tests indicate the absence of pollution for at least 2 full days. The unit will not be accepted until satisfactory bacteriological results have been obtained.

8. CLEANUP. Upon completion of the installation of the water distribution lines, water service lines, and appurtenances, all debris and surplus materials resulting from the work shall be removed.

* * * * *

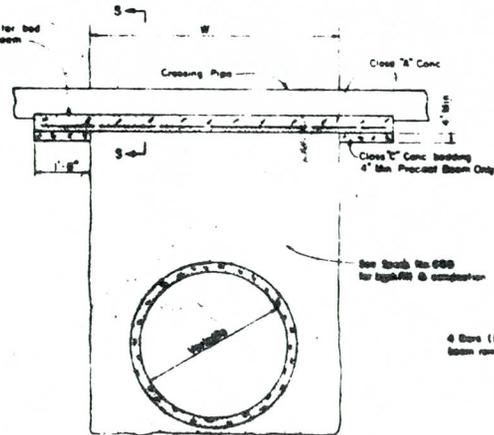


SECTION T-T

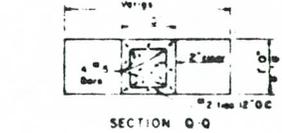


TYPE "A"

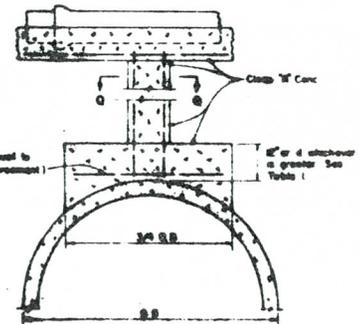
PIPE CONDUIT



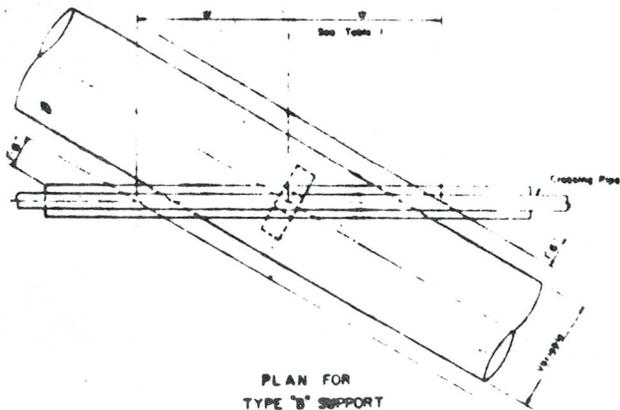
TYPE "B"



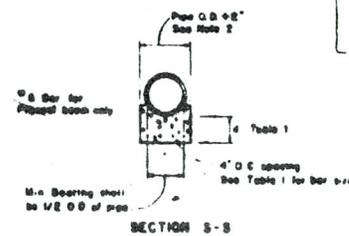
SECTION Q-Q



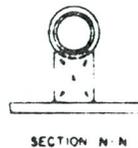
INTERMEDIATE SUPPORT FOR TYPE "B" CROSSINGS



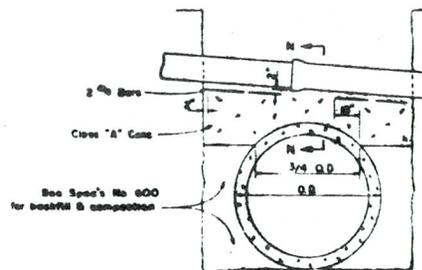
PLAN FOR TYPE "B" SUPPORT



SECTION S-S



SECTION N-N



TYPE "C"

NOTES:

- 1 Type "A" Pipe Support may be used for any Type Crossing condition.
- 2 Type "B" Pipe Support may be used for Crossing Pipes with a Ball Diameter of 18" or less if sufficient clearance over Storm Sewer is available and total depth is less than 14'.
- 3 Intermediate Pipe Support shall be used in conjunction with Type "B" Pipe Support if total span exceeds Maximum "S" in Table I.
- 4 The contractor shall be responsible for furnishing all Supports both Permanent and Temporary. Temporary Supports shall not be a separate pay item.
- 5 Permanent Pipe Supports may be decreased from span quantities or extended to include some listed below as temporary supports if conditions warrant those changes at the time of construction. Decision shall be made by the Engineer.
- 6 When Type "A" Pipe Support is used and whenever as directed by the engineer, the contractor shall pierce the wall with suitable openings to prevent upward pressure resulting from flooding of the boxfill. The volume of the pierced opening shall not exceed 1/2 the volume of the supporting wall.
- 7 Use Type "C" Pipe Support instead of Type "B" when clearance is less than "S" in Table I, between pipes.

SCHEDULE OF REQUIRED SUPPORTS

PERMANENT	TEMPORARY
Cast Iron Pipe	Cast Iron Pipe
Cast Iron Storm Drain	Cast Iron Storm Drain
Cast Iron Sewer Pipe	Cast Iron Sewer Pipe
Cast Iron Water Main	Cast Iron Water Main
Cast Iron Gas Pipe	Cast Iron Gas Pipe
Cast Iron Telephone Cable or Conduit	Cast Iron Telephone Cable or Conduit
Cast Iron Traffic Control Conduit	Cast Iron Traffic Control Conduit
Cast Iron Gas Pipe	Cast Iron Gas Pipe
Cast Iron Sewer Lines	Cast Iron Sewer Lines
Cast Iron Water Lines	Cast Iron Water Lines

TABLE I

Span	Depth of Cover on Supports			
	0 to 6'	6 to 8'	8 to 10'	10 to 14'
12"	5	6	8	10
18"	5	6	8	10
24"	5	6	8	10
30"	5	6	8	10
36"	5	6	8	10
42"	5	6	8	10
48"	5	6	8	10
54"	5	6	8	10
60"	5	6	8	10
66"	5	6	8	10
72"	5	6	8	10
78"	5	6	8	10
84"	5	6	8	10
90"	5	6	8	10
96"	5	6	8	10
102"	5	6	8	10
108"	5	6	8	10
114"	5	6	8	10
120"	5	6	8	10

DETAILS NOT TO SCALE

STANDARD DETAIL 22
CITY OF PHOENIX
P. U. WORKS DEPARTMENT
DIVISION OF ENGINEERING
PIPE SUPPORTS ACROSS TRENCHES

APPROVED: *R.L. [Signature]* *Oct 19, 1948*

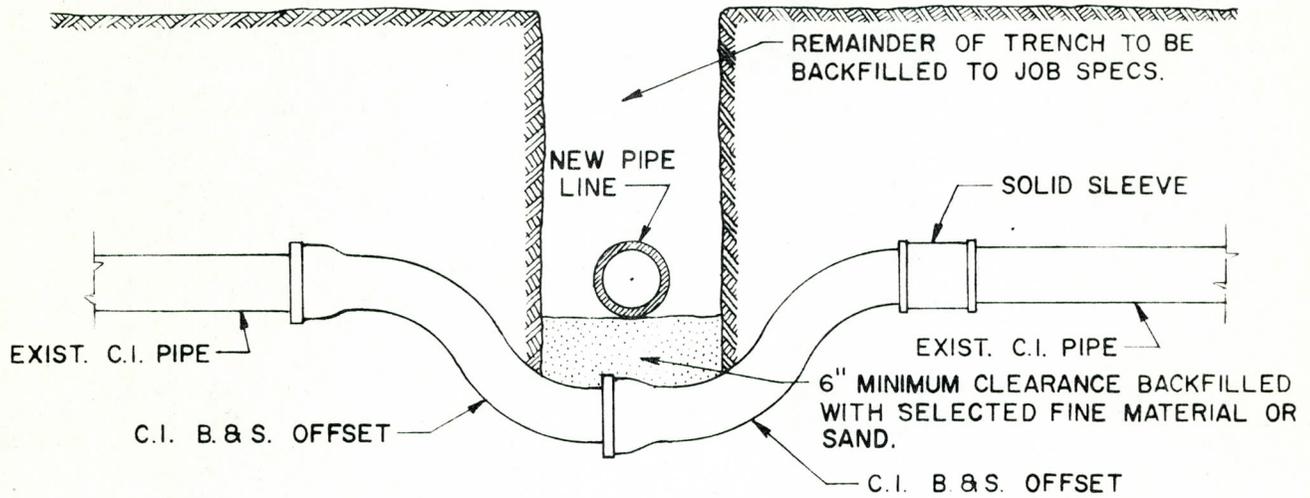
STANDARD DETAIL 470

CITY OF PHOENIX
PUBLIC WORKS DEPARTMENT
DIVISION OF ENGINEERING

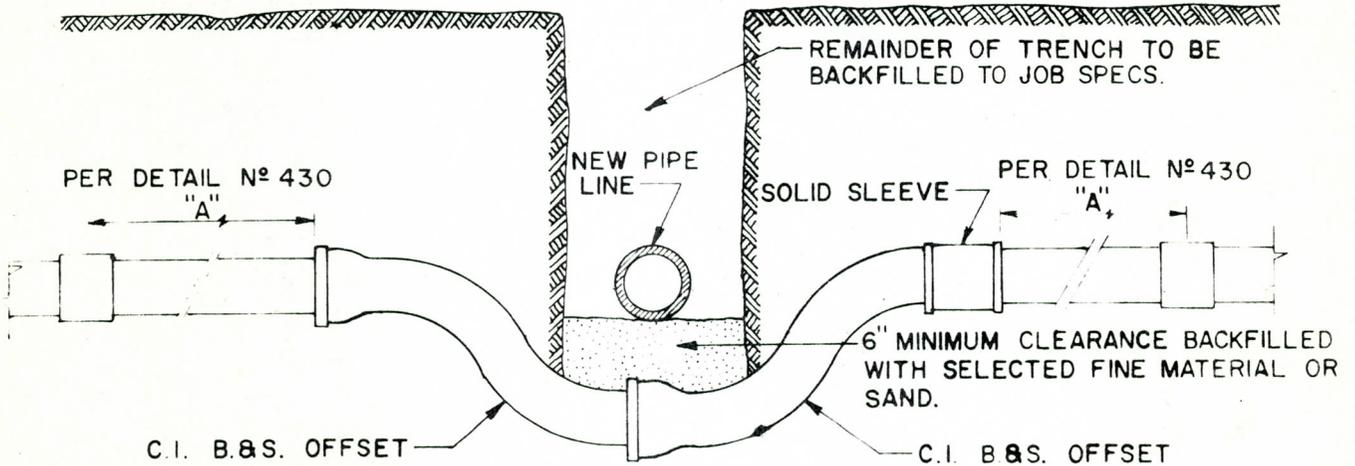
MOVING WATER MAINS

APPROVED: *Sam Tucker* 12 Aug 60, APPROVED: *David J. ...* 7/25/60
CITY ENGINEER DATE DIR. OF WATER & SEWERS DATE

NOTE:
THIS DETAIL COVERS MOVING WATER MAINS, 2" TO 12" ONLY.
45° CAST IRON BENDS MAY BE USED IN PLACE OF CAST IRON
OFFSETS, AS SHOWN.



CAST IRON



ASBESTOS CEMENT

SECTION 2E

SEWERS; SANITARY, GRAVITY

Index

- | | |
|----------------------------|--|
| 1. Applicable Publications | 6. Wye Branches |
| 2. General | 7. Manholes |
| 3. Materials | 8. Connections to Existing Sewer Manhole |
| 4. Installation | 9. Building Connections |
| 5. Concrete Encasement | 10. Surface Cleanouts |

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

1.1 American Society for Testing and Materials (ASTM), Publications.

A 48-64
A 74-72
C 94-74
C 139-73

C 150-73a
C 270-73
C 425-74

C 478-73
C 541-73
C 564-70

C 644-74

C 700-74

Gray Iron Castings
Cast Iron Soil Pipe and Fittings
Ready-Mixed Concrete
Concrete Masonry Units for Construction
of Catch Basins and Manholes
Portland Cement
Mortar for Unit Masonry
Compression Joints for Vitrified Clay
Bell-and-Spigot Pipe
Precast Reinforced Concrete Manhole Sections
Linings for Asbestos-Cement Pipe
Rubber Gaskets for Cast-Iron Soil
Pipe and Fittings
Asbestos-Cement Nonpressure Small
Diameter Sewer Pipe
Extra Strength and Standard Strength Clay
Pipe and Perforated Clay Pipe

2. GENERAL. Gravity sanitary sewers shall be constructed in conformance with this section of the specifications. The construction required herein shall include appurtenant structures and building sewers to points of connection with the building drains 5 feet outside the buildings to which the sewer system is to be connected. Excavation and backfilling shall conform to section: EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS. Backfilling shall be accomplished after inspection by the Contracting Officer. Work covered by this section will not be accepted until backfilling connected with the work has been completed satisfactorily.

3. MATERIALS shall conform to the respective specifications and other requirements specified below.

3.1 Pipe may be of any of the following materials unless otherwise specified or shown on plans.

3.1.1 Asbestos-Cement Pipe.

3.1.1.1 Asbestos-Cement Pipe, 6 Inches in Diameter. ASTM C 644, Type II, Class 2400.

3.1.1.2 Joints. Rubber rings for asbestos-cement pipe joints shall conform to ASTM D 1869.

3.1.1.3 Fittings and specials for use with asbestos-cement pipe shall have a strength not less than the pipe and shall be either asbestos-cement or cast iron, bell end conforming to ASTM A 74 except that profile of bell may have special dimensions as required by the pipe manufacturer.

3.1.1.4 Asbestos-Cement Pipe, Fittings, and Specials shall be made acid resistant by the application of a plastic lining conforming to ASTM C 541.

3.1.2 Cast Iron Soil Pipe and Fittings. ASTM A 74, Class SV.

3.1.2.1 Rubber Gaskets for Compression Joints. ASTM C 564.

3.1.3 Clay Pipe and Fittings.

3.1.3.1 Extra Strength Clay Pipe and Fittings. ASTM C 700, bell and spigot type.

3.1.3.2 Compression Joints. ASTM C 425.

3.2 Cement Mortar. ASTM C 270, Type M.

3.3 Portland Cement. ASTM C 150, Type II for concrete used in manholes and type optional with the Contractor for cement used in concrete cradle and encasement.

3.4 Portland Cement Concrete. ASTM C 94, compressive strength of 3,000 pounds per square inch at 28 days. Concrete in place shall be protected from freezing and moisture loss for 7 days.

3.5 Precast Reinforced Concrete Manhole Sections. ASTM C 478, except that Portland cement shall be as specified herein.

3.5.1 Joints for Precast Reinforced Concrete Manhole Sections. Joints shall be mortar, or an approved mastic or rubber gasket, or an approved combination of these types.

4. INSTALLATION.

4.1 Location. Where the location of the sewer is not clearly defined by dimensions on the drawings, the sewer shall not be closer horizontally than 10 feet to a water-supply main or service line, except that where the bottom of the water pipe will be at least 12 inches above the top of the sewer pipe, the horizontal spacing may be a minimum of 6 feet. Where gravity flow sewers cross above waterlines, the sewer pipe for a distance of 10 feet on each side of the crossing shall be fully encased in concrete, or shall be acceptable pressure pipe with no joint closer horizontally than 3 feet to the crossing. The thickness of the concrete encasement including that at the pipe joints shall be not less than 4 inches. Encasement of sewer lines shall conform to the details indicated on the attached drawings.

4.2 Pipe Laying.

4.2.1 Pipe shall be protected during handling against impact shocks and free fall and the pipe interior shall be free of extraneous material.

4.2.2 Pipe laying shall proceed upgrade with the spigot ends of bell-and-spigot pipe pointing in the direction of the flow. Each pipe shall be laid accurately to the line and grade shown on the drawings. Pipe shall be laid and centered so that the sewer has a uniform invert. As the work progresses, the interior of the sewer shall be cleared of all superfluous materials.

4.2.3 Before making pipe joints all surfaces of the portions of the pipe to be joined shall be clean and dry. Lubricants, primers, and adhesives shall be used as recommended by the pipe manufacturer. The joints shall then be placed, fitted, joined, and adjusted so as to obtain the degree of water tightness required.

4.3 Trenches shall be kept free of water and as dry as possible during bedding, laying, and jointing and for as long a period as required. When work is not in progress, open ends of pipe and fittings shall be satisfactorily closed so that no trench water or other material will enter the pipe or fittings.

4.3.1 Backfill. As soon as possible after the joint is made, sufficient backfill material shall be placed along the pipe to prevent pipe movement off line or grade.

4.3.2 Width of Trench. If the maximum width of the trench at the top of the pipe, as specified in section: EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS, is exceeded for any reason other than by direction, the Contractor shall install at no additional cost to the Government such concrete cradling, pipe encasement, or other bedding as may be required to satisfactorily support the added load of the backfill.

4.3.3 Joints Between Different Pipe Materials shall be made as hereinbefore specified, using approved jointing materials.

4.4 Leakage Tests. Lines shall be tested for leakage by either infiltration tests or exfiltration tests, as appropriate. Prior to testing for leakage the trench shall be backfilled up to at least the lower half of the pipe. If required, sufficient additional backfill shall be placed to prevent pipe movement during testing, leaving the joints uncovered to permit inspection. Visible leaks encountered shall be corrected regardless of leakage test results. When the water table is 2 feet or more above the top of the pipe at the upper end of the pipe line section to be tested, infiltration shall be measured using a suitable weir or other device acceptable to the Contracting Officer. When the Contracting Officer determines that infiltration cannot be properly tested, an exfiltration test shall be made by filling the line to be tested with water so that a head of at least 2 feet is provided above both the water table and the top of the pipe at the upper end of the pipe line to be tested. The filled line shall be allowed to stand until the pipe has reached its maximum absorption, but not less than 4 hours. After absorption, the head shall be reestablished. The amount of water required to maintain this water level during a 2-hour test period shall be measured. Leakage as measured by either the infiltration test or exfiltration test shall not exceed 0.4 gallons per inch diameter per 100 feet of pipe line per hour. When leakage exceeds the maximum amount specified, satisfactory correction shall be made and retesting accomplished. Testing, correction, and retesting shall be made at no additional cost to the Government.

5. CONCRETE CRADLE AND ENCASEMENT. The pipe shall be supported on a concrete cradle, or encased in concrete where indicated or directed.

6. WYE BRANCHES shall be installed where sewer connections are indicated or where directed. Cutting into piping, for connections shall not be done except in special approved cases. When conditions are such that the connecting pipe cannot be adequately supported on undisturbed earth or tamped backfill, the pipe shall be encased in concrete backfill or supported on a concrete cradle as directed. Concrete required because of conditions resulting from faulty construction methods or negligence by the Contractor shall be installed at no additional cost to the Government. The installation of wye branches in an existing sewer shall be made by a method which does not damage the integrity of the existing sewer. One acceptable method consists of removing one pipe section, breaking off the upper half of the bell of the next lower section and half the running bell of the wye section. After placing the new section, it shall be rotated so that the unbroken half of the bell will be at the bottom. The 2 joints shall then be made with joint packing and cement mortar.

7. MANHOLES.

7.1 General. Manholes shall be constructed of precast concrete rings with cast iron frames and covers. The invert channels shall be smooth and semicircular in shape conforming to the inside of the adjacent sewer section. Changes in direction of flow shall be made with a smooth curve of as large a radius as the size of the manhole will permit. Changes in size and grade of the channels shall be made gradually and evenly. The invert channels shall be formed directly in the concrete of the manhole base, or shall be built up with brick and mortar, or shall be half tile laid in concrete, or shall be constructed by laying full section sewer pipe through the manhole and breaking out the top half after the surrounding concrete has hardened. The floor of the manhole outside the channels shall be smooth and shall slope toward the channels not less than one inch per foot 6 nor more than 2 inches per foot. Free drop inside the manholes shall not exceed one foot 6 inches, measured from the invert of the inlet pipe to the top of the floor of the manhole outside the channels, and drop manholes shall be constructed whenever the free drop would otherwise be greater than one foot 6 inches. When the depth of sewer is less than 5 feet from the top of the manhole to the top of the sewer pipe, shallow manholes shall be constructed in accordance with the drawings.

7.2 Jointing. Mortar joints shall be completely filled and shall be smooth and free from surplus mortar on the inside of the manhole. Mortar and mastic joints between precast rings shall be full-bedded in jointing compound and shall be smoothed to a uniform surface on both the interior and exterior of the manhole. Installation of rubber gasket joints between precast rings shall be in accordance with the recommendations of the manufacturer.

7.3 Frames and Covers. Cast iron frames and locking covers shall conform to the details indicated on the attached drawing, type as suitable for the application, circular, without vent holes. The frames and covers shall conform to ASTM A 48, Class 20B. The word "Sewer" at least 2 inches high, shall be cast into all covers so as to be plainly visible. Unless otherwise shown on the drawings, the frames and covers shall be so set that the top of the cover will be flush with finished pavement grade or 2 inches higher than finished grade in unpaved areas. All sewer manhole frames and covers shall be of watertight design and fitted with composition gaskets and stainless steel cap screws.

8. CONNECTIONS TO EXISTING SEWER MANHOLE. Pipe connections to existing manholes shall be made in such manner that the finish work will conform as nearly as practicable to the essential applicable requirements specified for new manholes, including all necessary concrete work, cutting, and shaping.

9. BUILDING CONNECTIONS shall include the lines to and connection with the building waste drainage piping at a point approximately 5 feet outside the building, unless otherwise indicated. Where building drain piping is not installed, the Contractor shall terminate the building connections approximately 5 feet from the site of the building at a point and in a manner designated by the Contracting Officer.

10. Surface Cleanouts.

10.1 Parkway Type Cleanout. The cleanout riser shall be constructed of vitrified clay pipe and pipe fittings, 6-inch size, with the top section terminating in a standard spigot end of pipe. The top fitting shall consist of a precast concrete valve box top section, of a size that will loosely fit the outside of the cleanout riser. The cover designating letters shall be "C. O." Top of cover shall be set one inch above finished grade, or as directed.

10.2 Precast Concrete Equipment shall be the standard product of a manufacturer of precast concrete equipment for water lines and sewer lines.

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SECTION 2F

DETOURS AND TRAFFIC CONTROL FACILITIES

Index

- | | |
|------------------------|-------------------------------|
| 1. Detours | 3. Traffic Control Facilities |
| 2. Equipment Crossings | |

1. **DETOURS.** Traffic on streets that are closed to thru traffic for construction shall be routed over existing streets. Roosevelt Street shall not be used in rerouting traffic. The Contractor shall submit for approval a plan for routing of traffic including traffic control facilities prior to start of construction. Street closures shall conform to the applicable requirements of the GENERAL REQUIREMENTS.

2. **EQUIPMENT CROSSINGS.** The Contractor shall not cross existing paved roadways with construction equipment except at approved marked crossings. Crossings shall be maintained in accordance with applicable state, county, and city regulations.

3. **TRAFFIC CONTROL FACILITIES.** As required by applicable state, city, and county traffic regulations, the Contractor shall furnish, install, maintain, and remove all temporary barricades, lights, warning signs, flagmen, and other facilities necessary to control the traffic and protect pedestrians within the limits of the construction area. All signs to be used on the job during periods of darkness shall be reflectorized. Traffic control shall conform to the Traffic Barricade Manual, City of Phoenix and Part 400 of Uniform Standard Specifications for Public Works Construction, Maricopa Association of Governments, Arizona.

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SECTION 3A
EXCAVATION

Index

- | | |
|------------------------------|--|
| 1. General | 6. Excavation For Streets |
| 2. Blasting | 7. Excavation for Drains, Pipelines and Sewers |
| 3. Preservation of Property | 8. Removal of Unsatisfactory Soils |
| 4. Topsoil | 9. Disposal of Excavated Materials |
| 5. Excavation For Structures | 10. Overcut |

1. **GENERAL.** Excavation shall consist of the removal of every type of material encountered except materials covered by the provisions of the section: **CLEARING SITE, REMOVING OBSTRUCTIONS AND PROTECTING UTILITIES** in the designated areas or from areas directed. The material to be removed may include but is not limited to earth, hardpan, silt, clay, sand, gravel, cemented sand and gravel, rock, adobe, detached pieces of stone and concrete, rock fills, existing fills of miscellaneous debris and rubbish, and other unsuitable materials. Slope lines indicated on the drawings 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. Except as otherwise specified, the finished surface of subgrades shall be smooth and shall not vary more than 1/2 inch from indicated grade.

2. **BLASTING.** Excessive blasting will not be permitted. Any material outside the authorized cross section which may be shattered or loosened because of blasting shall be removed by the Contractor at his expense. Any method of blasting which leads to overshooting or is dangerous to the public or destructive to property or to natural features shall be discontinued.

3. **PRESERVATION OF PROPERTY.** All excavation operations shall be conducted in such a manner that street pavements, sidewalks, curbs, utilities, or other facilities and improvements which are to remain in place permanently will not be subjected to settlement or horizontal movement. The Contractor shall furnish and install sheet piling, cribbing, bulkheads, shores, or whatever means may be necessary to adequately support material carrying such improvements or to support the improvements themselves and shall maintain such means in position until they are no longer needed. Temporary sheet piling, cribbing, bulkheads, shores or other protective means shall remain the property of the Contractor and when no longer needed shall be removed from the site.

4. **TOPSOIL** shall be stripped to a depth of 6 inches within the designated excavations and grading lines. Topsoil shall be kept free from subsoil, clay lumps, brush, objectionable weed growth, litter, stones larger than 2 inches in diameter, stumps, roots, and other material that would interfere with planting and maintenance operations. Topsoil shall be transported and deposited in storage piles convenient to areas that are to receive applications of topsoil later or spread on areas already prepared for topsoil.

5. **EXCAVATION FOR STRUCTURES.** Excavation within the vicinity of existing structures, utilities, and drainage pipes to remain in place shall be performed in a manner to prevent damage to the structure. Earth banks and facilities to remain in place shall be supported as necessary during excavation. In general, unless otherwise shown or specified, the actual side slopes will be at the Contractor's option.

6. **EXCAVATION FOR STREETS** will include excavation for curbs, sidewalks, depression, and driveways, including materials unsuitable for street subgrade.

7. **EXCAVATION FOR DRAINS, PIPELINES, AND SEWERS.** All excavations shall be made by open cut unless otherwise specified. 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 bottom of all trenches excavated shall be shaped and rounded to conform to the lowest one-fourth of the outside portion of circular pipe or to the lower curved portion of pipe arch for the entire length of the pipe or arch. 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.

8. **REMOVAL OF UNSATISFACTORY SOILS.** The removal of soils which are unsatisfactory for foundations of the channel, structures, streets, and drains, may be required in certain areas. Material within the abandoned sewage pond area shall be removed to the extent as directed. The Contractor will be required to excavate any such areas to the depth directed and backfill the areas with compacted fill conforming to the requirements of the section: **FILLS AND SUBGRADE PREPARATION.**

9. **DISPOSAL OF EXCAVATED MATERIALS.** Excavated materials suitable for required fills, topsoiling and lake lining shall be placed in temporary stock piles or used directly in the work. All excess materials shall be placed in the indicated disposal area. No excavated material or waste of any kind shall be disposed of at any place beyond the limits of the work under this contract without express authority. Prior to placing material, the disposal and stockpile areas shall be cleared of trash and vegetation. Vegetation shall be cut off at the existing ground line. Clearing shall conform to the applicable requirements of the section: **CLEARING SITE AND REMOVING EXISTING OBSTRUCTIONS.** The stockpiles and disposal fills shall be placed in a manner to preclude ponding of water. Contractor shall furnish notice of his intentions in connection with the use of indicated disposal areas in accordance with the requirements of the paragraph: **PUBLIC UTILITIES, NOTICES, and RESTRICTIONS** of the **GENERAL REQUIREMENTS.**

10. **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 directed shall be backfilled with compacted fill or concrete, and all excavating, backfilling, compacting of backfill, and concreting occasioned thereby shall be by the Contractor at no additional cost to the Government. Any overcut under bridge footings shall be backfilled with concrete.

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SECTION 3B

FILLS AND SUBGRADE PREPARATION

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| 6. Compacted Fill, Levee | 12. Subgrade Preparation |

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

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

D 698-70	Moisture-Density Relations of Soils Using a 5.5-Lb. (2.5 Kg) Rammer and 12-In. (304.8mm) Drop
D 1557-70	Moisture-Density Relations of Soils Using 10-Lb. 4.5(Kg) Rammer and 18-In. (457 mm) Drop
D 1556-64	Density of Soil In Place by the Sand-Cone Method

1.2 American Association of State Highway and Transportation Officials (AASHTO) Standards.

T 99-74	Moisture-Density Relations of Soils Using a 5.5-Lb. (2.5 Kg) Rammer and a 12-In. (305 mm) Drop
T 180-74	Moisture-Density Relations of Soils Using a 10-Lb. (4.54 Kg) Rammer and an 18-In. (457 mm) 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.

3.1 Control. Moisture-density relations shall be established by the Contractor. Field density tests shall be performed by the Contractor in sufficient number and in such locations to insure that the specified density is being obtained. Moisture-density relations and field densities shall be reported on approved forms. One copy of density data less dry weight determinations shall be provided on the day each test is taken. The completed test reports shall be provided with the Contractor Quality Control Report on the work day following the test.

3.1.1 Laboratory Control. One moisture-density relation shall be made for each classification, blend or change in classification of soil materials encountered. Approval of moisture-density relations shall be obtained prior to the compaction of any material in the work. The moisture-density relations shall be determined in a laboratory in accordance with the following requirements:

3.1.1.1 Outside of Street, Road, and Highway Rights-of-Way. AASHTO Standard T 99, Method D or ASTM Specification D 698, Method D, modified as specified hereafter.

3.1.1.2 Within Street, Road, and Highway Rights-of-Way. AASHTO Standard T 180, Method D, or ASTM Specifications D 1557, Method D, modified as specified hereafter.

3.1.1.3 Modifications to Method D.

3.1.1.3.1 All material over 3/4 inch in size will be removed and replaced with an equal portion of material between 0.187 inch, No. 4 sieve, and 3/4 inch in size.

3.1.1.3.2 A separate batch of materials will be used for each compaction test specimen. No materials will be re-used.

3.1.1.3.3 The desired amount of mixing water will be added for each compaction test specimen, mixed well, and the mixture will be placed in a container with an airtight cover and allowed to cure for 24 hours. A shorter curing time may be allowed where tests show that shortening the curing time will not affect the results.

3.1.2 Field Control. Field in-place density shall be determined in accordance with AASHTO Standard T 191 or ASTM Specifications D 1556, except that in each test, the weight of the disturbed sample representing the full depth of layer shall be not less than 10 pounds for fine grain material and 12 pounds for coarse grain material using a scale for weighing of sufficient capacity and sensitive to .01 pounds. The density tests shall be well distributed and shall average not less than one test for each 500 cubic yards of material. At least one test shall be made in each 2 feet of compacted material processed as a unit and at least one test shall be made in each area.

3.1.3 Moisture-Density Curves for Cohesionless and Cohesive Materials. Cohesionless materials include gravels, gravel-sand mixtures, sands, and gravelly sands. Cohesive materials include clayey and silty gravels, gravel-silt mixtures, clayey and silty sands, sand-clay mixtures, clays, silts, and very fine sands. When results of compaction tests for moisture-density relations are recorded on graphs, cohesionless soils will show straight lines or reverse-shaped moisture-density curves, and cohesive soils will show normal moisture density curves.

3.2 Settling of Fills or Backfills With Water will not be permitted.

3.3 Material shall be obtained from the required excavations, 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. 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, INVERT.

4.1 Preparation for Placing. Before placing material for compacted fill, the foundation surface shall be cleared of all existing obstructions, vegetation, and debris. Unsuitable material not meeting the requirements for fill material shall be removed where directed, and the existing surfaces scarified to a depth of 6 inches before placing the fill. Sloped ground surfaces steeper than one vertical to 4 horizontal, on which fill or compacted backfill is to be placed, shall be stepped in such a manner that the compaction equipment will bear on the full depth of the fill layer.

4.2 Compaction. Each layer of the materials shall be compacted to not less than 95% of maximum density.

5. COMPACTED FILL BEHIND WALLS.

5.1 Limitations on Equipment. The gross weight of any piece of equipment, or the combined weight of any combinations of equipment coupled together, used to place, moisten and/or compact fill behind walls shall not exceed 35,000 pounds, including dynamic forces produced by vibratory equipment. Equipment used to compact the fill behind the walls shall be of such size as to be capable of operating in the area between the cut slope and the wall. Compaction equipment will not be required to operate at elevations lower than 2 feet above the top of wall footings. This equipment shall be of such size as to be capable of operating in the area between the cut slope and the wall at any point 2 feet above the top of the heel of wall footings.

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

5.3 Trimming. The berms top of fill adjacent to walls shall be trimmed to the lines indicated with a tolerance of plus or minus one inch. Any material loosened by trimming shall be recompactd 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. The bridge approach areas other than paved areas shall be trimmed to a uniform alignment and reasonably uniform slopes.

6. COMPACTED FILL, LEVEE.

6.1 Preparation for Placing shall conform to the requirements specified for preparation for placing of fill material for the invert in the paragraph: COMPACTED FILL, INVERT.

6.2 Compaction. Each layer of levee fill shall be compacted to not less than 90% of maximum density for cohesive material and to not less than 95% of maximum density for cohesionless material.

6.3 Trimming. The water side and top of levees shall be trimmed to the lines indicated with a tolerance of plus or minus one inch, as measured perpendicular to the slope. Any material loosened by trimming shall be recompactd. The land side of levees shall be trimmed to a uniform alignment at top of levee and to a reasonably uniform slope at or outside the lines shown. The ramps and bridge approach areas other than paved areas shall be trimmed to a uniform alignment and reasonably uniform slopes.

7. COMPACTED FILL, STREET.

7.1 Location. Compacted street fill shall consist of fill placed for bridge approaches, new street, construction, and all other fill and backfill within the street right-of-way. The street and bridge approach work includes fill and backfill for streets, curbs, and driveways.

7.2 Compaction. Each layer of street fill shall be compacted to not less than 90% of maximum density, except the upper 2.5 feet of fill shall be compacted to not less than 95% of maximum density.

7.3 Trimming. All shoulders and side slopes shall be neatly and accurately trimmed to the cross section indicated.

8. BACKFILLS.

8.1 Backfill and Fill About Structures.

8.1.1 Location. Backfill and fill shall consist of all fill against and/or around structures, except backfill for pipe trenches and drain material placed behind retaining wall.

8.1.2 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.

8.1.3 Placing. Fill material shall not be placed against concrete which has not been in place at least 14 days. Fill shall be placed in 4-inch layers.

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

8.2 Backfill, Pipe Trenches.

8.2.1 Location. Backfill for pipe trenches shall consist of all fill placed in pipe trench or open excavation for pipes, drains or sewers.

8.2.2 Material shall conform to the requirements in paragraph: BACKFILL AND FILL ABOUT STRUCTURES except that the material placed around the pipe and until the pipe has a cover of 2 feet, shall not contain any stone larger than 3/4 inch. Bedding under the pipe shall consist of compacted sand.

8.2.3 Placing. Backfill shall be placed in 4-inch layers.

8.2.4 Compaction of the material around the pipe, and until a pipe has a cover of 2 feet, shall be not less than 90% of maximum density. The compaction of the remainder of backfill shall be not less than 95% of maximum density.

8.3 Backfill, Toe shall consist of material placed over the toe stone protection. In general the fill shall consist of material suitable for compacted fill placed in horizontal layers not more than 24 inches in thickness, smoothed and dressed to the lines and grades indicated, and compacted to not less than 90% maximum density. Broken concrete, rock, and boulders to be wasted may be buried in the lower portion of toe backfill areas, provided such material is placed in a manner that will prevent the formation of voids and provided it is placed in a manner that compaction will not be impeded. No depressions shall be left in toe backfill areas.

9. LANDSCAPE FILL shall consist of material from the required excavation, placed in the area indicated and shall be placed with suitable equipment in layers which shall not exceed 12 inches in depth before compaction. Material shall be free from sod, roots, brush, debris, trash or other objectionable material, and shall contain no stone larger than 3-inches. Each layer of fill shall be compacted to not less than 85 percent of the maximum density. The top 6-inches of landscape fill shall meet the material requirements for TOPSOIL as specified in section: EXCAVATION and shall be placed in accordance with requirements for PLACING TOPSOIL specified herein.

10. PLACING TOPSOIL. Topsoil shall be distributed uniformly and spread evenly to a thickness of 6 inches. Topsoil shall be spread so that planting can proceed with little additional soil preparation or tillage. Surface irregularities resulting from topsoiling or other operations shall be leveled to prevent depressions. Grade shall be adjusted to assure that planted grade will be 1 inch below adjoining grade of any surfaced area in accordance with the applicable requirements of section: ESTABLISHMENT OF TURF. Topsoil shall not be placed when the underlying material is excessively wet, extremely dry, excessively compacted, or in a condition detrimental to the proposed planting or grading. Soil compacted by construction equipment or soil on compacted cut slopes or grades shall be pulverized to a minimum depth of 6 inches by disking or plowing before applying topsoil.

11. RETAINING WALL DRAINAGE. Drain material shall be placed behind retaining walls as indicated.

11.1 Pervious Drain Material shall consist of gravel, crushed gravel, crushed rock, natural sands, manufactured sand, or combinations thereof. Pervious material shall conform to the following grading requirements:

Sieve Sizes	Percentage Passing
2 Inch	100
No. 50	0-100
No. 100	0-8
No. 200	0-4

That portion of pervious drain material passing the No. 4 sieve shall have a Sand Equivalent of not less than 60.

11.2 Installation. Pervious drain material shall be placed in horizontal layers along with and by the same methods as specified for structure backfill.

11.3 Wall Drain Outlets shall conform to the requirements of the section: CONCRETE.

12. SUBGRADE PREPARATION.

12.1 Subgrade for Filter Material. After the channel has been excavated to rough grade, the entire subgrade for the filter material shall be trimmed to a uniform grade and smoothed with a steel-wheeled roller to make the subgrade ready to receive the filter material. If the subgrade is disturbed by the Contractor's operations or is overexcavated, the subgrade shall be restored to grade and compacted to a density of 95% of maximum density. The finished surface of the subgrade shall not be more than 1/2 inch from the indicated grade at any point when tested with a 10-foot straightedge.

12.2 Subgrade for Levee Slope Pavement. Fills and excavation for levee slopes shall be trimmed to the lines and grades indicated. The finished surface of subgrade shall be smooth and shall not vary more than 1/2 inch from the indicated grade at any point when tested with a 10-foot straightedge.

12.3 Subgrade Preparation for Street Pavement, Curbs, Gutters, Sidewalks, Driveways, and Riding and Hiking Trail. The subgrade shall be alternately watered and scarified until the material is uniformly moistened throughout for a depth of not less than 4 inches. All stones larger than 4 inches in diameter, and hard ribs of earth shall be removed. The amount of water to be applied shall be that which is required to provide optimum results in compaction under rolling. Following the above operations, the roadbed shall be shaped to a true cross section sufficiently higher than the specified grade to allow for subsequent compaction and then be thoroughly compacted to not less than 95% of maximum density. After the subgrade has been prepared and completed, the surface shall be firm, hard, and unyielding, with a true, even, and uniform surface conforming to the grade and cross section indicated on the drawings. All points of the finished subgrade shall be not more than 1/4 inch below or above true subgrade.

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SECTION 3C

EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS

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1. DELETED.

2. GENERAL. This section covers the excavation, trenching, and backfilling for utilities systems to the points of connection with the building utilities 5 feet outside the building to be served.

3. EXCAVATION.

3.1 General. All excavation of every description and of whatever substances encountered shall be performed to the depths indicated or as otherwise specified. During excavation, material suitable for backfilling shall be piled in an orderly manner a sufficient distance from the banks of the trench to avoid overloading and to prevent slides or cave-ins. All excavated materials not required or suitable for backfill shall be removed and wasted as indicated or as directed. Grading shall be done as may be necessary to prevent surface water from flowing into trenches or other excavations, and any water accumulating therein shall be removed by pumping or by other approved methods. Sheeting and shoring shall be done as may be necessary for the protection of the work and for the safety of personnel. Unless otherwise indicated, excavation shall be by open cut except that short sections of a trench may be tunneled if, in the opinion of the Contracting Officer, the pipe, cable, or duct can be safely and properly installed and backfill can be properly tamped in such tunnel sections.

3.2 Trench Excavations. Trenches shall be of the necessary width for proper laying of pipe, cables, or ducts. The banks of pipe trenches shall be as nearly vertical as practicable. Care shall be taken not to overexcavate. The bottom of the trenches shall be accurately graded to provide uniform bearing and support for each section of the pipe or undisturbed soil at every point along its entire length, except for the portions of the pipe sections where it is necessary to excavate for bell holes and for the proper sealing of pipe joints and as hereinafter specified. Bell holes and depressions for joints shall be dug after the trench bottom has been graded, and, in order that the pipe rest on the prepared bottom for as nearly its full length as practicable, bell holes and depressions shall be only of such length, depth, and width as required for properly making that particular type of joint. Stones shall be removed as necessary to avoid point bearing. Except as hereinafter specified for wet or otherwise unstable material, overdepths shall be backfilled as and with materials specified for backfilling the lower portion of trenches. Whenever wet or otherwise unstable material that is incapable for properly supporting the pipe is encountered in the bottom of the trench, such material shall be overexcavated to a depth to allow for construction of a stable pipe bedding. The trench shall be backfilled to the proper grade with suitable approved materials. Special requirements relating to the specified utilities are as follows:

3.2.1 Sanitary Sewers. The width of the trench at and below the top of the pipe shall be such that the clear space between the barrel of the pipe and the trench wall shall not exceed 8 inches on either side of the pipe. The width of the trench above that level shall be as wide as necessary for sheeting and bracing and the proper performance of the work. The bottom of the trench shall be rounded so that at least the bottom quadrant of the pipe shall rest firmly on undisturbed soil for as nearly the full length of the barrel as proper jointing operations will permit. This part of the excavation shall be done manually only a few feet in advance of the pipe laying by men skilled in this type of work.

3.2.2 Water Lines. Unless otherwise indicated, trenches shall be graded to avoid high points with the necessity of placing vacuum and relief valves in the waterlines. Trenches shall be of a depth to provide a minimum cover over the top of the pipe of 3 feet from the existing ground surface or the indicated finished grade and to avoid interference of the waterlines with other utilities.

3.2.3 Electrical System. The banks of trenches for electrical cables and duct lines need not be kept vertical but may be sloped or widened to such general limits as may be set by the Contracting Officer, provided there is no interference with other utilities. Overexcavating and backfilling with suitable selected material where rock is encountered will not be required except for a gradual cushioning towards points of abrupt dropoff of the rock to levels considerably below the grade of the duct. Special trenching requirements for direct-buried electrical cables and conduit or duct lines are specified in section: ELECTRICAL-DISTRIBUTION AND LIGHTING SYSTEMS: UNDERGROUND.

3.3 Excavation for Appurtenances. Excavation for manholes and similar structures shall be sufficient to leave at least 12 inches in the clear between the outer surfaces and the embankment or timber that may be used to hold and protect the banks. Any overdepth excavation below such appurtenances that has not been directed will be considered unauthorized and shall be refilled with sand, gravel, or concrete, as directed, at no additional cost to the Government.

4. REMOVAL OF UTILITY LINES. When utility lines that are to be removed are encountered within the area of operations, the Contracting Officer shall be notified in ample time for the necessary measures to be taken to prevent interruption of the service.

5. BACKFILLING. The trenches shall not be backfilled until all required pressure tests are performed and until the utilities system as installed conform to the requirements specified in the several sections covering the installation of the various utilities. Where, in the opinion of the Contracting Officer, damage is likely to result from withdrawing sheeting, the sheeting shall be left in place and the contract price will be adjusted accordingly. Except as otherwise specified for special conditions of overdepths trenches shall be backfilled to the ground surface with selected material that is suitable for the specified compaction and as hereinafter specified. Trenches improperly backfilled shall be reopened to the depth required for proper compaction, then refilled and compacted as specified, or the condition shall be otherwise corrected as approved. The surface shall be restored to its original condition as near as practicable and as hereinafter specified. Pavement, base course, and compacted subgrade disturbed by trenching operations shall be replaced in an acceptable manner with materials equal to the adjacent compacted subgrade, base course, and pavement for a minimum distance of 12 inches on each side of the trench.

5.1 Lower Portion of Trench. Backfill material shall be deposited in 6-inch-maximum-thickness layers and compacted with suitable tampers to the density of the adjacent soil or graded as hereinafter specified until there is a cover of not less than 2 feet over sewers and 1 foot over other utility lines. The backfill material in this portion of the trench shall consist of a selected material at a moisture content that will facilitate compaction, free from stones larger than 3 inches in any dimension and hard clods and frozen conglomerates larger than 6 inches in any dimension, except that where the pipe is coated or wrapped for protection against corrosion the backfill material shall be free from stones larger than 1 inch in any dimension. In any portion of the cover in the lower portion of the trench is in the depth of special compaction and materials requirements under pavement the special requirements shall control. Special care shall be taken not to damage the coating or wrapping of pipes.

5.2 Remainder of Trench. Except for special materials for pavements the remainder of the trench shall be backfilled with material that is free of stones larger than 6 inches of 1/2 the layered thickness, whichever is smaller, in any dimension. Backfill material shall be deposited in layers not exceeding the thickness specified, and each layer shall be compacted to the minimum density specified as applicable to the particular area except that in areas other than under roadways, parking areas, and other paved areas subject to vehicular movement, settling of granular, noncohesive material with water will be permitted. Degree of compaction shall be as follows, expressed as a percentage of the maximum density obtained by the test procedure specified in section: FILLS AND SUBGRADE PREPARATION.

5.2.1 Under Pavements. Six-inch layers, 90 percent maximum density for cohesive soils and 95 percent maximum density for cohesionless soils up to the elevations at which the requirements for pavement subgrade materials and compaction control.

5.2.2 Under Turfed or Seeded Lawn Areas and Sidewalks. Twelve-inch layers, 85 percent maximum density for cohesive soils and 90 percent maximum density for cohesionless soils. This requirement also applies to areas designated to be turfed or seeded as indicated on the drawings.

5.2.3 Under Other Areas. Two-foot layers, density equal to the adjacent soil.

5.3 Determination of Density. Field testing and laboratory tests for moisture-density relations shall be determined in accordance with the requirements of section: FILLS AND SUBGRADE PREPARATION.

6. TEST FOR DISPLACEMENT OF SEWERS. Sewer main will be checked by the Contracting Officer to determine whether any displacement of the pipe has occurred after the trench has been backfilled to 2 feet above the pipe and tamped as specified. The test will be as follows: A light will be flashed between manholes, or, if the manholes have not as yet been constructed, between the location of the manholes, by means of a flashlight or by reflecting sunlight with a mirror. If the illuminated interior of the pipe line shows poor alignment, displacement pipe, or any other defects, the defects as designated by the Contracting Officer shall be satisfactorily remedied.

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SECTION 3D

LAKE LINING

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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) Specifications.

D 420-69

Investigating and Sampling Soils and Rock for Engineering Purposes

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

2. **GENERAL.** Lake lining shall consist of a uniformly blended mixture of soil and sodium chloride placed and compacted on the areas indicated.

3. **MATERIALS.**

3.1 Soil shall consist of material obtained from required excavation within the areas indicated. Material shall be those classified by the Unified Soil Classification System as sandy clay (CL) or clayey sand (SC). Stones larger than 3 inches, sticks, debris, vegetable matter, and other deleterious matter shall be removed.

3.2 Sodium chloride (NaCl) shall be finely ground having at least 95 percent passing the No. 30 sieve and less than 5 percent passing the No. 100 sieve. Chemical composition shall not be less than 97 percent sodium chloride. Rock salt may be used at the option of the Contractor.

3.3 Water shall be clean, fresh, and free from injurious amounts of oil, acid, salt, alkali, organic matter, and other substances deleterious to the hardening of soil-salt, and shall be subject to approval.

4. **RATES OF MATERIALS APPLICATIONS AND DENSITY.** The rate of application of sodium chloride for the mixture and the optimum water content will be determined by the Contracting Officer from soil samples submitted by the Contractor. Samples shall be taken as required in paragraph SAMPLING, TESTING, AND APPROVAL. The density of the compacted soil-salt mixture shall be at least 95 percent of the maximum density obtained in the laboratory as specified in paragraph SAMPLING AND TESTING. Sodium chloride shall be applied at the rate of 0.225 to 0.25 percent by weight of dry soil. The exact quantities, that may be varied to suit field conditions, will be determined by the Contracting Officer.

5. **SAMPLING AND TESTING.**

5.1 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. Soil samples shall be obtained in conformance with ASTM D 420. Samples for determining the optimum moisture content and the specified degree of compaction shall be representative of mixtures obtained from the area being processed. Samples for determining the density of the compacted mixture shall be taken in conformance with ASTM D 1556. Where necessary, the sampling will be supervised by the Contracting Officer.

5.1.1 Density Tests. The density shall be determined in the field in accordance with ASTM D 1556. The maximum density shall be determined in the laboratory in accordance with ASTM D 698, Method D. The density tests shall be well distributed and shall average not less than one test for each 1,000 cubic yards of material. At least one test shall be made in each area processed as a unit.

6. STORAGE OF SODIUM CHLORIDE. Sodium chloride shall be stored in a manner to prevent the absorption of moisture.

7. EQUIPMENT. Any combination of equipment, plant, machines, or tools may be used that will produce a mixture conforming to these specifications. Sufficient equipment shall be provided to perform the work continuously. Equipment used in placing and compacting shall be of a type that will not damage the subgrade. Equipment, plant, machines, and tools used in the performance of the work covered by this section shall be approved prior to commencement of work and shall be maintained in satisfactory working condition at all times. The Contracting Officer shall have access at any time to all parts of the plant for the purpose of checking the adequacy of the equipment in use, inspecting the operation of the plant, and verifying the weights, proportions, and character of materials.

7.1 Rollers.

7.1.1 Steel-Wheel Rollers shall be the self-propelled, three-wheel or tandem type, weighing not less than 10 tons, and shall be suitable for rolling soil-cement mixtures. The wheels shall be equipped with adjustable scrapers.

7.1.2 Rubber-Tired Rollers shall be self-propelled and equipped with not less than 9 rubber-tired wheels mounted on 2 axles in such manner that the rear group of tires will not follow in the tracks of the forward group. The rubber-tired roller shall also be equipped with suitable boxes or platforms for ballast loading and shall be loaded as directed. The tires shall be uniformly inflated.

7.2 Mixing Plants, if used, shall be designed and constructed to thoroughly mix the soil, sodium chloride, and water. The plants shall be equipped to accurately measure the required amounts of sodium chloride and water while the plants are in operation.

7.3 Mechanical Spreader shall be self-propelled or attached to a propelling unit capable of moving the spreader and material truck. The device shall be steerable and shall be carried on rubber tires or drum-type wheel rollers that will not disturb the underlying layer. The spreader shall contain a hopper, an adjustable screen, and outboard bumper rolls and shall be so designed that there will be a uniform, steady flow of material from the hopper. The spreader shall be capable of laying material across the full width of the lane to a uniform thickness and to a uniform loose density so that when compacted the layer or layers shall conform to the thickness and grade requirements indicated.

7.4 Blade Graders shall have a wheel base not less than 15 feet, a blade not less than 12 feet, and shall be self propelled.

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

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

7.7 Power Brooms and Power Blowers shall be suitable for effectively cleaning prepared surfaces.

7.8 Miscellaneous Equipment. Other equipment shall be suitable for construction of soil-salt mixture.

8. WEATHER LIMITATIONS. Uncompacted soil-salt mixture that is wet by rain so that the average moisture content at the time of compaction exceeds the tolerance specified in the paragraph MIXING AND PLACING MATERIALS, hereinafter, or any portion of the completed areas that is damaged shall be completely removed and replaced in accordance with the paragraph CORRECTION OF DEFECTIVE AREAS, hereinafter.

9 DRAINAGE. Adequate drainage shall be provided during the entire construction period to prevent water from collecting or standing on the area to be lined or on the pulverized, mixed, or partially mixed material.

10. **PREPARATION OF SUBGRADE.** Subgrade areas shall be cleaned of debris. The areas will be inspected by the Contracting Officer for adequate compaction and shall be capable of withstanding, without displacement, the compaction specified. Soft yielding spots and ruts or other irregularities in the subgrade shall be corrected. The material in the affected areas shall be loosened and unsatisfactory material removed. Approved material shall be added where required. The subgrade shall then be shaped to line, grade, and cross section, and shall be compacted to 95 percent of maximum density as specified in the section: **FILLS AND SUBGRADE PREPARATION.** Debris and removed in-place material designated as unsuitable shall be disposed of in accordance with the paragraph **DISPOSAL OF UNSUITABLE MATERIALS,** hereinafter.

11. **GRADE CONTROL.** The finished and completed lining shall conform to the lines, grades, cross section, and dimensions indicated. The lines and grades indicated shall be maintained by means of line and grade stakes placed by the Contractor at the site of the work in accordance with **SPECIAL PROVISIONS.**

12. **MIXING AND PLACING MATERIALS.** Methods of mixing and placing of materials shall be as approved except that methods in which materials are mixed-in-place on the subgrade will not be acceptable. No sodium chloride shall be applied if the soil-moisture content exceeds 6 percent above the optimum moisture content specified for the mixture. When application of water and mixing are completed, the moisture in the mixture, on the basis of dry weight, shall not be below the specified optimum moisture content of the mixture nor shall it be more than 6 percent of the specified optimum moisture content. Previously constructed layers shall be cleaned of loose and foreign matter by sweeping with power sweepers or power brooms, except that hand brooms may be used where permitted by the Contracting Officer. Mixing of the mixture with the underlying course shall be prevented. A central plant may be used to mix the soil, sodium chloride, and water. Soil and sodium chloride shall be dry-mixed sufficiently to prevent balls from forming when water is added. The plant shall be capable of producing a uniform mixture with the specified sodium chloride and moisture contents. The mixture shall be hauled to the job in trucks equipped with protective covers. The underlying material and/or previously constructed layer shall be moistened and the mixture then placed in a uniform layer with mechanical spreaders. Not more than 60 minutes shall elapse between the start of the moist mixing and the start of compaction of the treated layer. Each successive layer shall be placed as soon as practicable after the preceding layer has been completed. Each layer shall be uniform in thickness and surface contour and in such quantity that the completed layer, after compaction, will not be in excess of 6 inches. Dumping the mixture in piles or windrows will not be permitted.

12.1 **Optional Method.** If approved by the Contracting Officer, in writing, a machine or a combination of machines may be used to loosen and pulverize the material; mix the soil, water, and sodium chloride; spread; compact; and finish the mixture in a continuous operation, in accordance with this specification.

13. **COMPACTION.** Compaction shall be started immediately after placing the mixture and shall be completed within 45 minutes. The loose mixture shall be uniformly and continuously compacted until the entire depth and width of the layer are compacted to 95 percent of the maximum density. The moisture content shall be maintained between 2 percent below and 2 percent above optimum at all times through the rolling but shall be controlled to prevent the mixture from becoming unstable during compaction. The speed of the roller at all times shall be such that displacement of the mixture does not occur. Areas that are inaccessible to rollers shall be compacted with mechanical tampers.

14. **FINISHING.** If necessary, the surface of each layer shall be lightly scarified to eliminate any imprints made by the compacting equipment. The surface shall then be thoroughly compacted to the specified density with rubber-tired rollers and smooth-wheel tandem rollers to the extent necessary to provide a smooth, dense, uniform surface that is free of surface checking, ridges, or loose material. These finishing operations shall be completed within 2 hours after completion of mixing operations. In places not accessible to finishing and shaping equipment, the mixture shall be compacted with mechanical tampers to the density specified and shall be shaped and finished by hand methods. Any portion of the compacted mix that has density less than that specified, that has not properly hardened, or that is improperly finished shall be corrected in accordance with the paragraph **CORRECTION OF DEFECTIVE AREAS,** hereinafter. The finished surface shall be reasonably smooth, compacted, and free from irregular surface changes. The finished surface of each layer shall be not more than 0.15 foot above or below the established grade or approved cross section.

15. **CONSTRUCTION JOINTS.** At the end of each day's construction, a straight transverse construction joint shall be formed by cutting back into the completed work to form a true vertical face free of loose or shattered material. Material along construction joints not properly compacted shall be removed and replaced with material that is mixed, moistened, and compacted in accordance with this specification.

16. **CORRECTION OF DEFECTIVE AREAS.** Defective areas shall be remedied by removing defective material for the full depth and width of the area as directed and replacing with new mixture in accordance with this specification at no additional cost to the Government. The addition of a thin layer of mixture will not be permitted. Correction of defective areas shall be made in a manner that will assure restoration of a uniform surface and durability of the portion repaired.

17. **EDGES OF LAKE LINING.** The edges of the lake and lake lining shall have a gravel protection as indicated. Gravel shall be washed river run material, well graded, with a maximum size of 4 inches and not more than 10 percent passing a No. 4 sieve. Gravel shall be placed in a manner to prevent segregation of sizes and voids.

18. PROTECTION. Immediately after completion of compaction, the exposed surfaces shall be kept moist until the lake has been filled with water. All surfaces bonding to succeeding layers shall be kept continuously moist until covered by an additional layer. If cracking occurs due to drying, the cracked portions shall be removed and replaced by the Contractor at no additional cost to the Government.

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SECTION 4A

CONCRETE

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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 (Fed. Spec.)

TT-S-227b & Am-1	Sealing Compound; Rubber Base Two Component (for Calking, Sealing, and Glazing in Building Construction)
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1.2 American Concrete Institute (ACI), Standards.

ACI 315-65PR	Manual of Standard Practice for Detailing Reinforced Concrete Structures (5th edition, 1970)
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ACI 318-71	Building Code Requirements for Reinforced Concrete
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1.3 American Society for Testing and Materials (ASTM), Publication.

C 94-74	Ready-Mixed Concrete
C 33-71a	Concrete Aggregates
C 131-69	Resistance to Abrasion of Small Size Coarse Aggregate by Use of the Los Angeles Machine

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

CRD-C 513-65	Rubber Waterstops
CRD-C 572-66	Polyvinylchloride Waterstops

2. GENERAL. The work shall be in conformance with ACI 318, part entitled "Construction Requirements", except as specified herein. Concrete shall be as required by ASTM C94.

3. STORAGE. Materials shall be stored so as not to deteriorate or become contaminated.

4. MATERIALS shall conform to the requirements specified below.

4.1 Anchorage Items for anchoring work of other trades to concrete shall be of standard manufacture and of types to engage with anchors provided and installed under other sections.

4.2 Concrete Materials. ASTM C94, low alkali cement type optional. Only one brand of any one type of cement shall be used for exposed concrete surfaces of any individual structure. Coarse aggregate shall be of one maximum size the least of the following: 1/5 the narrowest dimension of the member, 3/4 the minimum clear spacing between reinforcing bars or between bars and forms, or 1/3 the slab depth.

4.3 Curing Materials.

4.3.1 Absorptive Materials. Burlap, jute, or fabric-type mats.

4.3.2 Impervious-Sheet Materials. White opaque polyethylene sheeting 4 mil minimum nominal thickness, waterproof Kraft paper, or polyethylene-coated burlap or waterproof paper.

4.3.3 Membrane-Forming Curing Compound. Liquid of commercial formulation, sprayable and nontoxic, that will form a film highly resistant to moisture loss from concrete while curing and will dry within 4 hours. Compound shall be clear with fugitive dye, pigmented, resin-base, or chlorinated-rubber-base type as required.

4.4 Form Coating. Nonstaining form oil or form release agent that will not deleteriously affect concrete surfaces nor impair subsequent applications.

4.5 Form Materials. For exposed or painted surfaces, plywood or hardboard especially made for concrete form use. For unexposed surfaces, sound, tight lumber shall be used. Other materials may be used that will produce the specified joint requirements and finishes without adversely affecting the concrete surfaces.

4.6 Form Ties. Metal, factory-fabricated removable or snap-off, that will leave holes 1/2 to 1 inch in diameter and not less than 1-1/2 inches deep in surfaces to be exposed or painted and shall not project beyond the concrete elsewhere.

4.7 Reinforcement. Bars shall be deformed, grade 40 billet steel, except as otherwise indicated. Mesh shall be welded steel wire fabric with wires at right angles to each other.

4.8 Expansion Joints.

4.8.1 Filler Strips, Premoulded. Nonextruding, resilient bituminous or nonbituminous type commercially used in concrete paving or construction, 1/2 inch thick unless otherwise indicated.

4.8.2 Elastic Sealant shall conform to Fed. Spec. TT-S-227, Type I for horizontal joints and Type II for vertical joints, class A or B as applicable.

4.8.3 Dowels shall be of the type indicated.

4.9 Joint Sealer. Hot or cold applied made specifically for sealing construction and/or contraction joints in concrete against moisture infiltration.

4.10 Waterstops. Waterstops shall be of natural rubber, a suitable synthetic rubber, or a blend of natural and synthetic rubber or of polyvinylchloride (PVC). Rubber waterstops shall conform to CRD-C 513. Polyvinylchloride waterstops shall conform to CRD-C 572. The Contractor shall submit samples of waterstops and samples of job-made and factory-made splices of waterstops. Each sample shall be a piece not less than 12 inches long cut from each 200 feet of finished waterstop furnished. Samples of waterstop shall include not less than a total of four lineal feet of each size and type furnished in each shipment to the job site. Each sample shall be identified to indicate the manufacturer, size, type of material, and quantity of material and shipment sample represents.

4.11 Stamped Concrete.

4.11.1 Color Admixture. The color admixture shall be the product of a reputable company regularly engaged in the production of concrete coloring agents. The color shall be uniform, lime proof and weatherproof. The admixture shall produce a color in the finished concrete that approximately matches the color indicated. The color to be used in the project will be selected by the Contracting Officer from sample panels submitted by the Contractor. The color shall be added to the batch in sufficient weight to correctly color a predetermined volume of concrete.

4.11.2 Color Hardener shall consist of an integral of pigments, conditioning and dispersing agents and portland cement, blended with hard graded aggregate.

5. CONCRETE QUALITY. Proportioning of concrete mixes to meet the requirements specified below shall be the Contractor's responsibility.

5.1 Compressive Strength in 28 days shall be 4,000 psi for trail underpass and 3,000 psi for all other concrete unless otherwise shown or specified. The compressive strengths shall be reached in 7 days when high-early-strength cement is used.

5.2 Entrained-Air Content of exposed exterior concrete shall be maintained at 3 to 5 percent by volume of concrete.

5.3 Slump shall be 2 to 3 inches for all work.

6. FORMWORK shall provide concrete members conforming accurately to the indicated shapes, lines, and dimensions and with surfaces free of offset, waviness, or bulges. Where surfaces are to be exposed or painted, panels shall be manufacturer's stock size material, using smaller panels cut to required dimensions only where required by openings and joints. Panel joints in exposed or painted work shall occur at control joints, including alinement with masonry control joints and construction joints, and shall be finished smooth where to be in contact with concrete. Exposed corners shall be chamfered, beveled, or rounded by moldings placed in the forms. Surfaces shall be thoroughly cleaned and coated before each use. Material that will impair texture or finish of concrete surfaces shall not be used. Forms shall be removed at a time and in a manner that will not injure the concrete.

- 6.1 Forms for Textured Finish shall be of an approved type that will produce the texture indicated. Forms shall be installed and shall remain in place as recommended by the manufacturer.
7. REINFORCEMENT. Detailing and placement, including supports and concrete protection for reinforcement, shall conform additionally to ACI 315 except as otherwise indicated and specified below. Reinforcement shall be interrupted, 2 inches clear, each side, of joints in slabs on grade and perimeter joints.
- 7.1 Wire-Mesh Reinforcement shall be continuous between joints in slabs on grade. Laps shall be at least one full mesh plus 2 inches, staggered to avoid continuous lap in either direction, and securely wired or clipped with the standard clips. Mesh shall be supported on precast concrete units in a manner that will support the mesh at the minimum height indicated.
8. INSTALLATION OF ANCHORAGE ITEMS. Anchorage items shall be of number, size, and location to insure sufficient anchorage for purpose intended.
9. JOINTS.
- 9.1 Expansion Joints with Joint Sealer. Premolded expansion-joint filler strips shall be installed at the proper level below the finished slab with a slightly tapered, dressed-and-oiled wood strip temporarily secured to the top thereof to form a groove not less than one inch deep. The wood strip shall be removed after the concrete has set. The groove, when surface dry, shall be cleaned of foreign matter, loose particles, and concrete protrusions, then filled approximately flush with elastic sealant so as to be slightly concave after drying. Application of sealant shall be as recommended by the manufacturer.
- 9.2 Dowels shall be installed at right angles to joints, accurately aligned parallel to the finished surface and rigidly held in place and supported during concrete placement.
- 9.3 Waterstops. 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.
- 9.3.1 Splices. All joints in the waterstop shall be spliced together to form a continuous watertight diaphragm in each joint. All splices shall be neat with the ends of the joined materials in true alignment. A temporary shop and bench shall be provided at the site of the installation and in every possible instance splices shall be made on the bench in the shop. All intersection splices shall be prefabricated at the manufacturer's plant or on the bench in the field shop. A meter box guide and portable power saw shall be provided and used to cut the ends to be joined to insure good alignment and contact between joined surfaces. The continuity of the characteristic members of the cross sections of the waterstop design shall be maintained across the splice.
- 9.3.1.1 Rubber. Splices in rubber waterstops shall be vulcanized in accordance with the manufacturer's recommendations.
- 9.3.1.2 Polyvinylchloride (PVC). Splices in PVC waterstops shall be made by heat sealing the adjacent surfaces in accordance with the manufacturer's recommendations. A thermostatically controlled electric source of heat shall be used to make all splices. The correct temperature at which splices should be made will differ with the material concerned but should be sufficient to melt but not char the plastic. After splicing, a remolding iron with ribs and corrugations to match the pattern of the waterstop shall be used to reform the ribs at the splice.
- 9.3.1.3 Samples of Job-Made and Factory-Made Splices. As a condition of approval of the proposed method of splicing the Contractor shall make 3 test splices in the presence of the Contracting Officer of the finished waterstops of each size and type of waterstop to be spliced in the factory and at the job site using the proposed method of splicing for inspection and testing. The sample splices shall be made using straight run pieces with the splice located at the mid-length of the sample and finished as required for the installed waterstop. The total length of each spliced sample shall be not less than 12 inches long. In addition to the foregoing test splices at least one test splice of each size and type, using the approved method, shall be furnished for inspection and testing for every 50 splices made in the factory and for every 10 splices made at the job site.
10. PLACING. Concrete footings and exterior slabs shall be placed upon clean undisturbed surfaces free from frost, ice, and water. Dry or pervious surfaces receiving concrete shall be covered with impervious sheet materials specified for curing except that materials need not be white. Concrete may be placed directly on impervious surfaces that are thoroughly moistened but not muddy. Concrete shall be placed in layers not over 12 inches deep. The embedment of conduit and pipes in concrete shall be avoided unless the embedment is specifically indicated. Concrete to receive other construction shall be screeded to the proper level.

11. CONSOLIDATION OF CONCRETE shall be with internal concrete vibrators supplemented by handspading, rodding, and tamping. Vibrating equipment shall be adequate to thoroughly consolidate the concrete.
12. SLABS ON GRADE.
 - 12.1 Concrete shall be compacted, screeded to grade, and prepared for the specified finish.
 - 12.2 Construction Joints shall be located where shown and shall conform to the details indicated.
 - 12.3 Contraction Joints shall be true to line, 1/8 inch wide, and of depth equal to approximately 1/4 of the slab thickness. Joints shall be formed by inserting fiberboard strips of the required dimensions after placing concrete.
 - 12.4 Sealing. Joints in permanently exposed slabs shall be filled with joint sealer.
13. FINISHES OF CONCRETE OTHER THAN SLABS. Fins and loose material shall be removed. Unsound concrete, voids over 1/2 inch in diameter, and tie-rod and bolt holes shall be cut back to solid concrete, reamed, brush-coated with cement grout, and filled solid with a stiff portland-cement-sand mortar mix. Patchwork shall finish flush with adjoining concrete surfaces and where exposed, shall match adjoining surfaces in texture and color. Patchwork shall be cured for 72 hours. White portland cement shall be used as needed to attain color match.
 - 13.1 Smooth Finish. After completing the above, surfaces to be painted or exposed to view shall be thoroughly wetted and then brush-coated with portland-cement-sand grout of thick consistency and of mixture so that final color will approximately match the concrete. White portland cement shall be used as needed to attain color match. Grout shall be cork- or wood-floated to fill voids, excess scraped off with a trowel and visible grout film removed by rubbing with burlap. Grout shall be kept damp until set.
 - 13.2 Exposed Aggregate Finish. Surfaces indicated shall receive an exposed aggregate finish. The Contractor shall submit for approval, details of the proposed method(s) and materials to be used to produce the exposed aggregate finish. For horizontal surfaces the aggregate broadcasting and/or surface retarder methods may be used and for vertical surfaces the surface retarder and/or aggregate transfer methods may be used. The aggregate exposure shall be approximately 1/4 inch.
 - 13.3 Sample Panels. Before constructing formwork, sample concrete panel for exposed aggregate concrete and textured finish shall be constructed and approved. The panel shall be not less than 6 feet long by 4 feet high. Concrete shall be of the approved design mix. Forms shall include a typical joint between form panels. Sample panels shall show tie-hole patching and exposed finish. Sample panels shall be constructed at an approved location, not as part of the structure, and shall be protected from construction operations, weather, and other damage until acceptance of the completed concrete work. The approved sample panel shall be representative of the exposed aggregate and textured finishes required in the work.
14. CONCRETE SLAB FINISHES shall be true planes with no deviation exceeding 1/8 inch when tested with a 10-foot straightedge. Surfaces shall be pitched to drains. Surfaces shall be screeded and floated to the required finish level with no coarse aggregate visible before finishing as specified below.
 - 14.1 Monolithic Finish shall be given to slabs unless otherwise specified. After the surface moisture has disappeared, floated-surfaces shall be steel-troweled to a smooth, even dense finish free from blemish including trowel marks.
 - 14.2 Nonslip finish shall be given to all exterior slabs, stair treads and ramps by lightly brooming in a direction transverse to that of the main traffic.
 - 14.3 Exposed aggregate finish for median strips shall conform to the requirements specified hereinbefore in paragraph: EXPOSED AGGREGATE FINISH.
 - 14.4 Colored Concrete. The concrete floor areas of the ramadas where indicated shall be colored concrete. Color shall be as indicated. After finishing operations are completed and no excess moisture appears on the surface but while still plastic throughout, the color coat material shall be applied to the surface by methods and in the amount as recommended by the manufacturer. Materials and application shall be approved. Curing of colored concrete shall be as recommended by the manufacturer of the coloring compound.
 - 14.5 Stamped Concrete Finish. After the colored concrete has been placed, screeded, and wood floated to a uniform surface, colored hardener shall be applied evenly to the plastic surface using a two-step dry-shake method. No water shall be added to the surface during finishing. Approximately 40 pounds of hardener per 100 square feet shall be uniformly applied and the surface thoroughly floated. Immediately following the floating an additional 20 pounds of hardener per 100 square feet shall be applied and the surface floated and troweled. While the concrete is still plastic, the indicated pattern shall be uniformly impressed into the concrete surface. Pattern shall be done with joints approximately 1/2-inch wide and grouted.

15. CURING shall start as soon as free water has disappeared from concrete surfaces after placing and finishing. Curing materials shall be applied and maintained so as to protect the concrete from moisture loss. Water used in curing shall be potable. Curing shall be accomplished by one of the following methods.

15.1 Moist Curing. Unformed surfaces shall be covered with absorptive materials wetted before placing. Absorptive materials or forms used in curing shall be kept continually wet.

15.2 Impervious-Sheet Curing. Concrete surfaces shall be thoroughly wetted and covered with impervious-sheet materials.

15.3 Membrane-Forming Compound Curing. The compound shall be applied in a two-coat continuous operation, each coat applied at a coverage of not more than 400 square feet per gallon and at right angles to each other. Surfaces damaged during curing shall be resprayed at the above rate. The compound shall not be used on surfaces receiving applications depending on adhesion or bonding except that resin-base or chlorinated-rubber-base compounds may be used on floors receiving resilient flooring. Compounds on permanently exposed surfaces shall be clear type containing a fugitive dye and shall be shaded from the sun while curing.

16. BUILT-UP CONCRETE shall consist of 1 part portland cement and 2-1/2 parts of fine aggregate conforming to ASTM C 33, proportioned by weight, and not more than 4-1/2 gallons of water per bag of cement. The space between the bottom of the plate and the top of the masonry shall be packed with bedding mortar to the required slope and all voids filled.

17. PARKING AREA WALKWAY, WHEEL STOP AND DIVIDER STRIP. Concrete shall be proportioned for a compressive strength of 3,000 p.s.i. at 28 days. The maximum size of coarse aggregate shall be 1-1/2 inches. Concrete shall have a slump of not more than 3 inches. Expansion and contraction joints and finishing shall conform to the applicable requirements of the section: CONCRETE SIDEWALK. Edges shall be rounded to the radius indicated.

18. DRAINS IN WALLS. Weep holes shall be constructed in retaining walls as indicated. Pervious drain material shall be placed as specified in section: FILLS AND SUBGRADE PREPARATION. Plastic pipe shall conform to the requirements of the section: IRRIGATION SYSTEM. Weep hole shall be covered at the back face of the wall with hardware cloth and gravel. Hardware cloth shall be a commercial quality, approximately 4-mesh wire cloth of aluminum or of galvanized steel wire. The aluminum wire, and steel wire before galvanizing shall have a diameter of 0.03-inch, minimum. Hardware cloth shall be mounted in the forms prior to placing concrete in such a manner that the wire is firmly bonded to the concrete or may be fastened to the exterior of the concrete surface by masonry nails or other methods approved. Alternative methods of providing screened drain hole openings may be submitted for approval. Gravel drain material may be washed river run gravel or crushed stone, shall show a loss of weight of not more than 50 percent when tested in accordance with ASTM C 131, and shall conform to the following gradation.

Sieve Size	Percent by Weight Passing
1 inch	100
3/4 inch	90-100
3/8 inch	20-55
No. 4	0-5

19. RIDING AND HIKING TRAILS. Concrete, placement finishing and curing shall conform to the requirements of the section: CONCRETE SIDEWALK. Surfaces shall be divided into approximately rectangular areas.

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SECTION 4E

CONCRETE CURB, GUTTER, COMBINATION CURB AND GUTTER, AND DRIVEWAY

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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.

CCC-C-467C	Cloth, Burlap, Jute (or Kenaf)
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1.2 American Society for Testing and Materials (ASTM) Standards.

C 171-69	Sheet Materials for Curing Concrete
C 309-73	Liquid Membrane-Forming Compounds for Curing Concrete
D 1751-73	Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
D 1752-67	Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction, (Nonextruding and Resilient Nonbituminous Types)

2. CONCRETE and the equipment, workmanship, and materials therefor shall conform to the applicable requirements of the Section: CONCRETE, except as hereinafter specified. Concrete shall have a minimum compressive strength of 3,000 psi at 28 days. The maximum size of coarse aggregate shall be 1-1/2 inches.

3. SUBGRADE PREPARATION. The subgrade shall be constructed true to grade and cross section. The subgrade shall be of materials equal in bearing quality to the subgrade under the adjacent roadway, street, or open area and shall be placed and compacted to conform with applicable requirements of the Section: FILLS AND SUBGRADE PREPARATION. The subgrade shall be tested for grade and cross section by means of a template extending the full width of the curb, gutter, driveway, or combination curb and gutter. The subgrade shall be maintained in a smooth, compacted condition, in conformity with the required section and established grade until the concrete is placed. The subgrade shall be in a moist condition when concrete is placed. In cold weather, the subgrade shall be prepared and protected so as to produce a subgrade free from frost when the concrete is deposited.

4. FORMS shall be of wood or steel, straight, and of sufficient strength to resist springing during depositing and consolidating the concrete. The outside forms shall have a height equal to the full depth of the curb or gutter. The inside form of curb shall have batter as indicated and shall be securely fastened to and supported by the outside form. Straight forms of wood shall be 2-inch nominal surfaced plank, and of steel, shall be of approved section with a flat surface at the top. Rigid forms shall be provided for curb returns, except that benders or thin plank forms may be used for curb or curb returns with a radius of 10 feet or more, where grade changes occur in the return, or where the central angle is such that a rigid form with a central angle of 90 degrees cannot be used. Back forms for curb returns may be made of 1/2-inch benders, for the full height of the curb, cleated together. Curb forms shall be carefully set to alinement and grade and to conform to the dimensions of the curb. Forms shall be held rigidly in place by the use of stakes placed at intervals not to exceed 4 feet. Clamps, spreaders, and braces shall be used where required to insure rigidity in the forms. The forms on the front of the curb shall be removed not less than 2 hours nor more than 6 hours after the concrete has been placed. Forms back of curb shall remain in place until the face and top of the curb have been finished as specified in the Finishing paragraph. Gutter forms shall not be removed for 12 hours after the concrete has been placed. Forms shall not be removed while the concrete is sufficiently plastic to slump in any direction. Forms shall be cleaned and coated with form oil each time before concrete is placed. Wood forms may, instead, be thoroughly wetted with water before concrete is placed, except that with probable freezing temperatures, oiling is mandatory.

5. JOINTS. Expansion joints and contraction joints shall be constructed at right angles to the line of curb, gutter, driveway, and combination curb and gutter.

5.1 Contraction Joints shall be constructed by means of 1/8-inch-thick separators, of a section conforming to the cross section of the curb, gutter, driveway, and combination curb and gutter. Contraction joints shall be constructed directly opposite contraction joints in abutting Portland-cement-concrete pavement. Where curb, gutter, driveway, and combination curb and gutter do not abut Portland-cement-concrete pavements, contraction joints shall be so placed that monolithic sections between curb returns will be not less than 5 feet nor greater than 15 feet in length. Separators shall be removed as soon as practicable after the concrete has set sufficiently to preserve the width and shape of the joint. Separators shall be removed prior to finishing.

5.2 Expansion Joints shall be formed by means of preformed expansion-joint filler material cut and shaped to the cross section of the curb, gutter, entrance, and combination curb and gutter. Expansion joint filler, unless otherwise specified, shall conform to ASTM Specifications D 1751 or D 1752 or shall be resin-impregnated fiberboard conforming to the physical requirements of ASTM Specifications D 1752. Expansion joints shall be provided in curb at the ends of all returns. Expansion joints shall be provided in curb, gutter, driveway, and combination curb and gutter directly opposite the expansion joints of abutting Portland-cement-concrete pavement and shall be of the same type and thickness as the joints in the pavement. Where curb, gutter, driveway, and combination curb and gutter do not abut Portland-cement-concrete pavement, expansion joints at least 1/2 inch in width shall be provided at intervals not less than 30 feet nor greater than 120 feet. Expansion joints shall be provided in nonreinforced concrete gutter at the locations indicated.

6. CONSTRUCTION.

6.1 Placing Concrete. Concrete shall be placed in 6-inch layers in curb. The concrete shall be thoroughly consolidated by tamping and spading or with approved mechanical vibrators.

6.2 FINISHING. The edges of the gutter and top of the curb shall be rounded with an edging tool to a radius of 1/4 inch and the surfaces shall be floated and finished with a smooth wood float until true to grade and section and uniform in texture. The floated surfaces shall then be brushed with a fine-hair brush with longitudinal strokes. Immediately after removing the front curb form, the face of the curb shall be rubbed with a wood or concrete rubbing block and water until blemishes, form marks, and tool marks have been removed. The surface, while still wet, shall be brushed in the same manner as the gutter and curb top. The top surface of gutter and driveway shall be finished to grade with a wood float. Except at grade changes or curves, the finished surfaces shall not vary, from the testing edge of a 10-foot straightedge, more than 1/8 inch for gutter and driveway and 1/4 inch for top and face of curb. Irregularities exceeding the above shall be satisfactorily corrected. Visible surfaces and edges of the finished curb, gutter, driveway, and combination curb and gutter shall be free of blemishes and form and tool marks, and shall be uniform in color, shape, and appearance.

6.3 Curb-Forming Machines for constructing curb and gutter will be approved based on trial use on the job. Use of the equipment shall be discontinued at any time during the construction if the equipment produces unsatisfactory results, and the work shall be accomplished as specified hereinbefore. Unsatisfactory work shall be removed and reconstructed for the full length between regularly scheduled joints. Removed portions shall be disposed of as directed.

7. CURING AND PROTECTION.

7.1 Curing. Immediately after the finishing operations, the exposed concrete surfaces shall be cured by one of the following methods as the Contractor may elect.

7.1.1 Mat Method. The entire exposed surface shall be covered with cotton mats conforming to Federal Specification DDD-M-148 or with 2 or more layers of burlap conforming to Federal Specification CCC-C-467 having a combined weight of 14 ounces or more per square yard when dry. Mats shall overlap each other at least 6 inches. The mat shall be thoroughly wetted with water prior to placing on the concrete surface and shall be kept continuously in a saturated condition and in intimate contact with concrete for not less than 7 days.

7.1.2 Impervious-Sheeting Method. The entire exposed surface shall be wetted with a fine spray of water and then covered with a white sheet material conforming to ASTM Specification C 171. Sheets shall be laid directly on the concrete surface with the light-colored side up and overlapped 12 inches when a continuous sheet is not used. The curing medium shall be not less than 18 inches wider than the concrete surface to be cured and shall be securely weighted down by placing a bank of moist earth on the edges just outside the forms and over the transverse laps to form closed joints. Sheets shall be satisfactorily repaired or replaced if damaged during curing. The curing medium shall remain on the concrete surface to be cured for not less than 7 days.

7.1.3 Membrane-Curing Method. The entire exposed surfaces shall be covered with a non-pigmented membrane-forming curing compound conforming to ASTM C309, type I-D. Surfaces coated with membrane forming compound shall be shaded from the direct rays of the sun for the entire 7 day curing period. The curing compound shall be applied in 2 coats by hand-operated pressure sprayers at a coverage of approximately 200 square feet per gallon for both coats. The second coat shall be applied in a direction approximately at right angles to the direction of application of the first coat. The compound shall form a uniform continuous, coherent film that will not check, crack, or peel and shall be free from pinholes or other imperfections. Concrete surfaces that are subjected to heavy rainfall within 3 hours after the curing compound has been applied shall be resprayed by the method and at the coverage specified above at no additional cost to the Government. Joint openings shall be sealed at the top by inserting moistened paper or fiber rope or covering with strips of waterproof paper prior to application of the curing compound, in a manner to prevent the curing compound from entering the joint. Concrete surfaces to which membrane-curing compounds have been applied shall be adequately protected for 7 days from pedestrian and vehicular traffic and from any other action which might disrupt the continuity of the membrane. Any area covered with curing compound and damaged by subsequent construction operations within the 7-day period shall be resprayed as specified above at no additional expense to the Government.

7.2 Backfilling. After curing, debris shall be removed, and the backfill shall be placed as indicated.

7.3 Protection. The completed curb, gutter, driveway, and combination curb and gutter shall be protected from damage until accepted. The Contractor shall repair damaged concrete and clean concrete discolored during construction. Curb, gutter, driveway, and combination curb and gutter that are damaged shall be removed and reconstructed for the entire length between regularly scheduled joints. Refinishing the damaged portion will not be acceptable. Removed damaged portions shall be disposed of as directed.

* * * * *

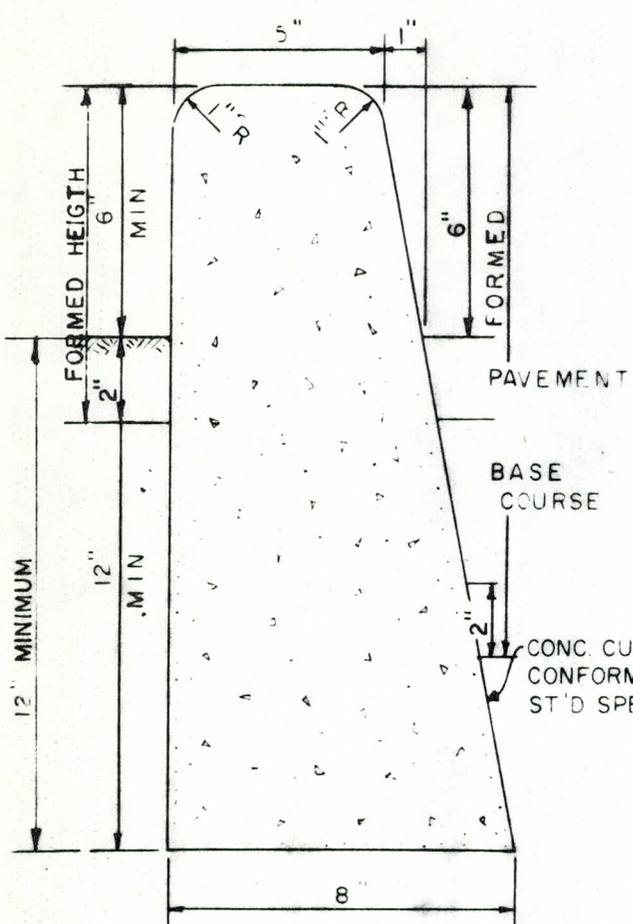
STANDARD DETAIL

141 & 142

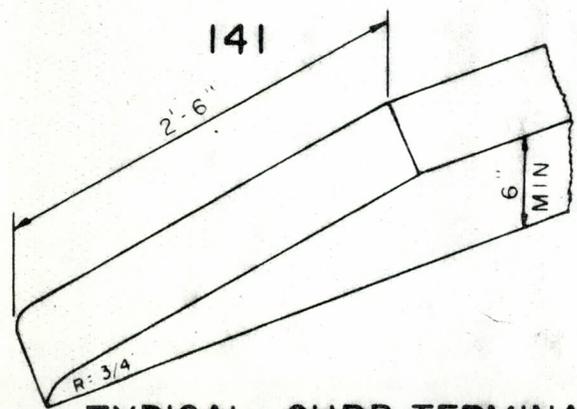
CITY OF PHOENIX
ENGINEERING DEPARTMENT

SINGLE CURB

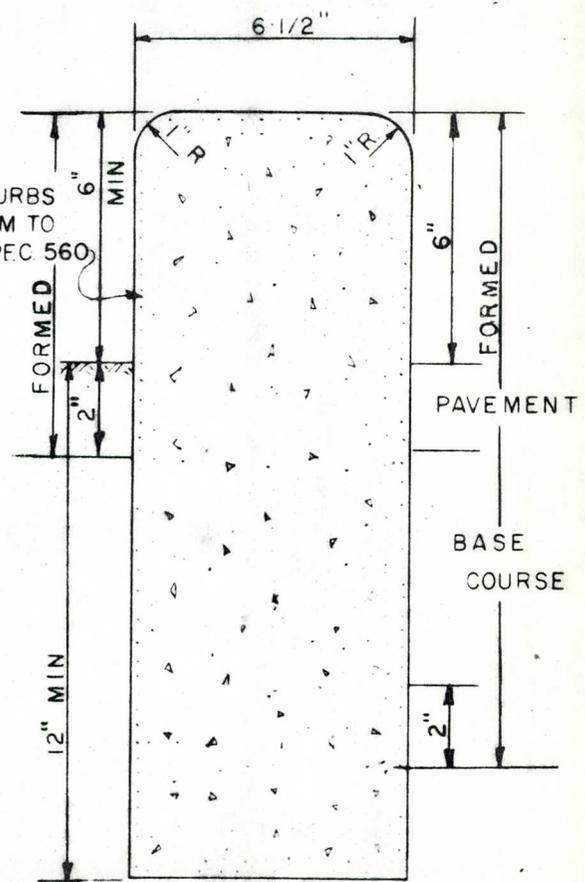
APPROVED *Sam Tucker* 17 June 60
CITY ENGINEER DATE



ALL VERTICAL SURFACES FROM 2" BELOW UNDISTURBED SOIL TO BE FORMED
VERTICAL SURFACES DOWN FROM 2" BELOW UNDISTURBED SOIL MAY BE PLACED AGAINST NEAT CUT IF APPROVED BY THE ENGINEER AND CONCRETE WILL NOT EXTEND MORE THAN 1" BEYOND THEORETICAL FACE
ALL EXPOSED SURFACES TO BE STRIPPED GREEN AND TROWEL FINISHED.

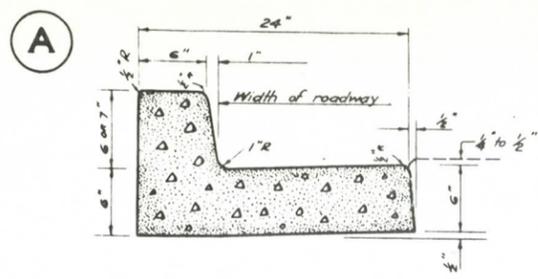


TYPICAL - CURB TERMINATION

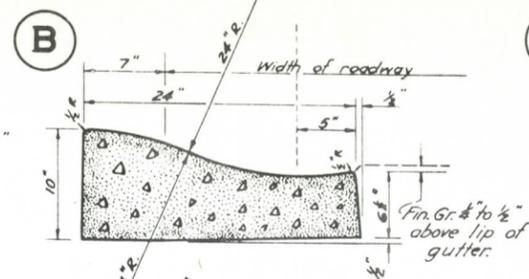


142

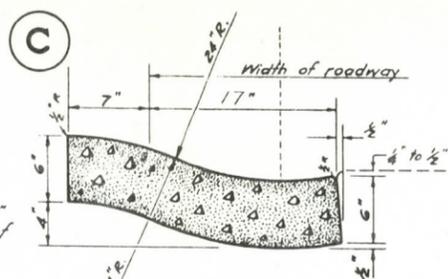
REV 3-72 WF
REV EUL 3-60



VERTICAL CURB & GUTTER.

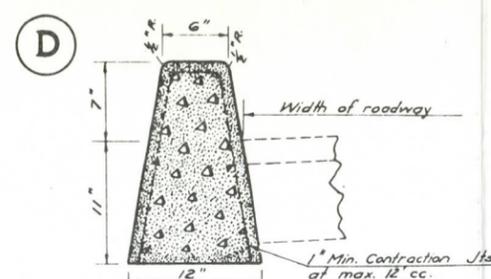


ROLL CURB & GUTTER.

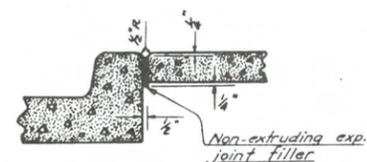


(B) DEPRESSED AT ALLEY ENTRANCE OR (OPTIONALLY) AT DRIVEWAYS.

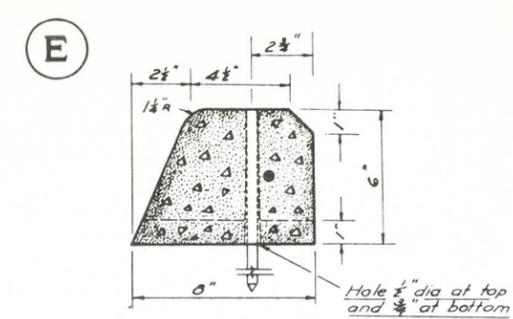
(C) NOT APPROVED FOR USE IN IMPROVEMENT DISTRICTS.
 Type 'C' cannot be depressed. Where Type 'C' curbs prevail and a depressed entrance is desired use Type 'B'.



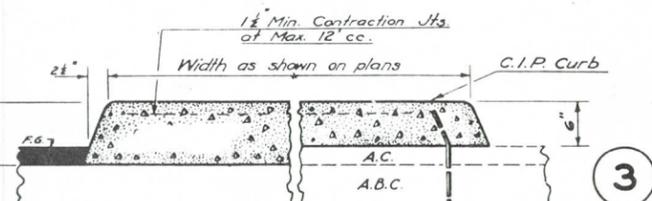
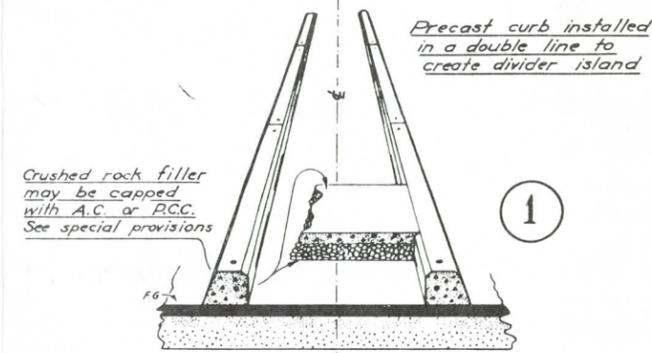
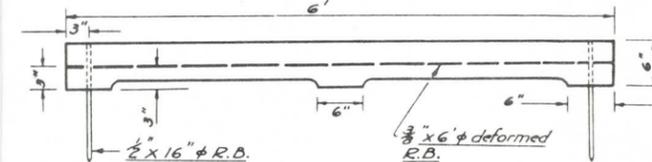
DIVIDER CURB.



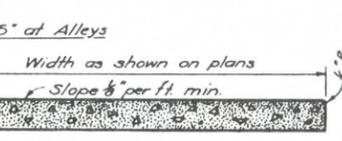
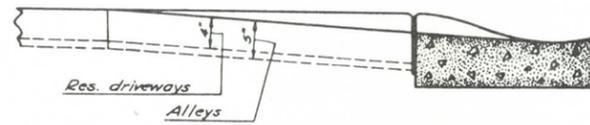
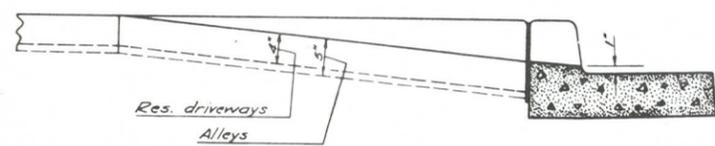
EXPANSION JOINT BETWEEN CURB AND END OF SIDEWALK.



PRECAST CURB.

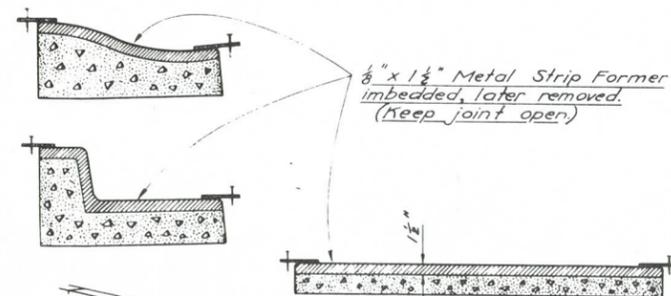
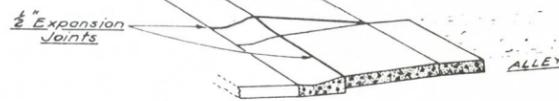
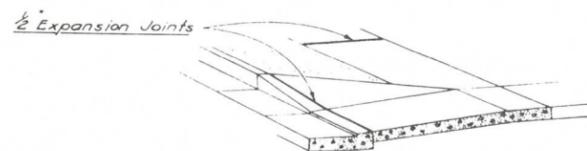


TRAFFIC ISLANDS.

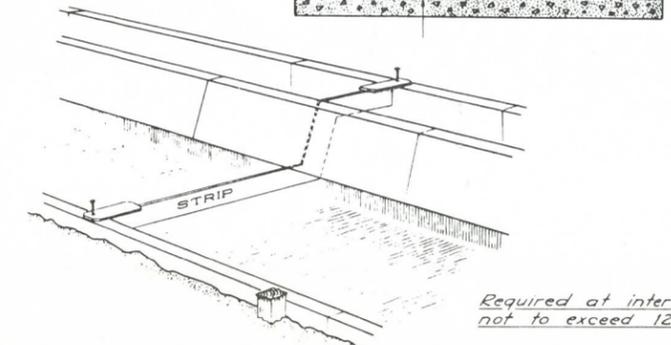


SIDEWALK.

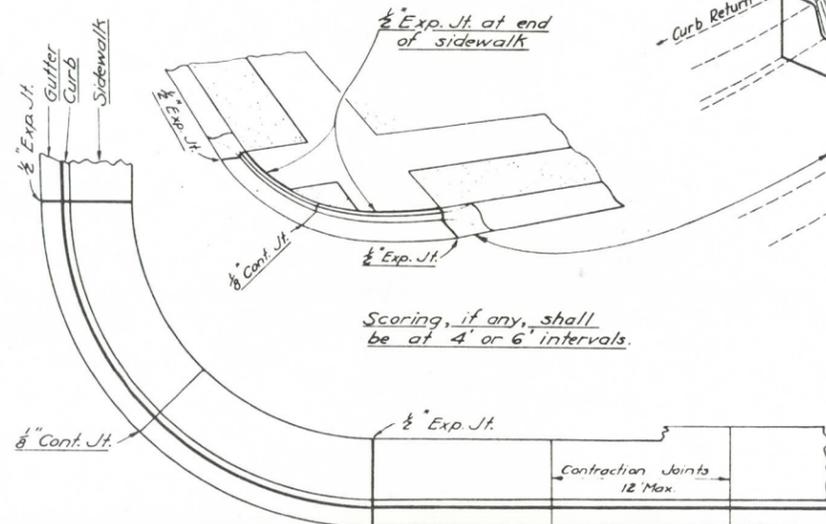
(A) DEPRESSED AT DRIVEWAY.



1/2" x 1 1/2" Metal Strip Former imbedded, later removed. (Keep joint open)



TYPICAL CONTRACTION JOINT STRIP.



Expansion Joints not required between curb and EDGE of sidewalk.

EXPANSION AND CONTRACTION JOINTS.

NOTE:

SEE M.C.H.D. SPEC. ITEM 62 FOR CURBS & GUTTERS AND ITEM 63 FOR SIDEWALKS.

1/2" Non-extruding expansion joint may be substituted for open contraction joint at contractor's option.

MARICOPA COUNTY HIGHWAY DEP'T.
 ENGINEERING DIVISION

CONCRETE CURBS, GUTTERS AND SIDEWALKS

C-120

DRAWN: JHM DATE: MAY 8, 1959 CHECKED: C.C.Q.

APPROVED: *[Signature]* 5/18/59
 COUNTY ENGINEER.

APPROVED FOR COUNTY BOARD OF SUPERVISORS:
[Signature]
 VICE-CHAIRMAN.

SECTION 4F
CONCRETE SIDEWALK

Index

- | | |
|----------------------------|-------------------------------------|
| 1. Applicable Publications | 4. Forms |
| 2. Concrete | 5. Concrete Placement and Finishing |
| 3. Subgrade Preparation | 6. Curing and Protection |

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.

CCC-C-467C	Cloth, Burlap, Jute (or Kenaf)
DDD-M-148	Mats; Cotton (for Concrete-Curing)

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

C 171-69	Sheet Materials for Curing Concrete
C 231-74	Air Content of Freshly Mixed Concrete by the Pressure Method
C 309-73	Liquid Membrane-Forming Compounds for Curing Concrete
D 1751-73	Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
D 1752-67	Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Nonextruding and Resilient Nonbituminous Types)

2. **CONCRETE** and the equipment, workmanship, and materials including all sampling and testing shall conform to the applicable requirements of section: **CONCRETE**, except as hereinafter specified. Concrete shall have a minimum compressive strength of 2,500 psi at 28 days. The maximum size of coarse aggregate shall be 1-1/2 inch. Concrete shall have a slump of not more than 3 inches. The concrete mixtures shall have an air content by volume of concrete, based on measurements made immediately after discharge from the mixer, of 3 to 5 percent. Air content shall be determined in accordance with ASTM C 231.

3. **SUBGRADE PREPARATION.** The subgrade shall be constructed true to grade and to the cross section. The subgrade shall be compacted to a density of 95% maximum density in accordance with the requirements of the section: **FILLS AND SUBGRADE PREPARATION**. The completed subgrade shall be tested for grade and cross section with a template extending the full width of the walk and supported between side forms. The subgrade and forms shall be wet down sufficiently in advance of placing the concrete to insure a firm and moist condition. In cold weather the subgrade shall be protected and prepared so as to provide a satisfactory subgrade entirely free from frost when the concrete is deposited.

4. **FORMS** shall be of wood or steel, straight, free from warp, of sufficient strength to resist springing during construction and of a height equal to the full depth of the finished walk. Wood forms shall be 2-inch surfaced plank. Steel forms shall be of approved section with a flat top surface. Forms shall be set with the upper edge true to line and grade and shall be held rigidly in place by stakes, braced as necessary, placed at intervals not to exceed 4 feet on the outside of forms and set flush with the top edge of the form. Forms shall be coated with form oil each time before concrete is placed. Wood forms may be thoroughly wetted with water before concrete is placed, except that with probable freezing temperatures, oiling is mandatory. Side forms shall remain in place at least 12 hours after finishing operation.

5. CONCRETE PLACEMENT AND FINISHING.

5.1 General. Concrete shall be placed in the forms in one layer of such thickness that when compacted and finished the sidewalk will be of the thickness indicated. Concrete placement shall be continuous between expansion joints. After the concrete has been placed in the forms, a strike-off guided by the side forms shall be used to bring the surface to the proper section to be compacted. The concrete shall be tamped and consolidated with a suitable wood or metal tamping bar, and the surface shall be finished to grade with a wood float. After floating, the surface shall be troweled smooth and then finished with a fine-hair push broom drawn over the surface transverse to the line of traffic. The finished surface of the walk shall not vary more than 3/16 inch from the testing edge of a 10-foot straightedge. Irregularities exceeding the above shall be satisfactorily corrected. The surface shall be divided into rectangular areas by means of contraction joints.

5.2 Contraction Joints. The contraction joints shall be formed in the fresh concrete as shown on the attached drawing by cutting a groove in the top portion of the slab to a depth of at least one-fourth of the sidewalk slab thickness, using a jointer to cut the groove, or by sawing a groove in the hardened concrete with a power-driven saw in conformance with paragraph: SAWED JOINTS hereinafter, unless otherwise approved.

5.2.1 Sawed Joints shall be constructed by sawing a groove in the concrete with a 1/8-inch blade to a depth of at least one-fourth of the sidewalk slab thickness. The time of sawing shall be varied, depending on existing and anticipated weather conditions, and shall be such as to prevent uncontrolled cracking of the pavement. Sawing of the joints shall commence as soon as the concrete has hardened sufficiently to permit cutting the concrete without chipping, spalling or tearing. The sawed faces of joints will be inspected for undercutting or washing of the concrete due to early sawing, and sawing shall be delayed if undercutting or washing is sufficiently deep to cause structural weakness or excessive roughness in the joint. The sawing operation shall be carried on as required during both day and night regardless of weather conditions. The joints shall be sawed at the required spacing consecutively in the sequence of the concrete placement. A chalk line or other suitable guide shall be used to mark the alinement of the joint. The saw cut shall not vary more than 1/2 inch from the true joint alinement. Before sawing a joint, the concrete shall be examined closely for cracks, and the joint shall not be sawed if a crack has occurred near the joint location. Sawing shall be discontinued when a crack develops ahead of the saw cut. Workmen and inspectors shall wear clean, rubber-soled footwear, and the number of persons walking on the pavement shall be limited to those actually performing the sawing operation. Immediately after each joint is sawed, the saw cut and adjacent concrete surface shall be thoroughly flushed with water until all waste from sawing is removed from the joint. Any membrane-cured surface damaged during the sawing operations shall be resprayed as soon as the surface becomes dry. The sawing equipment shall be adequate in number of units and power to complete the sawing at the required rate. An ample supply of saw blades shall be available on the job before concrete placement is started, and at least one standby sawing unit in good working order shall be available at the jobsite at all times during the sawing operations.

5.3 Expansion Joints. Transverse expansion joints shall be installed at all walk returns. Transverse expansion joints shall be installed at the intervals and as detailed on attached drawing. The expansion joint filler strips shall be of the thickness shown and shall conform to ASTM D 1751 or D 1752, or may be resin-impregnated fiberboard conforming to the physical requirements of ASTM D 1752. Joint filler shall be held in place by means of steel pins or other devices to prevent warping of the filler during floating and finishing. Expansion joints shall be formed about structures and features that project through or into or abut the walk pavement, installed in such manner as to form a complete, uniform separation between the structure and walk pavement. Immediately after finishing operations are completed, joint edges shall be rounded with an edging tool having a radius of 1/4 inch and concrete over the joint filler shall be removed.

5.4 Surface Uniformity. The complete surface shall be uniform in color and free of surface blemishes and tool marks.

6. CURING AND PROTECTION.

6.1 Curing. Immediately after the finishing operations, the exposed concrete surfaces shall be cured by one of the following methods.

6.1.1 Mat Method. The entire exposed surface shall be covered with cotton mats conforming to Fed. Spec. DDD-M-148 or with two or more layers of burlap conforming to Fed. Spec. CCC-C-467 having a combined weight of 14 ounces or more per square yard when dry. Mats shall overlap each other at least 6 inches. The mat shall be thoroughly wetted with water before placing, and shall be kept continuously in a saturated condition and in intimate contact with concrete for not less than 7 days.

6.1.2 Impervious Sheeting Method. The entire exposed surface shall be wetted with a fine spray of water and then covered with a white sheet material conforming to ASTM C 171. Sheets shall be laid directly on the concrete surface with the light-colored side up and overlapped 12 inches when a continuous sheet is not used. The curing medium shall be not less than 18 inches wider than the concrete surface to be cured and shall be securely weighted down by heavy wood planks or by placing a bank of moist earth on the edges and laps in the sheets. Sheets shall be repaired or replaced if torn or otherwise damaged during curing. The curing medium shall remain on the concrete surface to be cured for not less than 7 days.

6.1.3 Membrane-Curing Method. The entire exposed surfaces shall be covered with a non-pigmented membrane-forming curing compound conforming to ASTM C 309, type I-D. Surfaces shall be shaded from the direct rays of the sun during the entire 7 day curing period. The curing compound shall be applied in two coats by hand-operated pressure sprayers at a coverage of approximately 400 square feet per gallon for each coat. The second coat shall be applied in a direction approximately at right angles to the direction of application of the first coat. The compound shall form a uniform, continuous, coherent film that will not check, crack, or peel and shall be free from pinholes or other imperfections. Concrete surfaces that are subjected to heavy rainfall within 3 hours after the curing compound has been applied shall be resprayed by the method and at the above coverage at no additional cost to the Government. Concrete surfaces to which membrane-curing compounds have been applied shall be adequately protected for 7 days from pedestrian and vehicular traffic and from any other action which might disrupt the continuity of the membrane. Any area covered with curing compound and damaged by subsequent construction within the 7-day curing period shall be resprayed as specified above.

6.2 Protection After Curing. After the concrete has been cured, all debris shall be removed and the area adjacent to the walk shall be backfilled, graded and compacted in accordance with the lines and grades shown. The completed sidewalk shall be protected from damage until accepted. The Contractor shall clean concrete discolored during construction. Sidewalk that is damaged shall be removed and reconstructed for the entire length between joints, rather than by refinishing the damaged portion. Removed damaged portion shall be disposed of as directed.

* * * * *

SECTION 4H
GROUTING STONE PROTECTION

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- | | |
|----------------------------|--------------------------|
| 1. Applicable Publications | 4. Placing |
| 2. Materials | 5. Protection and Curing |
| 3. Mixing | |

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-C-192g & Am-3	Cement, Portland
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1.2 American Society for Testing and Materials (ASTM) Publication.

C 309-73	Liquid Membrane-Forming Compounds for Curing Concrete
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2. MATERIALS.

2.1 Aggregate shall conform to the requirements specified for fine aggregate of the section: CONCRETE.

2.2 Portland Cement shall conform to the requirements of Federal Specification SS-C-192, Type I and/or Type II. The alkali content of the cement shall not exceed 0.6 percent.

2.3 Water shall be fresh, clean, and potable.

3. MIXING. Grout shall be composed of cement, sand, and water mixed in the proportions as directed. The estimated cement content requirement per cubic yard of grout is 7-1/2 sacks. The water content of the mix shall not exceed 8-1/2 gallons per sack of cement. In calculating total water content of the mix, the amount of moisture carried on the surfaces of aggregate particles shall be included. Slump of grout mix shall be between 9 and 10 inches for the first course and between 7 and 8 inches for the second course or where one course is placed. The grout shall be mixed in a concrete mixer in the manner specified for concrete, except that time of mixing shall be as long as is required to produce a satisfactory mixture, and the grout shall be used in the work within a period of 30 minutes after mixing. Retempering of grout will not be permitted. The consistency of the grout shall be such as to permit gravity flow into the interstices of the stones with the help of spading, rodding, and brooming. Grout batches in the same course shall be uniform in mix, size, and consistency.

4. PLACING. Prior to grouting, the stone shall be flushed with water to wash down the fines and to prevent absorption of water from grout. The stone shall be kept wet just ahead of the actual placing of grout. The grout shall be placed in one course in invert and in 2 courses in side slopes. Each course shall be placed full width or in successive lateral strips approximately 10 feet in width, as applicable, extending from toe of slope to top on side slopes. The grout shall be brought to the place of final deposit by approved means and discharged directly on the stones using a splash plate of metal or wood to prevent displacement of stone directly under the discharge. The flow of grout shall be directed with brooms or other approved baffles to cover the entire area and to assure that all crevices are filled. Sufficient barring shall be done to loosen tight pockets of stone and otherwise aid the penetration of grout. The first course shall fully penetrate the stone blanket. The second course shall be placed as soon as the first course has sufficiently stiffened so that it will not flow when additional grout is added. On side slopes, all brooming shall be uphill, and after the second course has stiffened the entire surface shall be rebroomed to eliminate runs in the top course and to fill voids caused by sloughing of the layers of grout.

4.1 Smooth Finish. Areas indicated to receive a smooth finish shall have the second course of grout placed to a thickness to provide a minimum of 1-1/2 inches of grout over the highest stone. The finished surface of the grout shall be level and smooth and finished to provide a suitable surface for hiking and bicycle riding.

5. PROTECTION AND CURING. After completion of any strip or panel, no workmen or other load shall be permitted on the grouted surface for a period of 24 hours. The grouted surface shall be protected from injurious action of the sun; shall be protected from rain, flowing water, and mechanical injury; and shall be moist cured or membrane cured at the Contractor's option for a period of 7 days. Moist curing shall consist of covering the grout with a uniform thickness of 2 inches of sand which shall be kept continuously saturated. Membrane curing shall consist of a non-pigmented curing compound conforming to ASTM C 309, Type I-D. Surfaces shall be shaded from the direct rays of the sun for the first 7 days of the curing period. The curing compound shall be applied as soon as the free water disappears and shall be applied in a 2-coat continuous operation by approved power-spraying equipment at a rate of not to exceed 200 square feet per gallon for the combined coats. The second coat shall be applied to overlap the first coat in a direction approximately at right angles to the direction of the first application.

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SECTION 4K

REINFORCED MASONRY
(CONCRETE BLOCK)

Index

- | | |
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| 1. Applicable Publications | 6. Air-Dry Condition |
| 2. Materials | 7. Tests |
| 3. Handling and Storage | 8. Erection |
| 4. Samples | 9. Pointing and Cleaning |
| 5. Certificates | |

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

1.1 Federal Specification (Fed. Spec.).

QQ-W-461g & Am-1	Wire, Steel, Carbon, (Round, Bare and Coated)
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1.2 American Society for Testing and Materials (ASTM) Specifications.

A 153-73	Zinc Coating (Hot-Dip) on Iron and Steel Hardware
A 615-74a	Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
C 33-74	Concrete Aggregates
C 64-72	Refractories for Incinerators and Boilers
C 90-70	Hollow Load-Bearing Concrete Masonry Units
C 144-70	Aggregate for Masonry Mortar
C 266-74	Time of Setting of Hydraulic Cement by Gillmore Needles
C 331-69	Lightweight Aggregates for Concrete Masonry Units
C 404-70	Aggregates for Masonry Grout
C 426-70	Drying Shrinkage of Concrete Block
C 427-64	Moisture Condition of Hardened Concrete by the Relative Humidity Method
C 476-71	Mortar and Grout for Reinforced Masonry

1.3 U.S. Army Corps of Engineers Handbook for Concrete and Cement.

CRD-C 566-64	Specification for Grout Fluidifier
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1.4 American Concrete Institute (ACI) Standard.

ACI 315-65	Manual of Standard Practice for Detailing Reinforced Concrete Structures (5th edition, 1970)
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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 A 153. Class B-1, B-2, or B-3, as required.

2.1.1 Supports and Fastenings for Fixtures and Equipment are specified in section: PLUMBING, GENERAL.

2.1.2 Centering-Clips and Caging-Devices for positive positioning reinforcing bars shall conform to Fed. Spec. QQ-W-461, AISI No. 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 C 33 or C 331, except as modified hereinafter. Grading of aggregates as stipulated in Section 7 in ASTM C 33 and testing of lightweight aggregates for drying shrinkage as stipulated in Section 6(a) in ASTM 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 Fe203, the iron stain deposited on the filter paper from a 200-gram sample shall not exceed 1.2 mg. Fe203.

2.2.2 Aggregate for Mortar shall conform to ASTM C 144.

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

2.2.4 Aggregate for Low-Lift and High-Lift Grout shall conform to ASTM C 404, table 1, coarse aggregate, size No. 8, except that the coarse aggregate shall be graded with 100 percent passing the 3/8 inch sieve and not more than 5 percent 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 C 90, type I, grade N-1 or S-1, except that maximum linear drying-shrinkage shall be 0.045 percent as determined in conformance with ASTM C 426, and units shall be delivered to the jobsite in an air dry condition as specified in paragraph: AIR-DRY CONDITION. Grade N-1 shall be used for exterior walls; either grade N-1 or S-1, at the option of the Contractor, shall be used for all other work. Exposed-to-view and/or painted units in any one building 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.

2.3.1 Slump Block shall conform to the requirements specified for concrete masonry units, except faces shall have a simulated slump finish. Slump block shall weigh not more than 135 pounds per cubic foot.

2.4 Firebrick shall conform to ASTM C 64, low duty.

2.5 Grout shall conform to ASTM 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, 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 test 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.

2.6 Mortar for concrete masonry units shall conform to ASTM 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 furnishes additional evidence that such mortar meets the requirements as specified herein.

2.7 Mortar for setting firebrick shall be specifically prepared clay that will withstand the temperature requirements specified for the firebrick and of consistency to spread easily after tempering with water.

2.8 Reinforcing Steel Bars and Rods shall conform to ASTM A 615, grade 40.

2.9 Slate shall conform to ASTM C 629, clear stock, sand-rubbed finish. Mortar for setting slate shall be as recommended by the manufacturer.

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 as delivered to the project site. Representative samples shall be taken periodically from on-the-site stockpiles as required by the Contracting Officer for testing.

4.1 Anchors, Centering Clips, and Caging Devices. Two of each type proposed 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 and firebrick shall be certified for compliance with all specification requirements. Aggregate for 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. The reports shall state whether any formulation or production change has been made since the tests were conducted.

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 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 percent higher than the average relative humidity at the project site, except that the relative humidity of the unit at equilibrium shall not exceed 85 percent and shall not be required to be less than 50 percent. 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 tests 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 procedure 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 C 426.

7.2 Test 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. Concrete masonry units 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. Concrete masonry units shall not be wetted before laying. 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 percent 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 alinement 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 two 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 alinement shall be on the exterior side of exterior walls and on the corridor side of corridor walls. Units in exposed-to-view or painted walls and partitions shall be free from chipped edges or other imperfection detracting from the appearance of the finished work.

8.1.1 Firepit. Backing construction of firepits shall have built-in metal ties one foot on centers in every other course, to tie in the fireplace facing and lining. Firepit shall be lined on the interior of the fire chamber with firebrick selected for uniformity of shape and color. Brick shall be wetted when laid. Firebrick shall be laid with mortar joints not more than 1/4 inch wide. Joints shall be completely filled with mortar when laid and finished flush.

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 or snow 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 with 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. Spaces around metal door frames and other built-in-items shall be solidly filled with grout or mortar. Anchors, wall plugs, accessories, relgets, flashings, 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 points and in the manner indicated. Cells which receive anchor bolts or support bearing plates shall be filled, solidly with grout.

8.1.6 Mortar Joints on the weather side of exterior walls and on all exposed-to-view or interior wall and partition 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, except control joints shall be cut off flush and not tooled. Chases and raked out joints shall be kept free from mortar or other debris. 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 three 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 of 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.

8.1.7.2 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. Bars shall be continuous in exterior wall bond beams at floor and roof levels; bar splices shall be staggered.

8.1.7.4 Lintel Bars. Lintels shall be reinforced with two No. 4 bars, unless otherwise indicated. Bars shall extend 40-bar diameters or 2-feet, whichever is greater beyond each face of opening. Steel stirrups shall be provided when indicated.

8.1.7.5 Basic Wall and Partition Reinforcement. All walls and partitions shall be reinforced with both vertical and horizontal bars. Reinforcement shall be as detailed or scheduled. Any wall or partition which carries a vertical load other than its own weight or which is not structurally isolated along its top edge is classified as a structural element. Any partition which is isolated along top in such a manner so as not to introduce external loads or forces is classified as nonstructural. As part of the minimum reinforcement vertical reinforcements shall be provided at openings, corners, anchored intersections, control joints, end of panels, and at each side of openings and one horizontal bar shall be provided at the top and the bottom of each opening. All vertical bars shall extend from diaphragm to diaphragm (floor-to-roof levels). Horizontal bars at openings shall be No. 4 or larger and shall extend at least 40 bar diameters or 24 inches, whichever is greater beyond the corners of the opening. Where bond beam or lintel bars occur immediately adjacent to the opening the No. 4 or larger bar specified above to be in that location may be omitted.

8.1.7.6 Additional Bars Around Wall Openings. For all exterior walls and structural partitions, provide at least one extra deformed bar, No. 4 or larger, on all sides of and adjacent to every opening which exceeds 2 feet in either direction. Such extra perimeter bars shall extend not less than 40 bar diameters or 24 inches, whichever is greater, beyond the corners of the opening. Where opening exceeds 4 feet in either direction, the extra vertical reinforcement shall be of the same size and number of bars as indicated for the wall or partition in which the opening occurs shall extend from floor-to-roof levels. The bars required by this paragraph shall be in addition to the minimum reinforcement required by paragraph: BASIC WALL AND PARTITION REINFORCEMENT, except over openings where the total combined depth of lintel and bond-beam is not less than 16 inches, (i.e., where a bond-beam is immediately above a lintel). The additional perimeter reinforcement at openings shall be located in the nearest cavity that does not contain other required reinforcement.

8.1.7.7 Additional Vertical Reinforcements at Corners, Anchored Intersection, Control Joints, and End of Wall Panels. Provide additional vertical reinforcement so that a total of at least 2 reinforced cells are adjacent to external corners; on each side of control joints, and seismic or expansion joints; at end of each wall panel; and at junction of an intersected wall which is anchored to the intersecting wall. Additional vertical reinforcement at each location shall be of the same size and number of bars as shown on drawings for the wall or partition in which the reinforcement is located and shall extend from floor-to-roof levels.

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. Intersecting walls and partitions shall be anchored by continuous reinforcing bars, except where otherwise indicated.

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 Lintel Beams in hollow unit masonry construction, unless otherwise indicated, shall be constructed of U-shaped units, reinforced as indicated and filled solidly with grout. Lintels shall extend at least 24-inches beyond each face of the opening with open-bottom cells over reinforced vertical studs. Lintels shall be of a depth equal to the wall thickness, unless otherwise indicated, but not less than 8 inches in depth.

8.1.11 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.

8.1.12 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 one face shell of each reinforced vertical core, or at option of Contractor an approved manufacturer's standard cleanout unit. In case of filled-cell (solid-concrete) construction, the cleanout course shall be constructed with open-bottom bond-beam units, inverted, to permit cleaning of all cells by flushing. 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.

8.1.13 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 group 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.

8.1.13.1 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.

8.1.13.2 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.

8.1.13.3 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 spaces as stipulated in table II.

8.1.13.4 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 Color Joint (Inches)	(As Specified in Paragraph: Grout)	(Inches)
Less 2 x 4	Less 2	Fine or Mortar	8
2 x 4	2	Fine or Mortar	16
2-1/2 x 4	2-1/2	Fine or Low-Lift(1)	24(2)
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.

8.1.13.5 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 (1) Not Tested for Initial Set		TIME INTERVAL (1) (At Option of Contractor) Tested for Initial Set	
	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) "T Initial Set" for cement or cements used shall be determined in accordance with ASTM Standard C 266.

8.1.13.6 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 one lift and rodded or vibrated to thoroughly fill all voids, spaces and interstices. After a waiting period a second lift shall be poured to the same depth and all spaces again rodded. 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 two 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. Pours in vertical studs (grouted cores) or other vertical members shall terminate at the underside of the deepest horizontal member framing thereto. For keying, the grout pour shall be stopped at least 1-1/2 inches below top of upper masonry course. Vertical members shall be poured at least 2 hours before any horizontal overhead work is placed thereon. Grout in bond beams lintels, and other grouted horizontal spaces shall be placed continuously so that pour of the member will be monolithic. At least 28 hours shall elapse between the pouring of adjoining sections, unless this requirement is waived by the Contracting Officer. Reinforcing bars splashed with grout shall be cleaned 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.

8.1.13.7 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 one 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.

8.1.13.8 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.

8.1.13.9 Curing. Attention shall be given to proper curing of the mortar joints as well as the grout. The masonry work and top of grout pour shall be kept damp to prevent too rapid drying during hot drying weather or winds.

8.1.14 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 walls before constructing roof and an additional 48 hours shall elapse before applying a concentrated load such as beam.

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 where indicated.

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 or partitions supporting plumbing, heating or other fixtures, voids at door and window 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, gable slopes, 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 II. 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 grouting holes or masonry units as applicable. 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 bond beams. Unreinforced cores shall not be filled.

8.2.3 Filled Cell (Solid-Concrete) Construction. When drawings indicate filled-cell construction, all cells and voids in the wall shall be filled by the high-lift grout method after the wall is laid. The height of grout pours shall be governed by table II. All masonry courses shall be limited to open-bottom bond-beam units laid in running bond pattern to produce a solid-concrete wall when grout is placed, except that corners, jambs, lintels, vertical barriers and other special conditions shall be accomplished with standard or special shapes as shown or required for a complete and proper installation. Vertical barriers to confine horizontal flow of grout shall be provided at not more than 25 foot spacings. Also, provided barriers below and at each face of wall openings.

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

Index

- 1. Applicable Publications
- 2. Material
- 3. Foundation Preparation
- 4. Placement
- 5. Scales
- 6. Waybills and Delivery Tickets

1. APPLICABLE PUBLICATIONS. The following American Society for Testing and Materials Standards of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the references thereto.

C 127-73
C 136-71
C 535-69

Specific Gravity and Absorption of Coarse Aggregate
Sieve or Screen Analysis of Fine and Coarse Aggregates
Resistance to Abrasion of Large Size Coarse
Aggregate by Use of the Los Angeles Machine

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 500 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 90 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	2.60	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 for each 15,000 tons of stone and 3,000 tons of filter material produced. 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 Filter Material shall consist of sand and gravel or crushed stone and may be obtained from required excavations or from any other source approved by the Contracting Officer. The materials shall be well-graded between the limits specified below, and the test method for gradation of the filter material shall be ASTM C 136.

Sieve Size	Percent by Weight Passing
4 Inch	100
1-1/2 Inch	50-80
No. 4	30-60
No. 200	0-10

2 4.2 Stone may be quarried stone or cobblestone reasonably well graded within the limits specified below:

Weight of Pieces	Percent Smaller by Weight
200	100
100	65-100
50	35-65
20	0-30
5	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 one inch from the theoretical slope lines and grades. Where such areas are below the allowable minus tolerance limit they shall be brought to grade by filling with earth similar to the adjacent material and well compacted, or by filling with filter material, and no additional payment will be made for any material thus required. Immediately prior to placing the filter material or stone, the prepared base shall be inspected by the Contracting Officer and no material shall be placed thereon until that area has been approved.

4 PLACEMENT.

4.1 Filter Material shall be spread uniformly on the prepared base, in a satisfactory manner, to the neat lines indicated on the drawings or as directed. Placing of material by methods which will tend to segregate particle sizes within the filter will not be permitted. Any damage to the surface of the filter base during placing of the filter shall be repaired before proceeding with the work. Compaction of the filter blanket will not be required but it shall be finished to present a reasonably even surface free from mounds or windrows. A tolerance of plus or minus one inch from the slope lines and grades when measured with a 10-foot straightedge will be allowed in each finished filter course, except that either extreme of such tolerance shall not be continuous over an area greater than 200 square feet.

4.2 Stone, except dumped stone, shall be placed on the prepared foundation or filter 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 levee slopes and/or toe slopes. Hand placing, barring, or placing by crane will be required only to the extent necessary to secure the results specified. Placing stone by methods likely to cause segregation will not be permitted. A tolerance of plus 2 inches or minus one inch 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.

4.3 Dump Stone shall be placed in a uniform, well-graded mass to the lines indicated on the drawings or as staked in the field. Barring of stone will be required only to the extent necessary to secure the results specified above. Hand placing will not be required. A tolerance of plus or minus 3 inches from the indicated lines and grades will be allowed in the finished surface, except either extreme of such tolerance shall not be continuous over an area greater than 200 feet.

5 SCALES shall be standard truck scales of the beam type. The scales shall be of sufficient size and capacity to accommodate all trucks used in hauling the material. Scales shall be tested, approved, and sealed by an inspector of the State Inspection Bureau charged with scales inspection within the state in which the project is located. Scales shall be calibrated and resealed as often as necessary to insure continuous accuracy. The necessary number of standard weights for testing the scales shall be on hand at all times and, if an official inspection bureau of the state is not available, the scales will be tested by the Contracting Officer.

6. WAYBILLS AND DELIVERY TICKETS. Copies of waybills or delivery tickets shall be submitted to the Contracting Officer during the progress of the work. Before the final statement is allowed, the Contractor shall file with the Contracting Officer certified waybills and/or certified delivery tickets for all stone actually used in the construction covered by the contract.

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SECTION 6A

MISCELLANEOUS METAL WORK AND MATERIALS

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| 1. Applicable Publications | 11. Side Drain Gates |
| 2. General | 12. Protection Barriers |
| 3. Dissimilar Materials | 13. Aluminum Siding (Entrance Screen) |
| 4. Materials | 14. Ramada Railing |
| 5. Shop Drawings | 15. Skylight |
| 6. Samples | 16. Miscellaneous Plates and Shapes |
| 7. Workmanship | 17. Frames and Grates |
| 8. Qualification of Welders | 18. Aluminum Guard Rail |
| 9. Anchorage | 19. Pipe Railing |
| 10. Wall Vent | 20. Walkway Barrier (Bollards) and Pipe Gate |
| | 21. Shop Painting |

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

1.1 Federal Specifications. (Fed. Spec.)

- | | |
|-------------|--|
| FF-B-575C | Bolts, Hexagon and Square |
| FF-B-588C | Bolt, Toggle: and Expansion Sleeve, Screw |
| FF-H-00111b | Hardware, Builders', Shelf and |
| (GSA-FSS) | Miscellaneous |
| FF-N-836C | Nut: Square, Hexagon, Cap, Slotted, |
| & Am-1 | Castellated, Clinch, Knurled, Welding |
| | and Single Ball Seat (and Material for Same) |
| FF-S-85C | Screw, Cap, Slotted and Hexagon Head |
| & Am-1 | |
| FF-S-92a | Screws, Machine: Slotted, Cross-Recessed |
| & Am-3 | or Hexagon Head |
| FF-S-111c | Screw, Wood |
| & Am-1 | |
| FF-S 325 | Shield, Expansion; Nail, Expansion; and |
| & Int. Am-3 | Nail, Drive Screw (Devices, Anchoring, |
| (GSA-FSS) | Masonry) |
| FF-W-84a | Washers, Lock (Spring) |
| & Am-2 | |
| FF-W-92a | Washers, Metal, Flat (Plain) |
| & Am-1 | |
| QQ-S-763d | Steel Bars, Wire, Shapes, and Forgings, |
| & Int. Am-1 | Corrosion-Resisting |
| TT-V-51e | Varnish; Asphalt |
| WW-T-700/6E | Tube, Aluminum Alloy, Drawn, Seamless, 6061 |

1.2 Military Specifications.

- | | |
|--------------|--|
| MIL-C-18480A | Coating Compound, Bituminous, Solvent, |
| (DOCKS) | Coal Tar Base |
| & Am-3 | |

1.3 The Aluminum Association Publications.

- Designation System for Aluminum Finishes (January 1971).
- Standards for Anodized Architectural Aluminum (July 1971).
- Specifications for Aluminum Siding (October 1972 & Supplement).

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

A 27-73	Mild-to Medium-Strength Carbon-Steel Castings for General Application
A 36-74	Structural Steel
A 53-73	Welded and Seamless Steel Pipe
A 120-73	Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe For Ordinary Uses
A 123-73	Zinc (Hot-Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars, and Strip
A 126-73	Gray Iron Castings for Valves, Flanges, and Pipe Fittings
A 306-64	Carbon Steel Bars Subject to Mechanical Property Requirements
A 320-74	Alloy-Steel Bolting Materials for Low-Temperature Service
A 386-73	Zinc Coating (Hot-Dip) on Assembled Steel Products
A 525-73	Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, General Requirements
A 536-72	Ductile Iron Castings
B 32-70	Solder Metal
B 211-74	Aluminum - Alloy Bars, Rods, and Wire

1.5 American Welding Society (AWS) Standards.

B 3.0-41T	Qualification Procedure (Reprint April 1969)
D 1.0-69	Code for Welding in Building Construction

2. GENERAL. The Contractor shall verify all measurements and shall take all field measurements necessary before fabrication. Welding to or on structural steel shall be in accordance with the Structural Welding Code of the American Welding Society. Items specified to be galvanized, when practicable and not indicated otherwise, shall be hot-dip processed after fabrication. Galvanizing shall be in accordance with ASTM A 123, A 386, or A 525, as applicable. Exposed fastenings shall be compatible materials, shall generally match in color and finish, and shall harmonize with the material to which fastenings are applied. Materials and parts necessary to complete each item, even though such work is not definitely shown or specified, shall be included. Miscellaneous bolts and anchors, supports, braces, and connections necessary for completion of the miscellaneous metalwork shall be provided. The necessary rebates, lugs, and brackets shall be provided so that the work can be assembled in a neat and substantial manner. Holes for bolts and screws shall be drilled or punched. Poor matching of holes shall be cause for rejection. Fastenings shall be concealed where practicable. Thickness of metal and details of assembly and supports shall give ample strength and stiffness. Joints exposed to the weather shall be formed to exclude water.

3. DISSIMILAR MATERIALS. Where dissimilar metals are in contact, or where aluminum is in contact with concrete, mortar, masonry, wet or pressure-treated wood, or absorptive materials subject to wetting, the surfaces shall be protected with a coat of bituminous paint conforming to Military Specification MIL-C-18480 or to Federal Specification TT-V-51, unless otherwise specified, to prevent galvanic or corrosive action.

4. MATERIALS.

4.1 General. Materials shall conform to the requirements specified for the particular item; and where these requirements are not specified in detail, the materials shall be suitable for the intended usage of the item. The materials listed below shall conform to the respective specifications and other requirements as designated.

4.1.1 Trade Names, Manufacturers and Suppliers. Where material or equipment is designated by trade name, or by manufacturer's or supplier's catalog number, it is merely an indication of quality and type.

4.1.2 Identical Articles and/or Equipment. Where two or more identical articles or pieces of equipment are required, they shall be the products of the same manufacturer.

4.2 Aluminum. Unless otherwise specified, aluminum items shall be in standard mill finish. When anodic coatings are specified hereinafter, the coatings shall conform to The Aluminum Association publication Standards for Anodized Architectural Aluminum, with treatment to a coating thickness not less than that specified in The Aluminum Association publication Designation System for Aluminum Finishes for the protective and decorative type finish. Items to be anodized shall receive a polished-satin-finish pretreatment and a clear-lacquer overcoating conforming to the Standards for Anodized Architectural Aluminum.

4.3 Structural Steel shall conform to ASTM A 36.

4.4 Corrosion-Resisting Steel Bolts, and Anchor Bolts shall conform to the applicable requirements of Fed. Spec. QQ-S-763, Class 304, Condition A, or the applicable requirements of ASTM A 320, Grade B8. Corrosion-resisting fastenings shall be used where specified or indicated and also may be used in lieu of galvanized steel fastenings.

4.5 Washers.

4.5.1 General. Washers shall be provided for applications specified elsewhere and where indicated on the drawings.

4.5.2 Plain Washers shall conform to the requirements of Fed. Spec. FF-W-92, Type A, Grade I, Glass A or B as applicable.

4.5.3 Lock Washers shall conform to the applicable requirements of Fed. Spec. FF-W-84.

4.6 Bolts and Nuts. Except as otherwise specified, bolts shall conform to Fed Spec. FF-B-575, nuts, shall conform to Fed. Spec. FF-N-836, as best suited for intended use. Toggle bolts shall conform to Fed. Spec. FF-B-588.

4.7 Steel Castings shall conform to the applicable requirements of ASTM A 27, Grade 70-36.

4.8 Pipe for Ordinary Use shall conform to the applicable requirements of Fed. Spec. WW-P-406, Weight A, Class as required or ASTM A 120, finish as required.

4.9 Expansion Anchors shall conform to the applicable requirements of Fed. Spec. FF-S-325. Anchors shall be multiple unit with inside thread.

4.10 Cast Iron for Drainage Gates shall conform to the applicable requirements of ASTM A 126, Class B.

4.11 Carbon Steel for Drainage Gates shall conform to ASTM A 306.

4.12 Ductile Iron for Drainage Gates shall conform to ASTM A 536, Grade 80-55-06.

4.13 Powder-Driven fasteners may be used only when approved in writing.

4.14 Screws shall conform to Fed. Spec. FF-S-85, FF-S-92 and FF-S-111, as best suited for use intended.

4.15 Hardware. Unless otherwise specified, hardware provided as an integral part of miscellaneous metal items shall conform to Fed. Spec. FF-H-111.

5. SHOP DRAWINGS, along with catalog cuts, templates, and erection and installation details, as appropriate, for all miscellaneous metal items shall be submitted for approval in accordance with the SPECIAL PROVISIONS. Submittals shall be complete in detail; shall indicate thickness, type, grade, class of metal, and dimensions; and shall show construction details, reinforcement, anchorage, and installation with relation to the building construction.

6. SAMPLES shall be full size, shall be taken from manufacturer's stock, and shall be complete as required for installation in the structure. After approval, samples may be installed in the work, provided each sample is clearly identified and its location recorded. One sample of any item shall be submitted for approval upon request by the Contracting Officer.

7. WORKMANSHIP. Miscellaneous metalwork shall be well formed to shape and size, with sharp lines and angles and true curves. Drilling and punching shall produce clean true lines and surfaces. Welding shall be continuous along the entire area of contract except where tack welding is permitted. Exposed connections of work in place shall not be tack welded. Exposed welds shall be ground smooth. Exposed surfaces of work in place shall have a smooth finish, and unless otherwise approved, exposed riveting shall be flush. Where tight fits are required, joints shall be milled to a close fit. Corner joints shall be coped or mitered, well formed, and in true alinement. Work shall be accurately set to established lines and elevations and securely fastened in place. Work shall be executed and finished in accordance with approved drawings, cuts, details, and samples.

8. **QUALIFICATION OF WELDERS.** Welding to or on structural steel or miscellaneous items of structural steel shall be performed by certified welders qualified in accordance with procedures covered in American Welding Society Standard B3.0 using procedures and materials and equipment of the type required for the work.

9. **ANCHORAGE** shall be provided where necessary for fastening miscellaneous metal items securely in place. Anchorage not otherwise specified or indicated shall include slotted inserts, expansion shields, and powder-driven fasteners when approved for concrete; toggle bolts and through bolts for masonry; machine and carriage bolts for steel; through bolts, lag bolts, and screws for wood. Slotted inserts shall be of types required to engage with the anchors and shall be approved.

10. **WALL VENT** shall be of the size indicated and shall be constructed as shown. Screen shall be installed at the back of the vent with installation permitting removal and replacement. Vents shall be cast iron Model LV 1TS as manufactured by McKinley Iron Work, 901 N. Throckmorton, P.O. Box 790, Ft. Worth, Texas, 76101 or approved equal.

11. **SIDE DRAIN GATES.** Automatic drainage gates for side drains shall be of the size indicated, and constructed for a 50 foot seating head. Seat and cover lugs and links shall be steel or ductile iron. Seating faces shall be bronze or steel. Fasteners and bushings shall be bronze or corrosion-resistant steel. Each gate shall be rigidly secured in place with seating faces inclined from the vertical by approximately 3 degrees. Installation of gates shall be as recommended by the gate manufacturer. Bronze or corrosion-resistant steel fasteners of the size recommended by the gate manufacturer shall be utilized in assembly of gate and to secure the gates to the headwall. The gates shall be so constructed as to prevent the gates from locking in a partially open position.

12. PROTECTION BARRIERS.

12.1 **General.** Protection barriers shall be constructed and installed as indicated. Prior to starting any construction work on barriers, detailed shop drawings shall be submitted showing the complete barrier. Barriers shall not be fabricated until shop drawings are approved by the Contracting Officer.

12.2 **Shear Pins** shall be made of commercially pure aluminum alloy 1100, temper 0, conforming to the requirements of ASTM B 211.

12.3 **Fabrication and Erection.** The barriers shall be fabricated of structural steel, steel bars, and standard pipe as indicated. All welds joining exposed surfaces shall be ground smooth. The barriers shall be straight and true to dimensions. The complete barrier units shall be galvanized after fabrication. After erection of the barriers, the galvanized surfaces shall be thoroughly cleaned of all foreign matter, and all abraded and/or damaged surfaces shall be neatly soldered over with 50B alloy grade solder conforming to ASTM B 32. All bolts, nuts, washers and other fittings (except shear pin) shall be galvanized.

13. ALUMINUM SIDING (ENTRANCE SCREEN).

13.1 **Material.** Aluminum siding shall be unbacked horizontal lap aluminum siding 0.024 inches thick with a factory applied paint finish. Siding shall conform to the Architectural Aluminum Manufacturers Association AAMA Specifications for Aluminum Siding. Horizontal lap siding shall be provided in 4 inch exposure pattern.

13.2 **Application.** Siding shall be applied in accordance with the manufacturer's printed instructions, except as otherwise specified. Nails shall be 0.120 inch diameter aluminum nails. Nail heads shall not be driven tight against nailing lock.

14. **RAMADA RAILING.** Railing shall be constructed of ornamental wrought iron as indicated. Joints shall be welded and ground smooth. Finish shall be satin black as approved.

15. **SKYLIGHT** shall be of the single slope type, consisting of acrylic white translucent plastic top, extruded aluminum retaining frame and curb frame. Curb frame shall be mitered and welded with a condensation gutter for drainage. The unit shall be so designed and installed as to preserve water-tight integrity without use of mastic or caulking. Unit shall be the product of a manufacturer regularly engaged in this type of construction and shall be similar and equal to single slope skylight model as manufactured by Super Sky Products Inc., local representative Watkins & Associates, P.O. Box 128, West Covina, California 91793, telephone 213-966-1788.

16. **MISCELLANEOUS PLATES AND SHAPES** for items that do not form a part of the structural steel framework, such as lintels, sill angles, miscellaneous mountings, and frames, shall be provided to complete the work. Miscellaneous plates and shapes shall conform to ASTM A 36.

17. **FRAMES AND GRATES.** Frames and grates for drainage structures, including anchors, shall be all welded construction of structural steel shapes and plates. Frame construction shall be such that finished surfaces are flush with surrounding construction. Frame and grate shall be galvanized after fabrication.

18. **ALUMINUM GUARD RAIL** shall be shop fabricated of posts, rails, and accessories, of the types and sizes shown conforming to Fed. Spec. WW-T-700/6, Temper T6, and shall be installed at the locations indicated. Exposed fittings and fastenings shall be cast or extruded aluminum except where corrosion-resisting steel is employed as a standard fabricator's item for use. Rail joints shall be finished flush and shall occur only at supports. Fittings and brackets shall be designed for concealed pin fastenings or welding. Railings shall be anodized satin finish. Necessary anchors shall be provided as required for a rigid installation. Railing shall conform to details shown on the attached drawings.

19. **PIPE RAILING.**

19.1 Steel Railings including pipe inserts in concrete, shall be standard-weight steel pipe conforming to ASTM A 53. Pipe shall be 1-1/2-inch size. Pipe railings shall be galvanized.

19.1.1 Fabrication. Jointing of post, rail, and corners shall be by one of the following methods.

19.1.1.1 Flush-Type Rail Fittings of commercial standard, welded and ground smooth with railing splice locks secured with 3/8-inch hexagonal-recessed-head setscrews.

19.1.1.2 Mitered and Welded Joints made by fitting post to top rail and intermediate rail to post, mitering corners, groove welding joints, and grinding smooth. Railing splices shall be butted and reinforced by a tight-fitting interior sleeve not less than 6 inches long.

19.1.1.3 Railings May Be Bent at Corners in lieu of jointing, provided bends are made in suitable jigs and that the pipe is not crushed.

19.1.2 Installation. Rails shall be installed by means of sleeve inserts set and anchored in the concrete as indicated. Posts shall be inserted into the sleeves, leveled, plumbed, and alined. The annular space between pipe posts and sleeve inserts shall be filled solid with molten lead or sulphur or a quick-setting hydraulic cement.

20. **WALKWAY BARRIER (BOLLARDS) AND PIPE GATE.** Pipe posts shall conform to ASTM A120, standard weight, galvanized, of the sizes shown. Posts shall be set plumb in concrete bases of dimension indicated. Concrete in bases shall be thoroughly compacted and finished in a dome. Pipe gate chain shall be welded type, steel, proof coil, welded to part as indicated. Reflectors shall be 3-inch diameter, plastic or glass, clear type mounted on target plate with baked enamel finish. Plate shall be secured to pipe rail with tamper proof fasteners.

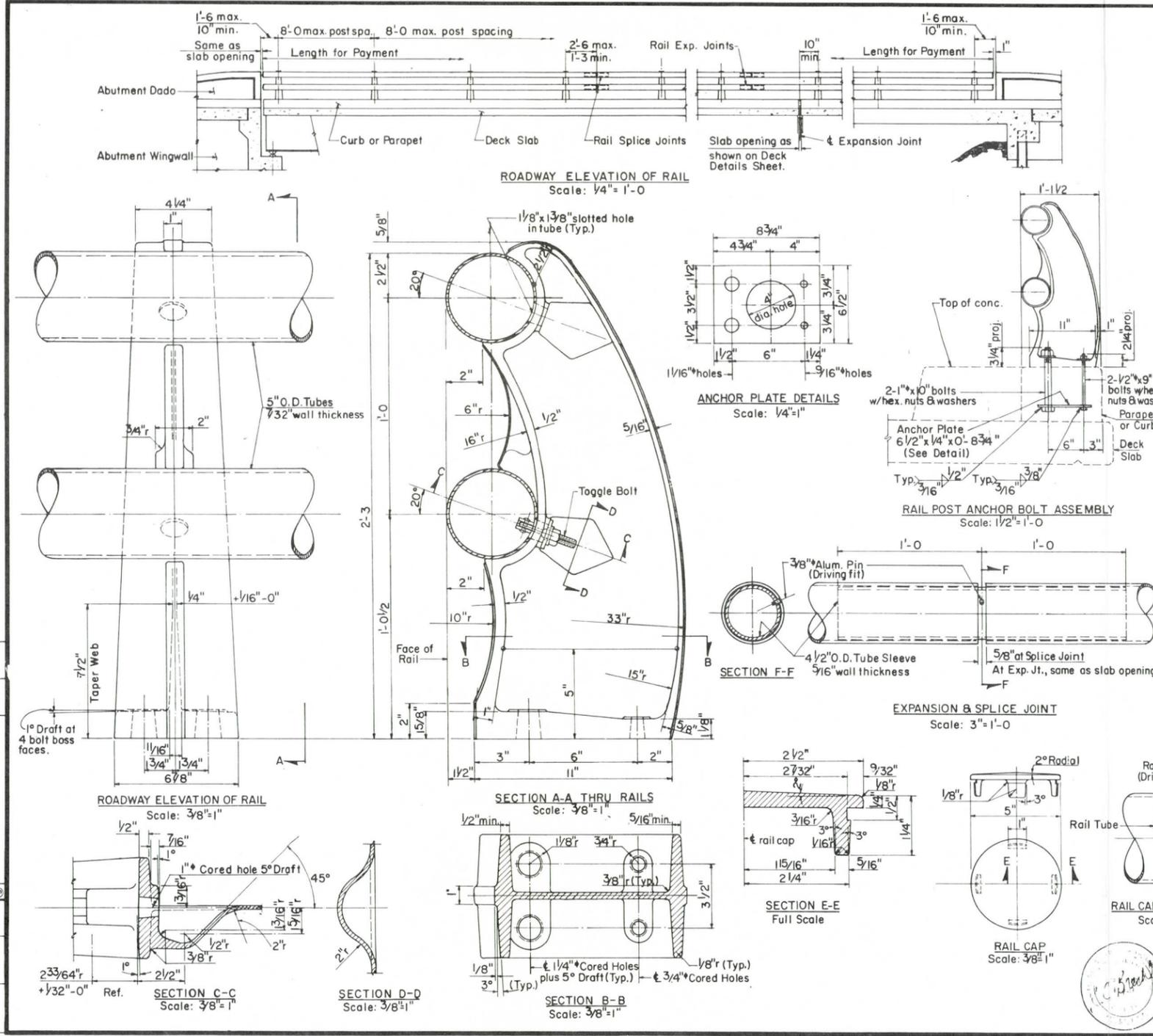
21. **SHOP PAINTING.** Unless otherwise specified, surfaces of ferrous metal, except galvanized surfaces, shall be cleaned and shop coated with the manufacturer's standard protective coating. Items to be finish painted shall not be given a bituminous protective coating. Surfaces shall be cleaned with solvents to remove grease and oil and with power wire-brushing or sandblasting to remove loose rust, loose mill scale, and other foreign substances. Surfaces of items embedded in concrete shall not be painted. Bituminous primer shall conform to Fed Spec TT-V-51 or to Military Specification MIL-C-18480.

21.1 Drainage Gates shall be given 3 coats of cold applied coal tar base paint. The paint shall be applied heavily by brush, at a coverage rate of approximately 100 sq. ft./gal. to give a total film thickness for 3 coats of 1/32 of an inch. Each additional coat shall be brushed perpendicularly to strokes of preceding coat. Drying time between coats shall be as recommended by manufacturer of coating.

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Rev. genl. Spec. from ASTM A123 to A153.
 Rev. Rail Anchor Bolt Assembly.
 Rev. 2" Proj. to 2 1/2" Rev. 2" Anchor bolts.
 4-1-66. Added Post to note All dimensions are min.
 Added Alum. Post Spec. AASHTO M193-64 I.
 Alum. Tubing 6061-T6 cold red.

DESIGN	AGS	RCB	10-64	NO.	DESCRIPTION OF REVISIONS	MADE BY	DATE
DRAWN	RWB		12-64	1			
CHECKED	AGS		12-64	2			



MATERIALS

At the option of the contractor, tubing and rail posts shall be either galvanized steel or aluminum. Castings shall have a maximum draft of 3° and a minimum radius of fillet of 1/4" unless otherwise shown. All post dimensions are minimum. Material for metal handrail shall be as follows:
 Aluminum Tubing: Alloy 6061-T6, ASTM Specification B221.
 Steel Tubing: ASTM A36 or ASTM A53, Grade A or B; galvanized after fabrication in accordance with ASTM A123.
 Cast Aluminum Posts: AASHTO M193 (Alloy A 444-T4).
 Cast Steel Posts: AASHTO M192, Class 70; galvanized in accordance with ASTM A123.

Toggle Bolt Assembly: Toggle Bolt-1335 C.R. steel heat treated RC 32-38, ASTM A354; Toggle-1015 H.R. steel, ASTM A303; Washer-SAE 1020 H.R. steel plate, ASTM A7; Nut-1035 C.R. steel heat treated, ASTM A325, Grade 2H; Special Rivet-1038 C.R. steel heat treated, ASTM A195. All parts shall be cadmium plated type NS.0005" thick, ASTM A165.

Anchor Bolt Assembly: Anchor Bolts, Nuts, and Washers shall be ASTM A325. Anchor Plates shall be ASTM A36. Exposed portion of the assembly to be galvanized in accordance with ASTM A153.

GENERAL NOTES

Design: AASHTO 1973. Specifications for Highway Bridges.
 All posts shall be normal to parapet or curb.
 All open ends of rail members shall be capped.
 For horizontal curves of radius less than 2,000 ft., the rail member shall be fabricated to follow the curvature of the roadway.
 Panel lengths of rail shall be attached to a minimum of four posts, (except at Abutment Dados). Rail tube sections shall be spliced in the same panel, joints being spliced as detailed.
 Rail posts shall be seated on at least one shim having dimensions as shown. Additional shims or half-shims may be used in shimming for alignment. These shims shall be 1/16" in thickness and made of tightly twisted asbestos yarn spun with brass wire, woven into Asbestos-Metallic cloth and impregnated with a rubber heat-resisting compound.
 For spacing of rail posts, concrete dimensions, and reinforcing steel, see Deck Details Sheet.



DESIGN APPROVED R.C. Bruchler	STATE OF ARIZONA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS STANDARD DRAWINGS	REVISION
APPROVED FOR DISTRIBUTION E.L. Bruchler	DOUBLE HANDRAIL	STANDARD NO. H-2-1 DRAWING NO. B-22.02

SECTION 8A

SIDE DRAINS AND STORM DRAINS

Index

- | | |
|---|--|
| 1. Applicable Publications | 10. Bedding |
| 2. Delivery, Storage, and Handling of Materials | 11. Placing Pipe |
| 3. General | 12. Backfilling |
| 4. Tests for Pipe | 13. Hydrostatic Test on Watertight Joints |
| 5. Pipe | 14. Installation of Drain Pipe in Walls |
| 6. Drainage Structures | 15. Automatic Drainage Gate |
| 7. Mortar | 16. Plugging Abandoned Drains and Future Drain Outlets |
| 8. Joints | 17. Paving |
| 9. Excavation and Trenching | |

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

1.1 Federal Specifications (Fed. Spec.).

- | | |
|-------------------------|---|
| RR-F-621b | Frames, Covers, Gratings, Steps, Sump and Catch Basins, Manhole |
| SS-S-00210
(GSA-FSS) | Sealing Compound, Preformed Plastic, for Expansion Joints and Pipe Joints |

1.2 Federal Standard (Fed. Std.).

- | | |
|--|------------------------------|
| No. 601
& Change Notices
1 through 6 | Rubber: Sampling and Testing |
|--|------------------------------|

1.3 American Association of State Highway and Transportation Officials (AASHTO) Publications.

- | | |
|----------|---|
| M 170-74 | Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe |
| M 198-74 | Joints for Circular Concrete Sewer and Culvert Pipe Using Rubber Gaskets |
| M 199-74 | Precast Reinforced Concrete Manhole Sections |
| T 180-74 | Moisture-Density Relations of Soil Using a 10-lb (4.5 kg) Rammer and a 18-in. (457 mm) Drop |
| T 191-61 | Density of Soil In-Place by the Sand-Cone Method |

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

- | | |
|-----------|---|
| C 76-73 | Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe |
| C 476-71 | Mortar and Grout for Reinforced Masonry |
| C 443-72a | Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets |

C 478-73

Precast Reinforced Concrete Manhole Sections

D 1556-64

Density of Soil In-Place by the Sand-Cone Method

D 1557-70

Moisture-Density Relations of Soils, Using 10-lb. (4.5 Kg) Rammer and 18-in. (457-mm) Drop

2. DELIVERY, STORAGE, AND HANDLING OF MATERIALS.

2.1 Delivery and Storage. Materials delivered to site shall be inspected for damage, unloaded, and stored with the minimum of handling. Do not store materials directly on the ground. Inside of pipes and fittings shall be kept free of dirt and debris.

2.2 Handling. Materials shall be handled in such a manner as to insure delivery to the trench in sound undamaged condition. Pipe shall be carried to the trench not dragged. Gasket materials and plastic materials that are not to be installed immediately shall not be stored in the direct sunlight.

3. GENERAL. Concrete shall conform to the section: CONCRETE. 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 drains and structures shall conform to the applicable requirements of the sections: EXCAVATION; EXCAVATION, TRENCHING AND BACKFILLING FOR UTILITIES; and FILLS AND SUBGRADE PREPARATION. Removal of existing pipe and appurtenant structures is specified in the section: CLEARING SITE, REMOVING OBSTRUCTIONS, AND PROTECTING UTILITIES. Specified and/or indicated pipe class or D-loading are the minimum acceptable and heavier pipe may be furnished at the option of the Contractor.

3.1 Extension of Drain Lines. Drain lines shall be extended with the same kind of pipe and shall have joints to match the existing joints. All joints shall be watertight. Bends, elbows, and other fittings shall be standard fittings for the various types of pipe. Except as otherwise specified, all pipe and fittings shall be new. Salvaged pipe and fittings from drain removals may be used in temporary installations necessary to the work.

3.2 Manufacturers Recommendations. Where installation procedures or any part thereof are required to be in accordance with the recommendations of the manufacturer of the material being installed, printed copies of these recommendations shall be furnished to the Contracting Officer prior to installation. Installation of the item will not be allowed until the recommendations are received. Failure to furnish these recommendations can be cause for rejection of the material.

4. TESTS FOR PIPE. Certified copies of test reports demonstrating conformance to applicable pipe specifications shall be delivered to the Contracting Officer before pipe is installed. Strength tests for concrete pipe as required in applicable specifications shall be the three-edge bearing tests.

5. PIPE shall be as indicated and shall conform to the following requirements.

5.1 Reinforced Concrete Pipe. ASTM C 76 or AASHTO M 170, class and/or D-load as indicated. Pipe shall be suitable for rubber gasket joints.

6. DRAINAGE STRUCTURES.

6.1 Manholes, Catch Basins, and Outlets and Inlets. Construction shall be of reinforced concrete and/or precast reinforced concrete as indicated, complete with frames and covers or gratings where indicated.

6.2 Precast Reinforced Concrete Manholes shall conform to ASTM C 478 or AASHTO M 199. Joints between precast concrete risers and tops shall be full-bedded in cement mortar and shall be smoothed to a uniform surface on both interior and exterior of the structure.

6.3 Frames and Covers or Gratings. Frames and covers shall be cast iron conforming to Fed. Spec. RR-F-621. Frames and gratings shall be structural steel conforming to the requirements of the section: MISCELLANEOUS METALWORK AND MATERIALS. Weight, shape, size, and waterway openings for grates and curb inlets shall be as indicated on the plans.

6.4 Overflow Spillway. Construction shall be grouted stone conforming to the applicable sections of this specification.

7. MORTAR. Mortar and grout for pipe connections to drainage structures shall conform to ASTM C 476, mortar type PL. The mortar shall be used within 30 minutes after the ingredients are mixed with water.

8. JOINTS.

8.1 For Concrete Pipe. Joints shall be flexible watertight joints made with rubber gaskets.

8.1.1 Materials. The design of joints and the physical requirements for rubber-type gaskets shall conform to ASTM C 443 or AASHTO M 198. Gaskets shall have not more than one factory-fabricated splice, except that 2 factory-fabricated splices of the rubber gasket type are permitted if nominal diameter of pipe being gasketed exceeds 54 inches. Material conforming to Fed. Spec. SS-S-00210 is acceptable as an alternate to ASTM C 443 provided the necessary installation instructions are furnished.

8.1.2 Test Requirements. Joints shall be tested and shall meet test requirements of paragraph: HYDROSTATIC TEST ON WATERTIGHT JOINTS. Gaskets or jointing materials shall not swell more than 100 percent by volume when immersed in accordance with Method 6211 of Fed. Std. 601, in immersion medium No. 3 for 70 hours at 212 degrees F. Certified copies of test results shall be delivered to the Contracting Officer before gaskets or jointing materials are installed. Alternate types of watertight joint may be furnished if specifically approved.

8.1.3 Installation. Gaskets and jointing materials shall be as recommended by the particular manufacturer in regard to use of lubricants, cements, adhesives, and other special installation requirements. Surfaces to receive lubricants, cements, or adhesives shall be clean and dry. Gaskets and jointing materials shall be affixed to the pipe not more than 24 hours prior to the installation of the pipe, and shall be protected from the sun, blowing dust, and other deleterious agents at all times. Gaskets and jointing materials shall be inspected before installing the pipe; any loose or improperly affixed gaskets and jointing materials shall be removed and replaced. The pipe shall be aligned with the previously installed pipe, and the joint pulled together. If, while making the joint, the gasket or jointing material becomes loose and can be seen through the exterior joint recess when joint is pulled up to within one inch of closure, the pipe shall be removed and the joint remade.

9. EXCAVATION AND TRENCHING. Excavation of trenches and backfilling shall be in accordance with the applicable portions of sections: EXCAVATION and FILLS AND SUBGRADE PREPARATION and the following requirements.

9.1 Trenching. Sheeting and bracing where required shall be placed within the trench width as specified. Care shall be taken not to overexcavate. Where trench widths are exceeded, redesign with a resultant increase in cost of stronger pipe or special installation procedures shall be necessary. Cost of this redesign and increased cost of pipe or installation shall be borne by the Contractor without additional cost to the Government.

9.2 Removal of Rock. Rock in either ledge or boulder formation shall be replaced with selected materials to provide a compacted earth cushion having a thickness between unremoved rock and the pipe of at least 8 inches or 1/2-inch for each foot of fill over the top of the pipe, whichever is greater, but not more than 3/4 the nominal diameter of the pipe. Where bell-and-spigot pipe is used, the cushion shall be maintained under the bell as well as under the straight portion of the pipe.

9.3 Removal of Unstable Material. Where wet or otherwise unstable soil incapable of properly supporting the pipe, as determined by the Contracting Officer, is encountered in bottom of trench, such material shall be removed to depth required and replaced to the proper grade with selected material, compacted as provided in paragraph: BACKFILLING. When removal of unstable material is due to the fault or neglect of the Contractor in his performance of shoring and sheeting, water removal, or other specified requirements, resulting material shall be excavated and replaced.

10. BEDDING. The bedding surface for the pipe shall provide a firm foundation of uniform density throughout the entire length of the pipe. The pipe shall be bedded carefully in a soil foundation accurately shaped and rounded to conform to the lowest 1/4 of the outside portion of circular pipe for the entire length of pipe. When necessary, the bedding shall be tamped. Bell holes and depressions for joints shall be only of such length, depth, and width as required for properly making the particular type joint.

11. PLACING PIPE. Each pipe shall be carefully examined before being laid, and defective or damaged pipe shall not be used. Pipelines shall be laid to the grades and alignment 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 be inspected before backfilling, and those damaged during placement shall be removed and replaced at no additional cost to the Government.

11.1 Concrete Pipe. Laying shall proceed upgrade with spigot ends of bell-and-spigot pipe and tongue ends of tongue-and-groove pipe pointing in the direction of the flow. Circular concrete pipe with elliptical reinforcing shall be placed so that reference lines designating top of pipes will be not more than 5 degrees from the vertical plane through the longitudinal axis of the pipe. In all backfilling operations care shall be taken to prevent damage to or misalignment of the pipe.

12. BACKFILLING.

12.1 Backfilling Pipe in Trenches. After the bedding has been prepared and the pipe installed, selected material from excavation or borrow, at a moisture content that will facilitate compaction, shall be placed along both sides of pipe in layers not exceeding 6 inches in compacted depth. The backfill shall be brought up evenly on both sides of pipe for the full length of pipe. Care shall be taken to insure thorough compaction of the fill under the haunches of the pipe. Each layer shall be thoroughly compacted with mechanical tampers or rammers. This method of filling and compacting shall continue until the fill has reached an elevation of at least 12 inches above the top of the pipe. The remainder of the trench shall be backfilled and compacted by spreading and rolling or compacted by mechanical rammers or tampers in layers not exceeding 8 inches. Tests for density will be made as necessary to insure conformance to the compaction requirements specified in "Compaction" below. Where it is necessary in the opinion of the Contracting Officer, any sheeting and/or portions of bracing used shall be left in place, and the contract will be adjusted accordingly. Untreated sheeting shall not be left in place beneath structures or pavements.

12.2 Backfilling Pipe in Fill Sections. For pipe placed in fill sections, backfill material and the placement and compaction procedures shall be as specified above and in "Compaction" below. The fill material shall be uniformly spread in layers longitudinally on both sides of pipe, not exceeding 6 inches in compacted depth, and shall be compacted by rolling parallel with pipe or by mechanical tamping or ramming. Prior to commencing normal filling operations, the crown width of the fill at a height of 12 inches above the top of the pipe shall extend a distance of not less than twice the outside pipe diameter on each side of the pipe or 12 feet, whichever is less. After the backfill has reached at least 12 inches above the top of the pipe, the remainder of the fill shall be placed and thoroughly compacted in layers not exceeding 8 inches.

12.3 Movement of Construction Machinery. In compacting by rolling or operating heavy equipment parallel with the pipe, displacement of or injury to the pipe shall be avoided. Movement of construction machinery over a drain pipe at any stage of the construction shall be at the Contractor's risk. Any pipe damaged thereby shall be repaired or replaced at the expense of the Contractor.

12.4 Compaction. Cohesionless materials include gravels, gravel-sand mixtures, sands, and gravelly sands. Cohesive materials include clayey and silty gravels, gravel-silt mixtures, clayey and silty sands, sand-clay mixtures, clays, silts, and very fine sands. When results of compaction tests for moisture-density relations are recorded on graphs, cohesionless soils will show straight lines or reverse-shaped moisture-density curves, and cohesive soils will show normal moisture-density curves.

12.4.1 Minimum Density. Backfill over and around pipe and backfill around and adjacent to drainage structures shall be compacted at the approved moisture content to the following applicable minimum densities which will be determined as specified below in "Determination of Density."

12.4.1.1 Under paved roads, streets, parking areas, and similar-use pavements including adjacent shoulder areas, the density shall be not less than 90 percent of maximum density for cohesive material and 95 percent of maximum density for cohesionless material up to the elevation where requirements for pavement subgrade materials and compaction shall control.

12.4.1.2 Under other areas, 90 percent of maximum density for cohesive material and 95 percent of maximum density for cohesionless material.

12.4.2 Determination of Density. Testing shall be the responsibility of the Contractor and performed at no additional cost to the Government. Testing shall be performed by an approved commercial testing laboratory or by the Contractor subject to approval. Tests shall be performed in sufficient number to insure that specified density is being obtained and shall average not less than one test for each 2 feet or less of backfill. At least one test shall be made in each trench.

12.4.2.1 Laboratory Control. The moisture-density relations shall be determined in a laboratory in accordance with AASHTO T 180, Method D, or ASTM D 1557, Method D, modified as follows:

a. All material over 3/4 inch in size shall be removed and replaced with an equal portion of material between 0.187 inch (No. 4 sieve) and 3/4 inch in size.

b. A separate batch of materials shall be used for each compaction test specimen. No materials shall be reused.

c. The desired amount of mixing water shall be added for each compaction test specimen, mixed well, and the mixture placed in a container with an airtight cover and allowed to cure for 24 hours. A shorter curing time may be allowed where tests show that shortening the curing time will not affect the results.

12.4.2.2 Field Control. Field in-place density shall be determined in accordance with AASHTO T 191 or ASTM D 1556, except that in each test, the weight of the disturbed sample representing the full depth of layer shall not be 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.

13. HYDROSTATIC TEST ON WATERTIGHT JOINTS. A hydrostatic test shall be made on the watertight joint types proposed. Only one sample joint of each type needs testing; however, if the sample joint fails because of faulty workmanship, an additional sample joint may be tested. During the test period the joint shall be protected from high temperatures that might soften or adversely affect the jointing materials. The possibility that some water may be absorbed by concrete pipes during this test will be considered before rejecting any rubber seals proposed. No allowance will be made for leakage in the seams of corrugated metal pipe. Performance requirements for joints in reinforced concrete pipe shall conform to ASTM C 443 or AASHTO M 198, except that tests shall be performed at an internal hydrostatic pressure of 10 psi for a 24-hour period.

14. INSTALLATION OF DRAIN PIPE IN WALLS. At the option of the Contractor, side drain pipes may be either cast in place in walls or installed through a blockout. The edge of the pipe shall end approximately 3/4 inch back of the face of the wall. Pipe installed in blockouts shall be dry-packed in place.

14.1 Dry-Pack Installation. Dry-pack material shall consist of one part Portland cement, 2 parts aggregate, and water. Aggregate shall consist of sand and fine gravel. The water content shall be such that a ball of dry-pack may be squeezed in the hand without bringing free water to the surface. Materials shall conform to the applicable requirements of the section: CONCRETE. The dry-pack shall be tamped uniformly and symmetrically around the pipe and finished to match the wall.

15. AUTOMATIC DRAINAGE GATE. Gate and fastening shall conform to the requirements of the section: MISCELLANEOUS METALWORK AND MATERIALS. All gates shall be the product of the same manufacturer. The gate shall be rigidly secured in place with the seating surfaces vertical. The gate shall be cast in place, flush with the wall, and with the indicated recess for link clearance. Gates shall be secured to the headwall with galvanized steel or corrosion-resisting steel anchor bolts and bronze washers. The anchor bolts shall be of the size recommended by the gate manufacturer with the nuts tightened after the concrete has cured.

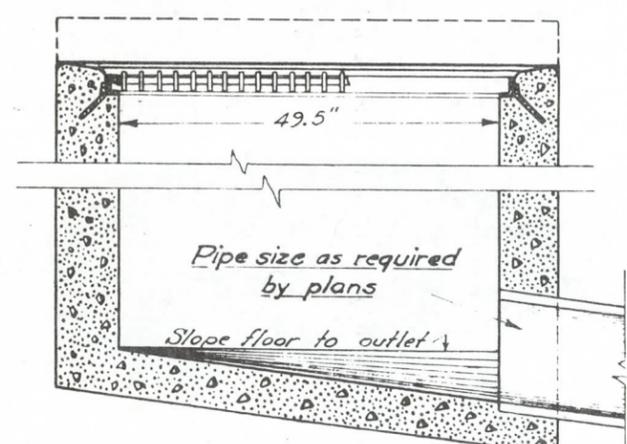
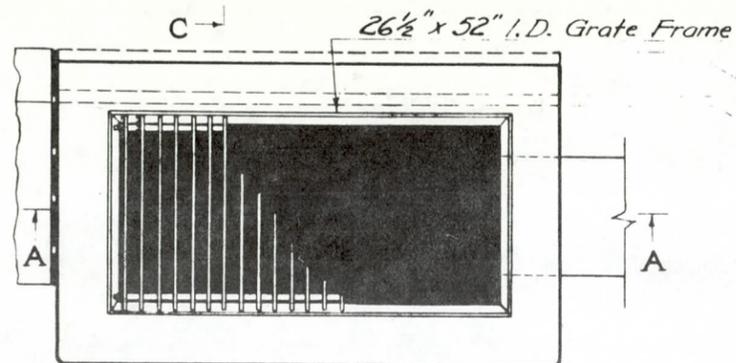
16. PLUGGING ABANDONED DRAINS AND FUTURE DRAIN OUTLETS. Drain pipe indicated as abandoned, drain pipe abandoned on completion of new drain lines, and drain outlets for future use shall be plugged with standard clay sewer disks calked with oakum and mortared in place, or plugged with brickwork in accordance with the applicable requirements of the section: CONCRETE.

17. PAVING removed for the construction or modification of side drains and/or storm drain systems shall be replaced to match the existing paving.

* * * * *

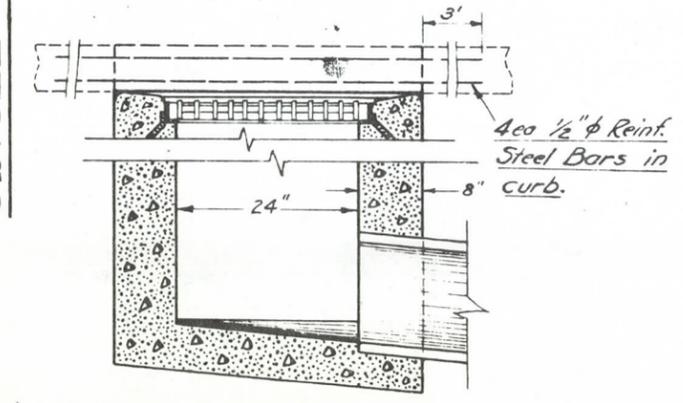
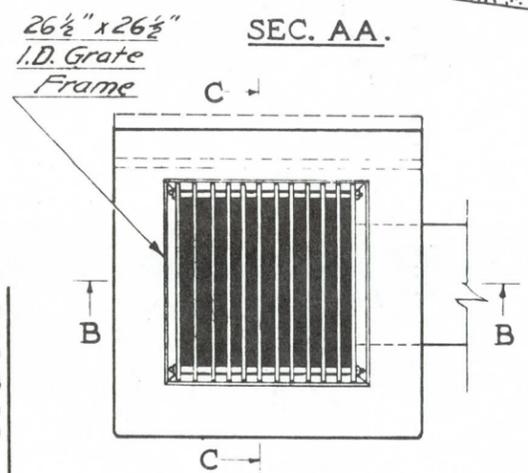
DOUBLE GRATE.

SINGLE GRATE.

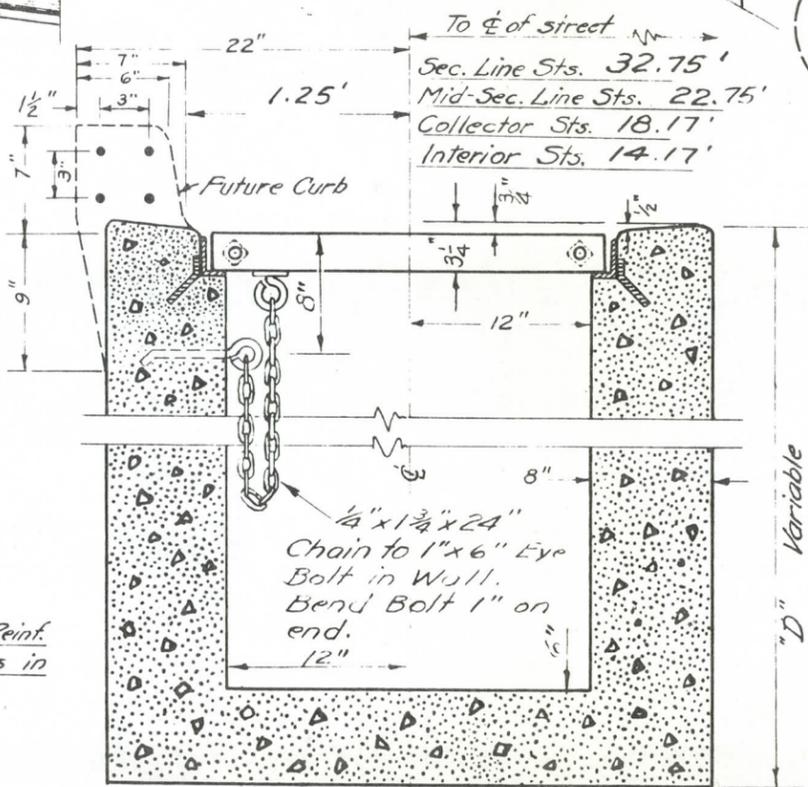


	C.Y. CONC. FOR D=4'
SINGLE GRATE	1.1
DOUBLE GRATE	1.6

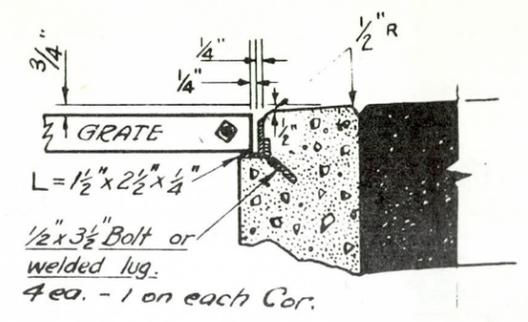
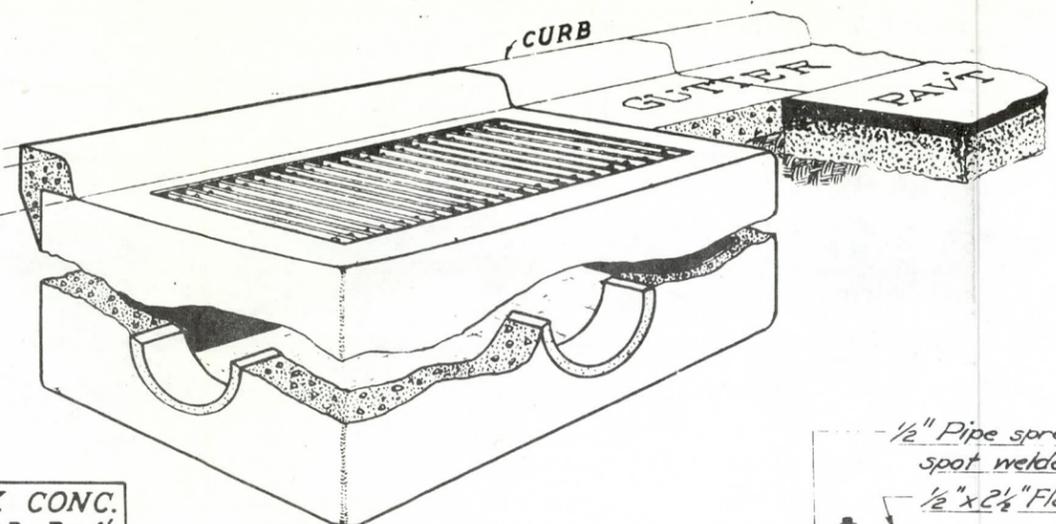
NOTE: For each 6" of depth over 4' add .10 CY for single grate. Add .15 CY for double grate.



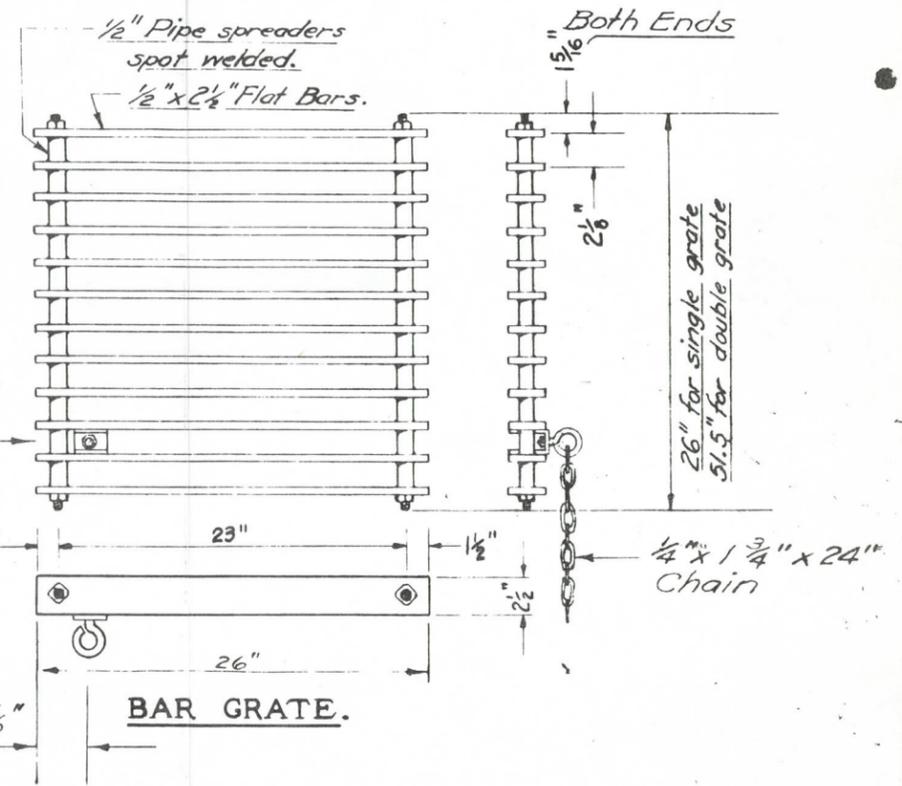
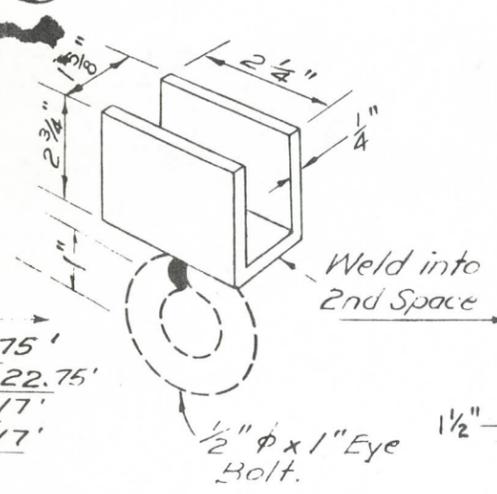
SEC. BB.



SEC. CC.



DETAIL OF ANGLE FRAME GRATE SUPPORT.



BAR GRATE.

ALL CONCRETE SHALL BE CLASS "A".
ALL EXPOSED EDGES SHALL BE FINISHED WITH A 1/2" RADIUS.

APPROVED FOR BOARD OF SUPERVISORS.

BY: *[Signature]*
DATE: *[Date]* CHAIRMAN.

MARICOPA COUNTY HIGHWAY DEPARTMENT ENGINEERING DIVISION		REV. 2-19-63
CATCH BASIN		
DRAWN	<i>[Signature]</i>	C-125
DATE	4-22-57	
CHECKED	S.F.L.	
APPROVED	<i>[Signature]</i> CO. ENGINEER	

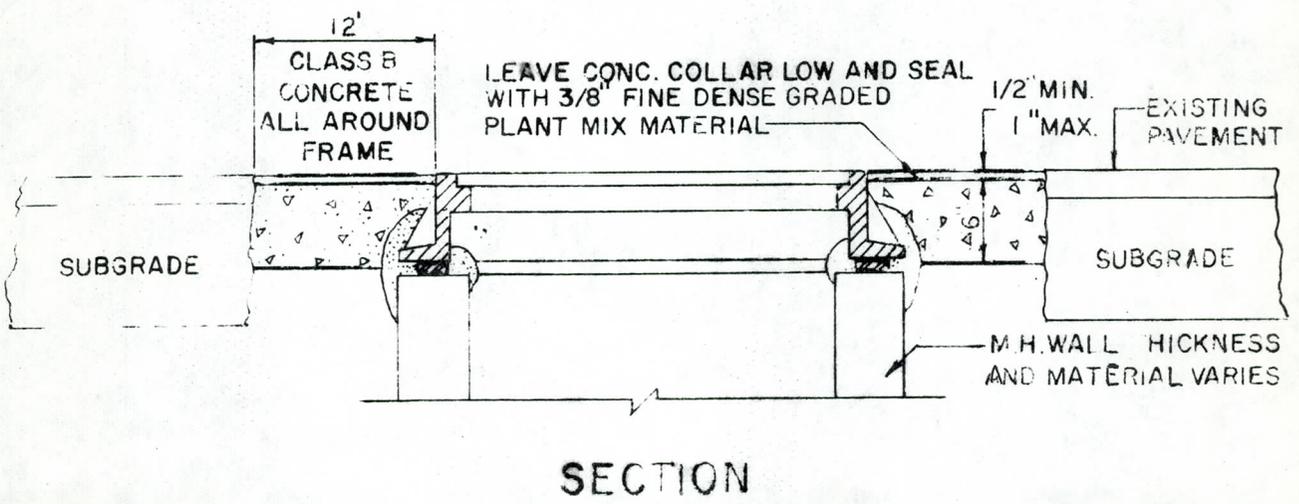
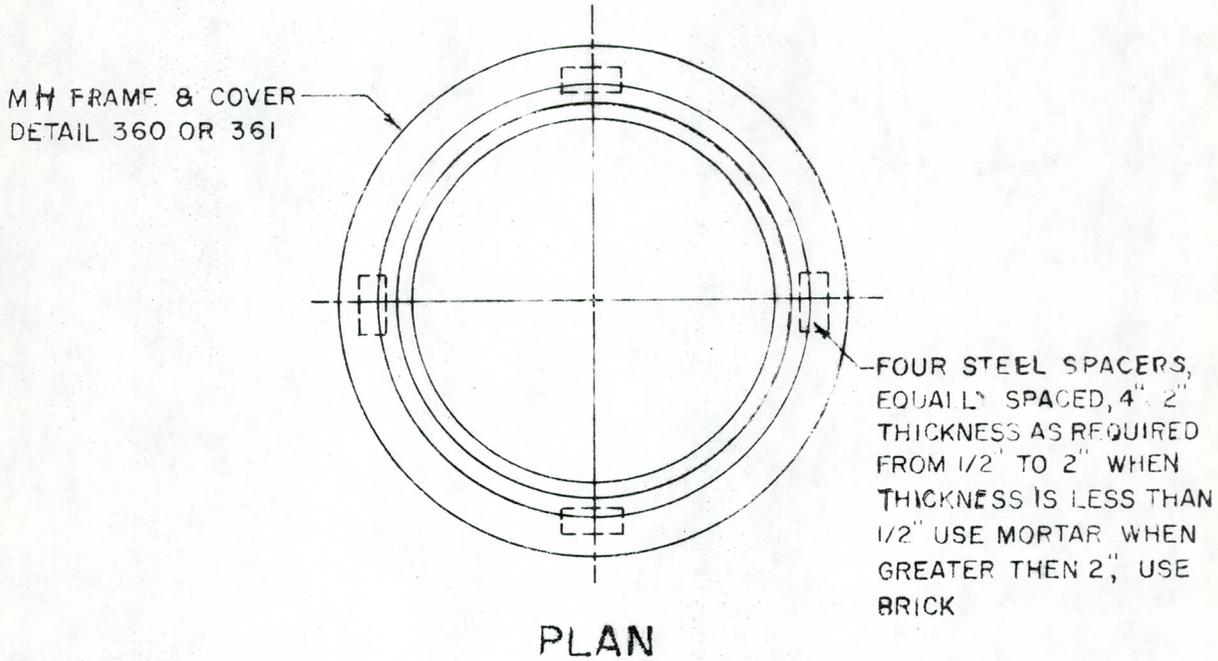
STANDARD DETAIL 200

CITY OF PHOENIX
ENGINEERING DEPARTMENT

MANHOLE FRAME - GRADE ADJUSTMENT

APPROVED *Attebery* 2-1-71 APPROVED *David ...*
CITY ENGINEER DATE WATER & SEWERS DIRECTOR DATE

E. P.



REV. FEB. 1971

NOT TO SCALE

STANDARD DETAIL 213

CITY OF PHOENIX
PUBLIC WORKS DEPARTMENT
DIVISION OF ENGINEERING

STORM DRAIN LATERAL PIPE CONNECTIONS

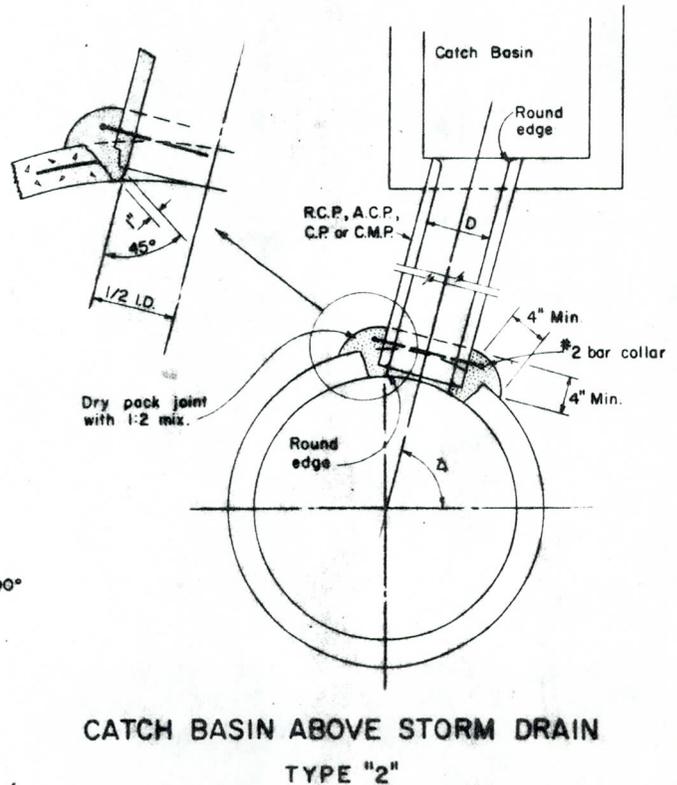
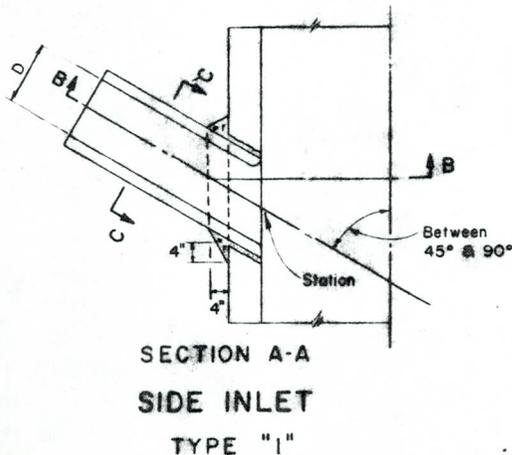
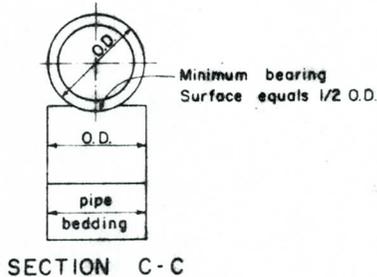
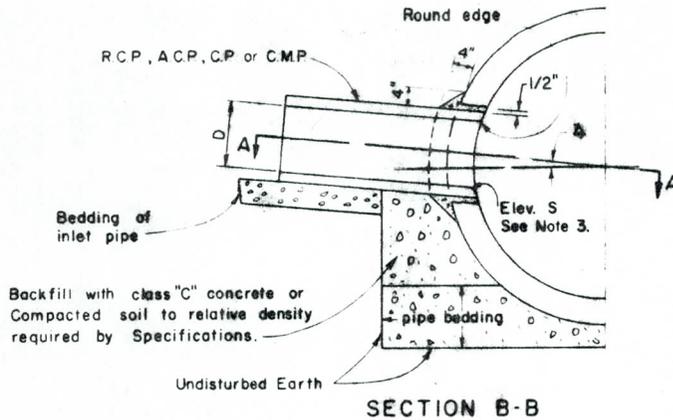
APPROVED

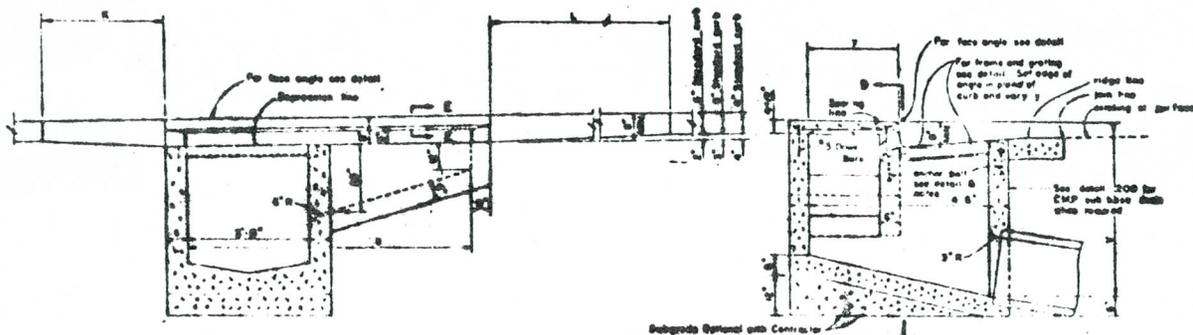
A.C. [Signature]
ENGINEER

Oct. 10, 1968
DATE

NOTES

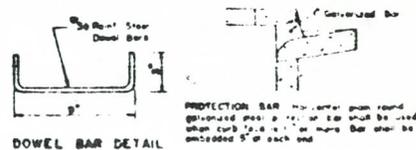
1. D shall be 24" or less. For larger value of D use Manhole or Junction Structure.
2. In no case shall the outside diameter of the inlet pipe exceed one half the inside diameter of main storm drain.
3. Δ of inlet shall be on radius of main storm drain except when elevation S is shown on plans.
4. The minimum opening into the storm drain shall be the outside diameter of the connecting pipe plus 1 inch.
5. If Δ is 45° or less use type 1.
If Δ is greater than 45°, use type 2.
6. See Std. Detail 215 for connection to C.M.P. main.



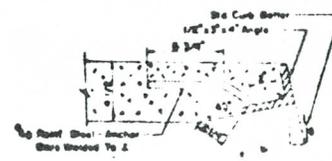


SECTION B-B

SECTION C-C



DOWEL BAR DETAIL



SECTION E-E

GENERAL NOTES

All Structural Steel to be galvanized in accordance with the requirements of the specification for Hot Dip Galvanized Steel (See Part 514, Item 514.04 B 7-B Paint and Painting) Connection Parts may be galvanized in place or the bolts provided the position is compatible with the joint.

Outlet Pipe shall be terminated at final slope and length before concrete is poured. Face of curb shall be finished to final smooth surface and shall slope from the curb to the outlet.

Reinforcing Steel clearance shall be 1" from bottom of slab.

Dimensions:
 1) Depth of depression (see detail 2'-3")
 2) 3'-0" x 3'-0" or less
 3) 3'-0" x 3'-0" or less than 3'-0" x 3'-0" shall be design rounded
 4) 3'-0" x 3'-0" or less than 3'-0" x 3'-0" shall be design rounded
 5) For catch basins 7' or more width as specified on plan.

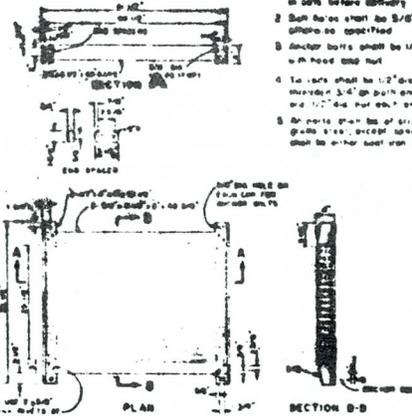
NOTES FOR LOCAL DEPRESSION

Local depression to be constructed only when specified on plan.
 Concrete in local depression shall be not less than 8".
 Curb faces on both sides, opening and outlet shall be flat to final finished curb face plus 1/4" or as otherwise specified.

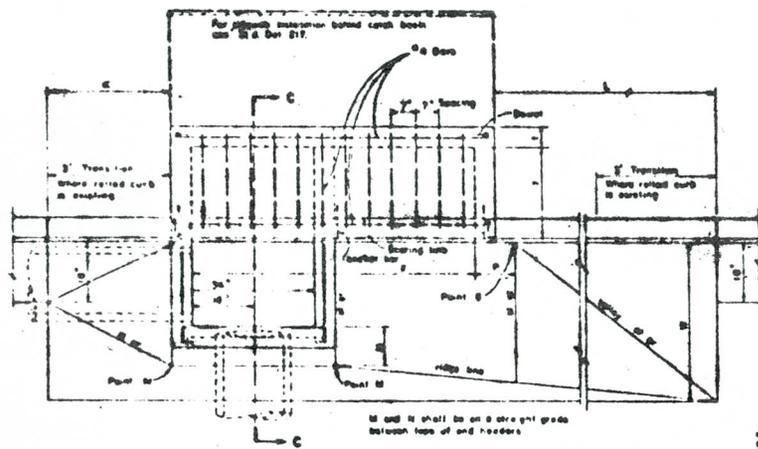
Dimensions for local depression:
 1) 3'-0" unless otherwise specified
 2) 3'-0" unless otherwise specified
 3) 3'-0" unless otherwise specified
 4) 3'-0" unless otherwise specified
 5) 3'-0" unless otherwise specified
 Elevations of the outlet ends of local depression shall be the same as the elevations of the finished surface.

NOTES FOR FRAME & GRATE

- Frame may be riveted to existing frame. Grating shall be tested to accuracy of fit. It shall be stored in curb before delivery.
- Butt faces shall be 3/8" dia unless otherwise specified.
- Anchor bolts shall be 1/2" dia x 6" with head and nut.
- Tees shall be 1/2" dia x 25 S&W rounded 3/4" on both ends. Use the 1/2" dia part only.
- Grates shall be of structural grade steel, except for 3/8" which shall be either cast iron or steel.



FRAME AND GRATE DETAIL



PLAN

7' CURB OPENING CATCH BASIN WITH LOCAL DEPRESSION TYPE 'D'

REV. 3-72
 NEW 10-1-66

STANDARD DETAIL 218
 CITY OF PHOENIX
 ENGINEERING DEPARTMENT
 CATCH BASIN TYPE 'D'

APPROVED: *[Signature]* 10/1/66

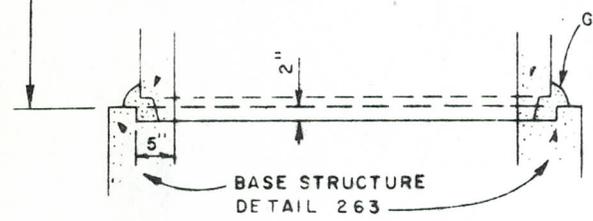
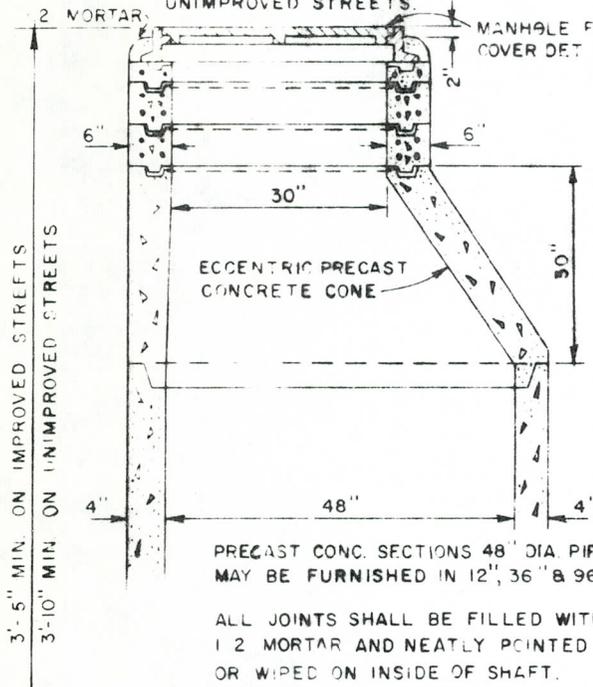
STANDARD DETAIL 260

CITY OF PHOENIX
ENGINEERING DEPARTMENT

STORM DRAIN MANHOLE SHAFT

APPROVED _____ DATE _____
CITY ENGINEER

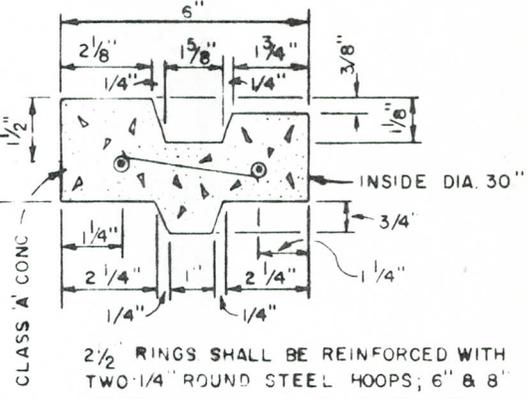
UNLESS OTHERWISE SHOWN ON PLANS
USE 2-2 1/2" PRECAST CONCRETE RINGS ON
IMPROVED STREETS & USE 4-2 1/2" RINGS ON
UNIMPROVED STREETS.



VERTICAL SECTION OF ECCENTRIC MANHOLE SHAFT

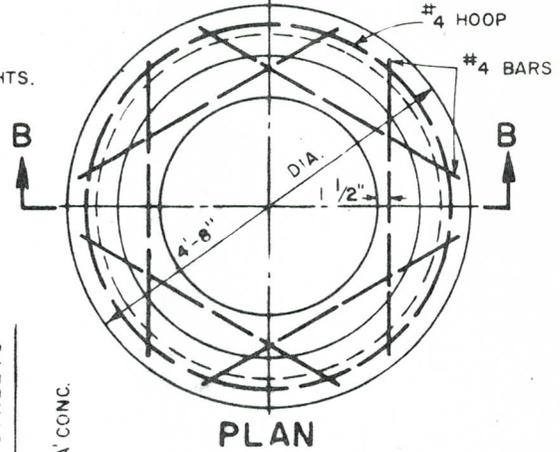
NOTES:
PRECAST CONC. CONES & SECTIONS
TO BE ASTM C-76 CLASS II WALL A

UNLESS OTHERWISE SPECIFIED BRICK
MAY BE USED IN LIEU OF CONCRETE
ADJUSTING RINGS.

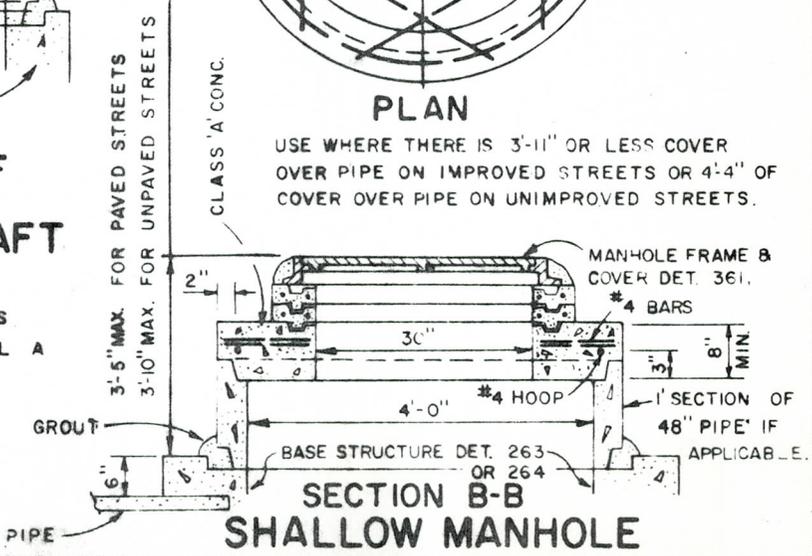


2 1/2" RINGS SHALL BE REINFORCED WITH
TWO 1/4" ROUND STEEL HOOPS; 6" & 8"
RINGS SHALL BE REINFORCED WITH
FOUR 1/4" HOOPS, TIED WITH NO 14 A.S. & W
GAUGE WIRE 8" O.C.

REINFORCED CONC. RING



USE WHERE THERE IS 3'-11" OR LESS COVER
OVER PIPE ON IMPROVED STREETS OR 4'-4" OF
COVER OVER PIPE ON UNIMPROVED STREETS.



STANDARD DETAIL 263

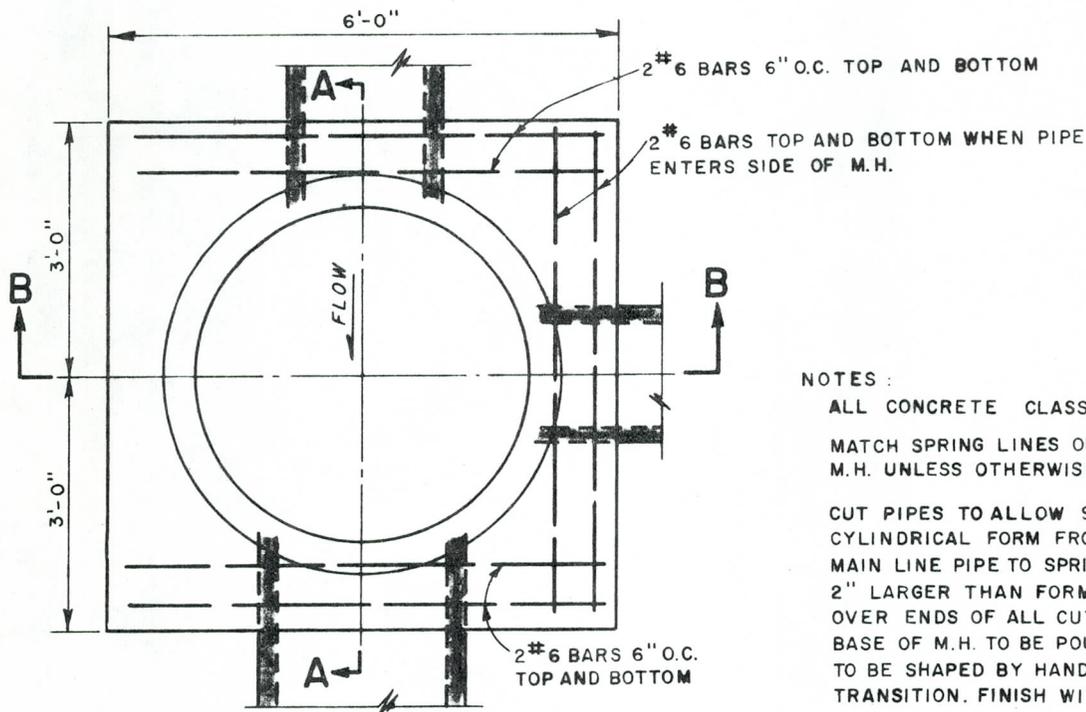
CITY OF PHOENIX

PUBLIC WORKS DEPARTMENT

DIVISION OF ENGINEERING

STORM DRAIN MANHOLE BASE NO. 1, 48" DIA. PIPE & UNDER

APPROVED: *R.C. Estabrook* 3/31/66
 CITY ENGINEER DATE



PLAN

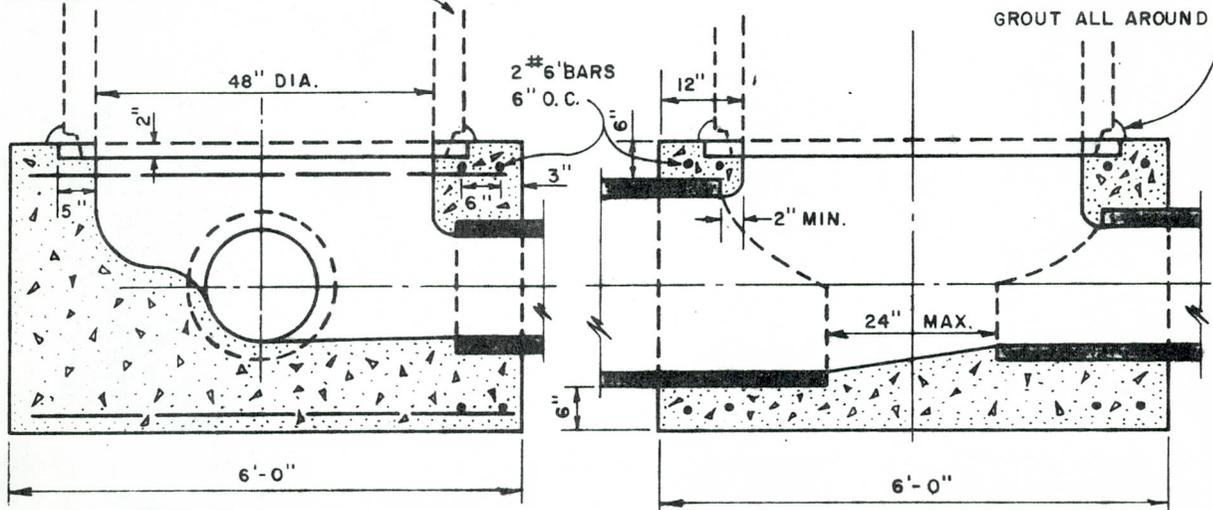
NOTES :

ALL CONCRETE CLASS 'A'.

MATCH SPRING LINES OF PIPES ENTERING M.H. UNLESS OTHERWISE NOTED.

CUT PIPES TO ALLOW SETTING OF 4' DIA. CYLINDRICAL FORM FROM 6" ABOVE MAIN LINE PIPE TO SPRING LINE. CUT PIPE 2" LARGER THAN FORM TO ALLOW 2" CONC. OVER ENDS OF ALL CUT PIPE. INVERT AND BASE OF M.H. TO BE POURED AND INVERT TO BE SHAPED BY HAND TO MAKE SMOOTH TRANSITION. FINISH WITH RUBBER FLOAT. CENTER M.H. ON PIPE JOINT WHERE PIPE CHANGES SIZE, LEAVE GAP. 12" MIN., 24" MAX.

STORM DRAIN M.H. SHAFT DETAIL 260



SECTION B-B

SECTION A-A

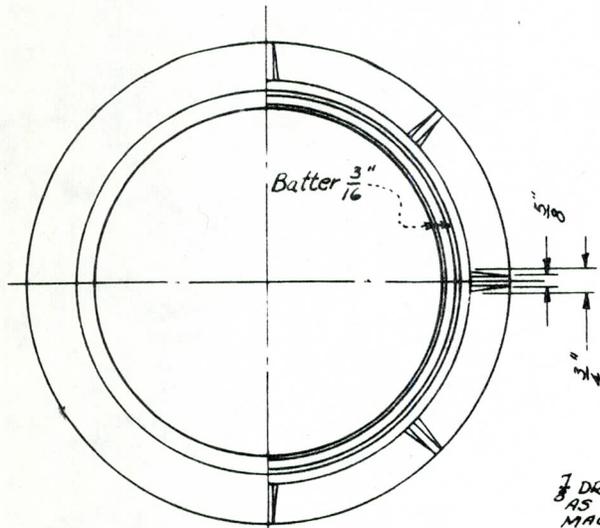
NEW JUNE 1966

STANDARD DETAIL 360

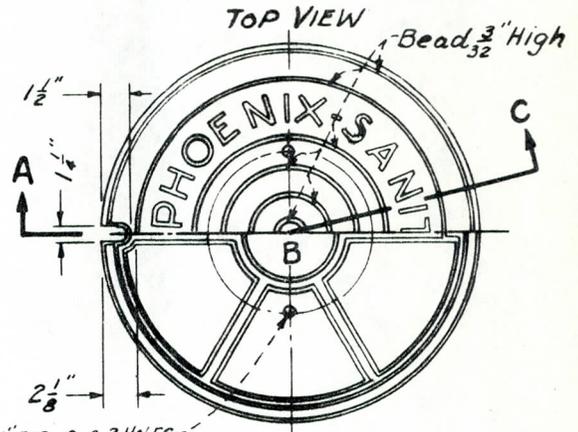
CITY OF PHOENIX
PUBLIC WORKS DEPARTMENT
DIVISION OF ENGINEERING

24" MANHOLE FRAME & COVER

APPROVED: Sam Tucker 12/24/60 DATE CITY ENGINEER
APPROVED: Dario L. ... 7-25-60 DATE WATER & SEWERS DIRECTOR



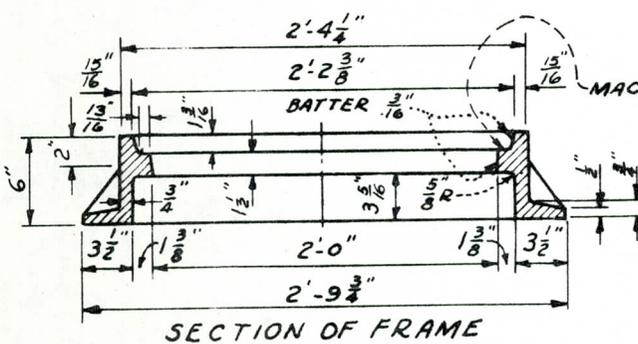
BOTTOM VIEW TOP VIEW
APPROXIMATE WEIGHT - 205 LBS.



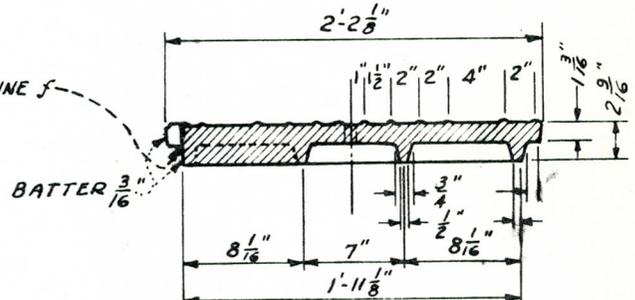
7 DRILL, 11" DIA. O.C. 2 HOLES -
3 AS NECESSARY FOR
MACHINING

BOTTOM VIEW
APPROXIMATE WEIGHT - 200 LBS.

Castings to Conform to Standard Specification 954



SECTION OF FRAME



SECTION "A-B-C" OF COVER

LETTERING ON MANHOLE COVER TO BE AS FOLLOWS: "PHOENIX STORM SEWER" "PHOENIX SANITARY SEWER" "PHOENIX WATER" OR AS DIRECTED. - TOTAL WIDTH OF INDIVIDUAL LETTERS TO BE SUCH THAT LETTERS AND WORDS ARE EQUALLY SPACED AND BALANCED TO FORM COMPLETE CIRCLE WITH SPACERS BEFORE AND AFTER THE WORD PHOENIX AS SHOWN ABOVE. LETTERS TO BE 2" IN HEIGHT AND RAISED 1/8" ABOVE LEVEL OF COVER. TYPE OF LETTERS TO BE SUBMITTED FOR APPROVAL.

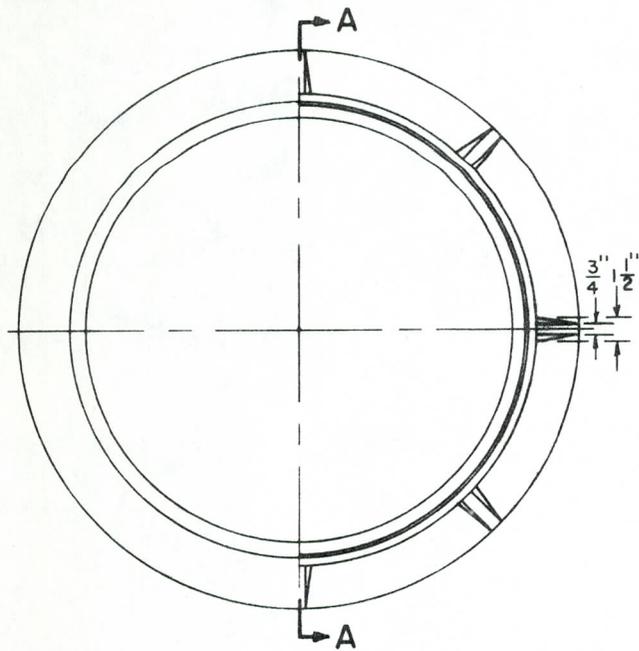
REV. E.J.L. 6-60
DR. BY E.J.L. 8-25-58

STANDARD DETAIL 361

CITY OF PHOENIX
PUBLIC WORKS DEPARTMENT
DIVISION OF ENGINEERING

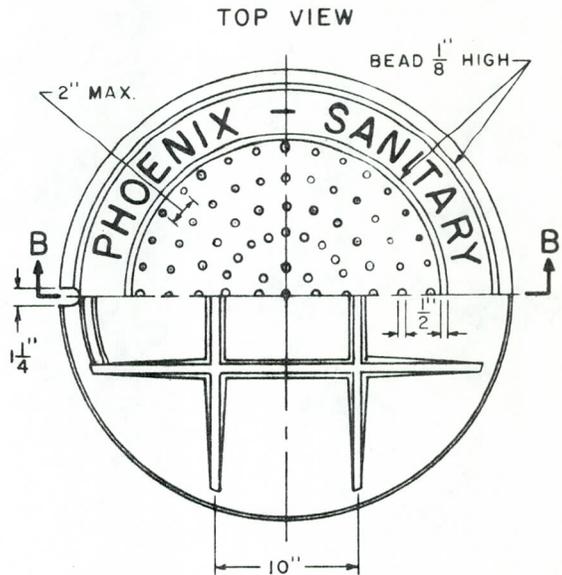
30" MANHOLE FRAME & COVER

APPROVED A.C. Esterbrook Feb 3, 1966 APPROVED Dario Travani Feb 1, 1966
CITY ENGINEER DATE WATER & SEWERS DIRECTOR DATE



BOTTOM VIEW TOP VIEW
FRAME

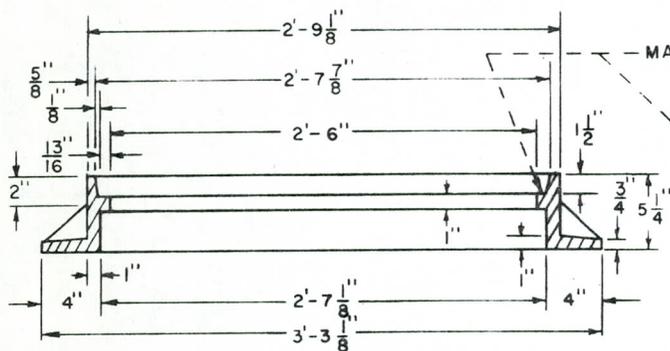
APPROXIMATE WEIGHT - 224 LBS.



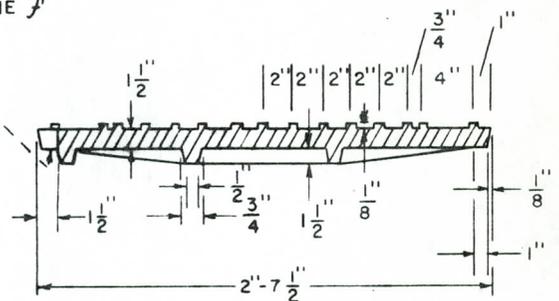
TOP VIEW
BOTTOM VIEW
COVER

APPROXIMATE WEIGHT - 324 LBS.

SEE STANDARD SPEC. 954 FOR CASTINGS



SECTION A-A



SECTION B-B

LETTERING ON MANHOLE COVER TO BE AS FOLLOWS "PHOENIX STORM SEWER," "PHOENIX SANITARY SEWER," "PHOENIX WATER" OR AS DIRECTED. THE TOTAL WIDTH OF INDIVIDUAL LETTERS TO BE SUCH THAT LETTERS AND WORDS ARE EQUALLY SPACED AND BALANCED TO FORM A COMPLETE CIRCLE WITH SPACERS BEFORE AND AFTER THE WORD PHOENIX AS SHOWN. ABOVE LETTERS TO BE 2" IN HEIGHT AND RAISED 1/8" ABOVE LEVEL OF COVER. TYPE OF LETTERS TO BE SUBMITTED FOR APPROVAL. WEIGHT OF CASTINGS SHALL BE NO MORE THAN 2% LESS THAN THE APPROXIMATE WEIGHT SPECIFIED.

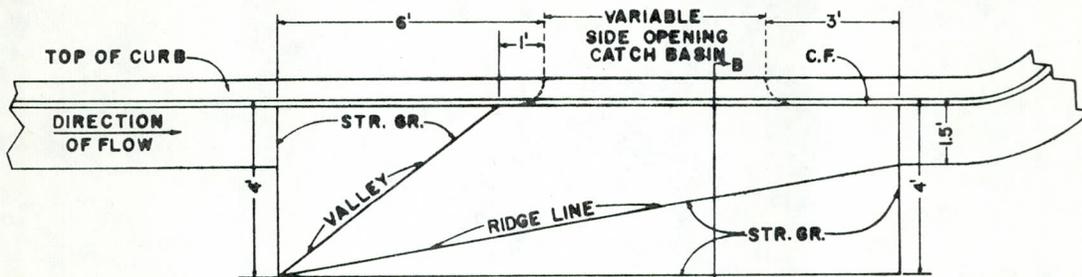
STANDARD DETAIL No. 248

CITY OF TEMPE
DEPARTMENT OF PUBLIC WORKS
DIVISION OF ENGINEERING

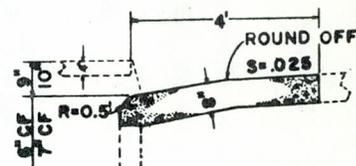
LOCAL DEPRESSION FOR SIDE OPENING BASIN

APPROVED [Signature] 9/20/74
CITY ENGINEER

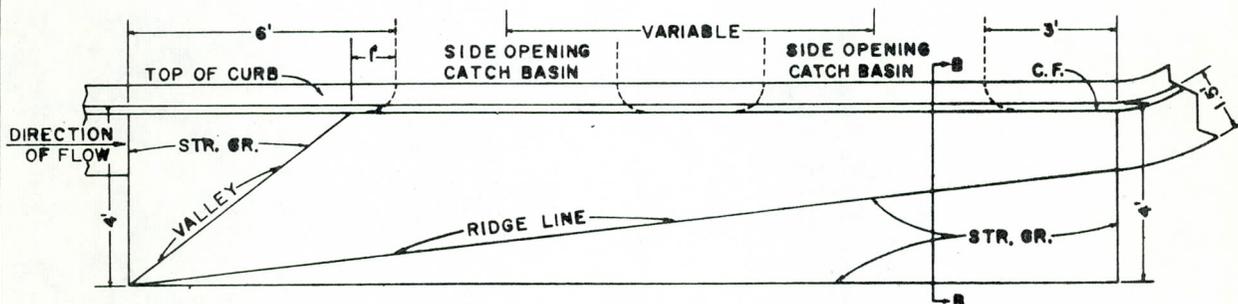
CHECKED LMQ DRAWN TCL 8-13-70



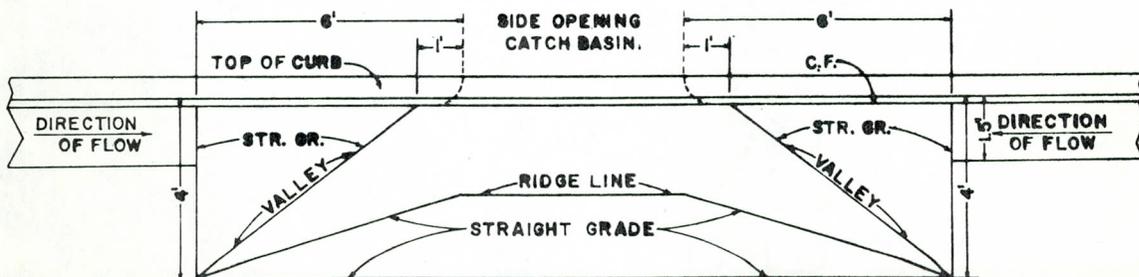
SINGLE CATCH BASIN



SECTION B B



MULTIPLE CATCH BASINS



SUMP CATCH BASIN

SECTION 9A
SELECT-MATERIAL SUBBASE COURSE

Index

- | | |
|----------------------------|---|
| 1. Applicable Publications | 8. Grade Control |
| 2. Definitions | 9. Placing and Compacting Select Material |
| 3. Sampling and Testing | 10. Edges of Subbase Course |
| 4. Equipment | 11. Smoothness Tests |
| 5. Operation of Pits | 12. Thickness Control |
| 6. Weather Limitations | 13. Maintenance |
| 7. Preparation of Subgrade | |

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

1.1 American Society for Testing and Materials (ASTM), publications.

C 117-69(R 1974)	Materials Finer than No. 200 Sieve in Mineral Aggregates by Washing
C 136-71	Sieve or Screen Analysis of Fine and Coarse Aggregates
D 75-71	Sampling Aggregates
D 1556-64	Density of Soil in Place by the Sand-Cone Method
D 1557-70	Moisture-Density Relations of Soils Using 10-lb (4.5-kg) Rammer and an 18-in. (457-mm) Drop

2. DEFINITIONS.

2.1 Select Materials shall consist of selected soil or other materials from field excavation, stockpiles, or other sources. Select material shall be free from lumps, balls of clay, organic and other objectionable matter. The maximum size of the material shall not exceed 3 inches. Not more than 25 percent by weight shall pass the No. 200 sieve. The portion of material passing the No. 40 sieve shall have a liquid limit less than 35 and a plasticity index less than 12.

3. SAMPLING AND TESTING shall be the responsibility of the Contractor. Sampling and testing shall be performed by an approved commercial testing laboratory, or by the Contractor subject to approval. Tests shall be performed in sufficient number to insure that materials meet specified requirements. Copies of test results shall be furnished to Contracting Officer.

3.1 Samples for material gradation, liquid-limit tests, and plastic-limit tests shall be taken in conformance with ASTM D 75. Samples for density tests shall be taken as specified in ASTM D 1556, after the material has been placed and compacted. When deemed necessary, the sampling will be observed by the Contracting Officer.

3.2 Tests.

3.2.1 Sieve Analyses shall be made in conformance with ASTM C 117 and C 136. Sieves shall conform to ASTM E 11.

3.2.2 Liquid Limit shall be determined in accordance with ASTM D 423.

3.2.3 Plasticity Index shall be determined in accordance with ASTM D 424.

3.2.4 Density Tests. Density shall be measured in the field in accordance with ASTM D 1556. Maximum density at optimum moisture will be determined in the laboratory in accordance with ASTM D 1557, Method D.

3.3 Approval of Material. The source of the material shall be selected well in advance of the time the material will be required in the work. Tentative approval of the source will be based on an inspection by the Contracting Officer. Tentative approval of material will be based on tests of samples for the specific job. Final approval will be based on tests made on samples of material taken from the completed and compacted select-material subbase-course layer. The completed select-material subbase-course layer is defined as one that is ready for the next layer.

4. EQUIPMENT. All plant, equipment, tools, and machines used in the performance of the work will be subject to approval before the work is started and shall be maintained in satisfactory working condition at all times.
- 4.1 Rollers.
- 4.1.1 Steel-Wheeled Rollers shall be self-propelled, 3-wheel type, weighing not less than 10 tons, and having a minimum weight of 300 pounds per inch width of rear wheel. The wheels shall be equipped with adjustable scrapers. The use of vibratory rollers is optional.
- 4.1.2 Light Pneumatic-Tired Rollers shall have 2 axles on which are mounted not less than 9 pneumatic-tired wheels in such manner that the rear group of tires will not follow in the tracks of the forward group. Axles shall be mounted in a rigid frame provided with a loading platform or body suitable for ballast loading. Tires shall be uniformly inflated. Tractor or other towing equipment shall also be pneumatic-tired.
- 4.1.3 Tamping Rollers, sheepfoot type, shall consist of one or more units. Each unit shall consist of a watertight cylindrical drum not less than 48 inches in length, surmounted by metal studs with tamping feet projecting not less than 7 inches from the surface of drum, and spaced 6 to 10 inches apart, measured diagonally from center to center. The tamping feet shall be an approved type suitable for compacting select-material subbase courses. Each unit shall be equipped with a suitable device for cleaning the tamping feet. The rolling units of multitype tamping rollers shall be pivoted on the main frame in a manner that will permit the units to adapt themselves to uneven ground surfaces and to rotate independently. When fully loaded, the rollers shall produce a pressure of at least 300 psi on the combined areas of the tamping feet in contact with the ground.
- 4.2 Blade Graders shall have a wheel base of not less than 15 feet, a blade of not less than 10 feet, and shall be self-propelled.
- 4.3 Sprinkling Equipment shall consist of tank trucks, pressure distributors, or other equipment designed to apply water uniformly and at controlled quantities to variable widths of surface.
- 4.4 Hauling Equipment shall consist of pneumatic-tired vehicles having dump bodies suitable for dumping materials in windrows or spreading machines.
- 4.5 Tampers shall be an approved mechanical type, operated by pneumatic pressure or internal combustion. Tampers shall have sufficient weight and striking power to produce the compaction required in paragraph: PLACING AND COMPACTING SELECT MATERIAL.
- 4.6 Miscellaneous Equipment. Tractors, plows, and other equipment shall be of approved types, suitable for constructing select-material courses.
5. OPERATION OF PITS. All clearing, stripping, and excavating work involved in the opening or operation of pits shall be performed by the Contractor. Pits shall be opened to expose vertical faces of the deposit for suitable working depths. 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 in the deposit shall be wasted as directed. The methods of operating pits may be changed or modified by the Contracting Officer when necessary to obtain material conforming to specified requirements. Upon completion of work, pits shall be left in an approved condition that is also in agreement with local laws and authorities.
6. WEATHER LIMITATIONS. Select-material subbase courses shall be constructed when the atmospheric temperature is above 35 degrees F. When the temperature falls below 35 degrees F., all areas of completed select-material subbase course shall be protected by approved methods against detrimental effects of freezing. Areas of completed select-material subbase course damaged by freezing, rainfall, or other weather conditions shall be corrected to meet specified requirements.
7. PREPARATION OF SUBGRADE. Prior to constructing the select-material subbase course, the previously constructed subgrade shall be cleaned of all foreign substances. Surface of subgrade shall meet specified compaction and surface tolerances. Subgrade for select-material subbase course shall conform to requirements of section: FILLS AND SUBGRADE PREPARATION. Ruts or soft, yielding spots that may appear in subgrade, areas having inadequate compaction, and deviations of the surface from requirements set forth therein shall be corrected by loosening, removing, and by adding approved material, reshaping to line and grade, and recompacting to specified density requirements.
8. GRADE CONTROL. Finished and completed subbase course shall conform to lines, grades, cross sections, and dimensions shown. The lines and grades indicated shall be maintained by means of line and grade stakes placed by Contractor at the worksite in accordance with the SPECIAL PROVISIONS.
9. PLACING AND COMPACTING SELECT MATERIAL. The select material shall be hauled to the area to be paved in approved pneumatic-tired vehicles and dumped or spread on the subgrade. Material shall be leveled with blade graders to a uniform thickness so that the layer, after compaction, will not exceed 6 inches in thickness. Water shall be added by sprinkling and mixing or reduced by aeration as necessary. Mixing and aeration shall be accomplished with mechanical mixers, plows, graders, or other approved equipment until the water content is at

optimum or at the percentage directed. Mixing shall be continued until a uniform distribution of water is obtained. The layer shall be compacted with sheepsfoot rollers, pneumatic-tired rollers, or other approved equipment until the layer is compacted through the full depth to at least 95 percent maximum density. Methods of determining the maximum density and the density of compacted material are specified in paragraph: SAMPLING AND TESTING. In places inaccessible to rolling equipment, compaction to the degree specified shall be accomplished with tampers. Field densities will be measured on the total sample. The surface shall be finished by blading and rolling with steel-wheeled rollers, pneumatic-tired rollers, or combinations thereof. Adjustments shall be made in placing, spreading, rolling, or finishing procedures as may be directed to obtain uniform layer thickness and true grades, to minimize segregation and degradation where pertinent, to reduce or increase water content, and to insure a satisfactory select-material course. Materials found unsatisfactory shall be replaced with satisfactory material or reworked to produce a satisfactory material.

10. EDGES OF SUBBASE COURSE. Earth or other approved material shall be placed along the edges of the select-material subbase course in sufficient quantity to allow at least one foot of the shoulder to be rolled and compacted simultaneously with the rolling and compacting of each subbase-course layer.

11. SMOOTHNESS TESTS. The surface shall show no deviations in excess of 3/8 inch when tested with a 10-foot straightedge applied parallel with and at right angles to centerline of area to be paved. Deviations exceeding this amount shall be corrected by loosening, adding or removing material, reshaping, and compacting as directed.

12. THICKNESS CONTROL. The completed thickness of the subbase course shall be within 1/2 inch of the thickness shown. The thickness of the select-material subbase course shall be measured at intervals providing at least one depth measurement for each 500 square yards of subbase course. The depth measurement shall be made by test holes at least 3 inches in diameter. Where the measured thickness of the select-material subbase course is more than 1/2 inch deficient, the Contractor shall correct such areas by scarifying, adding mixture of proper gradation, reblading, and recompacting as directed. Where the measured thickness of the select-material subbase course is 1/2 inch thicker than shown, the course will be considered as conforming to the specified thickness requirements plus 1/2 inch. The average job thickness shall be the average of the job measurements as specified above but within 1/4 inch of the thickness shown.

13. MAINTENANCE. The finished select-material subbase course shall be maintained in a satisfactory condition until accepted.

* * * * *

SECTION 9B
AGGREGATE BASE

Index

- | | |
|--------------------------------------|-----------------------------------|
| 1. Applicable Publications | 9. Mixing and Placing Materials |
| 2. Materials | 10. Layer Thickness |
| 3. Sampling and Testing | 11. Compaction |
| 4. Equipment | 12. Edges of Base Course |
| 5. Operation of Pits or Quarries | 13. Smoothness Test |
| 6. Weather Limitations | 14. Thickness Control |
| 7. Preparation of Underlying Surface | 15. Maintenance |
| 8. Grade Control | 16. Waybills and Delivery Tickets |

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

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

C 117-69	Materials Finer than No. 200 (75-m)
C 127-73	Sieve in Mineral Aggregates by Washing
C 128-73	Specific Gravity and Absorption of
C 131-69	Coarse Aggregate
C 136-71	Specific Gravity and Absorption of Fine Aggregate
D 75-71	Resistance to Abrasion of Small Size Coarse
D 422-63	Aggregate by Use of the Los Angeles Machine
D 423-66	Sieve or Screen Analysis of Fine and
D 424-59	Coarse Aggregates
D 1556-64	Sampling Aggregates
D 1557-70	Particle-Size Analysis of Soils
E 11-61	Liquid Limit of Soils
	Plastic Limit and Plasticity Index of Soils
	Density of Soil In Place by the
	Sand-Cone Method
	Moisture-Density Relations of Soils,
	Using 10-lb. (4.5-kg) Rammer and
	18-in. (457-mm) Drop
	Sieves for Testing Purposes

2. 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.

2.1 Coarse Aggregate conforming to the requirements specified above shall have a percentage of wear not to exceed 40 percent after 500 revolutions. Coarse aggregate shall consist of angular fragments reasonably uniform in density and quality. The amount of flat and elongated particles shall not exceed 30 percent. A flat particle is one having a ratio of width to thickness greater than 3, and an elongated particle is one having a ratio of length to width greater than 3.

2.1.2 Coarse aggregate retained on each sieve specified shall contain at least 50 percent by weight of crushed pieces having two or more freshly fractured faces with the area of each face being at least equal to 75 percent of the smallest midsectional area of the piece. When two fractures are adjacent, the angle between the planes of the fractures must be at least 30 degrees to count as two fractured faces.

2.2 Binder Material shall consist of screenings, angular sand, soil, or other finely divided mineral matter processed or naturally combined with the coarse aggregate. Liquid-limit and plasticity-index requirements stated herein shall apply to any component that is blended to meet the required gradation and shall also apply to the completed course. The portion of any component or of the completed course passing the No. 40 sieve shall be either nonplastic or shall have a liquid limit not greater than 25 and a plasticity index not greater than 3.

2.3 Gradation requirements specified herein shall apply to the completed base course, and it shall be the responsibility of the Contractor to obtain materials that will meet the gradation requirements after mixing, placing, compacting, and other operations. The aggregates shall have a maximum size of one inch and shall be continuously graded within the limits specified below:

Sieve Designation	Percentage by Weight Passing Square-Mesh Sieve†
1 inch	100
3/4 inch	90-100
1/4 inch	38-70
No. 200	3-12

†The values are based on aggregates of uniform specific gravity, and the percentages passing the various sieves are subject to appropriate correction by the Contracting Officer when aggregates of varying specific gravities are used.

3. SAMPLING AND TESTING shall be by and at the expense of the Contractor.

3.1 Samples shall be the size required and shall be taken by the Contractor. Copies of test results shall be submitted for approval 30 days prior to starting the work, and thereafter at regular intervals during production as specified hereinafter. These samples shall be obtained at the source, from test pits, borings, trucks, stockpiles, or from other designated locations. Samples for material gradation, liquid-limit determination, and plasticity-index tests shall be taken in conformance with ASTM D 75. After the material has been placed and compacted, samples for density tests shall be taken as specified in ASTM D 1556, and additional samples for gradation, liquid-limit, and plasticity-index tests shall be taken by an appropriate method. Where deemed necessary, the sampling will be supervised by the Contracting Officer. The Contractor shall arrange his work so that sampling and testing may be performed without interruption.

3.2 Tests.

3.2.1 Aggregate Gradation. Aggregate gradation shall be determined in accordance with ASTM C 117, C 127, C 128, C 136, and D 422. Sieves shall conform to ASTM E 11.

3.2.2 Liquid Limit shall be determined in accordance with ASTM D 423.

3.2.3 Plasticity Index shall be determined in accordance with ASTM D 424.

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

3.2.5 Field-In Place Density shall be determined in accordance with ASTM D 1556. Moisture-density relations shall be established in the laboratory in accordance with ASTM D 1557, method D.

3.3 Frequency of Testing. 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 at the start of production and one test at the mid point of production and the results shall be submitted. Deviations from specification requirements shall be corrected immediately upon discovery. After the material has been placed and compacted, one field density test for each 1,000 square yards or fraction thereof of finished base course and one additional gradation, liquid-limit, and plasticity index test for each 3,000 square yards of base course or fraction thereof shall be performed. Maximum-density moisture relations shall be established for each 1,000 square yards of base course material. The location of the after-placement tests shall be as directed. One copy of density data (less dry weight determinations) shall be provided on the day each test is taken. The completed test report shall be provided with the Contractor Quality Control Report on the following work day. Results of all tests made shall be submitted for approval on a daily basis and subsequent paving operations shall not commence until final approval has been obtained. Failure of any test shall be reported verbally, by the most expeditious means and followed promptly by written report. Contractor field operations shall immediately reflect corrective measures. For every failing test, retesting after completion of corrective measures have been taken will be required.

3.4 Approval of Material. The source of the material shall be selected well in advance of the time materials will be required in the work. Tentative approval of the preliminary reports submitted by the Contractor and the source will be based on an inspection by the Contracting Officer. Tentative approval of the materials will be based on test samples as specified herein. Final approval of both the source and the materials will be based on specified tests performed on samples taken from the completed and compacted base course.

4. EQUIPMENT. All plant equipment, 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.

4.1 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.

4.2 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.

4.3 Compaction Equipment.

4.3.1 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.

4.3.2 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.

4.3.3 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.

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

4.5 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.

4.6 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.

4.7 Miscellaneous Equipment. Other equipment used on the job shall be of approved types suitable for constructing aggregate base course.

5. OPERATION OF PITS OR QUARRIES. All work involved in clearing, stripping, and excavating in opening or operation of pits or quarries shall be performed by the contractor. Pits or quarries shall be opened so as to expose the vertical faces of the deposit to depths suitable for working. Materials excavated from pits shall be obtained in successive vertical cuts extending through all exposed strata. All pockets or strata of unsuitable materials overlying or occurring within the deposit shall be wasted as directed. The methods of operating the pits or quarries and the processing and blending of the material may be changed or modified by the Contracting Officer without adjustments in the contract prices when such action is necessary to obtain material conforming to the specified requirements. Quarries shall be conditioned in agreement with the local laws or authorities.

6. WEATHER LIMITATIONS. Aggregate base courses shall not be constructed when the atmospheric temperature is below 35 degrees F. When the temperature falls below 35 degrees F., it shall be the responsibility of the Contractor to protect by approved method or methods, all areas of the completed aggregate base course against any detrimental effects of freezing. Any areas of completed 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.

7. PREPARATION OF UNDERLYING SURFACE. Prior to constructing the aggregate base course, the previously constructed subgrade and subbase course shall be cleaned of all foreign substances. The surface of the subgrade and subbase course shall be inspected by the Contractor for adequate compaction and surface tolerances. The subbase shall conform to section: SELECT MATERIAL SUBBASE. Ruts or soft, yielding spots that may appear in the subgrade and subbase course, 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 and subbase shall not be disturbed by traffic or other operations and shall be maintained by the Contractor in a satisfactory condition until the base course is placed.

8. **GRADE CONTROL.** During construction the lines and grades including crown and cross slope indicated for the aggregate base course shall be maintained by means of line and grade stakes placed by the Contractor at the worksite in accordance with SPECIAL PROVISIONS of these specifications.

9. **MIXING AND PLACING MATERIALS.** The placing procedures apply to each layer of the 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, reduce or accelerate loss or gain of water, and to insure a satisfactory aggregate base course. 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 conform with these specifications. 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 and 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.

10. **LAYER THICKNESS.** The compacted thickness of the aggregate base course shall be as indicated. When a compacted layer of 6 inches or less is indicated, the material shall be placed in a single layer.

11. **COMPACTION.** Each layer of the 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 maximum density. The Contractor shall make such adjustments in rolling or finishing procedures as may be required to obtain true grades, to minimize segregation and degradation, to reduce or accelerate loss or gain of water, and to insure a satisfactory aggregate base course. Unsatisfactory materials shall be reworked to produce a satisfactory material.

12. **EDGES OF BASE COURSE.** Where the course is not placed between curbs or similar construction, approved material shall be placed along the edges of the aggregate base course in such quantities as will compact to the thickness of the course being considered, or, when the course is being constructed in two layers, to the thickness of each layer of the course, allowing in each operation at least a 1-foot width of the shoulder to be rolled and compacted simultaneously with the rolling and compacting of each layer of the base course, as directed.

13. **SMOOTHNESS TEST.** The surface of each layer shall not show any deviations in excess of 3/8 inch when tested with either a 10- or 12-foot straightedge applied both parallel with and at right angles to the centerline of the paved area. Any deviation in excess of this amount shall be corrected by the Contractor by removing material and replacing with new material, or by reworking existing material and compacting, as directed. The Contractor shall perform such straightedge testing as is required to demonstrate compliance with the smoothness requirements.

14. **THICKNESS CONTROL.** The completed thicknesses of the base course shall be within 1/4 inch, plus or minus, of the thickness indicated. Thickness test shall be made and recorded by the Contractor. The thickness of the base course shall be measured at intervals in such manner that there will be a thickness measurement for at least each 500 square yards of base course. The thickness measurement shall be made by test holes at least 3 inches in diameter through the base course. Where the measured thickness of the base course is more than 1/4 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 1/2 inch. The average job thickness shall be the average of the job measurements determined as specified above, but shall be within 1/4 inch of the thickness indicated.

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

16. **WAYBILLS AND DELIVERY TICKETS.** Copies of waybills or delivery tickets shall be attached to the Daily Contractor Quality Control Report for the day of delivery. Before the final statement is allowed, the Contractor shall file with the Contracting Officer waybills and/or certified delivery tickets for all aggregates actually used in the construction covered by the contract.

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SECTION 9D
PRIME COAT AND WEED KILLER

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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 2027-72	Liquid Asphalt (Medium-Curing Type)

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

T 102-68	Spot Test of Asphaltic Materials
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2. **BITUMINOUS MATERIAL.** The bituminous material prime coat shall be liquid asphalt, conforming to ASTM D 2027, designation MC-70 with the additional requirement that the residue from distillation to 680 degrees F. shall show a negative spot test when submitted to AASHO T 102, using the standard naphtha specified therein.

3. **SAMPLING AND TESTING.**

3.2 Sampling: Samples of bituminous material, unless otherwise specified, shall be in accordance with ASTM D 140.

3.2 Testing shall be the responsibility of the Contractor. Testing shall be performed by an acceptable commercial testing laboratory or by the Contractor on approval of the Contracting Officer. Materials shall be tested to establish compliance with the specified requirements. Certificate of compliance, with specified requirements shall be submitted.

3.3 Certified Laboratory Test Reports: Before delivery of bituminous materials, certified copies, in triplicate, of the tests specified herein and in referenced publications shall be submitted to and approved by the Contracting Officer. The testing shall have been performed by an independent laboratory approved by the Contracting Officer.

4. **QUANTITY TO BE APPLIED.** Bituminous material for the prime coat shall be applied in quantities of not less than 0.15 gallon nor more than 0.4 gallon per square yard of the surface to be primed. Application of prime coat shall be divided, if necessary, into 2 applications to avoid flowing off the surface. The exact quantities which may be varied to meet field conditions shall be determined by the Contractor and approved.

5. **WEATHER LIMITATIONS.** The prime coat shall be applied only when the prepared surface is dry or contains moisture not exceeding quantity to permit uniform distribution and desired penetrations; and the temperature has not been below 35 degrees F. for 12 hours immediately prior to application. Prime coat shall not be applied when the atmospheric temperature in the shade is below 50 degrees F.

6. **EQUIPMENT.**

6.1 General. All equipment, tools, and machines, used in the performance of the work required by this section shall be subject to the approval of the Contracting Officer and shall be maintained in satisfactory working condition.

6.2 Bituminous Distributor shall have pneumatic tires of such width and number that the load produced on the base surface shall not exceed 650 pounds per inch of tire width. The distributor shall be designed and equipped to distribute the bituminous material uniformly at even heat on variable widths of surface at readily determined and controlled rates from 0.05 to 2.0 gallons per square yard with a pressure range of 25 to 75 pounds per square inch and with an allowable variation not to exceed 5% from any specified rate. Distributor equipment shall include a separate power unit for the bitumen pump, full circulation spray bars, tachometer, pressure gage, volume measuring

devices, adequate heaters for heating the materials to the proper application temperature, a thermometer to show the temperature of the tank contents, and a hose attachment suitable for applying bituminous material to spots unavoidably missed by the distributor. The distributor shall be equipped to circulate and agitate the bituminous material during the heating process.

6.3 Heating Equipment for Storage Tanks. Equipment for heating bituminous material shall consist of steam coils and equipment for producing steam, so designed that steam cannot get into the material. 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 read at all times.

6.4 Brooms and Blowers shall be of the power type and shall be suitable for cleaning prepared surfaces.

7. PREPARATION OF SURFACE. Immediately before applying the weed killer and prime coat, all loose material, dirt, clay or other objectionable substance 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.

8. WEED KILLER. A chemical weed killer shall be applied to subgrade surfaces of top of levees, berms adjacent to channel walls, and access ramps 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 (B_2O_3) 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.

9. APPLICATION OF BITUMINOUS MATERIAL. Immediately following the preparation of the surface, the bituminous material shall be applied by means of a bituminous distributor. The bituminous material shall be applied at 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 to obtain satisfactory results at the junction of the previous and subsequent applications, building paper shall be spread on the surface of applied material for a sufficient distance back from the ends of each application so that flow from the sprays may be started and stopped on the paper, and all sprayers operate at full force on the surface to be treated. Immediately after the application, building paper shall be removed and destroyed. Spots unavoidably missed by the distributor shall be properly treated with bituminous material. Following the application of bituminous material, the surface shall be allowed to dry without being disturbed for a period of not less than 48 hours, or longer as necessary to attain penetration into the foundation course and evaporation of the volatiles from prime material. The Contractor shall furnish and spread enough approved sand to blot up effectively and cure any excess bituminous material. The Contractor shall maintain the primed surface until the succeeding layer of pavement is placed by protecting the surface against damage and by repairing and repriming deficient areas at no additional cost to the Government. No smoking, fires, or flames other than heaters that are a part of the equipment shall be permitted within heating, distributing or transferring operations of bituminous material.

9.1 Application temperature shall be as directed and shall provide an application viscosity between 40 and 120 centistokes, kinematic, or 20 and 60 seconds, Saybolt-Furol. Application temperatures shall be between 120-190 degrees F. except that appropriate changes should be made when the range of viscosity is raised or lowered. The temperature-viscosity relationship shall be furnished to the Contracting Officer.

10. WAYBILLS AND DELIVERY TICKETS. Copies of waybills or delivery tickets shall be submitted during the progress of the work. Before the final statement is allowed, the Contractor shall file with the Contracting Officer certified waybills and/or certified delivery tickets for all bituminous material actually used in the construction of pavement covered by this section of the specification. The Contractor shall not remove bituminous material from the tank 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 9E

TACK 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 the specification to the extent indicated by the references thereto.

1.2 American Society for Testing and Materials (ASTM) Standard.

D 140-70	Sampling Bituminous Materials
D 977-73	Emulsified Asphalt

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

T 102-74	Spot Test of Asphaltic Materials
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2. BITUMINOUS MATERIAL used for the tack coat shall conform to the following requirements.

2.1 Asphalt Emulsion shall conform to ASTM D 977, Grade SS-1h, with the additional requirement that the base asphalt used in the manufacture of the emulsion shall show a negative spot when tested in accordance with AASHO Standard T 102, using the standard naphtha specified therein.

2.2 Sampling. Samples of bituminous material, unless otherwise specified, shall be in accordance with ASTM D 140.

2.3 Testing shall be the responsibility of the Contractor. Testing shall be performed by an acceptable commercial testing laboratory or by the Contractor on approval of the Contracting Officer. Materials shall be tested to establish compliance with the specified requirements. Certificates of compliance shall be furnished.

3. QUANTITIES TO BE APPLIED. Bituminous material for the tack coat shall be diluted with approximately equal proportions of water and applied at a rate of 0.05 and 0.15 gallon per square yards of diluted material. The exact quantities which may be varied to suit field conditions shall be determined by the Contractor and approved.

4. EQUIPMENT.

4.1 General. All equipment, tools, and machines used in the performance of the work required by this section of the specifications shall be subject to the approval of the Contracting Officer and shall be maintained in satisfactory working condition at all times.

4.2 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 ranging from 0.05 to 2.0 gallons per square yard, with a pressure range of from 25 to 75 pounds per square inch, and with an allowable variation from any specified rate not exceeding 5 percent. Distributor equipment shall include an independently operated bitumen pump, tachometer pressure gages, volume measuring devices, a thermometer for reading the temperature of tank contents, and a hose attachment suitable for applying bituminous material manually to spots missed by the distributor. The distributor shall be equipped for circulation and agitation of the bituminous material during the heating process.

4.3 Heating Equipment. The 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 degrees F. to 170 degrees F. shall be fixed to the tank so that the temperature of the bituminous material may be determined at all times.

4.4 Power Brooms and Power Blowers shall be suitable for cleaning the surfaces to which the tack coat is to be applied.

5. WEATHER LIMITATIONS. The tack coat shall be applied only when the surface to be treated is dry and the temperature shall not have been lower than 35 degrees F. for 12 hours prior to application. It shall not be applied when the atmospheric temperature in the shade is lower than 50 degrees F.

6. PREPARATION OF SURFACE. Immediately before applying the tack coat, all loose material, dirt, clay, or other objectionable material shall be removed from the surface to be treated with a power broom or blower supplemented with hand brooms. After the cleaning operation, and prior to the application of the tack coat, an inspection of the area to be treated will be made by the Contracting Officer to determine its fitness to receive the bituminous coating. That portion of the surface prepared for immediate treatment shall be dry and in a satisfactory condition.

7. APPLICATION OF BITUMINOUS MATERIAL. Immediately following the preparation of the surface, the bituminous material shall be applied by means of a bituminous distributor at the temperature determined by the Contracting Officer, within the range of 75 to 130 degrees F. Under no circumstances shall the emulsion be heated to a temperature of greater than 140 degrees F. or exposed to a temperature of less than 40 degrees F. The bituminous material shall be so applied that uniform distribution is obtained over all of the surface to be treated. Unless the distributor is equipped so as to obtain satisfactory results at the junction of 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 in order 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 lightly coated areas and spots missed by the distributor shall be properly treated with the bituminous material. Following the application of bituminous material, the surface shall be allowed to cure without being disturbed for such period of time as may be necessary to permit drying out and setting of the tack coat. The period of time shall be as determined by the Contracting Officer. The Contractor shall furnish and spread a sufficient quantity of clean, dry sand on all areas which show an excess of bituminous material, to effectively blot up and cure the excess, as directed by the Contracting Officer. The treated surface shall be maintained by the Contractor until the succeeding layer of pavement has been placed. During this interval the Contractor shall protect the treated surface against damage and shall repair all damaged spots.

8. 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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Sieve Openings	Percentage by Weight, Passing	
	Base Course	Surface Course
1 inch	100	100
3/4 inch	80-100	97-100
1/2 inch	65-85	85-100
3/8 inch	55-75	70-90
No. 4	40-60	50-75
No. 8	25-45	35-65
No. 30	10-30	20-40
No. 200	2-8	2-8

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 6.0 percent for the base course and 6.0 and 7.0 percent for the surface course. The percentage of asphalt cement for bituminous curbs shall be between 7 and 8.0 percent. Samples of the aggregates and asphalt shall be submitted for approval with the job-mix formula.

6.2 Test Properties of Bituminous Mixtures. The apparent specific gravity, as determined by ASTM C 127 and C 128, shall be used in computing the voids total mix and voids filled with bitumen, and the mixture shall meet the following requirements as determined by ASTM D 1559:

Test Property	50-Blow Compaction
Stability, minimum, pounds	500
Flow, maximum, 1/100-inch	20
Voids total mix, percent	3-5
Voids filled with bitumen, percent	75-85
Retained stability, minimum	75

6.3 Stripping of Aggregates. If the index of retained stability of the job-mix formula is less than 75 when tested in accordance with Method 104 of MIL-STD-620, the aggregates shall be rejected or treated by one of the following procedures:

(1) Addition of heat-stable additives to bitumen.

(2) Addition of hydrated lime, or other cementitious material containing free lime, as a portion of the mineral filler.

7. MIXING PLANT shall be a weigh-batch or continuous-mixing type approved by the Contracting Officer and operated so as to produce a mixture within the job-mix formula.

8. OTHER EQUIPMENT.

8.1 Bituminous-Materials Spreaders shall be self-propelled, capable of producing a finished surface conforming to the smoothness requirements specified hereinafter. The use of a spreader that leaves indentations or other objectionable irregularities in the freshly-laid mix will not be permitted.

8.2 Blowers and Brooms shall be of the power type suitable for cleaning the surface to be paved.

8.3 Saw shall be of the power type, capable of rapidly cutting pavement and trimming joints and edges of pavement.

8.4 Small Tools available on the work shall consist of the following: rakes, lutes, shovels, tampers, smoothing irons, pavement cutters, portable heater for heating small tools, wood sandals and stilt sandals of standard type, and other small tools as may be required.

8.5 Steel-Wheel Rollers shall be self-propelled, 3-wheel (tricycle) and/or tandem type, weighing not less than 20,000 pounds each. The rollers shall have adjustable wheel scrapers, water tanks, and sprinkling apparatus to keep the wheels sufficiently wet to prevent the bituminous mixture from sticking to the wheels. Rollers shall be capable of reversing without backlash and shall be free from worn parts. Roller wheels shall not have flat or pitted areas or projections that will leave marks in the pavement.

8.6 Pneumatic-Tired Rollers shall be self-propelled and shall consist of two axles on which are mounted multiple pneumatic-tired wheels in such manner that the rear group of wheels will not follow in the tracks of the forward group but spaced to give essentially uniform coverage with each pass. Axles shall be mounted in a rigid frame provided with a loading platform or body suitable for ballast loading. Tires shall be smooth and capable of being inflated to at least 90 p.s.i. Construction of roller shall be such that each wheel can be loaded to a minimum of 4,500 pounds.

9. TREATMENT OF UNDERLYING SURFACE. Prior to laying a bituminous course, the underlying surface shall be cleaned of loose and foreign matter by sweeping with power sweepers, power brooms, and hand brooms, as directed. The surfaces of the subgrade and aggregate base course shall receive a prime coat prior to placing the asphalt paving. The surfaces of the asphalt base course shall receive a tack coat when the asphalt surface course is not placed immediately after spreading and compacting the asphalt base course. Prime coat shall conform to the requirements of the section: PRIME COAT. Tack coat shall conform to the requirements of the section: TACK 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, mixtures having temperatures less than 235 degrees, or mixtures which form or show indications of moisture will be rejected. Hauling over freshly laid material will not be permitted.

11. PLACING.

11.1 Surface Preparation of Underlying Course. Prior to placing of asphalt base or surface course, the underlying course shall be cleared of all foreign or objectionable matter with power blowers, power brooms, or hand brooms.

11.2 Spraying of Contact Surfaces of Structures. Contact surfaces of previously constructed pavement, curbs, manholes, and similar structures shall be sprayed with a thin coat of bituminous material conforming to the requirements of section: BITUMINOUS TACK COAT.

11.3 Offsetting Joints in Base and Surface Courses. The surface course shall be placed so that longitudinal joints of the surface course will not coincide with joints in the base course by at least one foot. Transverse joints in the surface course shall be offset by at least 2 feet from transverse joints in the base course.

11.4 General Requirements for Use of Mechanical Spreader. Range of temperatures of the mixtures, when dumped into the mechanical spreader shall be as determined by the Contracting Officer. Asphalt mixtures having temperatures less than 200 F. when dumped into a mechanical spreader will be rejected. The mechanical spreader shall be adjusted and speed regulated so that surface of the course will be smooth and continuous without tears and pulling, and of such depth that, when compacted, surface will conform with cross section, grade, and contour indicated. Unless otherwise directed, placing shall begin along the centerline of areas paved on a crowned section or on the high side of areas with a one-way slope, and shall be in the direction of the major traffic flow. Mixture shall be placed in consecutive adjacent strips having a minimum width of 10 feet, except when edge lanes require strips less than 10 feet to complete area. Each strip placed before a succeeding strip shall be of such length that sufficient heat will be retained to make strip readily compactible so that joint can be obtained to conform to requirements for texture, density, and smoothness specified in paragraph: JOINTS. Length of a strip that is to be followed by another strip will be determined by the Contracting Officer, and may be decreased or increased as required by air temperatures, wind, and other climatic conditions existing at time of placement. Longitudinal joints and edges shall be constructed to true line markings. The Contractor shall establish lines parallel to the centerline of area to be paved and shall place stringlines coinciding with established lines for spreading machine to follow. Number and location of lines shall be as directed. Placing of mixture shall be as nearly continuous as possible; speed of placing shall be adjusted, as directed, to permit proper rolling. At the option of the Contractor base course material may be placed with a motor grader.

11.5 Special Requirements for Placing Strips Succeeding Initial Strips. In placing each succeeding strip after the initial strip has been spread and compacted as specified below, screed of the mechanical spreader shall overlap previously placed strip 3 to 4 inches and shall be sufficiently high so that compaction will produce a smooth, dense joint. Mixture placed on edge of previously placed strip by mechanical spreader shall be pushed back to edge of strip being placed by use of lute. When the quantity of mixture on previously placed strip plus uncompacted material in strip being placed exceeds that required to produce smooth, dense joint, excess mixture shall be removed and wasted.

11.6 Shoveling, Raking, and Tamping After Machine Spreading. A sufficient number of experienced shovelers and rakers shall follow spreading machine, adding hot mixture and raking mixtures as required to produce a course that, when completed, will conform to all requirements specified herein. Broadcasting or fanning of mixture over areas being compacted will not be permitted. When segregation occurs in mixture during placing, the spreading operation shall be suspended until cause is determined and corrected. Irregularities in alinement of the course left by mechanical spreader shall be corrected by trimming directly behind machine. Immediately after trimming, edges of the course shall be thoroughly compacted by tamping laterally with lute. Distortion of course during tamping will not be permitted.

11.7 Hand Spreading in Lieu of Machine Spreading. In areas where use of machine spreading is impractical, mixture shall be spread by hand. Spreading shall be in a manner to prevent segregation. Mixture shall be spread uniformly with hot rakes in a loose layer of thickness that, when compacted, will conform to required grade and thickness. Rakers without stilt sandals shall not be permitted to stand in hot mixture while raking course.

12. COMPACTION OF MIXTURE shall be accomplished by steel-wheel and pneumatic tired rollers. Rolling shall begin as soon after placing as the mixture will support the roller without undue displacement. Rolling of each course shall be continued until all roller marks are eliminated and at least 95 percent of the density of a laboratory specimen of the same mixture has been obtained. The speed of the rollers at all times shall be slow enough to avoid displacement of the hot mixture. The wheels of the roller shall be moistened to prevent adhesion of the mixture. In areas not accessible to the roller, the mixture shall be compacted with hot hand tampers. Asphalt curbs shall be compacted to at least 90 percent of the density of a laboratory specimen of the same mixture with surfaces finished to a smooth even texture.

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 previously placed strips 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 of each course shall not vary more than 1/8 inch from a 10-foot straightedge placed parallel with the centerline and transverse from crown to edge. The straightedge shall be furnished by the Contractor. Defective areas shall be corrected by the Contractor at no additional cost to the Government.

16. SAMPLING. Sampling for the determination of thickness and density of the completed pavements will be performed by the Contracting Officer. All tests necessary to determine conformance with the specified requirements will be performed by the Contracting Officer without cost to the Contractor. The Contractor shall replace the pavement where samples are removed at his expense. No payment will be made for areas of pavement deficient in composition, density, or thickness until they are removed and replaced by the Contractor as directed by the Contracting Officer.

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SECTION 9L

PAVEMENT MARKINGS

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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 references thereto.

1.1 Federal Specifications (Fed. Spec.).

TT-P-85D & Am-1	Paint, Traffic: Reflectorized for Airfield Runway Marking (Drop-on Type)
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TT-P-115D & Am-2	Paint, Traffic, Highway, White and Yellow
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1.2 Federal Standard (Fed. Std.).

No. 141a & Change Notices 1, 2, & 3	Paint, Varnish, Lacquer, and Related Materials; Methods of Inspection, Sampling, and Testing
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2. MATERIALS. Paint shall be in sealed containers that plainly show the designated name, formula or specification number, batch number, color, date of manufacturer, manufacturer's name, formulation number and directions, all of which shall be plainly legible at time of use. The paint shall be homogeneous, easily stirred to smooth consistency, and shall show no hard settlement or other objectionable characteristics during a storage period of six months.

2.1 Paints. Paints shall conform to Fed. Spec. TT-P-115 or TT-P-85, and shall be white.

3. SAMPLING AND TESTING. Materials proposed for use shall be stored on the project site in sealed and labeled containers, or segregated at source of supply, sufficiently in advance of needs to allow 60 days for testing. Upon notification by the Contractor that the material is at the site or source of supply, a quart sample of each batch of paint shall be taken by random selection from sealed containers by the Contractor in the presence of a representative of the Contracting Officer. Contents of the sampled containers shall be so thoroughly mixed as to render the sample truly representative. Samples shall be clearly identified by designated name, specification number, batch number, manufacturer's formulation number, project contract number, intended use, and quantity involved. At the discretion of the Contracting Officer, samples may be tested by the Government before approval, or material may be approved for use based on either of the following data furnished by the Contractor:

a. A test report showing that the proposed batch meets all specified requirements.

b. A test report showing that a previous batch manufactured using the same formulation as that used in manufacturing the proposed batch met all specified requirements, and a report showing test results on the proposed batch for the following properties required in the material specification: weight per gallon, viscosity, fineness of grind, drying time, and gradation. Testing procedures and reports shall be as specified in paragraph 5 of Method 1031.2 of Fed. Std. 141. If materials are approved based on reports furnished by the Contractor, samples will be retained by the Government for possible future testing should the material appear defective during or after application. When tested by the Government and samples fail to meet specification requirements, the materials represented by the samples shall be replaced and the cost of testing will be deducted from the payments due the Contractor at the rate of \$100 per sample retested.

4. EQUIPMENT. All machines, tools, and equipment used in performance of the work shall be approved and maintained in satisfactory operating condition. Hand-operated push-type machines of a type commonly used for application of paint to pavement surfaces shall be acceptable for marking parking areas. Applicator machine shall be equipped with the necessary paint tanks and spraying nozzles, and shall be capable of applying paint uniformly a coverage specified. Sandblasting equipment shall be provided as required for cleaning surfaces to be painted. Hand-operated spray guns shall be provided for use in areas where push-type machines cannot be used.

5. SURFACE PREPARATION. New pavement surfaces shall be allowed to cure for a period of not less than 30 days before application of marking materials. All surfaces to be marked shall be thoroughly cleaned before application of the paint. Dust, dirt, and other granular surface deposits shall be removed by sweeping, blowing with compressed air, rinsing with water or a combination of these methods as required. Rubber deposits, surface laitance, existing paint markings, and other coatings adhering to the pavement shall be completely removed with scrapers, wire brushes, sandblasting, approved chemicals, or mechanical abrasion as directed.

6. APPLICATION.

6.1 Paint. Paint shall be applied to clean, dry surfaces, and unless otherwise approved when air and pavement temperatures are above 40 degrees F. and less than 95 degrees F. Paint temperature shall be maintained within these same limits. Paint shall be applied pneumatically with approved equipment at a rate of 105 plus or minus 5 square feet per gallon. The Contractor shall provide guidelines and templates as necessary to control paint application. Special precautions shall be taken in marking numbers, letters, and symbols. All edges of markings shall be sharply outlined. The maximum drying time requirements of the paint specifications will be strictly enforced, to prevent undue softening of bitumen, and pickup, displacement, or discoloration by tires of traffic. If there is a deficiency in drying of the markings, painting operations shall be discontinued until cause of the slow drying is determined and corrected.

6.2 Traffic Controls. Suitable warning signs shall be placed near the beginning of the worksite and well ahead of the worksite for altering approaching traffic from both directions. Small markers shall be placed along newly painted lines to control traffic and prevent damage newly painted surfaces. Painting equipment shall be marked with large warning signs indicating slow-moving painting equipment in operation.

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SECTION 10A
ESTABLISHMENT OF TURF

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| 5. Preparation of Ground Surface | 11. Establishment |
| 6. Application of Fertilizer
Redwood Compost | 12. Repair |

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

1.1 Association of Official Analytical Chemists (AOAC) Publication.

Official Methods of Analysis (12th Edition, 1975)

2. MATERIALS.

2.1 Fertilizer of 17-13-5 grade, uniform in composition, free flowing, and suitable for application with approved equipment, shall be provided. The fertilizer shall be delivered to the site in bags or other convenient containers, each fully labeled, conforming to the applicable state fertilizer laws, and bearing the name, trade name or trademark, and warranty of the producer.

2.2 Redwood Compost shall be redwood shavings and shall have a one percent nitrogen content. The material shall be composed of 100 percent redwood. Nitrided wood shavings of other species will be acceptable if approved in writing by the Contracting Officer.

2.3 Seed labeled in accordance with U.S. Department of Agriculture Rules and Regulations under the Federal Seed Act shall be furnished. Seed shall be furnished in sealed, standard containers unless written exception is granted. Seed that is wet or moldy or that has been otherwise damaged in transit or storage will not be acceptable.

2.3.1 Seed.

2.3.1.1 Mowed Turf Areas. Seed with the following minimum percentage by weight of pure live seed in each lot shall be provided.

Seed Kind	Percentage by Weight
Cynodon Dactylon	82
Hulled Bermuda	
Weed Seed, not to exceed 1%	1
Other than weed and pure live seed, maximum	17
TOTAL	100

2.3.1.2 Unmowed Turf Areas. Seed with the following minimum percentage by weight of pure live seed of each seed kind in the mixture in each lot shall be furnished.

2.3.1.2.1 Low Flow Channel Areas.

a. Single Species.

Seed Kind	Percentage by Weight of Pure Live Seed
Eragrostis lehmanniana (Lehmann lovegrass)	82
Weed Seed (not to exceed 1%)	1
Other than weed and pure live seed	17
TOTAL	100

b. Seed Mixture.

Seed Kind	Percentage by Weight of Each Seed Kind in Mixture	Percentage by Weight of Pure Live Seed of Each Kind	Percentage by Weight of Pure Live Seed in Mixture
Pennisetum Villosus	32	40	11.8
Plantago lanceolata (Plantago)	68	45	30.4
TOTAL pure live seed in mixture			42.2
Weed seed, not to exceed 1% by weight			1.0
Other than weed and pure live seed, maximum			56.8
TOTAL			100.0

2.3.1.2.2 Unmowed Turf Areas Other Than Low Flow Channel.

a. Single Species.

Seed Kind	Percentage by Weight of Pure Live Seed
Eragrostis lehmanniana (Lehmann lovegrass)	82
Weed Seed (not to exceed 1%)	1
Other than weed and pure live seed	17
TOTAL	100

b. Seed Mixture.

63 lbs
ave

Seed Kind	Percentage by Weight of Each Seed Kind in Mixture	Percentage by Weight of Pure Live Seed of Each Kind	Percentage by Weight of Pure Live Seed in Mixture
Chilopsis linearis (Desert willow)	1	80	0.8
Encelia farinosa (Desert encelia)	19	33	6.3
Isomeris arborea (Bladder pod)	13	49	6.4
Atriplex lentiformis (Quail bush)	4.7	66	3.1
Pennisetum Villosus	19.8	40	8.0
Plantago lanceolate (Plantago)	42.5	45	19.1
TOTAL pure live seed mixture			43.7
Weed seed, not to exceed 1% by weight			1.0
Other than weed and pure live seed, maximum			55.3
TOTAL			100.0

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

2.5 Water shall be free from oil, acid, alkali, salt, and other substances harmful to growth of grass, and shall be from a source approved prior to use.

2.6 Wood Cellulose Fiber Mulch, for use with the hydraulic application of grass seed and fertilizer, shall consist of specially prepared wood cellulose fiber, processed to contain no growth- or germination-inhibiting factors, and dyed an appropriate color to facilitate visual metering of application of the materials. The mulch material shall be supplied in packages having a gross weight not in excess of 100 pounds. The wood cellulose fiber shall contain not in excess of 10% moisture, air dry weight basis. The wood cellulose fiber shall be manufactured so that after addition and agitation in slurry tanks with fertilizers, grass seeds, water, and any other approved additives, the fibers in the material will become uniformly suspended to form a homogeneous slurry; and that when hydraulically sprayed on the ground, the material will form a blotter-like ground cover impregnated uniformly with grass seed; and which, after application, will allow the absorption of moisture and allow rainfall or mechanical watering to percolate to the underlying soil. Suppliers shall be prepared to certify that laboratory and field testing of their product has been accomplished, and that their product meets all the foregoing requirements based upon such testing.

3. SAMPLING AND TESTING shall be the responsibility of the Contractor and shall be performed at no additional cost to the Government. Sampling and testing shall be performed by an approved commercial testing laboratory or may be performed by the Contractor subject to approval. Tests shall be performed in sufficient number to insure that materials meet the specified requirements. Copies of the test results shall be furnished to the Contracting Officer.

3.1 Fertilizer. Duplicate copies of invoices shall be furnished. Invoices shall show quantities and grade of fertilizer. Samples of each lot of fertilizer shall be tested in accordance with Official Methods of Analysis of the Association of Official Analytical Chemists. Upon completion of project, a final check of total quantities of fertilizer used will be made against total area treated, and if minimum rates of application have not been met, additional quantities of these materials to make up minimum application specified shall be distributed as directed.

3.2 Seed. Contracting Officer shall be furnished duplicate signed copies of statement from vendor, certifying that each container of seed delivered is labeled in accordance with Federal Seed Act and is at least equal to requirements previously specified. This certification shall be obtained from vendor and shall be furnished on or with all copies of seed invoices.

4. SPECIAL SEEDING.

4.1 Seeder. Equipment to be used for applying a seed-fertilizer mix over areas shall be a hydraulic seeder designed to pump and discharge a waterborne homogenous slurry of seed, fertilizer, and wood cellulose fiber at the desired specified rate. The seeder shall be equipped with a power-driven agitator, and shall be capable of discharging up to 200 gallons per minute at 100 pounds pressure from a nozzle with clearance for 1/2-inch solids.

4.2 Wood Cellulose Fiber Mulch Spreader. Hydraulic equipment used for the application of fertilizer, seed, and slurry of prepared wood pulp shall have a built-in agitation system with an operating capacity sufficient to agitate, suspend, and homogeneously mix a slurry containing up to 40 pounds of fiber plus a combined total of 70 pounds of fertilizer solids for each 100 gallons of water. The slurry distribution lines shall be large enough to prevent stoppage. The discharge shall be equipped with a set of hydraulic spray nozzles that will provide even distribution of the slurry. The slurry tank shall have a minimum capacity of 1,000 gallons and shall be mounted on a traveling unit which may be either self-propelled or drawn by a separate unit that will place the slurry tank and spray nozzles in a position to provide uniform distribution without waste. The Contracting Officer may authorize equipment with smaller tank capacity provided that the equipment has the necessary agitation system and sufficient pump capacity to spray the slurry in a uniform coat over the surface.

5. PREPARATION OF GROUND SURFACE.

5.1 General. Equipment, in good condition, shall be provided for the proper preparation of the ground and for handling and placing all materials. Equipment shall be approved before work is started.

5.2 Clearing. Prior to grading and tilling, vegetation that may interfere with operations shall be mowed, grubbed, and raked; the collected material shall be burned or removed from the site, or when suitable, the material shall be used for mulch as directed. The surface shall be cleared of stumps, stones larger than 3 inches in diameter, roots, cable, wire, and other materials that might hinder the work or subsequent maintenance.

5.3 Grading. Previously established grades shall be maintained on the areas to be treated in a true and even condition; necessary repairs shall be made to previously graded areas. Where grades have not been established, the areas shall be graded as shown, and all surfaces shall be left in an even and properly compacted condition to prevent formation of depressions. Finished grade shall be such that after subsequent treatments, i.e. tillage, and planting, the planted grade will join one inch below adjoining surfaced grade of walks and paving unless otherwise indicated.

5.4 Tillage. Areas to be seeded shall be tilled to a depth of at least 6 inches by plowing, disking, harrowing, or other approved operations until the condition of the soil is acceptable. The work shall be performed only during periods when, in the opinion of the Contracting Officer, beneficial results are likely to be obtained. When drought, excessive moisture, or other unsatisfactory conditions prevail, the work shall be stopped when directed. Undulations or irregularities in the surface shall be leveled before the next specified operation.

6. APPLICATION OF FERTILIZER REDWOOD COMPOST.

6.1 Preplanting Application. Fertilizer shall be distributed uniformly at a rate of 300 pounds per acre over areas to be seeded. The fertilizer shall be incorporated into the soil to a depth of at least 4 inches by disking, harrowing or other acceptable methods. Incorporation of fertilizer may be part of the tillage operations specified hereinbefore.

6.2 Redwood Compost. Immediately following or simultaneously with incorporation of fertilizer, redwood compost shall be distributed uniformly at a rate of 2 cubic yards per 1,000 square feet and shall be incorporated into the soil to depth of at least 4 inches by disking, harrowing, or other acceptable methods. Incorporation of redwood compost along with fertilizer may be part of the operation specified in paragraph: TILLAGE.

6.3 Leveling. Surface irregularities resulting from tillage or other operations before seeding shall be leveled.

7. PLANTING SEED.

7.1 General. Seed shall be sown between dates of 15 February and 15 August unless otherwise directed in writing. Except as otherwise specified, a satisfactory method of sowing shall be employed, using approved mechanical power-drawn drills or seeders, mechanical hand-seeders, cultipacker hydraulic seeders, or other approved methods. When drills are used, markers or other means shall be provided to insure that the successive seeded strips will overlap or be separated by a space no greater than equipment row spacings. When delays in operations extend the work beyond the most favorable planting season for species designated or when conditions are such by reason of drought, high winds excessive moisture, or other factors that satisfactory results are not likely to be obtained, work shall be halted as directed and resumed only when conditions are favorable or when approved alternate or corrective measures and procedures have been effected. If inspection during seeding operations or after there is show of green indicates that strips wider than space between rows planted have been left unplanted, or other areas skipped, additional seed shall be sown if so directed.

7.2 Broadcast Seeding (Mowed Turf Areas). Seed shall be distributed uniformly either by hand or with other approved sowing equipment at the rate of 2 pounds per 1,000 square feet. Half of seed shall be sown with sower moving in one direction, and the remainder with sower moving at right angles to first sowing. Seed shall be covered to an average depth of 1/4 inch by brush harrow, spike-tooth harrow, chain harrow, cultipacker, hand rake with wood tines, or other approved device. Seed shall not be broadcast during windy weather.

7.3 Native-Grass Seeding (Unmowed Turf Areas) shall be accomplished with a cultipacker seed with exception of lovegrass. The several species of grass seed mixtures specified hereinbefore shall be mixed in proportion specified and seeded, except that lovegrass shall be seeded separately through clean seed attachment. Lovegrass shall be uniformly broadcast on ground surface at the rate of 7.4 pounds per acres. In low flow channel areas seed mixture shall be sown at the rate of 39 pounds per acre. In unmowed turf areas other than low flow channel seed mixture shall be sown at the rate of 63 pounds per acre.

7.4 Hydraulic Seeding. Seeding with approved hydraulic seeding equipment shall be accomplished in a manner to provide the same application rates for seed and fertilizer specified hereinbefore. Covering of seed and subsequent compacting will not be required when hydraulic seeding methods are used. Areas not to be seeded and structures shall be protected.

8. COMPACTING. Immediately after broadcast seeding operations have been completed, the surface shall be compacted by a cultipacker, roller, or other approved equipment weighing 100 to 160 pounds per linear foot of roller. When planting by machine, the roller shall be operated immediately behind the planter unless otherwise directed. Under certain soil conditions, the Contracting Officer may direct that rolling be delayed for 15 to 30 minutes following planting to avoid balling the soil on the roller or squeezing water out of furrows. If the soil is of such type that a smooth or corrugated roller cannot be operated satisfactorily, a pneumatic-tired roller, not wobble-wheel, shall be used. A roller having tires of sufficient size shall be used, or sufficient passes of the roller shall be made, to cover the soil surface completely.

9. WATERING. Watering equipment of a type that prevents damage to finished surface shall be used. If the sprinkler system is used, hand water the edges of all areas and any portions of the seeded areas that appear to be dry. Turf shall be kept continuously moist by watering as often as required.

10. PROTECTION shall be provided against traffic or other use by erecting barricades immediately after treatment is completed, and by placing warning signs, as directed, on various areas.

11. ESTABLISHMENT.

11.1 General. Responsibility shall be assumed for proper care of seeded areas while grass is becoming established for 3 months after completion of treatment on entire project, unless desired cover is established in a shorter period of time and Contracting Officer shortens responsibility period.

11.2 Mowing. Mowed turf seeded areas shall be mowed with approved mowing equipment to a height of 1-1/2 inches when average height of grass becomes 3 inches. When amount of cut grass is heavy, grass shall be removed to prevent destruction of underlying turf. If weeds or other undesirable vegetation threatens to smother planted species, such vegetation shall be mowed, or in case of exceedingly rank growths, grass shall be uprooted, raked, and removed from area.

12. REPAIR. When any portion of the surface becomes gullied or otherwise damaged or treatment is destroyed, the affected portion shall be repaired to reestablish condition and grade of soil and treatment prior to injury, as directed. Repair work required because of faulty operations or negligence on the part of the Contractor shall be performed without cost to the Government.

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SECTION 10B

PLANTING OF TREES AND GROUND COVER

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| 2. Certificates of Inspection | 7. Obstructions Below Ground |
| 3. Materials Other Than Plants | 8. Planting Operations |
| 4. Plant Materials | 9. Maintenance |
| 5. Plants Required | 10. Replacement |

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

- 1.1 American Association of Nurserymen, Inc. (AAN) Standard.

American Standard for Nursery Stock (February 1973) (ANSI Z60.1-1973)

- 1.2 American Joint Committee on Horticultural Nomenclature Publication.

Standardized Plant Names (2d Edition, 1942).

- 1.3 Association of Official Analytical Chemists (AOAC) Publication.

Official Methods of Analysis (12th Edition, 1975).

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, as 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 18-6-12 grade, uniform in composition, slow release type, 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 Manure shall be well-rotted, unleached cattle manure or a combination of well-rotted cattle and horse manure. Manure shall be not less than 8 months and not more than 2 years old. Manure shall be free of material not acceptable for landscape use and shall contain not more than 25 percent by volume of straw, sawdust, or other organic litter material. No manure shall be used until the Contracting Officer has had the material tested and approved.

3.3 Material for Staking.

3.3.1 Stakes for supporting trees shall be new 1 inch diameter, standard strength, galvanized iron pipe, 10-1/2 feet long.

3.3.2 Wires shall be annealed galvanized steel or steel of gages hereinafter specified.

3.3.3 Hose for tree ties shall be new, 1/2 inch diameter, green in color.

3.4 Peat shall be a natural product of either sphagnum moss, reed, or sedge peat, taken from a fresh-water site. Peat 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. Peat shall have been conditioned in storage piles after excavation for at least 6 months, including one freezing and thawing period. Peat shall contain not less than 90 percent organic matter by weight on an oven-dry basis. A sample, and an analysis made by a recognized laboratory in accordance with the current methods of the Association of Official Agricultural Chemists, shall be furnished by the Contractor at his own expense for the approval of the Contracting Officer before delivery of the peat.

3.5 Prepared Soil Mixture for backfilling plant pits and beds, shall be mixed in a central location on the jobsite and transported to locations where soil mixture is to be used. Topsoil shall be thoroughly mixed in the following proportions by volume: 200 parts of topsoil, 100 parts of peat, and 1 part commercial fertilizer. 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 Topsoil. Topsoil shall be fertile, friable, natural surface soil obtained from excavation and possessing characteristics of representative soils in the project vicinity that produce heavy growths of crops, grass, or other vegetation. 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. Topsoil shall contain at least 6 percent organic matter determined by loss on ignition on moisture-free samples. The acidity range shall be between pH 5.0 to 7.0 inclusive.

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 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 infestation. 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 in the list of required plants. Plants larger in size than specified 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 Handling. Plants shall be container grown and shall be 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 specified 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 given in the plant list. Plant quantities on the list are indicated only for the convenience of the Contractor. Except as otherwise indicated and specified, 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. Under no circumstances shall balled plants be dropped from box cars or trucks to the ground. 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 between 1 March and 31 July. 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. Planting of trees and shrubs shall conform to the details shown on the attached sketches and as specified herein.

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. No shrubs shall be planted less than 36 inches from a building unless specifically indicated on the drawings or designated by the Contracting Officer.

8.2 Protection of Planting Areas. Before excavations are made, precautionary measures shall be taken to protect all turfed areas that are to be trucked over and upon which soil is to be temporarily stacked pending removal or reuse of the soil for the filling of holes, pits, and beds. Existing trees, shrubbery, and beds 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 trenches, plant pits, and planting beds. Except as otherwise indicated, excavation of trenches, plant pits, and planting beds shall extend to the depths as indicated on the attached 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 shall be measured from finished grade. Planting beds in which ground cover or similar planting are indicated shall be excavated as required to eliminate objectionable weeds or grasses that are difficult to eradicate.

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 ball, container, or spread of roots.

8.5 Preparation of Planting Beds. The planting beds for ground cover plants, outline of which are shown on the drawings, shall be tilled and fertilized (including addition of redwood compost amendment) as specified for preparation of surfaces for seeding in the section: ESTABLISHMENT OF TURF. Beds shall be brought to a smooth even surface conforming to established grades after full settlement has occurred. Soil in the beds shall be moist at the time the plants are set.

8.6 Disposal of Excess Soil. Acceptable excess excavated topsoil shall be used to form saucers around plants, wasted uniformly over nearby low or rough lawn 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 project site as directed by the Contracting Officer, within 24 hours following excavation.

8.7 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 or roots. 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 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 soil around the edge of each filled-in pit.

8.7.1 Container-Grown Plants. Containers shall be opened, and the plants carefully removed so that the earth around the roots of the plants remains unbroken. Plants shall then be placed in the plant pit and the prepared soil mixture tamped to fill all voids under the base and around the ball after which backfilling shall be completed.

8.8 Staking.

8.8.1 All 15 gallon container trees in the plant list, shall be staked with a single stake as hereinbefore specified and as indicated.

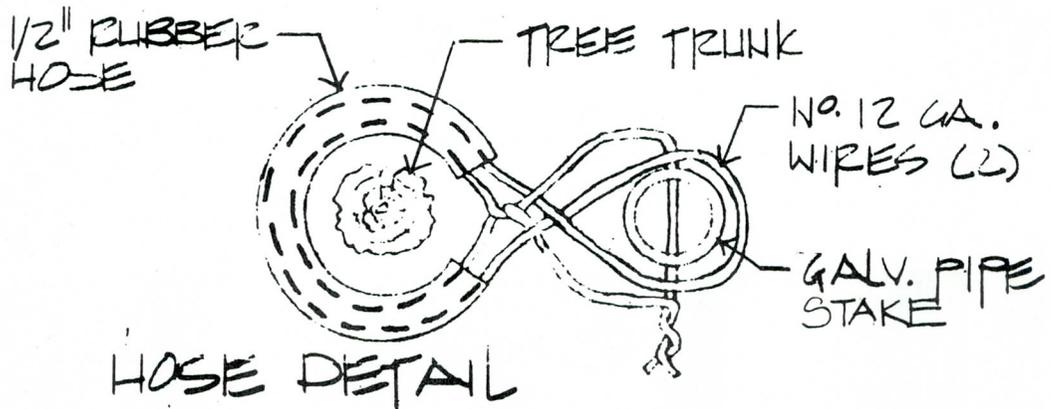
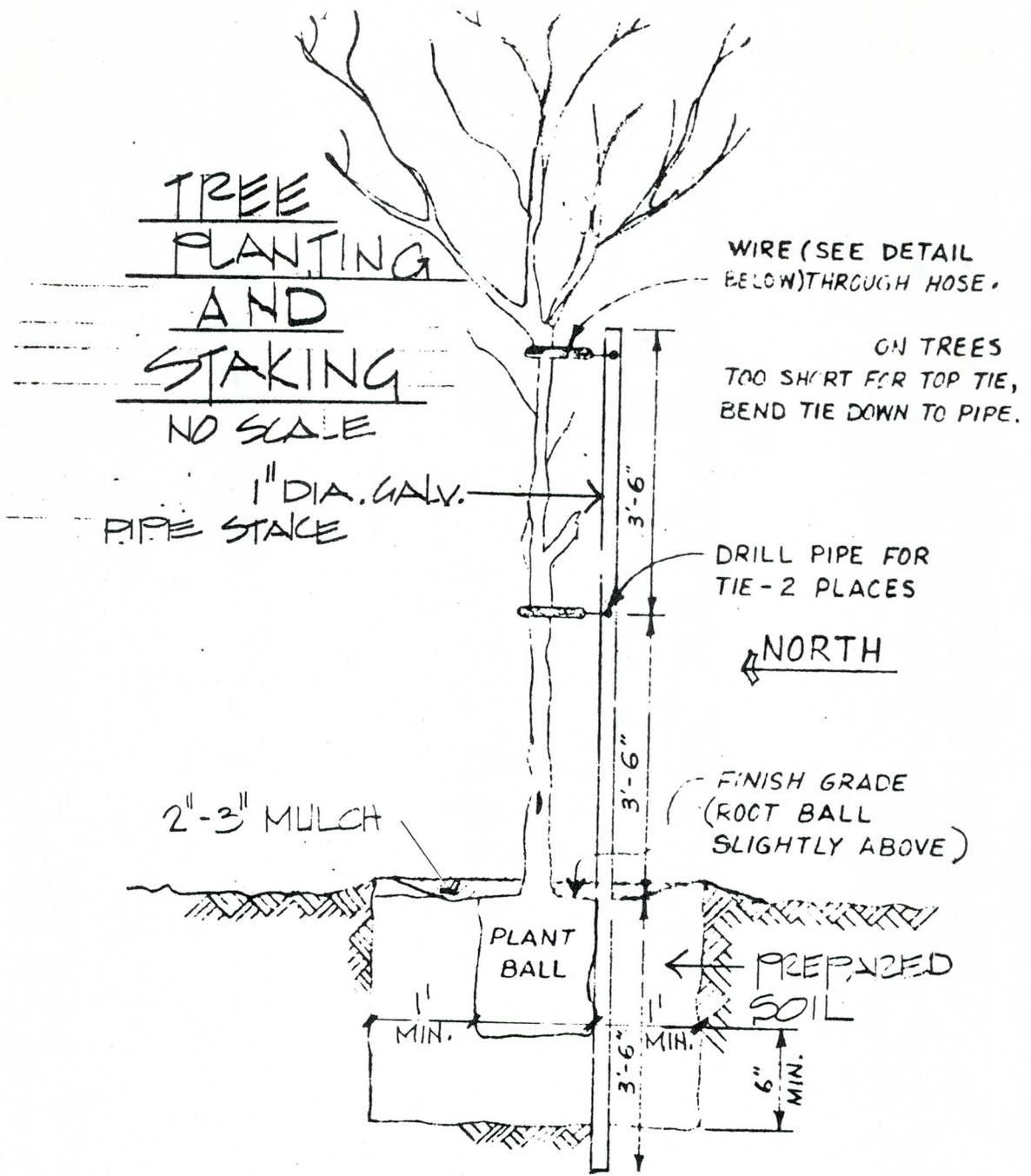
8.9 Pruning shall be limited to the minimum necessary to remove injured twigs and branches, and to compensate for the loss of roots during transplanting, but never to exceed one-half of the branching structure. With the approval of the Contracting Officer, pruning may be done before delivery of plants, 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 tree-wound paint. To further aid in the recovery of transplanted trees, the leaves may be stripped prior to shipment where this is a locally accepted practice and approved by the Contracting Officer. Evergreens shall not be pruned except to remove injured branches.

8.10 Mulching. Within 2 days after planting, plants shall be mulched with a layer of manure covering the entire drip line 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 until 90 days after the last plant is planted. Plants shall be kept in a healthy growing condition by watering, pruning, spraying, weeding, cultivating, tightening of guys, and by any other necessary operations of maintenance. Plant saucers and planting beds 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. 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. Maintenance of the replacements will be by the Government after the original maintenance period.

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SECTION 10C
IRRIGATION SYSTEM

Index

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|--------------------------------------|--|
| 1. Applicable Publications | 7. Deleted |
| 2. General | 8. Tools |
| 3. Materials | 9. Cleanup |
| 4. Installation | 10. Variation in Arrangement of Sprinklers |
| 5. Connection to Existing Waterlines | 11. Guarantee |
| 6. Tests | |

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.

- | | |
|------------------------|--|
| WW-P-325a | Pipe, Bends and Traps; Lead (for Plumbing and Water-Distribution) |
| WW-P-421C | Pipe, Cast Gray and Ductile Iron, Pressure (For Water and Other Liquids) |
| WW-U-531D | Unions, Pipe, Steel or Malleable Iron, Threaded Connection |
| WW-V-54D
& Int Am-1 | Valve, Gate, Bronze (125, 150 and 200 Pound, Threaded Ends, Flange Ends, Solder End and Brazed Ends, for Land Use) |

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

- | | |
|---------------------------------|--|
| A 21.6-1970 | Cast-Iron Pipe. Centrifugally Cast in Metal Molds, for Water or Other Liquids |
| A 21.8-1970 | Cast-Iron Pipe, Centrifugally Cast in Sand-Lined Molds, for Water or Other Liquids |
| A 21.10-1971
& A 21.10a-1972 | Gray-Iron and Ductile-Iron Fittings, 2 in. Through 48 in., for Water and Other Liquids |
| A 21.11-1972 | Rubber-Gasket Joints for Cast-Iron and Ductile-Iron Pressure Pipe and Fittings |
| B16.3-1971 | Malleable-Iron Threaded Fittings, 150 and 300 lb. |

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

- | | |
|-----------|---|
| A 120-73 | Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Ordinary Uses |
| B 88-74a | Seamless Copper Water Tube |
| D 1785-74 | Poly (Vinyl Chloride) (PVC) and Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40, 80, and 120. |

D 1861-73	Homogeneous Bituminized Fiber Drain and Sewer Pipe
D 1862-73	Laminated-Wall Bituminized Fiber Drain and Sewer Pipe
D 1869-66	Rubber Rings for Asbestos-Cement Pipe
D 2241-73	Poly (Vinyl Chloride) (PVC) Plastic Pipe (SDR-PR)
D 2464-74	Threaded Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80
D 2466-74	Socket-Type Poly (Vinyl Chloride) (PVC) and Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 40
D 2564-73a	Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings
D 2774-72	Recommended Practice for Underground Installation of Thermoplastic Pressure Piping

1.4 American Water Works Association (AWWA) Standards.

C 400-72	Asbestos-Cement Water Pressure Pipe for Water and other Liquid
C 500-71	Gate Valves 3 In. Through 48 In. for Water and Other Liquids
C 600-64	Installation of Cast-Iron Water Mains
C 603-65	Installation of Asbestos-Cement Water Pipe
C 800-66	Threads for Underground Service Line Fittings

2. GENERAL. This section covers irrigation piping including connection to source of water supply, complete. Excavation, trenching, and backfill are specified in Section: EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES.

2.1 Aboveground and Riser piping shall be galvanized steel.

2.2 Below Ground Piping. Pipe 4 inches and larger shall be cast-iron, asbestos-cement or plastic. Pipe smaller than 4-inches shall be plastic or galvanized steel. Pipe for sleeving shall be corrugated metal, galvanized steel, plastic or bituminized fiber pipe. The minimum cover for laterals and branches shall be 12 inches. The minimum cover for pressure lines shall be 2.5 feet except that under roadways, parking and paved areas, the minimum cover shall be 3 feet

2.3 Electrical Work shall conform to the applicable requirements of section: ELECTRICAL WORK, INTERIOR.

3. MATERIALS shall conform to the respective specifications and other requirements specified below:

3.1 Pipe.

3.1.1 Galvanized Steel Pipe shall conform to ASTM A 120, standard weight.

3.1.2 Plastic Pipe shall conform to ASTM D 1785, schedule 40 for pipe with solvent welded joints and schedule 80 for pipe with threaded joints or to ASTM D 2241, Type 1, grade 1, 315 psi for pressure lines and 200 psi for other lines for pipe with solvent welded joints. Pipe and fittings shall bear the seal of approval (nsf mark) of the National Sanitation Foundation's standard for plastic pipe and fittings for potable water service.

3.1.3 Asbestos Cement Pipe. AWWA C 400, class 150, unless otherwise shown. Uncombined hydroxide content shall not exceed 1.0 percent.

3.1.4 Cast Iron Pipe. Federal Specification WW-P-421, type II or III, class 150 or ANSI A 21.6 or A 21.8, working pressure 150, with push-on or mechanical joints, unless otherwise shown.

3.1.5 Bituminized Fiber Pipe. ASTM D 1861 or D 1862.

3.2 Joints.

3.2.1 Plastic Pipe Joints shall be solvent welded or threaded. Solvent for welded joints shall conform to ASTM D 2564 as applicable. Use of pipe dope or solvents on threaded joints will not be permitted.

3.2.2 Asbestos Cement Pipe. Rubber rings, ASTM D 1869.

3.2.3 Cast Iron Pipe. Mechanical joints, ANSI A21.11, stuffing box type. Push-on joints, ANSI A21.11.

3.2.4 Insulating Joints shall be installed between nonthreaded ferrous and nonferrous metallic pipe, fittings and valves. Insulating joints shall consist of a sandwich-type flange insulating gasket of the dielectric type, insulating washers, and insulating sleeves for flange bolts. Insulating gaskets shall be full faced with outside diameter equal to the flange outside diameter. Bolt insulating sleeves shall be full length. Units shall be of a shape to prevent metal-to-metal contact of dissimilar metallic piping elements.

3.2.5 Insulation joints. A rubber-gasketed or other suitable type of insulating joint shall be provided to effectively prevent metal-to-metal contact between adjacent dissimilar metallic pipes or fittings.

3.2.6 Connections between asbestos cement pipe and cast iron fittings, or valves shall be made with jointing materials conforming to AWWA C 603.

3.3 Fittings and Specials.

3.3.1 For Asbestos Cement Pipe. Fittings and specials shall be cast iron, bell-end in accordance with ANSI A 21.10, 150 psi pressure rating, except that profile of bell may have special dimensions as required by the pipe manufacturer.

3.3.2 For Cast Iron Pipe. Fittings and specials shall be suitable for 150 psi working pressure, unless otherwise indicated. Fittings and specials for mechanical joint pipe shall conform to ANSI A 21.10. Fittings and specials for use with push-on joints shall conform to ANSI A 21.10 and A 21.11.

3.3.3 For Galvanized Steel Pipe. Steel fittings shall be galvanized. Threaded fittings shall conform to ANSI B16.3

3.3.4 For Plastic Pipe Fittings shall conform to ASTM D 2464 or D 2466.

3.4 Gate Valves shall be designed for a working pressure of not less than 150 psi. Valve connections shall be as required for the piping in which they are installed. Valves shall have a clear waterway equal to the full nominal diameter of the valve, and shall be opened by turning counterclockwise. The operating nut or wheel shall have an arrow, cast in the metal, indicating the direction of opening.

3.4.1 Valves smaller than 3 inches shall be all bronze and shall conform to Federal Specification WW-V-54, type I.

3.4.2 Valves 3 inches and larger shall be iron body, bronze mounted, and shall conform to AWWA C500.

3.5 Valve Boxes shall be plastic, cast iron, or concrete, except that concrete boxes may be installed only in locations not subjected to vehicular traffic. Cast iron boxes shall be extension type with slide-type adjustment and with flared base. The minimum thickness of metal shall be 3/16 inch. Concrete boxes shall be the standard product of manufacturer of precast concrete equipment. The words "Irrigate", for gate valves; and "RVC" for remote control valves shall be cast in covers of boxes for the irrigation system. The boxes shall be such length as will be adapted, without full extension, to the depth of cover required over the pipe at valve location. Plastic boxes shall be a standard catalog product of a manufacturer regularly engaged in the manufacture of valve boxes. Plastic boxes installed in paved areas, roadways and other areas subject to vehicular traffic shall be equipped with cast iron rings and covers. Plastic boxes installed in turfed areas shall have green covers. Boxes housing control valves shall have lockable covers. Plastic shall be rigid combination of ployolefin and fibrous inorganic materials having the following physical properties:

	ASTM Test Method	Value
Tensile Strength (2.0 in. Min.)	D-638	3,400 psi
Impact Strength, Izod	D-256	0.5 ft-lb/in
Shore-D Hardness	D-2240	63
Deflection Temp. @ 66 psi stress	D-648	230 degrees F
Specific Gravity	D-792	1.15

3.6 Sprinklers.

3.6.1 Sprinkler heads of the types indicated shall be installed on pipe risers. The radius of coverage, nozzle diameter, rate of water application and the available pressure at the riser, shall be as indicated for each type and size of head. Sprinkler units of each type shall be the product of manufacturers regularly engaged in the production of lawn sprinkler or irrigation equipment.

3.6.2 Fixed Head Stationary Sprinklers shall be of the lawn sprinkler type having removable spray tip nozzles of the full, half or quarter circle patterns, as required. Bodies shall be cast red brass. Nozzles shall be machined from rod brass. Inlet end shall be tapped for National Standard Pipe threads.

3.6.3 Fixed Head, Pop-Up Nozzle Sprinklers shall be of the lawn sprinkler type having removable spray tip nozzles of the full, half or quarter circle patterns, as required. The pop-up feature shall consist of a piston to which the spray tip nozzle is attached, a synthetic rubber gasket and shall be of sufficient height to permit it to rise at least 1 inch while in operation. Bodies shall be cast red brass, and the recess for the piston shall be sufficiently deep to contain the piston completely within the body of the sprinkler head. Pistons or piston parts, spray tip nozzles and other parts shall be machined from rod brass. Pistons shall be cylindrical in cross section and shall fit sufficiently close in a machined hole at top of head, or shall have a machined flange and seat, so as to exclude debris from the recess.

3.6.4 Fixed, Single-Nozzle, Rotary Sprinklers. The fixed sprinklers shall normally rotate in a complete circle but the construction shall be such that adjustments can be made for oscillating in any arc between 20 and 340 degrees. Bearings shall be of low friction type, water lubricated, with replaceable parts. Sprinklers shall be fabricated of non-corrosive material such as bronze, copper or brass, except that minor parts may be of stainless steel, aluminum or other suitable material. Nozzle shall be adjustable to control stream break-up.

3.6.5 Rotary Pop-Up Sprinklers of the full or part circle pattern as indicated shall be actuated by a water-driven gear motor. Gears shall be inclosed and protected from sand. Inner parts shall be of brass, bronze, or other corrosion resistant material. Outer body shall be of sufficient strength and design to protect sprinkler from vandalism. Sprinklers shall be of one piece housing type so that interior parts may be removed or replaced from top without removing housing from the riser. Sprinklers shall be equipped with free turning covers to eliminate vandalism or damage.

3.6.6 Shrubbery Spray Heads shall be fully adjustable from full flow to shut off. Heads shall be of all brass construction tapped for 1/2-inch I.P.S. female thread. Nozzles shall be interchangeable. Heads shall be equipped with vandal-proof locking screws.

3.6.7 Bubbler Type Irrigation Heads shall be fully adjustable from full flow to shut off. Heads shall be of all brass construction tapped for 1/2-inch I.P.S. female thread. Bubbler heads shall distribute the water in multiple, short throw streams spaced 60 degrees apart. Heads shall be equipped with vandal-proof locking screws.

3.7 Sprinkler Control Valves and Valve Accessories.

3.7.1 Remote Control Valves shall be completely serviceable while installed in line or shall have a union connection on the downstream side, shall have brass bodies, a flow control device, shall operate on approximately 24 volts, be normally closed, be of slow-closing globe type; and be of the same manufacturer as the automatic controller used in the work.

3.7.2 Quick Coupling Valves shall be two piece, spring-loaded, compression type, normally closed, opening against line pressure, and actuated by downward thrust against the valve. Body shall be of cast red bronze. Machined parts shall be fabricated from red brass. Valve washers and sealers for key stems shall be of a semi-rigid, non-metallic, material and shall be easily replaceable. Inlets shall be tapped for National Standard pipe thread of the pipe riser size or sizes shown on the drawings. Valves shall be suitable for a maximum operating pressure of 150 psi and shall be the standard product of a reputable manufacturer of quick coupling valves for lawn sprinkling systems. The Contractor shall furnish two coupler keys for operating the valves with hose swivels. Quick Couplers shall be equipped with vandal-proof, locking, vinyl covers. Contractor shall provide at least two keys.

3.8 Deleted.

3.9 Unions shall conform to the requirements of Federal Specification WW-U-531, Type B.

3.10 Automatic Controllers. Controllers shall be the product of a manufacturer regularly engaged in the production of turf sprinkler systems and shall be specifically designed for use on large turf areas. Controller shall be suitable for operation on the available electrical supply and shall be capable of complete automatic operation or manual operation of at least 20 stations. Control circuit voltage shall be less than 30 volts. Each controller shall have a master switch to disconnect controller from supply lines.

3.10.1 Housing. Each controller shall be inclosed in a tamper-proof lockable metal housing. Exterior wall mounted and pedestal mounted controllers shall be weatherproof. Where more than one controller is installed in an irrigation system, a single key shall open all cabinets. Two keys for each system shall be furnished.

3.10.2 Programming. Timing for each station shall be variable up to 60 minutes. The programming cycle shall be not less than 14 calendar days. Each station shall be independently timed, scheduled, or omitted. Programming shall be changeable without special tools and without disassembling controller.

3.10.3 Electrical Work shall conform to the requirements of section: ELECTRICAL WORK, INTERIOR. Electrical wiring from controller to control valves shall be solid, single conductor, copper wire, type UF, size recommended by the controller manufacturer except that minimum wire size shall be No. 16. Common wire shall be a different color from all others. Wiring from controllers to panel shall be installed in rigid conduit.

3.11 Gravel shall be crushed or natural material, washed and uniformly graded between 3/8 and 1-inch size.

3.12 Pipe Bedding and Backfill Material. Sand bedding material not less than 2 inches thick shall be placed under pipe where trench excavation is in rock. Where sand bedding is not required, the bottom of trenches shall be accurately graded to provide uniform bearing and support for each section of pipe on undisturbed soil at every point along its entire length. Backfill material shall be suitable for the required compaction and free from stones larger than 1-inch in any dimension.

3.13 Miscellaneous Items.

3.13.1 Service clamps shall have a pressure rating not less than that of the pipe to be connected and shall be either the single or double flattened strap type. Clamps shall have a galvanized malleable iron body with cadmium plated straps and nuts. Clamps shall have rubber gasket cemented to the body.

3.13.2 Corporation stops shall have standard corporation stop thread conforming to AWWA C800 on the inlet end, with flanged joints, compression pattern flared tube couplings, or wiped joints for connections to goosenecks.

3.13.3 Goosenecks. Lead pipe for gooseneck connections shall conform to the applicable requirements of Federal Specification WW-P-325, Class 100. Copper tubing for gooseneck connections shall conform to the applicable requirements of ASTM B 88, type K, annealed. Length of connections shall be in accordance with standard practice.

3.13.4 Service stops shall be water-works inverted-ground-key type, oval or round flow way, tee handle, without drain. Pipe connections shall be suitable for the type of service pipe used. All parts shall be of bronze with female iron-pipe-size connections or compression-pattern flared tube couplings, and shall be designed for a hydrostatic test pressure not less than 200 pounds per square inch.

4. INSTALLATION.

4.1 General. Unless otherwise specified, installation of sprinklers, control valves, and boxes shall conform to the standard details attached to this section.

4.2 Handling. Pipe and accessories shall be handled so as to insure delivery to the trench in sound, undamaged condition. The interior of pipe and accessories shall be thoroughly cleaned of foreign matter before being lowered into the trench and shall be kept clean during laying operations by plugging or other approved method. Before installation, the pipe shall be inspected for defects. Material found to be defective before or after laying shall be replaced with sound material at no additional cost to the Government.

4.3 Cutting of pipe shall be done in a neat and workmanlike manner without damage to the pipe. Unless otherwise recommended by the manufacturer and authorized by the Contracting Officer, cutting shall be done with an approved type mechanical cutter. Wheel cutters shall be used when practicable.

4.3.1 Plastic Pipe shall be cut square and all burrs, particles and curls shall be removed.

4.4 Joint Deflection.

4.4.1 Asbestos Cement Pipe. Maximum allowable deflections from a straight line or grade, as required by vertical curves, horizontal curves, or offsets, will be 5 degrees unless a lesser amount is recommended by the manufacturer.

4.4.2 Cast Iron Pipe. The maximum allowable deflection will be given in AWWA C600. Table I shows maximum deflection for 18 foot lengths of pipe. For other lengths the deflection will vary proportionately.

TABLE I
Deflection In Inches

Diameter in Inches	Push-On Joint Pipe	Mechanical- Joint Pipe
3	19	31
4	19	31
6	19	27
8	19	20
10	19	20

If the alinement required deflection in excess of the above limitations, special bends or a sufficient number of shorter lengths of pipe shall be furnished to provide angular deflections within the limit set forth.

4.5 Placing and Laying. Pipe and accessories shall be carefully lowered into the trench by means of derrick, ropes, belt slings, or other authorized equipment. Under no circumstances shall any of the materials be dropped or dumped into the trench. The full length of each section of pipe shall rest solidly upon the pipe bed, with recesses excavated to accommodate joints. Pipe that has the grade or joint disturbed after laying shall be taken up and relaid. Pipe shall not be laid in water or when trench conditions are unsuitable for the work. Water shall be kept out of the trench until jointing is completed. When work is not in progress, open ends of pipe, fitting, and valves shall be securely closed so that no trench water, earth, or other substance will enter the pipes of fittings.

4.5.1 Asbestos Cement Pipe shall be installed in accordance with AWWA C603, except as otherwise specified. Short lengths of pipe machined at each end or overall shall be used at fittings and rigid structures and for tying-in and closures.

4.5.2 Plastic Pipe shall be installed in accordance with the procedures recommended in ASTM D 2774 and as herein specified.

4.5.3 Tracer Wire of No. 12, type TW plastic coated copper wire, or Tracer Tape shall be installed with non-metallic (asbestos-cement or plastic) irrigation pressure lines.

a. The tracer wire shall be placed on the bottom of the trench under the vertical projections of the pipe with spliced joints soldered and covered with insulating tape.

b. Tracer tape shall be taped to the pipe for the entire length of the pipe, spliced joints shall be soldered and covered with insulating tape.

c. Tracer wire or tracer tape shall follow the main line pipe lines and terminate in the yard box with the gate valve that controls these main irrigation lines. Provide enough length of wire or tape to make a loop and attach a plastic label with the designation "Tracer Wire."

4.6 Jointing

4.6.1 Asbestos Cement Pipe. Couplings shall be installed in accordance with AWWA C603.

4.6.2 Cast Iron Pipe. Mechanical and push-on type joints shall be installed in accordance with AWWA C600.

4.6.3 Galvanized Steel Pipe. Threaded joints shall be made tight with a stiff mixture of graphite and oil, inert filler and oil, or with an approved graphite compound, applied with a brush to the male threads only. Compounds shall not contain lead.

4.6.4 Insulation Joints shall be installed in accordance with recommendations of the manufacturer.

4.6.5 Connections between different types of pipe and accessories shall be made with transition fittings approved by the Contracting Officer.

4.6 Pipe Sleeves shall be installed with a minimum of off-set at the joints to permit easy installation and removal of the irrigation lines. All plastic lines shall be installed in sleeves under paved areas. Sleeves shall extend at least 12 inches beyond the edges of the pavement. Sizes of sleeves shall be as follows:

Pipe Size (inches)	Minimum Sleeve Size (inches)
1/2	2
3/4	2-1/2
1, 1-1/4 and 1-1/2	3
2 and 2-1/2	4
3 and 4	6

4.7 Setting of Valves, and Meter Boxes. Valves and valve boxes shall be installed where shown or directed, and shall be set plumb. Valve boxes shall be centered on the valves. Valves shall be located outside the area of roads and streets. Earth fill shall be carefully tamped around each valve or meter box to a distance of 4 feet on all sides of the box, or to the undisturbed trench face if less than 4 feet. Valves shall have the interiors cleaned of all foreign matter before installation. Stuffing boxes shall be tightened and the valve shall be inspected in open and closed positions to insure that all parts are in working condition.

4.8 Reaction Backing.

4.8.1 Thrust blocks shall be concrete mixed not leaner than 1 cement: 2 1/2 sand: 5 gravel. Blocks shall be placed between solid ground and the fitting to be anchored. The area of bearing shall be as indicated or as approved.

4.8.2 Backing for sprinkler risers shall be redwood stakes size and location as indicated. Tie wire shall be corrosion resistant not less than 0.0475- inch diameter, 18-gage.

4.9 Remote Control Valves.

4.9.1 Install remote control valves in locations as shown on the drawings, with a cover of 8 inches maximum over top of flow control stem. Install a union on downstream side of all valves not provided with a union type connection. Fit with concrete valve box and cover. Top of valve box shall be flush with finish grade.

4.10 Remote Control Wiring. Connections of wiring, other than in the controller housing, shall be made with epoxy encapsulated connectors. Where more than one wire is placed in trench, the wiring shall be taped together at maximum intervals of 10 feet.

4.11 Automatic Sprinkler Controller. Controller shall be mounted on wood with wood screws and on concrete with expansion shield type anchors or embedded anchor bolts. Connect electrical to panel as shown on the drawings. Connection to control wiring shall be made within the pedestal or head of the controller. Electrical wiring shall be in a rigid conduit from controllers to panel provided under other sections. The work under this section shall include all wiring to the panels or elsewhere as required, in order to complete the installation of the control system.

5. CONNECTION TO EXISTING WATERLINES. Where connections are made between new work and existing mains, the connections shall be made by using specials and fittings to suit the actual conditions. Standard methods are readily available for making connections to various types of pipe, either under pressure or in the dewatered condition.

6. TESTS.

6.1 After completion of the piping system and prior to backfilling and the installation of the sprinkler heads, the entire system shall be tested for leaks and thoroughly flushed under pressure to remove any dirt, scale or other material. Lines shall be tested at 200 p.s.i. for 1 hour duration. Cracked or defective pipe, fittings, or accessories disclosed in the pressure test shall be replaced by the Contractor with sound material at no additional cost to the Government, and the test shall be repeated until results are satisfactory to the Contracting Officer.

6.1.1 No line shall be covered until inspection and approval has been given by the Contracting Officer.

6.1.2 Testing of plastic pipe shall not be done until all joints have had at least 24 hours to set and cure. During cold weather, 48 hours elapsed time shall be allowed for setting prior to testing. No water under pressure shall come in contact with any joint during the specified curing period. In hot weather, water shall not be permitted to stand in pipes until after backfilling is completed. Water used in testing shall be drained from pipes after completion of testing.

6.2 Coverage Test. When the irrigation system is completed the entire system shall be tested to determine if the water coverage is complete and adequate and to demonstrate that the system conforms to the requirements of the plans and specifications. All deficiencies and inadequacies resulting from defective or inadequate materials and/or workmanship shall be corrected at no additional cost to the Government. In the event any modifications to the system or deviation from the approved plans and specifications are directed, an adjustment in contract price will be made.

7. Deleted.

8. **TOOLS.** Three sets of special wrenches for removal and/or installation of sprinkler heads shall be provided at locations designated by the Contracting Officer.

9. **CLEANUP.** Upon completion of the installation of the irrigation system and appurtenances, all debris and surplus materials resulting from the work shall be removed.

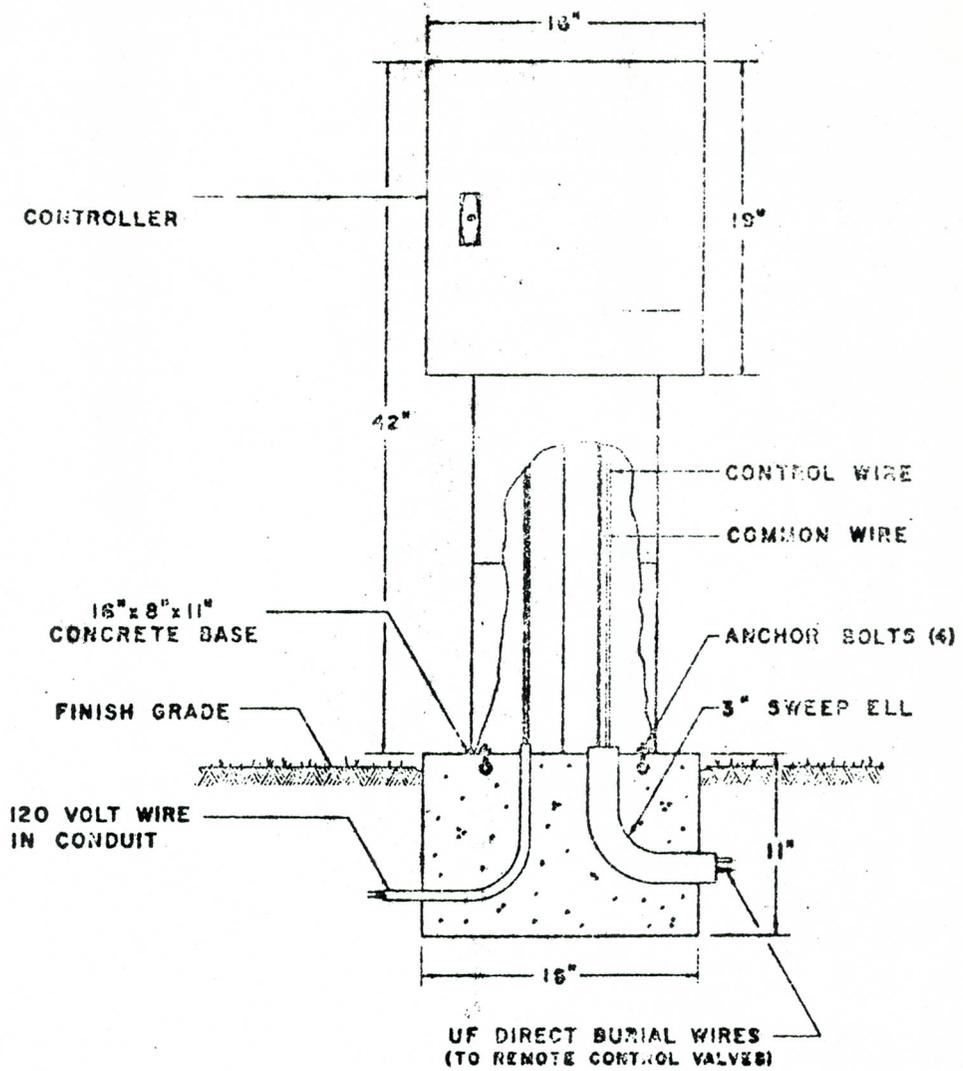
10. **VARIATION IN ARRANGEMENT OF SPRINKLERS** from those shown on drawings will be permitted. If such variation is made, the Contractor shall submit a shop drawing for approval in accordance with the Special Provisions. If any conflicts occur necessitating departures from the contract drawings, details of departures, hydraulic calculations and reasons shall be submitted as soon as practicable for written approval of the Contracting Officer. Hydraulic calculations shall include application rate per hour, maximum triangular spacing of heads for design flow rate and pressure, overlap including wind loss allowance and friction loss thru pipe fittings, valves and accessories.

11. **GUARANTEE.** The following equipment to be furnished under this specification shall be guaranteed for a period of 1 year from the date of acceptance thereof, either for beneficial use or final acceptance, whichever is earlier, against defective materials, design, and workmanship:

- Quick coupling valves and keys
- Rotary sprinklers
- Control valves
- Automatic controller

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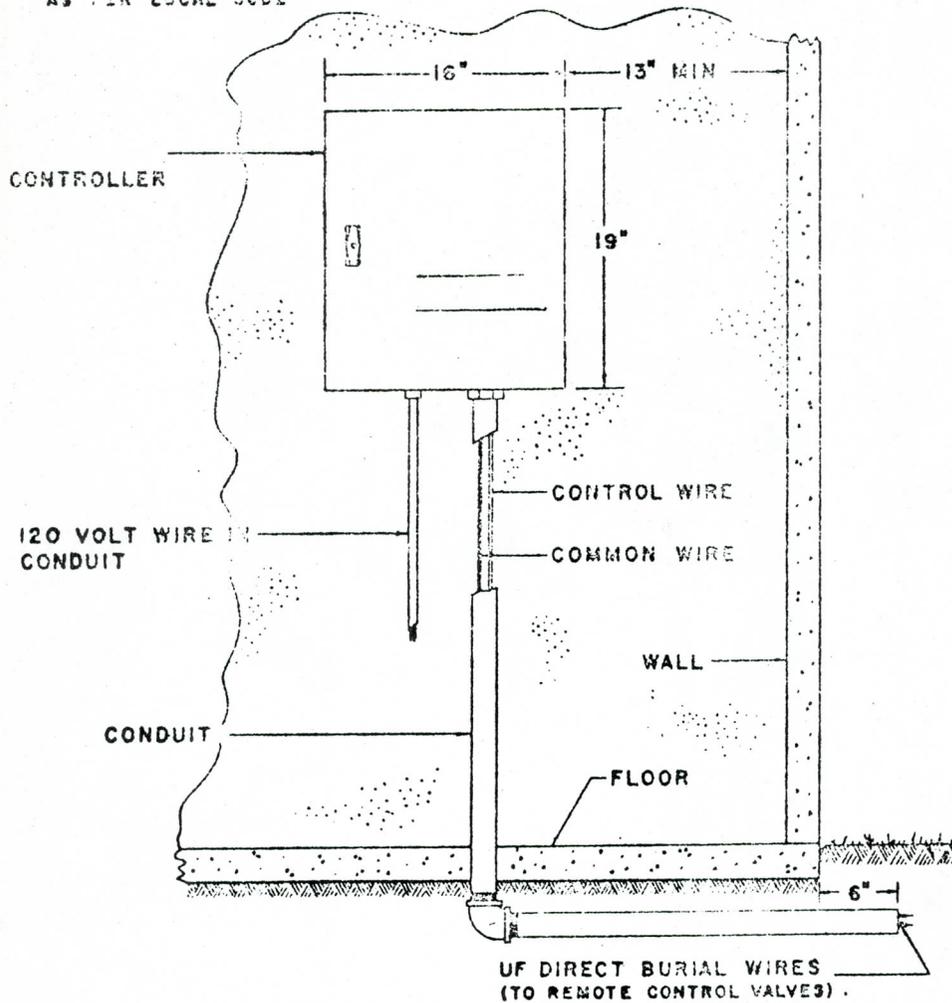
NOTE
ALL WIRING TO BE INSTALLED
AS PER LOCAL CODE



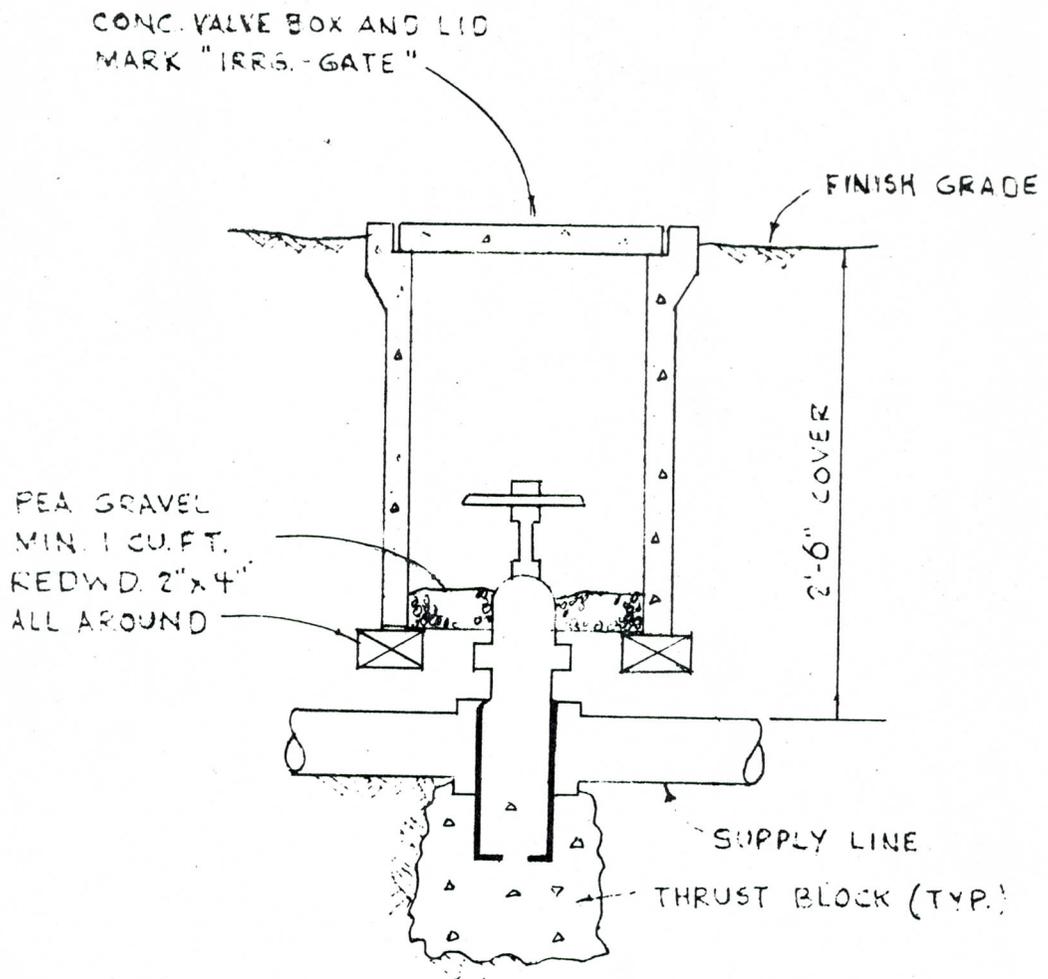
CONTROLLER DETAIL
(ELECTRIC PEDESTAL MOUNT)

NOTE

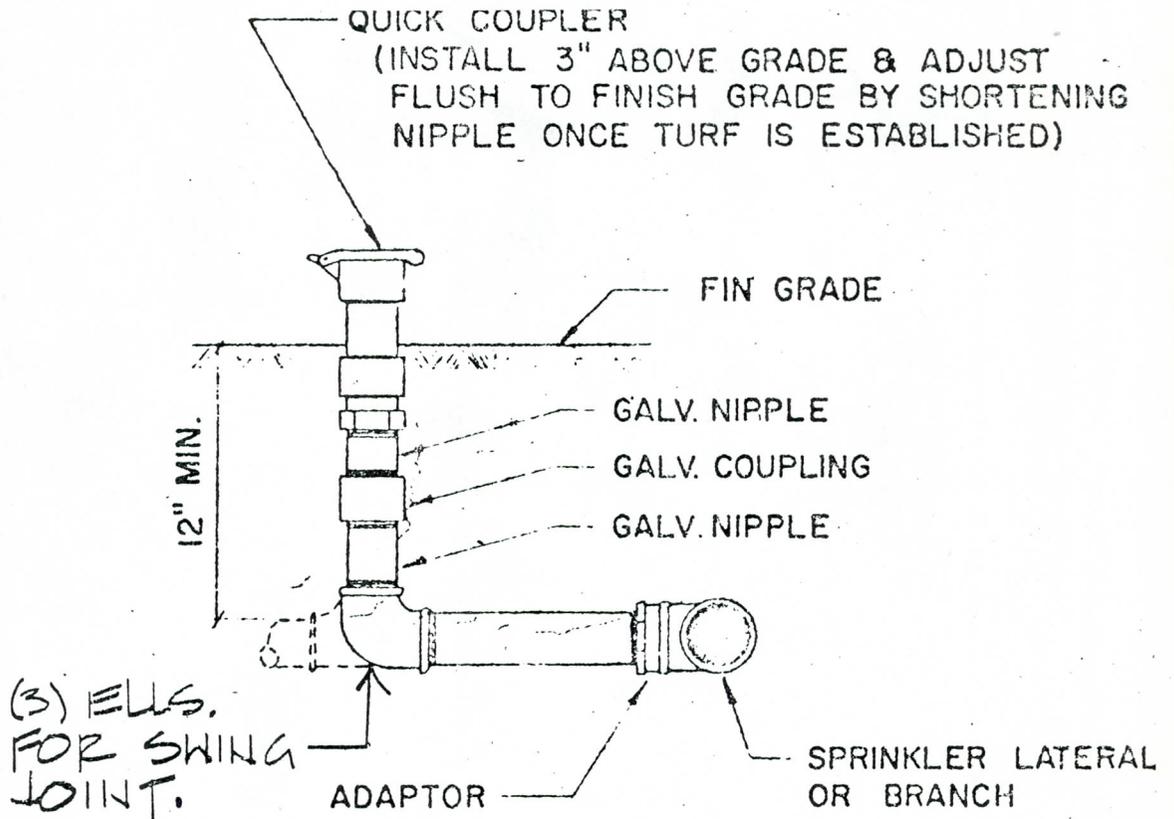
1. SEE MANUAL FOR MOUNTING INSTRUCTIONS
2. ALL WIRING TO BE INSTALLED AS PER LOCAL CODE



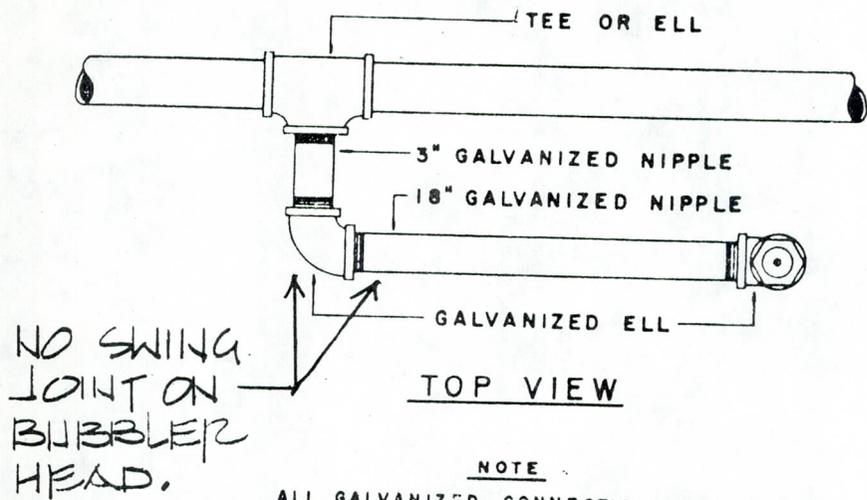
CONTROLLER DETAIL
(ELECTRIC WALL MOUNT)



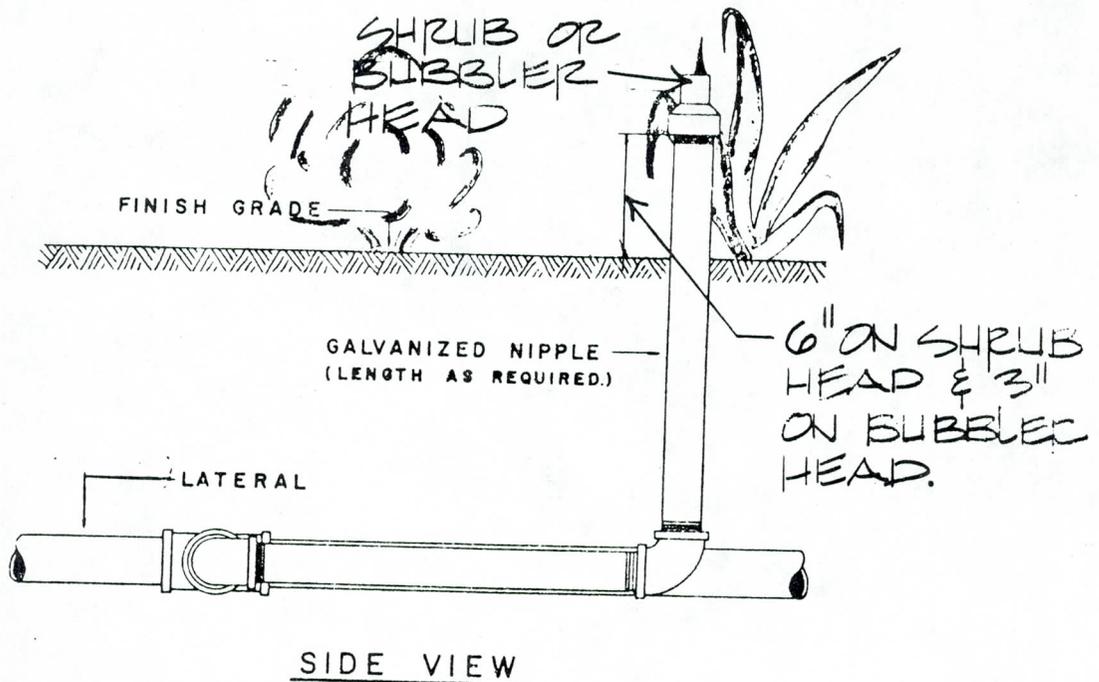
✕ GATE VALVE



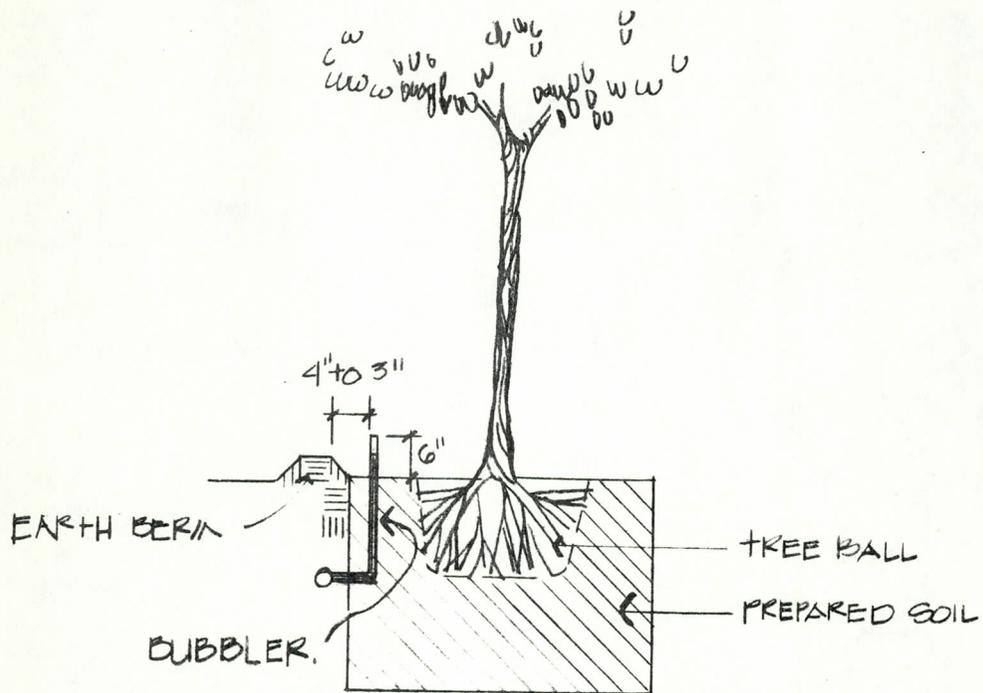
TYPICAL 1" QUICK COUPLER



NOTE
ALL GALVANIZED CONNECTIONS TO BE COATED WITH PIPE JOINT COMPOUND.



TYPICAL SHRUB HEAD & BUBBLER DETAIL



BUBBLER DETAIL
LOCATED IN TREE WELL

MAIN SUPPLY, LATERAL
AND
WIRING

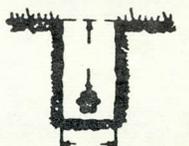
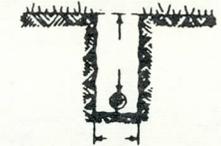
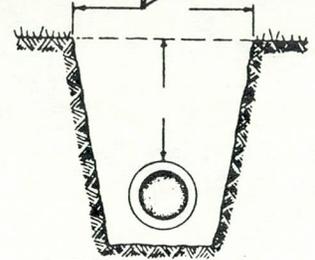
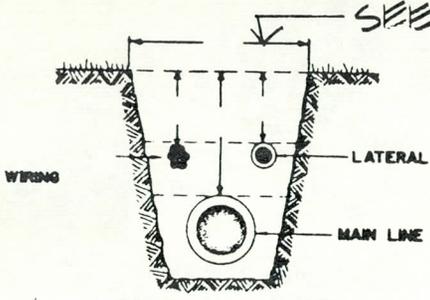
MAIN SUPPLY

PLASTIC LATERAL

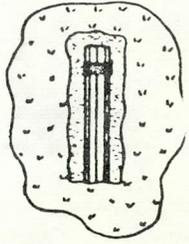
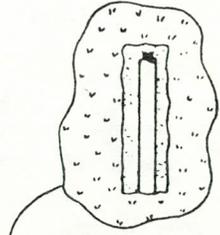
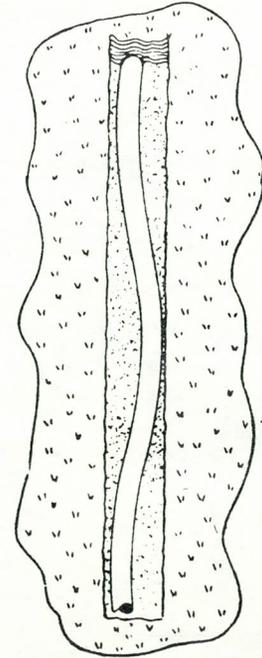
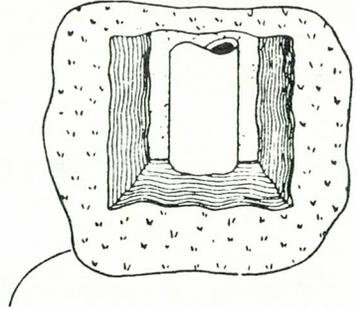
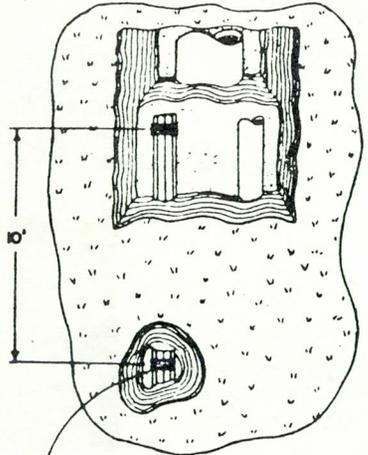
120 VOLT IN CONDUIT

WIRE

SEE SPECS.



100-15

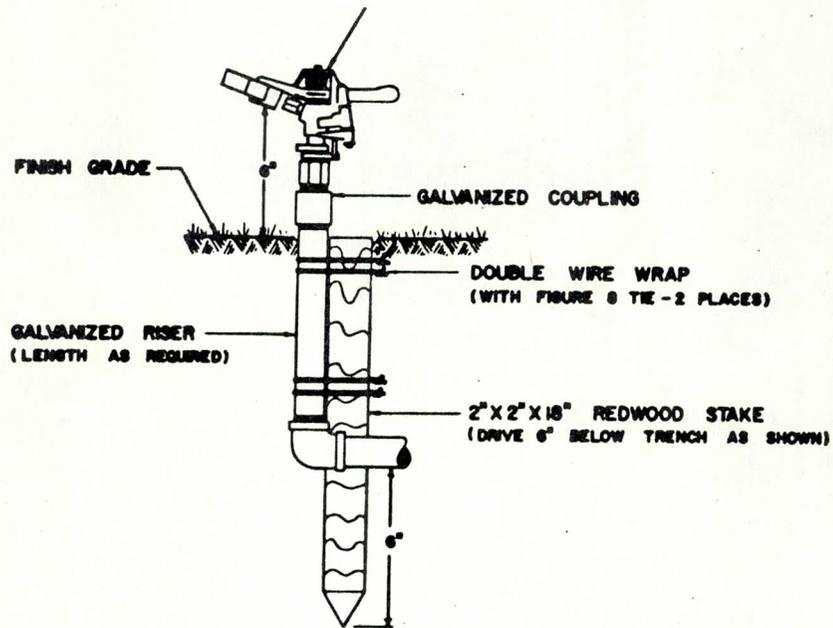


TAPE AND BUNDLE TUBING OR WIRING
AT 10 FT. INTERVALS

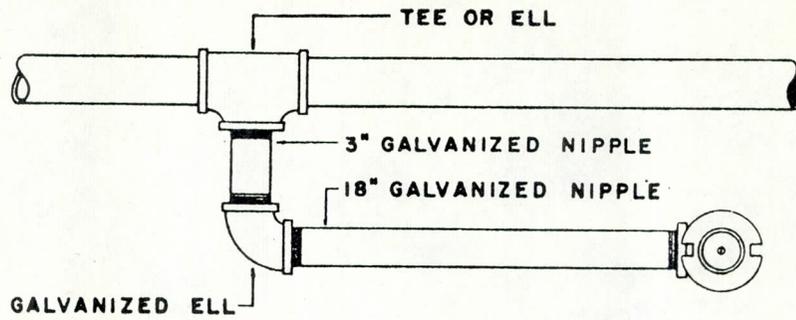
ALL 120 VOLT WIRING IN
CONDUIT TO BE INSTALLED
IN ACCORDANCE WITH LOCAL
CODE.

ALL PLASTIC PIPING TO BE
SHAKED IN TRENCHES AS
SHOWN.

TYPICAL TRENCHING DETAIL



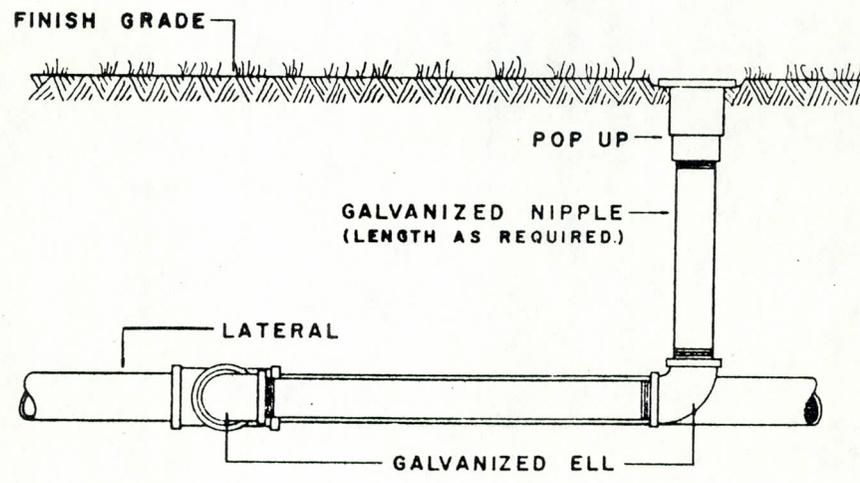
FIXED SINGLE NOZZLE ROTARY SPRINKLER
 (REDWOOD STAKE STABILIZER)



TOP VIEW

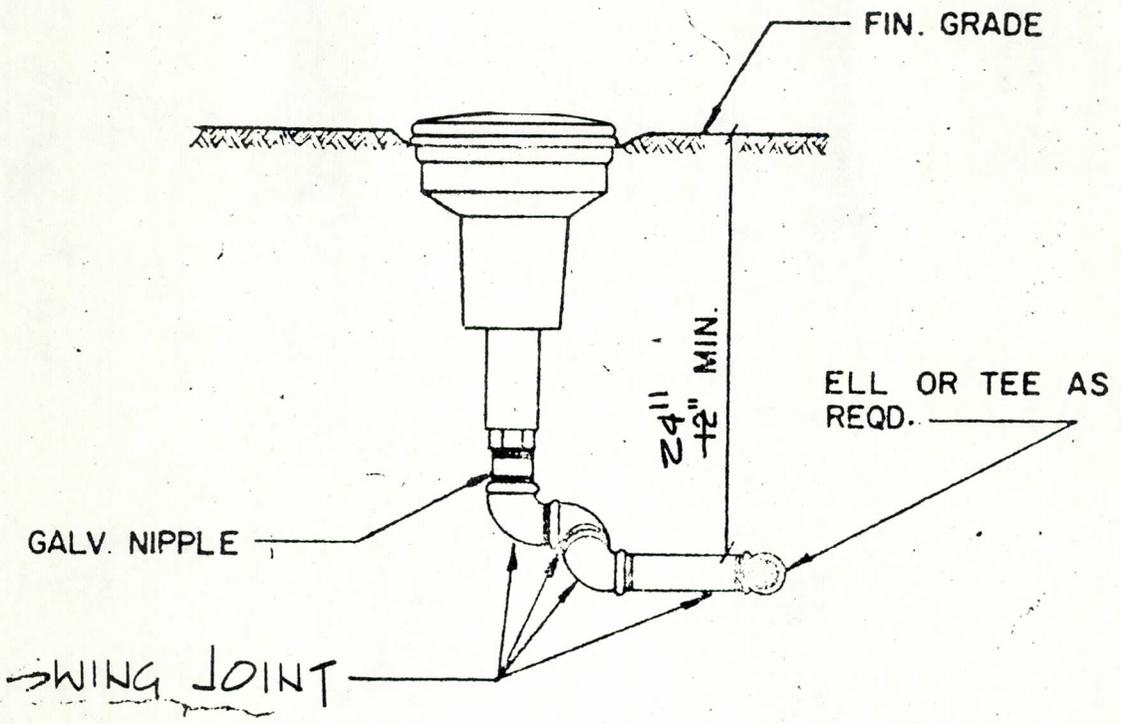
NOTE

ALL GALVANIZED CONNECTIONS TO BE COATED WITH 'PIPE JOINT' COMPOUND.
 ALL HEADS FLUSH TO GRADE ONCE TURF IS ESTABLISHED.



SIDE VIEW

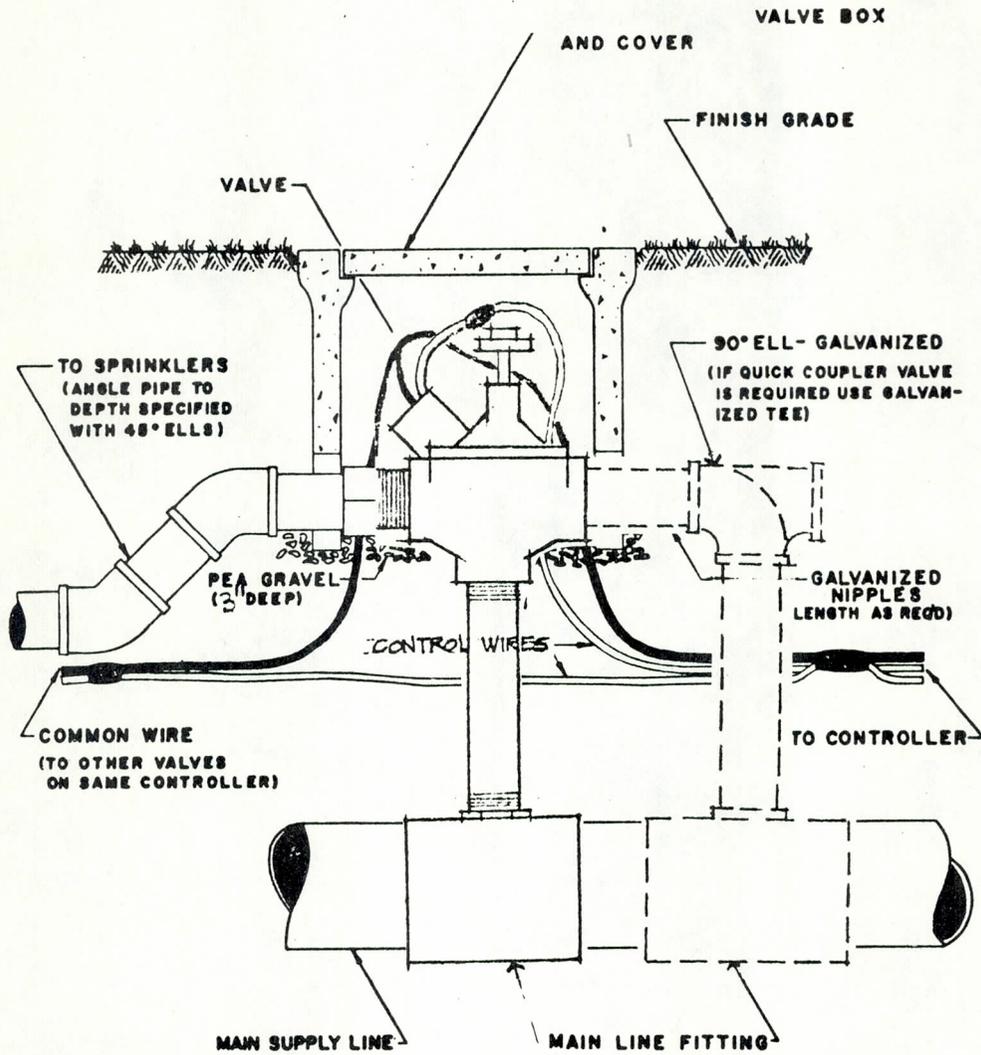
FIXED HEAD POP-UP NOZZLE SPRINKLER
 (SWING JOINT RISER)



ROTARY POP-LIP SPRINKLER

NOTE

1. ALL WIRE TO BE INSTALLED AS PER LOCAL CODE.
2. TAPE AND BUNDLE WIRE EVERY TEN FEET.
3. PROVIDE 6" EXPANSION LOOP AT EACH WIRE CONNECTION IN VALVE BOX.



REMOTE CONTROL VALVE DETAIL

(WITH VALVE BOX)

SECTION 11A
STATION MARKING

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- | | |
|----------------------------|--|
| 1. Applicable Publications | 4. Painting |
| 2. Materials | 5. Tabulation of Location and Text of Markings |
| 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.

TT-P-115D & Am-2

Paint, Traffic, Highway, White and Yellow

2. **MATERIALS.**

2.1 Paint.

2.1.1 Exterior Paint on Concrete shall conform to Federal Specification TT-P-115, except the color shall be non-fading black.

2.2 Concrete for markers and setting marker posts shall conform to the applicable requirements of the section: CONCRETE.

3. **INSTALLATION.**

3.1 General. The intersection of the main channel center line with the center lines of new, relocated, and existing facilities such as bridges, street intersections, underground utility crossings, side drains, upstream and downstream limits of permanent work, and other required information shall be marked by painting station numbers and additional identifying data as listed in the tabulation of location and text of markings. All markings shall be painted either on concrete walls (headwalls, abutments, etc.) or on concrete markers as indicated.

3.2 Concrete Markers shall be 24 inches long, 18 inches wide, and a minimum of 3-5/8 inches thick. Markers may be poured in place or precast. The top surface of each marker shall be set flush with the top of berm and the longer side aligned along the edge of berm.

4. **PAINTING.**

4.1 Preparation of Surfaces. Concrete shall be thoroughly cleaned of all curing compound, efflorescence, dirt, oil or other deleterious material by approved methods. The surface preparation shall be accomplished in such manner that paint will satisfactorily adhere to the surface.

4.2 Application. Painting shall be done in a neat and workmanlike manner and may be applied by brush, spray, roller or any combination of these methods. Painting of numbers and letters shall be accomplished with stencils and brush or spray application. Color for letters and numbers shall be black. All markings on concrete shall be in uniform capital block letters and numbers, 6 inches high, 3 inches wide, and 3/4-inch width of line. Markings on concrete walls shall be horizontal with the bottom of the marking not lower than 2 feet below the top of the wall. Markings shall read from left to right looking downstream. Markings on concrete markers shall be read from the center of the berm.

5. **TABULATION OF LOCATION AND TEXT OF MARKINGS.**

5.1 Abbreviations. The following abbreviations shall be used where applicable. All other words shall be spelled out.

Description	Abbreviation
Bridge	BR
Sewer Line	S
Water Line	W
Gas Line	G
Side Drains	SD
Inspection Manhole	IM
Drop Structure	DS
Drive	DR
Road	RD

5.2 Tabulation.

LOCATION OF MARKING				
* Station	Wall or Bank	Paint on	Text of Marking	Remarks
120+00	R	CM	120+00 ±	Upstream Limit
102+80	R	CM	108+50	
99+50	L	CM	SD-2-42 101+80	
99+77	L	CM	SD-30 99+77	
99+75	R	CM	SD-42 99+75	
98+50	R	ABUT	SD 2-24 McKellips Road Bridge	
97+75	L	CM	98+24 97+75	74+45(LF)
96+50	R	CM	SD-42 96+50	74+40(LF)
91+40	R	CM	SD-48 89+80	
91+00	R	CM	S-39 91+00	
88+65	L	CM	1M 89+80 S-39	
87+90	L	CM	87+90	
84+90	L	CM	SD-36 84+90	Lt. Bank Main Chan.
84+70	L	CM	1M 84+70	
84+60	L	CM	1M 84+60	Lt. Bank Main Chan.
84+20	L	CM	1M 83+65	
83+00	R	CM	S-21 83+00	
82+62	R	CM	SD 2-30 83+65	
78+50	L	CM	S-21 78+50	
70+70	L	CM	SD-36 70+70	
70+15	R	CM	SD-36 70+15	
70+32	L	CM	SD-42 70+06	
69+82	R	CM	W-12 70+06	
69+92	R	CM	W-12 69+92	39+70(L.F)
61+58	R	CM	DS 61+58	48+10(L.F.)
50+00	L	CM	DS 59+00	
58+55	R	CM	SD-36 58+55	35+70(L.F.)
57+50	R	ABUT	SD-42 Princess Drive Bridge	
56+50	L	CM	57+46 56+50	33+20 LF
56+32	R	CM	SD-48 56+32	
56+28	R	CM	W-8 56+28 G-2	

53+80	L	CM	53+80	
			1M	
53+48	L	CM	53+48	
			1M	
53+90	L	CM	53+40	
			S-24	
53+30	R	CM	53+40	
			S-24	
53+00	L	CM	53+00	
			1M	
44+50	L	CM	43+00	
			S-54	
41+30	R	CM	43+00	
			S-54	
24+65	L&R	CM	24+65	Confluence of
			S-5	Side Drain
10+85	L&R	CM	10+85	
			W-30	
10+40	R	CM	10+40	Downstream Limit

C = Center
 R = Right Bank (Looking Downstream)
 L = Left Bank (Looking Downstream)
 CW = Concrete Wall
 CM = Concrete Marker

"As Constructed" - Corrections. The above tabulation is based on project drawings. Where the "As Constructed" condition will deviate from the data contained in the above tabulation, the "As Constructed" condition shall be used for markings, with station numbers rounded off to the nearest foot.

* * * * *

SECTION 11K

MISCELLANEOUS ITEMS OF WORK

Index

- | | |
|--|-------------------|
| 1. Applicable Publications | 6. Entrance Signs |
| 2. Park Information Signs | 7. Picnic Tables |
| 3. Drinking Fountains | 8. Trash Cans |
| 4. Barbecue Braziers (Small Picnic Ramada) | 9. Bicycle Rack |
| 5. Barbecue Braziers (Group Picnic Ramada) | |

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

1.1 Federal Specification. (Fed. Spec.)

RR-C-82E

Cans, Ash and Garbage, Corrugated,
Taper-Side, Zinc-Coated: and Covers

2. **PARK INFORMATION SIGNS.** Signs shall conform to the applicable requirements of the Department of Interior, National Park Service Sign System Specifications. Posts shall conform to the details shown. Sign faces shall be reflective plastic sheeting laminated to metal panels. Background color of sheeting shall be brown. Signs shall be installed at the various locations indicated on the drawings and shall be of the types indicated.

3. **DRINKING FOUNTAINS.**

3.1 **Group Picnic Ramada.** Drinking fountains shall be installed at the locations indicated. Drinking fountains shall be pedestal mounted, 33-inch height with vandal proof bubbler and valve. Drinking fountain shall be similar and equal to Drinking Fountain Model 3376 as manufactured by Haws Drinking Faucet Company, Fourth and Page Street, Berkeley, California, 94710, telephone (415) 525-5801. Local representative for Haws Drinking Faucet Company is Ulibarri Sales Corporation, 2736 West Osborn Road, Phoenix, Arizona, 85017, telephone (602) 252-5883. Piping shall conform to the applicable requirements of the sections: WATER LINES and PLUMBING, GENERAL PURPOSE.

3.2 **Small Picnic Ramadas.** Drinking fountains shall be installed at the locations indicated. Drinking fountains shall be pedestal mounted, 36-inch height with vandal proof bubbler and valve. Pedestal shall be precast concrete with exposed aggregate finish. Fountains shall be furnished with bib faucet, Model 6250. Drinking fountains shall be similar and equal to Drinking Fountain Model 3050, including concrete step Model 6615, as manufactured by Haws Drinking Faucet Company, Fourth and Page Street, Berkeley, California, 94710, telephone (415) 525-5801. Local representative for Haws Drinking Faucet Company is Ulibarri Sales Corporation, 2736 West Osborn Road, Phoenix, Arizona, 85017, telephone (602) 252-5883. Piping shall conform to the applicable requirements of the sections: WATER LINES and PLUMBING, GENERAL PURPOSE.

3.3 **Floor drain and trap** shall be combination unit with the grating secured in place with screws. Floor drain shall be similar and equal to No. A 314 as manufactured by Alhambra Foundry Company, 1147 Meridian Ave., Alhambra, California 91802.

3.4 **Valve box cover** shall be round, cast brass, flush, cleanout access cover with anchor lugs on the frame and the cover secured in place with screws. The cover shall be sized for 4-inch pipe and shall be similar and equal to No. Y-84-BB, manufactured by Josam Manufacturing Co., Michigan City, Indiana 46360.

4. **BARBECUE GRILLS (SMALL PICNIC RAMADA).** Grills shall be constructed of galvanized steel not less than 3/16 inch thick with adjustable height grilling surface. Grill shall be vandal and theft proof type. Cooking surface shall be not less than 280 square inches. Unit shall be attached to post with concealed fastenings. Grills shall be similar and equal to picnic grill as manufactured by State of Arizona, Department of Corrections, Phoenix, Arizona, telephone (602) 271-5536.

5. **BARBECUE BRAZIER (GROUP PICNIC RAMADA).**

5.1 **Masonry** shall be in accordance with section: REINFORCED MASONRY (CONCRETE BLOCK).

5.2 **Concrete work** shall be in accordance with section: CONCRETE.

5.3 **Sand Fill** shall consist of clean, washed, natural sand conforming to the requirements of fine aggregate of section: CONCRETE except that material shall have 100 percent passing No. 20 sieve and not less than 90 percent retained on a No. 100 sieve.

5.4 Grille, supports and other metal work shall be in accordance with section: MISCELLANEOUS METALWORK AND MATERIALS.

5.5 Paint all metal parts not set in concrete, mortar or grout with 2 coats of heat-resistant aluminum paint similar and equal to "Heat-Rem" by Speco, Inc. of Cleveland, Ohio, "Lumino Aluminum Enamel" by National Chemical and Mfg. Co. of Los Angeles.

6. ENTRANCE SIGNS.

6.1 General. Signs shall be constructed of the following materials and as indicated on the drawings.

6.2 Concrete shall conform to applicable requirements of section: CONCRETE.

6.3 Lumber for signs shall be rough sawed construction heart grade redwood.

6.4 Reversed routing of letters shall be as indicated on the drawings. Routing of emblems shall be cut to the style indicated. Emblem for City of Scottsdale will be furnished by others and installed by Contractor.

6.5 Painting. Letters and emblems shall be painted with 2 coats of paint. Painting shall conform to applicable requirements of section: PAINTING, GENERAL.

7. PICNIC TABLES. Tables shall be 8 feet in length. Frame shall be 2-inch steel pipe, welded construction with baked enamel finish. Color shall be as selected by Contracting Officer. Top and seat shall be Douglas Fir, kiln dried, straight grain, with eased edges. Mounting hardware shall be cadmium or zinc-coated. Wood surfaces shall have 2 coats of clear weatherproof enamel. Tables shall be similar and equal to picnic table as manufactured by State of Arizona, Department of Corrections, Phoenix, Arizona, telephone (602) 271-5536. Tables shall be anchored to slab as indicated.

8. TRASH CANS.

8.1 Trash Can Holders shall conform to details shown. Pipe and accessories shall conform to requirements of section: MISCELLANEOUS METALWORK AND MATERIALS.

8.2 Trash Cans shall be 32 gallon capacity with covers, conforming to Federal Specification RR-C-82.

8.3 Concrete shall conform to requirements of section: CONCRETE.

9. BICYCLE RACKS shall be installed where indicated. Bicycle rack shall be single side, 8 bike type and shall be similar to "wall bike unit" as manufactured by American Playworld Inc. and distributed by Don Renner Company, P.O. Box 1873, Newport Beach, California, 92663, telephone (714) 673-9541.

* * * * *

SECTION 14A
ROUGH CARPENTRY

Index

- | | |
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| 1. Applicable Publications | 7. Shop Drawings |
| 2. Materials | 8. Samples and Descriptive Data |
| 3. Grading and Marking | 9. Preservative Treatment |
| 4. Sizes | 10. Installation of Framing and
Miscellaneous Wood Members |
| 5. Moisture Content | 11. Installation of Roof Sheathing |
| 6. Delivery and Storage | |

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

1.1 Federal Specification (Fed. Spec.).

FF-N-105B & Am-3	Nails, Brads, Staples and Spikes: Wire, Cut and Wrought
---------------------	--

1.2 U.S. Department of Commerce, Product Standard (Prod. Std.).

PS 1-74	Construction and Industrial Plywood
PS 20-70	American Softwood Lumber Standard

1.3 American Institute of Timber Construction (AITC), publication.

AITC 109-69	Treating Standards for Structural Timber Framing
Un-numbered	Timber Construction Manual (1974)

1.4 American Wood Preservers Bureau (AWPB), standard.

AWPB Quality Mark Lumber, Timber, Plywood (Oct 1971, reprinted Jun 1973)

LP-2	Softwood Lumber, Timber and Plywood Pressure Treated with Water-Borne Preservatives for Above Ground Use (Jul 1971)
------	--

LP-3	Softwood Lumber, Timber and Plywood Pressure Treated With Light Petroleum Solvent-Penta Solution for Above Ground Use (Jul 1971)
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LP-4	Softwood Lumber, Timber and Plywood Pressure Treated With Volatile Petroleum Solvent (LPG) – Penta Solution, for Above Ground Use (Jul 1971)
------	--

LP-55	Softwood Lumber, Timber and Plywood Pressure Treated with Creosote or Creosote Coal Tar Solutions for Use in Ground Contact (Jul 1971)
-------	---

1.5 National Forest Products Association (NFPA), publication.

National Design Specification for Stress-Grade Lumber and Its Fastenings (1973 Edition & Supplement (Apr 1973).

Manual for House Framing (1970).

1.6 Redwood Inspection Service (RIS), publication.

Standard Specifications for Grades of California Redwood Lumber (November 1970 and Supplements Nos. 1 & 2, Oct 1, 1972, Feb 15, 1974)

1.7 West Coast Lumber Inspection Bureau (WCLB), standard.

Standard Grading and Dressing Rules for West Coast Lumber, No. 16 (Sep 1, 1970 and Supplement Nos. I through VII) (Reprinted Apr 1, 1974 w/suppl)

1.8 Truss Plate Institute (TPI), publication.

TPI-74

Design Specification for Light Metal Plate Connected Wood Trusses

2. MATERIALS shall conform to the respective specifications and other requirements specified below:

2.1 Accessories and Nails.

2.1.1 Anchor Bolts. Steel, size as indicated, complete with nuts and washers.

2.1.2 Bolts; Lag, Toggle, and Miscellaneous Bolts, and Screws. Type, size, and finish best suited for intended use.

2.1.3 Clip Angles. Steel, 3/16-inch thick, size best suited for intended use; or zinc-coated steel or iron commercial clips designed for connecting wood members.

2.1.4 Expansion Shields. Type and size best suited for intended use.

2.1.5 Joist Hangers. Steel or iron, zinc-coated, size to fit members where used, sufficient strength to develop the full strength of supported member, complete with any special nails required.

2.1.6 Nails and Staples. Size and type best suited for purpose, in accordance with Fed. Spec. FF-N-105 when applicable to type used. For sheathing, length of nails shall be sufficient to extend 1 inch into supports. In general, 8-penny or larger nails shall be used for nailing through 1-inch thick lumber and for toe nailing 2-inch thick lumber; 16-penny or larger nails shall be used for nailing through 2-inch thick lumber.

2.1.7 Timber Connectors. Unless otherwise specified, in accordance with NFPA publication, National Design Specification for Stress-Grade Lumber and Its Fastenings; TPI-74; or AITC publication, Timber Construction Manual.

2.2 Structural and Miscellaneous Wood Members.

2.2.1 Structural Members. Except as otherwise indicated, Douglas Fir, grades indicated, graded in accordance with the West Coast Lumber Inspection Bureau. Design of members and fastenings shall conform to AITC publication, Timber Construction Manual. Members shall be rough sawn where indicated.

2.2.2 Nonstress Graded Members shall include plates, bucks, blocking, and nailers. Members shall be construction grade or No. 2 grade. Nonstress member grades shall conform to the National Grading Rule for dimension Lumber established in conformance with Section 10 or Prod. Std. PS 20 and as applied in individual grading rules of applicable grading agencies. For species graded under other grading rules, grade used shall be equivalent to grades outlined above. Sizes shall be as follows unless otherwise shown:

Member	Size (inches)
Blocking	2 x 4 or such larger size as required when applied between framing members; smaller sizes when approved for a specific use.
Furring	1 x 3.
Nailing strips	1 x 3 when used as shingle base for interior finish, otherwise 2-inch stock.

2.3 Roof Sheathing shall be plywood conforming to Prod. Std. PS 1, structural grade C-D with exterior glue, thickness indicated, with an Identification Index of 24/0.

3. GRADING AND MARKING. Lumber and plywood shall bear the grademark, stamp or other identifying marks indicating grades of material and rules or standards under which produced. Such identifying marks on a material shall be in accordance with the rule or standard under which the material is produced, including requirements for qualifications and authority of the inspection organization, usage of authorized identification, and information included in the identification. The inspection agency for lumber shall be certified by the Board of Review, American Lumber Standards Committee, to grade species used.

4. SIZES. Lumber sizes shall conform to Prod. Std. PS 20, and unless otherwise specified, lumber shall be surfaced on four sides. Sizes for materials other than lumber shall conform to requirements of the rules or standards under which produced. Size references unless otherwise specified are nominal sizes, and actual sizes shall be within manufacturing tolerances allowed by the standard under which the product is produced.

5. MOISTURE CONTENT. At the time lumber and other materials are delivered and when installed in the work their moisture content shall be as follows:

Treated and untreated lumber 2 inches or less in thickness:
19 percent maximum.

Treated and untreated lumber over 2 inches in thickness:
25 percent maximum.

Materials other than lumber: In accordance with standard under which product is produced.

6. DELIVERY AND STORAGE. Materials shall be delivered to the site in undamaged condition, stored in fully covered, well ventilated areas, and protected from extreme changes in temperature and humidity.

7. SHOP DRAWINGS of fabricated structural members shall be submitted for approval in accordance with the SPECIAL PROVISIONS. Shop drawings shall indicate materials, details of construction, methods of fastening, and erection details. Shop drawings shall be accompanied by a reference to design criteria used and stress computations.

8. SAMPLES AND DESCRIPTIVE DATA. The following shall be submitted for approval.

Accessories and nails: Two of each accessory and four of each kind of nail with description of application for each.

Fabricated structural members: Manufacturer's installation instructions and a list of successful installations of similar products.

9. PRESERVATIVE TREATMENT. To the extent indicated below, wood members shall be preservative-treated by pressure methods and so marked in accordance with the AWPI Standards. Unless otherwise specified it will include all wood members exposed to weather or in contact with soil, water, masonry or concrete, and all wood framing members directly above soil when the bottom elevation is 24 inches or less above soil. It will always include:

All wood members set into concrete regardless of location, including wood nailers for roofs.

All wood members in contact with slab-on-grade.

All wood members in contact with foundation walls.

Except as otherwise specified, treatment shall be in accordance with AWPB LP-2, LP-3, or LP-4, at the option of the Contractor. Treatment of wood to be in contact with soil or water shall be in accordance with AWPB LP-55. Treatment of wood to be painted or to make contact with painted parts, and wood to which finishing materials will be fastened, shall be in accordance with AWPB LP-2 or LP-4. Wood treated with oil-borne preservatives shall be clean, free from surface oil, and properly seasoned for use in building construction. Wood treated with water-borne preservatives shall be air-dried or kiln-dried to the moisture content specified for lumber and marked with the work "Dry". Treated wood which is cut shall be brush-coated with the preservative used in the original treatment.

10. INSTALLATION OF FRAMING AND MISCELLANEOUS WOOD MEMBERS.

10.1 General. Members shall be closely fitted, accurately set to required lines and levels, and rigidly secured in place. Nailing shall be in accordance with the Recommended Nailing Schedule as contained in the NFPA publication, Manual for House Framing. Where detailed nailing requirements are not specified, nail size and nail spacing shall be sufficient to develop an adequate strength for the connection without splitting the members. Installation of timber connectors shall conform to applicable requirements of the NFPA publication, National Design Specification for Stress-Grade Lumber and Its Fastenings. Members shall be framed for passage of ducts and pipes and shall be cut, notched, or bored in accordance with applicable requirements of the NFPA publication, Manual for House Framing. Rafters and joists shall be set with crown edge up. Leveling of joists, beams, and girders shall be without shims.

10.2 Fabricated Structural Members. Members shall be adequately braced before erection. Members shall be aligned and all connections completed before removal of bracing. Individually wrapped members shall be unwrapped only after adequate protection by a roof or other cover has been provided. Scratches and abrasions of factory applied sealer shall be treated with two brush coats of the same sealer used at the factory.

10.3 Sill Plates shall be set level and square and anchor bolted at not more than six feet on centers and not more than 12 inches from each end of each piece. A minimum of two anchors shall be used for each piece.

10.4 Blocking shall be provided as necessary for application of sheathing, and other materials or building items, and to provide fire stopping. Blocking shall be cut to fit between framing members and rigidly nailed thereto.

10.5 Nailers and Nailing Strips shall be provided as necessary for the attachment of finish materials and for roof tiles. Strips shall be run in lengths as long as practicable, butt jointed, cut into wood framing members when necessary, and rigidly secured in place.

10.6 Roof Framing with Rafters. Tops of rafters shall form a true plane. Ridges shall be straight and true intersections of roof planes. Rafters shall be secured to wall plate as shown. Openings in roof shall be framed as indicated.

11. INSTALLATION OF ROOF SHEATHING. Plywood sheathing shall be applied with edges 1/8 inch apart at side joints and 1/16 inch apart at end joints, and nailed at supported edges at 6 inches on center and at intermediate supports 12 inches on center. Nailing of edges shall be 3/8 inch from the edges. Roof sheathing shall have face grain at right angles to supports, end joints made over supports, and end joints staggered.

* * * * *

SECTION 14B

FINISH CARPENTRY

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

1.1 Federal Specification (Fed. Spec.).

FF-N-105B
& Am-3

Nails, Brads, Staples, and Spikes:
Wire, Cut and Wrought

1.2 National Woodwork Manufacturers Association (NWMA) Standard.

I.S. 4-70
& Addendum

Water Repellent Preservative Non-
Pressure Treatment for Millwork

1.3 U.S. Department of Commerce, Product Standard (Prod. Std.).

PS 1-74

Construction and Industrial Plywood

PS 20-70

American Softwood Lumber Standard

1.4 West Coast Lumber Inspection Bureau (WCLB), publication.

Standard Grading and Dressing Rules for West Coast Lumber,
No. 16 (Sep 1, 1970 and Supplement Nos. I through VII)
(Reprinted Apr 1, 1974 w/suppl)

2. MATERIALS shall conform to the respective specifications and other requirements specified below.

2.1 Nails. Size and type best suited for purpose, hot dip galvanized or aluminum for exterior use, in accordance with Fed. Spec. FF-N-105 when applicable to type used. Screws for use where nailing is impracticable shall be size best suited for purpose.

2.2 Trim. Douglas Fir, C and Better; graded in accordance with WCLB; assembled and sanded at the mill insofar as practicable; maximum practicable lengths, finger joints permitted when finish is paint. Lumber shall be preservative-treated and so marked in accordance with Com. Std. CS 262. Treated wood which is cut shall be brush coated with preservative used in the original treatment.

3. GRADING AND MARKING. Plywood and trim shall bear the grademark, stamp or other identifying marks indicating grades of material and rules or standards under which produced. Such identifying marks on a material shall be in accordance with the rule or standard under which the material is produced, including requirements for qualifications and authority of the inspection organization, usage of authorized identification, and information included in the identification. The inspection agency for lumber shall be certified by the Board of Review, American Lumber Standards Committee, to grade the species used. Except for plywood and lumber, bundle marking or certificates will be permitted in lieu of marking each individual piece.

4. SIZES AND PATTERNS. Lumber sizes and patterns shall conform to Prod. Std. PS 20, and unless otherwise specified, shall be surfaced on four sides. Sizes and patterns for materials other than lumber shall conform to requirements of the rules or standards under which produced. Size references, unless otherwise specified, are nominal sizes, and actual sizes shall be within manufacturing tolerances allowed by the standard under which the product is produced.

5. MOISTURE CONTENT at time of delivery and when installed in the work shall be as follows:

Treated and untreated trim	12 percent maximum
Other materials	In accordance with the standard under which product is produced

6. DELIVERY AND STORAGE. Materials shall be delivered to the site in undamaged condition, stored in fully covered, well-ventilated areas, and protected from extreme changes in temperature and humidity.

7. SHOP DRAWINGS of fabricated items, special mill items, and woodwork items shall be submitted for approval in accordance with the SPECIAL PROVISIONS. Shop drawings shall indicate materials and details of construction, methods of fastening, and erection details.

8. SAMPLES AND DESCRIPTIVE DATA. The following shall be submitted for approval:

- Shaped or molded trim: One linear foot of each kind.
- Nails: Four of each kind of each application.

9. INSTALLATION OF TRIM. Trim shall be installed straight, plumb, level and with closely fitted joints. Blind nailing shall be used to extent practicable, and face nailing shall be set and stopped with a non-staining putty to match the finish applied. Joints shall be staggered, concealed, or placed in unobjectionable locations. Exterior joints shall be made water-resistant by careful fitting and caulking. Molded work shall be coped at returns and interior angles and mitered at external corners. Intersections of flat work shall be shouldered to ease any inherent change in plane.

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SECTION 14E
STEEL DOORS AND FRAMES

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| 1. Applicable Publications | 4. Construction of Frames |
| 2. Shop Drawings | 5. Construction of Doors |
| 3. General Requirements for
Hollow Doors and Frames | 6. Delivery and Storage |
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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 National Standards Institute, Inc. (ANSI) Standards:

A 115.1-1971	Mortise Door Locks for 1-3/4" Doors
A 115.2-1971	Bored or Cylindrical Locks for 1-3/4" Doors
A 115.4-1971	Lever Extension Flush Bolts
A 123.1-1967	Nomenclature for Steel Doors and Steel Door Frames

1.2 American Society for Testing and Materials (ASTM) Publications:

A 366-72	Steel Sheets, Carbon, Cold-Rolled, Commercial Quality
A 569-72	Steel, Carbon (0.15 Maximum, Percent), Hot-Rolled Sheet and Strip, Commercial Quality
D 1692-74	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 each door and frame, elevation of each type of door and frame, details of construction, method of assembling sections, location and extent of hardware reinforcement, hardware locations, type and location of struts and anchors for frames, and thicknesses of metal. Shop drawings shall include specifications for shop painting including pretreating and painting materials and processes, and catalog cuts or descriptive data for the weatherstripping and thresholds.

3. GENERAL REQUIREMENTS FOR HOLLOW METAL 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 alignment. Exposed welded joints shall be dressed smooth.

3.4 Preparation of hardware. Doors and frames shall be prepared for hardware in conformance with the templates provided under SECTION: HARDWARE; BUILDERS'; the requirements of American National Standards A 115.1, A 115.2, A 115.4, and A 123.1; and the application locations specified in SECTION: HARDWARE; BUILDERS'. 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 in the referenced American National Standards, 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.

3.5 Weatherstripping for head and jamb protection shall be spring-tension type with hemmed edges and shall be of bronze, aluminum, or corrosion-resisting steel. Spring bronze or spring aluminum shall be not less than 0.008 inch thick; and corrosion-resisting steel shall be not less than 0.005 inch thick. Weatherstripping for bottom of doors shall be of the surface-mounted sweep type consisting of 1/8-inch thick neoprene in an extruded aluminum or bronze housing not less than 0.070 inch thick.

3.6 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 and other openings 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 alignment or 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 or 3/16-inch diameter wire.

5. CONSTRUCTION OF DOORS. Doors shall be of the type, size, and design shown. Door clearances shall not exceed the following: 1/8 inch at jambs and heads; 1/4 inch at meeting stiles of pairs of doors; 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 joined 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, stored out of contact with the ground and under a weathertight covering, permitting good air circulation. Whenever they become evident, abraded, scarred or rusty areas shall be cleaned and touched up with the paint used for the ship 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 thresholds shall be installed at exterior door openings to provide a weathertight installation.

TABLE I. REINFORCEMENT

Hardware Item	Minimum Gage	Minimum Size, Inches
Hinges	Door 10	8 x 1-5/8 (1-3/4-inch thick door)
	Frame 10	8 x 1-5/8 (1-3/4-inch thick door)
Mortise Locksets and Deadlocks	Door 14	10 x 3-3/4
	Frame 14	6-1/2 x 1-1/2 (1-3/4-inch thick door)
Surface-Applied Closers	Door 12	16 x 4-1/2
	Frame 12	18 x width of face of head and 8 x width of jamb, or stop as required
Hold-Open Arms	Door 12	14 x 4
	Frame 12	14 x width of face, jamb, or stop as required
Flush Bolts	Door 14	7-1/2 x 1/14
	Frame 14	4 x 1

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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SECTION 14F
TOILET STALL DOORS

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|----------------------------|---------------------------|
| 1. Applicable Publications | 3. Toilet Enclosure Doors |
| 2. General | 4. Installation |

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

- | | |
|---|------------------------------------|
| 1.1 Federal Specification (Fed. Spec.)
RR-P-1352 | Partitions, Metal Toilet, Complete |
|---|------------------------------------|

2. **GENERAL.** Metal toilet enclosure doors shall conform to the details shown. Zinc coating on steel sheets shall be 1.25 commercial coating class, and color of panels noted on the drawings shall be selected from the manufacturer's standard colors.

2.1 **Shop Drawings.** Shop drawings shall be submitted for approval in accordance with **SPECIAL PROVISIONS**. Shop drawings shall show plans, elevations, details of construction, gauges of metal, hardware, reinforcing, fittings, mountings, and anchorings.

2.2 **Certificates.** Certificates stating that the toilet enclosure doors conform to the specified requirements shall be furnished in accordance with the **SPECIAL PROVISIONS**.

3. **TOILET ENCLOSURE DOORS** shall conform to the applicable requirements of Fed. Spec. RR-P-1352. Size shall be as shown. Finish surface of doors shall be baked enamel.

4. **INSTALLATION.** Toilet partition doors shall be installed straight and plumb with all horizontal lines level and rigidly anchored to the supporting construction. Drilling and cutting for installation of anchors shall be at locations that will be concealed in the finished work. Doors shall have a uniform vertical edge clearance of approximately 3/16 inch and shall rest open at approximately 30 degrees when unlatched. Baked enamel finish shall be touched-up with the same type and color of paint that was used for the finish. Doors shall be cleaned and protected from damage until acceptance.

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SECTION 14G

CLAY TILE ROOFING

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| 1. Applicable Publications | 4. Preparation of Surfaces |
| 2. General | 5. Underlayment |
| 3. Materials | 6. Roofing Tiles |

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

1.1 Federal Specifications (Fed Spec).

SS-C-153B	Cement, Bituminous, Plastic
SS-R-620B	Roofing Felt, Glass Fiber, Asphalt Coated (for Flashing and Roofing)

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

D226-68	Asphalt Saturated Roofing Felt for Use in Waterproofing and in Constructing Built-up Roofs
D312-71	Asphalt for Use in Constructing Built-up Roof Coverings

1.3 International Conference of Building Officials (UBC) Standard.

32-12	Roofing Tile
-------	--------------

2. GENERAL. Clay roof tile shall be applied to roof surfaces indicated. Clay tile shall be installed over an asphalt-saturated felt underlayment.

3. MATERIALS.

3.1 Clay Tile shall be mission tile type, 18 inches long, 7-1/2 inches at large end and tapered to 6 inches at small end, free of laminations, lime particles, or defects, red color. Tile shall conform to UBC Standard No. 32-12.

3.2 Asphalt shall conform to ASTM D312, type III.

3.3 Asphalt Saturated Felt Underlayment shall conform to ASTM D226, 30 pound type.

3.4 Plastic Cement. Fed. Spec. SS-C-153, type 1.

3.5 Nails, Fasteners and Anchors.

3.5.1 Underlayment Nails. Non-ferrous or zinc-coated steel, with shank not greater than 10 gauge (0.138 inch) not less than 12 gauge (0.105 inch) and head not less than 3/8 inch diameter. Lengths shall be sufficient to penetrate into the wood sheathing for not less than 3/8 inch. Nails shall be driven through 1-inch diameter tin disks.

3.5.2 Tile Nails. Standard tile nails, non-ferrous or zinc-coated steel to suit the depth of the tile and penetrate the framing 3/4 inch.

3.5.3 Tile Fasteners. Tile fasteners shall be "Tyle-Tye", wire fasteners or approved equal as manufactured by San Valle Tile Kilns, 1258 North Highland, Los Angeles, California 90038, telephone (213) 464-7289. The anchoring system shall be UBC approved. Fasteners shall be installed in accordance with the recommendations of the manufacturer except that each fastener shall be anchored at eaves and at ridge.

4. PREPARATION OF SURFACES. The entire roof deck construction of the building shall be completed and the ambient temperature shall be no lower than 40 degrees F., before roofing work is begun thereon. The surface on which the underlayment is to be applied, shall be free from ice, frost, moisture, dirt, projections and foreign materials and shall be smooth and firm. Vents and other items penetrating the roofing shall be secured in position and properly prepared for flashings. Surfaces shall be inspected immediately prior to application of underlayment and roofing.

5. UNDERLAYMENT.

5.1 Underlayment shall consist of two layers of asphalt saturated felt, solid mopped between layers and on the top layer with asphalt at a rate of not less than 20 pounds per square. Felts shall be laid at right angles to roof slope, shingle method, lapping 19 inches, leaving 17 inches exposure. Apply the roofing in lengths not to exceed 18 feet, lapping 4 inches on ends with end laps broken not less than 2 feet apart. Alternate layers shall be nailed in two rows, staggered 18 inches on centers. Top row 1-inch from under edge and 16 inches from center row, covering all nails with a succeeding layer. Nail exposed edge of roofing at rakes 12 inches on centers. All tile fasteners and anchoring devices penetrating the roofing shall be sealed with plastic cement. Ridges shall be capped with an 18 inch wide strip of roofing felt mopped over completed underlayment.

5.2 Pipe Flashing. Set flange in hot asphalt on first layer of roofing. Nail flange and seal with a 6 inch strip of glass fabric, mopped solid, followed with a collar of roofing to fit around vent and overlap flanges 6 inches on all sides and set in hot asphalt. Form a plastic cement cant around base of vent on top of roofing felt.

6. ROOFING TILES.

6.1 Roof Tile. Lay roofing tiles spaced in rows 10-1/2 inches on centers. Cover tile and pan tile shall be laid with 14 inch exposure. First row of tops after gable roll shall be set in cement mortar. Double cover tile at eaves using a booster tile set in cement mortar. Where tile joins ridge, voids shall be filled with cement mortar. Cap ridge with cover tiles and point neatly with cement mortar. Work shall be complete with bird stops and boosters.

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Section 14M

CERAMIC TILE

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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.

QQ-L-101C

Lath, Metal, (and Other Metal Plaster Bases).
Calking, Sealing, and Glazing in
Buildings and Other Structures)

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

A 137.1-1967

Ceramic Tile

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

C 144-70
C 150-73a

Aggregate for Masonry Mortar.
Portland Cement.

2. MATERIALS.

2.1 Portland Cement shall conform to ASTM Specification C 150, type I, color as hereinafter specified.

2.2 Sand for Setting Beds shall conform to ASTM Specification C 144. Sand for grout and dry-set mortar shall conform to ASTM Specification C 144, except that 100 percent shall pass the No. 16 sieve size.

2.3 Tile shall conform to ANSI Standard A 137.1 and shall be standard grade. Containers shall be grade-sealed, and seals shall be marked to correspond with the marks on the signed "master grade certificate" specified hereinafter. Sizes specified are nominal.

2.3.1 Ceramic-Mosaic Floor Tile shall be unglazed natural clay with cushion edges.

2.3.2 Trim Units shall be type, size, and shape as required.

3. GENERAL. Tile in colors and patterns indicated, shall be applied in the areas shown on the drawings. Work shall not be performed unless the area's ambient temperature is at least 50 degrees F. and rising. Manufacturer's original containers, bundles, or packages shall be delivered to the project site unopened, with seals unbroken and labels and hallmarks intact. Floor tile installation shall not be started in spaces requiring wall tile until after the wall tile has been installed. Surfaces to receive applications of materials shall be clean and free of dirt, dust, oil, grease, and other objectionable matter. Tile shall be installed with the respective surfaces in true even planes to the elevations and grades shown. Each tile shall be brought to true and level plane by use of a beating block, and a test of plane distortion shall be made with a straightedge. Positive beat-in of each tile is required to establish proper bond. Tiles that are out of true plane or misplaced shall be removed and reset. Tile shall be laid from the centerlines of each space outward and adjustments made along walls, partitions, and borders, if any, so as to symmetrize the pattern with no cuts less than one-half the tile width. Joints between tiles shall be of uniform width as specified for the tile installed and parallel over the entire area. Fractional changes in dimensions without varying the uniformity of joint width will be permitted. Tile shall be cut with a suitable cutting tool and rough edges shall be rubbed smooth. Cut-tile misfits shall be replaced with properly cut tile. Installation of tile shall be deferred until hangers, door bucks, and electrical and mechanical work that is to be in or behind tile have been installed and satisfactory protection of adjoining work has been provided. Before installing tile on concrete surfaces in which the tile is to be laid in dry-set mortar, the tolerances, as specified in Section: CONCRETE shall be checked and corrected if necessary. Stops, returns, trimmers, caps, and special shapes shall be provided as required for jambs, offsets, external corners, and other conditions to provide a complete and neatly finished installation. Tile bases or cove shall be solidly backed with mortar.

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

4.1 Floor Tile. Duplicate sheets of tile, each about 12 inches square, showing colors and patterns of each type, class, and form.

4.2 Trimmers. Duplicate pieces of each color and shape.

5. CERTIFICATES. The Contractor shall furnish certificates prior to delivery of the certified material to the project site. Each certificate shall be signed by the Contractor and an authorized officer of the manufacturing company, and shall bear the name and address of the Contractor, the project location, the quantity, and date or dates of the applicable shipment or delivery. Certificates in triplicate will be required for the following materials.

5.1 All Tile. A "master grade certificate" certifying conformance to specification requirements.

6. INSTALLATION OF FLOOR TILE.

6.1 Setting Beds shall be composed by volume of 1 part portland cement to 6 parts damp sand, and mixed with the minimum amount of water necessary to produce a workable mass. Area, of setting bed, spread at one time shall be only as large as can be covered with tile before the mortar has obtained its initial set. Surplus mortar shall be removed. Setting beds shall be spread and tamped to force out air pockets, screeded to a true plane, and sloped to drains or leveled as shown. The average thickness of setting bed in any room or space shall be 1 inch, but in no case shall the setting beds be less than 3/4 inch or more than 1-1/4 inch thick. Setting beds shall be bonded over concrete slabs or filled with a slurry of neat cement; reinforcement will not be required.

6.2 Ceramic-Mosaic Floor Tile. The sheets of ceramic-mosaic floor tile shall be laid with joints the same as the joints between the tiles on the sheets. As soon as the setting bed has set sufficiently to be worked upon, either a dust coat of dry portland cement not more than 1/16 inch thick shall be sprinkled over the surface and lightly worked with a steel trowel, or a thin skim coat of neat portland cement grout shall be troweled or brushed onto the backs of tiles immediately before each sheet is laid. Tile sheets shall be laid on the freshly prepared setting bed while the surface is still plastic and then tamped into the mortar to insure solid bedding to the exact slope or level of finished-floor surface. When installation has hardened sufficiently, paper, sheets, and pasting glue shall be removed from face mounted tile sheets, by brushing as much water as necessary onto the paper. Misplaced tiles shall be repositioned and reset, and damaged or defective tile shall be replaced.

6.3 Grouting. A thick slurry of gray portland cement and fine-screened sand of equal parts mixed with a minimum amount of water shall be brushed or squeegeed over the floor until all joints are thoroughly filled and excess slurry removed. Following beat-in and adjustment, the excess slurry shall be washed clean from the face of tile. Neat portland cement shall then be applied to the floor and forced into the joints with the edge of a wood block or trowel. Excess grout shall be removed by use of a sponge, squeegee, or burlap to finish the joints and clean the surface without disturbing the floor surface.

6.4 Curing. Floors shall be covered with waterproofed paper with joints lapped at least 4 inches and tape-sealed or held down with planks or other weights. Floors shall be allowed to damp-cure for at least 72 hours before foot traffic is permitted thereon.

7. CONTROL JOINTS. Control joints shall be approximately 3/16 inch wide and shall be raked out 1/4 inch deep and sealed with joint sealing compound conforming to Federal Specification TT-S-230, colored to match the mortar joints. Control joints shall be provided over construction joints and expansion joints in concrete slabs. Control joints shall also be provided at perimeter walls.

8. CLEANING AND PROTECTING. Upon completion, tile floor and wall surfaces shall be thoroughly cleaned. Acid shall not be used for cleaning glazed tile. After the grout has set, tile wall surfaces shall be given a protective coat of a noncorrosiv soap or other approved method of protection. Tiled floor areas shall be covered with building paper before foot traffic is permitted over the finished tile floors. Board walkways shall be laid on tiled floors that are to be continuously used as passageways by workmen. Damaged or defective tiles shall be replaced.

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SECTION 14P

TOILET ACCESSORIES

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| 2. General | 5. Accessory Items |
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1. APPLICABLE PUBLICATIONS. The following Federal Specifications (Fed. Spec.) 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:

WW-P-541/8A (GSA-FSS) & Am-1	Plumbing Fixtures (Accessories, Land Use) (Detail Specification)
FF-D-396G	Dispensers, Soap.
QQ-S-766c & Am-5	Steel Plates, Sheets, and Strip - Corrosion Resisting
WW-P-541D/GEN (GSA-FSS) & Am-1	Plumbing Fixtures (Land Use) (General Specification)

2. GENERAL. Toilet accessories as specified herein shall be provided as indicated. Each accessory item shall be complete with the necessary mounting plates, anchors, and fasteners. Concealed mounting plates shall be of sturdy construction and may be unpolished or unplated.

3. SAMPLES AND DESCRIPTIVE DATA. One sample of each accessory proposed for use shall be submitted for approval. Samples shall be accompanied by descriptive data indicating materials of construction, fasteners proposed for use for each type of wall construction recommended mounting locations, and mounting instructions. Samples will be returned to the Contractor at the site of the work upon completion of toilet accessories; or the approved samples may be incorporated into the finished work provided they are identified and their locations noted.

4. ANCHORS AND FASTENERS shall be capable of developing a retaining force commensurate with the strength of the accessory to be mounted and shall be well suited for use with the supporting construction. Fasteners shall be of tamper-proof design.

5. ACCESSORY ITEMS shall conform to the respective specifications and other requirements specified below.

5.1 Grab Bar, Institutional (GBI). Stainless steel with minimum nickel content of 8 percent and minimum chromium content of 17 percent, satin finish, 1-inch minimum bar diameter, 0.049-inch minimum bar-wall thickness, bent wall-returns with minimum 2-1/2-inch bar centerline radius, flanged for connection to walls and floors, size and configuration as shown. Installed bars shall be capable of withstanding a 500-pound, vertical load without becoming loose from the fastenings and without obvious permanent deformation.

5.2 Paper Towel Dispenser and Waste Receptacle. Paper towel dispenser shall be type I, class 3, mounting S, style N, kind b. Waste receptacle shall be type II, mounting S, 20 gallon capacity, open top with liner. Containers may be corrosion-resisting steel or zinc-coated carbon steel. Exposed steel surfaces shall have a polished finish.

5.3 Soap Dispenser (SD). Fed. Spec. FF-D-396, type I, plastic case.

5.4 Toilet Paper Holder, Cabinet (TPC). Fed. Spec. WW-P-541, type 447.

5.5 Seat Cover Dispenser and Napkin Disposer (NDD) shall be type I, Class 2, mounting S, style M.

5.6 Napkin Dispenser (ND) shall be type I, class 5, capacity G, mounting S. Cabinet shall have key-operated locking mechanism with two operating keys and a 10 cent coin operating mechanism.

5.7 Mirror, Metal (MM). Stainless steel or chromium plated steel, 0.037-inch minimum thickness, edges turned back 1/4 inch and recess fitted with fiber board backing, mounting through face holes in each corner, size 16 inches by 20 inches. For stainless steel, finish shall be equal to a No. 8 finish. For chromium plated steel, the plating shall consist of a copper bond coating not less than 0.00020 inch thick, a nickel plating not less than 0.00015 inch thick, and a chromium plating not less than 0.00001 inch thick.

5.8 Toilet Seat Cover Dispenser (Men's toilet only) shall be type 1, class 2, Mounting R, Style L.

6. INSTALLATION. Toilet accessories shall be securely fastened to the supporting construction in accordance with the approved submittals. Accessories shall be protected from damage from the time of installation until acceptance.

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SECTION 14Q

HARDWARE; BUILDERS'

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| 7. Finishes of Hardware | 14. Application of Hardware |
| | 15. Hardware Sets |

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

1.1 Federal Specifications (Fed. Spec.).

FF-H-106a & Am-1 & Int. Am-9	Hardware, Builders'; Locks and Door-Trim
FF-H-111c	Hardware, Builders'; Shelf and Miscellaneous Hinges, Hardware, Builders'
FF-H-116c & Int. Am-5 (GSA-FSS)	
FF-H-121c	Hardware, Builders'; Door-Closing Devices

1.2 Corps of Engineers Pamphlet.

EP 1110-345-8	Builders' Hardware Samples for Military Construction, on File in Washington, D.C.
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2. GENERAL. Hardware shall conform to the applicable requirements of the Federal Specifications listed herein, unless otherwise specified. Reinforcement for hardware in metal doors shall be as specified in section: STEEL DOORS AND FRAMES. Modifications to hardware, required by reason of construction characteristics, shall be such as to provide the specified operative or functional features.

3. MATERIALS. Except as hereinafter specified, hardware shall be supplied in the material specified in the applicable Federal Specification for the types indicated.

4. TEMPLATES. The Contractor shall furnish templates required by the manufacturer of the hollow metal doors and pressed steel door-frames so as to enable the door manufacturer to make proper provision in his work to receive the specified hardware and deliver his products to the project site on schedule. Where 2 or more articles of hardware are to be mounted on the same door, the Contractor shall effect proper coordination between the manufacturers of the different articles in order that each manufacturer may furnish templates that will allow installation of his hardware without interference with the installation and operation of other hardware.

5. SAMPLE REQUIREMENTS AND HARDWARE SCHEDULE.

5.1 Samples List. The Contractor shall submit for approval a samples list in triplicate, listing each of the different articles of builders' hardware required. The samples list shall be submitted in the following form with the Federal Specification reference and type, and the manufacturer's name and catalog number of the article supplied.

Item number & file designation	Spec. reference, type or catalog no.	Name of article	Mfr's name & catalog no. of article supplied
1(F)	161B	Lock	ABC Lock Co. BOR99
2(NF)	T2102 NRP	Hinge	XYZ Hinge Co. 0B123

5.1.1 Opposite each listed item number, the following shall be inserted as applicable: the symbol (F) denotes that the item appears in Corps of Engineers Pamphlet EP 1110-345-8 list of samples of builders' hardware for military construction on file in Washington, D.C. The symbol (NF) indicates the article is not on file or listed and a sample will be required.

5.1.2 Samples of Items Listed above with symbol (NF) shall accompany the samples list, properly tagged and marked for identification, for approval by the Contracting Officer. Items listed above with symbol (F) shall be accompanied by a certification that the articles so noted conform to the samples on file in Washington, D.C.

5.2 The Hardware Schedule shall list all of the materials to be furnished and shall be submitted in triplicate to the Contracting Officer for approval before any hardware is delivered to the project site. The schedule shall include for each item the quantities, manufacturer's catalog numbers, detail information and location and hardware set identification, corresponding Federal Specification type number to manufacturer's catalog number, keying information, list of abbreviations and template numbers.

6. **PACKING, MARKING, AND LABELING.** Hardware shall be delivered to the project site in the manufacturer's original packages. Each article of hardware shall be individually packaged in the manufacturer's substantial commercial carton or container, properly marked or labeled so as to be readily identifiable with the permanent hardware schedule. Each change-key shall be tagged or otherwise identified with the door for which its cylinder is intended.

7. **FINISHES OF HARDWARE.**

7.1 Hinge finishes for the following types of doors and locations.

7.1.1 Exterior Door Hinges shall be US26D.

7.2 Lock and Door Trim finishes for the following types of doors and locations.

7.2.1 Exterior Doors shall be US26D.

7.3 Door Closer finishes shall be silver aluminum standard with the manufacturer of the closers.

7.4 Door Stops shall be finished US32D.

8. **FASTENINGS** of proper type, size, quantity, and finish shall be supplied with each article of hardware. Machine screws and expansion shields shall be used for attaching hardware to concrete, stone, or other masonry. Fastenings exposed to the weather in the finished work shall be of brass, bronze, or stainless steel, as applicable.

9. **KEYING.** Cylinder locks shall be keyed alike. Keys for cylinder locks shall be stamped with change number. Keys shall be supplied as follows:

Cylinder locks: 2 change keys each lock

The keys shall be turned over to the Contracting Officer properly tagged and designated as to location.

10. **LOCKSETS, LOCK TRIM AND DOOR TRIM** of the following types shall conform to Fed. Spec. FF-H-106 except as otherwise specified.

10.1 Locks, and Locksets, shall be similar and equal to heavy duty type, D76PD as manufactured by Schlage Lock Co., P.O. Box 3324, San Francisco, California 94119. Locks shall have similar operating features.

10.1.1 **Manufacture.** The locksets and deadlocks supplied for the project shall be the products of a single manufacturer.

10.1.2 **Cylinder Locks.** Cylinders shall have 5 pins. Finish shall be US26D.

10.2 **Lock Trim.**

10.2.1 Trim shall be No. 4.

10.3 Door Trim shall be of the following types.

10.3.1 Sectional door pulls for metal doors shall be type 349.

10.3.2 Push Plates shall be type 465R, size 3-1/2 by 15 inches rectangular.

11. **MISCELLANEOUS HARDWARE** of the following types shall conform to Fed. Spec. FF-H-111.

11.1 Floor-Applied Door Stops shall be type 1330E. A door stop shall be provided at each inswinging exterior door.

11.2 Door Holders shall be type hereinafter specified.

11.2.1 Floor-Type Holders for exterior doors shall be type 1149.

- 11.3 Surface Bolts shall be type 1061, length 9 inches.
12. BUTTS AND HINGES. Hinges of the following types shall conform to Fed. Spec. FF-H-116.
- 12.1 The Number and Size of Butts shall be as recommended in paragraph 6 notes, of Fed. Spec. FF-H-116.
- 12.2 Hinges for Exterior Reverse-Bevel Doors With Locks shall have a pin that is made nonremovable, by means of a set screw in the barrel, when the door is in the closed position.
- 12.3 Contractor's Option. Hinges with hylon or oil-impregnated bearings may be furnished in lieu of the ball-bearing hinges specified.
- 12.4 For Outswinging Exterior Doors without Closers. Type T2106.
- 12.5 For Inswinging Exterior Doors with Closers. Type T2107.
13. DOOR-CLOSING DEVICES shall conform to Fed. Spec. FF-H-121, of the following types.
- 13.1 Surface-Type Closers shall be type 3001. Closers shall be provided with a clock-key or capped vave. Size requirements shall conform to table I of Fed. Spec. FF-H-121, including the footnote. Surface-type closers shall be the products of one manufacturer only.
14. APPLICATION OF HARDWARE.
- 14.1 Butts and Hinges.
- 14.1.1 Top Hinges shall be installed with the center of hinge not more than 9-3/4 inches below the top of door.
- 14.1.2 Bottom Hinges shall be installed with the center of hinge not more than 10-3/8 inches above the finish floor.
- 14.1.3 Intermediate Hinges shall be installed equidistant between the top and bottom hinges.
- 14.2 Door-Closing Devices shall be installed and adjusted in strict accordance with the templates and printed instructions supplied by the manufacturer of the devices.
- 14.3 Door Pulls, Sectional shall be centered 42 inches above the finish floor.
- 14.4 Locks and Strikes. The locations of strikes for locks shall be as follows.
- 14.4.1 Mortise Deadlock Strike shall be centered 60 inches above the finish floor.
- 14.5 Push Plates shall be installed with the center of plate 45 inches above the finish floor.
15. HARDWARE SETS shall be as follows:
- Storage Room Doors
 - Butts as required
 - Lockset
 - 2 Door Holders
 - 2 Surface Bolts
 - Rest Room Entrance Doors
 - Butts as required
 - Lockset
 - Door Pull
 - Push Plate
 - Door Closer

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SECTION 14R

PAINTING, GENERAL

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| 1. Applicable Publications | 6. Paint Application |
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1. APPLICABLE PUBLICATIONS. The following publications of the issues below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the references thereto.

1.1 Federal Specifications.

- | | |
|---|--|
| SS-C-192g & Am-3
TT-C-535B
& Am-1 | Cement, Portland.
Coating, Epoxy, Two-Component, for Interior Use on Metal, Wood, Wallboard, Painted Surfaces, Concrete and Masonry |
| TT-E-489F
& Int Am-1
TT-E-505a & Am-3 | Enamel, Alkyd, Gloss (For Exterior and Interior Surfaces) |
| TT-E-506J | Enamel, Odorless, Alkyd, Interior, High Gloss, White and Light Tints |
| TT-E-508b & Am-4 | Enamel, Alkyd, Gloss, Tints and White (For Interior Use) |
| TT-E-509b & Am-1 | Enamel: Interior Semigloss, Tints and White |
| TT-E-543a
& Am-1
TT-E-545a
& AM-2
TT-F-001098D | Enamel, Odorless, Alkyd, Interior, Semigloss, White and Tints |
| TT-P-19C
TT-P-31D | Enamel, Interior, Undercoat, Tints and White |
| TT-P-37C & Am-3 | Enamel, Odorless, Alkyd, Interior, Undercoat, Tints and White |
| TT-P-38D
TT-P-57b
& Am-1
TT-P-86G
TT-P-105a
& Am-1 | Block Solvent Thinned, for Porous Surfaces (Concrete Block, Cinder Block, Stucco, Etc.) |
| TT-P-320C | Paint, Acrylic Emulsion: Exterior, Red and Brown |
| TT-P-615d
& Am-2
TT-P-641F | Paint, Oil: Iron-Oxide, Ready-Mixed, Red and Brown |
| TT-P-645 | Paint, Alkyd Resin; Exterior Trim, Deep Colors |
| TT-S-708a
& Am-1
TT-S-711b
& Am-2
TT-V-51e | Paint, Aluminum, Ready-Mixed |
| | Paint, Zinc Yellow-Iron Oxide-Base, Ready-Mixed |
| | Paint, Read-Lead-Base, Ready-Mixed. |
| | Paint, Oil: Chalk-Resistant, Lead-Free, Exterior Ready-Mixed White and Tints |
| | Pigment, Aluminum; Power and Paste for Paint |
| | Primer Coating: Basic Lead Silico Chromate, Ready Mixed |
| | Primer Coating; Zinc Dust-Zinc Oxide (For Galvanized Surfaces) |
| | Primer, Paint, Zinc-Chromate, Alkyd Type |
| | Stain, Oil; Semi-Transparent, Wood, Exterior |
| | Stain; Oil Type, Wood, Interior. |
| | Varnish; Asphalt. |

1.2 Federal Standards.

No. 141a & Change Notices
1, 2 & 3

Paint, Varnish, Lacquer, and
Related Materials; Methods of Inspection,
Sampling, and Testing

No. 595a & Change Notice 1

Colors

1.3 Military Specifications.

MIL-S-12935D
MIL-P-14504A

Sealer, Surface; for Knots
Primer Coating, Pretreatment,
One-Package Wash Primer (For Steel,
Aluminum and Magnesium)
Primer (Wash), Pretreatment, Blue
(Formula No. 117-B for Metals)
Primer Coating, Zinc Dust Pigmented,
for Steel Surfaces
Primer Coating, Exterior,
Lead-Pigment Free (Undercoat for Wood,
Ready-Mixed, White and Light Tints
Paint, Oil, Alkyd, Exterior,
White and Light Tints

MIL-P-15328C
& Am-1
MIL-P-26915A
(USAF) & Am-1
MIL-P-28582
(YD)

MIL-P-52324
(MO)

2. GENERAL. The term "paint," as used herein, includes emulsions, enamels, paints, stains, varnishes, sealers, cement-emulsion filler and other coatings, whether used as prime, intermediate, or finish coats.

3. MATERIALS. Paints shall be in sealed containers that plainly show the designated name, formula or specification number, batch number, color, quantity involved, date of manufacture, manufacturer's formulation number, manufacturer's directions, and name of manufacturer, all of which shall be plainly legible at the time of use. Pigmented paints shall be furnished in containers not larger than 5 gallons. Materials shall conform to the specifications shown in the painting schedule herein and to the requirements hereinafter specified. Contractor inspection responsibility shall be as specified in paragraph titled QUALITY ASSURANCE PROVISIONS. When the required quantity of a material of a particular color is 5 gallons or less, a proprietary brand material similar to that specified may be proposed, and the responsibility of the Contractor for inspection, as specified above, may be waived.

3.1 Cement-Emulsion Filler Coat shall be acrylic base cement-emulsion filler. The acrylic base cement-emulsion filler coat shall be used with an acrylic exterior emulsion finish.

3.1.1 Acrylic Base Cement-Emulsion Filler.

3.1.1.1 Materials.

3.1.1.1.1 White Portland Cement shall conform to Federal Specification SS-C-192, type I or II.

3.1.1.1.2 Aggregate shall be washed silica sand containing not more than 0.5 percent colloidal clay. One hundred percent shall pass through a No. 20 sieve, 15-30 percent shall pass a No. 70 sieve, and 0-15 percent shall pass a No. 100 sieve.

3.1.1.1.3 Mixing Liquid, acrylic emulsion polymer, 46 percent nonvolatile, shall be the same resin emulsion as used in formulating acrylic emulsion paint, exterior, specified below.

3.1.1.1.4 Acrylic emulsion paint, exterior, shall conform to Federal Specification TT-P-19.

3.1.1.2 Composition:

White portland cement	16.5 pounds
Aggregate	33.5 pounds
Mixing liquid	0.75 gallon
Potable water, maximum	1.0 gallon
Acrylic emulsion paint, exterior	1.0 gallon

3.1.1.3 Mixing Instructions. Cement and aggregate shall be dry mixed so that uniform distribution and intermixing are obtained. Mixing liquid and one-half of the total amount of water shall be added gradually to the white portland cement and aggregate with constant stirring until a thick, smooth material is obtained. Emulsion paint shall then be added to the foregoing and stirred until uniformity is obtained. The blend shall have a thick,

creamy consistency. The remainder of the water shall be added if necessary, to obtain a material with adequate application characteristics. Blending resin emulsion or emulsion paint with any other component shall be done with caution; too rapid agitation will cause air entrapment and foaming. Filler shall be free of entrapped air and foam when applied.

3.2 Exterior Emulsion Paint for concrete and masonry surfaces shall be exterior acrylic emulsion paint conforming to Federal Specification TT-P-19. Exterior emulsion paint for wood surfaces shall be TT-P-19.

3.3 Exterior Oil Paint shall conform to the following Federal or Military Specifications.

White: TT-P-105; or MIL-P-52324, class 1
Light tints: TT-P-105; or MIL-P-52324, class 2
Red or Brown: TT-P-31
Other deep Colors: TT-P-37.

3.4 Ferrous-Metal Primer shall conform to Federal Specification TT-P-57, type I; TT-P-86, type I or II; TT-P-615, type I, II, or V; or TT-P-645.

3.5 Vinyl-Type Wash Coat shall conform to Military Specification MIL-P-14504 or MIL-P-15328.

3.6 Zinc-Dust-Containing Paint shall conform to Federal Specification TT-P-641, type II, or Military Specification MIL-P-26915.

4. QUALITY ASSURANCE PROVISIONS. Paint proposed for use shall be stored on the project site in sealed and labeled containers, or segregated at the source of supply, sufficiently in advance of need to allow 30 days for testing. The Contractor shall furnish either one of the following data for all batches in excess of 5 gallons:

a. A test report showing that the proposed batch met all specification requirements.

b. A test report showing that a previous batch manufactured using the same formulation as that used in manufacturing the proposed batch met all specification requirements, and a report showing test results on the proposed batch for the following properties for which there are requirements in the material specification: weight per gallon, viscosity, fineness of grind, drying time, color, and gloss.

Testing procedures and reports shall be as specified in paragraph 5 of Method 1031.2 of Federal Standard 141. Upon notification by the Contractor that the material is at the site or source of supply, a 1-quart sample of each batch, except for small quantities for which the use of proprietary brands has been approved, shall be taken by random selection from the sealed containers by the Contractor in the presence of a representative of the Contracting Officer. The contents of the sampled containers shall be so thoroughly mixed as to render the sample truly representative. Samples shall be clearly identified by designated name, specification number, batch number, project contract number, intended use, and quantity involved. At the discretion of the Contracting Officer, samples may be tested by the Government before approval, or materials may be approved for use based on the test reports furnished. If the materials are approved based on reports furnished by the Contractor, samples will be retained by the Government for possible future testing should the materials appear to be defective during or after application. If the sample is tested by the Government and it fails to meet specification requirements, the material represented by the sample shall be replaced, and the cost of retesting will be deducted from the payments due the Contractor at the rate of \$100 per sample retested.

5. CLEANING, PREPARATION, AND PRETREATMENT OF SURFACES.

5.1 General. Hardware, hardware accessories, machined surfaces, plates, lighting fixtures, and similar items in contact with painted surfaces and not to be painted shall be removed, masked, or otherwise protected prior to surface preparation and painting operations. Such removal shall be done by workmen skilled in the trades involved. Exposed nails and other ferrous metal on or in contact with surfaces to be painted with water-thinned paints shall be spot-primed with zinc dust, zinc dust-zinc oxide, red lead, basic lead silico chromate, or zinc chromate primer. Surfaces to be painted shall be clean before applying paint or surface treatments. Surfaces not to be painted shall be in a new condition or shall be wire-brushed and touched up to remove all evidence of rust, corrosion, or abrasion. Oil and grease shall be removed with clean cloths and cleaning solvents prior to mechanical cleaning. Cleaning solvents shall be of low toxicity and shall have a flashpoint in excess of 100 degrees F. Cleaning and painting shall be so programmed that dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.

5.2 Concrete and Masonry Surfaces to be painted shall be prepared by removing efflorescence, chalk, dust, dirt, grease, oil, asphalt, tar, excessive mortar, and mortar droppings, and by roughening to remove glaze. Surface deposits of free iron shall be removed prior to painting. Immediately be painted shall be uniformly and thoroughly dampened, with no free surface water visible, by several applications of potable water with a fog spray, allowing time between the sprayings for the water to be absorbed.

5.3 Wood Surfaces.

5.3.1 General. Wood surfaces, except surfaces to be given natural finish, shall be primed and finish-coated as specified in the painting schedule herein. Wood surfaces to be painted shall be cleaned of dirt, oil and other foreign substances with mineral spirits, scrapers, and/or sandpaper. Finished surfaces exposed to view shall be made smooth by sandpapering. Small, dry, seasoned knots shall be surface scraped and thoroughly cleaned, and shall be given a thin coat of knot sealer conforming to Military Specification MIL-S-12935 before application of the priming coat. Pitch on large, open, unseasoned knots and all other beads or streaks of pitch shall be scraped off, or if still soft, shall be removed with mineral spirits or turpentine and the resinous area thinly coated with knot sealer. The surface shall be checked to insure that finishing nails have been properly set; then all holes and surface imperfections shall be primed. After priming, all holes and imperfections in finish surfaces shall be filled with putty or plastic wood filler, colored to match the finish coat if natural finish is required, allowed to dry, and sandpapered smooth. Unless otherwise authorized painting shall proceed only when the moisture content of the wood does not exceed 12 percent as measured by a moisture meter.

5.3.2 Interior Wood Surfaces to receive stained or natural finish, except as hereinafter specified, shall be properly prepared to approved shade and lightly sanded. Wood beams and underside of roof deck shall be stained to the approved shade. Where staining raises the grain, such surfaces shall be sanded prior to application of subsequent coatings.

5.4 Ferrous surfaces that have not been shop-coated shall be solvent-cleaned to remove oil and grease. Surfaces that contain loose rust, loose mill scale, and other foreign substances shall be mechanically cleaned by power wirebrushing or sandblasting. Minor amounts of residual rust, that cannot be removed except by thorough blast-cleaning, and tight mill scale that cannot be removed by applying a sharp knife to any edge, will be allowed to remain. After cleaning, one coat of ferrous-metal primer shall be applied to ferrous surfaces to receive paint other than asphalt varnish. The semitransparent film applied to some pipes and tubing at the mill is not to be considered as a shop coat, but shall be overcoated with the specified ferrous metal primer prior to application of finish coats.

5.4.1 Shop Coated Ferrous Surfaces shall be stored out of contact with the ground in such manner and location as will minimize the formation of water-holding pockets, soiling, contamination and deterioration of the paint film. Such metal work shall be protected from corrosion before and after installation by treating corroded areas immediately upon detection. Abraded or corroded spots on shop-coated surfaces shall be wire-brushed and touched up with material similar to the shop coat.

5.5 Galvanized Surfaces to be painted shall be solvent-cleaned and treated with vinyl-type wash coat. Galvanized surfaces not to be painted shall be solvent-cleaned.

6. PAINT APPLICATION.

6.1 General. The finished surfaces shall be free from runs, drops, ridges, waves, laps, brush marks, and variations in color, texture, and finish. The hiding shall be complete, and each coat shall be so applied as to produce film of uniform thickness. Special attention shall be given to insure that all surfaces including edges, corners, crevices, welds, and rivets receive a film thickness equivalent to that of adjacent painted surfaces. Respirators shall be worn by persons engaged or assisting in spray painting. Adjacent areas and installations shall be protected by the use of drop cloths, or other approved precautionary measures shall be taken. Metal or wood surfaces adjacent to surfaces to receive water-thinned paints shall be primed and/or touched up prior to the application of water-thinned paints. The first coat on both faces of wood doors shall be applied at essentially the same time.

6.2 Coating Progress. Sufficient time shall elapse between successive coats to permit proper drying. This period shall be modified as necessary to suit adverse weather conditions. Oil base or oleoresinous solvent-type paints shall be considered dry for recoating when the paint feels firm, does not deform or feel sticky under moderate pressure of the thumb, and the application of another coat of paint does not cause lifting or loss of adhesion of the undercoat.

6.3 Storage, Mixing, and Thinning.

6.3.1 General. At time of application, paint shall show no signs of hard settling, excessive skinning, livering, or other deterioration. Emulsion paints shall be protected, from exposure to cold weather, by storing in shelters so as to prevent freezing of the paint. Paint shall be thoroughly stirred, strained, and kept at a uniform consistency during application. Paints of different manufacturers shall not be mixed together. Where necessary to suit conditions of surface, temperature, weather, and method of application, packaged paint other than cement-emulsion filler may be thinned immediately prior to application in accordance with the manufacturer's directions, but not in excess of 1 pint of suitable thinner per gallon. The use of thinner for any reason shall not relieve the Contractor from obtaining complete hiding.

6.3.2 Vinyl-type Wash Coat conforming to Military Specification MIL-P-15328 shall be mixed by adding 1 volume of acid component to 4 volumes of resin component. The acid component shall be added slowly with constant stirring to the resin component. After mixing, the wash coat shall be used within 8 hours. If additional thinning is required to maintain a wet spray, reduction shall be made with normal butyl alcohol or 99 percent isopropyl alcohol.

6.4 Atmospheric Conditions. Paints other than water-thinned coatings shall be applied only to surfaces that are completely free of surface moisture as determined by sight or touch. In no case shall paint be applied to surfaces upon which there is visible frost or ice. While painting is being done, the temperature of the surfaces to be painted and of the atmosphere in contact therewith shall be at or above 50 degrees F. for water-thinned coatings and 45 degrees F. for other coatings. During periods of inclement weather, painting may be continued by inclosing the surfaces with temporary shelters and applying artificial heat, provided the temperature requirements prescribed above are maintained. Unvented combustion type heaters will not be permitted.

6.5 Time Between Surface Preparation and Painting. Surfaces that have been cleaned, pretreated, and/or otherwise prepared for painting shall be given a coat of the specified first-coat material as soon as practicable after such preparation has been completed, but in any event prior to any deterioration of the prepared surface.

6.6 Method of Paint Application.

6.6.1 Metal. First coats other than vinyl-type wash coats shall be applied by brush, except that where the item has been shop primed or field primed, the first coat may be applied by brush, roller, or spray. Subsequent coats may be applied by brush, roller, or spray. Vinyl-type wash coats may be applied by brush, spray, or swab.

6.6.2 Exterior Wood Surfaces to Receive Natural Finish. The finish shall be applied by brushing with the grain of the wood for the full length of the board or course of siding without stopping for more than 5 minutes. The finish shall be stirred frequently during application to maintain uniform suspension of the pigments.

6.6.3 Other Surfaces may be coated by brush, roller, or spray, except for filler coats. Cement-emulsion filler shall be vigorously scrubbed into the surface with a stiff-bristle brush having Tampico or Palmyra bristles not longer than 2-1/2 inches. Surface voids, pores, and cracks shall be filled, and the dry film shall be uniform and free from pinholes or other voids. Surface irregularities need not be completely filled. The material shall not be applied over calking compound.

6.6.4 Exterior Emulsion Paint. At least 24 hours shall elapse before applying exterior emulsion paint over cement-emulsion filler coat. When the ambient temperature is in excess of 85 degrees F., cement-emulsion-filler surfaces shall be lightly dampened with a fog spray of potable water immediately prior to application of the subsequent paint coat.

6.6.5 Vinyl-Type Wash Coat shall be applied at a spreading rate of 250 to 300 square feet per gallon to give a dry-film thickness of 0.3 to a maximum of 0.5 mil. Care shall be exercised in spray application to avoid the deposition of dry particles on the surface. A wet spray shall be maintained at all times. Surfaces treated with the wash coat shall be permitted to dry for not less than 1 hour and shall be coated as soon thereafter as practicable but within 48 hours after application and prior to any deterioration or accumulation of dust or dirt.

6.6.6 Special Requirements.

6.6.6.1 Rollers for applying enamels shall have a short nap. Rollers for applying paint to masonry surfaces shall be a type designed for that purpose.

6.6.6.2 Brushes used for emulsion paint shall be soaked in water for a period of 2 hours prior to brushing.

6.7 Exterior Wood Surfaces to Receive Natural Finish. On smooth surfaces such as planed face of bevel siding, the finish shall be applied at a spreading rate of 400 to 500 square feet per gallon. On rough surfaces such as unplanned or scarred face of bevel siding, the finish shall be spread at the rate of 200 to 250 square feet per gallon.

6.8 Epoxy Coatings shall only be applied where an average temperature of 55 degrees F. or higher can be maintained during the application and for a five day period subsequent to application of any coat. Adequate ventilation shall be provided. Manufacturer's instructions for application, curing and drying time between coats shall be followed. Thinning, if any, of the first coat to insure proper penetration and sealing shall be as recommended by the manufacturer for each type of substrate. The second coat shall be applied at a maximum spreading rate of 450 square feet per gallon. The pigmented epoxy resin shall be mixed with the hardener one hour before thinning or application.

7. MISCELLANEOUS.

7.1 Installation of Removed Items. Following completion of painting of each space, removed items, listed under paragraph: CLEANING, PREPARATION, AND PRETREATMENT OF SURFACES, shall be reinstalled by workmen skilled in the trade involved.

8. PAINTING SCHEDULE. Except as specified under paragraph: SURFACES NOT TO BE PAINTED, the surfaces listed in the PAINTING SCHEDULE shall receive the surface preparation, paints, and number of coats prescribed. Piping shall not be painted until the piping has been tested and approved. Explanatory information for use with the painting schedule is as follows:

8.1 Shop-Painted Items. Surfaces of fabricated and assembled items that are finish-painted by the manufacturer, or specified to be finish-painted under other sections of the specifications, are exempted from the following schedule requirements for surface preparation and painting. Shop-primed items shall receive surface preparation and finish painting as required by this section.

8.2 Colors and Tints, including shades of stain, shall match the respective color specimens selected by the Contracting Officer. Colors and tints shall conform to Federal Standard No. 595. Undercoats shall vary slightly from the color of the next coat. Stains shall conform in shade to manufacturer's standard color.

8.3 Surface Preparation and Pretreatment. Cleaning and pretreatment of surfaces prior to painting shall be accomplished in accordance with the detailed requirements specified.

9. SURFACES NOT TO BE PAINTED. The following listed items will not require painting: Concrete floors, walls and ceiling of pipe space and prefinished items.

10. CLEANING. Cloths and cotton waste that might constitute a fire hazard shall be placed in closed metal containers or destroyed at the end of each day. Upon completion of the work, staging, scaffolding, and containers shall be removed from the site or destroyed in an approved manner. Paint spots, oil, or stains upon adjacent surfaces shall be removed and the entire job left clean and acceptable.

PAINING SCHEDULE

Surface	Surface preparation and pretreatment	1st coat	2d coat	3d coat
Exterior concrete masonry unit and exposed poured concrete in masonry unit	Remove foreign matter, loose particles, and efflorescence. Dampen as specified.	Cement-emulsion filler	Exterior emulsion paint.	None.
Exterior wood surfaces not otherwise specified.	Solvent cleaning, scraping, sealing, and sandpapering as specified.	MIL-P-28582	Exterior oil paint.	Exterior oil paint.
Exterior wood surfaces to receive natural finish.	Remove foreign matter.	TT-S-708	None.	None.
Exterior ferrous surface, exposed unless otherwise specified.	As previous specified.	Exterior oil paint.	Exterior oil paint.	None.
Exterior galvanized surfaces.	As previously specified.	TT-P-641, type II, or MIL-P-26915, type I, class A.	Exterior oil paint.	None.
Interior concrete-masonry-units, concrete (except concrete floors), and wood trim in restrooms.	As previously specified for each type of surface. Fill concrete masonry units with cement emulsion filler or TT-F-1098 filler.	TT-C-535, type II.	TT-C-535, type II.	None.
Interior exposed ferrous surfaces, unless otherwise specified.	As previously specified.	TT-E-543 or TT-E-545.	TT-E-508 or TT-E-509.	None.
Interior unpainted ferrous surfaces in exposed areas having unpainted adjacent surfaces.	Solvent cleaning and wire brushing; no pretreatment.	TT-V-51.	None.	None.

Ferrous surfaces of mechanical and electrical equipment that has been factory primed.

Solvent clean as specified.

TT-E-489, class A.

TT-E-489, class A.

None.

Ferrous surfaces of mechanical and electrical equipment that has been factory finished.

Clean as required.

None.

None.

None.

Metal doors and trim

As previously specified for each type of surface.

TT-E-543 or TT-E-545.

TT-E-505 or TT-E-506.

None.

Interior galvanized surfaces, unless otherwise specified.

As previously specified.

Same as for adjacent surfaces.

Interior wood surfaces to receive stain or natural finish.

Clean and sandpaper as required. stain with TT-S-711 for shade as necessary. Fill and seal as necessary.

None.

None.

None.

Electrical conduit runs, metallic tubing, uninsulated pipes, pipe hangers, louvers, grilles, and air outlets in areas having painted adjacent surfaces.

As previously specified for each type of surface.

Where painted adjacent surfaces have gloss finish:

TT-E-543 or TT-E-545.

TT-E-506 or TT-E-505.

None.

Where painted adjacent surfaces have semigloss finish:

TT-E-543 or TT-E-545.

TT-E-508 or TT-E-509.

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SECTION 15D

PLUMBING, GENERAL PURPOSE

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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.

HH-P-117
 QQ-C-40 & Am-2
 QQ-S-571E

TT-C-00598C
 (COM-NBS)
 & Am-1
 TT-P-001536
 (GSA-FSS)
 WW-H-171D
 WW-N-351b & Am-1
 WW-P-351a

WW-P-401D
 & Am-1
 WW-P-421c

WW-P-460b
 & Am-1
 WW-P-491b
 WW-P-501d

WW-P-521F

WW-P-541b
 & Am-4
 & Int. Am-6
 WW-T-799E

WW-U-516B

WW-U-531D

WW-V-51E
 & Int. Am-2

WW-V-54D
 & Int. Am-1

Packing; Jute, Twisted
 Calking; Lead Wool and Lead Pig
 Solder; Tin Alloy; Lead-Tin Alloy;
 and Lead Alloy
 Calking Compound, Oil and Resin Base
 Type (for Building Construction)

Plumbing Fixture Setting Compound

Hangers and Supports, Pipe
 Nipples, Pipe, Threaded
 Pipe; Red Brass, (Copper Alloy No. 230),
 Seamless Standard Pipe Size,
 Regular and Extra-Strong
 Pipe and Pipe Fittings, Cast-Iron, Soil

Pipe, Cast Gray and Ductile Iron,
 Pressure (for Water and Other Liquids)
 Pipe Fittings; Brass or Bronze (Threaded)
 125- and 250-Pound
 Pipe-Fittings; Cast-Iron (Threaded): Drainage
 Pipe Fittings, Cast Iron, Screwed
 125 and 250 Pound
 Pipe Fittings, Flange Fittings, and
 Flanges, Steel and Malleable Iron
 (Threaded and Butt-Welding) 150 Pound
 Plumbing Fixtures, Land Use

Tube, Copper, Seamless, Water and Refrigeration
 (for Use With Solder-Flared- or
 Compression-Type Fittings)

Unions, Pipe, Brass or Bronze Threaded
 Pipe Connection and Solder-Joint Tube
 Connections

Unions, Pipe Steel or Malleable Iron;
 Threaded Connection 150 and 250 Pound
 Valve, Angle, Check, and Globe, Bronze,
 (125, 150 and 200 Pound, Threaded End,
 Flange Ends, Solder Ends, and Brazed
 End, for Land Use)

Valve, Gate, Bronze (125, 150 and 200
 Pound, Threaded Ends, Flange Ends,
 Solder End and Brazed Ends, for Land Use)

1.2 Military Specification.

MIL-T-27730A
(ASG)

Tape, Antiseize, Polytetrafluoroethylene,
With Dispenser

1.3 U.S. Department of Commerce, National Bureau of Standards (NBS) Handbook.

H28

Screw-Thread Standards for Federal Services.
Part I (1969); Parts II and III (1957
reprinted December 1966 with corrections)

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

B16.18-1972
B16.22-1973

Cast Bronze Solder Joint Pressure Fittings
Wrought Copper and Bronze Solder-Joint
Pressure Fittings

B16.23-1969
& B16.23a-1973

Cast Bronze Solder Joint Drainage
Fittings – DWV

B16.26-1967

Cast Bronze Fittings for Flared Copper Tubes

1.5 American Society for Testing and Materials (ASTM) Specifications.

A120-73

Black and Hot-Dipped Zinc-Coated
(Galvanized) Welded and Seamless Steel
Pipe for Ordinary Uses

B62-74

Composition Bronze or Ounce Metal Castings

B88-74a

Seamless Copper Water Tube

B306-74a

Copper Drainage Tube (DWV)

D226-68

Asphalt-Saturated Roofing Felt for Use
In waterproofing and in Constructing
Built-Up Roofs

1.6 American Society of Mechanical Engineers (ASME) Publication.

National Plumbing Code (A40.8-1955)

2. GENERAL. The general arrangement of the plumbing shall be as indicated. Detailed drawings of proposed departures due to actual field conditions or other causes shall be submitted to the Contracting Officer for approval. The Contractor shall carefully examine the drawings and shall be responsible for the proper fitting of materials and equipment in each building, as indicated, without substantial alteration. Material and equipment installed in the plumbing system shall be suitable for the pressures and temperatures encountered. Installation shall be as required by the National Plumbing Code and as specified herein.

2.1 Utilities. Water and drainage piping shall be extended 5 feet outside the building, unless otherwise indicated, where the piping shall be connected to the existing service connection or capped or plugged if the exterior service is not in place. Sewer and water pipes shall be laid in separate trenches, except when otherwise shown. Utilities shall be installed below the frostline. If the trenches are closed or the pipes are otherwise covered before being connected to the mains, the location of the end of each plumbing utility shall be marked with a stake or other acceptable means.

2.2 Cross Connections and Interconnections. No plumbing fixture, device, equipment, or pipe connection shall be installed that will provide a cross connection or interconnection between a potable water supply and any source of nonpotable water, such as the irrigation system, a drainage system, a soil or waste pipe.

2.3 Connections To Equipment and Fixtures. The Contractor shall provide all necessary material and labor to connect to the plumbing system all fixtures and equipment having plumbing connections, and which are furnished by the Government or are specified in other sections of these specifications. Drainage connections shall be trapped. The supply line to each item of equipment or fixture, except faucets, flush valves, or other control valves which are supplied with an integral stop, shall be equipped with a cutoff valve to enable isolation of the item for repair and maintenance without interfering with operation of other equipment or fixtures. Supply piping to all fixtures shall be anchored to prevent movement.

2.4 Drawings. Because of the small scale of the drawings, it is not possible to indicate all offsets, fittings, and accessories that may be required. The Contractor shall carefully investigate the structural and finish conditions affecting all his work and shall arrange such work accordingly, furnishing such fittings, traps, valves, and accessories as may be required to meet such conditions, at no additional cost to the Government.

2.5 Cutting and Repairing. The work shall be carefully laid out in advance, and no excessive cutting of construction will be permitted. Damage to buildings, piping, wiring, or equipment as a result of cutting for installation shall be repaired by mechanics skilled in the trade involved, at no additional expense to the Government.

2.6 Protection to Fixtures, Materials, and Equipment. Pipe openings shall be closed with caps or plugs during installation. Fixtures and equipment shall be tightly covered and protected against dirt, water, and chemical or mechanical injury. Upon completion of all work, the fixtures, materials, and equipment shall be thoroughly cleaned, adjusted, and operated.

2.7 Temporary Facilities. The Contractor shall furnish, install, and keep in proper repair all temporary water lines, sewer lines, and toilet facilities required for construction purposes. All temporary water and waste lines shall be removed when directed by the Contracting Officer.

3. MATERIALS, FIXTURES, AND EQUIPMENT shall conform to the respective publications and other requirements specified below. Other materials, fixtures, and equipment shall be as specified elsewhere herein and as shown on the drawings. Fixtures and equipment shall be the products of manufacturers regularly engaged in the manufacture of such products. Fixtures and equipment differing in minor respects from that specified may be proposed, provided such differences are clearly stated. If the Contracting Officer judges the product to be equal to or better than that specified, it will be given consideration; and if based on a technical evaluation, the Contracting Officer judges the difference to be minor, he may approve the use of the product.

3.1 Bituminous Cement. Federal Specification SS-C-153, type I with asphalt saturated felts and type II with coal-tar-pitch felts.

3.2 Calking.

3.2.1 Compound. Federal Specification TT-C-598, type I.

3.2.2 Lead. Federal Specification QQ-C-40, type I.

3.3 Copper. Federal Specification QQ-C-576, sheet form, light cold-rolled temper.

3.4 Fittings.

3.4.1 Cast Iron Soil-Pipe Fittings. Federal Specification WW-P-401.

3.4.2 Cast Iron Threaded Fittings. Federal specification WW-P-501, type I, class 125 or 250.

3.4.3 Drainage Fittings. Federal Specification WW-P-491, type I or II. Cast bronze solder-joint drainage fittings ANSI Standard B16.23.

3.4.5 Fittings For Copper and Stainless Steel Tubing. Wrought copper and bronze solder-joint pressure fittings shall conform to ANSI Standard B16.22 and ASTM Specification B75. Cast bronze solder-joint pressure fittings shall conform to ANSI Standard B16.18. Flared brass fittings shall conform to ANSI Standard B16.26 and ASTM Specification B62.

3.4.6 Malleable-Iron Fittings. Federal Specification WW-P-521, type I, except that type II shall be used where connected to zinc-coated piping.

3.4.7 Nipples. Federal Specification WW-N-351, same material as pipe system where used.

3.4.8 Unions. Federal Specifications WW-U-516, WW-U-531, or WW-F-406, as applicable, and where used in connection with tubing modified therefor.

3.5 Pipe and Tubing.

3.5.1 Brass Pipe. Federal Specification WW-P-351, class 1.

3.5.2 Cast Iron Soil Pipe. Federal Specification WW-P-401, as modified hereinafter.

3.5.3 Cooper Tubing and Tube, DWV. Federal Specification WW-R-799, class 1, type K or L. Copper drainage-waste and vent tube, DWV, shall conform to ASTM Specification B306.

3.5.4 Steel Pipe. ASTM Specification A120, schedule 40.

3.5.5 Pipe Hangers and Supports. Federal Specification WW-H-171, types as specified.

3.6 Plumbing Fixtures and Drains. Federal Specification WW-P-541, with chair carriers. Polyethylene floor drains with clamping device, ASTM Specification D1248.

3.7 Plumbing Fixture Setting Compound. Federal Specification TT-P-1536, type II.

3.8 Solder. Federal Specification QQ-S-571, composition Sn50.

3.9 Twisted-Jute Packing. Federal Specification HH-P-117, type I, dry, for calking type I cast iron water pipe; type II, tarred, or as specified hereinafter, for calking cast iron soil pipe.

3.10 Tape.

3.10.1 For Threaded Pipe Joints. Military Specification MIL-T-27730.

3.11 Valves.

3.11.1 Angle, Check, and Globe Valves. Federal Specification WW-V-51, class A or B, type as suitable for the application, and where used in connection with tubing, modified therefor.

3.11.2 Gate Valves. Federal Specification WW-V-54, type I, II, or III, class A or B.

4. APPROVAL OF MATERIALS, FIXTURES, AND EQUIPMENT. Before starting installation, the Contractor shall submit to the Contracting Officer for approval, in accordance with Special Provisions, layout drawings and lists of materials, fixtures, and equipment to be incorporated in the work. The layout drawings shall consist of plans drawn to scale, with elevations and sections to show clearly the location and size of major items of equipment and large piping, and clearances for maintenance withdrawal of removal components. If departures from the contract drawings are deemed necessary by the Contractor, details of such departures, including changes in related portions of the project and the reasons therefor, shall be submitted with the drawings. Where such departures require piping or equipment to be supported otherwise than shown, the details submitted shall include loadings and type and kinds of frames, brackets, stanchions, or other supports necessary. Approved departures shall be made at no additional cost to the Government. The lists of materials and equipment shall be supported by sufficient descriptive material, such as catalogs, cuts, diagrams, and other data published by the manufacturer, as well as evidence of compliance with safety and performance standards, to demonstrate conformance to the specification requirements; catalog numbers alone will not be acceptable. The data shall include the name and address of the nearest service and maintenance organization that regularly stocks repair parts. One copy of the layout drawings and of each list will be returned, marked to indicate approval.

5. ELECTRICAL WORK. Electrical characteristics shall be as indicated. Manual or automatic control and protective or signal devices required for operation herein specified and any wiring required but not shown on the electrical drawings shall be provided. A complete electrical-connection diagram for each piece of mechanical equipment having more than one automatic or manual electrical-control device shall be submitted for approval.

6. EXCAVATING, TRENCHING, AND BACKFILLING is specified in Section: EXCAVATION, FILLING, AND BACKFILLING FOR UTILITIES SYSTEM.

7. SOIL, WASTE, DRAIN, AND VENT PIPING. Underground soil, waste, and drain pipe and fittings shall be hub-type cast iron. Aboveground soil, waste, drain, and vent piping shall be galvanized steel, cast iron soil pipe with or without hubs, or copper tube DWV. Fittings for aboveground pipe shall be cast iron or malleable iron of the drainage-pattern type and shall be compatible with the pipe material except where adapters are required for interconnection of different pipe materials. Fittings on dry vents shall be regular-pattern type.

7.1 Installation.

7.1.1 Drainage and Vent Pipes. Main vertical soil and waste stacks shall be extended full size to the roofline and above as vents, except where otherwise specifically indicated. Where practicable, two or more vent pipes shall be connected and extended as one pipe through the roof. Vent pipes in roof spaces shall be run as close as possible to the underside of the roof without forming traps in pipes, using fittings as required. Vertical vent pipes may be connected into one main vent riser above vented fixtures. Horizontal waste lines receiving the discharge from two or more fixtures shall be provided with end vents, unless separate venting of fixture is noted. Cast iron soil pipe hubs inside buildings shall be extended 6 inches above the lowest floor where the floor is supported on the ground, and 6 inches aboveground where the lowest floor is self-supporting.

7.1.2 Fittings. Changes in pipe size on soil, waste, and drain lines shall be made with reducing fittings. Changes in direction shall be made by the use of fittings.

7.1.3 Union Connections. Slip joints will be permitted only in trap seals or on the inlet side of the traps. Tucker or hub drainage fittings shall be used to make union connections wherever practicable. Use of bushings will not be permitted.

7.2 Joints. Installation of pipe and fittings shall be made in accordance with the manufacturers' recommendations. Mitering of joints for elbows and notching of straight runs of pipe for tees will not be permitted. Threaded joints shall have American Standard taper pipe threads conforming to National Bureau of Standards Handbook H28, with graphite or inert filler and oil, with an approved graphite compound, or with polytetrafluoroethylene tape applied to the male threads only.

7.2.1 Cast Iron Soil Pipe. Joints in hub-type cast iron soil pipe and fittings shall be firmly packed with either tarred twisted jute or a preservative-treated twisted jute covered with a braided-yarn jacket to provide a uniform rope-like strand and calked with lead at least 1 inch deep. Joints in cast iron soil pipe and fittings using a double-seal, compression-type molded neoprene gasket shall be provided with a modified hub as required to provide a positive seal. Joints in cast iron soil pipe and fittings without hubs shall be made using a mechanical compression-type coupling consisting of a neoprene collar, stainless steel band with transverse corrugations and two stainless steel clamps with stainless steel setscrews all assembled to provide a positive seal.

7.2.2 Copper Tube DWV, shall be made with solder-type fittings. Tube shall be cut square with burrs removed. Outside of tube where engaged in the fitting and inside of the fitting in contact with the tube shall be cleaned with an abrasive material before sweating. Care shall be taken to prevent annealing of tube and fittings when making connections. Joints shall be made with a noncorrosive paste flux and solid-string or wire solder. Core solder will not be permitted. Joints 1-1/2 inches and larger shall be made with heat applied uniformly around the entire circumference of the tube and fittings by a multiflame torch.

8. PIPE CLEANOUTS shall be the same size as the pipe except that cleanout plugs larger than 4 inches will not be required. A cleanout installed in connection with cast iron soil pipe shall consist of a long-sweep 1/4 bend or one or two 1/8 bends extended to the place indicated on the drawings. An extra-heavy cast brass ferrule with countersunk head screw plug shall be calked into the hub of the fitting and shall be flush with the floor. Cleanouts in connection with other pipe, where indicated, shall be T-pattern, 90-degree branch drainage fittings with screw cast brass plugs of the same size as the pipe up to and including 4 inches. Cleanouts on pipe concealed in partitions and walls and where installed in finished floors subject to foot traffic shall be provided with chromium-plated cast-brass covers secured to plugs as shown in Federal Specification WW-P-541, type 212. Cleanouts installed in finished floors subject to foot traffic shall be provided with a chrome-plated cast brass cover secured to plug and flush with the finished floor.

9. FLASHINGS. A sheet-lead flashing shield shall be provided for drains and pipe sleeves with integral clamping devices that penetrate a membrane. Flashing shield shall be made from not lighter than 4-pound sheet lead and extend not less than 8 inches from the drain or sleeve in all directions. Flashing shall be inserted into the clamping device and made watertight. Lead flashing shields, and roof flanges of lead or copper flashing with integral flange, shall be set over membrane in a solid coat of bituminous cement and strip-flashed as specified in Section: CLAY TILE ROOFING. Pipes passing through pitched roofs shall be flashed using lead or copper flashing with an adjustable integral flange of adequate size to extend not less than 8 inches from the pipe in all directions and lapped into the roofing to provide a watertight seal.

10. TRAPS. Each fixture and piece of equipment requiring connections to the drainage system shall be equipped with a trap. Each trap shall be placed as near the fixture as possible, and no fixture shall be double-trapped. Traps installed on cast iron soil pipe shall be cast iron. Traps installed on steel pipe or copper tube shall be recess-drainage pattern, or brass-tube type as specified, hereinafter.

11. DRAINS. Floor drains shall conform to Federal Specification WW-P-541. The size of the drains shall be determined by the branch sizes indicated.

11.1 Drains.

11.1.1 Floor Drains shall be type 216, with threaded or calked connection.

12. WATER PIPE, FITTINGS, AND CONNECTIONS.

12.1 Water Pipe. Water-service pipe to the structure and cold-water piping underground within the structure shall be K copper tubing. Water-service pipe shall extend from approximately 6 inches above the lower floor or inside the structure wall to a point not less than 5 feet outside the structure into undisturbed soil. Cold-water pipe aboveground and inside the structure shall be type L copper tubing, stainless steel tubing or iron-pipe-size brass pipe. Exposed cold-water supply piping shall be chrome-plated brass pipe to the shutoff or stop valve of each fixture. Piping connection from the shutoff or stop valve to the fixture shall be as specified hereinafter.

12.2 Fittings. Fittings for type K copper tubing shall be flared brass or solder-type bronze or wrought copper. Fittings for type L copper tubing and stainless steel tubing shall be solder-type bronze or wrought copper. Fittings for chrome-plated tubing shall be chrome-plated brass. Fittings for brass pipe shall be brass.

12.3 Installation. A gate valve and drain on the service line shall be installed inside the building as close to the floor or wall as possible. Service piping shall be installed below the frostline. The piping shall be extended to all fixtures, outlets, and equipment from the gate valve. The cold-water piping system shall be installed so as to be drained.

12.3.1 Mains, Branches, and Runouts. Piping shall be installed as indicated. Pipe shall be cut accurately to measurements established at the building by the Contractor and shall be worked into place without springing or forcing. Care shall be taken not to weaken structural portions of the building. Aboveground piping shall be run parallel with the lines of the building unless otherwise indicated. Branch pipes from service lines may be taken from top, bottom, or side of main, using such crossover fittings as may be required by structural or installation conditions. Supply pipes, valves, and fittings shall be kept a sufficient distance from other work and other services to permit not less than 1/2 inch between finished covering and other work and not less than 1/2 inch between finished covering on the different services. No water pipe shall be buried in floors unless specifically indicated or approved. Changes in pipe sizes shall be made with reducing fittings. Use of bushings will not be permitted. Change in direction shall be made with fittings except that bending of pipe 4 inches and smaller will be permitted, provided a pipe bender is used and wide sweep bends are formed. The center line radius of bends shall not be less than 6 diameters of the pipe. Bent pipe showing kinks, wrinkles, flattening or other malformations will not be accepted.

12.3.2 Pipe Drains indicated shall consist of 1/2-inch globe valves with renewable disks and 3/4-inch hose nipples. Provide 1/2-inch brass plugs or caps at all other low points. Disconnection of the supply piping at the fixture is an acceptable drain.

12.4 Joints. Connections between ferrous and nonferrous metallic pipe installed underground and connections to water heaters shall be made with dielectric unions or flanges specified hereinafter. Installation of pipe and fittings shall be made in accordance with the manufacturers' recommendations. Mitering of joints for elbows and notching of straight runs of pipe for tees will not be permitted. Threaded joints shall have American Standard taper pipe threads conforming to NBS Handbook H28 with graphite or inert filler and oil, with an approved graphite compound, or with polytetrafluoroethylene tape applied to the male threads only. Unions shall be provided where required for disconnection.

12.4.1 Flared, Compression, or Sweated Tubing shall be cut square, and burrs shall be removed. Flared joints shall be made using flared fittings. Compression joints shall be made using compression fittings. Joints in copper and stainless steel tubing shall be made as specified in paragraph SOIL, WASTE, DRAIN, AND VENT PIPING.

13. VALVES shall be provided on supplies to equipment or fixtures if not specified in paragraph TYPES OF FIXTURES AND FIXTURE TRIMMINGS. Valves indicated in connection with runouts, risers, branches, and mains shall be in accordance with these specifications. All valves shall be gate valves unless otherwise specified or indicated. Valves up to and including 3 inches shall be bronze with threaded ends for ferrous pipe and sweat-type connections for tubing.

14. UNIONS. Unions on ferrous pipe 2 inches in diameter and smaller shall be malleable iron in accordance with Federal Specification WW-U-531, type B, zinc-coated. Unions on tubing 2 inches in diameter and smaller shall be composition B, conforming to Federal Specification WW-U-516. Unions shall not be concealed in walls, ceilings, or partitions.

- 14.1 Dielectric Unions. The unions shall meet the dimensional requirements and tensile strength of pipe unions in accordance with Federal Specification WW-U-531. The unions shall be suitable for the required operating pressures and temperature conditions. The unions shall have metal connections on both ends of union. The ends of the unions shall be threaded or soldered to match adjacent piping. The metal parts of the union shall be separated to prevent current flow between the dissimilar metals.
15. HOSE FAUCETS shall be brass with 1/2-inch male inlet threads, hexagon shoulder, and 3/4-inch hose connection, conforming to Federal Specification WW-P-541, type 65.
16. PIPE SLEEVES, HANGER, AND FIXTURE SUPPORTS shall be furnished and set, and the Contractor shall be responsible for their proper and permanent location.
17. IDENTIFICATION TAGS made of brass or aluminum, indicating function of the valve, size, and working pressure, shall be installed on all valves except valves installed on supplies at plumbing fixtures. Tags shall be 1-3/8 inches minimum in diameter, and marking shall be stamped. Tags shall be wired to valve with 0.0808-inch-diameter, No. 12 AWG, copper wire.
18. FLOOR, WALL, AND CEILING ESCUTCHEONS. Escutcheons shall be provided at all finished surfaces where exposed piping, bare or insulated, passes through floors, walls, or ceilings. Escutcheons shall be fastened securely to pipe or pipe covering and shall be chromium-plated iron or chromium-plated brass, either one-piece or split-pattern, held in place by internal spring tension or setscrew.
19. PAINTING required for pipes, hangers, supports, and other iron work in concealed spaces and painting of exposed items is specified in Section: PAINTING, GENERAL.
20. TYPES OF FIXTURES AND FIXTURE TRIMMINGS specified herein shall be furnished and installed complete with all trimmings and fittings, unless otherwise specified under the item.
- 20.1 General Requirements. References made herein to outfit numbers and figure numbers of plumbing fixtures, unless otherwise indicated, are to Federal Specification WW-P-541. Fixtures and trimmings not covered by Federal Specification WW-P-541 shall be considered special, but shall be of equal quality and material. Generally, all fixtures except water closets and urinals shall have the water supply above the rim. Fixtures with the supply discharge below the rim shall be equipped with backflow preventers. Angle stops, straight stops, stops integral with the faucets, or concealed type of lock-shield, loose-key pattern stops for supplies shall be furnished and installed with fixtures. Piping connections from the shutoff or stop valve to the fixture shall be chrome-plated brass pipe or chrome-plated copper tubing. Exposed traps and supply pipes for all fixtures and equipment shall be connected to the rough piping systems at the wall, unless otherwise specified under the item. Floor and wall escutcheons shall be as specified hereinbefore or as covered by the outfit numbers. Exposed fixture trimmings and fittings shall be chromium-plated or nickel-plated brass with polished, bright surfaces.
- 20.2 Fixture Connections. Where space conditions will not permit standard fittings in conjunction with the cast iron floor flange, special short-radius fittings shall be provided. Connections between earthenware fixtures and flanges on soil pipe shall be made absolutely gastight and watertight with a closet-setting compound or with a neoprene gasket and seal. Use of natural-rubber gaskets or putty will not be permitted for these connections. Bolts shall be not less than 1/4 inch diameter and shall be equipped with chromium-plated nuts and washers. Fixtures with outlet flanges shall be set the proper distance from floor or wall to make a first-class joint with the closet-setting compound or gasket and fixture used.
- 20.3 Traps. Brass tube P-traps shall be type 114. Type 106 listed in Federal Specification WW-P-541 shall not be used.
- 20.4 Height of Fixture Rims Above Floor. Lavatories shall be mounted with rims 31 inches from finished floor.
- 20.5 Fixtures.
- 20.5.1 Lavatories and Urinals shall be supplied less chair carriers and shall be mounted as described hereinbefore.
- 20.5.1.1 Lavatories shall be outfit EL 20B.
- 20.5.1.2 Water Closet - Wall Hung shall be outfit VW 20B.
- 20.5.1.3 Urinal shall be outfit No. VU 13W.
- 20.5.1.4 Drinking Fountain shall be outfit No. VD 13 with back approximately 5 inches in height.
- 20.6 Flush Valves. Flush valves shall be of the non-hold-open type, large diaphragm flushometer, concealed mounting with front oscillating handles.

21. INSPECTION, TESTS, AND STERILIZATION.

21.1 Methods of Sampling, Inspecting, and Testing Fixtures shall conform to Federal Specification WW-P-541.

21.2 Tests for Plumbing Systems. Soil, waste, vent, and water piping shall be tested by the Contractor and approved before acceptance. Underground soil and waste piping shall be tested before backfilling. Equipment required for test shall be furnished by the Contractor at no additional cost to the Government.

21.2.1 Drainage and Venting System Piping shall be tested with water or air before the fixtures are installed. After the plumbing fixtures have been set and their traps filled with water, the entire drainage and venting system shall be submitted to a final test with smoke or peppermint.

21.2.1.1 Water Test shall be applied to the drainage and venting system either in its entirety or in sections. If the entire system is tested, all openings in the pipes shall be tightly closed except the highest opening, and the system shall be filled with water to the point of overflow. If the system is tested in sections, each opening except the highest opening of the section under test shall be tightly plugged, and each section shall be filled with water and tested with at least a 10-foot head of water. In testing successive sections, at least the upper 10 feet of the next preceding section shall be tested so that each joint or pipe in the building except the uppermost 10 feet of the system has been submitted to a test of at least a 10-foot head of water. The water shall be kept in the system, or in the portion under test, for at least 15 minutes before the inspection starts; the system shall then be tight at all joints.

21.2.1.2 Air Test. If tests are made with air, a pressure of not less than 5 pounds per square inch shall be applied with a force pump and maintained at least 15 minutes without leakage. A mercury-column gage shall be used in making the air test.

21.2.1.3 Final Test. When the smoke test is employed, the smoke shall be produced by a smoke machine, and a pressure equal to 1-inch water column shall be maintained for 15 minutes before inspection starts. When the peppermint test is used, 2 ounces of peppermint shall be introduced into each line or stack.

21.2.2 Water System. When the roughing-in is completed and before fixtures are set, the entire cold-water piping system shall be tested at a hydrostatic pressure of not less than 100 pounds per square inch gage, and proved tight at this pressure for not less than 30 minutes in order to permit inspection of all joints. Where a portion of the water-piping system is to be concealed before completion, this portion shall be tested separately as specified for the entire system.

21.2.3 Defective Work. If inspection or test shown defects, such defective work or material shall be replaced or repaired as necessary and inspection and tests shall be repeated. Repairs to piping shall be made with new materials. No calking of screwed joints or holes will be acceptable.

21.2.4 Cleaning and Adjusting. Equipment, pipes, valves, fittings, and fixtures shall be cleaned of grease, metal cuttings, and sludge that may have accumulated from operation of the system during the test. Any stoppage, discoloration, or other damage to the finish, furnishings, or parts of the building, due to the Contractor's failure to properly clean the piping system, shall be repaired by the Contractor without cost to the Government. When the work is complete, flush valves and automatic control devices shall be adjusted for proper operation.

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SECTION 16A
ELECTRICAL WORK, INTERIOR

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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.

<p>J-C-30A</p> <p>L-T-0075 & Am-1 L-T-001512 (GSA-FSS) W-B-30 & Int. Am-4 W-C-375a & Int. Am-4 (GSA-FSS) W-C-586B</p> <p>W-C-00596C (GSA-FSS) W-F-406b & Int. Am-1 (GSA-FSS) W-F-408C & Am-1 W-F-414a</p> <p>W-J-800c & Am-3</p> <p>W-L-00116c (GSA-FSS) & Am-2 W-P-115a & Am-2 W-P-455a & Am-4 W-S-610b & Am-1 W-S-00896d (GSA-FSS) HH-I-510D HH-I-553B</p> <p>HH-I-595B & Am-1</p> <p>WW-C-563</p>	<p>Cable and Wire, Electrical (Power, Fixed Installation)</p> <p>Tape, Pipe-Coating; Pressure-Sensitive and Laminated</p> <p>Tape, Pressure Sensitive Adhesive, Pipe Wrapping</p> <p>Ballast, Fluorescent Lamp</p> <p>Circuit Breaker, Molded Case; Branch-Circuit and Service</p> <p>Conduit Outlet Boxes, Bodies and Entrance Caps, Electrical: Cast Metal – for Shore Use</p> <p>Connector, Plug, Electrical; Connector, Receptacle, Electrical</p> <p>Fittings for Cable, Power, Electrical and Conduit, Metal, Flexible</p> <p>Fittings for Conduit, Metal, Rigid, (Thick-Wall and Thin-Wall (EMT) Type)</p> <p>Fixture, Lighting (Fluorescent, Alternating-Current, General Purpose)</p> <p>Junction Box; Extension, Junction Box; Cover, Junction Box (Steel, Cadmium, or Zinc-Coated)</p> <p>Lamps, Fluorescent (General Specification)</p> <p>Panel, Power Distribution</p> <p>Plate, Wall Electrical</p> <p>Splice, Conductor</p> <p>Switch, Toggle</p> <p>Insulation Tape, Electrical, Friction</p> <p>Insulation Tape, Electrical, (Rubber, Natural and Synthetic)</p> <p>Insulation Tape, Electrical, Pressure-Sensitive Adhesive, Plastic, General Purpose</p> <p>Conduit, Metal, Rigid; and Bend and Elbow, Electrical Conduit: Thin-Wall Type (EMT)</p>
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WW-C-581d
& Am-3

Conduit, Metal, Rigid; and Coupling,
Elbow, and Nipple, Electrical
Conduit: Zinc-Coated

1.2 National Electrical Manufacturers Association (NEMA) Standards.

ICS-1970
(Rev. Oct. 1971,
Feb. 1972, & Feb. 1973)

Industrial Controls and Systems.

1.3 National Fire Protection Association (NFPA) Publication.

No. 70-1975

National Electrical Code

1.4 Underwriters' Laboratories, Inc. (UL) Standards.

Building Materials Directory (January 1973 with Quarterly Supplements).

UL 508

Industrial Control Equipment (August
1971, Rev. June 12, July 28, Aug. 24,
Aug. 30, & Sept. 28, 1972, &
Apr. 12, Apr. 26, May 1, & Aug. 13,
1973)

UL 651

Rigid Nonmetallic Conduit
(Aug. 24, 1972)

2. GENERAL.

2.1 Rules. The installation shall conform to the applicable requirements and recommendations of the National Electrical Code.

2.2 Coordination. The contract drawings indicate the extent and the general location and arrangement of equipment, conduit, and wiring. The Contractor shall study building plans and details so that the outlets and equipment will be properly located and readily accessible. Lighting fixtures, equipment, and outlets shall be located to avoid interference with mechanical or structural features. If any conflicts occur necessitating departures from the contract drawings, details of departures and reasons therefor shall be submitted as soon as practicable for written approval of the Contracting Officer.

2.3 Capacities of equipment and material shall be not less than those indicated.

3. MATERIALS AND EQUIPMENT shall conform to the respective publications and other requirements specified below. Other materials and equipment shall be as specified elsewhere herein and as shown on the drawings and shall be the products of manufacturers regularly engaged in the manufacture of such products.

3.1 Ballast, Fluorescent Lamp. High-power-factor type conforming to Federal Specification W-B-30. In addition, ballasts for 40-watt and larger lamps shall be class P and shall be automatic-resetting type.

3.2 Circuit Breakers.

3.2.1 Molded-Case Circuit Breakers. Federal Specification W-C-375.

3.3 Conductors, Insulated. Federal Specification J-C-30, types as specified.

3.4 Conduit.

3.4.1 Zinc-Coated Rigid Steel Conduit. Federal Specification WW-C-581.

3.4.2 Rigid Plastic. Underwriters' Laboratories Standard UL 651. Plastic conduit for direct-burial shall be high-density polyethylene (PE) or heavy-wall polyvinyl chloride (PVC).

3.4.3 Conduit Coatings.

3.4.3.1 Pipe-Wrapping Plastic Tape. Federal Specification L-T-75, type II, or L-T-1512, type I.

3.5 Connectors, Wire Pressure. Federal Specification W-S-610.

- 3.6 Controls. NEMA Pub. No. ICS and Underwriters' Laboratories, Inc., Standard UL 508.
 - 3.7 Device Plates. Federal Specification W-P-455.
 - 3.8 Fittings, Cable and Steel Conduit. Federal Specifications W-F-406 and W-F-408.
 - 3.9 Fixtures.
 - 3.9.1 Fluorescent, General-Purpose. Federal Specification W-F-414, class B.
 - 3.10 Lamps.
 - 3.10.1 Fluorescent Lamps. Federal Specification W-L-116.
 - 3.11 Outlets.
 - 3.11.1 Conduit, Cast Metal or Malleable Metal. Federal Specification W-C-586.
 - 3.12 Outlet Boxes.
 - 3.12.1 Sheet-Steel Outlet Boxes. Federal Specification W-J-800.
 - 3.13 Panelboards. Dead-front construction, Federal Specification W-P-115.
 - 3.13.1 Lighting and Appliance Branch Circuits, feeder and distribution panelboards, class 1, type as specified hereinafter.
 - 3.14 Receptacles. Federal Specification W-C-596.
 - 3.15 Splice, Conductor. Federal Specification W-S-610.
 - 3.16 Switches.
 - 3.16.1 Toggle Switches, Single-Unit Type. Federal Specification W-S-896.
 - 3.17 Tape.
 - 3.17.1 Friction Tape. Federal Specification HH-I-510.
 - 3.17.2 Plastic Tape. Federal Specification HH-I-595.
 - 3.17.3 Rubber Tape. Federal Specification HH-I-553.
 - 3.18 Tubing, Electrical, Zinc-Coated Metallic Steel. Federal Specification WW-C-563.
4. APPROVAL OF MATERIALS AND EQUIPMENT will be based on the manufacturer's published data
- 4.1 The Label or Listing of the Underwriters' Laboratories, Inc., will be accepted as evidence that the materials or equipment conform to the applicable standards of that agency. In lieu of this listing the Contractor shall submit a statement from a nationally recognized, adequately equipped testing agency indicating that the items have been tested in accordance with required procedures and that the materials and equipment comply with all contract requirements.
 - 4.2 A Manufacturer's Statement indicating complete compliance with the applicable Federal Specification, Military Specification, or standard of the National Electrical Manufacturers, or other commercial standard, is acceptable.
5. SHOP DRAWINGS shall be submitted for equipment not completely identifiable by information submitted in the materials and equipment lists, in accordance with requirements contained in the SPECIAL PROVISIONS, and will be submitted for but not limited to panelboards.
6. WORKMANSHIP. All materials and equipment shall be installed in accordance with recommendations of the manufacturer as approved by the Contracting Officer, to conform with the contract documents. The installation shall be accomplished by workmen skilled in this type of work.
7. GROUNDING. Except where specifically indicated otherwise, all exposed non-current-carrying metallic parts of electrical equipment, metallic raceway systems, grounding conductor in nonmetallic raceways and neutral conductor of the wiring system shall be grounded. The ground connection shall be made from the main service equipment to the metal underground water pipe supplemented by extending to driven ground rods on the exterior of the building. The interior metallic cold water piping system shall be bonded to the ground rods.

7.1 Ground Rods shall be of copper-clad steel not less than 3/4 inch in diameter, 8 feet long, driven full length into the earth. The maximum resistance of a driven ground shall not exceed 25 ohms under normally dry conditions. If this resistance cannot be obtained with a single rod, 2 additional rods shall be installed not less than 6 feet on centers, or if sectional-type rods are used, 2 additional sections may be coupled and driven with the first rod. If the resultant resistance exceeds 25 ohms measured not less than 24 hours after rainfall, the Contracting Officer shall be notified immediately.

8. WIRING METHODS.

8.1 General. Unless otherwise indicated, wiring shall consist of insulated conductors installed in zinc-coated-steel conduit or electrical metallic tubing.

8.2 Conduit and Tubing Systems shall be installed as indicated. Minimum size of raceways shall be 1/2 inch. Only rigid steel conduit shall be installed in concrete. Electrical metallic tubing may be installed only within buildings. Raceways shall be concealed where possible within finished walls.

8.2.1 Installing Below Slab-On Grade or in Ground. For slab-on-grade construction, rigid plastic or rigid steel conduit shall be installed below the floor slab. Steel conduits installed below slab-on-grade or in the ground shall be field-wrapped with 0.010-inch-thick pipe-wrapping plastic tape applied with a 50-percent overlap. Conduit stub-ups from plastic conduit shall be rigid steel.

8.2.2 Exposed Raceways shall be installed parallel or perpendicular to walls, structural members, or intersections of vertical planes and ceilings.

8.2.3 Changes In Direction of runs shall be made with symmetrical bends or cast-metal fittings. Field-made bends and offsets shall be made with an approved hickey or conduit-bending machine. Crushed or deformed raceways shall not be installed. Trapped raceways in damp and wet locations shall be avoided where possible. Care shall be taken to prevent the lodgment of plaster, dirt, or trash in raceways, boxes, fittings and equipment during the course of construction. Clogged raceways shall be entirely freed of obstructions or shall be replaced.

8.2.4 Supports. Raceways shall be securely supported and fastened in place at intervals of not more than 10 feet with pipe straps, wall brackets, hangers, or ceiling trapeze. Fastenings shall be by wood screws or screw-type nails to wood; by toggle bolts on hollow masonry units; by expansion bolts on concrete or brick; by machine screws, welded or threaded studs, or spring-tension clamps on steel work. Nail-type nylon anchors or threaded studs driven in by a powder charge and provided with lock washers and nuts may be used in lieu of expansion bolts or machine or wood screws. Threaded C-clamps shall not be used. Conduits shall be fastened to all sheet-metal boxes and cabinets with two locknuts where required by the National Electrical Code, where insulating bushings are used, and where bushings cannot be brought into firm contact with the box; otherwise, a single locknut and bushing may be used. Bushings shall be installed on the ends of all conduits and shall be of the insulating type where required by the National Electrical Code. Threadless fittings for electrical metallic tubing shall be of a type approved for the conditions encountered; those installed in wet locations shall be raintight.

8.3 Conductors shall be of copper, except that aluminum conductors may be used as an equivalent for copper conductors of No. 6 AWG and larger. Intermixing of copper and aluminum conductors in these sizes will not be permitted except where required by terminal connections. Design is based on copper conductors. Aluminum conductors shall have ampacity and conductivity of not less than the copper conductors. Connectors for aluminum conductors shall have tinned aluminum bodies and shall be secured to conductors by circumferential pressure. Aluminum contact surfaces of conductors and connectors shall be cleaned and covered with antioxidant compound prior to making of connections. Wire connectors of insulating material or solderless pressure connectors properly taped shall be utilized for all splices where possible. Soldered mechanical joint insulated with tape shall be kept to a minimum.

8.3.1 Sizes shall be not less than indicated. Branch-circuit conductors shall be not smaller than No. 12 American Wire Gage. Class 1 remote-control and signal-circuit conductors shall be not less than No. 14 AWG. Class 2 low-energy remote-control and signal-circuit conductors shall be not less than No. 16 AWG.

8.3.2 Insulation. Conductors No. 8 AWG or larger shall be type THW or RHW. Conductors smaller than No. 8 AWG shall be type THW or TW. Conductors of all sizes for temperatures in excess of 75 degrees C. shall be type RHH or SA.

8.3.3 Conductor Identification of Branch Circuits shall be by color coding. Control circuit conductor identification shall be made by color-coded insulated conductors, plastic-coated self-sticking printed markers, permanently attached stamped metal foil markers, or equivalent means as approved by the Contracting Officer. Conductor identification shall be provided within each enclosure where a tap, splice, or termination is made. Control circuit terminals of equipment shall be properly identified. Terminal and conductor identification shall match that shown on approved shop drawings. Hand lettering or marking is not acceptable.

9. **BOXES AND SUPPORTS.** Boxes shall be provided in the wiring or raceway systems wherever required for pulling of wires, making connections, and mounting of devices or fixtures. Boxes shall be of the cast-metal hub type when located in normally wet locations, when surface mounted on outside of exterior surfaces and when installed exposed up to 7 feet above interior floors. Boxes in other locations shall be sheet steel. Each box shall have the volume required by the National Electrical Code for the number of conductors enclosed in the box. Boxes for mounting lighting fixtures shall be not less than 4 inches except that smaller boxes may be installed as required by fixture configuration, as approved. Boxes installed for concealed wiring shall be provided with suitable extension rings or plaster covers, as required. Cast-metal boxes installed in wet locations and boxes installed flush with the outside of exterior surfaces shall be gasketed. Boxes and supports shall be fastened to wood with wood screws or screw-type nails of equal holding strength, with toggle bolts on hollow masonry units, and with machine screws or welded studs on steel work. Threaded studs driven in by powder charge and provided with lockwashers and nuts, or nail-type nylon anchors may be used in lieu of wood screws, expansion shields, or machine screws. In open overhead spaces, cast metal boxes threaded to raceways need not be separately supported except where used for fixture support; cast metal boxes having threadless connectors and sheet metal boxes shall be supported directly from the building structure or by bar hangers. Where bar hangers are used, the bar shall be attached to raceways on opposite sides of the box and the raceway shall be supported with an approved type fastener not more than 24 inches from the box.

9.1 Boxes For Use With Raceway Systems shall not be less than 1-1/2 inches deep except where shallower boxes required by structural conditions are approved. Boxes for other than lighting-fixture outlets shall be not less than 4 inches square except that 4- by 2-inch boxes may be used where only one raceway enters the outlet.

10. **DEVICE PLATES** of the one-piece type shall be provided for all outlets and fittings to suit the devices installed. Plates shall be of zinc-coated sheet steel or cast metal having rounded or beveled edges. Screws shall be of metal with countersunk heads, in a color to match the finish of the plate. Plates shall be installed with all four edges in continuous contact with finished wall surfaces without the use of mats or similar devices. Plaster fillings will not be permitted. Plates shall be installed with an alignment tolerance of 1/16 inch. The use of sectional-type device plates will not be permitted. Plates installed in wet locations shall be gasketed.

11. RECEPTACLES.

11.1 Duplex Receptacles shall be rated 15 amperes, 125 volts, two-pole, three-wire, grounded type with polarized parallel slots, style D series, in accordance with Federal Specification W-C-596. Bodies shall be of brown phenolic compound supported by mounting strap having plaster ears. Contact arrangement shall be such that contact is made on two sides of an inserted blade. Receptacle shall be side- and back-wired with two screws per terminal, or shall have pressure-type screwless terminals with suitable conductor release arrangement. The third grounding pole shall be connected to the metal mounting yoke.

11.2 Weatherproof receptacles shall consist of a single receptacle as specified in paragraph, above, mounted in a box with a gasketed, weatherproof, cast-metal cover plate and cap over the receptacle opening. The cap shall be provided with a spring-hinged flap.

12. **WALL SWITCHES** shall be of the totally enclosed tumbler type with bodies of phenolic compound. Handles shall be brown. Wiring terminals shall be of the screw type or of the solderless pressure type having suitable conductor-release arrangement. Not more than one switch shall be installed in a single-gang position. Switches shall be rated 15-ampere 120-volt for use on alternating current only.

13. **PANELBOARDS.** Panelboards shall be circuit-breaker equipped, type I. Circuit-breaker interrupting capacities shall conform to Federal Specification W-C-375 unless otherwise indicated. Single-pole breakers shall be full module size; two poles shall not be installed in a single module. Multipole circuit breakers shall be of the common-trip type having a single operating handle and for sizes of 50 amperes or less may consist of single-pole circuit breakers permanently assembled at the factory into a multipole unit. Plug-in type circuit breakers are not acceptable. Panelboards shall not exceed 78 inches in height and shall be so mounted that the height of the top operating handle will not exceed 6 feet 6 inches from the floor. Locks shall be keyed alike. Nameplates shall be as approved. Directories shall be typed to indicate load served by each circuit and mounted in holder behind protective covering.

14. **UNDERGROUND CONDUITS.** Empty conduits for underground service entrance, branch circuit and feeder conductors shall be installed as indicated.

15. **LAMPS AND LIGHTING FIXTURES** of types and sizes as indicated shall be furnished and installed complete.

15.1 Lamps of the proper type, wattage and voltage rating shall be delivered to the project in the original cartons and installed in the fixtures just prior to the completion of the project.

15.1.1 Fluorescent lamps shall have standard cool-white color characteristics and shall be of a type that will not require starter switches. The 40-watt lamps shall be of the rapid start type.

1.2 Mercury vapor lamps shall be color corrected type, unless otherwise indicated.

1.2 Accessories such as straps, mounting plates, nipples, or brackets shall be provided for proper installation.

1.3 EQUIPMENT CONNECTIONS. All wiring for the connection of control equipment as indicated on the electrical drawings shall be furnished and installed under this section of the specifications.

1.4 PAINTING AND FINISHING. Field-applied paint on exposed surfaces shall be provided under section: PAINTING, GENERAL

1.5 REPAIR OF WORK The work shall be carefully laid out in advance, and where cutting, channeling, chasing, drilling of floors, walls, partitions, ceilings, or other surfaces is necessary for the proper installation, support, or anchorage of the conduit raceways, or other electrical work, this work shall be carefully done, and any damage to building piping, or equipment shall be repaired by skilled mechanics of the trades involved, at no additional cost to the Government

1.6 TESTS After the interior-wiring-system installation is completed, and at such time as the Contracting Officer may direct the Contractor shall conduct an operating test for approval. The equipment shall be demonstrated to operate in accordance with the requirements of this specification. The test shall be performed in the presence of the Contracting Officer or an authorized representative. The Contractor shall furnish all instruments and personnel required for the tests, and the Government will furnish the necessary electric power. The Contractor shall submit in writing to the Contracting Officer upon completion of the project the measured ground resistance of each ground rod, indicating the location of the rod and the resistance and the soil conditions at the time the measurements were made

1.7 GUARANTEE The following equipment to be furnished under this section of the specifications shall be guaranteed against defective materials, design, and workmanship for a period of 1 year from the date of acceptance, or later for beneficial use or final acceptance, whichever is earlier:

- Receptacles
- Switches
- Circuit breakers
- Panelboards
- Control devices
- Lighting fixtures

Upon receipt of notice from the Government of failure of any part of the guaranteed equipment during the guarantee period new replacement parts shall be furnished and installed promptly at no cost to the Government.

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SECTION 16B
ELECTRICAL-DISTRIBUTION
AND LIGHTING SYSTEMS; UNDERGROUND

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1. WORK SPECIFIED ELSEWHERE.

1.1 Conduits stubbed out 5 feet from buildings are specified in Section: ELECTRICAL WORK, INTERIOR.

2. 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.

2.1 Federal Specifications.

W-C-586B & Am-1	Conduit Outlet Boxes, Bodies, and Entrance Caps, Electrical: Cast Metal - For Shore Use
W-F-406b & Int. Am-1 (GSA-FSS)	Fittings for Cable, Power, Electrical and Conduit, Metal, Flexible
W-F-408C & Am-1	Fittings for Conduit, Metal, Rigid, (Thick-Wall and Thin-Wall (EMT) Type)
W-S-610C	Splice Conductor
QQ-I-652C	Iron Castings, Gray
QQ-S-681F	Steel Castings
WW-C-581d & Am-3	Conduit, Metal, Rigid; and Coupling, Elbow, and Nipple, Electrical Conduit: Zinc-Coated.

2.2 U.S. Department of Commerce, National Bureau of Standards (NBS) Handbook.

H30	National Electrical Safety Code (March 1948) (Including Handbook 81, November 1961, & Errata & Suppls. 1 & 2)
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2.3 American Society for Testing and Materials (ASTM) Standards.

A 123-73	Zinc (Hot Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates Bars and Strip
A 153-73	Zinc Coating (Hot Dip) on Iron and Steel Hardware
D 752-73	Heavy Duty Black Polychloroprene Jacket for Wire and Cable
D 1679-74	Synthetic Rubber Heat- and Moisture-Resisting Insulation for Wire and Cable, 75 degrees C Operation

2.4 Insulated Power Cable Engineers Association (IPCEA) Standards Publications.

- | | |
|--------------|---|
| No. S-19-81 | Rubber-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy (Fifth Edition, July 1969; Rev. Mar. 1971 & Editorial Corrections May 1971 & Rev. Feb. 1972) |
| No. S-61-402 | Thermoplastic-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy (January 1968, Rev. May 1969, February 1971, & March 1972) |
| No. S-66-524 | Cross-Linked-Thermosetting-Polyethylene-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy (May 1971, Rev. March 1972) |

2.5 National Electrical Manufacturers Association (NEMA) Standards Publications.

- | | |
|----------------|--|
| No. 129-1953 | Open Reflector Mountings Used in Street and Highway Lighting
Voltage Classification of Luminaries Used in Street and Highway Lighting
Tubular Steel, Aluminum and Prestressed Concrete Roadway Lighting Poles
Metal Head and Reflector Interchangeability Used in Roadway Lighting Equipment
Insulator Head and Reflector Interchangeability Used in Street and Highway Lighting |
| No. SH 3-1960 | |
| No. SH 5-1969 | |
| No. SH 10-1964 | |
| No. SH 11-1956 | |

2.6 National Fire Protection Association (NFPA) Publication.

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| No. 70-1975 | National Electrical Code |
|-------------|--------------------------|

2.7 Underwriters' Laboratories, Inc. (UL) Publication.

- | | |
|--------|---|
| UL 651 | Rigid Nonmetallic Conduit (Aug. 24, 1972) |
| UL 854 | Service-Entrance Cables (July 20, 1971; Rev. Feb. 15, 1972) |

3. GENERAL. The contract drawings indicate the extent and general arrangement of the underground electrical distribution and parking and pathway lighting systems.

3.1 Capacities of all equipment and material shall be not less than those indicated.

3.2 Codes. The installation shall comply with the applicable requirements and recommendations of the National Electrical Code, the National Electrical Safety Code and local codes.

3.3 Conformance With Agency Requirements. Where materials or equipment are specified to conform to the standards of the Underwriters' Laboratories, Inc., or to the constructed or tested, or both, in accordance with the standards of the National Electrical Manufacturers Association or the American National Standards Institute, Inc., the Contractor shall submit proof that the items furnished under this section of the specifications conform to such requirements. The label of, or listing by the Underwriters' Laboratories, Inc., will be acceptable as sufficient evidence that the items conform to Underwriters' Laboratories, Inc., requirements. A certification or published catalog specification data statement to the effect that the item is in accordance with the referenced NEMA standard by a company listed as a member company of NEMA for the section whose standards cover the item under consideration, will be acceptable as sufficient evidence that the item conforms to the requirements of the National Electrical Manufacturers Association. In lieu of such stamp, certification, label or listing, the Contractor may submit a written certificate from any nationally recognized testing agency adequately equipped and competent to perform such services, stating that the items have been tested and that the units conform to the requirements listed hereinbefore, including methods of testing of the specified agencies. Conformance with the agency requirements does not relieve the item from complying with any other requirements of the specifications.

3.4 Nameplates. Each major component of equipment shall have as a minimum the manufacturer's name, address, and catalog number, model, style, or type on a plate securely and conspicuously attached to the item of equipment. Nameplates for electrical apparatus shall conform to the referenced standards.

3.5 Prevention of Corrosion. All metallic materials shall be protected against corrosion. Exposed metallic parts of outdoor apparatus shall be given a rust-inhibiting treatment and standard finish by the manufacturer. Aluminum shall not be used in contact with the earth, and where connected to dissimilar metal shall be protected by approved fittings and treatment. All parts such as boxes, bodies, fittings, guards, and miscellaneous parts made of ferrous metals but not of corrosion-resistant steel, shall be zinc-coated in accordance with ASTM A 123 or A 153, except where other equivalent protective treatment is specifically approved in writing by the Contracting Officer. Steel conduits installed underground or under slabs on grade shall be wrapped with a single layer of pressure-sensitive plastic tape, half-lapped. The conduit shall be coated with a primer recommended by the tape manufacturer before applying the tape.

3.6 Standard Products. Materials and equipment shall be essentially the standard products of a manufacturer regularly engaged in the manufacture of the product, shall meet the requirements of the specification, and essentially duplicate materials and equipment that have been in satisfactory use at least 2 years.

3.7 Verification of Dimensions. The Contractor shall be specifically responsible for the coordination and proper relation of his work to the site and to the work of all trades. The Contractor shall visit the premises and thoroughly familiarize himself with all details of the work and working conditions, shall verify all dimensions in the field, and advise the Contracting Officer of any discrepancy before performing any work.

3.8 McKellips Lake Recreation Area. In the event the restroom is not constructed electrical service to recreation area shall be provided from power post and panel type service similar to post and panel type south of McKellips Road. Posts and panels shall be installed near restroom site and sprinkler controller outlet where directed. Existing commercial power along McKellips Road shall be the source for service panel near sprinkler controller. Each service shall be separately metered in accordance with power company requirements.

4. MATERIALS AND EQUIPMENT shall conform to the respective specifications and other requirements specified herein.

4.1 Cable shall have copper conductors for copper sizes No. 8 AWG and smaller. For copper sizes No. 6 AWG and larger, conductors may be copper or aluminum. Design is based on copper conductors. Aluminum conductors shall have ampacity and conductivity of not less than the copper conductors. Connectors for aluminum conductors shall have tinned aluminum bodies and shall be secured to conductors by circumferential pressure. Aluminum conductors and connectors shall be cleaned and covered with anti-oxidant compound in the joints.

4.1.1 Cross-Linked Polyethylene Insulated, Polyvinyl Jacketed or Polyethylene Jacketed Cable. IPCEA Specification S-61-402, except that the cross-linked polyethylene insulation shall conform to IPCEA Specification S-66-524.

4.1.2 Cross-Linked Polyethylene Insulation for Cables shall be an extruded single wall of heat-stabilized and light-stabilized, filled or unfilled, chemically cross-linked polyethylene conforming to IPCEA Specification S-66-524.

4.1.3 Rubber Insulated, Polychloroprene Jacketed Cable. ASTM Standards D 1679 and D 752 for insulation and jacket, respectively, and IPCEA Specification S-19-81 for the construction and for conductor gages.

4.1.4 Underground-Service-Entrance Cable. Underwriters' Laboratories, Inc., Standard for Service-Entrance Cables, type USE, rated 75 degrees centigrade minimum.

4.2 Castings.

4.2.1 Cast Iron. Federal Specification QQ-I-652, class 30.

4.2.2 Cast Steel. Federal Specification QQ-S-681.

4.3 Circuit Breakers, Molded-Case. As specified in Section: ELECTRICAL WORK, INTERIOR.

4.4 Conduit, Nonmetallic.

4.4.1 Rigid Plastic. Underwriters' Laboratories Standard UL 651. Plastic conduit for direct-burial shall be high density polyethylene (PE) or heavy-wall polyvinyl chloride (PVC).

4.5 Conduit, Steel. Federal Specification WW-C-581.

4.6 Connectors. Federal Specification W-S-610.

4.7 Fittings, Cable and Steel Conduit. Federal Specification W-F-406 or W-F-408. Insulating material in bushings shall be of the thermosetting type and shall not support combustion.

- 4.8 Outlets, Metal, for Conduit. Federal Specification W-C-586.
- 4.9 Paint. As specified in Section: PAINTING, GENERAL.
- 4.10 Panelboard. As specified in Section: ELECTRICAL WORK, INTERIOR.
- 4.11 Lighting Components.
 - 4.11.1 Lighting Head Mountings and Reflector Interchangeability. NEMA Pub. Nos. SH 10, SH11, and 129
 - 4.11.2 Lighting Luminaires, Photometric Tests, Voltage Classification, and Mounting. NEMA Pub. No. SH 3
 - 4.11.3 Lighting Poles. NEMA Pub. No. SH 5.

5. LIST OF MATERIALS AND EQUIPMENT. Before starting installation of any materials or equipment, the Contractor shall submit to the Contracting Officer for approval a complete list, in triplicate, of materials and equipment to be incorporated in the work. This list shall include manufacturer's style or catalog numbers. Cuts or other descriptive data shall be furnished when required by the Contracting Officer. No consideration will be given to partial lists submitted from time to time. Approval of materials will be based on manufacturer's published data. approval of materials and equipment will be tentative subject to submission of complete shop drawings indicating compliance with the contract documents.

6. SHOP DRAWINGS. After receiving tentative approval of the equipment on the material lists and before installation of any of these items, the Contractor shall submit complete shop drawings and such other descriptive data as the Contracting Officer may require to demonstrate compliance with the contract documents. Shop drawings shall be submitted for the following items and such other items as the Contracting Officer may direct:

- Lighting luminaires and poles
- Service entrance post
- Panelboard

If departures from the contract drawings are deemed necessary by the Contractor, details of such departures, including changes in related portions of the project and the reasons therefor, shall be submitted with the shop drawings. Approved departures shall be made at no additional cost to the Government.

7. WORKMANSHIP.

7.1 General. All materials and equipment shall be installed in accordance with the recommendations of the manufacturer as approved by the Contracting Officer to conform with the contract documents. The installation shall be accomplished by workmen skilled in this type of work.

8. DUCT SYSTEM.

8.1 General. The duct system shall consist of single round-bore conduit for the electrical-distribution and street-lighting system. The number and size of the duct shall be as indicated. Duct lines shall be laid to a minimum grade of 4 inches per 100 feet. Duct lines shall be installed not less than 24 inches below finished grade or finished paving, except where a greater depth is indicated. Changes in direction of runs exceeding a total of 10 degrees, either vertical or horizontal, shall be accomplished by long sweep bends having a minimum radius of curvature of 25 feet, except that manufactured bends may be used at the ends of the run. The long sweep bends may be made up of one or more curved or straight sections and/or combinations thereof. Manufactured bends shall have a minimum radius of 18 inches for use with ducts of less than 3 inches in diameter and, except where indicated, a minimum radius of 36 inches for ducts of 3 inches in diameter and larger. Conduit shall be thoroughly cleaned before using or laying. During construction and after the duct line is completed, the ends of the conduits shall be plugged to prevent water washing mud into the conduits. Particular care shall be taken to keep the conduits clean of concrete, dirt, and any other substance during the course of construction. Where it is necessary to cut a tapered end on a piece of conduit at the site, the cut shall be made with a tool or lathe designed to cut a taper to match the taper of the particular conduit being used. After the duct line has been completed, a standard flexible mandrel not less than 12 inches long, having a diameter approximately 1/4 inch less than the inside diameter of the conduit, shall be pulled through each conduit, after which a brush with stiff bristles shall be pulled through each conduit to make certain that no particles of earth, sand, or gravel have been left in the line. Pneumatic rodding may be used to draw in the lead wire. Conduits shall be stored to avoid warping or deterioration. Plastic conduit shall be stored on a flat surface and protected from the direct rays of the sun. Conduit joints in concrete encasement may be placed side by side horizontally but shall be staggered at least 6 inches vertically.

8.2 Materials.

8.2.1 Duct Banks for electrical-distribution systems and lighting systems shall consist of plastic conduit.

8.3 Installation of Duct Banks.

8.3.1 Conduits shall be buried directly in the earth except that ducts under roads or paved areas shall be encased in a minimum of 3 inches of concrete. The width of the trench shall be approximately the width of the duct bank plus 6 inches, with depth of cover over the top of the duct bank not less than 24 inches. The bottom of the trench shall be graded toward manholes and pull boxes and shall be smooth and free of stones, soft spots, and sharp objects. Where bottom of trench comprises materials other than sand or stone-free earth, a 3-inch layer of sand, or stone-free earth shall be laid on the bottom of the trench and compacted to the approximate density of the surrounding firm soil before installing the conduits in direct-contact tiered fashion. Joints in adjacent tiers of conduit shall be vertically staggered at least 6 inches. The first layer of backfill cover shall be sand or stone-free earth, compacted as specified. Duct banks may be held in alinement with a few shovelfuls of dirt. However, high-tiered banks may use a wooden frame or equivalent form to hold the duct in alinement prior to backfilling. The selected earth at the sides of the duct bank shall be thoroughly tamped in 4- to 6-inch layers.

8.4 Installation of Couplings. Joints shall be made up in accordance with the manufacturer's recommendations for the particular conduit and coupling selected and as approved by the Contracting Officer. In the absence of specific recommendations, the conduit joint couplings shall be made watertight by brushing a plastic solvent cement on the inside of a plastic coupling fitting and on the outside of the conduit ends. The conduit and fitting shall then be slipped together with a quick one-quarter-turn twist to set the joint tightly.

8.5 Concrete shall be plain, class B, or 2,500 p.s.i. at 28 days. Duct lines shall be of monolithic construction.

8.6 Conduit stub ups from ducts shall be rigid steel conduit.

9. CABLE SYSTEM shall consist of 600-volt rubber insulated, polychloroprene jacketed cable, rubber insulated underground-service-entrance cable, cross-linked polyethylene insulated, polyvinyl chloride jacketed cable or cross-linked polyethylene insulated, polyethylene jacketed cable at the option of the Contractor. The size and number of conductors and the number of cables shall be as indicated. Conductors larger than No. 8 AWG shall be stranded. Each circuit shall be identified by means of fiber or nonferrous-metal tags, or approved equal, in each manhole and pull box and at each terminal. Cable shall be installed in conduit. Grounding conductor in duct systems may be 600 volt, type THW cables.

9.1 Cable Splices shall be made in accordance with the cable manufacturer's recommendations. A copy of the manufacturer's recommendations shall be furnished to the Contracting Officer for inspection purposes. Splices in cables shall provide insulation equal in every respect to that of the cable. Special care shall be taken to insure that all wax is removed from the section to be covered with splicing tape.

9.2 Connections to Buildings. Cables shall be extended into the various buildings as indicated, and shall be properly connected to the equipment. Empty conduits from a point 5 feet outside of the building wall and 2 feet below finished grade will be provided under Section: ELECTRICAL WORK, INTERIOR. After installation of cables, conduits shall be sealed to prevent entrance of moisture or gases into building.

10. LIGHTING POLES shall have the nominal height indicated on the drawings. Poles shall be designed for use with underground supply conductors. Poles shall be the anchor-base type. Each pole shall be provided with 4 one-inch by 40-inch galvanized-steel anchor bolts, threaded at the top end, and bent 90 degrees by 4 inches at the bottom. Anchor bolts shall be complete with galvanized nuts, washers, and ornamental cover. Pole brackets shall be not less than 1-1/4-inch galvanized steel pipe secured to pole. Bracket shall correctly position the luminaire not less than 6 feet from the pole at not less than the mounting height indicated. Slip-fitter or pipe threaded brackets may be used at the option of the Contractor, but brackets shall be coordinated to the luminaires provided. Poles shall be steel. Parking lot lighting poles shall be galvanized. After installation, the exposed surfaces of the pathway lighting poles shall be given 2 finish coats of exterior oil paint of a color selected by the Contracting Officer. Paint shall be as specified in Section: PAINTING, GENERAL.

11. INSTALLATION OF LIGHTING POLES. Lighting poles shall be installed on concrete foundations as indicated. Backfill shall be thoroughly compacted. Lighting poles shall be adjusted as necessary to provide a permanent vertical position.

12. LUMINAIRES shall be of the types as shown on the drawings. Metal halide luminaires shall be provided with a high power factor, constant wattage ballast mounted integrally in the luminaire.

13. PULLBOXES shall be constructed approximately where shown. The exact location of each pullbox shall be determined after careful consideration has been given to the location of other utilities, grading and paving. The location of each pullbox shall be approved by the Contracting Officer before installation of the pullbox is started. Pullboxes shall be concrete of the types indicated with traffic covers. Pullboxes shall be set on a pea gravel base 12 inches thick and as large as the bottom of the pullbox.

14. MANHOLES.

14.1 General. Manholes shall be constructed approximately where shown. The exact location of each manhole shall be determined after careful consideration has been given to the location of other utilities, grading and paving. The location of each manhole shall be approved by the Contracting Officer before construction of the manhole is started. Manholes shall be the type noted on the drawings. Frames and covers shall be made of gray cast iron. A machine-finished seat shall be provided to insure a perfect joint between the frame and cover. Frames and covers shall be delivered on the job unpainted and, after inspection shall be given 2 coats of asphalt paint. In paved areas, the top of manhole covers shall be flush with the finished surface of the paving. In unpaved areas, the top of manhole covers shall be approximately 1/2 inch above the finished grade.

14.2 Hardware. Cables shall be well supported on walls by hot-galvanized cable racks equipped with adjustable hooks and insulators. Insulators shall be made of best-quality, high-glazed porcelain.

15. GROUNDING shall conform to applicable requirements in the National Electrical Code, the National Electrical Safety Code, local codes and to requirements herein. Metallic conduits and all non-current-carrying metallic parts of equipment, shall be grounded. Ground rods shall be made of copper, or copper-clad steel, not less than 3/4 inch by 10 feet long, and shall be driven into the earth at least 10 feet.

16. TESTS.

16.1 Operating Test. After the installation has been completed, and at such time as the Contracting Officer may direct, the Contractor shall conduct an operating test for approval. The equipment shall be demonstrated to operate in accordance with the requirements of this section of the specifications. The test shall be performed in the presence of the Contracting Officer. The Contractor shall furnish the necessary instruments and personnel required for the test, and the Government will furnish the necessary electric power.

16.2 Ground-Resistance Measurements of each ground rod shall be taken and certified by the Contractor to the Contracting Officer. The Contractor shall submit in writing to the Contracting Officer upon completion of the project, the measured ground resistance of each ground rod and grounding system, indicating the location of the rod and grounding system, as well as the resistance and soil conditions at the time the measurements were made. When the building water service is used as a ground or part of the grounding system, ground-resistance measurements shall also be made of this connection. Ground-resistance measurements shall be made in normally dry weather and with the ground under test isolated from other grounds.

17. GUARANTEE. The following equipment furnished under this section of the specifications shall be guaranteed for a period of 1 year from the date of acceptance thereof, either for beneficial use or final acceptance, whichever is earlier, against defective materials, design, and workmanship:

Lighting luminaires and poles
Panelboard

Upon receipt of notice from the Government of failure of any part of the guaranteed equipment during the guarantee period, new replacement parts shall be furnished and installed promptly by the Contractor at no additional cost to the Government.

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