

<b>SOLICITATION, OFFER, AND AWARD</b> <i>(Construction, Alteration, or Repair)</i>	1. SOLICITATION NO. FA3010-04-R-0008-0002	2. TYPE OF SOLICITATION <input type="checkbox"/> SEALED BID (IFB) <input checked="" type="checkbox"/> NEGOTIATED (RFP)	3. DATE ISSUED 10-May-2004	PAGE OF PAGES 1 OF 34
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**IMPORTANT - The "offer" section on the reverse must be fully completed by offeror.**

4. CONTRACT NO. FA3010-04-D-0007	5. REQUISITION/PURCHASE REQUEST NO.	6. PROJECT NO. MAHG 04-2206
7. ISSUED BY 81ST CONTRACTING SQUADRON JANET VASTERLING 310 M STREET, RM 102 KEESLER AFB MS 39534-2147  TEL: 228-377-1820 FAX: 228-377-3298	CODE FA3010	8. ADDRESS OFFER TO <i>(If Other Than Item 7)</i>  <b>See Item 7</b>  TEL: FAX:
9. FOR INFORMATION CALL:	A. NAME JANET K. VASTERLING	B. TELEPHONE NO. <i>(Include area code) (NO COLLECT CALLS)</i> 228-377-1820

**SOLICITATION**

**NOTE: In sealed bid solicitations "offer" and "offeror" mean "bid" and "bidder".**

10. THE GOVERNMENT REQUIRES PERFORMANCE OF THE WORK DESCRIBED IN THESE DOCUMENTS IDQ Paving/Utilities IDQ - PAVING/UTILITIES  THIS ACQUISITION IS UNRESTRICTED  ENTER PRICES IN SECTION B  ALL AMENDMENTS TO THIS SOLICITATION (IF ANY) MUST BE ACKNOWLEDGED  YOUR ATTENTION IS DIRECTED TO SECTION "L" FOR PROPOSAL PREPARATION INSTRUCTIONS AND SECTION "M" FOR EVALUATION FACTORS FOR AWARD  CLAUSE 52.232-27 "PROMPT PAYMENT FOR CONSTRUCTION CONTRACTS" IS MODIFIED AS FOLLOWS: (a) SUBPARAGRAPH (a)(1)(i)(A), CHANGE ALL REFERENCES FROM "14 DAYS" AND "14TH DAY" TO READ "30 DAYS" AND "30TH DAY". PAYMENTS OF CONSTRUCTION INVOICES ARE DUE 30 DAYS AFTER RECEIPT OF A PROPER INVOICE. (b) SUBPARAGRAPH (a)(4)(i), CHANGE "7TH DAY" TO READ "14TH DAY". CONSTRUCTIVE ACCEPTANCE OCCURS ON THE 14TH DAY.  THE SMALL DISADVANTAGED BUSINESS EVALUATION PREFERENCE (FAR 52.219-23) HAS BEEN SUSPENDED AND WILL NOT BE CONSIDERED IF AWARDED, THIS AWARD WILL BE SUBJECT TO THE SMALL BUSINESS COMPETITIVENESS DEMONSTRATION PROGRAM	<i>(Title, identifying no., date):</i>
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11. The Contractor shall begin performance within _____ calendar days and complete it within _____ calendar days after receiving <input type="checkbox"/> award, <input type="checkbox"/> notice to proceed. This performance period is <input type="checkbox"/> mandatory, <input type="checkbox"/> negotiable. (See FAR 52.211-10 _____.)
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12 A. THE CONTRACTOR MUST FURNISH ANY REQUIRED PERFORMANCE AND PAYMENT BONDS? <i>(If "YES," indicate within how many calendar days after award in Item 12B.)</i> <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	12B. CALENDAR DAYS 10
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13. ADDITIONAL SOLICITATION REQUIREMENTS: A. Sealed offers in original and _____ 1 _____ copies to perform the work required are due at the place specified in Item 8 by _____ 04:00 PM _____ (hour) local time _____ 10 Jun 2004 _____ (date). If this is a sealed bid solicitation, offers must be publicly opened at that time. Sealed envelopes containing offers shall be marked to show the offeror's name and address, the solicitation number, and the date and time offers are due. B. An offer guarantee <input checked="" type="checkbox"/> is, <input type="checkbox"/> is not required. C. All offers are subject to the (1) work requirements, and (2) other provisions and clauses incorporated in the solicitation in full text or by reference. D. Offers providing less than _____ 120 _____ calendar days for Government acceptance after the date offers are due will not be considered and will be rejected.
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**SOLICITATION, OFFER, AND AWARD (Continued)**

*(Construction, Alteration, or Repair)*

**OFFER (Must be fully completed by offeror)**

14. NAME AND ADDRESS OF OFFEROR <i>(Include ZIP Code)</i> J O COLLINS CONTRACTOR INC DANIEL COLLINS 206 IBERVILLE DR BILOXI MS 39531-4347	15. TELEPHONE NO. <i>(Include area code)</i> 228-374-5314  16. REMITTANCE ADDRESS <i>(Include only if different than Item 14)</i>  <b>See Item 14</b>
CODE 0CV24	FACILITY CODE

17. The offeror agrees to perform the work required at the prices specified below in strict accordance with the terms of this solicitation, if this offer is accepted by the Government in writing within \_\_\_\_\_ calendar days after the date offers are due. *(Insert any number equal to or greater than the minimum requirements stated in Item 13D. Failure to insert any number means the offeror accepts the minimum in Item 13D.)*

AMOUNTS	SEE SCHEDULE OF PRICES
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18. The offeror agrees to furnish any required performance and payment bonds.

**19. ACKNOWLEDGMENT OF AMENDMENTS**

*(The offeror acknowledges receipt of amendments to the solicitation -- give number and date of each)*

AMENDMENT NO.	DATE								

20A. NAME AND TITLE OF PERSON AUTHORIZED TO SIGN OFFER <i>(Type or print)</i>	20B. SIGNATURE	20C. OFFER DATE
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**AWARD (To be completed by Government)**

21. ITEMS ACCEPTED:  
**SEE SCHEDULE**

22. AMOUNT <b>\$1,066,031.00 EST</b>	23. ACCOUNTING AND APPROPRIATION DATA
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24. SUBMIT INVOICES TO ADDRESS SHOWN IN <i>(4 copies unless otherwise specified)</i>	<b>ITEM</b>	25. OTHER THAN FULL AND OPEN COMPETITION PURSUANT TO <input type="checkbox"/> 10 U.S.C. 2304(c) <input type="checkbox"/> 41 U.S.C. 253(c)
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26. ADMINISTERED BY  <b>See Item 7</b>	CODE	27. PAYMENT WILL BE MADE BY: DFAS-SAVIFVD (1-888-478-5636) 500 MCCULLOUGH AVE SAN ANTONIO TX 78215-2100
		CODE      F60700

**CONTRACTING OFFICER WILL COMPLETE ITEM 28 OR 29 AS APPLICABLE**

<input type="checkbox"/> 28. NEGOTIATED AGREEMENT <i>(Contractor is required to sign this document and return _____ days to issuing office.)</i> Contractor agrees to furnish and deliver all items or perform all work, requisitions identified on this form and any continuation sheets for the consideration stated in this contract. The rights and obligations of the parties to this contract shall be governed by (a) this contract award, (b) the solicitation, and (c) the clauses, representations, certifications, and specifications or incorporated by reference in or attached to this contract.	<input checked="" type="checkbox"/> 29. AWARD <i>(Contractor is not required to sign this document.)</i> Your offer on this solicitation, is hereby accepted as to the items listed. This award commutes the contract, which consists of (a) the Government solicitation and your offer, and (b) this contract award. No further contractual document is necessary.  REF:
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30A. NAME AND TITLE OF CONTRACTOR OR PERSON AUTHORIZED TO SIGN <i>(Type or print)</i>	31A. NAME OF CONTRACTING OFFICER <i>(Type or print)</i> REGGIE E. TEMPLE / FLIGHT A, TEAM A LEADER
30B. SIGNATURE	TEL: 228-377-1837      EMAIL: reggie.temple@keesler.af.mil

30C. DATE	31B. UNITED STATES OF AMERICA BY	31C. AWARD DATE 22-Jul-2004
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Section B - Supplies or Services and Prices

MAGNITUDE

The magnitude of proposed construction is between \$1,000,000 and \$5,000,000.

ITEM NO	SUPPLIES/SERVICES	TOTAL ESTIMATED AMOUNT
0001	PAVING/UTILITIES - BASIC PERIOD Period of Performance: Date of award for a period of one year	\$ <hr/>

(Funds will be certified on each individual Task Order)

ITEM NO	SUPPLIES/SERVICES	ESTIMATED AMOUNT
0002	PAVING - FIRST OPTION PERIOD Period of Performance: One Year from end of Basic Period	\$ <hr/>

(Funds will be certified on each individual Task Order)

Section E - Inspection and Acceptance

INSPECTION AND ACCEPTANCE

81<sup>st</sup> Civil Engineering is designated as the office responsible for inspecting the work while the Contracting officer is responsible for final acceptance of the work.

CLAUSES INCORPORATED BY REFERENCE

52.246-12            Inspection of Construction

AUG 1996

## Section F - Deliveries or Performance

ALLOTTED WORK TIME

Prior to issuance of each individual Task Order, the Performance Time will be negotiated between the contractor and the government. When a Task Order is issued, it will specify a required start date and a required completion date to reflect the Performance Time that has been negotiated. Performance Time on Task Orders is independent of each other and may run concurrently.

## CLAUSES INCORPORATED BY FULL TEXT

## 52.211-12 LIQUIDATED DAMAGES--CONSTRUCTION (SEP 2000)

(a) If the Contractor fails to complete the work within the time specified in the contract, the Contractor shall pay liquidated damages to the Government in the amount of \$126.40\* for each calendar day of delay until the work is completed or accepted.

(b) If the Government terminates the Contractor's right to proceed, liquidated damages will continue to accrue until the work is completed. These liquidated damages are in addition to excess costs of repurchase under the Termination clause.

\*If the contractor is performing concurrently on more than one Task Order, liquidated damages shall be assessed at 50% of the above rate for each day of delay, i.e., \$126.40 x 50% = \$63.20.  
(End of clause)

Section H - Special Contract Requirements

NOTE OF INSURANCE COMP

NOTIFICATION OF COMPLIANCE WITH INSURANCE REQUIREMENTS

The undersigned Contractor hereby acknowledges that he or she has read and understand the insurance requirements specified in this contract and hereby agrees (1) that such insurance will be maintained in at least the amounts and types specified in this contract and during any modifications and or time extensions granted thereto; (2) that the policies evidencing required insurance shall contain an endorsement to the effect that any cancellation or any material change adversely affecting the Government’s interest shall not be effective for such period as the laws of the State in which this contract is to be performed prescribe, or until 30 days after the insurer or contractor gives written notice to the Contracting Officer, whichever period is longer; (3) that \_\_\_\_\_(State) Workmen’s Compensation Insurance, or letter of reciprocal agreement with another state, shall be maintained on this contract for and during the entire performance period and for any modifications and time extensions granted thereto; and (4) that a copy of all subcontractors’ proof of insurance shall be maintained and shall be made available to the Contracting Officer upon request. This agreement shall become a part of the contract file.

INSURANCE COMPANY(S): \_\_\_\_\_

(NAME(S) (TELEPHONE NUMBER(S)) \_\_\_\_\_

CONTRACTOR:

(NAME) \_\_\_\_\_

(ADDRESS) \_\_\_\_\_

(AUTHORIZED SIGNATURE) (DATE) \_\_\_\_\_

(TYPED NAME AND TITLE) \_\_\_\_\_

REQUIRED INSURANCE

Reference FAR clause entitled Insurance the Contractor shall, at its own expense, procure and thereafter maintain the following kinds of insurance with respect to performance under the contract.

- (1) Workman’s Compensation and Employers Liability Insurance as required by law except that if this contract is to be performed in a state which does not require or permit private insurance, then compliance with the statutory or administrative requirements in any such state will be satisfactory. The required Workmen’s Compensation insurance shall extend to cover employer’s liability for accidental bodily injury or death and for occupational disease with a minimum liability limit of **\$100,000**.
- (2) General Liability Insurance. Bodily injury liability insurance, in the minimum limits of **\$500,000** per occurrence shall be required on the comprehensive form of policy.
- (3) Automobile Liability Insurance. This insurance shall be required on the comprehensive form of policy and shall provide bodily injury liability and property damage liability covering the operation of all automobiles used in connection with the performance of the contract. At least the minimum limits of **\$200,000** per person and **\$500,000** per occurrence of bodily injury and **\$20,000** per occurrence for property damage shall be required.

**SMOKING IN AETC FACILITIES**

Contractors are advised that the Commander has placed restrictions on the smoking of products in AETC facilities. AFI 40-102, *Tobacco Use in the Air Force*, and its AETC Supplement 1, outline the procedures used by the commander to control smoking in our facilities. Contractor employees and visitors are subject to the same restrictions as government personnel. Smoking is permitted only in designated smoking areas.

(End of clause)

## Section I - Contract Clauses

AVAILABILITY OF UTILITIES

Notwithstanding the provisions of Contract Clause FAR 52.236-14, Availability and Use of Utility Services, all reasonable required amounts of water, gas, electricity, etc., essential to contract performance, will be made available at no cost to the contractor from existing systems, outlets, and supplies. All temporary connections, outlets, and distribution lines, as may be required, shall be installed by the contractor at the contractor's own expense.

PREPERFORMANCE CONFERENCE

Offerors are hereby advised, if they are awarded a contract as a result of this solicitation, they may be required to appear at the 81<sup>st</sup> Contracting Squadron, Construction Flight, 81 CONS/LGCA, 310 M St., Room 102, Keesler AFB to attend a Preperformance Conference prior to commencement of any work on the military installation.

CLAUSES INCORPORATED BY REFERENCE

52.202-1	Definitions	DEC 2001
52.202-1 Alt I	Definitions (Dec 2001) --Alternate I	MAY 2001
52.203-3	Gratuities	APR 1984
52.203-5	Covenant Against Contingent Fees	APR 1984
52.203-6	Restrictions On Subcontractor Sales To The Government	JUL 1995
52.203-7	Anti-Kickback Procedures	JUL 1995
52.203-8	Cancellation, Rescission, and Recovery of Funds for Illegal or Improper Activity	JAN 1997
52.203-10	Price Or Fee Adjustment For Illegal Or Improper Activity	JAN 1997
52.203-12	Limitation On Payments To Influence Certain Federal Transactions	JUN 2003
52.204-4	Printed or Copied Double-Sided on Recycled Paper	AUG 2000
52.204-7	Central Contractor Registration	OCT 2003
52.209-6	Protecting the Government's Interest When Subcontracting With Contractors Debarred, Suspended, or Proposed for Debarment	JUL 1995
52.211-15	Defense Priority And Allocation Requirements	SEP 1990
52.215-2	Audit and Records--Negotiation	JUN 1999
52.215-8	Order of Precedence--Uniform Contract Format	OCT 1997
52.215-11	Price Reduction for Defective Cost or Pricing Data--Modifications	OCT 1997
52.215-13	Subcontractor Cost or Pricing Data--Modifications	OCT 1997
52.215-21	Requirements for Cost or Pricing Data or Information Other Than Cost or Pricing Data--Modifications	OCT 1997
52.217-8	Option To Extend Services	NOV 1999
52.219-8	Utilization of Small Business Concerns	OCT 2000
52.219-9	Small Business Subcontracting Plan	JAN 2002
52.219-16	Liquidated Damages-Subcontracting Plan	JAN 1999
52.219-25	Small Disadvantaged Business Participation Program--Disadvantaged Status and Reporting	OCT 1999
52.222-3	Convict Labor	JUN 2003
52.222-4	Contract Work Hours and Safety Standards Act - Overtime Compensation	SEP 2000
52.222-6	Davis Bacon Act	FEB 1995

52.222-7	Withholding of Funds	FEB 1988
52.222-8	Payrolls and Basic Records	FEB 1988
52.222-9	Apprentices and Trainees	FEB 1988
52.222-10	Compliance with Copeland Act Requirements	FEB 1988
52.222-11	Subcontracts (Labor Standards)	FEB 1988
52.222-12	Contract Termination-Debarment	FEB 1988
52.222-13	Compliance with Davis-Bacon and Related Act Regulations.	FEB 1988
52.222-14	Disputes Concerning Labor Standards	FEB 1988
52.222-15	Certification of Eligibility	FEB 1988
52.222-21	Prohibition Of Segregated Facilities	FEB 1999
52.222-26	Equal Opportunity	APR 2002
52.222-27	Affirmative Action Compliance Requirements for Construction	FEB 1999
52.222-30	Davis-Bacon Act--Price Adjustment (None or Separately Specified Method)	DEC 2001
52.222-35	Equal Opportunity For Special Disabled Veterans, Veterans of the Vietnam Era, and Other Eligible Veterans	DEC 2001
52.222-36	Affirmative Action For Workers With Disabilities	JUN 1998
52.222-37	Employment Reports On Special Disabled Veterans, Veterans Of The Vietnam Era, and Other Eligible Veterans	DEC 2001
52.223-5	Pollution Prevention and Right-to-Know Information	AUG 2003
52.223-6	Drug-Free Workplace	MAY 2001
52.223-14	Toxic Chemical Release Reporting	AUG 2003
52.225-13	Restrictions on Certain Foreign Purchases	DEC 2003
52.227-1	Authorization and Consent	JUL 1995
52.227-2	Notice And Assistance Regarding Patent And Copyright Infringement	AUG 1996
52.227-4	Patent Indemnity-Construction Contracts	APR 1984
52.228-2	Additional Bond Security	OCT 1997
52.228-5	Insurance - Work On A Government Installation	JAN 1997
52.228-11	Pledges Of Assets	FEB 1992
52.228-12	Prospective Subcontractor Requests for Bonds	OCT 1995
52.228-14	Irrevocable Letter of Credit	DEC 1999
52.228-15	Performance and Payment Bonds--Construction	JUL 2000
52.229-3	Federal, State And Local Taxes	APR 2003
52.230-2	Cost Accounting Standards	APR 1998
52.232-5	Payments under Fixed-Price Construction Contracts	SEP 2002
52.232-17	Interest	JUN 1996
52.232-23	Assignment Of Claims	JAN 1986
52.232-23 Alt I	Assignment of Claims (Jan 1986) - Alternate I	APR 1984
52.232-27	Prompt Payment for Construction Contracts	OCT 2003
52.232-33	Payment by Electronic Funds Transfer--Central Contractor Registration	OCT 2003
52.233-1	Disputes	JUL 2002
52.233-3	Protest After Award	AUG 1996
52.236-2	Differing Site Conditions	APR 1984
52.236-3	Site Investigation and Conditions Affecting the Work	APR 1984
52.236-5	Material and Workmanship	APR 1984
52.236-6	Superintendence by the Contractor	APR 1984
52.236-7	Permits and Responsibilities	NOV 1991
52.236-8	Other Contracts	APR 1984
52.236-9	Protection of Existing Vegetation, Structures, Equipment, Utilities, and Improvements	APR 1984
52.236-10	Operations and Storage Areas	APR 1984

52.236-11	Use and Possession Prior to Completion	APR 1984
52.236-12	Cleaning Up	APR 1984
52.236-13	Accident Prevention	NOV 1991
52.236-13 Alt I	Accident Prevention (Nov 1991) - Alternate I	NOV 1991
52.236-14	Availability and Use of Utility Services	APR 1984
52.236-15	Schedules for Construction Contracts	APR 1984
52.236-17	Layout of Work	APR 1984
52.236-21	Specifications and Drawings for Construction	FEB 1997
52.236-26	Preconstruction Conference	FEB 1995
52.242-13	Bankruptcy	JUL 1995
52.242-14	Suspension of Work	APR 1984
52.243-4	Changes	AUG 1987
52.246-21	Warranty of Construction	MAR 1994
52.248-3	Value Engineering-Construction	FEB 2000
52.249-2 Alt I	Termination for Convenience of the Government (Fixed-Price) (Sep 1996) - Alternate I	SEP 1996
52.249-10	Default (Fixed-Price Construction)	APR 1984
52.253-1	Computer Generated Forms	JAN 1991
252.201-7000	Contracting Officer's Representative	DEC 1991
252.203-7001	Prohibition On Persons Convicted of Fraud or Other Defense-Contract-Related Felonies	MAR 1999
252.204-7003	Control Of Government Personnel Work Product	APR 1992
252.205-7000	Provision Of Information To Cooperative Agreement Holders	DEC 1991
252.209-7000	Acquisition From Subcontractors Subject To On-Site Inspection Under The Intermediate Range Nuclear Forces (INF) Treaty	NOV 1995
252.209-7004	Subcontracting With Firms That Are Owned or Controlled By The Government of a Terrorist Country	MAR 1998
252.215-7000	Pricing Adjustments	DEC 1991
252.219-7003	Small, Small Disadvantaged and Women-Owned Small Business Subcontracting Plan (DOD Contracts)	APR 1996
252.223-7006	Prohibition On Storage And Disposal Of Toxic And Hazardous Materials	APR 1993
252.225-7012	Preference For Certain Domestic Commodities	FEB 2003
252.227-7033	Rights in Shop Drawings	APR 1966
252.231-7000	Supplemental Cost Principles	DEC 1991
252.232-7003	Electronic Submission of Payment Requests	JAN 2004
252.236-7000	Modification Proposals-Price Breakdown	DEC 1991
252.236-7005	Airfield Safety Precautions	DEC 1991
252.242-7000	Postaward Conference	DEC 1991
252.243-7001	Pricing Of Contract Modifications	DEC 1991
252.243-7002	Requests for Equitable Adjustment	MAR 1998

#### CLAUSES INCORPORATED BY FULL TEXT

##### 52.211-10 COMMENCEMENT, PROSECUTION, AND COMPLETION OF WORK (APR 1984)

The Contractor shall be required to (a) commence work under this contract within **ten calendar days after receipt of the first delivery order and within five calendar days for subsequent delivery orders**, (b) prosecute the work diligently, and (c) complete the entire work ready for use not later than **\***. The time stated for completion shall include final cleanup of the premises.

**\*Performance time shall be negotiated for each individual Task Order. (See Section F, Allotted Work Time)**

(End of clause)

52.216-18 ORDERING. (OCT 1995)

(a) Any supplies and services to be furnished under this contract shall be ordered by issuance of delivery orders or task orders by the individuals or activities designated in the Schedule. Such orders may be issued from **date of award** for a period of one year (Basic Period), as well as for the period of time for each option.

(b) All delivery orders or task orders are subject to the terms and conditions of this contract. In the event of conflict between a delivery order or task order and this contract, the contract shall control.

(c) If mailed, a delivery order or task order is considered "issued" when the Government deposits the order in the mail. Orders may be issued orally, by facsimile, or by electronic commerce methods only if authorized in the Schedule.

(End of clause)

52.216-19 ORDER LIMITATIONS. (OCT 1995)

(a) Minimum order. When the Government requires supplies or services covered by this contract in an amount of less than **\$20,000.00**, the Government is not obligated to purchase, nor is the Contractor obligated to furnish, those supplies or services under the contract.

(b) Maximum order. The Contractor is not obligated to honor:

(1) Any order for a single item in excess of **\$350,000.00**;

(2) Any order for a combination of items in excess of **\$1,500,000.00**; or

(3) A series of orders from the same ordering office within **nine** days that together call for quantities exceeding the limitation in subparagraph (1) or (2) above.

(c) If this is a requirements contract (i.e., includes the Requirements clause at subsection 52.216-21 of the Federal Acquisition Regulation (FAR)), the Government is not required to order a part of any one requirement from the Contractor if that requirement exceeds the maximum-order limitations in paragraph (b) above.

(d) Notwithstanding paragraphs (b) and (c) above, the Contractor shall honor any order exceeding the maximum order limitations in paragraph (b), unless that order (or orders) is returned to the ordering office within **five** days after issuance, with written notice stating the Contractor's intent not to ship the item (or items) called for and the reasons. Upon receiving this notice, the Government may acquire the supplies or services from another source.

(End of clause)

52.216-21 REQUIREMENTS (OCT 1995)

(a) This is a requirements contract for the supplies or services specified, and effective for the period stated, in the

Schedule. The quantities of supplies or services specified in the Schedule are estimates only and are not purchased by this contract. Except as this contract may otherwise provide, if the Government's requirements do not result in orders in the quantities described as "estimated" or "maximum" in the Schedule, that fact shall not constitute the basis for an equitable price adjustment.

(b) Delivery or performance shall be made only as authorized by orders issued in accordance with the Ordering clause. Subject to any limitations in the Order Limitations clause or elsewhere in this contract, the Contractor shall furnish to the Government all supplies or services specified in the Schedule and called for by orders issued in accordance with the Ordering clause. The Government may issue orders requiring delivery to multiple destinations or performance at multiple locations.

(c) Except as this contract otherwise provides, the Government shall order from the Contractor all the supplies or services specified in the Schedule that are required to be purchased by the Government activity or activities specified in the Schedule.

(d) The Government is not required to purchase from the Contractor requirements in excess of any limit on total orders under this contract.

(e) If the Government urgently requires delivery of any quantity of an item before the earliest date that delivery may be specified under this contract, and if the Contractor will not accept an order providing for the accelerated delivery, the Government may acquire the urgently required goods or services from another source.

(f) Any order issued during the effective period of this contract and not completed within that period shall be completed by the Contractor within the time specified in the order. The contract shall govern the Contractor's and Government's rights and obligations with respect to that order to the same extent as if the order were completed during the contract's effective period; provided, that the Contractor shall not be required to make any deliveries under this contract after \*

\*As specified in each individual Task Order.

(End of clause)

#### 52.217-9 OPTION TO EXTEND THE TERM OF THE CONTRACT (MAR 2000)

(a) The Government may extend the term of this contract by written notice to the Contractor within 15 days; provided that the Government gives the Contractor a preliminary written notice of its intent to extend at least 60 days before the contract expires. The preliminary notice does not commit the Government to an extension.

(b) If the Government exercises this option, the extended contract shall be considered to include this option clause.

(c) The total duration of this contract, including the exercise of any options under this clause, shall not exceed 30 months.

(End of clause)

#### 52.219-4 NOTICE OF PRICE EVALUATION PREFERENCE FOR HUBZONE SMALL BUSINESS CONCERNS (JAN 1999)

(a) Definition. HUBZone small business concern, as used in this clause, means a small business concern that appears on the List of Qualified HUBZone Small Business Concerns maintained by the Small Business Administration.

(b) Evaluation preference. (1) Offers will be evaluated by adding a factor of 10 percent to the price of all offers, except--

(i) Offers from HUBZone small business concerns that have not waived the evaluation preference;

(ii) Otherwise successful offers from small business concerns;

(iii) Otherwise successful offers of eligible products under the Trade Agreements Act when the dollar threshold for application of the Act is exceeded (see 25.402 of the Federal Acquisition Regulation (FAR)); and

(iv) Otherwise successful offers where application of the factor would be inconsistent with a Memorandum of Understanding or other international agreement with a foreign government.

(2) The factor of 10 percent shall be applied on a line item basis or to any group of items on which award may be made. Other evaluation factors described in the solicitation shall be applied before application of the factor.

(3) A concern that is both a HUBZone small business concern and a small disadvantaged business concern will receive the benefit of both the HUBZone small business price evaluation preference and the small disadvantaged business price evaluation adjustment (see FAR clause 52.219-23). Each applicable price evaluation preference or adjustment shall be calculated independently against an offeror's base offer.

These individual preference amounts shall be added together to arrive at the total evaluated price for that offer.

(c) Waiver of evaluation preference. A HUBZone small business concern may elect to waive the evaluation preference, in which case the factor will be added to its offer for evaluation purposes. The agreements in paragraph (d) of this clause do not apply if the offeror has waived the evaluation preference.

\_\_\_ Offeror elects to waive the evaluation preference.

(d) Agreement. A HUBZone small business concern agrees that in the performance of the contract, in the case of a contract for

(1) Services (except construction), at least 50 percent of the cost of personnel for contract performance will be spent for employees of the concern or employees of other HUBZone small business concerns;

(2) Supplies (other than procurement from a nonmanufacturer of such supplies), at least 50 percent of the cost of manufacturing, excluding the cost of materials, will be performed by the concern or other HUBZone small business concerns;

(3) General construction, at least 15 percent of the cost of the contract performance incurred for personnel will be spent on the concern's employees or the employees of other HUBZone small business concerns; or

(4) Construction by special trade contractors, at least 25 percent of the cost of the contract performance incurred for personnel will be spent on the concern's employees or the employees of other HUBZone small business concerns.

(e) A HUBZone joint venture agrees that in the performance of the contract, the applicable percentage specified in paragraph (d) of this clause will be performed by the HUBZone small business participant or participants.

(f) A HUBZone small business concern nonmanufacturer agrees to furnish in performing this contract only end items manufactured or produced by HUBZone small business manufacturer concerns. This paragraph does not apply in connection with construction or service contracts.

(End of clause)

## 52.225-9 BUY AMERICAN ACT—CONSTRUCTION MATERIALS (JUN 2003)

(a) Definitions. As used in this clause--

Component means an article, material, or supply incorporated directly into a construction material.

Construction material means an article, material, or supply brought to the construction site by the Contractor or a subcontractor for incorporation into the building or work. The term also includes an item brought to the site preassembled from articles, materials, or supplies. However, emergency life safety systems, such as emergency lighting, fire alarm, and audio evacuation systems, that are discrete systems incorporated into a public building or work and that are produced as complete systems, are evaluated as a single and distinct construction material regardless of when or how the individual parts or components of those systems are delivered to the construction site. Materials purchased directly by the Government are supplies, not construction material.

Cost of components means--

(1) For components purchased by the Contractor, the acquisition cost, including transportation costs to the place of incorporation into the construction material (whether or not such costs are paid to a domestic firm), and any applicable duty (whether or not a duty-free entry certificate is issued); or

(2) For components manufactured by the Contractor, all costs associated with the manufacture of the component, including transportation costs as described in paragraph (1) of this definition, plus allocable overhead costs, but excluding profit. Cost of components does not include any costs associated with the manufacture of the end product.

Domestic construction material means--

(1) An unmanufactured construction material mined or produced in the United States; or

(2) A construction material manufactured in the United States, if the cost of its components mined, produced, or manufactured in the United States exceeds 50 percent of the cost of all its components. Components of foreign origin of the same class or kind for which nonavailability determinations have been made are treated as domestic.

Foreign construction material means a construction material other than a domestic construction material.

United States means the 50 States, the District of Columbia, and outlying areas.

(b) Domestic preference. (1) This clause implements the Buy American Act (41 U.S.C. 10a-10d) by providing a preference for domestic construction material. The Contractor shall use only domestic construction material in performing this contract, except as provided in paragraphs (b)(2) and (b)(3) of this clause.

(2) This requirement does not apply to the construction material or components listed by the Government as follows: None

(3) The Contracting Officer may add other foreign construction material to the list in paragraph (b)(2) of this clause if the Government determines that

(i) The cost of domestic construction material would be unreasonable. The cost of a particular domestic construction material subject to the requirements of the Buy American Act is unreasonable when the cost of such material exceeds the cost of foreign material by more than 6 percent;

(ii) The application of the restriction of the Buy American Act to a particular construction material would be impracticable or inconsistent with the public interest; or

(iii) The construction material is not mined, produced, or manufactured in the United States in sufficient and reasonably available commercial quantities of a satisfactory quality.

(c) Request for determination of inapplicability of the Buy American Act. (1)(i) Any Contractor request to use foreign construction material in accordance with paragraph (b)(3) of this clause shall include adequate information for Government evaluation of the request, including--

(A) A description of the foreign and domestic construction materials;

(B) Unit of measure;

(C) Quantity;

(D) Price;

(E) Time of delivery or availability;

(F) Location of the construction project;

(G) Name and address of the proposed supplier; and

(H) A detailed justification of the reason for use of foreign construction materials cited in accordance with paragraph (b)(3) of this clause.

(ii) A request based on unreasonable cost shall include a reasonable survey of the market and a completed price comparison table in the format in paragraph (d) of this clause.

(iii) The price of construction material shall include all delivery costs to the construction site and any applicable duty (whether or not a duty-free certificate may be issued).

(iv) Any Contractor request for a determination submitted after contract award shall explain why the Contractor could not reasonably foresee the need for such determination and could not have requested the determination before contract award. If the Contractor does not submit a satisfactory explanation, the Contracting Officer need not make a determination.

(2) If the Government determines after contract award that an exception to the Buy American Act applies and the Contracting Officer and the Contractor negotiate adequate consideration, the Contracting Officer will modify the contract to allow use of the foreign construction material. However, when the basis for the exception is the unreasonable price of a domestic construction material, adequate consideration is not less than the differential established in paragraph (b)(3)(i) of this clause.

(3) Unless the Government determines that an exception to the Buy American Act applies, use of foreign construction material is noncompliant with the Buy American Act.

(d) Data. To permit evaluation of requests under paragraph (c) of this clause based on unreasonable cost, the Contractor shall include the following information and any applicable supporting data based on the survey of suppliers:

Foreign and Domestic Construction Materials Price Comparison

---

Construction material description	Unit of measure	Quantity	Price (dollars) \1\
-----------------------------------	-----------------	----------	---------------------

-----  
Item 1

- Foreign construction material....
- Domestic construction material...

Item 2

- Foreign construction material....
  - Domestic construction material...
- 

Include all delivery costs to the construction site and any applicable duty (whether or not a duty-free entry certificate is issued).

List name, address, telephone number, and contact for suppliers surveyed. Attach copy of response; if oral, attach summary.

Include other applicable supporting information.

(End of clause)

52.228-1 BID GUARANTEE (SEP 1996)

(a) 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.

(b) The bidder shall furnish a bid guarantee in the form of a firm commitment, e.g., bid bond supported by good and sufficient surety or sureties acceptable to the Government, postal money order, certified check, cashier's check, irrevocable letter of credit, or, under Treasury Department regulations, certain bonds or notes of the United States. The Contracting Officer will return bid guarantees, other than bid bonds, (1) to unsuccessful bidders as soon as practicable after the opening of bids, and (2) to the successful bidder upon execution of contractual documents and bonds (including any necessary coinsurance or reinsurance agreements), as required by the bid as accepted.-

(c) The amount of the bid guarantee shall be 20 percent of the bid price or \$3 million, whichever is less.-

(d) If the successful bidder, upon acceptance of its bid by the Government within the period specified for acceptance, fails to execute all contractual documents or furnish executed bond(s) within 10 days after receipt of the forms by the bidder, the Contracting Officer may terminate the contract for default.-

(e) In the event the contract is terminated for default, the bidder is liable for any cost of acquiring the work that exceeds the amount of its bid, and the bid guarantee is available to offset the difference.

(End of clause)

52.232-19 AVAILABILITY OF FUNDS FOR THE NEXT FISCAL YEAR (APR 1984)

Funds are not presently available for performance under this contract beyond Sep 04. The Government's obligation for performance of this contract beyond that date is contingent upon the availability of appropriated funds from which payment for contract purposes can be made. No legal liability on the part of the Government for any payment may arise for performance under this contract beyond Sep 04, until funds are made available to the Contracting Officer for performance and until the Contractor receives notice of availability, to be confirmed in writing by the Contracting Officer.

(End of clause)

## 52.236-1 PERFORMANCE OF WORK BY THE CONTRACTOR (APR 1984)

The Contractor shall perform on the site, and with its own organization, work equivalent to at least **twenty-five** percent of the total amount of work to be performed under the contract. This percentage may be reduced by a supplemental agreement to this contract if, during performing the work, the Contractor requests a reduction and the Contracting Officer determines that the reduction would be to the advantage of the Government.

(End of clause)

## 52.236-4 PHYSICAL DATA (APR 1984)

Data and information furnished or referred to below is for the Contractor's information. The Government shall not be responsible for any interpretation of or conclusion drawn from the data or information by the Contractor.

(a) The indications of physical conditions on the drawings and in the specifications are the result of site investigations by: N/A

(b) Weather conditions: See Specifications, Section 01010, Paragraph 1.18, INCLEMENT WEATHER

(c) Transportation facilities: N/A

(d) Other pertinent information: NONE

(End of clause)

## 52.252-2 CLAUSES INCORPORATED BY REFERENCE (FEB 1998)

This contract incorporates one or more clauses by reference, with the same force and effect as if they were given in full text. Upon request, the Contracting Officer will make their full text available. Also, the full text of a clause may be accessed electronically at this/these address(es):

<http://farsite.hill.af.mil/>

(End of clause)

## 52.252-6 AUTHORIZED DEVIATIONS IN CLAUSES (APR 1984)

(a) The use in this solicitation or contract of any Federal Acquisition Regulation (48 CFR Chapter 1) clause with an authorized deviation is indicated by the addition of "(DEVIATION)" after the date of the clause.

(b) The use in this solicitation or contract of any Defense Federal Acquisition Regulation (48 CFR Chapter 2) clause with an authorized deviation is indicated by the addition of "(DEVIATION)" after the name of the regulation.

(End of clause)

## 252.236-7001 CONTRACT DRAWINGS, MAPS, AND SPECIFICATIONS (AUG 2000)

(a) The Government will provide to the Contractor, without charge, one set of contract drawings and specifications, except publications incorporated into the technical provisions by reference, in electronic or paper media as chosen by the Contracting Officer.

(b) The Contractor shall--

- (1) Check all drawings furnished immediately upon receipt;
- (2) Compare all drawings and verify the figures before laying out the work;
- (3) Promptly notify the Contracting Officer of any discrepancies;
- (4) Be responsible for any errors that might have been avoided by complying with this paragraph (b); and
- (5) Reproduce and print contract drawings and specifications as needed.

(c) In general--

- (1) Large-scale drawings shall govern small-scale drawings; and
- (2) The Contractor shall follow figures marked on drawings in preference to scale measurements.

(d) Omissions from the drawings or specifications or the misdescription of details of work that are manifestly necessary to carry out the intent of the drawings and specifications, or that are customarily performed, shall not relieve the Contractor from performing such omitted or misdescribed details of the work. The Contractor shall perform such details as if fully and correctly set forth and described in the drawings and specifications.

(e) The work shall conform to the specifications and the contract drawings identified on the following index of drawings:

Title	File	Drawing No.
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Drawings will be furnished with each individual Task Order.

(End of clause)

## 252.247-7023 TRANSPORTATION OF SUPPLIES BY SEA (MAY 2002)

(a) Definitions. As used in this clause --

- (1) "Components" means articles, materials, and supplies incorporated directly into end products at any level of manufacture, fabrication, or assembly by the Contractor or any subcontractor.
- (2) "Department of Defense" (DoD) means the Army, Navy, Air Force, Marine Corps, and defense agencies.
- (3) "Foreign flag vessel" means any vessel that is not a U.S.-flag vessel.
- (4) "Ocean transportation" means any transportation aboard a ship, vessel, boat, barge, or ferry through international waters.

(5) "Subcontractor" means a supplier, materialman, distributor, or vendor at any level below the prime contractor whose contractual obligation to perform results from, or is conditioned upon, award of the prime contract and who is performing any part of the work or other requirement of the prime contract.

(6) "Supplies" means all property, except land and interests in land, that is clearly identifiable for eventual use by or owned by the DoD at the time of transportation by sea.

(i) An item is clearly identifiable for eventual use by the DoD if, for example, the contract documentation contains a reference to a DoD contract number or a military destination.

(ii) "Supplies" includes (but is not limited to) public works; buildings and facilities; ships; floating equipment and vessels of every character, type, and description, with parts, subassemblies, accessories, and equipment; machine tools; material; equipment; stores of all kinds; end items; construction materials; and components of the foregoing.

(7) "U.S.-flag vessel" means a vessel of the United States or belonging to the United States, including any vessel registered or having national status under the laws of the United States.

(b)(1) The Contractor shall use U.S.-flag vessels when transporting any supplies by sea under this contract.

(2) A subcontractor transporting supplies by sea under this contract shall use U.S.-flag vessels if--

(i) This contract is a construction contract; or

(ii) The supplies being transported are--

(A) Noncommercial items; or

(B) Commercial items that--

(1) The Contractor is reselling or distributing to the Government without adding value (generally, the Contractor does not add value to items that it contracts for f.o.b. destination shipment);

(2) Are shipped in direct support of U.S. military contingency operations, exercises, or forces deployed in humanitarian or peacekeeping operations; or

(3) Are commissary or exchange cargoes transported outside of the Defense Transportation System in accordance with 10 U.S.C. 2643.

(c) The Contractor and its subcontractors may request that the Contracting Officer authorize shipment in foreign-flag vessels, or designate available U.S.-flag vessels, if the Contractor or a subcontractor believes that --

(1) U.S.-flag vessels are not available for timely shipment;

(2) The freight charges are inordinately excessive or unreasonable; or

(3) Freight charges are higher than charges to private persons for transportation of like goods.

(d) The Contractor must submit any request for use of other than U.S.-flag vessels in writing to the Contracting Officer at least 45 days prior to the sailing date necessary to meet its delivery schedules. The Contracting Officer will process requests submitted after such date(s) as expeditiously as possible, but the Contracting Officer's failure to grant approvals to meet the shipper's sailing date will not of itself constitute a compensable delay under this or any other clause of this contract. Requests shall contain at a minimum --

- (1) Type, weight, and cube of cargo;
  - (2) Required shipping date;
  - (3) Special handling and discharge requirements;
  - (4) Loading and discharge points;
  - (5) Name of shipper and consignee;
  - (6) Prime contract number; and
  - (7) A documented description of efforts made to secure U.S.-flag vessels, including points of contact (with names and telephone numbers) with at least two U.S.-flag carriers contacted. Copies of telephone notes, telegraphic and facsimile message or letters will be sufficient for this purpose.
- (e) The Contractor shall, within 30 days after each shipment covered by this clause, provide the Contracting Officer and the Maritime Administration, Office of Cargo Preference, U.S. Department of Transportation, 400 Seventh Street SW., Washington, DC 20590, one copy of the rated on board vessel operating carrier's ocean bill of lading, which shall contain the following information:
- (1) Prime contract number;
  - (2) Name of vessel;
  - (3) Vessel flag of registry;
  - (4) Date of loading;
  - (5) Port of loading;
  - (6) Port of final discharge;
  - (7) Description of commodity;
  - (8) Gross weight in pounds and cubic feet if available;
  - (9) Total ocean freight in U.S. dollars; and
  - (10) Name of the steamship company.
- (f) The Contractor shall provide with its final invoice under this contract a representation that to the best of its knowledge and belief--
- (1) No ocean transportation was used in the performance of this contract;
  - (2) Ocean transportation was used and only U.S.-flag vessels were used for all ocean shipments under the contract;
  - (3) Ocean transportation was used, and the Contractor had the written consent of the Contracting Officer for all non-U.S.-flag ocean transportation; or
  - (4) Ocean transportation was used and some or all of the shipments were made on non-U.S.-flag vessels without the written consent of the Contracting Officer. The Contractor shall describe these shipments in the following format:

ITEM DESCRIPTION	CONTRACT LINE ITEMS	QUANTITY
TOTAL		

(g) If the final invoice does not include the required representation, the Government will reject and return it to the Contractor as an improper invoice for the purposes of the Prompt Payment clause of this contract. In the event there has been unauthorized use of non-U.S.-flag vessels in the performance of this contract, the Contracting Officer is entitled to equitably adjust the contract, based on the unauthorized use.

(h) In the award of subcontracts for the types of supplies described in paragraph (b)(2) of this clause, the Contractor shall flow down the requirements of this clause as follows:

(1) The Contractor shall insert the substance of this clause, including this paragraph (h), in subcontracts that exceed the simplified acquisition threshold in part 2 of the Federal Acquisition Regulation.

(2) The Contractor shall insert the substance of paragraphs (a) through (e) of this clause, and this paragraph (h), in subcontracts that are at or below the simplified acquisition threshold in part 2 of the Federal Acquisition Regulation.

(End of clause)

#### 252.247-7024 NOTIFICATION OF TRANSPORTATION OF SUPPLIES BY SEA (MAR 2000)

(a) The Contractor has indicated by the response to the solicitation provision, Representation of Extent of Transportation by Sea, that it did not anticipate transporting by sea any supplies. If, however, after the award of this contract, the Contractor learns that supplies, as defined in the Transportation of Supplies by Sea clause of this contract, will be transported by sea, the Contractor --

(1) Shall notify the Contracting Officer of that fact; and

(2) Hereby agrees to comply with all the terms and conditions of the Transportation of Supplies by Sea clause of this contract.

(b) The Contractor shall include this clause; including this paragraph (b), revised as necessary to reflect the relationship of the contracting parties--

(1) In all subcontracts under this contract, if this contract is a construction contract; or

(2) If this contract is not a construction contract, in all subcontracts under this contract that are for--

(i) Noncommercial items; or

(ii) Commercial items that--

(A) The Contractor is reselling or distributing to the Government without adding value (generally, the Contractor does not add value to items that it subcontracts for f.o.b. destination shipment);

(B) Are shipped in direct support of U.S. military contingency operations, exercises, or forces deployed in humanitarian or peacekeeping operations; or

(C) Are commissary or exchange cargoes transported outside of the Defense Transportation System in accordance with 10 U.S.C. 2643.

(End of clause)

5352.242-9000 CONTRACTOR ACCESS TO AIR FORCE INSTALLATIONS (JUN 2002)

(a) The contractor shall obtain base identification and vehicle passes for all contractor personnel who make frequent visits to or perform work on the Air Force installation(s) cited in the contract. Contractor personnel are required to wear or prominently display installation identification badges or contractor-furnished, contractor identification badges while visiting or performing work on the installation.

(b) The contractor shall submit a written request on company letterhead to the contracting officer listing the following: contract number, location of work site, start and stop dates, and names of employees and subcontractor employees needing access to the base. The letter will also specify the individual(s) authorized to sign for a request for base identification credentials or vehicle passes. The contracting officer will endorse the request and forward it to the issuing base pass and registration office or security police for processing. When reporting to the registration office, the authorized contractor individual(s) should provide a valid driver's license, current vehicle registration, valid vehicle insurance certificate, and **I.D. Card** to obtain a vehicle pass.

(c) During performance of the contract, the contractor shall be responsible for obtaining required identification for newly assigned personnel and for prompt return of credentials and vehicle passes for any employee who no longer requires access to the work site.

(d) When work under this contract requires unescorted entry to controlled or restricted areas, the contractor shall comply with AFI 31-101, Volume 1, The Air Force Installation Security Program, and AFI 31-501, Personnel Security Program Management, as applicable.

(e) Upon completion or termination of the contract or expiration of the identification passes, the prime contractor shall ensure that all base identification passes issued to employees and subcontractor employees are returned to the issuing office.

(f) Prior to submitting an invoice for final payment, the prime contractor shall obtain a clearance certification from the issuing office which states all base identification passes have been turned in, accounted for, or transferred to a follow-on contract. This certification shall be submitted to the contracting officer prior to submission of the final invoice for payment.

(g) Failure to comply with these requirements may result in withholding of final payment.

Section J - List of Documents, Exhibits and Other Attachments

SECTION J

**ATTACHMENTS:**

1. SPECIFICATIONS FOR PROJECT MAHG 04-2206 PREPARED 11 MAR 2004
2. WAGE DETERMINATIONS MS20030056 (BUILDING) AND (RESIDENTIAL) 20030018
3. LIST OF REFERENCES FORM
4. PERFORMANCE QUESTIONNAIRE

ATTACHMENT 2

SPECIFICATIONS

FOR

KEESLER AIR FORCE BASE, MISSISSIPPI

PROJECT: MAHG 04-2206

**IDQ PAVING/  
REPAIR/REPLACE EXISTING UTILITY LINES**

PREPARED: 11 MARCH 2004

KEESLER AIR FORCE BASE  
CIVIL ENGINEER

## I-N-D-E-X

<u>SECTION</u>	<u>DESCRIPTION</u>
01010	GENERAL INSTRUCTIONS
01330	SUBMITTAL PROCEDURES
01575N	TEMPORARY ENVIRONMENTAL CONTROLS
02220	DEMOLITION
02300	EARTHWORK
02441	TRENCHLESS EXCAVATION USING MICROTUNNELING
02510N	WATER DISTRIBUTION
02531	SANITARY SEWERS
02556	GAS DISTRIBUTION SYSTEM
02630	STORM DRAINAGE
02722A	AGGREGATE AND/OR GRADED-CRUSHED AGGREGATE BASE COURSE
02741N	BITUMINOUS CONCRETE PAVEMENT
02748A	BITUMINOUS TACK AND PRIME COATS
02761N	PAVEMENT MARKINGS
02770A	CONCRETE SIDEWALKS AND CURBS AND GUTTERS
02921N	TURF
02964A	COLD MILLING OF BITUMINOUS PAVEMENTS
03307A	CONCRETE FOR MINOR STRUCTURES
APPENDIX	TYPICAL DRAWINGS

SECTION 01010

GENERAL REQUIREMENTS

**02/03**

## PART 1 GENERAL

1.1 STATEMENT OF WORK: The work to be performed under this contract shall consist of furnishing all labor, material, and equipment necessary to repair/replace existing underground utility service lines, repair existing asphaltic or Portland Cement Concrete (PCC) paving, install new asphaltic or PCC paving, and construct/repair associated appurtenances such as curb/gutter, sidewalks, ramps, etc. at Keesler AFB, MS. Utility work includes repair/replacement of water, storm drain, gravity sanitary sewer, and natural gas distribution to include appurtenances as specified. Utility work does not include repairs to underground electrical distribution, central heating/cooling, or sanitary sewer force mains. All work shall be performed in strict accordance with the specifications and subject to the terms and conditions of the contract.

1.2 WORKING CONDITIONS: The Contractor shall take all necessary and prudent safety precautions to ensure the safety of the workforce and other exposed personnel.

1.2.1. Maintenance of Traffic Flow: Work performed under this contract shall be planned to minimize disruption to normal traffic flow. Partial or complete interruption to normal traffic flow shall be approved by the Contracting Officer. Barricades shall be utilized where necessary to properly route vehicular or pedestrian traffic.

1.2.2 Underground Utilities: The work involved on this contract affects digging where utility lines are buried. The general location of known lines are identified on the drawings. However, other lines may also exist. The Contractor shall obtain a completed AF Form 103, BASE CIVIL ENGINEERING WORK CLEARANCE REQUEST, prior to beginning work. The Contractor shall field verify the location of all known utilities prior to excavation and utilize care when digging to avoid damage to buried facilities.

1.2.3 Hazardous Electrical Exposure: The work to be performed under this contract involves potential exposure to high voltage electrical circuits which require extreme care in handling and a high level of personnel expertise. Only well qualified workmen shall be assigned to the tasks and all safety precautions will be taken to prevent accidents to personnel and equipment.

1.3 WORKING HOURS: Work performed shall be during normal work hours as defined by the compressed work week schedule. This schedule is based on one week of four 9-hour days and one non-work day followed by a second week of four 9-hour days and one 8-hour day as specifically described below. The sequence of these weeks follows the normal weekly pay schedule for Keesler civilian employees.

First Week:

Sunday non-work day

Second Week:

Sunday non-work day

Monday	7:00 a.m. to 4:45 p.m.	Monday	7:00 a.m. to 4:45 p.m.
Tuesday	7:00 a.m. to 4:45 p.m.	Tuesday	7:00 a.m. to 4:45 p.m.
Wednesday	7:00 a.m. to 4:45 p.m.	Wednesday	7:00 a.m. to 4:45 p.m.
Thursday	7:00 a.m. to 4:45 p.m.	Thursday	7:00 a.m. to 4:45 p.m.
Friday	non-work day	Friday	7:00 a.m. to 3:45 p.m.
Saturday	non-work day	Saturday	non-work day

The following are legal holidays:

- New Year's Day
- Martin Luther King, Jr's Birthday - Third Monday in January
- President's Day - Third Monday in February
- Memorial Day - Last Monday in May
- Independence Day
- Labor Day - Second Monday in September
- Columbus Day - Second Monday in October
- Veteran's Day
- Thanksgiving Day
- Christmas Day

No work shall be accomplished outside of the normal base working hours, on weekends, or on federal holidays without the prior written approval of the Contracting Officer. Approval shall be requested at least 30 days in advance of the unusual hours. However, the Contracting Officer may require certain work to be performed outside of normal working hours in order to minimize disruption of base functions and activities.

1.4 SPECIFICATIONS: All accessories or incidental items not specifically shown and detailed in the specifications herein, which are necessary and/or required to complete the work within the intent of the specifications, shall be included by the Contractor without additional cost to the government.

1.5 MATERIAL DELIVERY AND STORAGE:

1.5.1 Delivery: The Contractor shall have all materials for his work delivered during normal working hours or shall have a representative present to receive shipments. The contractor should be particularly aware that all delivery vehicles must have sufficient information to locate project site. This includes name and address of the project site and name of prime contractor and a point of contact for delivery.

1.5.2 Storage: The Contractor shall be responsible for the storage of all material and equipment. All items shall be properly stored to maintain their original condition until actually installed.

1.6 REPAIR OF GOVERNMENT-OWNED FACILITIES: In order to complete the work on this job, certain government-owned facilities may have to be removed or altered in some way and others may be inadvertently damaged. It is the responsibility of the Contractor to return these facilities to a condition acceptable to the Contracting officer.

1.7 UTILITIES: All reasonable amounts of electricity and water required for the completion of this project will be furnished to the Contractor without charge from existing government facilities where feasible.

1.7.1 The following basic rules shall apply to all contractors requiring temporary electrical power for office trailer(s) and/or construction. The Contractor shall be responsible for the removal of any temporary electrical system upon contract completion.

1.7.1.1 Contractor shall provide the following information prior to obtaining permission to install temporary power:

Estimate of the kilo volt amperes (kVA) of power required.

Voltage required.

Phase of power supply required.

Length of time power will be required.

1.7.1.2 Keesler AFB will designate the source to be used to supply the electrical power. All secondary wiring shall be placed underground. All primary wiring shall be placed underground where feasible. Where underground wiring is not feasible overhead construction on poles may be allowed for primary wiring.

1.7.1.3 Contractor shall be responsible for all wiring and will be allowed to make the connection to the secondary terminals of the transformer under the supervision of a designated Keesler representative. Where primary wiring is required it shall be installed in accordance with Keesler standards and the primary circuit shall pass a Hi-Pot test prior to being energized.

1.7.1.4 Single phase power rated 120/240 volts shall normally be provided for temporary power. A requirement for a voltage higher than this or for three phase power will be furnished only if readily available. In cases where the available transformer is rated for 480 volts on the secondary and 120/240 volts is desired, the contractor shall supply a dry type transformer of sufficient capacity to step the voltage down to 120/240 volts.

1.7.1.5 Contractor shall provide either a 100 or a 200 amp underground lateral (as necessary for the anticipated load) from an available transformer to a fused main disconnect switch rated either 100 or 200 amps and the proper

voltage. The main disconnect shall feed either a 100 or a 200 amp loadcenter or panelboard with a sufficient number of poles to supply all required branch circuits. All equipment installed outdoors shall be in raintight enclosures. Equipment shall be installed on a suitable support as shown on drawing at a mounting height not more than five (5) feet above grade. Underground service lateral circuit shall be installed in schedule 40 PVC conduit buried to a depth of 18 inches.

1.7.1.6 Main disconnect shall be a fused disconnect rated for the applicable system voltage and required ampacity and have an interrupting rating of 200,000 A. I. C. It shall be fused with dual element, Class RX5, time delay fuses rated for 200,000 A.I.C. Disconnect shall be service rated and shall be grounded IAW the provisions of the latest edition of the NEC except that the grounding electrode shall consist of two 3/4" X 10' sectional ground rods coupled together and driven to full depth.

1.7.1.7 All wiring shall be installed IAW the provisions of the latest edition of the National Electrical Code (NEC). GFCI circuit breakers shall be installed IAW the NEC to provide a safe working environment.

1.7.1.8 All wiring shall be maintained in first class condition at all times in order to provide safe working conditions. All electrical problems that develop on site shall be communicated to the Keesler inspector assigned to that project as soon as possible.

1.7.1.9 On projects requiring large amounts of electrical power such as large chillers the contractor may be required to install a kilowatt hour meter and will be billed for the electricity used.

1.7.1.10 On projects where existing power is not readily available and is only required for a short period of time the contractor may be required to install a generator on site to provide the required power.

1.8 INTERRUPTION OF UTILITY SERVICE: Interruptions to utility services shall be minimized. Necessary outages shall be coordinated with the Contracting Officer a minimum of 10 days in advance of the planned outage.

1.9 TEMPORARY SANITARY FACILITIES: Sanitation facilities shall be provided by the contractor. This includes maintenance, transportation to and from job site, secure placement of unit as not to obstruct normal public activity, and unit clean-out as needed. The Contracting Officer shall approve the placement location(s) and the type units provided.

1.10 STORM PROTECTION: Should warnings of winds of gale force or stronger be issued, the Contractor shall take every practical precaution to minimize danger to persons and damage to property. These precautions shall be coordinated through the Contracting Officer and shall include closing all openings; removing all loose materials, tools, and equipment from exposed locations; as well as removing or securing scaffolding and other temporary work.

1.11 SURVEYS: The Contractor shall be responsible for laying out the work on this contract and shall include any cost in the unit price in the Bid Schedule. There will be no direct pay item for surveys. At the completion of each Delivery Order, the Contractor shall submit to the Contracting Officer as-built drawings detailing the location, size, material, etc of all newly installed utilities and paving.

1.12 SAFETY: The Contractor shall observe all security, traffic and fire regulations presently enforced at Keesler Air Force Base.

1.13 CONSTRUCTION:

1.13.1 Material: All material furnished by the Contractor for this job shall be new, unused material of high quality.

1.13.2 Cleaning: The Contractor shall maintain the premises, including any staging area or storage areas, free from accumulations of waste, debris, and rubbish caused by the Contractor's work and shall minimize the spread of dust and flying particles. As work is completed, or at the end of each day, the site shall be cleaned and all waste material shall be properly disposed of.

1.14 JOBSITE MAINTENANCE AND STORAGE AREAS: The contractor shall maintain the jobsite and staging areas in conformance with Keesler standards.

1.14.1 Laydown/staging areas shall be kept neat and free of debris at all times. Grass shall be cut and maintained regularly. Height and maintenance shall be consistent with normal Base standards and consistent with the immediate area.

1.14.2 Jobsites and laydown/staging areas which will be in use longer than 60 days shall be enclosed with a 6' chain link fence with brown fabric screening. Materials and equipment may be stored inside storage units. Items stored in the laydown area shall be stacked and arranged neatly.

1.14.3 All temporary storage trailers and storage containers, office trailers, etc. shall conform to the base color scheme, Keesler beige or dark brown. These facilities shall present a neat and clean appearance and shall be in a state of good repair and shall be located within the fenced area described in paragraph above.

1.14.4 If allowed by the contract and if approved by the Contracting Officer, an office mobile unit may be located outside of a fenced area. At a minimum, this unit shall be in a paved area and shall present a neat, professional appearance. Unit shall be of standard colors, shall have presentable skirting and access stairs. Ancillary items, such as porches and canopies, shall be neat and painted. Contractor shall submit a picture of the proposed unit for approval and before unit is moved to Base.

1.14.5 Execution of work may require excavation or other type of work both at and away from primary work area. These areas shall be secured and work times shall be kept to a minimum. Open excavations shall be directly in progress or shall be covered directly after work complete. Open excavations requiring extended period of inactivity shall be temporarily backfilled. IN no case shall an excavation be open for more than 72 hours. Barricades, fences and other warning devices shall be maintained neatly at all times.

1.15 SCHEDULING: For projects whose duration will exceed 60 days, the contractor shall prepare a construction schedule using an industry recognized electronic scheduling program showing each construction activity in bar chart format. Schedule shall factor in allowances for inclement weather as described later in this section.

1.16 MEASUREMENT: Quantities for payment shall be at the respective unit price as shown on the Bid Schedule and/or as described in these specifications. The Contractor shall field verify all dimensions on the drawings prior to submitting a price proposal. The Contractor shall take special note of the excavation and backfilling payment clause in these specifications to assure complete understanding. Separate payment for excavation and backfilling of utility trenches will only be paid when installing gravity flow type utilities. Excavation and backfilling for manholes, water lines, gas lines, and other utility service lines shall be included in the overall cost of the installation of those items.

1.17 SUBMITTALS: Submittals shall be provided as outlined in these specifications when requested by the Contracting Officer. Material submittal documentation shall include the manufactures pre-printed cut sheets showing all salient qualities of the items specified. The contractor shall highlight the pertinent salient characteristics with a brightly colored transparent marker. The contractor shall ensure that pertinent information showing compliance with the drawings and specifications is shown on the documents submitted.

1.18 INCLEMENT WEATHER: The performance period for this project has incorporated allowances for inclement weather. The basis for determining this allowance is shown as follows:

Month	weather days	Month	weather days
Jan	3	July	2
February	4	August	2
March	3	September	3
April	3	October	3
May	3	November	4
June	2	December	4

For the purposes of this contract, weather days shall be defined as a working day in which work cannot be effectively performed due to inclement weather. If

the number of weather days in any given month exceeds the planned number shown in the table, the performance period will be extended on a one for one basis upon request and approval by the contracting officer. For consideration, this request shall be submitted monthly with the progress report. All requests should identify all weather days in that month.

1.19 AIRFIELD CONSTRUCTION: Any and all construction activities/personnel within the boundaries of the Keesler AFB airfield shall conform to AFI 31-213, paragraphs 4.3.3.2.1 and 4.3.3.6 as follows:

4.3.3.2.1 Procedures for operating a vehicle on the flightline. All personnel driving/working on the airfield/flightline will receive training, briefing or an escort (according to local flightline driving program) prior to entry to the flightline. Sponsoring agency (e.g., Fire Department, Contracting, Civil Engineering, etc.) will provide a flightline qualified escort for personnel working on the airfield. Personnel acting as an escort must be authorized/certified to drive on the flightline.

4.3.3.6 TDY and Contractor Personnel. Outline minimum briefing and training requirements for non-base assigned personnel requiring temporary flightline access. Ensure appropriate training for TDY/contractor personnel based on type and location of work. Develop and impose restricted routes to and from work locations, as required.

4.3.3.6.1 Permanently assigned contractors (e.g., grass cutters, airfield lighting, pavement repair teams, etc.) must meet the same certification requirements as base assigned personnel.

4.3.3.6.2 TDY/contractor personnel must possess a valid AF Form 483 from their home station or complete the base flightline training program to operate a vehicle in the flight line area without an escort. As a minimum, TDY/contractor personnel with a valid AF Form 483 from another duty station require a local briefing/training and when necessary a practical orientation by the host/sponsoring unit.

The contractor shall attend an additional pre-construction meeting with the airfield management staff and will be responsible for ensuring that all construction personnel have attended the above mentioned briefing/training and have completed any and all requirements of the airfield management staff prior to going on site.

1.20 ADDITIONAL: This contract is a "Requirements Type Contract". Tasking on this contract shall be by delivery order, which will include a scope of work, single line drawing, and performance period. The Contractor will have 10 working days to respond with a cost proposal and schedule. The Contractor shall understand that the Government does not guarantee a minimum amount of work after award of this contract. In addition, the Government is not required to utilize this contract exclusively for all utility/paving projects.

-- End of Section --

SECTION 01330  
SUBMITTAL PROCEDURES  
05/02

## **PART 1 GENERAL**

### **1.1 SUBMITTAL IDENTIFICATION**

Submittals required are identified by SD numbers as follows:

SD-01 Data  
SD-04 Drawings  
SD-06 Instructions  
SD-07 Schedules  
SD-08 Statements  
SD-09 Reports  
SD-13 Certificates  
SD-14 Samples  
SD-18 Records  
SD-19 Operation and Maintenance Manuals

### **1.2 SUBMITTAL CLASSIFICATION**

Submittals are classified as follows:

#### **1.2.1 Government Approved**

Governmental approval is required for extensions of design, critical materials, deviations, equipment whose compatibility with the entire system must be checked, and other items as designated by the Contracting Officer. Within the terms of the Contract Clause entitled "Specifications and Drawings for Construction," they are considered to be "shop drawings."

## **1.2.2 Information Only**

All submittals not requiring Government approval will be for information only. They are not considered to be "shop drawings" within the terms of the Contract Clause referred to above.

## **1.3 APPROVED SUBMITTALS**

The Contracting Officer's approval of submittals shall not be construed as a complete check, but will indicate only that the general method of construction, materials, detailing and other information are satisfactory. Approval will not relieve the Contractor of the responsibility for any error which may exist. After submittals have been approved by the Contracting Officer, no resubmittal for the purpose of substituting materials or equipment will be considered unless accompanied by an explanation of why a substitution is necessary.

## **1.4 DISAPPROVED SUBMITTALS**

The Contractor shall make all corrections required by the Contracting Officer and promptly furnish a corrected submittal in the form and number of copies specified for the initial submittal. If the Contractor considers any correction indicated on the submittals to constitute a change to the contract, a notice in accordance with the Contract Clause "Changes" shall be given promptly to the Contracting Officer.

## **1.5 WITHHOLDING OF PAYMENT**

Payment for materials incorporated in the work will not be made if required approvals have not been obtained.

# **PART 2 PRODUCTS (Not Applicable)**

# **PART 3 EXECUTION**

## **3.1 GENERAL**

The Contractor shall make submittals in four copies as required by the specifications. The Contracting Officer may request submittals in addition to those specified when deemed necessary to adequately describe the work covered in the respective sections. Units of weights and measures used on all submittals shall be the same as those used in the contract drawings. Each submittal shall be complete and in sufficient detail to allow ready determination of compliance with contract requirements. Prior to submittal, all items shall be checked and approved by the Contractor's Quality Control (CQC) System Manager and each item shall be stamped, signed, and dated by the

CQC System Manager indicating action taken. Proposed deviations from the contract requirements shall be clearly identified. Submittals shall include items such as: Contractor's, manufacturer's, or fabricator's drawings; descriptive literature including (but not limited to) catalog cuts, diagrams, operating charts or curves; test reports; test cylinders; samples; O&M manuals (including parts list); certifications; warranties; and other such required submittals. Submittals requiring Government approval shall be scheduled and made prior to the acquisition of the material or equipment covered thereby. Samples remaining upon completion of the work shall be picked up and disposed of in accordance with manufacturer's Material Safety Data Sheets (MSDS) and in compliance with existing laws and regulations.

### **3.2 SUBMITTAL REGISTER**

The Contractor shall provide a list of items of equipment and materials for which submittals are required by the specifications. The Contracting Officer may require additional submittals throughout the duration of the contract. The approved submittal register will become the scheduling document and will be used to control submittals throughout the life of the contract. The submittal register and the progress schedules shall be coordinated.

### **3.3 SCHEDULING**

Submittals covering component items forming a system or items that are interrelated shall be scheduled to be coordinated and submitted concurrently. Certifications to be submitted with the pertinent drawings shall be so scheduled. Adequate time (a minimum of 20 calendar days exclusive of mailing time) shall be allowed and shown on the register for review and approval. No delay damages or time extensions will be allowed for time lost in late submittals.

### **3.4 TRANSMITTAL FORM (AF FORM 3000)**

AF Form 3000 shall be used for submitting both Government approved and information only submittals in accordance with the instructions on the reverse side of the form. These forms will be furnished to the Contractor. This form shall be properly completed by filling out all the heading blank spaces and identifying each item submitted. Special care shall be exercised to ensure proper listing of the specification paragraph and/or sheet number of the contract drawings pertinent to the data submitted for each item.

### **3.5 Deviations**

For submittals which include proposed deviations requested by the Contractor, the Contractor shall set forth in writing the reason for any deviations and annotate such deviations on the submittal. The Government reserves the right to rescind inadvertent approval of submittals containing unnoted deviations.

**3.6 CONTROL OF SUBMITTALS**

The Contractor shall carefully control his procurement operations to ensure that each individual submittal is made on or before the Contractor scheduled submittal date shown on the approved "Submittal Register."

**3.7 GOVERNMENT APPROVED SUBMITTALS**

Upon completion of review of submittals requiring Government approval, the submittals will be identified as having received approval by being so stamped and dated. Two copies of the submittal will be retained by the Contracting Officer, and two copies of the submittal will be returned to the Contractor.

**3.8 INFORMATION ONLY SUBMITTALS**

Normally submittals for information only will not be returned. Approval of the Contracting Officer is not required on information only submittals. The Government reserves the right to require the Contractor to resubmit any item found not to comply with the contract. This does not relieve the Contractor from the obligation to furnish material conforming to the plans and specifications; will not prevent the Contracting Officer from requiring removal and replacement of nonconforming material incorporated in the work; and does not relieve the Contractor of the requirement to furnish samples for testing by the Government laboratory or for check testing by the Government in those instances where the technical specifications so prescribe.

**3.9 STAMP**

A stamp shall be provided by the Contractor on the submittal data to certify that the submittal meets contract requirements.

CONTRACTOR	
(Firm Name)	
_____	Approved
_____	Approved with corrections as noted on submittal data and/or attached sheets(s).
SIGNATURE:	_____
TITLE:	_____
DATE:	_____

|\_\_\_\_\_|

For design-build construction, both the Contractor Quality Control System Manager and the Designer of Record shall stamp and sign to certify that the submittal meets contract requirements.

-- End of Section --

## SECTION 01575N

## TEMPORARY ENVIRONMENTAL CONTROLS

02/03

**PART 1 GENERAL****1.1 REFERENCES**

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

## U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1910	Occupational Safety and Health Standards
29 CFR 1910.120	Hazardous Waste and Emergency Response
40 CFR 112	Oil Pollution Prevention
40 CFR 122.26	EPA National Pollutant Discharge Elimination System Permit Regulations
40 CFR 173	Procedures Governing the Rescission of State Primary Enforcement Responsibility for Pesticide Use Violations
40 CFR 241	Guidelines for Disposal of Solid Waste
40 CFR 243	Guidelines for the Storage and Collection of Residential, Commercial, and Institutional Solid Waste
40 CFR 258	Subtitle D Landfill Requirements
40 CFR 260	Hazardous Waste Management Systems: General
40 CFR 261	Identification and Listing of Hazardous Waste
40 CFR 262	Generators of Hazardous Waste
40 CFR 263	Transporters of Hazardous Waste
40 CFR 264	Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
40 CFR 265	Interim Status Standard for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
40 CFR 266	Management of Specific Hazardous Wastes and Specific Types of Hazardous Waste Management Facilities

40 CFR 268	Land Disposal Restrictions
40 CFR 270	EPA Administrated Permit Programs: The Hazardous Waste Permit Program
40 CFR 271	Requirements for Authorization of State Hazardous Waste Programs
40 CFR 272	Approved State Hazardous Waste Management Programs
40 CFR 273	Universal Waste Management
40 CFR 279	Used Oil Regulations
40 CFR 280	Owners and Operators of Underground Storage Tanks
40 CFR 300	National Oil and Hazardous Substances Pollution Contingency Plan
40 CFR 355	Emergency Planning and Notification
40 CFR 372-SUBPART D	EPA Toxic Chemical Release Reporting Regulations
40 CFR 716	Health and Safety Data Reporting
40 CFR 761	Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions
49 CFR 171	General Information, Regulations and Definitions
49 CFR 172	Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements

## DEPARTMENT OF TRANSPORTATION (DOT)

49 CFR 173	Shipments and Packagings
49 CFR 178	Packagings

## MISSISSIPPI DEPARTMENT OF ENVIRONMENTAL QUALITY (MDEQ)

APC-S-1	Air Emission Regulations for the Prevention, Abatement, and Control of Air Contaminants
APC-S-2	Permit Regulations for the Construction And/or Operation of Air Emission Equipment
Guidance Manual March 2000	Mississippi Storm Water Pollution Prevention Plan (SWPPP) for Construction Activities

Field Manual 2002

Erosion and Sediment Control on Construction  
Sites in Mississippi

## AIR FORCE INSTRUCTIONS (AFI'S)

32 - 7040 Air Quality Compliance  
 32 - 7042 Solid and Hazardous Waste Compliance  
 32 - 7063 Air Installation Compatible Use Zone Program  
 32 - 7080 Pollution Prevention Program  
 32 - 7086 Hazardous materials Management

## ENGINEERING TECHNICAL LETTERS (ETL'S)

ETL 03-1 Storm Water Construction Standards

## U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

EPA 530/F-93/004 (1996) Evaluating Solid Waste  
(Physical/Chemical Methods)  
 EPA 832-R-92-005 Storm Water Management for Construction  
Activities

**1.2 DEFINITIONS****1.2.1 Sediment**

Soil and other debris that have eroded and have been transported by runoff water or wind.

**1.2.2 Solid Waste**

Garbage, refuse, debris, sludge, or other discharged material (except hazardous waste as defined in paragraph entitled "Hazardous Waste" or hazardous debris as defined in paragraph entitled "Hazardous Debris"), including solid, liquid, semisolid, or contained gaseous materials resulting from domestic, industrial, commercial, mining, or agricultural operations. Material not regulated as solid waste are: nuclear source or byproduct materials regulated under the Federal Atomic Energy Act of 1954 as amended; suspended or dissolved materials in domestic sewage effluent or irrigation return flows, or other regulated point source discharges; regulated air emissions; and fluids or wastes associated with natural gas or crude oil exploration or production.

- a. Green waste: The vegetative matter from landscaping, land clearing and grubbing, including, but not limited to, grass, bushes, scrubs,

small trees and saplings, tree stumps and plant roots. Marketable trees, grasses and plants that are indicated to remain, be re-located, or be re-used are not included.

- b. Surplus soil: Existing soil that is in excess of what is required for this work, including aggregates intended, but not used, for on-site mixing of concrete, mortars and paving. Contaminated soil meeting the definition of hazardous material or hazardous waste is not included.
- c. Inert construction and demolition debris: Broken or removed concrete, masonry, and rock asphalt paving; ceramics; roofing paper and shingles. Inert materials [may] [may not] be reinforced with or contain ferrous wire, rods, accessories and weldments.
- d. Wood: Dimension and non-dimension lumber, plywood, chipboard, hardboard. Treated and/or painted wood that meets the definition of lead contaminated or lead based contaminated paint is not included.
- e. Scrap metal: Scrap and excess ferrous and non-ferrous metals such as reinforcing steel, structural shapes, pipe and wire that are recovered or collected and disposed of as scrap. Scrap metal meeting the definition of hazardous material or hazardous waste is not included.
- f. Paint cans: Metal cans that are empty of paints, solvents, thinners and adhesives. If permitted by the paint can label, a thin dry film may remain in the can.
- g. Recyclables: Materials, equipment and assemblies such as doors, windows, door and window frames, plumbing fixtures, glazing and mirrors that are recovered and sold as recyclable. Metal meeting the definition of lead contaminated or lead based paint contaminated may be included as recyclable if the paint is not deteriorating or peeling. Paint cans may be included as recyclable as long as they meet the <1% residual rule.

### 1.2.3 Debris

Non-hazardous solid material generated during the construction, demolition, or renovation of a structure which exceeds 2.5 inch particle size that is: a manufactured object; plant or animal matter; or natural geologic material (e.g. cobbles and boulders). A mixture of debris and other material such as soil or sludge is also subject to regulation as debris if the mixture is comprised primarily of debris by volume, based on visual inspection.

### 1.2.4 Hazardous Debris

As defined in paragraph entitled "Debris" of this section, debris that contains listed hazardous waste (either on the debris surface, or in its interstices, such as pore structure) per 40 CFR 261; or debris that exhibits a characteristic of hazardous waste per 40 CFR 261.

### 1.2.5 Chemical Wastes

This includes salts, acids, alkalies, herbicides, pesticides, and organic chemicals.

### 1.2.6 Garbage

Refuse and scraps resulting from preparation, cooking, dispensing, and consumption of food.

### 1.2.7 Hazardous Waste

Any discarded material, liquid, solid, or gas, which meets the definition of hazardous material or is designated hazardous waste by the Environmental Protection Agency or State Hazardous Control Authority as defined in 40 CFR 260, 40 CFR 261, 40 CFR 262, 40 CFR 263, 40 CFR 264, 40 CFR 265, 40 CFR 266, 40 CFR 268, 40 CFR 270, 40 CFR 271, 40 CFR 272, 40 CFR 273, 40 CFR 279, and 40 CFR 280.

### 1.2.8 Oily Waste

Petroleum products and bituminous materials.

### 1.2.9 Regulated Waste

Those solid waste that have specific additional Federal, state, or local controls for handling, storage, or disposal.

### 1.2.10 Class I Ozone Depleting Substance (ODS)

Class I ODS is defined in Section 602(a) of The Clean Air Act and includes the following chemicals:

chlorofluorocarbon-11 (CFC-11)	chlorofluorocarbon-213 (CFC-213)
chlorofluorocarbon-12 (CFC-12)	chlorofluorocarbon-214 (CFC-214)
chlorofluorocarbon-13 (CFC-13)	chlorofluorocarbon-215 (CFC-215)
chlorofluorocarbon-111 (CFC-111)	chlorofluorocarbon-216 (CFC-216)
chlorofluorocarbon-112 (CFC-112)	chlorofluorocarbon-217 (CFC-217)
chlorofluorocarbon-113 (CFC-113)	halon-1211
chlorofluorocarbon-114 (CFC-114)	halon-1301
chlorofluorocarbon-115 (CFC-115)	halon-2402
chlorofluorocarbon-211 (CFC-211)	carbon tetrachloride
chlorofluorocarbon-212 (CFC-212)	methyl chloroform

### 1.2.11 Hazardous Materials

Any material that is defined in 49 CFR 171, listed in 49 CFR 172, and regulated as a hazardous material in accordance with 49 CFR 173, requires a Material Safety Data Sheet (MSDS) in accordance with 29 CFR 1910.120, or which during end use, treatment, handling, storage, transportation or disposal meets or has components which meet or have the potential to meet the definition of a Hazardous Waste in accordance with 40 CFR 261. Throughout this specification, hazardous material includes hazardous chemicals.

### **1.3 SUBMITTALS**

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only or as otherwise designated. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES if requested by the Contracting Officer for a specific Delivery Order:

#### SD-01 Preconstruction Submittals

Environmental protection plan; G

Storage Inventory Form;G

Dirt and dust control plan;G

Environmental Quality Board Permits;G

#### SD-06 Test Reports

Laboratory analysis

### **1.4 DIRT AND DUST CONTROL PLAN**

Submit truck and material haul routes along with a plan for controlling dirt, debris, and dust on base roadways. As a minimum, identify in the plan the subcontractor and equipment for cleaning along the haul route and measures to reduce dirt, dust, and debris from roadways.

### **1.5 LABORATORY ANALYSIS**

Submit a copy of a laboratory analysis of solid waste and debris with the potential of becoming classified as a hazardous waste (i.e., abrasive/sand blasting debris, etc.). Waste stream determinations are required at the point of generation and must sufficiently document whether the waste will be a solid waste, hazardous waste, or Resource Conservation and Recovery Act (RCRA) exempt waste. Determinations must use EPA approved methods and provide written rationale for whether the waste is classified as hazardous or non-hazardous. The Contractor will bear the cost of the waste stream determinations, and the Contracting Officer reserves the right to request waste stream determinations on questionable waste streams.

## **1.6 REPORTS**

### **1.6.1 Preconstruction Survey**

Perform a preconstruction survey of the project site with the Contracting Officer, and take photographs showing existing environmental conditions in and adjacent to the site. Submit a report for the record.

### **1.6.2 Solid Waste Disposal Permit**

Submit one copy of a State or county permit or license showing such agencies' approval of the disposal plan before transporting wastes off Government property.

### **1.6.3 Waste Determination Documentation**

The Contractor will complete a Waste Determination form (provided at the pre-construction conference) for all contractor derived wastes to be generated. The waste determination must be based upon either a constituent listing from the manufacturer used in conjunction with consideration of the process by which the waste was generated, EPA approved analytical data, or **laboratory analysis** (Material Safety Data Sheets (MSDS) by themselves are not adequate). All support documentation must be attached to the Waste Determination form. As a minimum, a Waste Determination form must be provided for the following wastes (this listing is not all inclusive): oil and latex based painting and caulking products, solvents, adhesives, aerosols, petroleum products, and all containers of the original materials.

### **1.6.4 Disposal Documentation for Hazardous and Regulated Waste**

Submit a copy of the applicable EPA and State permit(s), manifest(s), or license(s) for transportation, treatment, storage, and disposal of hazardous and regulated waste by permitted facilities.

### **1.6.5 Contractor 40 CFR Employee Training Records**

Prepare and maintain employee training records throughout the term of the contract meeting applicable 29 & 40 CFR requirements. The Contractor will ensure every employee completes a program of classroom instruction or on-the-job training that teaches them to perform their duties in a way that ensures compliance with Federal, State and local regulatory requirements.

### **1.6.6 Regulatory Notification**

The Contractor is responsible for all regulatory notification requirements in accordance with Federal, State and local regulations. Typically, regulatory notifications must be provided for the following (this listing is not all inclusive): demolition, renovation, NPDES defined site work, remediation of controlled substances (asbestos, hazardous waste, lead-based paint, air emission sources/equipment, Underground Storage Tank removal/installation).

### **1.6.7 Erosion and Sediment Control Inspection Reports**

Submit "Erosion and Sediment Control Inspection Reports" (form provided at the pre-construction conference) to the Contracting Officer once every 7 calendar days and within 24 hours of a storm event that produces 0.5 inch or more of rain.

### **1.6.8 Solid Waste Disposal Report**

If requested by the Contracting Officer, the Contractor will submit a solid waste disposal report. For each waste, the report will state the classification (using the definitions provided in this section), amount, location, and name of the business receiving the solid waste. The Contractor will include copies of the waste handling facilities' weight tickets, receipts, bills of sale, and other sales documentation. In lieu of sales documentation, the Contractor may submit a statement indicating the disposal location for the solid waste which is signed by an officer of the Contractor firm authorized to legally obligate or bind the firm. The sales documentation or Contractor certification will include the receiver's tax identification number and business, EPA or State registration number, along with the receiver's delivery and business addresses and telephone numbers. For each solid waste retained by the Contractor for his own use, the Contractor will submit on the solid waste disposal report the information previously described in this paragraph. Prices paid or received will not be reported to the Contracting Officer unless required by other provisions or specifications of this Contract or public law.

## **1.7 WHM/HW MATERIALS PROHIBITION**

No waste hazardous material or hazardous waste shall be disposed of on government property. No hazardous material shall be brought onto government property that does not directly relate to requirements for the performance of this contract. The government is not responsible for disposal of Contractor's waste material brought on the job site and not required in the performance of this contract. The intent of this provision is to dispose of that waste identified as waste hazardous material/hazardous waste as defined herein that was generated as part of this contract and existed within the boundary of the Contract limits and not brought in from offsite by the

Contractor. Incidental materials used to support the contract including, but not limited to aerosol cans, waste paint, cleaning solvents, contaminated brushes, rags, clothing, etc. are the responsibility of the Contractor. The list is illustrative rather than inclusive. The Contractor is not authorized to discharge any materials to sanitary sewer, storm drain, or conduct waste treatment or disposal on government property without written approval of the Contracting Officer.

## **1.8 CLASS I ODS PROHIBITION**

Class I ODS as defined and identified herein will not be used in the performance of this contract, nor be provided as part of the equipment. This prohibition will be considered to prevail over any other provision, specification, drawing, or referenced documents.

## **1.9 ENVIRONMENTAL PROTECTION REQUIREMENTS**

Provide and maintain, during the life of the contract, environmental protection as defined. Plan for and provide environmental protective measures to control pollution that develops during normal construction practice. Plan for and provide environmental protective measures required to correct conditions that develop during the construction of permanent or temporary environmental features associated with the project. Comply with Federal, State, and local regulations pertaining to the environment, including water, air, solid waste, hazardous waste and substances, oily substances, and noise pollution.

### **1.9.1 Facility Hazardous Waste Generator Status**

KAFB is designated as a Large Quantity Generator. All work conducted within the boundaries of this activity must meet the regulatory requirements of this generator designation. The Contractor will comply with all provisions of Federal, State and local regulatory requirements applicable to this generator status regarding training and storage, handling, and disposal of all construction derived wastes.

### **1.9.2 Licenses and Permits**

Obtain licenses and permits pursuant to the "Permits and Responsibilities" FAR Clause except for permits obtained by the Contracting Officer. For permits obtained by the Contracting Officer, whether or not required by the permit, the Contractor is responsible to perform quality control inspections of the work in progress, and to submit notifications and certifications to the applicable regulatory agency, via the Contracting Officer, that the work conforms to the contract and permit requirements. The inspections and certifications will be provided through the services of a Professional Engineer, registered in the State where the work is being performed. As a part of the quality control plan, which is required to be submitted for approval by the quality control section, provide a sub item containing the name, P.E. registration number, address, and telephone number of the

professional engineer(s) who will be performing the inspections and certifications for each permit listed above.

### **1.9.3 Contractor Liabilities for Environmental Protection**

The Contractor is advised that this project and the station are subject to Federal, State, and local regulatory agency inspections to review compliance with environmental laws and regulations. The Contractor will fully cooperate with any representative from any Federal, State or local regulatory agency who may visit the job site and will provide immediate notification to the Contracting Officer, who will accompany them on any subsequent site inspections. The Contractor will complete, maintain, and make available to the Contracting Officer, station, or regulatory agency personnel all documentation relating to environmental compliance under applicable Federal, State and local laws and regulations. The Contractor will immediately notify the Contracting Officer if a Notice of Violation (NOV) is issued to the Contractor.

The Contractor will be responsible for all damages to persons or property resulting from Contractor fault or negligence as well as for the payment of any civil fines or penalties which may be assessed by any Federal, State or local regulatory agency as a result of the Contractor's or any subcontractor's violation of any applicable Federal, State or local environmental law or regulation. Should a Notice of Violation (NOV), Notice of Noncompliance (NON), Notice of Deficiency (NOD), or similar regulatory agency notice be issued to the Government as facility owner/operator on account of the actions or inactions of the Contractor or one of its subcontractors in the performance of work under this contract, the Contractor will fully cooperate with the Government in defending against regulatory assessment of any civil fines or penalties arising out of such actions or inactions.

### **1.10 ENVIRONMENTAL MANAGER**

The Contractor will appoint in writing an Environmental Manager for the contract. The Environmental Manager will be directly responsible for coordinating contractor compliance with Federal, State, local, and station requirements. The Environmental Manager will ensure compliance with Hazardous material Management Program, AFI 32-7086, Keesler supplement 1, Section 1.9.4.5 thru 1.9.4.9. and Hazardous Waste Program requirements (including hazardous waste handling, storage, manifesting, and disposal); implement the Environmental Protection Plan; ensure that all environmental permits are obtained, maintained, and closed out; ensure compliance with Storm Water Program Management requirements; ensure compliance with Hazardous Materials (storage, handling, and reporting) requirements; and coordinate any remediation of regulated substances (lead, asbestos, PCB transformers). This can be a collateral position; however the person in this position must be trained to adequately accomplish the following duties: ensure waste segregation and storage compatibility requirements are met; inspect and manage Satellite Accumulation areas; ensure only authorized personnel add wastes to containers; ensure all Contractor personnel are trained in 40 CFR requirements in accordance with their position requirements; coordinate removal of waste containers; and maintain the Environmental Records binder and required documentation, including environmental permits compliance and close-out.

## **PART 2 PRODUCTS**

Not used.

## **PART 3 EXECUTION**

### **3.1 PROTECTION OF NATURAL RESOURCES**

Preserve the natural resources within the project boundaries and outside the limits of permanent work. Restore to an equivalent or improved condition upon completion of work. Confine construction activities to within the limits of the work indicated or specified. Conform to the national permitting requirements of the Clean Water Act.

#### **3.1.1 Land Resources**

Except in areas to be cleared, do not remove, cut, deface, injure, or destroy trees or shrubs without the Contracting Officer's permission. Do not fasten or attach ropes, cables, or guys to existing nearby trees for anchorages unless authorized by the Contracting Officer. Where such use of attached ropes, cables, or guys is authorized, the Contractor will be responsible for any resultant damage.

##### **3.1.1.1 Protection of Trees**

Protect existing trees which are to remain and which may be injured, bruised, defaced, or otherwise damaged by construction operations. Remove displaced rocks from uncleared areas. By approved excavation, remove trees with 30 percent or more of their root systems destroyed.

##### **3.1.1.2 Replacement**

Remove trees and other landscape features scarred or damaged by equipment operations, and replace with equivalent, undamaged trees and landscape features. Obtain Contracting Officer's approval before replacement.

#### **3.1.2 Water Resources**

##### **3.1.2.1 Oily and Hazardous Substances**

Prevent oil or hazardous substances from entering the ground, drainage areas, or navigable waters. In accordance with [40 CFR 112](#), surround all

temporary fuel oil or petroleum storage tanks with a temporary berm or containment of sufficient size and strength to contain the contents of the tanks, plus 10 percent freeboard for precipitation. The berm will be impervious to oil for 72 hours and be constructed so that any discharge will not permeate, drain, infiltrate, or otherwise escape before cleanup occurs.

### **3.1.2.2 Stormwater Drainage**

There will be no discharge of excavation ground water to the sanitary sewer, storm drains, or to natural bodies of water without prior specific authorization of the Environmental Programs Division in writing. Discharge of hazardous substances will not be permitted under any circumstances. Construction site runoff will be prevented from entering any storm drain directly by the use of straw bales or other method suitable to the Environmental Programs Division of the Shipyard. Contractor will provide erosion protection of the surrounding soils.

### **3.1.3 Fish and Wildlife Resources**

Do not disturb fish and wildlife. Do not alter water flows or otherwise significantly disturb the native habitat adjacent to the project and critical to the survival of fish and wildlife, except as indicated or specified.

## **3.2 HISTORICAL AND ARCHAEOLOGICAL RESOURCES**

Carefully protect in-place and report immediately to the Contracting Officer historical and archaeological items or human skeletal remains discovered in the course of work. Stop work in the immediate area of the discovery until directed by the Contracting Officer to resume work. The Government retains ownership and control over historical and archaeological resources.

## **3.3 EROSION AND SEDIMENT CONTROL MEASURES**

### **3.3.1 Burnoff**

Burnoff of the ground cover is not permitted.

### **3.3.2 Protection of Erodible Soils**

Immediately finish the earthwork brought to a final grade, as indicated or specified. Immediately protect the side slopes and back slopes upon completion of rough grading. Plan and conduct earthwork to minimize the duration of exposure of unprotected soils.

### **3.3.3 Temporary Protection of Erodible Soils**

Methods employed in the protection of exposed areas shall be selected from the Field Manual for Erosion and Sediment Control on Construction Sites in Mississippi and/or ETL 03-1:

#### **3.3.3.1 Mechanical Retardation and Control of Runoff**

Mechanically retard and control the rate of runoff from the construction site. This includes construction of diversion ditches, benches, berms, and use of silt fences and straw bales to retard and divert runoff to protected drainage courses.

### **3.4 CONTROL AND DISPOSAL OF SOLID WASTES**

Pick up solid wastes, and place in covered containers which are regularly emptied. Do not prepare or cook food on the project site. Prevent contamination of the site or other areas when handling and disposing of wastes. At project completion, leave the areas clean. Recycling is encouraged and can be coordinated with the Contracting Officer and the activity recycling coordinator. Remove all solid waste (including non-hazardous debris) from Government property and dispose off-site at an approved landfill. Solid waste disposal off-site must comply with most stringent local, State, and Federal requirements including 40 CFR 241, 40 CFR 243, and 40 CFR 258.

#### **3.4.1 Dumpsters**

Equip dumpsters with a secure cover and paint the standard base color. Keep cover closed at all times, except when being loaded with trash and debris. Locate dumpsters behind the construction fence or out of the public view. Empty site dumpsters at least once a week. or as needed to keep the site free of debris and trash. If necessary, provide 55 gallon trash containers painted the darker base color to collect debris in the construction site area. Locate the trash containers behind the construction fence or out of the public view. Empty trash containers at least once a day. For large demolitions, large dumpsters without lids are acceptable but should not have debris higher than the sides before emptying.

### **3.5 CONTROL AND DISPOSAL OF HAZARDOUS WASTES**

#### **3.5.1 Petroleum Products**

Conduct the fueling and lubricating of equipment and motor vehicles in a manner that protects against spills and evaporation. All used oil generated on site will be managed in accordance with 40 CFR 279. The Contractor will determine if any used oil generated while on-site exhibits a characteristic of hazardous waste. In addition, used oil containing 1000 parts per million of solvents will be considered a hazardous waste and disposed of at

Contractor's expense. Used oil mixed with a hazardous waste will also be considered a hazardous waste. All hazardous waste will be managed in accordance with the paragraph entitled Hazardous Waste/Debris Management of this section and will be managed in accordance with the approved Environmental Protection Plan.

### **3.5.2 Releases/Spills of Oil and Hazardous Substances**

Take precautions to prevent releases/spills of oil and hazardous substances. In the event of any releases of oil and hazardous substances, chemicals, or gases; immediately (within 15 minutes) notify the Base or Activity Fire Department, the activity's Command Duty Officer, and the Contracting Officer. The Contractor is responsible for verbal and written notifications as required by the federal 40 CFR 355, State, local regulations. Spill response will be in accordance with 40 CFR 300 and applicable State and local regulations. Contain and clean up these spills without cost to the Government. If Government assistance is requested or required, the Contractor will reimburse the Government for such assistance. Provide copies of the written notification and documentation that a verbal notification was made within 20 days. The Contractor shall notify the Contracting Officer immediately upon discovery of any spill. The contractor shall maintain spill cleanup equipment and materials at the work site.

### **3.6 DUST CONTROL**

Keep dust down at all times, including during nonworking periods. Sprinkle or treat, with dust suppressants, the soil at the site, haul roads, and other areas disturbed by operations. Dry power brooming will not be permitted. Instead, use vacuuming, wet mopping, wet sweeping, or wet power brooming. Air blowing will be permitted only for cleaning nonparticulate debris such as steel reinforcing bars. Only wet cutting will be permitted for cutting concrete blocks, concrete, and bituminous concrete. Do not unnecessarily shake bags of cement, concrete mortar, or plaster.

### **3.7 NOISE**

Make the maximum use of low-noise emission products, as certified by the EPA. Blasting or use of explosives will not be permitted.

-- End of Section --

## SECTION 02220

DEMOLITION  
09/03**PART 1 GENERAL****1.1 REFERENCES**

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

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

**ANSI A10.6** (1990; R 1998) Safety Requirements for Demolition Operations

THE NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

**40 CFR 61-SUBPART M** National Emission Standard for Asbestos

U.S. ARMY CORPS OF ENGINEERS (USACE)

**EM 385-1-1** (1996) Safety and Health Requirements Manual

**1.2 GENERAL REQUIREMENTS**

Do not begin demolition until authorization is received from the Contracting Officer. Rubbish and debris shall be removed from Government property daily, unless otherwise directed, to avoid accumulation at the demolition site. Materials that cannot be removed daily shall be stored in areas specified by the Contracting Officer. In the interest of occupational safety and health, the work shall be performed in accordance with **EM 385-1-1**, Section 23, Demolition, and other applicable Sections. In the interest of conservation, salvage shall be pursued to the maximum extent possible, if applicable; salvaged items and materials shall be disposed of as specified.

**1.3 REGULATORY AND SAFETY REQUIREMENTS**

Comply with federal, state, and local hauling and disposal regulations. In addition to the requirements of the "Contract Clauses," safety requirements shall conform with **ANSI A10.6**.

**1.4 DUST AND DEBRIS CONTROL**

Prevent the spread of dust and debris on airfield pavements and avoid the creation of a nuisance or hazard in the surrounding area. Do not use water

if it results in hazardous or objectionable conditions such as, but not limited to, ice, flooding, or pollution. Sweep pavements as often as necessary to control the spread of debris that may result in foreign object damage potential to aircraft.

## **1.5 PROTECTION**

### **1.5.1 Traffic Control Signs**

Where pedestrian, automobile, and aircraft safety is endangered in the area of removal work, use traffic barricades with flashing lights. Anchor barricades in a manner to prevent displacement by jet or prop blast. Notify the Contracting Officer prior to beginning such work.

### **1.5.2 Existing Work**

The Contractor shall take necessary precautions to avoid damage to existing items to remain in place, to be reused, or to remain the property of the Government; any damaged items shall be repaired or replaced as approved by the Contracting Officer. The Contractor shall coordinate the work of this section with all other work and shall construct and maintain shoring, bracing, and supports as required. Do not overload pavements to remain.

### **1.5.3 Trees**

Trees within the project site which might be damaged during demolition, and which are indicated to be left in place, shall be protected by a 6 foot high construction fence. The fence shall be securely erected a minimum of 5 feet from the trunk of individual trees or follow the outer perimeter of branches or clumps of trees. Any tree designated to remain that is damaged during the work under this contract shall be replaced in kind or as approved by the Contracting Officer.

### **1.5.4 Facilities**

Protect electrical and mechanical services and utilities. Where removal of existing utilities and pavement is specified or indicated, provide approved barricades, temporary covering of exposed areas, and temporary services or connections for electrical and mechanical utilities.

### **1.5.5 Protection of Personnel**

During the demolition work the Contractor shall continuously evaluate the condition of the structure being demolished and take immediate action to protect all personnel working in and around the demolition site. No area, section, or component of floors, roofs, walls, columns, pilasters, or other structural element will be allowed to be left standing without sufficient

bracing, shoring, or lateral support to prevent collapse or failure while workmen remove debris or perform other work in the immediate area.

## **1.6 BURNING**

The use of burning at the project site for the disposal of refuse and debris will not be permitted.

## **1.7 FOREIGN OBJECT DAMAGE (FOD)**

Aircraft and aircraft engines are subject to FOD from debris and waste material lying on airfield pavements. Remove all such materials that may appear on operational aircraft pavements due to the Contractor's operations. If necessary, the Contracting Officer may require the Contractor to install a temporary barricade to control the spread of FOD potential debris. The barricade shall consist of a fence covered with a fabric designed to stop the spread of debris; anchor the fence and fabric to prevent displacement by winds or jet/prop blasts. Remove barricade when no longer required.

## **1.8 USE OF EXPLOSIVES**

Use of explosives will not be permitted.

## **PART 2 PRODUCTS**

Not used.

## **PART 3 EXECUTION**

### **3.1 EXISTING FACILITIES TO BE REMOVED**

#### **3.1.1 Structures**

Sidewalks, curbs, gutters, and other structures shall be removed as indicated.

#### **3.1.2 Utilities and Related Equipment**

Remove existing utilities as indicated and terminate in a manner conforming to the nationally recognized code covering the specific utility and approved by the Contracting Officer. When utility lines are encountered that are not indicated on the drawings, the Contracting Officer shall be notified prior to further work in that area. Remove meters and related equipment and

deliver to a location in accordance with instructions of the Contracting Officer. If utility lines are encountered that are not shown on drawings, contact the Contracting Officer for further instructions.

### **3.1.3 Paving and Slabs**

Remove concrete and asphaltic concrete paving and slabs including aggregate base as indicated. Provide neat sawcuts at limits of pavement removal as indicated.

## **3.2 DISPOSITION OF MATERIAL**

### **3.2.1 Title to Materials**

Except where specified in other sections, all materials and equipment removed, and not reused, shall become the property of the Contractor and shall be removed from Government property.

### **3.2.2 Salvaged Materials and Equipment**

Contractor shall salvage items and material to the maximum extent possible.

## **3.3 CLEANUP**

Debris and rubbish shall be removed from excavations. Debris shall be removed and transported in a manner that prevents spillage on streets or adjacent areas. Local regulations regarding hauling and disposal shall apply.

-- End of Section --

## SECTION 02300

EARTHWORK  
08/03**PART 1 GENERAL****1.1 REFERENCES**

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

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS  
(AASHTO)

- AASHTO T 180** (2001) Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and an 457 mm (18-in) Drop
- AASHTO T 224** (2001) Correction for Coarse Particles in the Soil Compaction Test

ASTM INTERNATIONAL (ASTM)

- ASTM A 139** (2000) Electric-Fusion (Arc)-Welded Steel Pipe (NPS 4 and Over)
- ASTM A 252** (1998; R 2002) Welded and Seamless Steel Pipe Piles
- ASTM C 33** (2002a) Concrete Aggregates
- ASTM C 136** (2001) Sieve Analysis of Fine and Coarse Aggregates
- ASTM D 422** (1963; R 1998) Particle-Size Analysis of Soils
- ASTM D 698** (2000a) Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/cu. ft. (600 kN-m/cu. m.))
- ASTM D 1140** (2000) Amount of Material in Soils Finer than the No. 200 (75-micrometer) Sieve
- ASTM D 1556** (2000) Density and Unit Weight of Soil in Place by the Sand-Cone Method
- ASTM D 1557** (2000) Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/cu. ft. (2,700 kN-m/cu. m.))

ASTM D 1883	(1999) CBR (California Bearing Ratio) of Laboratory-Compacted Soils
ASTM D 2167	(1994; R 2001) Density and Unit Weight of Soil in Place by the Rubber Balloon Method
ASTM D 2434	(1968; R 2000) Permeability of Granular Soils (Constant Head)
ASTM D 2487	(2000) Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D 2922	(2001) Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
ASTM D 2937	(2000e1) Density of Soil in Place by the Drive-Cylinder Method
ASTM D 3017	(2001) Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)
ASTM D 4318	(2000) Liquid Limit, Plastic Limit, and Plasticity Index of Soils
AMERICAN WATER WORKS ASSOCIATION (AWWA)	
AWWA C600	(1999) Installation of Ductile-Iron Water Mains and Their Appurtenances
AMERICAN WOOD-PRESERVER'S ASSOCIATION (AWPA)	
AWPA C2	(2001) Lumber, Timber, Bridge Ties and Mine Ties - Preservative Treatment by Pressure Processes
AWPA P5	(2001) Standard for Waterborne Preservatives
AMERICAN WELDING SOCIETY (AWS)	
AWS D1.1/D1.1M	(2002) Structural Welding Code - Steel
U.S. ARMY CORPS OF ENGINEERS (USACE)	
EM 385-1-1	(1996) U.S. Army Corps of Engineers Safety and Health Requirements Manual
U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)	
EPA 530/F-93/004	1993; Rev O; Updates I, II, IIA, IIB, and III) Test Methods for Evaluating Solid Waste (Vol IA, IB, IC, and II) (SW-846)
EPA 600/4-79/020	(1983) Methods for Chemical Analysis of Water and Wastes
U.S. GENERAL SERVICES ADMINISTRATION (GSA)	
FS A-A-203	Rev. C) Paper, Kraft, Untreated

## **1.2 MEASUREMENT**

### **1.2.1 Excavation**

The unit of measurement for excavation and borrow will be the cubic yard, computed by the average end area method from cross sections taken before and after the excavation and borrow operations, including the excavation for ditches, gutters, and channel changes, when the material is acceptably utilized or disposed of as herein specified.

### **1.2.2 Piping Trench Excavation**

The unit of measurement for trench excavation for gravity flow utility trenches or ditches will be the cubic yard.

### **1.2.3 Topsoil Requirements**

The unit of measurement for topsoil will be the cubic yard.

### **1.2.4 Select Granular Material**

Select granular material shall be measured in place as the actual cubic yards replacing wet or unstable material in trench bottoms. The unit price shall include furnishing and placing the granular material, excavation and disposal of unsatisfactory material, and additional requirements for sheeting and bracing, pumping, bailing, cleaning, and other incidentals necessary to complete the work.

## **1.3 PAYMENT**

Payment will constitute full compensation for all labor, equipment, tools, supplies, sheeting, bracing, well points, and incidentals necessary to complete the work.

### **1.3.1 Excavation**

Excavation, regardless of classification, will be paid for at the contract unit price per cubic yard for common excavation. Excavation and backfill for appurtenances, such as manholes, fire hydrants, valves, etc., is included in the unit cost of the item.

### **1.3.2 Piping Trench Excavation/Backfill**

Payment for trench excavation for gravity flow utilities shall constitute full payment for excavation and backfilling and will be paid at the contract

unit price per cubic yard for the required depth. Payment for trench excavation and backfill for other utility systems is included in the contract unit price per lineal foot of the pipe.

### **1.3.5 Borrow**

Borrow, regardless of classification, will be paid for at the contract unit price per cubic yard for common borrow.

## **1.4 DEFINITIONS**

### **1.4.1 Satisfactory Materials**

Satisfactory materials for backfill and embankments shall comprise any materials classified by [ASTM D 2487](#) as GW, GP, GM, GP-GM, GW-GM, GC, GP-GC, GM-GC, SW, SM, SW-SM, and CL except under pavements. Satisfactory materials for backfill or subgrade under pavement shall be classified as GW, GP, GM, GC, SW, or SM. In addition, these materials shall have no less than six percent by weight nor greater than 40 percent by weight passing the No. 200 sieve and the Plasticity Index shall be less than 12.

### **1.4.2 Unsatisfactory Materials**

Materials which do not comply with the requirements for satisfactory materials are unsatisfactory. Unsatisfactory materials also include man-made fills; trash; refuse; backfills from previous construction; and material classified as satisfactory which contains root and other organic matter or frozen material. The Contracting Officer shall be notified of any contaminated materials.

### **1.4.3 Cohesionless and Cohesive Materials**

Cohesionless materials include materials classified in [ASTM D 2487](#) as GW, GP, SW, and SP. Cohesive materials include materials classified as GC, SC, ML, CL, MH, and CH. Materials classified as GM and SM will be identified as cohesionless only when the fines are nonplastic. Testing required for classifying materials shall be in accordance with [ASTM D 4318](#), [ASTM C 136](#), [ASTM D 422](#), and [ASTM D 1140](#).

### **1.4.4 Degree of Compaction**

Degree of compaction required, except as noted in the second sentence, is expressed as a percentage of the maximum density obtained by the test procedure presented in [ASTM D 1557](#) abbreviated as a percent of laboratory maximum density. Since [ASTM D 1557](#) applies only to soils that have 30 percent or less by weight of their particles retained on the 3/4 inch sieve, the degree of compaction for material having more than 30 percent by weight of their particles retained on the 3/4 inch sieve shall be expressed as a

percentage of the maximum density in accordance with [AASHTO T 180](#) Method D and corrected with [AASHTO T 224](#). To maintain the same percentage of coarse material, the "remove and replace" procedure as described in the NOTE 8 in Paragraph 7.2 of [AASHTO T 180](#) shall be used.

### **1.4.5 Topsoil**

Material suitable for topsoils obtained from offsite areas or excavations is defined as: Natural, friable soil representative of productive, well-drained soils in the area, free of subsoil, stumps, rocks larger than one inch diameter, brush, weeds, toxic substances, and other material detrimental to plant growth. Amend topsoil pH range to obtain a pH of 5.5 to 7.

### **1.4.6 Unstable Material**

Unstable material shall consist of materials too wet to properly support the utility pipe, conduit, or appurtenant structure.

### **1.4.7 Select Granular Material**

#### **1.4.7.1 General Requirements**

Select granular material shall consist of materials classified as GW, GP, SW, or SP by [ASTM D 2487](#) where indicated. The liquid limit of such material shall not exceed 35 percent when tested in accordance with [ASTM D 4318](#). The plasticity index shall not be greater than 12 percent when tested in accordance with [ASTM D 4318](#), and not more than 40 percent by weight shall be finer than No. 200 sieve when tested in accordance with [ASTM D 1140](#). Coefficient of permeability shall be a minimum of 0.002 feet per minute when tested in accordance with [ASTM D 2434](#).

### **1.4.8 Initial Backfill Material**

Initial backfill shall consist of select granular material or satisfactory materials free from rocks 2 inches or larger in any dimension or free from rocks of such size as recommended by the pipe manufacturer, whichever is smaller.

### **1.4.9 Expansive Soils**

Expansive soils are defined as soils that have a plasticity index equal to or greater than 15 when tested in accordance with [ASTM D 4318](#).

## **1.5 SUBMITTALS**

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only or as otherwise designated. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section [01330](#) SUBMITTAL PROCEDURES if requested by the Contracting Officer for a specific Delivery Order:

SD-01 Preconstruction Submittals

Shoring;G

Dewatering Work Plan;G

SD-03 Product Data

Utilization of Excavated Materials;G

SD-06 Test Reports

Testing;G

SD-07 Certificates

Testing;G

Qualifications of the commercial testing laboratory or Contractor's testing facilities.

## 1.6 CLASSIFICATION OF EXCAVATION

No consideration will be given to the nature of the materials, and all excavation will be designated as unclassified excavation.

## PART 2 PRODUCTS

### 2.1 REQUIREMENTS FOR OFFSITE SOILS

Offsite soils brought in for use as backfill shall be tested for TPH, BTEX and full TCLP including ignitability, corrosivity and reactivity if requested by the Contracting Officer. Backfill shall contain less than 100 parts per million (ppm) of total petroleum hydrocarbons (TPH) and less than 10 ppm of the sum of Benzene, Toluene, Ethyl Benzene, and Xylene (BTEX) and shall not fail the TCPL test. TPH concentrations shall be determined by using [EPA 600/4-79/020](#) Method 418.1. BTEX concentrations shall be determined by using [EPA 530/F-93/004](#) Method 5030/8020. TCLP shall be performed in accordance with [EPA 530/F-93/004](#) Method 1311. If requested by the Contracting Officer, the Contractor shall provide [Borrow Site Testing](#) for TPH, BTEX and TCLP from a composite sample of material from the borrow site, with at least one test from each borrow site. Material shall not be brought on site until tests have been approved by the Contracting Officer.

## **2.2 BURIED WARNING AND IDENTIFICATION TAPE**

Polyethylene plastic and metallic core or metallic-faced, acid- and alkali-resistant, polyethylene plastic warning tape manufactured specifically for warning and identification of buried utility lines. Provide tape on rolls, 3 inch minimum width, color coded as specified below for the intended utility with warning and identification imprinted in bold black letters continuously over the entire tape length. Warning and identification to read, "CAUTION, BURIED (intended service) LINE BELOW" or similar wording. Color and printing shall be permanent, unaffected by moisture or soil.

### Warning Tape Color Codes

Yellow:	Electric
Yellow:	Gas, Oil; Dangerous Materials
Orange:	Telephone and Other Communications
Blue:	Water Systems
Green:	Sewer Systems
White:	Steam Systems
Gray:	Compressed Air

### **2.2.1 Warning Tape for Metallic Piping**

Acid and alkali-resistant polyethylene plastic tape conforming to the width, color, and printing requirements specified above. Minimum thickness of tape shall be 0.003 inch. Tape shall have a minimum strength of 1500 psi lengthwise, and 1250 psi crosswise, with a maximum 350 percent elongation.

### **2.2.2 Detectable Warning Tape for Non-Metallic Piping**

Polyethylene plastic tape conforming to the width, color, and printing requirements specified above. Minimum thickness of the tape shall be 0.004 inch. Tape shall have a minimum strength of 1500 psi lengthwise and 1250 psi crosswise. Tape shall be manufactured with integral wires, foil backing, or other means of enabling detection by a metal detector when tape is buried up to 3 feet deep. Encase metallic element of the tape in a protective jacket or provide with other means of corrosion protection.

## **2.3 DETECTION WIRE FOR NON-METALLIC PIPING**

Detection wire shall be insulated single strand, solid copper with a minimum of 12 AWG.

# **PART 3 EXECUTION**

## **3.1 STRIPPING OF TOPSOIL**

Where indicated or directed, topsoil shall be stripped to a depth of 4 inches. Topsoil shall be spread on areas already graded and prepared for topsoil, or transported and deposited in stockpiles convenient to areas that are to receive application of the topsoil later, or at locations indicated or specified. Topsoil shall be kept separate from other excavated materials, brush, litter, objectionable weeds, roots, stones larger than 2 inches in diameter, and other materials that would interfere with planting and maintenance operations. Any surplus of topsoil from excavations and grading shall be removed from the site.

## **3.2 GENERAL EXCAVATION**

The Contractor shall perform excavation of every type of material encountered within the limits of the project to the lines, grades, and elevations indicated and as specified. Grading shall be in conformity with the typical sections shown and the tolerances specified in paragraph FINISHING. Satisfactory excavated materials shall be transported to and placed in fill or embankment within the limits of the work. Unsatisfactory materials encountered within the limits of the work shall be excavated below grade and replaced with satisfactory materials as directed. Such excavated material and the satisfactory material ordered as replacement shall be included in excavation. Surplus satisfactory excavated material not required for fill or embankment shall be disposed of in areas approved for surplus material storage or designated waste areas. Unsatisfactory excavated material shall be disposed of in designated waste or spoil areas. During construction, excavation and fill shall be performed in a manner and sequence that will provide proper drainage at all times. Material required for fill or embankment in excess of that produced by excavation within the grading limits shall be excavated from the borrow areas indicated or from other approved areas selected by the Contractor as specified.

### **3.2.1 Ditches, Gutters, and Channel Changes**

Excavation of ditches, gutters, and channel changes shall be accomplished by cutting accurately to the cross sections, grades, and elevations shown. Ditches and gutters shall not be excavated below grades shown. Excessive open ditch or gutter excavation shall be backfilled with satisfactory, thoroughly compacted, material or with suitable stone or cobble to grades shown. Material excavated shall be disposed of as shown or as directed, except that in no case shall material be deposited less than 4 feet from the edge of a ditch. The Contractor shall maintain excavations free from detrimental quantities of leaves, brush, sticks, trash, and other debris until final acceptance of the work.

### **3.2.2 Drainage Structures**

Excavations shall be made to the lines, grades, and elevations shown, or as directed. Trenches and foundation pits shall be of sufficient size to permit the placement and removal of forms for the full length and width of structure footings and foundations as shown. Rock or other hard foundation material shall be cleaned of loose debris and cut to a firm, level, stepped, or serrated surface. Loose disintegrated rock and thin strata shall be removed. When concrete or masonry is to be placed in an excavated area, the bottom of the excavation shall not be disturbed. Excavation to the final

grade level shall not be made until just before the concrete or masonry is to be placed. Where pile foundations are to be used, the excavation of each pit shall be stopped at an elevation 1 foot above the base of the footing, as specified, before piles are driven. After the pile driving has been completed, loose and displaced material shall be removed and excavation completed, leaving a smooth, solid, undisturbed surface to receive the concrete or masonry.

### **3.2.3 Drainage**

Provide for the collection and disposal of surface and subsurface water encountered during construction. Completely drain construction site during periods of construction to keep soil materials sufficiently dry. The Contractor shall establish/construct storm drainage features (ponds/basins) at the earliest stages of site development, and throughout construction grade the construction area to provide positive surface water runoff away from the construction activity and/or provide temporary ditches, swales, and other drainage features and equipment as required to maintain dry soils. When unsuitable working platforms for equipment operation and unsuitable soil support for subsequent construction features develop, remove unsuitable material and provide new soil material as specified herein. It is the responsibility of the Contractor to assess the soil and ground water conditions presented by the plans and specifications and to employ necessary measures to permit construction to proceed.

### **3.2.4 Dewatering**

Groundwater flowing toward or into excavations shall be controlled to prevent sloughing of excavation slopes and walls, boils, uplift and heave in the excavation and to eliminate interference with orderly progress of construction. French drains, sumps, ditches or trenches will not be permitted within 3 feet of the foundation of any structure, except with specific written approval, and after specific contractual provisions for restoration of the foundation area have been made. Control measures shall be taken by the time the excavation reaches the water level in order to maintain the integrity of the in situ material. Operate dewatering system continuously until construction work below existing water levels is complete.

### **3.2.5 Trench Excavation Requirements**

The trench shall be excavated as recommended by the manufacturer of the pipe to be installed. Trench walls below the top of the pipe shall be of such width as recommended in the manufacturer's installation manual. Trench walls more than 4 feet high shall be shored, cut back to a stable slope, or provided with equivalent means of protection for employees who may be exposed to moving ground or cave in. Special attention shall be given to slopes which may be adversely affected by weather or moisture content. The trench width below the top of pipe shall not exceed 24 inches plus pipe outside diameter (O.D.) for pipes of less than 24 inches inside diameter and shall not exceed 36 inches plus pipe outside diameter for sizes larger than 24 inches inside diameter.

### **3.2.5.1 Bottom Preparation**

The bottoms of trenches shall be accurately graded to provide uniform bearing and support for the bottom quadrant of each section of the pipe. Bell holes shall be excavated to the necessary size at each joint or coupling to eliminate point bearing. Stones of 2 inches or greater in any dimension, or as recommended by the pipe manufacturer, whichever is smaller, shall be removed to avoid point bearing.

### **3.2.5.2 Removal of Unyielding Material**

Where unyielding material is encountered in the bottom of the trench, such material shall be removed 4 inches below the required grade and replaced with suitable materials as provided in paragraph BACKFILLING AND COMPACTION.

### **3.2.5.3 Removal of Unstable Material**

Where unstable material is encountered in the bottom of the trench, such material shall be removed to the depth directed and replaced to the proper grade with select granular material as provided in paragraph BACKFILLING AND COMPACTION.

### **3.2.5.4 Excavation for Appurtenances**

Excavation for manholes, catch-basins, inlets, or similar structures shall be of sufficient size to permit the placement and removal of forms for the full length and width of structure footings and foundations as shown. Removal of unstable material shall be as specified above. When concrete or masonry is to be placed in an excavated area, special care shall be taken not to disturb the bottom of the excavation. Excavation to the final grade level shall not be made until just before the concrete or masonry is to be placed.

### **3.2.6 Underground Utilities**

For work immediately adjacent to or for excavations exposing a utility or other buried obstruction, excavate by hand. Start hand excavation on each side of the indicated obstruction and continue until the obstruction is uncovered or until clearance for the new grade is assured. Support uncovered lines or other existing work affected by the contract excavation until approval for backfill is granted by the Contracting Officer. Report damage to utility lines or subsurface construction immediately to the Contracting Officer.

## **3.3 SELECTION OF BORROW MATERIAL**

Borrow material shall be selected to meet the requirements and conditions of the particular fill or embankment for which it is to be used. Borrow material shall be obtained from the borrow areas from approved private

sources. Unless otherwise provided in the contract, the Contractor shall obtain from the owners the right to procure material, pay royalties and other charges involved, and bear the expense of developing the sources, including rights-of-way for hauling.

### **3.4 SHORING**

Shoring, including sheet piling, shall be furnished and installed as necessary to protect workmen, banks, adjacent paving, structures, and utilities. Shoring, bracing, and sheeting shall be removed as excavations are backfilled, in a manner to prevent caving.

### **3.5 GROUND SURFACE PREPARATION**

Unsatisfactory material in surfaces to receive fill or in excavated areas shall be removed and replaced with satisfactory materials. The surface shall be scarified to a depth of 6 inches before the fill is started. Sloped surfaces steeper than 1 vertical to 4 horizontal shall be plowed, stepped, benched, or broken up so that the fill material will bond with the existing material. When subgrades are less than the specified density, the ground surface shall be broken up to a minimum depth of 6 inches, pulverized, and compacted to the specified density. When the subgrade is part fill and part excavation or natural ground, the excavated or natural ground portion shall be scarified to a depth of 12 inches and compacted as specified for the adjacent fill.

### **3.6 UTILIZATION OF EXCAVATED MATERIALS**

Unsatisfactory materials removed from excavations shall be disposed of in designated waste disposal or spoil areas. Satisfactory material removed from excavations shall be used, insofar as practicable, in the construction of fills, embankments, subgrades, shoulders, bedding (as backfill), and for similar purposes. No satisfactory excavated material shall be wasted without specific written authorization.

### **3.7 BURIED TAPE AND DETECTION WIRE**

#### **3.7.1 Buried Warning and Identification Tape**

Provide buried utility lines with utility identification tape. Bury tape 12 inches below finished grade; under pavements and slabs, bury tape 6 inches below top of subgrade.

#### **3.7.2 Buried Detection Wire**

Bury detection wire directly above non-metallic piping at a distance not to exceed 12 inches above the top of pipe. The wire shall extend continuously and unbroken, from manhole to manhole. The ends of the wire shall terminate

inside the manholes at each end of the pipe, with a minimum of 3 feet of wire, coiled, remaining accessible in each manhole. The wire shall remain insulated over its entire length. The wire shall enter manholes between the top of the corbel and the frame, and extend up through the chimney seal between the frame and the chimney seal. For force mains, the wire shall terminate in the valve pit at the pump station end of the pipe.

### **3.8 BACKFILLING AND COMPACTION**

Backfill adjacent to any and all types of structures shall be placed and compacted to at least 90 percent laboratory maximum density for cohesive materials or 95 percent laboratory maximum density for cohesionless materials to prevent wedging action or eccentric loading upon or against the structure.

#### **3.8.1 Trench Backfill**

Trenches shall be backfilled to the grade shown. The trench shall be backfilled to 3 feet above the top of pipe prior to performing the required pressure tests. The joints and couplings shall be left uncovered during the pressure test.

##### **3.8.1.1 Replacement of Unyielding Material**

Unyielding material removed from the bottom of the trench shall be replaced with select granular material or initial backfill material.

##### **3.8.1.2 Replacement of Unstable Material**

Unstable material removed from the bottom of the trench or excavation shall be replaced with select granular material placed in layers not exceeding 6 inches loose thickness.

##### **3.8.1.3 Bedding and Initial Backfill**

Initial backfill material shall be placed and compacted with approved tampers to a height of at least one foot above the utility pipe or conduit. The backfill shall be brought up evenly on both sides of the pipe for the full length of the pipe. Care shall be taken to ensure thorough compaction of the fill under the haunches of the pipe. Except as specified otherwise in the individual piping section, provide bedding for buried piping in accordance with [AWWA C600](#), Type 4, except as specified herein. Backfill to top of pipe shall be compacted to 95 percent of [ASTM D 698](#) maximum density.

##### **3.8.1.4 Final Backfill**

The remainder of the trench, except for special materials for roadways, railroads and airfields, shall be filled with satisfactory material. Backfill material shall be placed and compacted as follows:

- a. Roadways, Railroads, and Airfields: Backfill shall be placed up to the required elevation as specified. Water flooding or jetting methods of compaction will not be permitted.
- b. Sidewalks, Turfed or Seeded Areas and Miscellaneous Areas: Backfill shall be deposited in layers of a maximum of 12 inch loose thickness, and compacted to 85 percent maximum density for cohesive soils and 90 percent maximum density for cohesionless soils. Compaction by water flooding or jetting will not be permitted. This requirement shall also apply to all other areas not specifically designated above.

### **3.8.2 Backfill for Appurtenances**

After the manhole, catchbasin, inlet, or similar structure has been constructed and the concrete has been allowed to cure for 7 days, backfill shall be placed in such a manner that the structure will not be damaged by the shock of falling earth. The backfill material shall be deposited and compacted as specified for final backfill, and shall be brought up evenly on all sides of the structure to prevent eccentric loading and excessive stress.

## **3.9 SPECIAL REQUIREMENTS**

Special requirements for both excavation and backfill relating to the specific utilities are as follows:

### **3.9.1 Gas Distribution**

Trenches shall be excavated to a depth that will provide not less than 24 inches of cover. Trenches shall be graded as specified for pipe-laying requirements in Section [02556A](#) GAS DISTRIBUTION SYSTEM.

### **3.9.2 Water Lines**

Trenches shall be of a depth to provide a minimum cover of 3 feet from the existing ground surface, or from the indicated finished grade, whichever is lower, to the top of the pipe.

## **3.10 EMBANKMENTS**

Earth embankments shall be constructed from satisfactory materials free of organic or frozen material and rocks with any dimension greater than 3 inches. The material shall be placed in successive horizontal layers of loose material not more than 8 inches in depth. Each layer shall be spread uniformly on a soil surface that has been moistened or aerated as necessary,

and scarified or otherwise broken up so that the fill will bond with the surface on which it is placed. After spreading, each layer shall be plowed, disked, or otherwise broken up; moistened or aerated as necessary; thoroughly mixed; and compacted to at least 90 percent laboratory maximum density for cohesive materials or 95 percent laboratory maximum density for cohesionless materials. Compaction requirements for the upper portion of earth embankments forming subgrade for pavements shall be identical with those requirements specified in paragraph SUBGRADE PREPARATION.

### **3.11 SUBGRADE PREPARATION**

#### **3.11.1 Proof Rolling**

Proof rolling shall be performed in the presence of the Contracting Officer. Proof rolling shall be done on an exposed subgrade free of surface water (wet conditions resulting from rainfall), which would promote degradation of an otherwise acceptable subgrade. Proof roll the existing subgrade with six passes of a dump truck loaded with 4 cubic yards of soil or a 15 ton, pneumatic-tired roller. Operate the roller or truck in a systematic manner to ensure the number of passes over all areas, and at speeds between 2 1/2 to 3 1/2 mph. When proof rolling, one-half of the passes made with the roller shall be in a direction perpendicular to the other passes. Rutting or pumping of material shall be undercut to a depth of 6 inches and replaced with select material.

#### **3.11.2 Construction**

Subgrade shall be shaped to line, grade, and cross section, and compacted as specified. This operation shall include plowing, disking, and any moistening or aerating required to obtain specified compaction. Soft or otherwise unsatisfactory material shall be removed and replaced with satisfactory excavated material or other approved material as directed. Rock encountered in the cut section shall be excavated to a depth of 6 inches below finished grade for the subgrade. Low areas resulting from removal of unsatisfactory material or excavation of rock shall be brought up to required grade with satisfactory materials, and the entire subgrade shall be shaped to line, grade, and cross section and compacted as specified. After rolling, the surface of the subgrade for roadways shall not show deviations greater than 1/2 inch when tested with a 10 foot straightedge applied both parallel and at right angles to the centerline of the area. The elevation of the finish subgrade shall not vary more than 0.05 foot from the established grade and cross section.

#### **3.11.3 Compaction**

Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment. Except for paved areas and railroads, each layer of the embankment shall be compacted to at least 90 percent of laboratory maximum density.

### **3.11.3.1 Subgrade for Pavements**

Subgrade for pavements shall be compacted to at least 95-percentage laboratory maximum density for the depth below the surface of the pavement shown. When more than one soil classification is present in the subgrade, the top 6 inches of subgrade shall be scarified, windrowed, thoroughly blended, reshaped, and compacted.

### **3.11.3.2 Subgrade for Shoulders**

Subgrade for shoulders shall be compacted to at least 90 percentage laboratory maximum density for the full depth of the shoulder.

## **3.12 SHOULDER CONSTRUCTION**

Shoulders shall be constructed of satisfactory excavated or borrow material or as otherwise shown or specified. Shoulders shall be constructed as soon as possible after adjacent paving is complete, but in the case of rigid pavements, shoulders shall not be constructed until permission of the Contracting Officer has been obtained. The entire shoulder area shall be compacted to at least the percentage of maximum density as specified in paragraph SUBGRADE PREPARATION above, for specific ranges of depth below the surface of the shoulder. Shoulder construction shall be done in proper sequence in such a manner that adjacent ditches will be drained effectively and that no damage of any kind is done to the adjacent completed pavement. The completed shoulders shall be true to alignment and grade and shaped to drain in conformity with the cross section shown.

## **3.13 FINISHING**

The surface of excavations, embankments, and subgrades shall be finished to a smooth and compact surface in accordance with the lines, grades, and cross sections or elevations shown. The degree of finish for graded areas shall be within 0.1 foot of the grades and elevations indicated except that the degree of finish for subgrades shall be specified in paragraph SUBGRADE PREPARATION. Gutters and ditches shall be finished in a manner that will result in effective drainage. The surface of areas to be turfed shall be finished to a smoothness suitable for the application of turfing materials. Settlement or washing that occurs in graded, topsoiled, or backfilled areas prior to acceptance of the work, shall be repaired and grades re-established to the required elevations and slopes.

## **3.14 PLACING TOPSOIL**

On areas to receive topsoil, the compacted subgrade soil shall be scarified to a 2-inch depth for bonding of topsoil with subsoil. Topsoil then shall be spread evenly to a thickness of 4 inches and graded to the elevations and slopes shown. Topsoil shall not be spread when frozen or excessively wet or dry. Material required for topsoil in excess of that produced by excavation within the grading limits shall be obtained from offsite areas.

### **3.15 TESTING**

Testing shall be the responsibility of the Government and shall be performed at no cost to the Contractor. However, costs incurred to perform subsequent testing because of failure of initial testing will be charged to the Contractor. Gradation of fill and backfill material shall be determined in accordance with ASTM C 136, ASTM D 422, or ASTM D 1140. Field in-place density shall be determined in accordance with ASTM D 1556, ASTM D 2167, or ASTM D 2922. When ASTM D 2922 is used, the calibration curves shall be checked and adjusted using only the sand cone method as described in ASTM D 1556. ASTM D 2922 results in a wet unit weight of soil and when using this method ASTM D 3017 shall be used to determine the moisture content of the soil. The calibration curves furnished with the moisture gauges shall also be checked along with density calibration checks as described in ASTM D 3017; the calibration checks of both the density and moisture gauges shall be made at the beginning of a job on each different type of material encountered and at intervals as directed by the Contracting Officer. ASTM D 2937, Drive Cylinder Method shall be used only for soft, fine-grained, cohesive soils. When test results indicate, as determined by the Contracting Officer, that compaction is not as specified, the material shall be removed, replaced and recompact to meet specification requirements. Tests on recompact areas shall be performed to determine conformance with specification requirements. Inspections and test results shall be certified by a registered professional civil engineer. These certifications shall state that the tests and observations were performed by or under the direct supervision of the engineer and that the results are representative of the materials or conditions being certified by the tests.

### **3.16 Displacement of Sewers**

After other required tests have been performed and the trench backfill compacted to the finished grade surface, the pipe shall be inspected to determine whether significant displacement has occurred. This inspection shall be conducted in the presence of the Contracting Officer. Pipe sizes larger than 36 inches shall be entered and examined, while smaller diameter pipe shall be inspected by shining a light or laser between manholes or manhole locations, or by the use of television cameras passed through the pipe. If, in the judgment of the Contracting Officer, the interior of the pipe shows poor alignment or any other defects that would cause improper functioning of the system, the defects shall be remedied as directed at no additional cost to the Government.

### **3.17 DISPOSITION OF SURPLUS MATERIAL**

Surplus material or other soil material not required or suitable for filling or backfilling, and brush, refuse, stumps, roots, and timber shall be removed from Government property.

-- End of Section --

## SECTION 02441N

## TRENCHLESS EXCAVATION USING MICROTUNNELING

09/99

**PART 1 GENERAL****1.1 REFERENCES**

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

## AMERICAN PETROLEUM INSTITUTE (API)

- API Spec 5L (1995) Line Pipe
- API Spec 13A (1993) Drilling - Fluid Materials

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- ASTM A 53 (1997) Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless
- ASTM A 139 (1996) Electric-Fusion (ARC)-Welded Steel Pipe (NPS 4 and Over)
- ASTM A 716 (1994) Ductile Iron Culvert Pipe
- ASTM A 746 (1995) Ductile Iron Gravity Sewer Pipe
- ASTM C 76 (1997) Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
- ASTM C 301 (1997; Rev. A) Vitrified Clay Pipe
- ASTM C 443 (1994) Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets
- ASTM C 497 (1997) Concrete Pipe, Manhole Sections, or Tile
- ASTM C 700 (1997) Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated
- ASTM C 1208/C 1208M (1995) Vitrified Clay Pipe and Joints for Use in Jacking, Sliplining, and Tunnels
- ASTM D 1248 (1984; R 1989) Polyethylene Plastics Molding and Extrusion Materials
- ASTM D 3212 (1996; Rev. A) Joints for Drain and Sewer Plastic Pipe Using Flexible Elastomeric Seals

ASTM D 3262	(1996) "Fiberglass" (Glass-Fiber- Reinforced Thermosetting-Resin) Sewer Pipe
ASTM D 4161	(1996) "Fiberglass" (Glass- Fiber-Reinforced Thermosetting- Resin) Pipe Joints Using Flexible Elastomeric Seals
ASTM F 477	(1996; Rev. A) Elastomeric Seals (Gaskets) for Joining Plastic Pipe
ASTM F 794	(1997) Poly(Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter
AMERICAN WELDING SOCIETY (AWS)	
AWS D1.1/D1.1M	(1998) Structural Welding Code - Steel
AWS D1.5	(1996) Bridge Welding Code
AMERICAN WATER WORKS ASSOCIATION (AWWA)	
AWWA C104	(1995) Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water
AWWA C111	(1995) Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
AWWA C150	(1996) Thickness Design of Ductile-Iron Pipe
AWWA C151	(1996) Ductile-Iron Pipe, Centrifugally Cast, for Water or Other Liquids
AWWA C200	(1997) Steel Water Pipe 6 in. (150 mm) and Larger
AWWA C203	(1991) Coal-Tar Protective Coatings and Lining for Steel Water Pipelines - Enamel and Tape - Hot Applied

## **1.2 DESIGN REQUIREMENTS**

### **1.2.1 Pipe Casing**

Provide utility line accessories, valves, connections, and manholes as specified and where indicated. Submit design calculations of pipe casing.

## **1.3 SUBMITTALS**

The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES if requested by the Contracting Officer for a specific Delivery Order:

**SD-01 Preconstruction Submittals**

Microtunneling Boring Machine equipment to be used

**SD-03 Product Data**

Piping casing, joints, fittings, valves, and couplings

Bentonite

Submit manufacturer's standard drawings or catalog cuts, except submit both drawings and cuts for push-on joints. Include information concerning gaskets with submittal for joints and couplings.

**SD-05 Design Data**

Design calculations of pipe casing

**SD-07 Certificates**

Piping casing piping, fittings, joints, valves, and coupling

Shop-applied linings

Certificates shall attest that tests set forth in each applicable referenced publication have been performed, whether specified in that publication to be mandatory or otherwise and that production control tests have been performed at the intervals or frequency specified in the publication. Other tests shall have been performed within 3 years of the date of submittal or certificates on the same type, class, grade, and size of material as is being provided for the project.

**SD-08 Manufacturer's Instructions**

Installation procedures for pipe casing

## **1.4 QUALITY ASSURANCE**

### **1.4.1 Design Calculations of Pipe Casing**

If requested by the Contracting Officer, submit design calculations of pipe casing demonstrating that the pipe casing selected has been designed to support the maximum anticipated earth loads and superimposed live loads, both static and dynamic, which may be imposed on the pipe casing.

## **PART 2 PRODUCTS**

## 2.1 PIPING CASING MATERIALS

### 2.1.1 Piping Casing

#### 2.1.1.1 Ductile-Iron Piping

- a. Pipe and Fittings: Pipe, AWWA C151. The outside diameter of ductile iron microtunneling pipe shall be in accordance with AWWA C150.
  - (1) Deflection: The maximum allowable deflection shall not exceed three percent of the outside diameter of the pipe barrel for pipe manufactured with a rigid lining and/or rigid coating nor five percent for pipe manufactured with a flexible lining and/or flexible coating.
  - (2) Linings: Cement mortar shall be in accordance with latest version of AWWA C104. Polyethylene lining shall be virgin polyethylene complying with ASTM D 1248 compounded with an inert filler and with sufficient carbon black to resist ultraviolet rays.
  - (3) End Squareness: The ends of the pipe shall be perpendicular to the longitudinal axis of the pipe with a maximum deviation of not more than 0.25 inches.
  - (4) Hydrostatic Test: Each pipe section shall be subject to a hydrostatic test of not less than 500 psi as per the requirements of AWWA C151. Non-standard joint lengths shall be cut only from full length pipe having satisfactorily passed the required 500 psi hydrostatic test.
  - (5) Material Properties: The following are representative minimum values for the physical properties of ductile iron for use as microtunneling pipe for pressure or gravity service.
    - (a) Tensile strength: Minimum 60,000 psi
    - (b) Tensile yield strength: Minimum 42,000 psi
    - (c) Compressive strength: The compressive yield strength of ductile iron is 10 to 20 percent higher than the tensile yield strength. The ultimate strength in compression is not normally determined for ductile metals, though apparent strength in tests may be several times the tensile strength value.
    - (d) Elongation: Minimum 10 percent.
    - (e) Modulus of Elasticity: 24,000,000 psi (tension or compression).
    - (f) Poisson's ratio: 0.28
  - (6) Spigot End Outside Diameter: The Spigot end outside diameter must be within the following ranges: 3 to 12 inches,  $\pm$  0.06 inches;

14 to 24 inches,  $\pm 0.05$  inches; 30 to 48 inches,  $\pm 0.08$  inches; 54 to 64 inches,  $\pm 0.04$  inches.

b. Joints and Jointing Material:

(1) Joints: Pressure and gravity microtunneling pipe shall have either an integral-bell push-on or rubber gasket coupled joint meeting the following criteria:

(a) Integral-bell push-on joint microtunneling pipe shall consist of a rubber-gasket joint manufactured to conform with [AWWA C111](#) and the dimensions shown in [AWWA C151](#). The exterior of the pipe shall be coated with a durable cement-mortar or concrete coating applied in such a manner as to provide a uniform outside diameter.

(b) Cement-mortar or concrete strength, reinforcement and method of placement shall be in accordance with manufacturer's recommendations. Durable Coatings of other types may be substituted provided they maintain a uniform outside diameter and they are approved by the Contracting Officer. Rubber gasket coupled microtunneling joint shall be manufactured so as to provide a joint, which has the same nominal outside diameter as the pipe barrel.

### 2.1.1.2 Polyvinyl Chloride Pipe (PVC)

[ASTM F 794](#). [ASTM D 3212](#) for gasketed joint systems. [ASTM F 477](#) for gasket materials.

### 2.1.1.3 Reinforced Concrete Pipe

a. Pipe: Pipe, class, wall, nominal length and concrete strength in accordance with [ASTM C 76](#).

(1) Internal Diameter: The internal diameter of 12 to 24 inches pipe shall not vary by more than  $\pm 1/4$  inch from the design diameter. 27 inch and larger pipe shall not vary from the design diameter by more than  $\pm$ one percent or  $\pm 3/8$  inch, whichever is less.

(2) Wall Thickness: At any location along the length of the pipe, or at any point around its circumference, the wall thickness shall not vary by more than  $\pm$ five percent.

(3) End Squareness: Each pipe end shall lie within two planes perpendicular to the longitudinal center line of the pipe, spaced at  $3/8$  inches apart. The tongue or spigot end shall be square within  $3/16$  inches and the groove or bell end of the pipe shall be square within  $3/16$  inches.

(4) Hydrostatic Test: Each pipe section shall be subject to a hydrostatic test of not less than 10 psi for straight alignment as per the requirements of section 10 of [ASTM C 443](#) and section 8 of [ASTM C 497](#). Non-standard joint lengths shall be cut only from full length pipe having satisfactory passed the required 10 psi hydrostatic test.

(5) Roundness: The outside diameter of the pipe shall not vary from a true circle by more than 1.0 percent. The out-of-round dimensions shall be one half the difference between the maximum and minimum outer diameter of the pipe at any one location along the barrel.

(6) Length of Pipe: Finished pipe length shall not deviate from design length by more than  $\pm 1/8$  inch per foot with a maximum variation of  $1/2$  inch in any length of pipe.

(7) Length of two opposite sides: Variations in laying length of two opposite sides of the pipe shall not be more than  $1/4$  inch for all sizes through 24 inches internal diameter or  $1/8$  inch per foot for all sizes larger than 24 inches in internal diameter, with a maximum of  $3/8$  inches in any length of pipe.

b. Joints and Jointing Material:

(1) Joints: Joint shall utilize a rubber gasket or mastic to provide the seal. Incorporate an assembly of steel bands or steel bell ends and spigot rings and rubber gaskets in accordance with contract drawings.

#### 2.1.1.4 Steel Pipe

a. Pipe: Steel pipe shall be in conformance with **AWWA C200**. Steel pipe shall be welded, seamless, square cut with even lengths.

(1) Roundness: The difference between the major and minor outside diameters shall not exceed one percent of the specified nominal outside diameter of 0.25 inch whichever is less.

(2) Circumference: The outside circumference shall be within  $\pm 1$  percent of the nominal circumference or within  $\pm 0.50$  inches, whichever is less.

(3) Straightness: The maximum allowable straightness deviation in any 10 foot length shall be  $1/8$  inch.

(4) Pipe ends: The end of the pipe shall be perpendicular to the longitudinal axis of the pipe and within  $1/16$  inches per foot of diameter, with a maximum allowable deviation of  $1/4$  inch measured with a square and straightedge across the end of the pipe.

b. Joints: The connection of adjacent pieces of microtunneling steel pipe may be accomplished by field butt welding, internal weld sleeves, or integral press fit connectors as long as loading and installation design criteria are met.

#### 2.1.1.5 Fiberglass Pipe

a. Pipe: Fiberglass pipe shall meet the requirements of **ASTM D 3262**, Type 1, Liner 2, Grade 3. The method of the manufacture shall be

centrifugal casting resulting in a controlled outside diameter. Minimum wall thickness shall be  $\pm 1.5$  inches.

- (1) Roundness: The pipes shall be round within 0.1 percent of the outside diameter.
  - (2) Pipe lengths: Lengths tolerance shall be  $\pm 1/4$  inches per length of pipe.
  - (3) End squareness: Pipe ends shall be perpendicular to the pipe axis within a tolerance of  $\pm 1/16$  inch.
  - (4) Straightness: Pipes shall be straight to within  $\pm 1/16$  inch over 10 feet.
  - (5) Jacking strength: The average ultimate axial compressive strength shall be 12,000 psi minimum. The jacking capacity shall be based on the structural wall (end area) under the gasket groove (reduced cross-section). The allowable jacking capacity shall be determined by applying a 2.5 safety factor.
- b. Joints: The pipes shall be connected by gasket-sealed bell-spigot joints. The gasket material shall meet requirements of [ASTM F 477](#). The joint shall meet the requirements of [ASTM D 4161](#) and shall be leak-free under the following conditions:
- (1) External pressures up to 29 psi from bentonite injection, slurry system operation or groundwater head.
  - (2) Internal air testing up to 5 psi.
  - (3) Gaps between the pipe ends up to two percent of the diameter (maximum of one inch).

### 2.1.1.6 Vitrified Clay Pipe Not Used.

## 2.2 CONCRETE

Concrete shall be 3000 psi and conform with Section [03307N](#), "Concrete for Minor Structures" of this specification.

## 2.3 BENTONITE

Bentonite shall conform with [API Spec 13A](#) and have the capacity of mixing with water to form a stable and homogeneous suspension.

## 2.4 BACKFILL

Reuse excavated sand for backfill that conforms with Section [02300N](#), "Earthwork."

## **PART 3 EXECUTION**

### **3.1 PREPARATION**

#### **3.1.1 Access Shafts**

- a. Construction methods required to provide access shafts for microtunneling shall be subject to approval of the Contracting Officer. Acceptable construction methods may include the use of interlocked steel sheetpiling or precast circular concrete segments lowered in place during excavation.
- b. Final dimensions of access shafts selected by the Contractor shall be modified as required following installation of pipe casings to the size and shape of acceptable manhole designs shown on the Contract Drawings to permit installation of conveyance piping.
- c. Shafts shall be of a size commensurate with safe working practices and located as shown on plans. With the approval of the Contracting officer, the Contractor may relocate shafts to better suit the capabilities of the microtunneling method proposed. Where no locations are given, the Contractor shall determine such locations with the approval of the Contracting Officer.
- d. Shaft locations shall, where possible, be kept clear of road intersections and within a single traffic lane, in order to minimize disruption to the flow of traffic. Support equipment, spoil piles, and materials shall also be located such as to minimize disruption to traffic and are subject to the approval of the Contracting Officer.
- e. The Contractor shall properly support all excavations and prevent movement of the soil, pavement, utilities or structures outside of the excavation. The Contractor shall furnish, place and maintain sheeting, bracing, and lining required to support the sides and floor of all pits and to provide adequate protection of the work, personnel, and the general public. Design loads on the sides of the jacking and receiving pit walls are dependent on the construction method and flexibility of the wall systems.
- f. Construct a starter shaft to accommodate the installation of pipe casings, slurry shield and piping jacking device. Install thrust block as required and consolidate the ground (grout) where the casings exit the shaft.
- g. Construct a receiver shaft to accommodate the installation of pipe casings and the slurry shield. Consolidate the ground (grout) where the casings enter the shaft.
- h. The Contractor shall furnish, install, and maintain equipment to keep the jacking shaft free of excess water. The Contractor shall also provide surface protection during the period of construction to ensure that surface runoff does not enter driving shaft(s). Groundwater dewatering shall comply with the approved dewatering

plan and shall not affect surrounding soils or structures beyond the tolerances stated in paragraph entitled "Settlement, Alignment and Tolerances."

- i. Provide security fence around all access shaft areas and provide shaft cover(s) when the shaft area is not in use.
- j. Design of the jacking and receiving pit supports should also take into account the loading from shield or pipe jacking where appropriate, as well as special provisions and reinforcement around the breakout location. The base of the pits shall be designed to withstand uplift forces from the full design head of water, unless approved dewatering or other ground modification methods are employed.
- k. Where a thrust block is required to transfer jacking loads into the soil, it shall be properly designed and constructed by the Contractor. The backstop shall be normal (square) with the proposed pipe alignment and shall be designed to withstand the maximum jacking pressure to be used with a factor of safety of at least 2.0. It shall also be designed to minimize excessive deflections in such a manner as to avoid disturbance of adjacent structures or utilities or excessive ground movement. If a concrete thrust block or treated soil zone is utilized to transfer jacking loads into the soil, the tunnel boring is not to be jacked until the concrete or other materials have attained the required strength.
- l. Pit Backfill and Compaction: Upon completion of the pipe drive and approval of the installed pipeline by the Contracting Officer, remove all equipment, debris, and unacceptable materials from the pits and commence backfilling operation. Backfilling and compaction shall be completed in accordance with Section 02300, "Earthwork."

## **3.2 INSTALLATION**

### **3.2.1 Installation of Tracer Wire**

Install a continuous length of tracer wire for the full length of each run of nonmetallic pipe. Attach wire to top of pipe in such a manner that will not be displaced during construction operations.

### **3.2.2 Connections to Existing Lines**

Make connections to existing lines after Government approval is obtained and with a minimum interruption of service on the existing line. Make connections to existing lines under pressure in accordance with the recommended procedures of the manufacturer of the pipe being tapped.

### 3.2.3 Settlement, Alignment and Tolerances

- a. Settlement or heave of ground surface along centerline of microtunneling alignments during and after installation of pipe casings shall not exceed 3 inches.
- b. No more than 1-inch lateral and 1 inch vertical deviation shall be permitted in the position of the completed jacked pipe casings.
- c. Overcut shall not exceed one inch on the radius of the pipe being installed. The annular space created by the overcut must be filled with the lubrication material that is used to reduce soil friction drag on the pipe.

### 3.2.4 Microtunneling

- a. The **microtunneling boring machine** shall be an unmanned mechanical type earth pressure counter-balanced bentonite slurry shield system. The machine shall be laser guided and monitored continuously, with a closed circuit television system. The machine shall be capable of fully supporting the face both during excavation and during shutdown and shall have the capability, of positively measuring the earth pressure at the face. Excavation face pressure shall be maintained at all times between the measured active earth pressure and 50 percent of the computed passive earth pressure. Fluid pressure applied at the face to stabilize the excavation shall be maintained at a level slightly in excess of normal hydrostatic pressure and shall be monitored continuously. The machine shall be operated so as to prevent either surface heave or loss of ground during tunneling and shall be steerable and capable of controlling the advance of the heading to maintain line and grade within the tolerances specified in paragraph entitled "Settlement, Alignment and Tolerances." The machine shall be capable of handling and removing materials of high water content from the machine head.
- b. Each pipe casing section shall be jacked forward as the excavation progresses in such a way to provide complete and adequate, ground support at all times. A bentonite slurry (driller's mud) shall be applied to the external surface of the pipe to reduce skin friction. A jacking frame shall be provided for developing a uniform distribution of jacking forces around the periphery of the pipe. A plywood spacer shall be placed on the outer shoulder of the pipe casing joint. The thrust reaction backstop shall be properly designed and constructed.
- c. The backstop shall be normal (square) with the proposed pipe casing alignment and shall be designed to support the maximum obtainable jacking pressure with a safety factor at least 2.0.
- d. The jacking system shall be capable of continuously monitoring the jacking pressure and rate of advancement. Special care shall be taken when setting the pipe guard rails in the starter shaft to ensure correctness of the alignment, grade and stability.

- e. Do not jack pipe casing until the concrete thrust block and grouted soil zone in starter and receiving shafts have attained the required strength.
- f. The pipe casing shall be jacked in place without damaging the pipe casing joints or completed pipe casing section.
- g. After completion of the jacking operation between starter and receiver shafts, the lubricate material shall be displaced from between the pipe casing exterior and the surrounding ground by a cement grout. Pressure and the amount of grout shall be controlled to avoid pipe damage and displacement of the pipe and soil beyond the tolerances specified in paragraph "Settlement, Alignment and Tolerances." Grouting shall be accomplished promptly after pipe installation has been completed to prevent any surface settlement due to movement of soil material into the void space or loosened zone around the pipe casing.
- h. Any pipe casing which has been damaged during installation shall be replaced by the Contractor at no additional cost. If a new replacement pipe casing is required extending from the starter to the receiver shaft, it shall be installed in conformance with the contract drawings and this section.
- i. Steel pipe casing joints shall be continuously welded with butt joint per [AWS D1.1/D1.1M](#). The welds shall attain the full strength of the pipe and shall result in a full watertight section. The inner face of internal weld seam shall be flush with the pipe to facilitate the installation of the conveyance pipe in the pipe casing. Perform all welding in accordance with requirements for shielded metal arc welding of [AWS D1.5](#) for bridges and [AWS D1.1/D1.1M](#) for buildings and other structures.
- j. Fiberglass pipe casing joints shall be fully watertight and shall attain the full strength of the pipe. Casing joints shall be field connected with sleeve couplings or bell and spigot type joints that utilize elastomeric sealing gaskets as the sole means to maintain joint water tightness. The joint shall have the same outside diameter as the pipe so when the pipelines are assembled such that the joints are flush with the pipe inside and outside surface to facilitate installation of the conveyance pipe in the pipe casing.
- k. All excavated material from tunnel and shaft construction shall be disposed of away from the construction site.
- l. Monitor ground movements associated with the project and make suitable changes in the construction methods that control ground movements and prevent damage or detrimental movement to the work and adjacent structures and pavements.
- m. If directed by the Contracting Officer, install instrumentation, take readings and provide the inspector with weekly reports containing measurements data. These actions are meant to supplement the Contractor's monitoring system and do not relieve the Contractor of his responsibility, nor place on the Contracting Officer, responsibility for control of ground movement and protection of the project and adjacent structures. Instrumentation readings shall be continued for a period of 2 weeks after pipe

casings have been installed to establish that detrimental settlement has not occurred.

- n. The tunnel face and bore shall be fully supported at all times.

### **3.2.5 Ventilation**

- a. Adequate ventilation shall be provided for all cased tunnels and shafts. Follow confined space entry procedures.

### **3.2.6 Lighting**

Adequate lighting shall be provided for the nature of the activity being conducted by workers for the microtunneling. Both power and lighting circuits shall be separated and thoroughly insulated with ground fault interrupters are required. Lights shall comply with requirements with regards to shatter resistance and illumination requirements.

### **3.2.7 Spoil Transportation**

The soil transportation system shall match the excavation rate with rate of spoil removal. The system must also be capable of balancing groundwater pressures and adjustment to maintain face stability for the particular soil conditions of this project.

### **3.2.8 Pipe Jacking Equipment**

The main jacking equipment installed must have a capacity greater than the anticipated jacking load. Intermediate jacking stations shall be provided by the Contractor when the total anticipated jacking force needed to complete the installation may exceed the capacity of the main jacks or the designed maximum jacking force for the pipe. The jacking system shall develop a uniform distribution of jacking forces on the end of the pipe by use of thruster rings and cushioning material.

### **3.2.9 Jacking Pipe**

In general, pipe used for jacking shall be smooth, round, have an even outer surface, and joints that allow for easy connections between pipes. Pipe ends shall be square and smooth so that jacking loads are minimized when the pipe is jacking. Pipe used for pipe jacking shall be capable of withstanding the jacking forces that will be imposed by the process or installation, as well as the final place loading conditions. The driving ends of the pipe and intermediate joints shall be protected from damage.

- a. Any pipe showing signs of failure may be jacked through to the receiving shaft and removed. Other methods of repairing the damaged pipe may be used, as recommended by the manufacturer and subject to approval by the Contracting Officer.

- b. The pipe manufacturer's design jacking loads shall not be exceeded during the installation process. The pipe shall be designed to take full account of all temporary installation loads.

### **3.3 FIELD QUALITY CONTROL**

#### **3.3.1 Field Tests and Inspections**

The Contractor shall perform field tests, and provide labor, equipment, and incidentals required for testing. The Contractor will produce evidence, when required, that any item of work has been constructed in accordance with drawings and specifications.

-- End of Section --

## SECTION 02510N

WATER DISTRIBUTION  
09/00**PART 1 GENERAL****1.1 REFERENCES**

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

## AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

- ANSI B16.18** (1984; R 1994) Cast Copper Alloy Solder Joint Pressure Fittings
- ANSI B18.5.2.1M** (1981; R 1995) Metric Round Head Short Square Neck Bolts

## AMERICAN RAILWAY ENGINEERING &amp; MAINTENANCE-OF-WAY ASSOCIATION (AREMA)

- AREMA Manual** (1994) Manual for Railway Engineering (Fixed Properties)

## AMERICAN SOCIETY OF SANITARY ENGINEERING (ASSE)

- ASME B16.1** (1989) Cast Iron Pipe Flanges and Flanged Fittings
- ASME B16.3** (1992) Malleable Iron Threaded Fittings
- ASME B16.4** (1992) Gray Iron Threaded Fittings
- ASME B16.22** (1989) Wrought Copper and Copper Alloy Solder Joint Pressure Fittings
- ASME B16.26** (1988) Cast Copper Alloy Fittings for Flared Copper Tubes
- ASME B18.2.2** (1987; R 1993) Square and Hex Nuts (Inch Series)
- ASME B18.5.2.2M** (1982; R 1993) Metric Round Head Square Neck Bolts

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- ASTM A 47** (1990) Ferritic Malleable Iron Castings
- ASTM A 48** (1994; Rev. A) Gray Iron Castings
- ASTM A 53** (1995) Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless

ASTM A 307	(1994) Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength
ASTM A 536	(1984; R 1993) Ductile Iron Castings
ASTM A 563	(1994) Carbon and Alloy Steel Nuts
ASTM A 746	(1994) Ductile Iron Gravity Sewer Pipe
ASTM B 32	(1995; Rev. A) Solder Metal
ASTM B 42	(1993) Seamless Copper Pipe, Standard Sizes
ASTM B 61	(1993) Steam or Valve Bronze Castings
ASTM B 62	(1993) Composition Bronze or Ounce Metal Castings
ASTM B 88	(1995) Seamless Copper Water Tube
ASTM C 94	(1997) Ready-Mixed Concrete
ASTM C 150	(1997; Rev. A) Portland Cement
ASTM D 1527	(1994) Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe, Schedules 40 and 80
ASTM D 1785	(1994) Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
ASTM D 2235	(1993; Rev. A) Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings
ASTM D 2241	(1994) Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series)
ASTM D 2282	(1994) Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe
ASTM D 2466	(1994; Rev. A) Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40
ASTM D 2468	(1993) Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe Fittings, Schedule 40
ASTM D 2564	(1993) Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems
ASTM D 2774	(1994) Underground Installation of Thermoplastic Pressure Piping
ASTM D 2855	(1993) Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings
ASTM D 3139	(1995) Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals

- ASTM F 402 (1993) Safe Handling of Solvent Cements, Primers, and Cleaners Used for Joining Thermoplastic Pipe and Fittings
- ASTM F 477 (1995) Elastomeric Seals (Gaskets) for Joining Plastic Pipe
- AMERICAN WATER WORKS ASSOCIATION (AWWA)
- AWWA C104 (1990) Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water
- AWWA C105 (1993) Polyethylene Encasement for Ductile - Iron Pipe Systems
- AWWA C110 (1993) Ductile-Iron and Gray-Iron Fittings, 3 in. Through 48 in. (75 mm Through 1200 mm), for Water and Other Liquids
- AWWA C111 (1990; Erratum 1991) Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
- AWWA C115 (1994) Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges
- AWWA C151 (1991) Ductile-Iron Pipe, Centrifugally Cast, for Water or Other Liquids
- AWWA C153 (1994) Ductile-Iron Compact Fittings, 3 in. Through 24 in. (76 mm Through 610 mm) and 54 in. Through 64 in. (1,000 mm Through 1,600 mm), for Water Service
- AWWA C200 (1991) Steel Water Pipe 6 in. (150 mm) and Larger
- AWWA C203 (1991) Coal-Tar Protective Coatings and Lining for Steel Water Pipelines - Enamel and Tape - Hot Applied
- AWWA C205 (1989) Cement-Mortar Protective Lining and Coating for Steel Water Pipe - 4 in. and Larger - Shop Applied
- AWWA C206 (1991) Field Welding of Steel Water Pipe
- AWWA C207 (1994; Erratum 1994) Steel Pipe Flanges for Waterworks Service - Sizes 4 in. Through 144 in. (100 mm Through 3,600 mm)
- AWWA C208 (1983; Addendum 1984, R 1989) Dimensions for Fabricated Steel Water Pipe Fittings
- AWWA C209 (1990) Cold-Applied Tape Coatings for the Exterior of Special Sections, Connections, and Fittings for Steel Water Pipelines

AWWA C210	(1992) Liquid Epoxy Coating Systems for the Interior and Exterior of Steel Water Pipelines
AWWA C300	(1989; Addendum 1993) Reinforced Concrete Pressure Pipe, Steel-Cylinder Type, for Water and Other Liquids
AWWA C301	(1992) Prestressed Concrete Pressure Pipe, Steel-Cylinder Type, for Water and Other Liquids
AWWA C303	(1987; Erratum 1988) Reinforced Concrete Pressure Pipe, Steel Cylinder Type, Pretensioned, for Water and Other Liquids
AWWA C500	(1993) Metal-Seated Gate Valves for Water Supply Service
AWWA C502	(1994) Dry-Barrel Fire Hydrants
AWWA C503	(1988) Wet-Barrel Fire Hydrants
AWWA C508	(1993) Swing-Check Valves for Waterworks Service, 2 in. (50 mm) Through 24 in. (600 mm) NPS
AWWA C509	(1994) Resilient-Seated Gate Valves for Water and Sewerage Systems
AWWA C600	(1993) Installation of Ductile-Iron Water Mains and Their Appurtenances
AWWA C606	(1987) Grooved and Shouldered Joints
AWWA C651	(1992) Disinfecting Water Mains
AWWA C800	(1989) Underground Service Line Valves and Fittings
AWWA C900	(1989; Addendum 1992) Polyvinyl Chloride (PVC) Pressure Pipe, 4 in. Through 12 in., for Water Distribution
AWWA C906	(1990) Polyethylene (PE) Pressure Pipe and Fittings, 4 in. Through 63 in., for Water Distribution
AWWA M9	(1979) Concrete Pressure Pipe
AWWA M11	(1989) Steel Pipe - A Guide for Design and Installation
AWWA M23	(1980) PVC Pipe - Design and Installation
U.S. GENERAL SERVICES ADMINISTRATION (GSA)	
FS WW-P-460	(Rev. D) Pipe Fittings; Brass or Bronze (Threaded) Classes 125 and 250 Pound

MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS  
INDUSTRY (MSS)

MSS SP-80 (1987) Bronze Gate, Globe, Angle and Check  
Valves

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 24 (1995) Installation of Private Fire Service  
Mains and Their Appurtenances

UNI-BELL PVC PIPE ASSOCIATION (UBPPA)

UBPPA UNI-B-3 (1988) Installation of Polyvinyl Chloride  
(PVC) Pressure Pipe

UBPPA UNI-B-8 (1986) Direct Tapping of Polyvinyl Chloride  
(PVC) Pressure Water Pipe

UNDERWRITERS LABORATORIES (UL)

UL 246 (1993; R 1994, Bul. 1994) Hydrants for Fire-  
Protection Service

UL 262 (1994) Gate Valves for Fire-Protection  
Service

UL 312 (1993; R 1994) Check Valves for Fire-  
Protection Service

UL 789 (1993; R 1994) Indicator Posts for Fire-  
Protection Service

## 1.2 SUBMITTALS

The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES if requested by the Contracting Officer for a specific Delivery Order:

SD-03 Product Data

Piping Materials

Water distribution main piping, fittings, joints, valves, and coupling

Water service line piping, fittings, joints, valves, and coupling

Hydrants

Indicator posts

Corporation stops

Valve boxes

Submit manufacturer's standard drawings or catalog cuts, except submit both drawings and cuts for push-on joints. Include information concerning gaskets with submittal for joints and couplings.

#### SD-07 Certificates

Water distribution main piping, fittings, joints, valves, and coupling

Water service line piping, fittings, joints, valves, and coupling

Shop-applied lining and coating

lining

Fire hydrants, G

Certificates shall attest that tests set forth in each applicable referenced publication have been performed, whether specified in that publication to be mandatory or otherwise and that production control tests have been performed at the intervals or frequency specified in the publication. Other tests shall have been performed within 3 years of the date of submittal of certificates on the same type, class, grade, and size of material as is being provided for the project.

#### SD-08 Manufacturer's Instructions

Installation procedures for water piping

## **1.3 DELIVERY, STORAGE, AND HANDLING**

### **1.3.1 Delivery and Storage**

Inspect materials delivered to site for damage. Unload and store with minimum handling. Store materials on site in enclosures or under protective covering. Store plastic piping, jointing materials and rubber gaskets under cover out of direct sunlight. Do not store materials directly on the ground. Keep inside of pipes, fittings, valves and hydrants free of dirt and debris.

### **1.4.2 Handling**

Handle pipe, fittings, valves, hydrants, and other accessories in a manner to ensure delivery to the trench in sound undamaged condition. Take special care to avoid injury to coatings and linings on pipe and fittings; make satisfactory repairs if coatings or linings are damaged. Carry, do not drag pipe to the trench.

## PART 2 PRODUCTS

### 2.1 WATER DISTRIBUTION MAIN MATERIALS

#### 2.1.1 Piping Materials

##### 2.1.1.1 Ductile-Iron Piping

- a. Pipe and Fittings: Pipe, except flanged pipe, [AWWA C151](#). Flanged pipe, [AWWA C115](#). Fittings, [AWWA C110](#) or [AWWA C153](#); fittings with push-on joint ends conforming to the same requirements as fittings with mechanical-joint ends, except that the bell design shall be modified, as approved, for push-on joint]. Fittings shall have pressure rating at least equivalent to that of the pipe. Ends of pipe and fittings shall be suitable for the specified joints. Pipe and fittings shall have cement-mortar lining, [AWWA C104](#), standard thickness.
- b. Joints and Jointing Material:
  - (1) Joints: Joints for pipe and fittings shall be mechanical joints unless otherwise indicated.
  - (2) Push-On Joints: Shape of pipe ends and fitting ends, gaskets, and lubricant for joint assembly, [AWWA C111](#).
  - (3) Mechanical Joints: Dimensional and material requirements for pipe ends, glands, bolts and nuts, and gaskets, [AWWA C111](#).
  - (4) Flanged Joints: Bolts, nuts, and gaskets for flanged connections as recommended in the Appendix to [AWWA C115](#). Flange for setscrewed flanges shall be of ductile iron, [ASTM A 536](#), Grade 65-45-12, and conform to the applicable requirements of [ASME B16.1](#), Class 250. Setscrews for setscrewed flanges shall be 190,000 psi tensile strength, heat treated and zinc-coated steel. Gasket for setscrewed flanges, in accordance with applicable requirements for mechanical-joint gaskets specified in [AWWA C111](#). Design of setscrewed gasket shall provide for confinement and compression of gasket when joint to adjoining flange is made.
  - (5) Insulating Joints: Designed to effectively prevent metal-to-metal contact at the joint between adjacent sections of piping. Joint shall be of the flanged type with insulating gasket, insulating bolt sleeves, and insulating washers. Gasket shall be of the dielectric type, full face, and in other respects as recommended in the Appendix to [AWWA C115](#). Bolts and nuts, as recommended in the Appendix to [AWWA C115](#).
  - (6) Sleeve-Type Mechanical Coupled Joints: As specified in paragraph entitled "Sleeve-Type Mechanical Couplings."

(7) Grooved and Shouldered Type Joints: Grooved and shouldered pipe ends and couplings, [AWWA C606](#). Joint dimension shall be as specified in [AWWA C606](#) for rigid joints, except that where joints are indicated to be flexible, joint dimensions shall be as specified for flexible joints.

### 2.1.1.2 Polyvinyl Chloride (PVC) Plastic Piping

- a. Pipe and Fittings: Pipe, [AWWA C900](#), shall be plain end or gasket bell end, Pressure Class 150 (DR 18) with cast-iron-pipe-equivalent OD. Molecular Oriented (MO) PVC pipe, [AWWA C900](#), shall be plain end or gasket bell end, Pressure Class 150 with cast-iron-pipe-equivalent OD. Fittings shall be gray iron or ductile iron, [AWWA C110](#) or [AWWA C153](#), and have cement-mortar lining, [AWWA C104](#), standard thickness. Fittings with push-on joint ends shall conform to the same requirements as fittings with mechanical-joint ends, except that bell design shall be modified, as approved, for push-on joint suitable for use with PVC plastic pipe specified in this paragraph.
- b. Joints and Jointing Material: Joints for pipe shall be push-on joints, [ASTM D 3139](#). Joints between pipe and metal fittings, valves, and other accessories shall be push-on joints [ASTM D 3139](#), or compression-type joints/mechanical joints, [ASTM D 3139](#) and [AWWA C111](#). Provide each joint connection with an elastomeric gasket suitable for the bell or coupling with which it is to be used. Gaskets for push-on joints for pipe, [ASTM F 477](#). Gaskets for push-on joints and compression-type joints/mechanical joints for joint connections between pipe and metal fittings, valves, and other accessories, [AWWA C111](#), respectively, for push-on joints and mechanical joints. Mechanically coupled joints using a sleeve-type mechanical coupling, as specified in paragraph entitled "Sleeve-Type Mechanical Couplings," may be used as an optional jointing method in lieu of push-on joints on plain-end PVC plastic pipe, subject to the limitations specified for mechanically coupled joints using a sleeve-type mechanical coupling and to the use of internal stiffeners as specified for compression-type joints in [ASTM D 3139](#).

## 2.1.2 Valves, Hydrants, and Other Water Main Accessories

### 2.1.2.1 Gate Valves on Buried Piping

[AWWA C500](#), [AWWA C509](#), or [UL 262](#). Unless otherwise specified, valves conforming to: (1) [AWWA C500](#) shall be nonrising stem type with double-disc gates and mechanical-joint ends or push-on joint ends as appropriate for the adjoining pipe, (2) [AWWA C509](#) shall be nonrising stem type with mechanical-joint ends, and (3) [UL 262](#) shall be inside-screw type with operating nut, double-disc or split-wedge type gate, designed for a hydraulic working pressure of 150 psi, and shall have mechanical-joint ends or push-on joint ends as appropriate for the pipe to which it is joined. Materials for [UL 262](#) valves shall conform to the reference standards specified in [AWWA C500](#). Valves shall open by counterclockwise rotation of the valve stem. Stuffing

boxes shall have O-ring stem seals, except for those valves for which gearing is specified, in which case use conventional packing in place of O-ring seal. Stuffing boxes shall be bolted and constructed so as to permit easy removal of parts for repair. In lieu of mechanical-joint ends and push-on joint ends, valves may have special ends for connection to sleeve-type mechanical coupling. Valve ends and gaskets for connection to sleeve-type mechanical coupling shall conform to the applicable requirements specified for the joint or coupling.

### 2.1.2.2 Check Valves

Swing-check type, [AWWA C508](#) or [UL 312](#). Valves conforming to: (1) [AWWA C508](#) shall have iron or steel body and cover and flanged ends, and (2) [UL 312](#) shall have cast iron or steel body and cover, flanged ends, and designed for a working pressure of 150 psi. Materials for [UL 312](#) valves shall conform to the reference standards specified in [AWWA C508](#). Valves shall have clear port opening.

### 2.1.2.3 Fire Hydrants

a. Dry-Barrel Type Fire Hydrants, Mueller Super Centurion Series 200 or approved equal. Dry-barrel type hydrants, [AWWA C502](#) or [UL 246](#), "Base Valve" design, shall have 6 inch inlet, 5 1/4 inch valve opening, one 4 1/2 inch pumper connection, and two 2 1/2 inch hose connections. Pumper connection and hose connections shall be individually valved with independent nozzle gate valves. All hydrants shall be "traffic type," shall have breakable features as mentioned in [AWWA C503](#). The traffic type hydrant shall have special couplings joining upper and lower sections of hydrant barrel and upper and lower sections of hydrant stem and shall be designed to have the special couplings break from a force not less than that which would be imposed by a moving vehicle; hydrant shall operate properly under normal conditions. Paint hydrants with at least one coat of primer and two coats of enamel paint to match the Base Standard paint scheme. Stencil hydrant number and main size on the hydrant barrel using black stencil paint.

### 2.1.2.4 Indicator Posts

[UL 789](#). Provide for gate valves where indicated.

### 2.1.2.5 Valve Boxes

Provide a valve box for each gate valve on buried piping, except where indicator post is shown. Valve boxes shall be of cast iron or precast concrete of a size suitable for the valve on which it is to be used and shall be adjustable. Provide a round head. Cast the word "WATER" on the lid. The least diameter of the shaft of the box shall be 5 1/4 inches. Cast-iron box shall have a heavy coat of bituminous paint.

### 2.1.2.8 Tracer Wire for Nonmetallic Piping

Provide bare copper or aluminum wire not less than 0.10 inch in diameter in sufficient length to be continuous over each separate run of nonmetallic pipe.

## 2.2 WATER SERVICE LINE MATERIALS

### 2.2.1 Piping Materials

#### 2.2.1.1 Copper Pipe and Associated Fittings

Pipe, [ASTM B 42](#), regular, threaded ends. Fittings shall be brass or bronze, [FS WW-P-460](#), 125 pound.

#### 2.2.1.2 Copper Tubing and Associated Fittings

Tubing, [ASTM B 88](#), Type K. Fittings for solder-type joint, [ANSI B16.18](#) or [ASME B16.22](#); fittings for compression-type joint, [ASME B16.26](#), flared tube type.

#### 2.2.1.3 Plastic Piping

Polyvinyl Chloride (PVC) Plastic Piping, [ASTM D 1785](#), Schedule 40; or [ASTM D 2241](#), with SDR as necessary to provide 150 psi minimum pressure rating. Fittings, [ASTM D 2466](#). Pipe and fittings shall be of the same PVC plastic material. Solvent cement for jointing, [ASTM D 2564](#).

#### 2.2.1.5 Insulating Joints

Joints between pipe of dissimilar metals shall have a rubber-gasketed or other suitable approved type of insulating joint or dielectric coupling which will effectively prevent metal-to-metal contact between adjacent sections of piping.

### 2.2.2 Water Service Line Appurtenances

#### 2.2.2.1 Corporation Stops

Ground key type; bronze, [ASTM B 61](#) or [ASTM B 62](#); and suitable for the working pressure of the system. Ends shall be suitable for solder-joint, or flared tube compression type joint. Threaded ends for inlet and outlet of

corporation stops, [AWWA C800](#); coupling nut for connection to flared copper tubing, [ASME B16.26](#).

### **2.2.2.2 Curb or Service Stops**

Ground key, round way, inverted key type; made of bronze, [ASTM B 61](#) or [ASTM B 62](#); and suitable for the working pressure of the system. Ends shall be as appropriate for connection to the service piping. Arrow shall be cast into body of the curb or service stop indicating direction of flow.

### **2.2.2.3 Gate Valves on Buried Piping**

Gate valves 3 inch size and larger on buried piping [AWWA C500](#) or [UL 262](#) and of one manufacturer. Valves, [AWWA C500](#), nonrising stem type with double-disc gates. Valves, [UL 262](#), inside-screw type with operating nut, split wedge or double disc type gate, and designed for a hydraulic working pressure of 175 psi.

### **2.2.2.4 Gate Valves on Buried Piping**

Gate valves smaller than 3-inch size on Buried Piping [MSS SP-80](#), Class 150, solid wedge, nonrising stem. Valves shall have flanged or threaded end connections, with a union on one side of the valve. Provide handwheel operators.

### **2.2.2.5 Curb Boxes**

Provide a curb box for each curb or service stop. Curb boxes shall be of cast iron of a size suitable for the stop on which it is to be used. Provide a round head. Cast the word "WATER" on the lid. Each box shall have a heavy coat of bituminous paint.

### **2.2.2. Valve Boxes**

Provide a valve box for each gate valve on buried piping. Valve boxes shall be of cast iron or precast concrete of a size suitable for the valve on which it is to be used and shall be adjustable. Provide a round head. Cast the word "WATER" on the lid. The least diameter of the shaft of the box shall be 5 1/4 inches. Cast-iron box shall have a heavy coat of bituminous paint.

## **PART 3 EXECUTION**

### **3.1 INSTALLATION OF PIPELINES**

### 3.1.1 General Requirements for Installation of Pipelines

These requirements shall apply to all pipeline **installation** except where specific exception is made in the "Special Requirements..." paragraphs.

#### 3.1.1.1 Location of Water Lines

Do not lay water lines in the same trench with gas lines, fuel lines, or electric wiring.

- a. Water Piping Installation Parallel With Sewer Piping
  - (1) Normal Conditions: Lay water piping at least 10 feet horizontally from a sewer or sewer manhole whenever possible. Measure the distance edge-to-edge.
  - (2) Unusual Conditions: When local conditions prevent a horizontal separation of 10 feet, the water piping may be laid closer to a sewer or sewer manhole provided that:
    - (a) The bottom (invert) of the water piping shall be at least 18 inches above the top (crown) of the sewer piping.
    - (b) Where this vertical separation cannot be obtained, the sewer piping shall be constructed of AWWA-approved water pipe and pressure tested in place without leakage prior to backfilling.
    - (c) The sewer manhole shall be of watertight construction and tested in place.
- b. Installation of Water Piping Crossing Sewer Piping
  - (1) Normal Conditions: Water piping crossing above sewer piping shall be laid to provide a separation of at least 18 inches between the bottom of the water piping and the top of the sewer piping.
  - (2) Unusual Conditions: When local conditions prevent a vertical separation described above, use the following construction:
    - (a) Sewer piping passing over or under water piping shall be constructed of AWWA-approved ductile iron water piping, pressure tested in place without leakage prior to backfilling.
    - (b) Water piping passing under sewer piping shall, in addition, be protected by providing a vertical separation of at least 18 inches between the bottom of the sewer piping and the top of the water piping; adequate structural support for the sewer piping to prevent excessive deflection of the joints and the settling on and breaking of the water piping; and that the length, minimum 20 feet, of the water piping be centered at the point of the crossing so that joints shall be equidistant and as far as possible from the sewer piping.
- c. Sewer Piping or Sewer Manholes: No water piping shall pass through or come in contact with any part of a sewer manhole.

### **3.1.1.3 Pipe Laying and Jointing**

Remove fins and burrs from pipe and fittings. Before placing in position, clean pipe, fittings, valves, and accessories, and maintain in a clean condition. Provide proper facilities for lowering sections of pipe into trenches. Do not under any circumstances drop or dump pipe, fittings, valves, or any other water line material into trenches. Cut pipe accurately to length established at the site and work into place without springing or forcing. Replace by one of the proper length any pipe or fitting that does not allow sufficient space for proper installation of jointing material. Blocking or wedging between bells and spigots will not be permitted. Lay bell-and-spigot pipe with the bell end pointing in the direction of laying. Grade the pipeline in straight lines; avoid the formation of dips and low points. Support pipe at proper elevation and grade. Secure firm, uniform support. Wood support blocking will not be permitted. Lay pipe so that the full length of each section of pipe and each fitting will rest solidly on the pipe bedding; excavate recesses to accommodate bells, joints, and couplings. Provide anchors and supports where necessary for fastening work into place. Make proper provision for expansion and contraction of pipelines. Keep trenches free of water until joints have been properly made. At the end of each work day, close open ends of pipe temporarily with wood blocks or bulkheads. Do not lay pipe when conditions of trench or weather prevent installation. Depth of cover over top of pipe shall not be less than 2 1/2 feet.

### **3.1.1.4 Installation of Tracer Wire**

Install a continuous length of tracer wire for the full length of each run of nonmetallic pipe. Attach wire to top of pipe in such manner that it will not be displaced during construction operations.

### **3.1.1.5 Connections to Existing Water Lines**

Make connections to existing water lines after approval is obtained and with a minimum interruption of service on the existing line. Make connections to existing lines under pressure in accordance with the recommended procedures of the manufacturer of the pipe being tapped, except as otherwise specified, tap concrete pipe in accordance with [AWWA M9](#) for tapping concrete pressure pipe.

## **3.1.2 Special Requirements for Installation of Water Mains**

### **3.1.2.1 Installation of Ductile-Iron Piping**

Unless otherwise specified, install pipe and fittings in accordance with paragraph entitled "General Requirements for Installation of Pipelines" and with the requirements of [AWWA C600](#) for pipe installation, joint assembly, valve-and-fitting installation, and thrust restraint.

- a. Jointing: Make push-on joints with the gaskets and lubricant specified for this type joint; assemble in accordance with the applicable requirements of [AWWA C600](#) for joint assembly. Make mechanical joints with the gaskets, glands, bolts, and nuts specified for this type joint; assemble in accordance with the applicable requirements of [AWWA C600](#) for joint assembly and the recommendations of Appendix A to [AWWA C111](#). Make flanged joints with the gaskets, bolts, and nuts specified for this type joint. Assemble joints made with sleeve-type mechanical couplings in accordance with the recommendations of the coupling manufacturer. Make insulating joints with the gaskets, sleeves, washers, bolts, and nuts previously specified for this type joint. Assemble insulating joints as specified for flanged joints, except that bolts with insulating sleeves shall be full size for the bolt holes. Ensure that there is no metal-to-metal contact between dissimilar metals after the joint has been assembled.
- b. Pipe Anchorage: Provide concrete thrust blocks (reaction backing) for pipe anchorage. Thrust blocks shall be in accordance with the requirements of [AWWA C600](#) for thrust restraint. Use concrete, [ASTM C 94](#), having a minimum compressive strength of 2,500 psi at 28 days. Metal harness shall be in accordance with the requirements of [AWWA C600](#) for thrust restraint, using tie rods and clamps as shown in [NFPA 24](#).
- c. Exterior Protection: Completely encase buried ductile iron pipelines with polyethylene tube or sheet, using Class A polyethylene film, in accordance with [AWWA C105](#).

### 3.1.2.2 Installation of PVC Plastic Water Main Pipe

Installation of PVC Plastic Water Main Pipe and Associated Fittings: Unless otherwise specified, install pipe and fittings in accordance with paragraph entitled "General Requirements for Installation of Pipelines"; with the requirements of [UBPPA UNI-B-3](#) for laying of pipe, joining PVC pipe to fittings and accessories, and setting of hydrants, valves, and fittings; and with the recommendations for pipe joint assembly and appurtenance installation in [AWWA M23](#), Chapter 7, "Installation."

- a. Jointing: Make push-on joints with the elastomeric gaskets specified for this type joint, using either elastomeric-gasket bell-end pipe or elastomeric-gasket couplings. For pipe-to-pipe push-on joint connections, use only pipe with push-on joint ends having factory-made bevel; for push-on joint connections to metal fittings, valves, and other accessories, cut spigot end of pipe off square and re-bevel pipe end to a bevel approximately the same as that on ductile-iron pipe used for the same type of joint. Use an approved lubricant recommended by the pipe manufacturer for push-on joints. Assemble push-on joints for pipe-to-pipe joint connections in accordance with the requirements of [UBPPA UNI-B-3](#) for laying the pipe and the recommendations in [AWWA M23](#), Chapter 7, "Installation," for pipe joint assembly. Assemble push-on joints for connection to fittings, valves, and other accessories in accordance with the requirements of [UBPPA UNI-B-3](#) for joining PVC pipe to fittings and accessories and with the applicable requirements of [AWWA C600](#) for joint assembly. Make compression-

type joints/mechanical joints with the gaskets, glands, bolts, nuts, and internal stiffeners previously specified for this type joint; assemble in accordance with the requirements of [UBPPA UNI-B-3](#) for joining PVC pipe to fittings and accessories, with the applicable requirements of [AWWA C600](#) for joint assembly, and with the recommendations of Appendix A to [AWWA C111](#). Cut off spigot end of pipe for compression-type joint/mechanical-joint connections and do not re-bevel. Assemble joints made with sleeve-type mechanical couplings in accordance with the recommendations of the coupling manufacturer using internal stiffeners as previously specified for compression-type joints.

- b. Pipe Anchorage: Provide concrete thrust blocks (reaction backing) for pipe anchorage, except where metal harness is indicated. Thrust blocks shall be in accordance with the requirements of [UBPPA UNI-B-3](#) for reaction or thrust blocking and plugging of dead ends. Use concrete, [ASTM C 94](#), having a minimum compressive strength of 2,500 psi at 28 days.

### 3.1.2.3 Installation of Valves and Hydrants

- a. Installation of Valves: Install gate valves, [AWWA C500](#) and [UL 262](#), in accordance with the requirements of [AWWA C600](#) for valve-and-fitting installation and with the recommendations of the Appendix ("Installation, Operation, and Maintenance of Gate Valves") to [AWWA C500](#). Install gate valves, [AWWA C509](#), in accordance with the requirements of [AWWA C600](#) for valve-and-fitting installation and with the recommendations of the Appendix ("Installation, Operation, and Maintenance of Gate Valves") to [AWWA C509](#). Install gate valves on PVC water mains in accordance with the recommendations for appurtenance installation in [AWWA M23](#), Chapter 7, "Installation." Install check valves in accordance with the applicable requirements of [AWWA C600](#) for valve-and-fitting installation
- b. Installation of Hydrants: Install hydrants in accordance with [AWWA C600](#) for hydrant installation and as indicated. Make and assemble joints as specified for making and assembling the same type joints between pipe and fittings. Install hydrants with the 4 1/2 inch connections facing the adjacent paved surface.

## 3.1.3 Installation of Water Service Piping

### 3.1.3.1 Location

Connect water service piping to the building service where the building service has been installed. Where building service has not been installed, terminate water service lines approximately 5 feet from the building line at a point directed by the Contracting Officer; such water service lines shall be closed with plugs or caps.

### 3.1.3.2 Service Line Connections to Water Mains

Connect service lines to the main as indicated. Connect service lines to ductile-iron water mains in accordance with [AWWA C600](#) for service taps. Connect service lines to PVC plastic water mains in accordance with [UBPPA UNI-B-8](#) and the recommendations of [AWWA M23](#), Chapter 9, "Service Connections." Connect service lines to concrete water mains in accordance with the recommendations of [AWWA M9](#), Chapter 12, "Tapping Concrete Pressure Pipe." Connect service lines to steel water mains in accordance with the recommendations of the steel water main pipe manufacturer and with the recommendations for special and valve connections and other appurtenances in [AWWA M11](#), Chapter 13, "Supplementary Design Data and Details."

### 3.1.4 Special Requirements for Installation of Water Service Piping

#### 3.1.4.1 Installation of Metallic Piping

Install pipe and fittings in accordance with paragraph entitled "General Requirements for Installation of Pipelines" and with the applicable requirements of [AWWA C600](#) for pipe installation, unless otherwise specified.

a. Jointing:

(1) Screwed Joints: Make screwed joints up tight with a stiff mixture of graphite and oil, inert filler and oil, or graphite compound; apply to male threads only. Threads shall be full cut; do not leave more than three threads on the pipe exposed after assembling the joint.

(2) Joints for Copper Tubing: Cut copper tubing with square ends; remove fins and burrs. Handle tubing carefully; replace dented, gouged, or otherwise damaged tubing with undamaged tubing. Make solder joints using [ASTM B 32](#), 95-5 tin-antimony or Grade Sn96 solder. Solder and flux shall contain not more than 0.2 percent lead. Before making joint, clean ends of tubing and inside of fitting or coupling with wire brush or abrasive. Apply a rosin flux to the tubing end and on recess inside of fitting or coupling. Insert tubing end into fitting or coupling for the full depth of the recess and solder. For compression joints on flared tubing, insert tubing through the coupling nut and flare tubing.

(3) Flanged Joints: Make flanged joints up tight, taking care to avoid undue strain on flanges, valves, fittings, and accessories.

#### 3.1.4.2 Installation of Plastic Piping

Install pipe and fittings in accordance with paragraph entitled "General Requirements for Installation of Pipelines" and with the applicable requirements of [ASTM D 2774](#) and [ASTM D 2855](#), unless otherwise specified. Handle solvent cements used to join plastic piping in accordance with [ASTM F 402](#).

- a. **Jointing:** Make solvent-cemented joints for PVC plastic piping using the solvent cement previously specified for this material; assemble joints in accordance with [ASTM D 2855](#). Make plastic pipe joints to other pipe materials in accordance with the recommendations of the plastic pipe manufacturer.
- b. **Plastic Pipe Connections to Appurtenances:** Connect plastic pipe service lines to corporation stops and gate valves in accordance with the recommendations of the plastic pipe manufacturer.

### **3.1.5 Disinfection**

Disinfect new water piping and existing water piping affected by Contractor's operations in accordance with [AWWA C651](#). Fill piping systems with solution containing minimum of 50 parts per million of available chlorine and allow solution to stand for minimum of 24 hours. Flush solution from the systems with domestic water until maximum residual chlorine content is within the range of 0.2 and 0.5 parts per million, or the residual chlorine content of domestic water supply. Obtain at least two consecutive satisfactory bacteriological samples from new water piping, analyze by a certified laboratory, and submit the results prior to the new water piping being placed into service.

## **3.2 FIELD QUALITY CONTROL**

### **3.2.1 Field Tests and Inspections**

The Contracting Officer will conduct field inspections and witness field tests specified in this section. The Contractor shall perform field tests, and provide labor, equipment, and incidentals required for testing. The Contractor shall produce evidence, when required, that any item of work has been constructed in accordance with the drawings and specifications.

### **3.2.2 Testing Procedure**

Test water mains and water service lines in accordance with the applicable specified standard, except for the special testing requirements given in paragraph entitled "Special Testing Requirements." Test ductile-iron water mains in accordance with the requirements of [AWWA C600](#) for hydrostatic testing. The amount of leakage on ductile-iron pipelines with mechanical-joints or push-on joints shall not exceed the amounts given in [AWWA C600](#); no leakage will be allowed at joints made by any other method. Test PVC plastic water mains and water service lines made with PVC plastic water main pipe in accordance with the requirements of [UBPPA UNI-B-3](#) for pressure and leakage tests. The amount of leakage on pipelines made of PVC plastic water main pipe shall not exceed the amounts given in [UBPPA UNI-B-3](#), except that at joints made with sleeve-type mechanical couplings, no leakage will be allowed. Test water service lines in accordance with applicable requirements of [AWWA C600](#) for hydrostatic testing. No leakage will be allowed at copper pipe joints, copper tubing joints (soldered, compression type, brazed), plastic pipe joints, flanged joints and screwed joints.

### **3.2.3 Special Testing Requirements**

For pressure test, use a hydrostatic pressure 50 psi greater than the maximum working pressure of the system, except that for those portions of the system having pipe size larger than 2 inches in diameter, hydrostatic test pressure shall be not less than 200 psi. Hold this pressure for not less than 2 hours. Prior to the pressure test, fill that portion of the pipeline being tested with water for a soaking period of not less than 24 hours. For leakage test, use a hydrostatic pressure not less than the maximum working pressure of the system. Leakage test may be performed at the same time and at the same test pressure as the pressure test.

-- End of Section --

SECTION 02531  
SANITARY SEWERS  
07/03

## PART 1 GENERAL

### 1.1 REFERENCES

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

ASTM INTERNATIONAL (ASTM)

ASTM A 123/A 123M	(2002) Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A 307	(2002) Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength
ASTM A 47/A 47M	(1999) Ferritic Malleable Iron Castings
ASTM C 150	(2002a) Portland Cement
ASTM C 260	(2001) Air-Entraining Admixtures for Concrete
ASTM C 270	(2002) Mortar for Unit Masonry
ASTM C 33	(2002a) Concrete Aggregates
ASTM C 443	(2002) Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
ASTM C 478	(2002a) Precast Reinforced Concrete Manhole Sections
ASTM C 478M	(1997) Precast Reinforced Concrete Manhole Sections (Metric)
ASTM C 923	(2002) Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals
ASTM C 94/C 94M	(2000e2) Ready-Mixed Concrete
ASTM C 969	(2002) Infiltration and Exfiltration Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines
ASTM C 972	(2000) Compression-Recovery of Tape Sealant

ASTM C 990	(2001a) Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealers
ASTM D 1784	(1999ae1) Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
ASTM D 1785	(1999) Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
ASTM D 2241	(2000) Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series)
ASTM D 2412	(2002) Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading
ASTM D 2464	(1999) Threaded Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80
ASTM D 2466	(2002) Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40
ASTM D 2467	(2002) Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80
ASTM D 2680	(2001) Acrylonitrile-Butadiene-Styrene (ABS) and Poly(Vinyl Chloride) (PVC) Composite Sewer Piping
ASTM D 3034	(2000) Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings
ASTM D 3139	(1998) Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
ASTM D 3212	(1996a) Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
ASTM D 3753	(1999) Glass-Fiber-Reinforced Polyester Manholes and Wet Wells
ASTM D 412	(1998a) Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers - Tension
ASTM D 624	(2000e1) Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers
ASTM F 402	(1993; R 1999) Safe Handling of Solvent Cements, Primers, and Cleaners Used for Joining Thermoplastic Pipe and Fittings
ASTM F 477	(2002e1) Elastomeric Seals (Gaskets) for Joining Plastic Pipe

- ASTM F 758 (1995; R 2000) Smooth-Wall Poly(Vinyl Chloride) (PVC) Plastic Underdrain Systems for Highway, Airport, and Similar Drainage
- ASTM F 794 (2001) Poly(Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter
- ASTM F 949 (2001a) Poly(Vinyl Chloride) (PVC) Corrugated Sewer Pipe with a Smooth Interior and Fittings

AMERICAN WATER WORKS ASSOCIATION (AWWA)

- AWWA C900 (1997) Polyvinyl Chloride (PVC) Pressure Pipe, and Fabricated Fittings, 4 In. Through 12 In. (100 mm Through 300 mm), for Water Distribution
- AWWA M23 (2002) Manual: PVC Pipe - Design and Installation

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

- FS A-A-60005 (Basic) Frames, Covers, Gratings, Steps, Sump and Catch Basin, Manhole

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

- 29 CFR 1910.27 Fixed Ladders

UNI-BELL PVC PIPE ASSOCIATION (UBPPA)

- UBPPA UNI-B-3 (1992) Recommended Practice for the Installation of Polyvinyl Chloride (PVC) Pressure Pipe (Nominal Diameters 4-36 Inch)
- UBPPA UNI-B-6 (1998) Recommended Practice for the Low-Pressure Air Testing of Installed Sewer Pipe

## 1.2 SYSTEM DESCRIPTION

### 1.2.1 Sanitary Sewer Gravity Pipeline

Provide mains and laterals of polyvinyl chloride (PVC) plastic pipe as indicated. Provide building connections of polyvinyl chloride (PVC) plastic pipe as indicated.

### 1.2.2 Sanitary Sewer Pressure Lines

Work on existing pressure lines or installation of new pressure pipe is not within the scope of this contract.

### **1.3 GENERAL REQUIREMENTS**

The construction required herein shall include appurtenant structures and building sewers to points of connection with the building drains 5 feet outside the building to which the sewer system is to be connected. The Contractor shall replace damaged material and redo unacceptable work at no additional cost to the Government. Excavation and backfilling is specified in Section [02300, EARTHWORK](#). Backfilling shall be accomplished after inspection by the Contracting Officer. Before, during, and after installation, plastic pipe and fittings shall be protected from any environment that would result in damage or deterioration to the material. The Contractor shall have a copy of the manufacturer's instructions available at the construction site at all times and shall follow these instructions unless directed otherwise by the Contracting Officer. Solvents, solvent compounds, lubricants, elastomeric gaskets, and any similar materials required to install the plastic pipe shall be stored in accordance with the manufacturer's recommendation and shall be discarded if the storage period exceeds the recommended shelf life. Solvents in use shall be discarded when the recommended pot life is exceeded.

### **1.4 SUBMITTALS**

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only or as otherwise designated. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section [01330 SUBMITTAL PROCEDURES](#) if requested by the Contracting Officer for a specific Delivery Order:

#### SD-02 Shop Drawings

Precast concrete manhole

Metal items

Frames, covers, and gratings

#### SD-03 Product Data

Pipeline materials

Submit manufacturer's standard drawings or catalog cuts.

### **1.5 DELIVERY, STORAGE, AND HANDLING**

## **1.5.1 Delivery and Storage**

### **1.5.1.1 Piping**

Inspect materials delivered to site for damage; store with minimum of handling. Store materials on site in enclosures or under protective coverings. Store plastic piping and jointing materials and rubber gaskets under cover out of direct sunlight. Do not store materials directly on the ground. Keep inside of pipes and fittings free of dirt and debris.

### **1.5.1.2 Metal Items**

Check upon arrival; identify and segregate as to types, functions, and sizes. Store off the ground in a manner affording easy accessibility and not causing excessive rusting or coating with grease or other objectionable materials.

## **1.5.2 Handling**

Handle pipe, fittings, and other accessories in such manner as to ensure delivery to the trench in sound undamaged condition. Carry, do not drag, pipe to trench.

## **1.6 MEASUREMENT AND PAYMENT**

### **1.6.1 Pipe**

The length of pipe installed will be measured along the centerlines of the pipe and will be paid for at the contract unit price according to the Bid Schedule for the number of linear feet of the specified pipe placed and accepted.

### **1.6.2 Manholes**

The depth of manholes measured from the top of grating or cover to the bottom of the base slab will be paid for at the contract unit price in the Bid Schedule for vertical linear feet placed and accepted. Payment shall include manhole, frame, cover or grate, ladders or steps, excavation and backfill. Payment shall constitute full compensation for all materials and labor necessary to complete the work as specified

### **1.6.3 Pipe Excavation and Backfill**

Payment will be made for the number of cubic yards of material acceptably excavated and backfilled within the limits of the trench as specified in the contract Bid Schedule and defined in Section 02300, EARTHWORK.

## **PART 2 PRODUCTS**

### **2.1 PVC Plastic Gravity Sewer Piping**

#### **2.1.1 PVC Plastic Gravity Pipe and Fittings**

ASTM D 3034, SDR 35, or ASTM F 949 with ends suitable for elastomeric gasket joints. ASTM F 794, Series 46, for ribbed sewer pipe with smooth interior, size 8 inch through 48 inch diameters.

#### **2.1.2 PVC Plastic Gravity Joints and Jointing Material**

Joints shall conform to ASTM D 3212. Gaskets shall conform to ASTM F 477.

## **2.2 CONCRETE MATERIALS**

### **2.2.1 Cement Mortar**

Cement mortar shall conform to ASTM C 270, Type M with Type II cement.

### **2.2.2 Portland Cement**

Portland cement shall conform to ASTM C 150, Type II for concrete used in concrete pipe, concrete pipe fittings, and manholes and type optional with the Contractor for cement used in concrete cradle, concrete encasement, and thrust blocking.

### **2.2.3 Portland Cement Concrete**

Portland cement concrete shall conform to ASTM C 94/C 94M, compressive strength of 3000 psi at 28 days, except for concrete cradle and encasement or concrete blocks for manholes. Concrete used for cradle and encasement shall have a compressive strength of 2500 psi minimum at 28 days. Concrete in place shall be protected from freezing and moisture loss for 7 days.  
Text

## **2.3 MISCELLANEOUS MATERIALS**

### **2.3.1 Precast Concrete Manholes and Glass-Fiber-Reinforced Polyester Manholes.**

Precast concrete manhole risers, base sections, and tops shall conform to ASTM C 478; base and first riser shall be monolithic. Glass-Fiber-Reinforced Polyester Manholes shall conform to ASTM D 3753.

### **2.3.2 Gaskets and Connectors**

Gaskets for joints between manhole sections shall conform to ASTM C 443. Resilient connectors for making joints between manhole and pipes entering manhole shall conform to ASTM C 923 or ASTM C 990.

### **2.3.3 External Preformed Rubber Joint Seals**

An external preformed rubber joint seal shall be an accepted method of sealing cast iron covers to precast concrete sections to prevent ground water infiltration into sewer systems. All finished and sealed manholes constructed in accordance with paragraph entitled "Manhole Construction" shall be tested for leakage in the same manner as pipelines as described in paragraph entitled "Leakage Tests." The seal shall be multi-section with a neoprene rubber top section and all lower sections made of Ethylene Propylene Di Monomer (EPDM) rubber with a minimum thickness of 60 mils. Each unit shall consist of a top and bottom section and shall have mastic on the bottom of the bottom section and mastic on the top and bottom of the top section. The mastic shall be a non-hardening butyl rubber sealant and shall seal to the cone/top slab of the manhole/catch basin and over the lip of the casting. Extension sections shall cover up to two more adjusting rings.

### **2.3.4 Metal Items**

#### **2.3.4.1 Frames, Covers, and Gratings for Manholes**

FS A-A-60005, cast iron; Frames and covers shall be cast iron, ductile iron or reinforced concrete. Cast iron frames and covers shall be as indicated or shall be of type suitable for the application, circular, without vent holes. The frames and covers shall have a combined weight of not less than 400 pounds. Reinforced concrete frames and covers shall be as indicated or shall conform to ASTM C 478 or ASTM C 478M. The word "Sewer" shall be stamped or cast into covers so that it is plainly visible.

#### **2.3.4.2 Manhole Steps**

Zinc-coated steel conforming to 29 CFR 1910.27. As an option, plastic or rubber coating pressure-molded to the steel may be used if approved by the Contracting Officer.

### **2.3.4.3 Manhole Ladders**

A steel ladder shall be provided where the depth of a manhole exceeds 12 feet. The ladder shall not be less than 16 inches in width, with 3/4 inch diameter rungs spaced 12 inches apart. The two stringers shall be a minimum 3/8 inch thick and 2 inches wide. Ladders and inserts shall be galvanized after fabrication in conformance with ASTM A 123/A 123M.

## **PART 3 EXECUTION**

### **3.1 INSTALLATION OF PIPELINES AND APPURTENANT CONSTRUCTION**

#### **3.1.1 General Requirements for Installation of Pipelines**

Apply except where specific exception is made by the Contracting Officer.

##### **3.1.1.1 Location**

The work covered by this section shall terminate at a point approximately 5 feet from the building, unless otherwise indicated. Where the location of the sewer is not clearly defined by dimensions on the drawings, do not lay sewer line closer horizontally than 10 feet to a water main or service line. Where sanitary sewer lines pass above water lines, encase sewer in concrete for a distance of 10 feet on each side of the crossing, or substitute rubber-gasketed pressure pipe for the pipe being used for the same distance. Where sanitary sewer lines pass below water lines, lay pipe so that no joint in the sewer line will be closer than 3 feet, horizontal distance, to the water line.

a. Sanitary piping installation parallel with water line:

(1) Normal conditions: Sanitary piping or manholes shall be laid at least 10 feet horizontally from a water line whenever possible. The distance shall be measured edge-to-edge.

(2) Unusual conditions: When local conditions prevent a horizontal separation of 10 feet, the sanitary piping or manhole may be laid closer to a water line provided that:

(a) The top (crown) of the sanitary piping shall be at least 18 inches below the bottom (invert) of the water main.

(b) Where this vertical separation cannot be obtained, the sanitary piping shall be constructed of AWWA-approved ductile iron

water pipe pressure tested in place without leakage prior to backfilling.

(c) The sewer manhole shall be of watertight construction and tested in place.]

b. Installation of sanitary piping crossing a water line:

(1) Normal conditions: Lay sanitary piping crossing water lines to provide a separation of at least 18 inches between the top of the sanitary piping and the bottom of the water line whenever possible.

(2) Unusual conditions: When local conditions prevent a vertical separation described above, use the following construction:

(a) Sanitary piping passing over or under water lines shall be constructed of AWWA-approved ductile iron water pipe, pressure tested in place without leakage prior to backfilling.

(b) Sanitary piping passing over water lines shall, in addition, be protected by providing:

1. A vertical separation of at least 18 inches between the bottom of the sanitary piping and the top of the water line.

2. Adequate structural support for the sanitary piping to prevent excessive deflection of the joints and the settling on and breaking of the water line.

3. That the length, minimum 20 feet, of the sanitary piping be centered at the point of the crossing so that joints shall be equidistant and as far as possible from the water line.

c. Sanitary sewer manholes: No water piping shall pass through or come in contact with any part of a sanitary sewer manhole.

### 3.1.1.2 Pipe Laying and Jointing

Inspect each pipe and fitting before and after installation; replace those found defective and remove from site. Provide proper facilities for lowering sections of pipe into trenches. Lay nonpressure pipe with the bell ends in the upgrade direction. Adjust spigots in bells to give a uniform space all around. Blocking or wedging between bells and spigots will not be permitted. Replace by one of the proper dimensions, pipe or fittings that do not allow sufficient space for installation of joint material. At the end of each work day, close open ends of pipe temporarily with wood blocks or bulkheads. Provide batterboards not more than 25 feet apart in trenches for checking and ensuring that pipe invert elevations are as indicated. Laser beam method may be used in lieu of batterboards for the same purpose.

Branch connections shall be made by use of regular fittings or solvent cemented saddles as approved. Saddles for ABS and PVC composite pipe shall conform to Figure 2 of [ASTM D 2680](#); and saddles for PVC pipe shall conform to Table 4 of [ASTM D 3034](#).

Install pipe and fittings in accordance with the requirements of [ASTM D 2321](#) for laying and joining pipe and fittings. Make joints with the gaskets specified for joints with this piping and assemble in accordance with the requirements of [ASTM D 2321](#) for assembly of joints. Make joints to other pipe materials in accordance with the recommendations of the plastic pipe manufacturer.

### **3.1.1.3 Connections to Existing Lines**

Obtain approval from the Contracting Officer before making connections or repairs to existing line. Conduct work so that there is minimum interruption of service on existing lines. The Contractor shall bypass the section of pipe to be replaced by pumping from the upstream manhole to a point in the system of adequate size to accommodate the flow. The bypass will be considered a subsidiary obligation of the Contractor and no separate payment will be made for this work.

### **3.1.2 Concrete Work**

Cast-in-place concrete is included in Section [03307A](#), "Concrete for Minor Structures."

### **3.1.3 Manhole Construction**

Construct base slab of cast-in-place concrete or use precast concrete base sections. Make inverts in cast-in-place concrete and precast concrete bases with a smooth-surfaced semi-circular bottom conforming to the inside contour of the adjacent sewer sections. For changes in direction of the sewer and entering branches into the manhole, make a circular curve in the manhole invert of as large a radius as manhole size will permit. For cast-in-place concrete construction, either pour bottom slabs and walls integrally or key and bond walls to bottom slab. No parging will be permitted on interior manhole walls. For precast concrete construction, make joints between manhole sections with the gaskets specified for this purpose; install in the manner specified for installing joints in concrete piping. Parging will not be required for precast concrete manholes. Cast-in-place concrete work shall be in accordance with the requirements specified under paragraph entitled "Concrete Work" of this section. Make joints between concrete manholes and pipes entering manholes with the resilient connectors specified for this purpose; install in accordance with the recommendations of the connector manufacturer. Where a new manhole is constructed on an existing line, remove existing pipe as necessary to construct the manhole. Cut existing pipe so that pipe ends are approximately flush with the interior face of manhole wall, but not protruding into the manhole. Use resilient connectors as previously specified for pipe connectors to concrete manholes.

### **3.1.4 Miscellaneous Construction and Installation**

### **3.1.4.1 Connecting to Existing Manholes**

Pipe connections to existing manholes shall be made so that finish work will conform as nearly as practicable to the applicable requirements specified for new manholes, including all necessary concrete work, cutting, and shaping. The connection shall be centered on the manhole. Holes for the new pipe shall be of sufficient diameter to allow packing cement mortar around the entire periphery of the pipe but no larger than 1.5 times the diameter of the pipe. Cutting the manhole shall be done in a manner that will cause the least damage to the walls.

### **3.1.4.2 Metal Work**

- a. Workmanship and finish: Perform metal work so that workmanship and finish will be equal to the best practice in modern structural shops and foundries. Form iron to shape and size with sharp lines and angles. Do shearing and punching so that clean true lines and surfaces are produced. Make castings sound and free from warp, cold shuts, and blow holes that may impair their strength or appearance. Give exposed surfaces a smooth finish with sharp well-defined lines and arises. Provide necessary rabbets, lugs, and brackets wherever necessary for fitting and support.
- b. Field painting: After installation, clean cast-iron frames, covers, gratings, and steps not buried in concrete to bare metal of mortar, rust, grease, dirt, and other deleterious materials and apply a coat of bituminous paint. Do not paint surfaces subject to abrasion.

## **3.2 FIELD QUALITY CONTROL**

### **3.2.1 Field Tests and Inspections**

The Contractor shall conduct field inspections and conduct field tests specified in this section in the presence of the Contracting Officer. The Contractor shall perform field tests and provide labor, equipment, and incidentals required for testing. Be able to produce evidence, when required, that each item of work has been constructed in accordance with the drawings and specifications. Testing, correction, and retesting shall be conducted at no cost to the Government.

### **3.2.2 Tests for Nonpressure Lines**

Check each straight run of pipeline for gross deficiencies by holding a light in a manhole; it shall show a practically full circle of light through the pipeline when viewed from the adjoining end of line. When pressure piping is used in a nonpressure line for nonpressure use, test this piping as specified for nonpressure pipe.

### 3.2.2.1 Leakage Tests

Test lines for leakage by either infiltration tests or exfiltration tests, or by low-pressure air tests. Prior to testing for leakage, backfill trench up to at least lower half of pipe. When necessary to prevent pipeline movement during testing, place additional backfill around pipe sufficient to prevent movement, but leaving joints uncovered to permit inspection. When leakage or pressure drop exceeds the allowable amount specified, make satisfactory correction and retest pipeline section in the same manner. Correct visible leaks regardless of leakage test results.

- a. Infiltration tests and exfiltration tests: Perform these tests for sewer lines made of the specified materials, not only concrete, in accordance with [ASTM C 969](#). Make calculations in accordance with the Appendix to [ASTM C 969](#).
- b. Low-pressure air tests: Perform tests as follows:

PVC plastic pipelines: Test in accordance with [UBPPA UNI-B-6](#). Allowable pressure drop shall be as given in [UBPPA UNI-B-6](#). Make calculations in accordance with the Appendix to [UBPPA UNI-B-6](#).

### 3.2.2.2 Deflection Testing

Perform a deflection test on entire length of installed plastic pipeline on completion of work adjacent to and over the pipeline, including leakage tests, backfilling, placement of fill, grading, paving, concreting, and any other superimposed loads determined in accordance with [ASTM D 2412](#). Deflection of pipe in the installed pipeline under external loads shall not exceed 4.5 percent of the average inside diameter of pipe. Determine whether the allowable deflection has been exceeded by use of a pull-through device or a deflection measuring device.

- a. Pull-through device: This device shall be a spherical, spheroidal, or elliptical ball, a cylinder, or circular sections fused to a common shaft. Circular sections shall be so spaced on the shaft that distance from external faces of front and back sections will equal or exceed diameter of the circular section. Pull-through device may also be of a design promulgated by the Uni-Bell Plastic Pipe Association, provided the device meets the applicable requirements specified in this paragraph, including those for diameter of the device, and that the mandrel has a minimum of 9 arms. Ball, cylinder, or circular sections shall conform to the following:
  - (1) A diameter, or minor diameter as applicable, of 95 percent of the average inside diameter of the pipe; tolerance of plus 0.5 percent will be permitted.
  - (2) Homogeneous material throughout, shall have a density greater than 1.0 as related to water at 39.2 degrees F, and shall have a surface Brinell hardness of not less than 150.
  - (3) Center bored and through-bolted with a 1/4 inch minimum diameter steel shaft having a yield strength of not less than

70,000 pounds per square inch, with eyes or loops at each end for attaching pulling cables.

(4) Each eye or loop shall be suitably backed with a flange or heavy washer such that a pull exerted on opposite end of shaft will produce compression throughout remote end.

- b. Deflection measuring device: Sensitive to 1.0 percent of the diameter of the pipe being tested and shall be accurate to 1.0 percent of the indicated dimension. Deflection measuring device shall be approved prior to use.
- c. Pull-through device procedure: Pass the pull-through device through each run of pipe, either by pulling it through or flushing it through with water. If the device fails to pass freely through a pipe run, replace pipe which has the excessive deflection and completely retest in same manner and under same conditions.
- d. Deflection measuring device procedure: Measure deflections through each run of installed pipe. If deflection readings in excess of 4.5 percent of average inside diameter of pipe are obtained, retest pipe by a run from the opposite direction. If retest continues to show a deflection in excess of 4.5 percent of average inside diameter of pipe, replace pipe which has excessive deflection and completely retest in same manner and under same conditions.

-- End of Section --

SECTION 02556A  
GAS DISTRIBUTION SYSTEM  
07/03

## PART 1 GENERAL

### 1.1 REFERENCES

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

AMERICAN GAS ASSOCIATION (AGA)

AGA XR0104 (2001) AGA Plastic Pipe Manual for Gas Service

AMERICAN PETROLEUM INSTITUTE (API)

API Spec 5L (2000) Line Pipe

API Spec 6D (2002) Specification for Pipeline Valves

ASTM INTERNATIONAL (ASTM)

ASTM D 2513 (2001ae1) Thermoplastic Gas Pressure Pipe, Tubing, and Fittings

ASTM D 2517 (2000e1) Reinforced Epoxy Resin Gas Pressure Pipe and Fittings

ASTM D 2683 (1998) Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing

ASTM D 3261 (1997) Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing

ASTM D 3308 (2001) PTFE Resin-Skived Tape

ASTM D 3350 (2002a) Polyethylene Plastics Pipe and Fittings Materials

ASME INTERNATIONAL (ASME)

ASME B16.34 (1996) Valves Flanged, Threaded, and Welding End

ASME B16.40 (2002) Manually Operated Thermoplastic Gas Shutoffs and Valves in Gas Distribution Systems

MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS  
INDUSTRY (MSS)

MSS SP-25 (1998) Standard Marking System for Valves,  
Fittings, Flanges and Unions

THE SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC Paint 25 (1997; R 2000) Zinc Oxide, Alkyd, Linseed Oil  
Primer for Use Over Hand Cleaned Steel, Type  
I and Type II

SSPC SP 1 (1982; R 2000) Solvent Cleaning

SSPC SP 3 (1982; R 2000) Power Tool Cleaning

SSPC SP 6 (2000) Commercial Blast Cleaning

SSPC SP 7 (2000) Brush-Off Blast Cleaning

UNDERWRITERS LABORATORIES (UL)

UL Gas&Oil Dir (2000) Gas and Oil Equipment Directory

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

49 CFR 192 Transportation of Natural and Other Gas by  
Pipeline: Minimum Federal Safety Standards

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

FS TT-E-2784 (Rev A) Enamel (Acrylic-Emulsion, Exterior  
Gloss and Semigloss) (Metric)

## 1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only or as otherwise indicated. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES if requested by the Contracting Officer for a specific Delivery Order:

### SD-02 Shop Drawings

#### Pipe, Fittings, and Associated Materials;G

Drawings shall contain complete schematic and piping diagrams and any other details required to demonstrate that the system has been coordinated and will properly function as a unit. Drawings shall show proposed layout and anchorage of the system and appurtenances, and equipment relationship to other parts of the work including clearances for maintenance and operation.

### SD-03 Product Data

**Materials and Equipment;G**

- a. Pipe
- b. Valves

**Connections to Existing Lines;G**

Notification of the Contractor's schedule for making connections to existing gas lines, at least 10 days in advance.

**Welding Steel Piping;G**

A copy of qualified welding procedures along with a list of names and identification symbols of performance qualified welders and welding operators.

**Jointing Polyethylene and Fiberglass Piping;G**

A copy of qualified jointing procedures, training procedures, qualifications of trainer, and training test results for joiners and inspectors.

**Connection and Abandonment Plan;G,**

A copy of procedures for gas line tie in, hot taps, abandonment/removal or demolition, purging, and plugging as applicable in accordance with [ASME B31.8](#).

**SD-06 Test Reports****Pressure and Leak Tests;G,**

Data from all pressure tests of the distribution system.

**SD-07 Certificates****Utility Work;**

Certification from the Operating Agency/Utility Company that work for which the Utility is responsible has been completed.

## **1.3 GENERAL REQUIREMENTS**

### **1.3.1 Jointing Polyethylene and Fiberglass Piping**

Piping shall be joined by performance qualified joiners using qualified procedures in accordance with [AGA XR0104](#). Manufacturer's prequalified joining procedures shall be used.

### **1.3.2 Standard Products**

Materials and equipment shall be the standard products of a manufacturer regularly engaged in the manufacture of the products and shall essentially duplicate items that have been in satisfactory use for at least 2 years prior to bid opening. Asbestos or products containing asbestos shall not be used. Equipment shall be supported by a service organization that is, in the opinion of the Contracting Officer, reasonably convenient to the site. Valves, flanges, and fittings shall be marked in accordance with MSS SP-25.

### **1.3.3 Verification of Dimensions**

The Contractor shall become familiar with all details of the work, verify all dimensions in the field, and shall advise the Contracting Officer of any discrepancy before performing the work.

### **1.3.4 Handling**

Pipe and components shall be handled carefully to ensure a sound, undamaged condition. Particular care shall be taken not to damage pipe coating. Plastic pipe shall be handled in conformance with AGA XR0104.

## **1.4 measurement and payment for pipe**

The length of pipe installed will be measured along the centerline of the pipe and will be paid for at the contract unit price per lineal foot according to the Bid Schedule. Unit price shall include excavation and backfill, removal of old pipe if required, placement of new pipe, all fittings, service connections, and thrust blocks and shall constitute full compensation for all materials and labor necessary to complete the work as specified.

## **1.5 measurement and payment for valves**

Valves shall be measured and paid for at the respective unit price on the contract Bid Schedule. Payment shall include all excavation and backfill, removal of old valves as required, installation of new valve, thrust blocks, and valve box. Payment shall constitute full compensation for all materials and labor required to complete the work as specified.

## **PART 2 PRODUCTS**

### **2.1 PIPE, FITTINGS, AND ASSOCIATED MATERIALS**

### 2.1.1 Polyethylene Pipe, Tubing, Fittings and Joints

Polyethylene pipe, tubing, fittings and joints shall conform to [ASTM D 3350](#) and [ASTM D 2513](#), pipe designations PE 2406 and PE 3408, rated SDR 11 or less, as specified in [ASME B31.8](#). Pipe sections shall be marked as required by [ASTM D 2513](#).

### 2.1.2 Identification

Pipe flow markings and metal tags for each valve, meter, and regulator shall be provided as required by the Contracting Officer.

### 2.1.3 Gas Transition Fittings

Gas transition fittings shall be manufactured steel fittings approved for jointing steel and polyethylene or fiberglass pipe. Approved transition fittings are those that conform to [AGA XR0104](#) requirements for transition fittings.

## 2.2 VALVES

Valves shall be suitable for shutoff or isolation service and shall conform to the following:

### 2.2.1 Steel Valves

Steel valves 1-1/2 inches and smaller installed underground shall conform to [ASME B16.34](#), carbon steel, socket weld ends, with square wrench operator adaptor. Steel valves 2 inches and larger installed underground shall conform to [API Spec 6D](#), carbon steel, butt weld ends, Class 150 with square wrench operator adaptor.

### 2.2.2 Steel Valve Operators

Valves 8 inches and larger shall be provided with worm or spur gear operators, totally enclosed, grease packed, and sealed. The operators shall have Open and Closed stops and position indicators. Locking feature shall be provided where indicated. Wherever the lubricant connections are not conveniently accessible, suitable extensions for the application of lubricant shall be provided. Valves shall be provided with lubricant compatible with gas service.

### 2.2.3 Polyethylene Valves

Polyethylene valves shall conform to [ASME B16.40](#). Polyethylene valves, in sizes 1/2 inch to 6 inches, may be used with polyethylene distribution and service lines, in lieu of steel valves, for underground installation only.

## **PART 3 EXECUTION**

### **3.1 EXCAVATION AND BACKFILLING**

Excavation and backfilling shall be as specified in Section 02300, Earthwork.

### **3.2 GAS MAINS**

Pipe for gas mains shall be polyethylene.

### **3.3 SERVICE LINES**

Service lines shall be constructed of materials specified for gas mains and shall extend from a gas main to and including the point of delivery within 5 feet of the building. The service lines shall be as short and as straight as practicable between the point of delivery and the gas main and shall not be bent or curved laterally unless necessary to avoid obstructions or otherwise permitted. Service lines shall be laid with as few joints as practicable using standard lengths of pipe.

### **3.4 WORKMANSHIP AND DEFECTS**

Pipe, tubing, and fittings shall be clear and free of cutting burrs and defects in structure or threading and shall be thoroughly brushed and blown free of chips and scale. Defective pipe, tubing, or fittings shall be replaced and shall not be repaired.

### **3.5 INSTALLATION**

[Gas distribution system](#) and equipment shall be installed in conformance with the manufacturer's recommendations and applicable sections of [ASME B31.8](#), [AGA XR0104](#) and [49 CFR 192](#). Abandoning existing gas piping shall be done in accordance with [ASME B31.8](#). Pipe shall be cut without damaging the pipe. Unless otherwise authorized, cutting shall be done by an approved type of mechanical cutter. Wheel cutters shall be used where practicable. On steel pipe 6 inches and larger, an approved gas-cutting-and-beveling machine may be used. Cutting of plastic pipe shall be in accordance with [AGA XR0104](#). Valve installation in plastic pipe shall be designed to protect the plastic pipe against excessive torsional or shearing loads when the valve is

operated and from other stresses which may be exerted through the valve or valve box.

### **3.5.1 Installing Pipe Underground**

Gas mains and service lines shall be graded as indicated. Joints in steel pipe shall be welded except as otherwise permitted for installation of valves. Mains shall have 24 inch minimum cover; service lines shall have 18 inch minimum cover; and both mains and service lines shall be placed on firmly compacted select material for the full length. Where indicated, the main shall be encased, bridged, or designed to withstand any anticipated external loads as specified in [ASME B31.8](#). The encasement material shall be standard weight black steel pipe with a protective coating as specified. The pipe shall be separated from the casing by insulating spacers and sealed at the ends with casing bushings. Trench shall be excavated below pipe grade, bedded with bank sand, and compacted to provide full-length bearing. Laying the pipe on blocks to produce uniform grade will not be permitted. The pipe shall be clean inside before it is lowered into the trench and shall be kept free of water, soil, and all other foreign matter that might damage or obstruct the operation of the valves, regulators, meters, or other equipment. When work is not in progress, open ends of pipe or fittings shall be securely closed by expandable plugs or other suitable means. Minor changes in line or gradient of pipe that can be accomplished through the natural flexibility of the pipe material without producing permanent deformation and without overstressing joints may be made when approved. Changes in line or gradient that exceed the limitations specified shall be made with fittings. When cathodic protection is furnished, electrically insulated joints or flanges shall be provided. When polyethylene or fiberglass piping is installed underground, foil backed magnetic tape shall be placed above the pipe to permit locating with a magnetic detector.

## **3.6 PIPE JOINTS**

Pipe joints shall be designed and installed to effectively sustain the longitudinal pullout forces caused by the contraction of piping or superimposed loads. Jointing procedures shall conform to [AGA XR0104](#). Indiscriminate heat fusion joining of plastic pipe or fittings made from different polyethylene resins by classification or by manufacturer shall be avoided if other alternative joining procedures are available. If heat fusion joining of dissimilar polyethylenes is required, special procedures are required.

### **3.6.1 Connections Between Metallic and Plastic Piping**

Connections shall be made only outside, underground, and with approved transition fittings.

## **3.7 VALVE BOXES**

Valve boxes of cast iron not less than 3/16 inch thick shall be installed at each underground valve except where concrete or other type of housing is

indicated. Valve boxes shall be provided with locking covers that require a special wrench for removal. Wrench shall be furnished for each box. The word "GAS" shall be cast in the box cover. When the valve is located in a roadway, the valve box shall be protected by a suitable concrete slab at least 3 square feet. When in a sidewalk, the top of the box shall be in a concrete slab 2 feet square and set flush with the sidewalk. Boxes shall be adjustable extension type with screw or slide-type adjustments. Valve boxes shall be separately supported, not resting on the pipe, so that no traffic loads can be transmitted to the pipe. Valves shall only be located in valve boxes or inside of buildings.

### **3.8 CONNECTIONS TO EXISTING LINES**

Connections between new work and existing gas lines, where required, shall be made in accordance with ASME B31.8, using proper fittings to suit the actual conditions. When connections are made by tapping into a gas main, the connecting fittings shall be the same size as the pipe being connected. Connections shall be made by qualified personnel.

### **3.9 pressure and leak TESTS**

The system of gas mains and service lines shall be tested after construction and before being placed in service using air as the test medium. The test pressure is 50 psig. Prior to testing the system, the interior shall be blown out, cleaned and cleared of all foreign materials. All meters, regulators, and controls shall be removed before blowing out and cleaning and reinstalled after clearing of all foreign materials. Testing of gas mains and service lines shall be done with due regard for the safety of employees and the public during the test. Persons not working on the test operations shall be kept out of the testing area while testing is proceeding. The test shall be made on the system as a whole or on sections that can be isolated. Joints in sections shall be tested prior to backfilling when trenches must be backfilled before the completion of other pipeline sections. The test shall continue for at least 24 hours from the time of the initial readings to the final readings of pressure and temperature. The initial test readings of the instrument shall not be made for at least 1 hour after the pipe has been subjected to the full test pressure, and neither the initial nor final readings shall be made at times of rapid changes in atmospheric conditions. The temperatures shall be representative of the actual trench conditions. There shall be no indication of reduction of pressure during the test after corrections have been made for changes in atmospheric conditions in conformity with the relationship  $T(1)P(2)=T(2)P(1)$ , in which T and P denote absolute temperature and pressure, respectively, and the numbers denote initial and final readings. During the test, the entire system shall be completely isolated from all compressors and other sources of air pressure. Each joint shall be tested by means of soap and water or an equivalent nonflammable solution prior to backfilling or concealing any work. The testing instruments shall be approved by the Contracting Officer. All labor, materials and equipment for conducting the tests shall be furnished by the Contractor and shall be subject to inspection at all times during the tests. The Contractor shall maintain safety precautions for air pressure testing at all times during the tests.

-- End of Section --

SECTION 02630  
STORM DRAINAGE  
**07/03**

## PART 1 GENERAL

### 1.1 REFERENCES

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

ACI INTERNATIONAL (ACI)

**ACI 346** (2001) Specification for Cast-in-Place Concrete Pipe

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)

**AASHTO HB-17** (2002) Standard Specifications for Highway Bridges

**AASHTO M 167** (2000) Corrugated Steel Structural Plate, Zinc Coated, for Field Bolted Pipe, Pipe-Arches and Arches

**AASHTO M 190** (1995; R 2000) Bituminous-Coated Corrugated Metal Culvert Pipe and Pipe Arches

**AASHTO M 198** (1998) Joints for Circular Concrete Sewer and Culvert Pipe Using Flexible Watertight Gaskets

**AASHTO M 219** (1992; R 2000) Corrugated Aluminum Alloy Pipe, Structural Plate for Field Bolted Pipe-Arches and Arches

**AASHTO M 243** (1996; R 2000) Field Applied Coating of Corrugated Metal Structural Plate for Pipe, Pipe-Arches, and Arches

**AASHTO M 294** (2002) Corrugated Polyethylene Pipe, 300- to 1200- mm Diameter

**AASHTO MP 7** (2001) Specification for Corrugated Polyethylene Pipe, 1350 and 1500 mm Diameter

AMERICAN RAILWAY ENGINEERING & MAINTENANCE-OF-WAY ASSOCIATION (AREMA)

**AREMA Manual** (2003) Manual for Railway Engineering

ASTM INTERNATIONAL (ASTM)

ASTM A 48/A 48M	(2000) Gray Iron Castings
ASTM A 74	(1998) Cast Iron Soil Pipe and Fittings
ASTM A 123/A 123M	(2002) Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A 536	(1984; R 1999e1) Ductile Iron Castings
ASTM A 716	(1999) Ductile Iron Culvert Pipe
ASTM A 742/A 742M	(1998) Steel Sheet, Metallic Coated and Polymer Precoated for Corrugated Steel Pipe
ASTM A 760/A 760M	(2001a) Corrugated Steel Pipe, Metallic-Coated for Sewers and Drains
ASTM A 762/A 762M	(2000) Corrugated Steel Pipe, Polymer Precoated for Sewers and Drains
ASTM A 798/A 798M	(2001) Installing Factory-Made Corrugated Steel Pipe for Sewers and Other Applications
ASTM A 807/A 807M	(2002e1) Installing Corrugated Steel Structural Plate Pipe for Sewers and Other Applications
ASTM A 849	(2000) Post-Applied Coatings, Pavings, and Linings for Corrugated Steel Sewer and Drainage Pipe
ASTM A 929/A 929M	(2001) Steel Sheet, Metallic-Coated by the Hot-Dip Process for Corrugated Steel Pipe
ASTM B 26/B 26M	(2002) Aluminum-Alloy Sand Castings
ASTM B 745/B 745M	(1997) Corrugated Aluminum Pipe for Sewers and Drains
ASTM C 12	(2002) Installing Vitrified Clay Pipe Lines
ASTM C 14	(1999) Concrete Sewer, Storm Drain, and Culvert Pipe
ASTM C 32	(1993; R 1999e1) Sewer and Manhole Brick (Made from Clay or Shale)
ASTM C 55	(2001a) Concrete Brick
ASTM C 62	(2001) Building Brick (Solid Masonry Units Made from Clay or Shale)
ASTM C 76	(2002) Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
ASTM C 139	(2001) Concrete Masonry Units for Construction of Catch Basins and Manholes

ASTM C 231	(1997e1) Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C 270	(2002) Mortar for Unit Masonry
ASTM C 425	(2002) Compression Joints for Vitrified Clay Pipe and Fittings
ASTM C 443	(2002) Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
ASTM C 478	(2002a) Precast Reinforced Concrete Manhole Sections
ASTM C 506	(2002) Reinforced Concrete Arch Culvert, Storm Drain, and Sewer Pipe
ASTM C 507	(2002) Reinforced Concrete Elliptical Culvert, Storm Drain, and Sewer Pipe
ASTM C 564	(1997) Rubber Gaskets for Cast Iron Soil Pipe and Fittings
ASTM C 655	(2002) Reinforced Concrete D-Load Culvert, Storm Drain, and Sewer Pipe
ASTM C 789	(2000) Precast Reinforced Concrete Box Sections for Culverts, Storm Drains, and Sewers
ASTM C 877	(2002) External Sealing Bands for Concrete Pipe, Manholes, and Precast Box Sections
ASTM C 923	(2002) Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals
ASTM C 924	(2002) Testing Concrete Pipe Sewer Lines by Low-Pressure Air Test Method
ASTM C 1103	(2002) Joint Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines
ASTM D 1056	(2000) Flexible Cellular Materials - Sponge or Expanded Rubber
ASTM D 1171	(1999) Rubber Deterioration - Surface Ozone Cracking Outdoors or Chamber (Triangular Specimens)
ASTM D 1557	(2000) Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/cu. ft. (2,700 kN-m/cu.m.))
ASTM D 1751	(1999) Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)

ASTM D 1752	(1984; R 1996e1) Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction
ASTM D 1784	(1999ae1) Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
ASTM D 2167	(1994; R 2001) Density and Unit Weight of Soil in Place by the Rubber Balloon Method
ASTM D 2321	(2000) Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications
ASTM D 2729	(1996a) Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings
ASTM D 2922	(2001) Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
ASTM D 3017	(2001) Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)
ASTM D 3034	(2000) Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings
ASTM D 3212	(1996a) Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
ASTM D 3350	(2002a) Polyethylene Plastics Pipe and Fittings Materials
ASTM F 477	(2002e1) Elastomeric Seals (Gaskets) for Joining Plastic Pipe
ASTM F 679	(2001) Poly(Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings
ASTM F 794	(2001) Poly(Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter
ASTM F 894	(1998a) Polyethylene (PE) Large Diameter Profile Wall Sewer and Drain Pipe
ASTM F 949	(2001a) Poly(Vinyl Chloride) (PVC) Corrugated Sewer Pipe with a Smooth Interior and Fittings
ASTM F 1417	(1992; R 1998) Installation Acceptance of Plastic Gravity Sewer Lines Using Low-Pressure Air

## **1.2 MEASUREMENT AND PAYMENT**

### **1.2.1 Pipe Culverts and Storm Drains**

The length of pipe installed will be measured along the centerlines of the pipe and will be paid for at the contract unit price according to the Bid Schedule for the number of linear feet of culverts or storm drains placed and accepted.

### **1.2.2 Manholes**

The depth of manholes measured from the top of grating or cover to the bottom of the base slab will be paid for at the contract unit price in the Bid Schedule for vertical linear feet placed and accepted. Payment shall include manhole, frame, cover or grate, ladders or steps, excavation and backfill. Payment shall constitute full compensation for all materials and labor necessary to complete the work as specified

### **1.2.6 Pipe Excavation and Backfill**

Payment will be made for the number of cubic yards of material acceptably excavated and backfilled within the limits of the trench as specified in the contract Bid Schedule and defined in Section 02300, EARTHWORK.

## **1.3 SUBMITTALS**

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only or as otherwise designated. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES if requested by the Contracting Officer for a specific Delivery Order:

SD-03 Product Data

Pipe

SD-04 Samples

Pipe for Culverts and Storm Drains

## **1.4 DELIVERY, STORAGE, AND HANDLING**

### **1.4.1 Delivery and Storage**

Materials delivered to site shall be inspected for damage, unloaded, and stored with a minimum of handling. Materials shall not be stored directly on the ground. The inside of pipes and fittings shall be kept free of dirt

and debris. Before, during, and after installation, plastic pipe and fittings shall be protected from any environment that would result in damage or deterioration to the material. Solvents, solvent compounds, lubricants, elastomeric gaskets, and any similar materials required to install plastic pipe shall be stored in accordance with the manufacturer's recommendations and shall be discarded if the storage period exceeds the recommended shelf life. Solvents in use shall be discarded when the recommended pot life is exceeded.

## 1.4.2 Handling

Materials shall be handled in a manner that ensures delivery to the trench in sound, undamaged condition. Pipe shall be carried to the trench, not dragged.

# PART 2 PRODUCTS

## 2.1 PIPE FOR CULVERTS AND STORM DRAINS

Pipe for culverts and storm drains shall be of the sizes indicated and shall conform to the requirements specified.

### 2.1.1 Reinforced Concrete Pipe

Pipe sizes 14 inches in diameter: [ASTM C 76](#), Class II, or [ASTM C 655](#)

### 2.1.2 Type PSM PVC Pipe

Pipe sizes 4 - 12 inches in diameter: [ASTM D 3034](#), Type PSM, maximum SDR 35, produced from PVC certified by the compounder as meeting the requirements of [ASTM D 1784](#), minimum cell class 12454-B.

### 2.1.3 Precast Reinforced Concrete Box

Boxes subjected to highway loadings shall conform to [ASTM C 789](#).

## 2.2 MISCELLANEOUS MATERIALS

### 2.2.1 Concrete

Unless otherwise specified, concrete and reinforced concrete shall conform to the requirements for 3000 psi concrete under Section [03307](#), CONCRETE FOR MINOR STRUCTURES. The concrete mixture shall have air content by volume of concrete, based on measurements made immediately after discharge from the

mixer, of 5 to 7 percent when maximum size of coarse aggregate exceeds 1-1/2 inches. Air content shall be determined in accordance with [ASTM C 231](#). The concrete covering over steel reinforcing shall not be less than 1 inch thick for covers and not less than 1-1/2 inches thick for walls and flooring. Concrete covering deposited directly against the ground shall have a thickness of at least 3 inches between steel and ground. Expansion-joint filler material shall conform to [ASTM D 1751](#), or [ASTM D 1752](#), or shall be resin-impregnated fiberboard conforming to the physical requirements of [ASTM D 1752](#).

## 2.2.2 Mortar

Mortar for pipe joints, connections to other drainage structures, and brick or block construction shall conform to [ASTM C 270](#), Type M, except that the maximum placement time shall be 1 hour. The quantity of water in the mixture shall be sufficient to produce a stiff workable mortar. Water shall be clean and free of harmful acids, alkalies, and organic impurities. The mortar shall be used within 30 minutes after the ingredients are mixed with water. The inside of the joint shall be wiped clean and finished smooth. The mortar head on the outside shall be protected from air and sun with a proper covering until satisfactorily cured.

## 2.2.3 Precast Reinforced Concrete Manholes

Precast reinforced concrete manholes shall conform to [ASTM C 478](#). 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 or made with flexible watertight, rubber-type gaskets meeting the requirements of paragraph JOINTS.

## 2.2.4 Frame and Cover for Gratings

Frame and cover for gratings shall be cast gray iron, [ASTM A 48/A 48M](#), Class 35B; cast ductile iron, [ASTM A 536](#), Grade 65-45-12; or cast aluminum, [ASTM B 26/B 26M](#), Alloy 356.OT6 as specified for application. Weight, shape, size, and waterway openings for grates and curb inlets shall be as indicated on the plans. The word "DRAIN" shall be cast in the cover.

## 2.2.5 Joints

### 2.2.5.1 Flexible Watertight Joints

- a. Materials: Flexible watertight joints shall be made with plastic or rubber-type gaskets for concrete pipe and with factory-fabricated resilient materials for clay pipe. The design of joints and the physical requirements for plastic gaskets shall conform to [AASHTO M 198](#), and rubber-type gaskets shall conform to [ASTM C 443](#). Factory-fabricated resilient joint materials shall conform to [ASTM C 425](#). Gaskets shall have not more than one factory-fabricated splice, except that two factory-fabricated splices of the rubber-

type gasket are permitted if the nominal diameter of the pipe being gasketed exceeds 54 inches.

- b. Test Requirements: Watertight joints shall be tested and shall meet test requirements of paragraph HYDROSTATIC TEST ON WATERTIGHT JOINTS. Rubber gaskets shall comply with the oil resistant gasket requirements of [ASTM C 443](#). 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.

### **2.2.5.2 PVC Plastic Pipes**

Joints shall be solvent cement or elastomeric gasket type in accordance with the specification for the pipe and as recommended by the pipe manufacturer.

## **2.3 STEEL LADDER**

Steel ladder shall be provided where the depth of the manhole exceeds 12 feet. These ladders shall be not less than 16 inches in width, with 3/4 inch diameter rungs spaced 12 inches apart. The two stringers shall be a minimum 3/8 inch thick and 2-1/2 inches wide. Ladders and inserts shall be galvanized after fabrication in conformance with [ASTM A 123/A 123M](#).

## **2.4 HYDROSTATIC TEST ON WATERTIGHT JOINTS**

### **2.4.1 Concrete, Clay, PVC and PE Pipe**

A hydrostatic test shall be made on the watertight joint types as proposed. Only one sample joint of each type needs testing; however, if the sample joint fails because of faulty design or workmanship, an additional sample joint may be tested. During the test period, gaskets or other jointing material shall be protected from extreme temperatures which might adversely affect the performance of such materials. Performance requirements for joints in reinforced and nonreinforced concrete pipe shall conform to [AASHTO M 198](#) or [ASTM C 443](#). Test requirements for joints in clay pipe shall conform to [ASTM C 425](#). Test requirements for joints in PVC and PE plastic pipe shall conform to [ASTM D 3212](#).

## **PART 3 EXECUTION**

### **3.1 EXCAVATION FOR PIPE CULVERTS, STORM DRAINS, AND DRAINAGE STRUCTURES**

Excavation of trenches, and for appurtenances and backfilling for culverts and storm drains, shall be in accordance with the applicable portions of Section [02300](#) EARTHWORK and the requirements specified below.

### **3.1.1 Trenching**

The width of trenches at any point below the top of the pipe shall be not greater than the outside diameter of the pipe plus 24 inches to permit satisfactory jointing and thorough tamping of the bedding material under and around the pipe. The width of the trenches at any point above the top of the pipe shall not be greater than the outside diameter of the pipe plus 24 inches or a 6/12 slope. Sheeting and bracing, where required, shall be placed within the trench width as required. Contractor shall not overexcavate. Where trench widths are exceeded, redesign with a resultant increase in cost of stronger pipe or special installation procedures will 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.

## **3.2 BEDDING**

The bedding surface for the pipe shall provide a firm foundation of uniform density throughout the entire length of the pipe.

### **3.2.1 Concrete Pipe Requirements**

When no bedding class is specified or detailed on the drawings, concrete pipe shall be bedded in a soil foundation accurately shaped and rounded to conform to the lowest one-fourth of the outside portion of circular pipe or to the lower curved portion of pipe arch for the entire length of the pipe or pipe arch. When necessary, the bedding shall be tamped. Bell holes and depressions for joints shall be not more than the length, depth, and width required for properly making the particular type of joint.

### **3.2.5 Plastic Pipe**

Bedding for PVC and PE pipe shall meet the requirements of [ASTM D 2321](#). Bedding, haunching, and initial backfill shall be either Class IB or II material.

## **3.3 PLACING PIPE**

Each pipe shall be thoroughly examined before being laid; defective or damaged pipe shall not be used. Plastic pipe shall be protected from exposure to direct sunlight prior to laying, if necessary to maintain adequate pipe stiffness and meet installation deflection requirements. Pipelines shall be laid to the grades and alignment indicated. Proper facilities shall be provided for lowering sections of pipe into trenches. Lifting lugs in vertically elongated metal pipe shall be placed in the same vertical plane as the major axis of the pipe. Pipe shall not be laid in water, and pipe shall not 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 pipes damaged during placement shall be removed and replaced.

### **3.3.1 Concrete, Clay, PVC, Ribbed PVC, Ductile Iron and Cast-Iron 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.

### **3.3.2 Multiple Culverts**

Where multiple lines of pipe are installed, adjacent sides of pipe shall be at least half the nominal pipe diameter or 3 feet apart, whichever is less.

## **3.4 JOINTING**

### **3.4.1 Concrete Pipe**

#### **3.4.1.1 Cement-Mortar Bell-and-Spigot Joint**

The first pipe shall be bedded to the established gradeline, with the bell end placed upstream. The interior surface of the bell shall be thoroughly cleaned with a wet brush and the lower portion of the bell filled with mortar as required to bring inner surfaces of abutting pipes flush and even. The spigot end of each subsequent pipe shall be cleaned with a wet brush and uniformly matched into a bell so that sections are closely fitted. After each section is laid, the remainder of the joint shall be filled with mortar, and a bead shall be formed around the outside of the joint with sufficient additional mortar. If mortar is not sufficiently stiff to prevent appreciable slump before setting, the outside of the joint shall be wrapped or bandaged with cheesecloth to hold mortar in place.

#### **3.4.1.2 Cement-Mortar Oakum Joint for Bell-and-Spigot Pipe**

A closely twisted gasket shall be made of jute or oakum of the diameter required to support the spigot end of the pipe at the proper grade and to make the joint concentric. Joint packing shall be in one piece of sufficient length to pass around the pipe and lap at top. This gasket shall be thoroughly saturated with neat cement grout. The bell of the pipe shall be thoroughly cleaned with a wet brush, and the gasket shall be laid in the bell for the lower third of the circumference and covered with mortar. The spigot of the pipe shall be thoroughly cleaned with a wet brush, inserted in the bell, and carefully driven home. A small amount of mortar shall be inserted in the annular space for the upper two-thirds of the circumference. The gasket shall be lapped at the top of the pipe and driven home in the annular space with a caulking tool. The remainder of the annular space shall be filled completely with mortar and beveled at an angle of approximately 45 degrees with the outside of the bell. If mortar is not sufficiently stiff to prevent appreciable slump before setting, the outside

of the joint thus made shall be wrapped with cheesecloth. Placing of this type of joint shall be kept at least five joints behind laying operations.

### **3.4.1.3 Cement-Mortar Diaper Joint for Bell-and-Spigot Pipe**

The pipe shall be centered so that the annular space is uniform. The annular space shall be caulked with jute or oakum. Before caulking, the inside of the bell and the outside of the spigot shall be cleaned.

- a. Diaper Bands: Diaper bands shall consist of heavy cloth fabric to hold grout in place at joints and shall be cut in lengths that extend one-eighth of the circumference of pipe above the spring line on one side of the pipe and up to the spring line on the other side of the pipe. Longitudinal edges of fabric bands shall be rolled and stitched around two pieces of wire. Width of fabric bands shall be such that after fabric has been securely stitched around both edges on wires, the wires will be uniformly spaced not less than 8 inches apart. Wires shall be cut into lengths to pass around pipe with sufficient extra length for the ends to be twisted at top of pipe to hold the band securely in place; bands shall be accurately centered around lower portion of joint.
- b. Grout: Grout shall be poured between band and pipe from the high side of band only, until grout rises to the top of band at the spring line of pipe, or as nearly so as possible, on the opposite side of pipe, to ensure a thorough sealing of joint around the portion of pipe covered by the band. Silt, slush, water, or polluted mortar grout forced up on the lower side shall be forced out by pouring, and removed.
- c. Remainder of Joint: The remaining unfilled upper portion of the joint shall be filled with mortar and a bead formed around the outside of this upper portion of the joint with a sufficient amount of additional mortar. The diaper shall be left in place. Placing of this type of joint shall be kept at least five joints behind actual laying of pipe. No backfilling around joints shall be done until joints have been fully inspected and approved.

### **3.4.1.4 Flexible Watertight Joints**

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 pushed home. If, while the joint is being made the gasket becomes visibly dislocated the pipe shall be removed and the joint remade.

## **3.5 DRAINAGE STRUCTURES**

### **3.5.1 Manholes and Inlets**

Construction shall be of reinforced concrete or precast reinforced concrete; complete with frames and covers or gratings; and with fixed galvanized steel ladders where indicated.

### **3.5.2 Walls and Headwalls**

Construction shall be as indicated.

## **3.6 STEEL LADDER INSTALLATION**

Ladder shall be adequately anchored to the wall by means of steel inserts spaced not more than 6 feet vertically, and shall be installed to provide at least 6 inches of space between the wall and the rungs. The wall along the line of the ladder shall be vertical for its entire length.

## **3.7 BACKFILLING**

### **3.7.1 Backfilling Pipe in Trenches**

After the pipe has been properly bedded, 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. The fill shall be thoroughly compacted 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 12 inches. Tests for density shall be made as necessary to ensure conformance to the compaction requirements specified below. Where it is necessary, in the opinion of the Contracting Officer, that sheeting or portions of bracing used be left in place, the contract will be adjusted accordingly. Untreated sheeting shall not be left in place beneath structures or pavements.

### **3.7.2 Backfilling Pipe in Fill Sections**

For pipe placed in fill sections, backfill material and the placement and compaction procedures shall be as specified below. The fill material shall be uniformly spread in layers longitudinally on both sides of the 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 12 inches.

### **3.7.3 Movement of Construction Machinery**

When 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 culvert or storm drain at any stage of construction shall be at the Contractor's risk. Any damaged pipe shall be repaired or replaced.

### **3.7.4 Compaction**

#### **3.7.4.1 General Requirements**

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.

#### **3.7.4.2 Minimum Density**

Backfill over and around the pipe and backfill around and adjacent to drainage structures shall be compacted at the approved moisture content to the following applicable minimum density, which will be determined as specified below.

- a. Under airfield and heliport pavements, 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.
- b. Under unpaved or turfed traffic areas, density shall not be less than 90 percent of maximum density for cohesive material and 95 percent of maximum density for cohesionless material.
- c. Under nontraffic areas, density shall be not less than that of the surrounding material.

### 3.7.5 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 ensure that specified density is being obtained. Laboratory tests for moisture-density relations shall be made in accordance with ASTM D 1557 except that mechanical tampers may be used provided the results are correlated with those obtained with the specified hand tamper. Field density tests shall be determined in accordance with ASTM D 2167 or ASTM D 2922. When ASTM D 2922 is used, the calibration curves shall be checked and adjusted, if necessary, using the sand cone method as described in paragraph Calibration of the referenced publications. ASTM D 2922 results in a wet unit weight of soil and when using this method ASTM D 3017 shall be used to determine the moisture content of the soil. The calibration curves furnished with the moisture gauges shall be checked along with density calibration checks as described in ASTM D 3017 or ASTM D 2922. Test results shall be furnished the Contracting Officer. The calibration checks of both the density and moisture gauges shall be made at the beginning of a job on each different type of material encountered and at intervals as directed.

## 3.8 PIPELINE TESTING

### 3.8.1 Leakage Tests

Lines shall be tested for leakage by low pressure air or water testing or exfiltration tests, as appropriate. Low pressure air testing for concrete pipes shall conform to ASTM C 924. Low pressure air testing for plastic pipe shall conform to ASTM F 1417. Testing of individual joints for leakage by low pressure air or water shall conform to ASTM C 1103. Prior to exfiltration tests, 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 pipeline section to be tested, infiltration shall be measured using a suitable weir or other device acceptable to the Contracting Officer. 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 pipeline 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 the exfiltration test shall not exceed 0.2 gallons per inch in diameter per 100 feet of pipeline per hour. When leakage exceeds the maximum amount specified, satisfactory correction shall be made and retesting accomplished.

### 3.8.2 Deflection Testing

Perform a deflection test on entire length of installed plastic pipeline on completion of work adjacent to and over the pipeline, including leakage tests, backfilling, placement of fill, grading, paving, concreting, and any other superimposed loads. Deflection of pipe in the installed pipeline under external loads shall not exceed 4.5 percent of the average inside diameter of pipe. Determine whether the allowable deflection has been exceeded by use of a pull-through device or a deflection measuring device.

- a. Pull-through device: This device shall be a spherical, spheroidal, or elliptical ball, a cylinder, or circular sections fused to a common shaft. Circular sections shall be so spaced on the shaft that distance from external faces of front and back sections will equal or exceed diameter of the circular section. Pull-through device may also be of a design promulgated by the Uni-Bell Plastic Pipe Association, provided that the device meets the applicable requirements specified in this paragraph, including those for diameter of the device. Ball, cylinder, or circular sections shall conform to the following:
  - (1) A diameter, or minor diameter as applicable, of 95 percent of the average inside diameter of the pipe; tolerance of plus 0.5 percent will be permitted.
  - (2) A homogeneous material throughout, with a density greater than 1.0 as related to water at 39.2 degrees F, and a surface Brinell hardness of not less than 150.
  - (3) Center bored and through bolted with a 1/4 inch minimum diameter steel shaft having a yield strength of not less than 70,000 psi, with eyes or loops at each end for attaching pulling cables.
  - (4) Each eye or loop shall be suitably backed with a flange or heavy washer such that a pull exerted on opposite end of shaft will produce compression throughout remote end.
- b. Deflection measuring device: Sensitive to 1.0 percent of the diameter of the pipe being tested and accurate to 1.0 percent of the indicated dimension. Deflection measuring device shall be approved by the Contracting Officer prior to use.
- c. Pull-through device: Pass the pull-through device through each run of pipe, either by pulling it through or flushing it through with water. If the device fails to pass freely through a pipe run, replace pipe which has the excessive deflection and completely retest in same manner and under same conditions as specified.
- d. Deflection measuring device procedure: Measure deflections through each run of installed pipe. If deflection readings in excess of 4.5 percent of average inside diameter of pipe are obtained, retest pipe by a run from the opposite direction. If retest continues to show a deflection in excess of 4.5 percent of average inside diameter of pipe, remove pipe which has excessive deflection, replace with new pipe, and completely retest in same manner and under same conditions.
- e. Warranty period test: Pipe found to have a deflection of greater than 5 percent of average inside diameter when deflection test is performed just prior to end of one-year warranty period shall be

replaced with new pipe and tested as specified for leakage and deflection.

-- End of Section --

## SECTION 02722A

AGGREGATE AND/OR GRADED-CRUSHED AGGREGATE BASE COURSE  
05/01**PART 1 GENERAL****1.1 REFERENCES**

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

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS  
(AASHTO)

**AASHTO T 180** (1997) Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and an 457 mm (18-in) Drop

**AASHTO T 224** (1996) Correction for Coarse Particles in the Soil Compaction Test

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

**ASTM C 29/C 29M** (1997) Bulk Density ("Unit Weight") and Voids in Aggregates

**ASTM C 88** (1999a) Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate

**ASTM C 117** (1995) Materials Finer Than 75 micrometer (No. 200) Sieve in Mineral Aggregates by Washing

**ASTM C 127** (1988; R 1993e1) Specific Gravity and Absorption of Course Aggregate

**ASTM C 128** (1997) Specific Gravity and Absorption of Fine Aggregate

**ASTM C 131** (1996) Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine

**ASTM C 136** (1996a) Sieve Analysis of Fine and Coarse Aggregates

**ASTM D 75** (1987; R 1997) Sampling Aggregates

**ASTM D 422** (1963; R 1998) Particle-Size Analysis of Soils

ASTM D 1556	(2000) Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D 1557	(1991; R 1998) Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/cu. ft. (2,700 kN-m/cu.m.))
ASTM D 2167	(1994) Density and Unit Weight of Soil in Place by the Rubber Balloon Method
ASTM D 2487	(2000) Classification of Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D 2922	(1996e1) Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
ASTM D 3017	(1988; R 1996e1) Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)
ASTM D 4318	(2000) Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM E 11	(1995) Wire-Cloth Sieves for Testing Purposes

## 1.2 DEFINITIONS

For the purposes of this specification, the following definitions apply.

### 1.2.1 Aggregate Base Course

Aggregate base course (ABC) is well-graded, durable aggregate uniformly moistened and mechanically stabilized by compaction.

### 1.2.2 Graded-crushed Aggregate Base Course

Graded-crushed aggregate (GCA) base course is well-graded, crushed, durable aggregate uniformly moistened and mechanically stabilized by compaction. GCA is similar to ABC, but it has more stringent requirements and it produces a base course with higher strength and stability.

### 1.2.3 Degree of Compaction

Degree of compaction shall be expressed as a percentage of the maximum density obtained by the test procedure presented in [ASTM D 1557](#).

## 1.3 UNIT PRICES

### 1.3.1 Unit of Measurement

The quantity of ABC and GCA delivered, spread, compacted as specified, and accepted, as determined by the Contracting Officer, will be measured in square yards per inch of thickness.

### 1.3.2 Payment for Quantities

Quantities of ABC and GCA, determined as specified above, will be paid for at the respective contract unit prices on the Bid Schedule, which shall constitute full compensation for the construction and completion of the ABC and GCA.

## 1.4 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES if requested by the Contracting Officer for a specific Delivery Order:

#### SD-03 Product Data

##### Plant, Equipment, and Tools;

List of proposed equipment to be used in performance of construction work, including descriptive data.

##### Waybills and Delivery Tickets; G

Copies of waybills and delivery tickets during the progress of the work. Before the final statement is allowed, the Contractor shall file certified waybills and certified delivery tickets for all aggregates actually used.

#### SD-06 Test Reports

##### Sampling and testing; Field Density Tests;

## 1.5 SAMPLING AND TESTING

Sampling and testing shall be the responsibility of the Government. Initial testing shall be conducted at Government expense. The Contractor shall pay for any additional testing required due to failure of the initial tests. Work requiring testing will not be permitted until the testing laboratory has been inspected and approved. The materials shall be tested to establish compliance with the specified requirements; testing shall be performed at the specified frequency. The Contracting Officer may specify the time and location of the tests.

## 1.5.1 Sampling

Samples for laboratory testing shall be taken in conformance with [ASTM D 75](#). When deemed necessary, the sampling will be observed by the Contracting Officer.

## 1.5.2 Tests

The following tests shall be performed in conformance with the applicable standards listed.

### 1.5.2.1 Sieve Analysis

Sieve analysis shall be made in conformance with [ASTM C 117](#) and [ASTM C 136](#). Sieves shall conform to [ASTM E 11](#). Particle-size analysis of the soils shall also be completed in conformance with [ASTM D 422](#).

### 1.5.2.2 Liquid Limit and Plasticity Index

Liquid limit and plasticity index shall be determined in accordance with [ASTM D 4318](#).

### 1.5.2.3 Moisture-Density Determinations

The maximum density and optimum moisture content shall be determined in accordance with [ASTM D 1557](#).

### 1.5.2.4 Field Density Tests

Density shall be field measured in accordance with [ASTM D 1556](#), [ASTM D 2167](#), or [ASTM D 2922](#). For the method presented in [ASTM D 1556](#) the base plate as shown in the drawing shall be used. For the method presented in [ASTM D 2922](#) the calibration curves shall be checked and adjusted if necessary using only the sand cone method as described in paragraph Calibration, of the ASTM publication. Tests performed in accordance with [ASTM D 2922](#) result in a wet unit weight of soil and when using this method, [ASTM D 3017](#) shall be used to determine the moisture content of the soil. The calibration curves furnished with the moisture gauges shall also be checked along with density calibration checks as described in [ASTM D 3017](#). The calibration checks of both the density and moisture gauges shall be made by the prepared containers of material method, as described in paragraph Calibration of [ASTM D 2922](#), on each different type of material being tested at the beginning of a job and at intervals as directed.

### 1.5.2.5 Wear Test

Wear tests shall be made on ABC and GCA course material in conformance with [ASTM C 131](#).

### 1.5.2.6 Soundness

Soundness tests shall be made on GCA in accordance with [ASTM C 88](#).

### 1.5.2.7 Weight of Slag

Weight per cubic foot of slag shall be determined in accordance with [ASTM C 29/C 29M](#) on the ABC and GCA course material.

## 1.5.3 Testing Frequency

### 1.5.3.1 Initial Tests

One of each of the following tests may be performed on the proposed material at the discretion of the Contracting Officer prior to commencing construction.

- a. Sieve Analysis.
- b. Liquid limit and plasticity index.
- c. Moisture-density relationship.
- d. Wear.
- e. Soundness.
- f. Weight per cubic foot of Slag.

### 1.5.3.2 In Place Tests

Each of the following tests may be performed at the discretion of the Contracting Officer on samples taken from the placed and compacted ABC and GCA. Samples shall be taken and tested at the rates indicated.

- a. Density tests on every lift of material placed and at a frequency of one set of tests for every 250 square yards, or portion thereof, of completed area.
- b. Sieve Analysis including No. 635 size material for every 500 tons, or portion thereof, of material placed.
- c. Liquid limit and plasticity index tests at the same frequency as the sieve analysis.

### **1.5.4 Approval of Material**

Final approval of the materials will be based on sieve analysis, liquid limit, and plasticity index tests performed on samples taken from the completed and fully compacted ABC and GCA.

## **1.6 WEATHER LIMITATIONS**

Construction shall be done when the atmospheric temperature is above 35 degrees F. When the temperature falls below 35 degrees F, the Contractor shall protect all completed areas by approved methods against detrimental effects of freezing. Completed areas damaged by freezing, rainfall, or other weather conditions shall be corrected to meet specified requirements.

## **1.7 PLANT, EQUIPMENT, AND TOOLS**

All plant, equipment, and tools 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. The equipment shall be adequate and shall have the capability of producing the required compaction, meeting grade controls, thickness control, and smoothness requirements as set forth herein.

# **PART 2 PRODUCTS**

## **2.1 AGGREGATES**

The ABC and GCA shall consist of clean, sound, durable particles of crushed stone, crushed slag, crushed gravel, crushed recycled concrete, angular sand, or other approved material. ABC shall be free of lumps of clay, organic matter, and other objectionable materials or coatings. GCA shall be free of silt and clay as defined by [ASTM D 2487](#), organic matter, and other objectionable materials or coatings. The portion retained on the No. 4 sieve shall be known as coarse aggregate; that portion passing the No. 4 sieve shall be known as fine aggregate.

### **2.1.1 Coarse Aggregate**

Coarse aggregates shall be angular particles of uniform density. When the coarse aggregate is supplied from more than one source, aggregate from each source shall meet the specified requirements and shall be stockpiled separately.

a. **Crushed Gravel:** Crushed gravel shall be manufactured by crushing gravels, and shall meet all the requirements specified below.

b. **Crushed Stone:** Crushed stone shall consist of freshly mined quarry rock, and shall meet all the requirements specified below.

c. **Crushed Recycled Concrete:** Crushed recycled concrete shall consist of previously hardened portland cement concrete or other concrete containing pozzolanic binder material. The recycled material shall be free of all reinforcing steel, bituminous concrete surfacing, and any other foreign material and shall be crushed and processed to meet the required gradations for coarse aggregate. Crushed recycled concrete shall meet all other applicable requirements specified below.

d. **Crushed Slag:** Crushed slag shall be an air-cooled blast-furnace product having an air dry unit weight of not less than 65 pcf as determined by [ASTM C 29/C 29M](#), and shall meet all the requirements specified below.

### 2.1.1.1 Aggregate Base Course

ABC coarse aggregate shall not show more than 50 percent loss when subjected to the Los Angeles abrasion test in accordance with [ASTM C 131](#). 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; an elongated particle is one having a ratio of length to width greater than 3. In the portion retained on each sieve specified, the crushed aggregates 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 contiguous, the angle between planes of the fractures must be at least 30 degrees in order to count as two fractured faces. Crushed gravel shall be manufactured from gravel particles 50 percent of which, by weight, are retained on the maximum size sieve listed in TABLE 1.

### 2.1.1.2 Graded-Crushed Aggregate Base Course

GCA coarse aggregate shall not show more than 40 percent loss when subjected to the Los Angeles abrasion test in accordance with [ASTM C 131](#). GCA coarse aggregate shall not exhibit a loss greater than 40 percent weighted average, at five cycles, when tested for soundness in magnesium sulfate in accordance with [ASTM C 88](#). The amount of flat and elongated particles shall not exceed 20 percent for the fraction retained on the 1/2 inch sieve nor 20 percent for the fraction passing the 1/2 inch sieve. A flat particle is one having a ratio of width to thickness greater than 3; an elongated particle is one having a ratio of length to width greater than 3. In the portion retained on each sieve specified, the crushed aggregate shall contain at least 90 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 contiguous, the angle between planes of the fractures must be at least 30 degrees in order to count as two fractured faces. Crushed gravel shall be manufactured from gravel particles 90 percent of which by weight are retained on the maximum size sieve listed in TABLE 1.

### 2.1.2 Fine Aggregate

Fine aggregates shall be angular particles of uniform density. When the fine aggregate is supplied from more than one source, aggregate from each source shall meet the specified requirements.

### 2.1.2.1 Aggregate Base Course

ABC fine aggregate shall consist of screenings, angular sand, crushed recycled concrete fines, or other finely divided mineral matter processed or naturally combined with the coarse aggregate.

### 2.1.2.2 Graded-Crushed Aggregate Base Course

GCA fine aggregate shall consist of angular particles produced by crushing stone, slag, recycled concrete, or gravel that meets the requirements for wear and soundness specified for GCA coarse aggregate. Fine aggregate shall be produced by crushing only particles larger than No. 4 sieve in size. The fine aggregate shall contain at least 90 percent by weight of particles having two or more freshly fractured faces in the portion passing the No. 4 sieve and retained on the No. 10 sieve, and in the portion passing the No. 10 sieve and retained on the No. 40 sieve.

### 2.1.3 Gradation Requirements

The specified gradation requirements shall apply to the completed base course. The aggregates shall have a maximum size of 1-½ inches and shall be continuously well graded within the limits specified in TABLE 1. Sieves shall conform to [ASTM E 11](#).

TABLE I. GRADATION OF AGGREGATES

Percentage by Weight Passing Square-Mesh Sieve

Sieve Designation	No. 1	No. 2	No. 3
2 inch	100	----	----
1-1/2 inch	70-100	100	----
1 inch	45-80	60-100	100
1/2 inch	30-60	30-65	40-70
No. 4	20-50	20-50	20-50
No. 10	15-40	15-40	15-40
No. 40	5-25	5-25	5-25
No. 200	0-8	0-8	0-8

NOTE 1: Particles having diameters less than 0.0008 inch shall not be in excess of 3 percent by weight of the total sample tested.

NOTE 2: The values are based on aggregates of uniform specific gravity. If materials from different sources are used for the coarse and fine aggregates, they shall be tested in accordance with [ASTM C 127](#) and [ASTM C](#)

128 to determine their specific gravities. If the specific gravities vary by more than 10 percent, the percentages passing the various sieves shall be corrected as directed by the Contracting Officer.

#### **2.1.4 Liquid Limit and Plasticity Index**

Liquid limit and plasticity index requirements shall apply to the completed course and shall also apply to any component that is blended to meet the required gradation. The portion of any component or of the completed course passing the No. 40 sieve shall be either nonplastic or have a liquid limit not greater than 25 and a plasticity index not greater than 5.

### **PART 3 EXECUTION**

#### **3.1 GENERAL REQUIREMENTS**

When the ABC or GCA is constructed in more than one layer, the previously constructed layer shall be cleaned of loose and foreign matter by sweeping with power sweepers or power brooms, except that hand brooms may be used in areas where power cleaning is not practicable. Adequate drainage shall be provided during the entire period of construction to prevent water from collecting or standing on the working area. Line and grade stakes shall be provided as necessary for control. Grade stakes shall be in lines parallel to the centerline of the area under construction and suitably spaced for string lining.

#### **3.2 OPERATION OF AGGREGATE SOURCES**

Aggregates shall be obtained from offsite sources.

#### **3.3 STOCKPILING MATERIAL**

Prior to stockpiling of material, storage sites shall be cleared and leveled by the Contractor. All materials, including approved material available from excavation and grading, shall be stockpiled in the manner and at the locations designated. Aggregates shall be stockpiled on the cleared and leveled areas designated by the Contracting Officer to prevent segregation. Materials obtained from different sources shall be stockpiled separately.

#### **3.4 PREPARATION OF UNDERLYING COURSE**

Prior to constructing the ABC and GCA, the underlying course or subgrade shall be cleaned of all foreign substances. At the time of construction, the underlying course shall contain no frozen material. The surface of the underlying course or subgrade shall meet specified compaction and surface tolerances. The underlying course shall conform to Section 02300 EARTHWORK. Ruts or soft yielding spots in the underlying courses, areas having

inadequate compaction, and deviations of the surface from the requirements set forth herein shall be corrected by loosening and removing soft or unsatisfactory material and by adding approved material, reshaping to line and grade, and recompacting to specified density requirements. For cohesionless underlying courses containing sands or gravels, as defined in **ASTM D 2487**, the surface shall be stabilized prior to placement of the ABC and GCA. Stabilization shall be accomplished by mixing ABC or GCA into the underlying course and compacting by approved methods. The stabilized material shall be considered as part of the underlying course and shall meet all requirements of the underlying course. The finished underlying course shall not be disturbed by traffic or other operations and shall be maintained by the Contractor in a satisfactory condition until the ABC and GCA is placed.

### **3.5 INSTALLATION**

#### **3.5.1 Mixing the Materials**

The coarse and fine aggregates shall be mixed in a stationary plant, or in a traveling plant or bucket loader on an approved paved working area. The Contractor shall make adjustments in mixing procedures or in equipment as directed to obtain true grades, to minimize segregation or degradation, and to obtain the required water content.

#### **3.5.2 Placing**

The mixed material shall be placed on the prepared subgrade or subbase in layers of uniform thickness with an approved spreader. When a compacted layer 6 inches or less in thickness is required, the material shall be placed in a single layer. When a compacted layer in excess of 6 inches is required, the material shall be placed in layers of equal thickness. No layer shall exceed 6 inches or less than 3 inches when compacted. The layers shall be so placed that when compacted they will be true to the grades or levels required with the least possible surface disturbance. Where the ABC and GCA is placed in more than one layer, the previously constructed layers shall be cleaned of loose and foreign matter by sweeping with power sweepers, power brooms, or hand brooms, as directed. Such adjustments in placing procedures or equipment shall be made as may be directed to obtain true grades, to minimize segregation and degradation, and to adjust the water content.

#### **3.5.3 Grade Control**

The completed ABC and GCA shall conform to the lines, grades, and cross sections shown. Underlying material(s) shall be excavated and prepared at sufficient depth for the required ABC and GCA thickness so that the finished ABC and GCA with the subsequent surface course will meet the designated grades.

### 3.5.4 Compaction

Each layer of the ABC and GCA shall be compacted as specified with approved compaction equipment. Water content shall be maintained during the compaction procedure to within plus or minus 1-1/2 percent of the optimum water content determined from laboratory tests as specified in paragraph SAMPLING AND TESTING. Rolling shall begin at the outside edge of the surface and proceed to the center, overlapping on successive trips at least one-half the width of the roller. Alternate trips of the roller shall be slightly different lengths. Speed of the roller shall be such that displacement of the aggregate does not occur. In all places not accessible to the rollers, the mixture shall be compacted with hand-operated power tampers. Compaction shall continue until each layer has the specified degree of compaction or at least 95 percent of laboratory maximum density through the full depth of the layer. The Contractor shall make such adjustments in compacting or finishing procedures as may be directed to obtain true grades, to minimize segregation and degradation, to reduce or increase water content, and to ensure a satisfactory ABC and GCA. Any materials that are found to be unsatisfactory shall be removed and replaced with satisfactory material or reworked, as directed, to meet the requirements of this specification.

### 3.5.6 Thickness

Compacted thickness of the aggregate course shall be as indicated. No individual layer shall exceed 6 inches nor be less than 3 inches in compacted thickness. The total compacted thickness of the ABC and GCA course shall be within 1/2 inch of the thickness indicated. Where the measured thickness is more than 1/2 inch deficient, such areas shall be corrected by scarifying, adding new material of proper gradation, reblading, and recompacting as directed. Where the measured thickness is more than 1/2 inch thicker than indicated, the course shall be considered as conforming to the specified thickness requirements. Average job thickness shall be the average of all thickness measurements taken for the job, but shall be within 1/4 inch of the thickness indicated. The total thickness of the ABC and GCA course shall be measured at intervals in such a manner as to ensure one measurement for each 500 square yards of base course. Measurements shall be made in 3inch diameter test holes penetrating the base course.

### 3.5.7 Proof Rolling

Proof rolling of the areas indicated shall be in addition to the compaction specified and shall consist of the application of 30 coverages with a heavy pneumatic-tired roller having four or more tires, each loaded to a minimum of 30,000 pounds and inflated to a minimum of 150 psi. In areas designated, proof rolling shall be applied to the top of the underlying material on which ABC and GCA is laid and to each layer of ABC and GCA. Water content of the underlying material shall be maintained at optimum or at the percentage directed from start of compaction to completion of proof rolling of that layer. Water content of each layer of the ABC and GCA shall be maintained at the optimum percentage directed from start of compaction to completion of proof rolling. Any ABC and GCA materials or any underlying materials that produce unsatisfactory results by proof rolling shall be

removed and replaced with satisfactory materials, recompact and proof rolled to meet these specifications.

### **3.5.8 Finishing**

The surface of the top layer of ABC and GCA shall be finished after final compaction by cutting any overbuild to grade and rolling with a steel-wheeled roller. Thin layers of material shall not be added to the top layer of base course to meet grade. If the elevation of the top layer of ABC and GCA is 1/2 inch or more below grade, then the top layer should be scarified to a depth of at least 3 inches and new material shall be blended in and compacted to bring to grade. Adjustments to rolling and finishing procedures shall be made as directed to minimize segregation and degradation, obtain grades, maintain moisture content, and ensure an acceptable base course. Should the surface become rough, corrugated, uneven in texture, or traffic marked prior to completion, the unsatisfactory portion shall be scarified, reworked and recompact or it shall be replaced as directed.

### **3.5.9 Smoothness**

The surface of the top layer shall show no deviations in excess of 3/8 inch when tested with a 10 foot straightedge. Measurements shall be taken in successive positions parallel to the centerline of the area to be paved. Deviations exceeding this amount shall be corrected by removing material and replacing with new material, or by reworking existing material and compacting it to meet these specifications.

## **3.6 TRAFFIC**

Traffic shall not be allowed on the completed ABC and GCA course.

## **3.7 MAINTENANCE**

The ABC and GCA shall be maintained in a satisfactory condition until the full pavement section is completed and accepted.

## **3.8 DISPOSAL OF UNSATISFACTORY MATERIALS**

Any unsuitable materials that must be removed shall be disposed of in waste disposal areas off base. No additional payments will be made for materials that must be replaced.

-- End of Section --

## SECTION 02741N

BITUMINOUS CONCRETE PAVEMENT  
09/99**PART 1 GENERAL****1.1 REFERENCES**

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

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS  
(AASHTO)

**AASHTO T 30** (1993) Mechanical Analysis of Extracted of Aggregate

**AASHTO T 230** (1968; R 1993) Determining Degree of Pavement Compaction of Bituminous Aggregate Mixtures

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

**ASTM D 1559** (1989) Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus

**ASTM D 2172** (1995) Quantitative Extraction of Bitumen from Bituminous Paving Mixtures

**ASTM D 2950** (1991) Density of Bituminous Concrete in Place by Nuclear Methods

U.S. DEPARTMENT OF TRANSPORTATION (DOT)

**DOT D-6.1** (1989) Uniform Traffic Control Devices for Streets and Highways

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

**FS TT-P-115** (Rev. F) Paint, Traffic (Highway, White and Yellow)

STATE OF MISSISSIPPI HIGHWAY SPECIFICATION

1990, Standard Specifications for Road and Bridge Construction

**1.2 SUBMITTALS**

Submit the following in accordance with Section 01330, "Submittal Procedures."

SD-03 Product Data

Precast car stops

SD-04 Samples

Uncompacted mix

Pavement cores

SD-06 Test Reports

Trial batch reports

Mix design

Asphalt concrete

Density

Thickness

Straightedge test

Submit reports for testing specified under paragraph entitled "Field Quality Control."

SD-07 Certificates

Asphalt mix delivery record

Asphalt concrete and material sources

Obtain approval of the Contracting Officer for materials and material sources 2 days prior to the use of such material in the work.

Asphalt concrete

Curbs

Submit certificates, signed by the producer, that paving materials and incidental construction items conform to specification requirements.

## **1.3 QUALITY ASSURANCE**

### **1.3.1 Regulatory Requirements**

Provide work and materials in accordance with applicable requirements of **SHS Division 400-Bituminous Pavements**. Paragraphs in **SHS** entitled "Method of Measurement" and "Basis of Payment" shall not apply.

### 1.3.2 Modification of References

Where term "Engineer" is used in SHS it shall be construed to mean Contracting Officer. Where term "state" is used, it shall mean "Federal Government".

### 1.3.3 Mix Delivery Record Data

Record and submit the following information to each load of mix delivered to the job site. Submit within one day after delivery on Government-furnished forms:

- a. Truck No:
- b. Time In:
- c. Time Out:
- d. Tonnage and Discharge Temperature:
- e. Mix Type:
- f. Location:
- g. Stations Placed:

### 1.3.4 Trial Batch

Submit current bituminous design reports for all mix types proposed for use on the project.

### 1.3.5 Mix Design

Submit results of laboratory tests performed on each mix design. Testing shall have been accomplished not more than one year prior to date of material placement.

## 1.4 Unit of Measurement

The unit of measurement for asphalt pavement will be the ton for asphalt delivered in place according to specifications and accepted.

## 1.5 Basis of Payment

The basis of payment for asphalt pavement will be the price per ton according to the Bid Schedule.

## **PART 2 PRODUCTS**

### **2.1 ASPHALT CONCRETE**

Provide asphalt concrete in accordance with the applicable requirements of the [Mississippi Standard Specifications for Road and Bridge Construction, Division 400, Section 403](#), except where specified otherwise. Recycled asphalt pavement material may be used as approved by the Contracting Officer.

### **2.2 SURFACE COURSE**

Asphalt surface course shall conform to the requirements for SC-1, as Specified in the Mississippi Standard Specifications for Road and Bridge Construction. The bituminous material may be AC-20 or AC-30 at the Contractor's option.

### **2.3 ASPHALT BASE COURSE**

Asphalt base course shall conform to the requirements for BB-1, as Specified in the Mississippi Standard Specifications for Road and Bridge Construction.

### **2.4 PRECAST CAR STOPS**

Provide car stops to the profile and size indicated. Manufacture with air entrained concrete having a minimum compressive strength of 3,000 psi at 28 days, with two No. 4 reinforcing rods located at mid-point of its cross section and with two galvanized sleeves for anchoring.

### **2.5 COMPOSITION OF MIXTURE REQUIREMENTS**

#### **2.5.1 Mixture Properties**

Gradation of mineral aggregate shall be as specified. Percentage of bituminous material provided in the bituminous mixtures shall be within the limits specified. Mixtures shall have the following physical properties:

<u>Test Property</u>	<u>Values</u>
Stability (50 Blows)	Not less than 1000 pounds
Flow (0.01 inch)	Not more than 20 nor less than 8
Percent Air Voids	Not less than 3 nor more than 8 for binder course; not less than 3 nor more than 5 for wearing course
Percent Voids in Mineral Aggregates	See Table I

TABLE I

## MINIMUM PERCENT VOIDS IN MINERAL AGGREGATE (VMA)

<u>U.S.A. Standard Sieve Designation</u>	<u>Nominal Maximum Particle Size, Inch</u>	<u>Minimum VMA Percent</u>
No. 4	0.187	18
3/8 inch	0.375	16
1/2 inch	0.500	15
3/4 inch	0.750	14
1 inch	1.000	13

## 2.5.2 Quantity of Bituminous Material

Mix asphalt cement with aggregates of corresponding mixes in the following proportions:

ASPHALT CEMENT PERCENT BY WEIGHT OF TOTAL MIX

<u>Binder Course</u>	<u>Surface Course</u>
4 to 8	5 to 9

## 2.5.3 Job-mix Formula

Job-mix formula for plant hot-mix shall be submitted by the Contractor to the Contracting Officer and no bituminous mixture shall be manufactured until it has been approved. The hot-mix design shall indicate the percentage of each sieve fraction of aggregate. The percentage of asphalt in the job-mix formula shall be the percent determined to be acceptable for proper mixture in accordance with the State of Mississippi, Department of Highways requirements.

# PART 3 EXECUTION

## 3.1 EQUIPMENT

a. Bituminous material spreaders shall be self-propelled, capable of producing a finished surface conforming to the smoothness requirements specified herein. The use of a spreader that leaves indentations or other objectionable irregularities in the freshly laid mix will not be permitted.

b. Saws used shall be of the power type, capable of rapidly cutting pavements and trimming joints and edges of pavement.

c. Small tools available at the work site shall consist of the following: rakes, lutes, shovels, tampers, smoothing irons, pavement cutters, portable heating tools, etc. The lutes shall be

constructed of metal and shall consist of a plate or sheet 36" x 4" attached to a properly braced handle. Hand tampers shall weigh not less than twenty-five pounds and have a tamping face not larger than fifty square inches.

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

### **3.2 transportation of bituminous mixture**

The bituminous mixture shall be transported from the mixing plant to the site in trucks having tight, clean, and smooth bodies with a minimum coating of concentrated solution of hydrated lime and water to prevent the loss of heat. Mixtures having temperatures greater than 350 F or mixtures which foam or show indications of moisture will be rejected. Hauling over freshly placed material will not be permitted.

### **3.3 placing**

The mechanical spreader shall be adjusted and its speed regulated so that the course being placed will be of such depth that, after compaction, the cross section, grade, and contour will be as shown on the drawings. In areas where the use of machine spreading is impractical, the mixture shall be spread by hand. Unless otherwise directed, placing shall begin on the high side of areas having a one-way slope or along the centerline of areas with a crowned section and shall be in the direction of the main traffic flow. Placing of the mixture shall be as continuous as possible, and the speed of placing shall be adjusted to permit proper rolling.

### **3.4 compaction**

Compaction shall be accomplished by steel-wheel rollers. Rolling shall begin as soon after placing as the mixture will support the roller without undue displacement. Rolling of the course shall continue until all roller marks are eliminated and at least 95% of the density of a laboratory specimen of the same mixture, subjected to fifty blows of a standard Marshall hammer on each side of the specimen, has been obtained. The speed of the rollers shall not exceed two miles per hour and at all times be slow enough to avoid displacement of the hot mixture. The areas not accessible to the rollers will be compacted with hand tampers.

### **3.5 joints**

The joints between old and new pavement or between lanes of new work shall be constructed so as to ensure uniform bond, texture, density, and smoothness as in other sections of the course. Edges of existing pavement shall be cut to straight, vertical surface. All contact surfaces of existing pavement shall be painted with a thin, uniform coat of asphalt.

### **3.6 protection of pavement**

After final rolling, no vehicular traffic shall be permitted on the pavement for at least six hours.

### **3.7 Precast Car Stops**

Provide car stops where indicated. Install with an anchor rod driven through each sleeve.

### **3.8 FIELD QUALITY CONTROL**

Samples shall be taken by Contractor when requested by the Contracting Officer as specified herein. Contractor shall replace pavement where sample cores have been removed. Submit 2 pavement cores when using the in-place nuclear density method.

#### **3.8.1 Sample and Core Identification**

Place each sample and core in a container and securely seal to prevent loss of material. Tag each sample for identification. Tag shall contain the following information:

- a. Contract No.
- b. Sample No.
- c. Quantity
- d. Date of Sample
- e. Sample Description
- f. Source/Location/Stations Placed/depth below the finish grade
- g. Intended Use
- h. Thicknesses of various lifts placed

### 3.9 Testing

All testing shall be the responsibility of the Government and shall be performed by a recognized commercial testing laboratory. The Government shall pay for initial tests. The Contractor shall pay for subsequent tests required due to failed samples.

#### 3.9.1 Bituminous Mix Testing

Take two samples per day per mix type at plant or from truck. Test **uncompacted mix** for extraction in accordance with **ASTM D 2172** and sieve analysis in accordance with **AASHTO T 30**. Test samples for stability and flow in accordance with **ASTM D 1559**. When two consecutive tests fail to meet requirements of specifications, cease placement operations and test a new trial batch prior to resumption of placement operations.

#### 3.9.2 Testing of Pavement Course

- a. **Density:** Determine density of pavement by testing cores obtained from the binder and wearing course in accordance with **AASHTO T 230**. Take three cores at location designated by Contracting Officer for each 200 tons, or fraction thereof, of asphalt placed. Deliver cores undisturbed and undamaged to laboratory and provide test results within 48 hours of each day placement of paving materials.
- b. **Thickness:** Determine thickness of the binder and wearing course from cores taken for density test.
- c. **Straightedge Test:** Test compacted surface of binder course and wearing course with a straightedge as work progresses. Apply straightedge parallel with and at right angles to center line after final rolling. Variations in the binder course surface shall not be more than 1/4 inches from the lower edge of the 10 foot straightedge; variations in wearing course surface shall not be more than 1/4 from the lower edge of the 10 foot straightedge. Pavement showing irregularities greater than that specified shall be corrected as directed by Contracting Officer.

#### 3.9.3 Alternate Testing Method for Pavement Courses

At Contractor's option the following in-place testing method may be used to determine density and thickness in lieu of testing specified above. Frequency of testing shall be the same. When in-place nuclear method to determine density is used, take two pavement cores at locations designated by Contracting Officer and turn over to Government to verify pavement thickness.

- a. **Density:** Determine density of pavement by in-place testing using Nuclear Method in accordance with **ASTM D 2950**.
- b. **Thickness:** Determine thickness of finished pavement by use of following equation:

$$t = \frac{W}{0.75d}$$

Where t= pavement thickness, in inches.

W= average weight per square yard of mixture actually used in work.

d= compacted density as measured by nuclear density device.

-- End of Section --

## SECTION 02748A

BITUMINOUS TACK AND PRIME COATS  
01/98**PART 1 GENERAL****1.1 REFERENCES**

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

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS  
(AASHTO)

AASHTO M 20	(1970; R 1996) Penetration Graded Asphalt Cement
AASHTO M 81	(1992; R 1996) Cut-Back Asphalt (Rapid-Curing Type)
AASHTO M 82	(1975; R 1996) Cut-Back Asphalt (Medium-Curing Type)
AASHTO M 226	(1980; R 1996) Viscosity Graded Asphalt Cement
AASHTO T 40	(1978; R 1996) Sampling Bituminous Materials

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 140	(200) Sampling Bituminous Materials
ASTM D 946	(1982; R 1999) Penetration-Graded Asphalt Cement for Use in Pavement Construction
ASTM D 977	(1998) Emulsified Asphalt
ASTM D 1250	(1980; R 1997e1) Petroleum Measurement Tables
ASTM D 2026	(1972; R 1997) Cutback Asphalt (Slow-Curing Type)
ASTM D 2027	(1976; R 1997) Cutback Asphalt (Medium-Curing Type)
ASTM D 2028	(1976; R 1997) Cutback Asphalt (Rapid-Curing Type)
ASTM D 2397	(1998) Cationic Emulsified Asphalt
ASTM D 2995	(1999) Determining Application Rate of Bituminous Distributors

ASTM D 3381

(1992; R 1999) Viscosity-Graded Asphalt  
Cement for Use in Pavement Construction

## 1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section [01330](#) SUBMITTAL PROCEDURES if requested by the Contracting Officer for a specific Delivery Order:

### SD-03 Product Data

#### Waybills and Delivery Tickets

Waybills and delivery tickets, during progress of the work.

### SD-06 Test Reports

#### Sampling and Testing

Copies of all test results for bituminous materials, within 24 hours of completion of tests. Certified copies of the manufacturer's test reports indicating compliance with applicable specified requirements.

## 1.3 UNIT PRICES

### 1.3.1 Measurement

The bituminous material paid for will be the measured quantities used in the accepted work, provided that the measured quantities are not 10 percent over the specified application rate. Any amount of bituminous material more than 10 percent over the specified application rate for each application shall be deducted from the measured quantities, except for irregular areas where hand spraying of the bituminous material is necessary. Measured quantities shall be expressed in gallons at 60 degrees F. Volumes measured at temperatures other than 60 degrees F shall be corrected in accordance with [ASTM D 1250](#) using a coefficient of expansion of 0.00025 per degree F for asphalt emulsion.

### 1.3.2 Payment

The quantities of bituminous material, determined as specified above, will be paid for at the respective contract unit prices. Payment shall constitute full compensation for all operations necessary to complete the work as specified herein.

### **1.3.3 Waybills and Delivery Tickets**

Before the final statement is allowed, the Contractor shall file with the Contracting Officer certified waybills and certified delivery tickets for all bituminous materials used in the construction of the pavement covered by the contract. The Contractor shall not remove bituminous material from storage until the initial outage and temperature measurements have been taken. The delivery or storage units will not be released until the final outage has been taken.

## **1.4 PLANT, EQUIPMENT, MACHINES AND TOOLS**

### **1.4.1 General Requirements**

Plant, equipment, machines and tools used in the work shall be subject to approval and shall be maintained in a satisfactory working condition at all times.

### **1.4.2 Bituminous Distributor**

The distributor shall have pneumatic tires of such size and number to prevent rutting, shoving or otherwise damaging the base surface or other layers in the pavement structure. The distributor shall be designed and equipped to spray the bituminous material in a uniform coverage at the specified temperature, at readily determined and controlled rates with an allowable variation from the specified rate of not more than plus or minus 5 percent, and at variable widths. Distributor equipment shall include a separate power unit for the bitumen pump, full-circulation spray bars, tachometer, pressure gauges, volume-measuring devices, adequate heaters for heating of materials to the proper application temperature, a thermometer for reading the temperature of tank contents, and a hand hose attachment suitable for applying bituminous material manually to areas inaccessible to the distributor. The distributor shall be equipped to circulate and agitate the bituminous material during the heating process.

### **1.4.3 Power Brooms and Power Blowers**

Power brooms and power blowers shall be suitable for cleaning the surfaces to which the bituminous coat is to be applied.

## **1.5 WEATHER LIMITATIONS**

Bituminous coat shall be applied only when the surface to receive the bituminous coat is dry. Bituminous coat shall be applied only when the atmospheric temperature in the shade is 50 degrees F or above and when the temperature has not been below 35 degrees F for the 12 hours prior to application.

## **PART 2 PRODUCTS**

### **2.1 TACK COAT**

Cutback asphalt and/or emulsified asphalt shall conform to ASTM D 2028, ASTM D 2026, ASTM D 2027, ASTM D 977, and ASTM D 2397.

### **2.2 PRIME COAT**

Cutback asphalt and/or emulsified asphalt shall conform to ASTM D 2028, ASTM D 2026, ASTM D 2027, ASTM D 977, and ASTM D 2397.

## **PART 3 EXECUTION**

### **3.1 PREPARATION OF SURFACE**

Immediately before applying the bituminous coat, all loose material, dirt, clay, or other objectionable material shall be removed from the surface to be treated. The surface shall be dry and clean at the time of treatment.

### **3.2 APPLICATION RATE**

The exact quantities within the range specified, which may be varied to suit field conditions, will be determined by the Contracting Officer.

#### **3.2.1 Tack Coat**

Bituminous material for the tack coat shall be applied in quantities of not less than 0.05 gallon nor more than 0.15 gallon per square yard of pavement surface.

#### **3.2.2 Prime Coat**

Bituminous material for the prime coat shall be applied in quantities of not less than 0.15 gallon nor more than 0.40 gallon per square yard of pavement surface.

### **3.3 APPLICATION TEMPERATURE**

#### **3.3.1 Viscosity Relationship**

Asphalt application temperature shall provide an application viscosity between 10 and 60 seconds, Saybolt Furol, or between 20 and 120 centistokes, kinematic. The temperature viscosity relation shall be furnished to the Contracting Officer.

### 3.3.2 Temperature Ranges

The viscosity requirements shall determine the application temperature to be used. The following is a normal range of application temperatures:

#### Liquid Asphalts

SC-70	120-225 degrees F
SC-250	165-270 degrees F
MC-30	85-190 degrees F
MC-70	120-225 degrees F
MC-250	165-270 degrees F
RC-70	120-200 degrees F*
RC-250	165-250 degrees F*

#### Paving Grade Asphalts

##### Penetration Grades

200-300	plus 265 degrees F
120-150	plus 270 degrees F
85-100	plus 280 degrees F

##### Viscosity Grades

AC 2.5	plus 270 degrees F
AC 5	plus 280 degrees F
AC 10	plus 280 degrees F
AR 1000	plus 275 degrees F
AR 2000	plus 285 degrees F
AR 4000	plus 290 degrees F

##### Emulsions

RS-1	70-140 degrees F
MS-1	70-160 degrees F
HFMS-1	70-160 degrees F
SS-1	70-160 degrees F
SS-1h	70-160 degrees F
CRS-1	125-185 degrees F
CSS-1	70-160 degrees F
CSS-1h	70-160 degrees F

\*These temperature ranges exceed the flash point of the material and care should be taken in their heating.

## **3.4 APPLICATION**

### **3.4.1 General**

Following preparation and subsequent inspection of the surface, the bituminous coat shall be applied at the specified rate with uniform distribution over the surface to be treated. All areas and spots missed by the distributor shall be properly treated with the hand spray. Until the succeeding layer of pavement is placed, the surface shall be maintained by protecting the surface against damage and by repairing deficient areas at no additional cost to the Government. If required, clean dry sand shall be spread to effectively blot up any excess bituminous material. No smoking, fires, or flames other than those from the heaters that are a part of the equipment shall be permitted within 25 feet of heating, distributing, and transferring operations of bituminous material other than bituminous emulsions. All traffic, except for paving equipment used in constructing the surfacing, shall be prevented from using the underlying material, whether primed or not, until the surfacing is completed. The bituminous coat shall conform to all requirements as described herein.

### **3.4.2 Prime Coat**

The prime coat will be required if it will be at least seven days before a the surfacing (Asphalt cement hot mix concrete) layer is constructed on the underlying (base course, etc) compacted material. The type of liquid asphalt and application rate will be as specified herein. The Contractor shall protect the underlying from any damage (water, traffic, etc.) until the surfacing is placed. If the Contractor places the surfacing within seven days, the choice of protection measures or actions to be taken is at the Contractor's option. Damage to the underlying material caused by lack of, or inadequate, protection shall be repaired (recompacted or replaced) by approved methods at no additional cost to the Government. If the Contractor options to use the prime coat, it shall be applied as soon as possible after consolidation of the underlying material. To obtain uniform application of the prime coat on the surface treated 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 to start and stop the prime coat on the paper. Immediately after application, the building paper shall be removed and destroyed.

### **3.4.3 Tack Coat**

Tack coat shall be applied at the locations shown on the drawings.

## **3.5 CURING PERIOD**

Following application of the bituminous material and prior to application of the succeeding layer of pavement, the bituminous coat shall be allowed to cure and to obtain evaporation of any volatiles or moisture. Prime coat shall be allowed to cure without being disturbed for a period of at least 48

hours or longer, as may be necessary to attain penetration into the treated course.

### **3.6 FIELD QUALITY CONTROL**

Samples of the bituminous material used shall be obtained by the Contractor if requested by the Contracting Officer. The sample may be retained and tested by the Government at no cost to the Contractor.

### **3.7 SAMPLING AND TESTING**

Sampling and testing shall be performed by an approved commercial testing laboratory or by facilities furnished by the Contractor. No work requiring testing will be permitted until the facilities have been inspected and approved.

#### **3.7.1 Sampling**

The samples of bituminous material, unless otherwise specified, shall be in accordance with [ASTM D 140](#) or [AASHTO T 40](#). Sources from which bituminous materials are to be obtained shall be selected and notification furnished the Contracting Officer within 15 days after the award of the contract.

#### **3.7.2 Calibration Test**

The Contractor shall furnish all equipment, materials, and labor necessary to calibrate the bituminous distributor. Calibration shall be made with the approved job material and prior to applying the bituminous coat material to the prepared surface. Calibration of the bituminous distributor shall be in accordance with [ASTM D 2995](#).

#### **3.7.3 Trial Applications**

Before providing the complete bituminous coat, three lengths of at least 100 feet for the full width of the distributor bar shall be applied to evaluate the amount of bituminous material that can be satisfactorily applied.

##### **3.7.3.1 Tack Coat Trial Application Rate**

Unless otherwise authorized, the trial application rate of bituminous tack coat materials shall be applied in the amount of 0.05 gallons per square yard. Other trial applications shall be made using various amounts of material as may be deemed necessary.

##### **3.7.3.2 Prime Coat Trial Application Rate**

Unless otherwise authorized, the trial application rate of bituminous materials shall be applied in the amount of 0.25 gallon per square yard. Other trial applications shall be made using various amounts of material as may be deemed necessary.

-- End of Section --

SECTION 02761N  
PAVEMENT MARKINGS  
8/02

## PART 1 GENERAL

### 1.1 REFERENCES

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

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 471	(1998) Rubber Property - Effect of Liquids
ASTM D 522	(1993) Mandrel Bend Test of Attached Organic Coatings
ASTM D 711	(1998) No-Pick-Up Time of Traffic Paint
ASTM D 792	(1991) Density and Specific Gravity (Relative Density) of Plastics by Displacement
ASTM D 823	(1995) Producing Films of Uniform Thickness of Paints, Varnishes, and Related Products on Test Panels.
ASTM D 2240	(1997) Rubber Property-Durometer Hardness
ASTM D 2621	(1995) Infrared Identification of Vehicle Solids from Solvent Reducible Paints
ASTM D 2697	(1998) Volume Nonvolatile Matter in clear or Pigmented Coatings
ASTM D 3335	(1999) Lead, Cadmium, and Cobalt in Paint by Atomic Absorption Spectroscopy
ASTM D 3718	(1999) Low Concentrations of Chromium in paint by Atomic Absorption Spectroscopy
ASTM D 3924	(1996) Conditioning and Testing Paint, Varnish, Lacquers, and Related Materials
ASTM D 3960	(1998) Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings
ASTM D 4280	(1996) Extended Life Type, Nonplowables, Prismatic, Raised, Retroreflective Pavement Markers

ASTM D 4541	(1995) Pull-Off Strength of Coatings Using Portable Adhesion Testers
ASTM E 28	(1996) Softening Point by Ring-and-Ball Apparatus
ASTM G 53	(1996) Operating Light- and Water- Exposure Apparatus (Fluorescent UV Condensation Type) for Exposure of Nonmetallic Materials

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

FS A-A-2886	(1997; Rev A) Paint, Traffic, Solvent Based
FED-STD-595	(1989; 1994; Rev. B) Colors used in Government Procurement
FS TT-B-1325	(1993; 2000; Rev. C) Beads (Glass Spheres) Retro-Reflective
FS TT-P-1952	(1994; 2000; Rev. D) Paint, Traffic and Airfield Markings, Water Emulsion Base

INTERNATIONAL CONCRETE REPAIR INSTITUTE (ICRI)

ICRI Technical Guideline 03732	Selecting and Specifying Surface Preparation for Sealers, Coatings, and Membranes
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## 1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only or as otherwise designated. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES if requested by the Contracting Officer for a specific Delivery Order:

SD-03 Product Data

- Reflective media for airfields, G
- Reflective media for roads and streets
- Paints for airfields, G
- Paints for roads and streets
- High Build Acrylic Coating (HBAC);G
- Thermoplastic compounds and primer
- Raised Pavement Markers and Adhesive, G

SD-06 Test Reports

- Reflective media for airfields

Reflective media for roads and streets

Paints for airfields

Paints for roads and streets

High Build Acrylic Coating (HBAC);G

Thermoplastic compounds and primer

Raised Pavement Markers and Adhesive

Report from sampling and testing made in accordance with paragraph entitled "Sampling and Testing."

#### SD-07 Certificates

Reflective media for airfields

Reflective media for roads and streets

Paints for airfields

Paints for roads and streets

Thermoplastic compounds and primer

Construction equipment list

#### SD-08 Manufacturer's Instructions

Paints for airfields

Paints for roads and streets

Thermoplastic compounds and primer

Submit manufacturer's Material Safety Data Sheets.

### **1.3 DELIVERY AND STORAGE**

Deliver paints, paint materials and thermoplastic compound materials in original sealed containers that plainly show the designated name, specification number, batch number, color, date of manufacture, manufacturer's directions, and name of manufacturer. Provide storage facilities at the job site for maintaining materials at temperatures recommended by the manufacturer.

### **1.4 WEATHER LIMITATIONS**

Apply paint to clean, dry surfaces, and unless otherwise approved, only when air and pavement temperatures are above 40 degrees F and less than 95 degrees F for oil-based materials; above 50 degrees F and less than 110

degrees F for water-based materials. Maintain paint temperature within these same limits.

## **1.5 EQUIPMENT**

Machines, tools, and equipment used in the performance of the work shall be approved by the Contracting Officer and maintained in satisfactory operating condition. Submit **construction equipment list** approval by the Contracting Officer.

### **1.5.1 Paint Applicator**

Provide hand-operated push-type applicator machine of a type commonly used for application of paint to pavement surfaces. Paint applicator machine shall be acceptable for marking small street and parking areas. Applicator machine shall be equipped with the necessary paint tanks and spraying nozzles, and shall be capable of applying paint uniformly at coverage specified. Applicator for water-based markings shall be equipped with non-stickcoated hoses; metal parts in contact with the paint material shall be constructed of grade 302, 304, 316, or equal stainless steel.

### **1.5.2 Reflective Media Dispenser**

Attach dispenser for applying the reflective media to the paint dispenser and operate automatically and simultaneously with the paint applicator through the same control mechanism. Use dispenser capable of adjustment and designed to provide uniform flow of reflective media over the full width of the stripe at the rate of coverage specified herein at all operating speeds of the paint applicator to which it is attached.

### **1.5.3 Thermoplastic Application Equipment**

Application equipment shall be mobile and maneuverable to the extent that straight lines can be followed and normal curves can be made in a true arc. The equipment used for the placement of thermoplastic pavement markings shall be of two general types: mobile applicator and portable applicator.

#### **1.5.3.1 Mobile Application Equipment**

The mobile applicator shall be defined as a truck-mounted, self-contained pavement marking machine that is capable of hot applying thermoplastic by either the extrusion or spray method. The mobile unit shall be capable of operating continuously and of installing a minimum of 20,000 lineal feet of longitudinal markings in a 8-hour day. Equip the mobile unit with a melting kettle of such capacity as to hold a minimum of 6000 pounds of molten thermoplastic material. The kettle shall be capable of heating the thermoplastic composition to temperatures of 375 to 425 degrees F. The heating mechanism shall be by means of a thermostatically controlled heat transfer liquid. Heating of the composition by direct flame shall not be

allowed. Oil and material temperature gages shall be visible at both ends of the kettle.

### **1.5.3.2 Portable Application Equipment**

The portable applicator shall be defined as hand-operated equipment, specifically designed for placing special markings such as crosswalks, stopbars, legends, arrows, and short lengths of lane, edge and centerlines. The portable applicator shall be capable of applying thermoplastic pavement markings by the extrusion method. It is intended that the portable applicator will be loaded with hot thermoplastic composition from the melting kettles on the mobile applicator. Equip the portable applicator with all the necessary components, including a materials storage reservoir, bead dispenser, extrusion shoe, and heating accessories, so as to be capable of holding the molten thermoplastic at a temperature of 375 to 425 degrees F, of extruding a line of 3 to 12 inches in width, and in thickness of not less than 0.125 inch nor more than 0.190 inch and of generally uniform cross section.

### **1.6 Method of Measurement**

The method of measurement for painted and preformed pavement markings shall be the square foot of painted area approved and accepted. The unit of measurement for raised reflective markings will be each.

### **1.7 Basis of payment**

Payment for all pavement markings shall be based on the unit price in the contract Bid Schedule.

## **PART 2 PRODUCTS**

### **2.1 MATERIALS**

Provide materials conforming to the requirements specified herein.

#### **2.1.1 Paints for Airfields**

FS TT-P-1952, color as indicated.

#### **2.1.2 Paints for Roads and Streets**

FS TT-P-1952, color as indicated.

### 2.1.3 Reflective Media for Airfields

FS TT-B-1325, Type I, gradation A.

### 2.1.4 Reflective Media for Roads and Streets

FS TT-B-1325, Type I, Gradation A.

### 2.1.5 Thermoplastic Compounds

The thermoplastic reflectorized pavement marking compound shall be extruded or sprayed in a molten state onto a primed pavement surface. Following a surface application of glass beads and upon cooling to normal pavement temperatures, the marking shall be an adherent reflectorized strip of the specified thickness and width that is capable of resisting deformation by traffic.

#### 2.1.5.1 Composition Requirements

The binder component shall be formulated as a hydrocarbon resin. The pigment, beads and filler shall be uniformly dispersed in the binder resin. The thermoplastic composition shall be free from all skins, dirt, and foreign objects and shall comply with the following requirements:

<u>Component</u>	<u>Percent by Weight</u>	
	<u>White</u>	<u>Yellow</u>
Binder	17 min	17 min
Titanium dioxide	10 min	-
Glass beads	20 min	20 min
Calcium carbonate and inert fillers	49 min	*
Yellow pigments	-	*

\*Amount and type of yellow pigment, calcium carbonate and inert fillers shall be at the option of the manufacturer, providing the other composition requirements of this specification are met.

#### 2.1.5.2 Physical Properties

- a. Drying time: When installed at 70 degrees F and in thicknesses between 1/8 and 3/16 inch, the composition shall be completely solid and shall show no damaging effect from traffic after curing 15 minutes.
- b. Softening point: The composition shall have a softening point of not less than 194 degrees F when tested in accordance with ASTM E 28.
- c. Specific gravity: The specific gravity of the composition shall be between 1.9 and 2.2 as determined in accordance with ASTM D 792.

### 2.1.5.3 Primer

- a. Asphalt concrete primer: The primer for asphalt concrete pavements shall be a thermosetting adhesive with a solids content of pigment reinforced synthetic rubber and synthetic plastic resin dissolved or dispersed in a volatile organic solvent. The solids content shall not be less than 10 percent by weight at 70 degrees F and 60 percent relative humidity. A wet film thickness of 0.005 inch, plus or minus 0.001 inch, shall dry to a tack-free condition in less than 5 minutes.
- b. Portland cement concrete primer: The primer for portland cement concrete pavements shall be an epoxy resin primer. The primer shall be of the type recommended by the manufacturer of the thermoplastic composition.

### 2.1.6 Raised Pavement Markers

Either metallic or nonmetallic markers of the button or prismatic reflector type may be used. Markers shall be of permanent colors as specified for pavement marking, and shall retain the color and brightness under the action of traffic. Button markers shall have a diameter of not less than 4 inches. Button markers shall have rounded surfaces presenting a smooth contour to traffic and shall not project more than 3/4 inch above level of pavement. Pavement markers and adhesive epoxy shall conform to [ASTM D 4280](#)

## PART 3 EXECUTION

### 3.1 SURFACE PREPARATION

Allow new pavement surfaces to cure for a period of not less than 30 days before application of marking materials. Thoroughly clean surfaces to be marked before application of the paint. Remove dust, dirt, and other granular surface deposits by sweeping, blowing with compressed air, rinsing with water, or a combination of these methods as required. Remove rubber deposits, existing paint markings, residual curing compounds, and other coatings adhering to the pavement by water blasting or approved chemical. For Portland Cement Concrete pavement, grinding, light shot blasting, and light scarification, to a resulting profile equal to [ICRI Technical Guideline 03732](#) CSP 2, CSP 3, and CSP 4, respectively, can be used in addition to water blasting, to either remove existing coatings or for surface preparation on most pavements: shot blasting shall not be used on airfield pavements due to the potential of Foreign Object Damage (FOD) to aircraft. Scrub affected areas, where oil or grease is present on old pavements to be marked, with several applications of trisodium phosphate solution or other approved detergent or degreaser and rinse thoroughly after each application. After cleaning oil-soaked areas, seal with shellac or primer recommended by the manufacturer to prevent bleeding through the new paint. Do not commence painting in any area until pavement surfaces are dry and clean.

## **3.2 APPLICATION**

### **3.2.1 Rate of Application**

#### **3.2.1.1 Reflective Markings**

Apply paint evenly to the pavement area to be coated at a rate of 105 plus or minus 5 square feet per gallon. Apply glass spheres uniformly to the wet paint on airfield pavement at a rate of 10 pounds of glass spheres per gallon and on road and street pavement at a rate of 6 plus or minus 0.5 pounds of glass spheres per gallon.

#### **3.2.1.2 Nonreflective Markings**

Apply paint evenly to the pavement surface to be coated at a rate of 105 plus or minus 5 square feet per gallon.

#### **3.2.1.3 Thermoplastic Compound**

After surface preparation has been completed, prime the asphalt or concrete pavement surface with spray equipment. Allow primer materials to "set-up" prior to applying the thermoplastic composition. Apply asphalt concrete primer to all asphalt concrete pavements at a wet film thickness of 0.005 inch, plus or minus 0.001 inch 265 to 400 square feet per gallon. Apply portland cement concrete primer to all concrete pavements (including concrete bridge decks) at a wet film thickness of between 0.04 to 0.05 inch 320 to 400 square feet per gallon. After the primer has "set-up", apply the thermoplastic at temperatures no lower than 375 degrees F nor higher than 425 degrees F at the point of deposition. Immediately after installation of the marking, apply drop-on reflective glass spheres mechanically at the rate of one pound per 20 square feet such that the spheres are held by and imbedded in the surface of the molten material. Apply all extruded thermoplastic markings at the specified width and at a thickness of not less than 0.125 inch nor more than 0.190 inch. Apply all sprayed thermoplastic markings at the specified width and the thickness designated in the contract plans. If the plans do not specify a thickness, apply centerline markings at a wet thickness of 0.090 inch, plus or minus 0.005 inch, and edgeline markings at a wet thickness of 0.060 inch, plus or minus 0.005 inch.

### **3.2.2 Painting**

Apply paint pneumatically with approved equipment at rate of coverage specified herein. Provide guidelines and templates as necessary to control paint application. Take special precautions in marking numbers, letters, and symbols. Manually paint numbers, letters, and symbols. Sharply outline all edges of markings. 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.

Discontinue painting operations if there is a deficiency in drying of the markings until cause of the slow drying is determined and corrected.

### **3.2.3 Reflective Media**

Application of reflective media shall immediately follow the application of paint. Accomplish drop-on application of the glass spheres to ensure even distribution at the specified rate of coverage. Should there be malfunction of either paint applicator or reflective media dispenser, discontinue operations until deficiency is corrected.

### **3.2.4 Thermoplastic Compound**

Place thermoplastic pavement markings upon dry pavement. At the time of installation the pavement surface temperature shall be a minimum of 40 degrees F and rising. Thermoplastics, as placed, shall be free from dirt or tint. Apply all centerline, skipline, edgeline, and other longitudinal type markings with a mobile applicator. Place all special markings, crosswalks, stop bars, legends, arrows, and similar patterns with a portable applicator, using the extrusion method.

### **3.2.5 Raised Pavement Markers**

Prefabricated markers shall be aligned carefully at the required spacing or as directed and permanently fixed in place by means of epoxy adhesives. To ensure good bond, areas where markers will be set shall be thoroughly cleaned by water blasting and use of compressed air prior to applying adhesive.

## **3.3 FIELD TESTING AND INSPECTION**

### **3.3.1 Sampling and Testing**

At the discretion of the Contracting Officer, samples may be requested from the Contractor for testing by the Government for verification.

### **3.3.2 Inspection**

Examine material at the job site to determine that it is the material referenced in the report of test results or certificate of compliance. A certificate of compliance shall be accompanied by test results substantiating conformance to the specified requirements.

#### **3.3.2.1 Surface Preparations and Application Procedures**

Surface preparations and application procedures will be examined by the Contracting Officer to determine conformance with the requirements specified. Approve each separate operation prior to initiation of subsequent operations.

### **3.4 TRAFFIC CONTROL AND PROTECTION**

Place warning signs near the beginning of the work site and well ahead of the work site for alerting approaching traffic from both directions. Place small markers along newly painted lines to control traffic and prevent damage to newly painted surfaces. Mark painting equipment with large warning signs indicating slow-moving painting equipment in operation. Do not use foil-backed material for temporary pavement marking because of its potential to conduct electricity during accidents involving downed power lines.

-- End of Section --

## SECTION 02770A

CONCRETE SIDEWALKS AND CURBS AND GUTTERS  
03/98**PART 1 GENERAL****1.1 REFERENCES**

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

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS  
(AASHTO)

AASHTO M 182 (1991) Burlap Cloth Made from Jute or Kenaf

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 185 (1997) Steel Welded Wire Fabric, Plain, for Concrete Reinforcement

ASTM A 615/A 615M (1996a) Deformed and Plain Billet-Steel Bars for Concrete Reinforcement

ASTM A 616/A 616M (1996a) Rail-Steel Deformed and Plain Bars for Concrete Reinforcement

ASTM A 617/A 617M (1996a) Axle-Steel Deformed and Plain Bars for Concrete Reinforcement

ASTM C 31/C 31M (1996) Making and Curing Concrete Test Specimens in the Field

ASTM C 143 (1990a) Slump of Hydraulic Cement Concrete

ASTM C 171 (1997) Sheet Materials for Curing Concrete

ASTM C 172 (1997) Sampling Freshly Mixed Concrete

ASTM C 173 (1996) Air Content of Freshly Mixed Concrete by the Volumetric Method

ASTM C 231 (1997) Air Content of Freshly Mixed Concrete by the Pressure Method

ASTM C 309 (1997) Liquid Membrane-Forming Compounds for Curing Concrete

ASTM C 920 (1995) Elastomeric Joint Sealants

ASTM D 1751	(1983; R 1991) Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
ASTM D 1752	(1984; R 1996) Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction
ASTM D 3405	(1996) Joint Sealants, Hot-Applied, for Concrete and Asphalt Pavements

## **1.2 MEASUREMENT FOR PAYMENT**

### **1.2.1 Sidewalks**

The quantities of sidewalks to be paid for will be the number of square yards of each depth of sidewalk constructed as indicated.

### **1.2.2 Curbs and Gutters**

The quantities of curbs and gutters to be paid for will be the number of linear feet of each cross section constructed as indicated, measured along the face of the curb at the gutter line.

## **1.3 BASIS FOR PAYMENT**

### **1.3.1 Sidewalks**

Payment of the quantities of sidewalks measured as specified will be at the contract unit price per square yard of the thickness specified.

### **1.3.2 Curbs and Gutters**

Payment of the quantities of curbs and gutters measured as specified will be at the contract unit price per linear foot of each cross section.

## **1.4 SUBMITTALS**

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section [01330](#) SUBMITTAL PROCEDURES if requested by the Contracting Officer for a specific Delivery Order:

### SD-03 Product Data

#### Concrete; G

Copies of certified delivery tickets for all concrete used in the construction.

## **1.5 WEATHER LIMITATIONS**

### **1.5.1 Placing During Cold Weather**

Concrete placement shall not take place when the air temperature reaches 40 degrees F and is falling, or is already below that point. Placement may begin when the air temperature reaches 35 degrees F and is rising, or is already above 40 degrees F. Provisions shall be made to protect the concrete from freezing during the specified curing period.

### **1.5.2 Placing During Warm Weather**

The temperature of the concrete as placed shall not exceed 85 degrees F except where an approved retarder is used. The mixing water and/or aggregates shall be cooled, if necessary, to maintain a satisfactory placing temperature. The placing temperature shall not exceed 95 degrees F at any time.

## **1.6 PLANT, EQUIPMENT, MACHINES, AND TOOLS**

### **1.6.1 General Requirements**

Plant, equipment, machines, and tools used in the work shall be subject to approval and shall be maintained in a satisfactory working condition at all times. The equipment shall have the capability of producing the required product, meeting grade controls, thickness control and smoothness requirements as specified. Use of the equipment shall be discontinued if it produces unsatisfactory results. The Contracting Officer shall have access at all times to the plant and equipment to ensure proper operation and compliance with specifications.

### **1.6.2 Slip Form Equipment**

Slip form paver or curb forming machine, will be approved based on trial use on the job and shall be self-propelled, automatically controlled, crawler mounted, and capable of spreading, consolidating, and shaping the plastic concrete to the desired cross section in 1 pass.

## **PART 2 PRODUCTS**

### **2.1 CONCRETE**

Concrete shall conform to the applicable requirements of [Section [03307A](#) CONCRETE FOR MINOR STRUCTURES. Concrete shall have a minimum compressive strength of 3000 psi at 28 days. Maximum size of aggregate shall be 1-1/2 inches.

#### **2.1.1 Air Content**

Mixtures shall have air content by volume of concrete of 5 to 7 percent, based on measurements made immediately after discharge from the mixer.

#### **2.1.2 Slump**

The concrete slump shall be 2 inches plus or minus 1 inch where determined in accordance with [ASTM C 143](#).

#### **2.1.3 Reinforcement Steel**

Reinforcement bars shall conform to [ASTM A 615/A 615M](#), [ASTM A 616/A 616M](#), or [ASTM A 617/A 617M](#). Wire mesh reinforcement shall conform to [ASTM A 185](#).

### **2.2 CONCRETE CURING MATERIALS**

#### **2.2.1 Impervious Sheet Materials**

Impervious sheet materials shall conform to [ASTM C 171](#), type optional, except that polyethylene film, if used, shall be white opaque.

#### **2.2.2 Burlap**

Burlap shall conform to [AASHTO M 182](#).

#### **2.2.3 White Pigmented Membrane-Forming Curing Compound**

White pigmented membrane-forming curing compound shall conform to [ASTM C 309](#), Type 2.

## **2.3 CONCRETE PROTECTION MATERIALS**

Concrete protection materials shall be a linseed oil mixture of equal parts, by volume, of linseed oil and either mineral spirits, naphtha, or turpentine. At the option of the contractor, commercially prepared linseed oil mixtures, formulated specifically for application to concrete to provide protection against the action of deicing chemicals may be used, except that emulsified mixtures are not acceptable.

## **2.4 JOINT FILLER STRIPS**

### **2.4.1 Contraction Joint Filler for Curb and Gutter**

Contraction joint filler for curb and gutter shall consist of hard-pressed fiberboard.

### **2.4.2 Expansion Joint Filler, Premolded**

Expansion joint filler, premolded, shall conform to [ASTM D 1751](#) or [ASTM D 1752](#), 3/8 inch thick, unless otherwise indicated.

## **2.5 JOINT SEALANTS**

### **2.5.1 Joint Sealant, Cold-Applied**

Joint sealant, cold-applied shall conform to [ASTM C 920](#).

### **2.5.2 Joint Sealant, Hot-Poured**

Joint sealant, hot-poured shall conform to [ASTM D 3405](#).

## **2.6 FORM WORK**

Form work shall be designed and constructed to ensure that the finished concrete will conform accurately to the indicated dimensions, lines, and elevations, and within the tolerances specified. Forms shall be of wood or steel, straight, of sufficient strength to resist springing during depositing and consolidating concrete. Wood forms shall be surfaced plank, 2 inches nominal thickness, straight and free from warp, twist, loose knots, splits or other defects. Wood forms shall have a nominal length of 10 feet. Radius bends may be formed with 3/4 inch boards, laminated to the required thickness. Steel forms shall be channel-formed sections with a flat top surface and with welded braces at each end and at not less than two intermediate points. Ends of steel forms shall be interlocking and self-aligning. Steel forms shall include flexible forms for radius forming,

corner forms, form spreaders, and fillers. Steel forms shall have a nominal length of 10 feet with a minimum of 3 welded stake pockets per form. Stake pins shall be solid steel rods with chamfered heads and pointed tips designed for use with steel forms.

### **2.6.1 Sidewalk Forms**

Sidewalk forms shall be of a height equal to the full depth of the finished sidewalk.

### **2.6.2 Curb and Gutter Forms**

Curb and gutter 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. 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 1-1/2 inch benders, for the full height of the curb, cleated together. In lieu of inside forms for curbs, a curb "mule" may be used for forming and finishing this surface, provided the results are approved.

## **PART 3 EXECUTION**

### **3.1 SUBGRADE PREPARATION**

The subgrade shall be constructed to the specified grade and cross section prior to concrete placement. Subgrade shall be placed and compacted in conformance with Section 02300, EARTHWORK.

#### **3.1.1 Sidewalk Subgrade**

The subgrade shall be tested for grade and cross section with a template extending the full width of the sidewalk and supported between side forms.

#### **3.1.2 Curb and Gutter Subgrade**

The subgrade shall be tested for grade and cross section by means of a template extending the full width of the curb and gutter. The subgrade shall be of materials equal in bearing quality to the subgrade under the adjacent pavement.

### **3.2 FORM SETTING**

Forms shall be set to the indicated alignment, grade and dimensions. Forms shall be held rigidly in place by a minimum of 3 stakes per form placed at intervals not to exceed 4 feet. Corners, deep sections, and radius bends shall have additional stakes and braces, as required. Clamps, spreaders, and braces shall be used where required to ensure rigidity in the forms. Forms shall be removed without injuring the concrete. Bars or heavy tools shall not be used against the concrete in removing the forms. Any concrete found defective after form removal shall be promptly and satisfactorily repaired. 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.

### **3.2.1 Sidewalks**

Forms for sidewalks shall be set with the upper edge true to line and grade with an allowable tolerance of 1/8 inch in any 10 foot long section. After forms are set, grade and alignment shall be checked with a 10 foot straightedge. Forms shall have a transverse slope of 1/4 inch per foot with the low side adjacent to the roadway. Side forms shall not be removed for 12 hours after finishing has been completed.

### **3.2.2 Curbs and Gutters**

The forms of 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 for concrete finishing. Gutter forms shall not be removed while the concrete is sufficiently plastic to slump in any direction.

## **3.3 SIDEWALK CONCRETE PLACEMENT AND FINISHING**

### **3.3.1 Formed Sidewalks**

Concrete shall be placed in the forms in one layer. When consolidated and finished, the sidewalks shall be of the thickness indicated. After concrete has been placed in the forms, a strike-off guided by side forms shall be used to bring the surface to proper section to be compacted. The concrete shall be consolidated with an approved vibrator, and the surface shall be finished to grade with a strike off.

### **3.3.2 Concrete Finishing**

After straightedging, when most of the water sheen has disappeared, and just before the concrete hardens, the surface shall be finished with a wood float or darby to a smooth and uniformly fine granular or sandy texture free of waves, irregularities, or tool marks. A scored surface shall be produced by brooming with a fiber-bristle brush in a direction transverse to that of the traffic, followed by edging.

### **3.3.3 Edge and Joint Finishing**

All slab edges, including those at formed joints, shall be finished with an edger having a radius of 1/8 inch. Transverse joint shall be edged before brooming, and the brooming shall eliminate the flat surface left by the surface face of the edger. Corners and edges which have crumbled and areas which lack sufficient mortar for proper finishing shall be cleaned and filled solidly with a properly proportioned mortar mixture and then finished.

### **3.3.4 Surface and Thickness Tolerances**

Finished surfaces shall not vary more than 5/16 inch from the testing edge of a 10-foot straightedge. Permissible deficiency in section thickness will be up to 1/4 inch.

## **3.4 CURB AND GUTTER CONCRETE PLACEMENT AND FINISHING**

### **3.4.1 Formed Curb and Gutter**

Concrete shall be placed to the section required in a single lift. Consolidation shall be achieved by using approved mechanical vibrators. Curve shaped gutters shall be finished with a standard curb "mule".

### **3.4.2 Curb and Gutter Finishing**

Approved slipformed curb and gutter machines may be used in lieu of hand placement.

### **3.4.3 Concrete Finishing**

Exposed surfaces shall be floated and finished with a smooth wood float until true to grade and section and uniform in texture. Floated surfaces shall then be brushed with a fine-hair brush with longitudinal strokes. The edges of the gutter and top of the curb shall be rounded with an edging tool to a radius of 1/2 inch. 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 front curb surface, while still wet, shall be brushed in the same manner as the gutter and curb top. The top surface of gutter and entrance shall be finished to grade with a wood float.

### **3.4.4 Joint Finishing**

Curb edges at formed joints shall be finished as indicated.

### **3.4.5 Surface and Thickness Tolerances**

Finished surfaces shall not vary more than 1/4 inch from the testing edge of a 10-foot straightedge. Permissible deficiency in section thickness will be up to 1/4 inch.

## **3.5 SIDEWALK JOINTS**

Sidewalk joints shall be constructed to divide the surface into rectangular areas. Transverse contraction joints shall be spaced at a distance equal to the sidewalk width or 5 feet on centers, whichever is less, and shall be continuous across the slab. Longitudinal contraction joints shall be constructed along the centerline of all sidewalks 10 feet or more in width. Transverse expansion joints shall be installed at sidewalk returns and opposite expansion joints in adjoining curbs. Where the sidewalk is not in contact with the curb, transverse expansion joints shall be installed as indicated. Expansion joints shall be formed about structures and features which project through or into the sidewalk pavement, using joint filler of the type, thickness, and width indicated.

### **3.5.1 Sidewalk Contraction Joints**

The contraction joints shall be formed in the fresh concrete 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, unless otherwise approved. Sawed joints shall be constructed by sawing a groove in the concrete with a 1/8 inch blade to the depth indicated. 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.

### **3.5.2 Sidewalk Expansion Joints**

Expansion joints shall be formed with 3/8 inch joint filler strips. Joint filler shall be placed with top edge 1/4 inch below the surface and shall be held in place with steel pins or other devices to prevent warping of the filler during floating and finishing. Immediately after finishing operations are completed, joint edges shall be rounded with an edging tool having a radius of 1/8 inch, and concrete over the joint filler shall be removed. At the end of the curing period, expansion joints shall be cleaned and filled with joint sealant. The joint opening shall be thoroughly cleaned before the sealing material is placed. Sealing material shall not be spilled on exposed surfaces of the concrete. Concrete at the joint shall be surface dry and atmospheric and concrete temperatures shall be above 50 degrees F at the time of application of joint sealing material. Excess material on exposed surfaces of the concrete shall be removed immediately and concrete surfaces cleaned.

### **3.5.3 Reinforcement Steel Placement**

Reinforcement steel shall be accurately and securely fastened in place with suitable supports and ties before the concrete is placed.

## **3.6 CURB AND GUTTER JOINTS**

Curb and gutter joints shall be constructed at right angles to the line of curb and gutter.

### **3.6.1 Contraction Joints**

Contraction joints shall be constructed directly opposite contraction joints in abutting portland cement concrete pavements and spaced so that monolithic sections between curb returns will not be less than 5 feet nor greater than 15 feet in length. Contraction joints shall be constructed by means of 1/8 inch thick separators and of a section conforming to the cross section of the curb and gutter. Separators shall be removed as soon as practicable after concrete has set sufficiently to preserve the width and shape of the joint and prior to finishing.

### **3.6.2 Expansion Joints**

Expansion joints shall be formed by means of preformed expansion joint filler material cut and shaped to the cross section of curb and gutter. Expansion joints shall be provided in curb and gutter directly opposite expansion joints of abutting portland cement concrete pavement, and shall be of the same type and thickness as joints in the pavement. Where 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 exceeding 50 feet. Expansion joints shall be provided in nonreinforced concrete gutter at locations indicated. Expansion joints shall be sealed immediately following curing of the concrete or as soon thereafter as weather conditions permit. Expansion joints and the top 1 inch depth of curb and gutter contraction-joints shall be sealed with joint sealant. The joint opening shall be thoroughly cleaned before the sealing material is placed. Sealing material shall not be spilled on exposed surfaces of the concrete. Concrete at the joint shall be surface dry and atmospheric and concrete temperatures shall be above 50 degrees F at the time of application of joint sealing material. Excess material on exposed surfaces of the concrete shall be removed immediately and concrete surfaces cleaned.

## **3.7 CURING AND PROTECTION**

### **3.7.1 General Requirements**

Beginning immediately after placement and continuing for at least 7 days, all concrete shall be cured and protected from premature drying, extremes in temperature, rapid temperature change, freezing, mechanical damage, and

exposure to rain or flowing water. All materials and equipment needed for adequate curing and protection shall be available and at the site of the placement prior to the start of concrete placement. Preservation of moisture for concrete surfaces not in contact with forms shall be accomplished by one of the following methods:

- a. Continuous sprinkling or ponding.
- b. Application of absorptive mats or fabrics kept continuously wet.
- c. Application of sand kept continuously wet.
- d. Application of impervious sheet material conforming to [ASTM C 171](#).
- e. Application of membrane-forming curing compound conforming to [ASTM C 309](#), Type 1-D, on surfaces permanently exposed to view and Type 2 on other surfaces shall be accomplished in accordance with manufacturer's instructions.

The preservation of moisture for concrete surfaces placed against wooden forms shall be accomplished by keeping the forms continuously wet for 7 days. If forms are removed prior to end of the required curing period, other curing methods shall be used for the balance of the curing period. During the period of protection removal, the temperature of the air in contact with the concrete shall not be allowed to drop more than 25 degrees F within a 24 hour period.

Concrete shall be protected against loss of moisture and rapid temperature changes for at least 7 days from the beginning of the curing operation. Unhardened concrete shall be protected from rain and flowing water. All equipment needed for adequate curing and protection of the concrete shall be on hand and ready for use before actual concrete placement begins. Protection shall be provided as necessary to prevent cracking of the pavement due to temperature changes during the curing period.

### **3.7.2 Backfilling**

After curing, debris shall be removed and the area adjoining the concrete shall be backfilled, graded, and compacted to conform to the surrounding area in accordance with lines and grades indicated.

### **3.7.3 Protection**

Completed concrete shall be protected from damage until accepted. The Contractor shall repair damaged concrete and clean concrete discolored during construction. Concrete that is 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.

## **3.8 FIELD QUALITY CONTROL**

### **3.8.1 General Requirements**

Concrete testing will be the responsibility of the Government. The Contractor shall provide specimens for testing when requested by the Contracting Officer. Based upon the results of these inspections and tests, the Contractor shall take required action to correct deficiencies and perform any additional tests to ensure that the requirements of these specifications are met.

### **3.8.2 Concrete Testing**

#### **3.8.2.1 Strength Testing**

The Contractor shall provide molded concrete specimens for strength tests. Samples of concrete placed each day shall be taken not less than once a day nor less than once for every 250 cubic yards of concrete. The samples for strength tests shall be taken in accordance with [ASTM C 172](#). Cylinders for acceptance shall be molded in conformance with [ASTM C 31/C 31M](#) by an approved testing laboratory. Each strength test result shall be the average of 2 test cylinders from the same concrete sample tested at 28 days, unless otherwise specified or approved. Concrete specified on the basis of compressive strength will be considered satisfactory if the averages of all sets of three consecutive strength test results equal or exceed the specified strength, and no individual strength test result falls below the specified strength by more than 500 psi.

#### **3.8.2.2 Air Content**

Air content shall be determined in accordance with [ASTM C 173](#) or [ASTM C 231](#). [ASTM C 231](#) shall be used with concretes and mortars made with relatively dense natural aggregates. Two tests for air content shall be made on randomly selected batches of each class of concrete placed during each shift. Additional tests shall be made when excessive variation in concrete workability is reported by the placing foreman or the Government inspector. If results are out of tolerance, the placing foreman shall be notified and he shall take appropriate action to have the air content corrected at the plant. Additional tests for air content will be performed on each truckload of material until such time as the air content is within the tolerance specified.

#### **3.8.2.3 Slump Test**

Two slump tests shall be made on randomly selected batches of each class of concrete for every 250 cubic yards, or fraction thereof, of concrete placed during each shift. Additional tests shall be performed when excessive variation in the workability of the concrete is noted or when excessive crumbling or slumping is noted along the edges of slip-formed concrete.

### **3.8.3 Thickness Evaluation**

The anticipated thickness of the concrete shall be determined prior to placement by passing a template through the formed section or by measuring the depth of opening of the extrusion template of the curb forming machine. If a slip form paver is used for sidewalk placement, the subgrade shall be true to grade prior to concrete placement and the thickness will be determined by measuring each edge of the completed slab.

### **3.8.4 Surface Evaluation**

The finished surface of each category of the completed work shall be uniform in color and free of blemishes and form or tool marks.

## **3.9 SURFACE DEFICIENCIES AND CORRECTIONS**

### **3.9.1 Thickness Deficiency**

When measurements indicate that the completed concrete section is deficient in thickness by more than 1/4 inch the deficient section will be removed, between regularly scheduled joints, and replaced.

### **3.9.2 High Areas**

In areas not meeting surface smoothness and plan grade requirements, high areas shall be reduced either by rubbing the freshly finished concrete with carborundum brick and water when the concrete is less than 36 hours old or by grinding the hardened concrete with an approved surface grinding machine after the concrete is 36 hours old or more. The area corrected by grinding the surface of the hardened concrete shall not exceed 5 percent of the area of any integral slab, and the depth of grinding shall not exceed 1/4 inch. Pavement areas requiring grade or surface smoothness corrections in excess of the limits specified above shall be removed and replaced.

### **3.9.3 Appearance**

Exposed surfaces of the finished work will be inspected by the Government and any deficiencies in appearance will be identified. Areas which exhibit excessive cracking, discoloration, form marks, or tool marks or which are otherwise inconsistent with the overall appearances of the work shall be removed and replaced.

-- End of Section --

## SECTION 02921N

TURF  
09/99**PART 1 GENERAL****1.1 REFERENCES**

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

TURFGRASS PRODUCERS INTERNATIONAL (TPI)

**TPI GSS** (1988) Guideline Specifications for Sodding

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

**ASTM C 602** (1995; Rev. A) Agricultural Liming Materials

**ASTM D 4427** (1992; R 1996) Peat Samples by Laboratory Testing

**ASTM E 11** (1995) Wire-Cloth Sieves for Testing Purposes

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

**FS A-A-1909** Fertilizer

U.S. DEPARTMENT OF AGRICULTURE (USDA)

**AMS Seed Act** (January 1985) Federal Seed Act Rules and Regulations of the Secretary of Agriculture

**DOA SSIR** (April 1984) Soil Survey Investigation Report No. 1, Soil Survey Laboratory Methods and Procedures for Collecting Soil Samples, Soil Conservation Service

**1.2 DEFINITIONS****1.2.1 Stand of Turf**

95 percent ground cover of the established species.

**1.3 SUBMITTALS**

The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES if requested by the Contracting Officer for a specific Delivery Order:

SD-03 Product Data

Wood cellulose fiber mulch

Fertilizer

Include physical characteristics, and recommendations.

SD-07 Certificates

State certification and approval for seed

Sod farm certification for sods. Indicate type of sod in accordance with TPI GSS.

## **1.4 DELIVERY, STORAGE, AND HANDLING**

### **1.4.1 Delivery**

#### **1.4.1.1 Seed and Sod Protection**

Protect from drying out and from contamination during delivery, on-site storage, and handling.

### **1.4.2 Storage**

#### **1.4.2.1 Sod Storage**

Lightly sprinkle with water and protect from exposure to wind and direct sunlight until planted. Provide covering that will allow air to circulate so that internal heat will not develop. Do not store sod longer than 24 hours. Do not store directly on concrete or bituminous surfaces.

#### **1.4.2.2 Seed, Fertilizer, Gypsum, Sulfur, and Lime Storage**

Store in cool, dry locations away from contaminants.

#### **1.4.2.3 Handling**

Do not drop or dump materials from vehicles.

## **1.5 TIME RESTRICTIONS AND PLANTING CONDITIONS**

### **1.5.1 Restrictions**

Do not plant when the ground is frozen, muddy, or when air temperature exceeds 90 degrees Fahrenheit.

## **1.6 TIME LIMITATIONS**

### **1.6.1 Seed**

Apply seed within twenty four hours after seed bed preparation.

### **1.6.2 Sod**

Place sod a maximum of thirty six hours after initial harvesting.

## **1.7 Unit of measurement**

### **1.7.1 Seed**

The unit of measurement for seed/hydroseed will be CSF (100 square feet) of planted area.

### **1.7.2 Sod**

The unit of measurement for sod will be square yards of planted area.

### **1.7.3 Topsoil**

The unit of measurement for topsoil will be the cubic yard of delivered and installed material meeting the requirements of paragraph 2.4.

## **1.8 basis of payment**

The basis of payment for seed, hydroseed, and sod will be the price per unit of measure according to the Bid Schedule. The basis for payment of topsoil will be the price per cubic yard according to the Bid Schedule for material actually used on the job site. The unit price for seed, hydroseed, and sod includes maintenance of the planting until a stand of turf has developed from the seed/hydroseed or the sod has fully rooted to the subgrade.

## PART 2 PRODUCTS

### 2.1 SEED

#### 2.1.1 Classification

Provide State-certified seed of the latest season's crop delivered in original sealed packages, bearing producer's guaranteed analysis for percentages of mixtures, purity, germination, weedseed content, and inert material. Label in conformance with [AMS Seed Act](#) and applicable state seed laws. Wet, moldy, or otherwise damaged seed will be rejected. Field mixes will be acceptable when field mix is performed on site in the presence of the Contracting Officer.

#### 2.1.2 Composition

<u>Seed</u>	<u>Min. Percent Pure Seed</u>	<u>Min. Percent Germination and Hard Seed</u>	<u>Max. Percent Weed Seed</u>
Common Bermuda Grass (Cynodon Dactylon)	95%	90%	< 2%

### 2.2 SODS

If practical, lay sod from March to June for warm season spring planting and from September to November for cool season fall planting.

#### 2.2.1 Classification

Certified as classified in the [TPI GSS](#). Machine cut sod at a uniform thickness of 3/4 inch within a tolerance of 1/4 inch, excluding top growth and thatch. Each individual sod piece shall be strong enough to support its own weight when lifted by the ends. Broken pads, irregularly shaped pieces, and torn or uneven ends will be rejected. Wood pegs and wire staples for anchorage shall be as recommended by sod supplier.

#### 2.2.2 Composition

Acceptable grass species are as follows:

<u>Botanical Name</u>	<u>Common Name</u>
Eremochloa ophuiroides	Centipede

Cynodon dactylon

Common Bermuda

Stenatophorum secundatum

St. Augustine

## 2.3 **SPRIGS Not Used.**

## 2.4 **TOPSOIL**

### 2.4.1 **Existing Soil**

Modify existing soil to conform to the requirements specified in paragraph entitled "Composition."

### 2.4.2 **On-Site Topsoil**

Reusable surface soil stripped and stockpiled on site if requirements specified for topsoil in paragraph entitled "Composition" are met.

### 2.4.3 **Off-Site Topsoil**

Conform to requirements specified in paragraph entitled "Composition." Additional topsoil shall be furnished by the Contractor.

### 2.4.4 **Composition**

Containing from 5 to 8 percent organic matter as determined by the **topsoil composition tests** of the Organic Carbon, 6A, Chemical Analysis Method described in **DOA SSIR**. Maximum particle size, 3/4 inch, with maximum 3 percent retained on 1/4 inch screen. Other components shall be within the following percentages:

Silt	25-50
Clay	10-30
Sand	20-35
pH	5 to 7.6
Soluble Salts	600 ppm maximum

## 2.5 **WATER**

Source of water to be approved by Contracting Officer, suitable quality for irrigation.

## **PART 3 EXECUTION**

### **3.1 PREPARATION**

#### **3.1.1 EXTENT OF WORK**

Provide soil preparation, seeding, hydroseeding, or sod, as directed, of all newly graded finished earth surfaces, unless indicated otherwise, and at all areas inside or outside the limits of construction that are disturbed by the Contractor's operations.

#### **3.1.2 Soil Preparation**

Remove existing topsoil to a minimum depth of 2 inches and stockpile. After areas have been brought to finish subgrade elevation, thoroughly till to minimum depth of 6 inches by scarifying, disking, harrowing, or other methods approved by the Contracting Officer.. Remove debris and stones larger than one inch in any dimension remaining on surface after tillage. Spread stockpiled topsoil evenly to provide positive drainage. Provide off-site topsoil to meet indicated finish grade. Do not spread topsoil when excessively wet or dry. Thoroughly mix subgrade and topsoil to a depth of 8 inches by disking, harrowing, tilling or other method approved by the Contracting Officer. Correct irregularities in finished surfaces to eliminate depressions. Protect finished prepared soil areas from damage by vehicular or pedestrian traffic.

### **3.2 SEEDING**

#### **3.2.1 Seed Application Seasons and Conditions**

Immediately before seeding, restore soil to proper grade and thoroughly moisten soil to a depth of 6 inches. Do not seed when ground is muddy or in an unsatisfactory condition for seeding. Apply seed within twenty four hours after seedbed preparation. Sow seed by approved sowing equipment. Sow one-half the seed in one direction, and sow remainder at right angles to the first sowing.

#### **3.2.2 Seed Application Method**

##### **3.2.2.1 Broadcast and Drop Seeding**

Use broadcast or drop seeders. Sow one-half the seed in one direction, and sow remainder at right angles to the first sowing. Cover seed uniformly to a maximum depth of 1/4 inch in clay soils and 1/2 inch in sandy soils by means of spike-tooth harrow, cultipacker, raking or other approved devices.

### **3.2.2.3 Hydroseeding**

First, mix water and fiber. Fiber shall be added at 1,000 pounds, dry weight, per acre. Then add and mix seed and fertilizer to produce a homogeneous slurry. When hydraulically sprayed on the ground, material shall form a blotter like cover impregnated uniformly with grass seed. Spread with one application with no second application of mulch.

### **3.2.3 Watering**

Start watering areas seeded as required by temperature and wind conditions. Apply water at a rate sufficient to insure thorough wetting of soil to a depth of 4 inches without run off. During the germination process, seed is to be kept actively growing and not allowed to dry out.

## **3.3 SODDING**

### **3.3.1 Placing**

Place sod a maximum of 36 hours after initial harvesting, in accordance with **TPI GSS** as modified herein. Thoroughly moisten areas to be sodded immediately prior to placing sod.

### **3.3.2 Sodding Slopes and Ditches**

For slopes 2:1 and greater, lay sod with long edge parallel to slope. For V-ditches and flat bottomed ditches, lay sod with long edge parallel to flow of water. Anchor each piece of sod with wood pegs or wire staples maximum 2 feet on center.

### **3.3.3 Rolling**

Immediately after sodding, firm entire area except for slopes in excess of 3 to 1 with a roller not exceeding 90 pounds for each foot of roller width.

### **3.3.4 Watering**

Start watering areas sodded as required by daily temperature and wind conditions. Apply water at a rate sufficient to ensure thorough wetting of soil to minimum depth of 4 inches.

## **3.4 SPRIGGING NOT USED**

### **3.5 PROTECTION OF TURF AREAS**

Immediately after turfing, protect area against traffic and other use.

### **3.6 RESTORATION**

Restore to original condition existing turf areas which have been damaged during turf installation operations. Keep clean at all times at least one paved pedestrian access route and one paved vehicular access route to each building. Clean other paving when work in adjacent areas is complete.

-- End of Section --

## SECTION 02964A

COLD MILLING OF BITUMINOUS PAVEMENTS  
03/98**PART 1 GENERAL****1.1 REFERENCES**

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

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 136 (1996a) Sieve Analysis of Fine and Coarse Aggregates

**1.2 UNIT PRICES****1.2.1 Measurement**

The quantity of milled pavement shall be the number of square yards per inch of depth completed and accepted as determined by the Contracting Officer.

**1.2.2 Payment**

Payment will be based on the unit price Bid Schedule. A lump sum mobilization/demobilization charge will also be paid for each round trip to Keesler AFB to perform milling operations.

**1.3 EQUIPMENT, TOOLS, AND MACHINES**

Equipment, tools, and machines used in the performance of the work shall be maintained in a satisfactory working condition.

**1.3.1 Cold-Milling Machine**

The cold-milling machine shall be a self-propelled machine capable of milling the pavement to a specified depth and smoothness. Pavement milling machine shall be capable of establishing grade control; shall have means of controlling transverse slope; and shall have effective means of controlling dust produced during the pavement milling operation. The machine shall have the ability to remove the millings or cuttings from the pavement and load

them into a truck. The milling machine shall not cause damage to any part of the pavement structure that is not to be removed.

### **1.3.2 Cleaning Equipment**

Cleaning equipment shall be suitable for removing and cleaning loose material from the pavement surface.

### **1.3.3 Straightedge**

The Contractor shall furnish and maintain at the site, in good condition, one 12 foot straightedge or other suitable device for each milling machine, for testing the finished surface. Straightedge shall be made available for Government use. Straightedges shall be constructed of aluminum or other lightweight metal, and shall have blades of box or box-girder cross section with flat bottom reinforced to insure rigidity and accuracy. Straightedges shall have handles to facilitate movement on the pavement.

## **1.4 WEATHER LIMITATIONS**

Milling shall not be performed when there is accumulation of snow or ice on the pavement surface.

## **1.5 GRADE AND SURFACE-SMOOTHNESS REQUIREMENTS**

### **1.5.1 Grade**

The finished milled surfaces shall conform to the lines, grades, and cross sections indicated. The finished milled-pavement surfaces shall vary not more than 0.06 foot from the established plan grade line and elevation. Finished surfaces at a juncture with other pavements shall coincide with the finished surfaces of the abutting pavements. The deviations from the plan grade line and elevation will not be permitted in areas of pavements where closer conformance with planned grade and elevation is required for the proper functioning of appurtenant structures involved.

### **1.5.2 Surface Smoothness**

Finished surfaces shall not deviate from the testing edge of a straightedge more than 1/4 inch in the transverse or longitudinal direction.

## **PART 2 PRODUCTS (Not Applicable)**

## **PART 3 EXECUTION**

### **3.1 PREPARATION OF SURFACE**

The pavement surface shall be cleaned of excessive dirt, clay, or other foreign material immediately prior to milling the pavement.

### **3.2 MILLING OPERATION**

Sufficient passes shall be made so that the designated area is milled to the grades and cross sections indicated. The milling shall proceed with care and in depth increments that will not damage the pavement below the designated finished grade. Items damaged during milling, such as manholes, valve boxes, utility lines, pavement that is torn, cracked, gouged, broken, or undercut, shall be repaired or replaced as directed.

### **3.3 GRADE AND SURFACE-SMOOTHNESS TESTING**

#### **3.3.1 Grade-Conformance Tests**

The finished milled surface of the pavement shall be tested for conformance with the plan-grade requirements and will be tested for acceptance by the Contracting Officer. The Contractor shall correct variations from the designated grade line and elevation in excess of the plan-grade requirements as directed. Skin patching for correcting low areas will not be permitted. The Contractor shall remove and replace the deficient low area. Sufficient material shall be removed to allow at least 1 inch of asphalt concrete to be placed.

#### **3.3.2 Surface-Smoothness Tests**

After completion of the final milling, the finished milled surface will be tested by the Government with a straightedge. Other approved devices may be used, provided that when satisfactorily and properly operated, such devices reveal all surface irregularities exceeding the tolerances specified. Surface irregularities that depart from the testing edge by more than 1/4 inch shall be corrected.

### **3.4 REMOVAL OF MILLED MATERIAL**

Material that is removed shall be placed in the disposal area as specified.

-- End of Section --

## SECTION 03307A

CONCRETE FOR MINOR STRUCTURES  
11/01**PART 1 GENERAL****1.1 REFERENCES**

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

## ACI INTERNATIONAL (ACI)

- ACI 308 (1992; R 1997) Standard Practice for Curing Concrete
- ACI 318/318R (1999) Building Code Requirements for Structural Concrete and Commentary
- ACI 347R (1994; R 1999) Guide to Formwork for Concrete

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- ASTM A 185 (1997) Steel Welded Wire Fabric, Plain, for Concrete Reinforcement
- ASTM A 615/A 615M (2000) Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
- ASTM C 143/C 143M (2000) Slump of Hydraulic Cement Concrete
- ASTM C 150 (1999a) Portland Cement
- ASTM C 171 (1997a) Sheet Materials for Curing Concrete
- ASTM C 172 (1999) Sampling Freshly Mixed Concrete
- ASTM C 231 (1997e1) Air Content of Freshly Mixed Concrete by the Pressure Method
- ASTM C 260 (2000) Air-Entraining Admixtures for Concrete
- ASTM C 309 (1998a) Liquid Membrane-Forming Compounds for Curing Concrete
- ASTM C 31/C 31M (2000e1) Making and Curing Concrete Test Specimens in the Field
- ASTM C 33 (1999ae1) Concrete Aggregates

ASTM C 39/C 39M	(2001) Compressive Strength of Cylindrical Concrete Specimens
ASTM C 494/C 494M	(1999ae1) Chemical Admixtures for Concrete
ASTM C 595	(2000a) Blended Hydraulic Cements
ASTM C 618	(2000) Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete
ASTM C 685	(2000) Concrete Made by Volumetric Batching and Continuous Mixing
ASTM C 920	(1998) Elastomeric Joint Sealants
ASTM C 94/C 94M	(2000e2) Ready-Mixed Concrete
ASTM D 1752	(1984; R 1996e1) Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction
ASTM D 75	(1987; R 1997) Sampling Aggregates
ASTM D 98	(1998) Calcium Chloride
ASTM E 96	(2000) Water Vapor Transmission of Materials
U.S. ARMY CORPS OF ENGINEERS (USACE)	
COE CRD-C 400	(1963) Requirements for Water for Use in Mixing or Curing Concrete
COE CRD-C 572	(1974) Corps of Engineers Specifications for Polyvinylchloride Waterstop

## 1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES if requested by the Contracting Officer for a specific Delivery Order:

### SD-03 Product Data

Curing Materials;  
 Reinforcing Steel; G  
 Expansion Joint Filler Strips, Premolded;  
 Joint Sealants - Field Molded Sealants;  
 Waterstops;  
 Formwork;

### SD-06 Test Reports

**Aggregates;**

Aggregates will be accepted on the basis of certificates of compliance and test reports that show the material(s) meets the quality and grading requirements of the specifications under which it is furnished.

**Concrete Mixture Proportions;**

Ten days prior to placement of concrete, the contractor shall submit the mixture proportions that will produce concrete of the quality required. Applicable test reports shall be submitted to verify that the concrete mixture proportions selected will produce concrete of the quality specified.

**SD-07 Certificates****Cementitious Materials;**

Certificates of compliance attesting that the concrete materials meet the requirements of the specifications shall be submitted in accordance with the Special Clause "CERTIFICATES OF COMPLIANCE". Cementitious material will be accepted on the basis of a manufacturer's certificate of compliance, accompanied by mill test reports that the material(s) meet the requirements of the specification under which it is furnished.

**Aggregates;**

Aggregates will be accepted on the basis of certificates of compliance and tests reports that show the material(s) meet the quality and grading requirements of the specifications under which it is furnished.

## **1.3 UNIT PRICES**

### **1.3.1 Concrete**

#### **1.3.1.1 Payment**

All costs associated with furnishing, delivering, placing, finishing, and curing of concrete for the various items of the schedule, which price shall include the cost of all formwork. Payment for grout, preformed expansion joints, field-molded sealants, reinforcing steel bars or wire reinforcement, and waterstops, is included in the unit price payment item.

#### **1.3.1.2 Measurement**

Unit of measure shall be as on the Bid Schedule. Concrete will be measured for payment on the basis of the actual volume of concrete within the pay

lines of the structures as indicated. Measurement of concrete placed against the sides of any excavation without the use of intervening forms will be made only within the pay lines of the structure. No deductions will be made for rounded or beveled edge, for space occupied by metal work, for electrical conduits or timber, or for voids or embedded items that are either less than 5 cubic feet in volume or 1 square foot in cross section.

## **1.4 DESIGN AND PERFORMANCE REQUIREMENTS**

The Government will maintain the option to sample and test aggregates and concrete to determine compliance with the specifications. The Contractor shall provide facilities and labor as may be necessary to assist the Government in procurement of representative test samples. Samples of aggregates will be obtained at the point of batching in accordance with [ASTM D 75](#). Concrete will be sampled in accordance with [ASTM C 172](#). Slump and air content will be determined in accordance with [ASTM C 143/C 143M](#) and [ASTM C 231](#), respectively, when cylinders are molded. Compression test specimens will be made, cured, and transported in accordance with [ASTM C 31/C 31M](#). Compression test specimens will be tested in accordance with [ASTM C 39/C 39M](#). Samples for strength tests will be taken not less than once each shift in which concrete is produced. A minimum of three specimens will be made from each sample; two will be tested at 28 days (90 days if pozzolan is used) for acceptance, and one will be tested at 7 days for information.

### **1.4.1 Strength**

Acceptance test results will be the average strengths of two specimens tested at 28 days (90 days if pozzolan is used). The strength of the concrete will be considered satisfactory so long as the average of three consecutive acceptance test results equal or exceed the specified compressive strength, f'c, and no individual acceptance test result falls below f'c by more than 500 psi.

### **1.4.2 Construction Tolerances**

A Class "C" finish shall apply to all surfaces except those specified to receive a Class "D" finish. A Class "D" finish shall apply to all surfaces which will be permanently concealed after construction. The surface requirements for the classes of finish required shall be as specified in [ACI 347R](#).

### **1.4.3 Concrete Mixture Proportions**

Concrete mixture proportions shall be the responsibility of the Contractor. Mixture proportions shall include the dry weights of cementitious material(s); the nominal maximum size of the coarse aggregate; the specific gravities, absorptions, and saturated surface-dry weights of fine and coarse aggregates; the quantities, types, and names of admixtures; and quantity of water per cubic yard of concrete. All materials included in the mixture proportions shall be of the same type and from the same source as will be used on the project. Specified compressive strength f'c shall be 3,000 psi

at 28 days (90 days if pozzolan is used) unless directed otherwise. The maximum nominal size coarse aggregate shall be 1 inch, in accordance with [ACI 318/318R](#). The air content shall be between 4.5 and 7.5 percent. The slump shall be between 2 and 5 inches. The maximum water cement ratio shall be 0.50.

## **PART 2 PRODUCTS**

### **2.1 MATERIALS**

#### **2.1.1 Cementitious Materials**

Cementitious materials shall conform to the appropriate specifications listed:

##### **2.1.1.1 Portland Cement**

[ASTM C 150](#), Type I

##### **2.1.2 Aggregates**

Aggregates shall meet the quality and grading requirements of [ASTM C 33](#) Class Designations 4M or better.

##### **2.1.3 Admixtures**

Admixtures to be used, when required or approved, shall comply with the appropriate specification listed.

###### **2.1.3.1 Air-Entraining Admixture**

Air-entraining admixture shall meet the requirements of [ASTM C 260](#).

###### **2.1.3.2 Accelerating Admixture**

Calcium chloride shall meet the requirements of [ASTM D 98](#). Other accelerators shall meet the requirements of [ASTM C 494/C 494M](#), Type C or E.

###### **2.1.3.3 Water-Reducing or Retarding Admixture**

Water-reducing or retarding admixture shall meet the requirements of [ASTM C 494/C 494M](#), Type A, B, or D.

## 2.1.4 Water

Water for mixing and curing shall be fresh, clean, potable, and free from injurious amounts of oil, acid, salt, or alkali.

## 2.1.5 Reinforcing Steel

Reinforcing steel bar shall conform to the requirements of [ASTM A 615/A 615M](#), Grade 60. Welded steel wire fabric shall conform to the requirements of [ASTM A 185](#). Details of reinforcement not shown shall be in accordance with [ACI 318/318R](#), Chapters 7 and 12.

## 2.1.6 Expansion Joint Filler Strips, Premolded

Expansion joint filler strips, premolded shall be sponge rubber conforming to [ASTM D 1752](#), Type I.

## 2.1.7 Joint Sealants - Field Molded Sealants

Joint sealants - field molded sealants shall conform to [ASTM C 920](#), Type M, Grade NS, Class 25, use NT for vertical joints and Type M, Grade P, Class 25, use T for horizontal joints. Bond-breaker material shall be polyethylene tape, coated paper, metal foil, or similar type materials. The backup material shall be compressible, nonshrink, nonreactive with the sealant, and a nonabsorptive material such as extruded butyl or polychloroprene foam rubber.

## 2.1.8 Waterstops

Waterstops shall conform to [COE CRD-C 572](#).

## 2.1.9 Formwork

The design and engineering of the formwork as well as its construction, shall be the responsibility of the Contractor.

## 2.1.10 Form Coatings

Forms for exposed surfaces shall be coated with a nonstaining form oil, which shall be applied shortly before concrete is placed.

## 2.1.11 Vapor Barrier

Vapor barrier shall be polyethylene sheeting with a minimum thickness of 6 mils or other equivalent material having a vapor permeance rating not exceeding 0.5 perms as determined in accordance with [ASTM E 96](#).

### **2.1.12 Curing Materials**

Curing materials shall conform to the following requirements.

#### **2.1.12.1 Impervious Sheet Materials**

Impervious sheet materials, [ASTM C 171](#), type optional, except polyethylene film, if used, shall be white opaque.

#### **2.1.12.2 Membrane-Forming Curing Compound**

[ASTM C 309](#), Type 1-D or 2.

## **PART 3 EXECUTION**

### **3.1 PREPARATION**

#### **3.1.1 General**

Construction joints shall be prepared to expose coarse aggregate, and the surface shall be clean, damp, and free of laitance. Ramps and walkways, as necessary, shall be constructed to allow safe and expeditious access for concrete and workmen. Snow, ice, standing or flowing water, loose particles, debris, and foreign matter shall have been removed. Earth foundations shall be satisfactorily compacted. Spare vibrators shall be available. The entire preparation shall be accepted by the Government prior to placing.

#### **3.1.2 Embedded Items**

Reinforcement shall be secured in place; joints, anchors, and other embedded items shall have been positioned. Internal ties shall be arranged so that when the forms are removed the metal part of the tie will be not less than 2 inches from concrete surfaces permanently exposed to view or exposed to water on the finished structures. Embedded items shall be free of oil and other foreign matters such as loose coatings or rust, paint, and scale. The embedding of wood in concrete will be permitted only when specifically authorized or directed. All equipment needed to place, consolidate, protect, and cure the concrete shall be at the placement site and in good operating condition.

### 3.1.3 Formwork Installation

Forms shall be properly aligned, adequately supported, and mortar-tight. The form surfaces shall be smooth and free from irregularities, dents, sags, or holes when used for permanently exposed faces. All exposed joints and edges shall be chamfered, unless otherwise indicated.

### 3.1.4 Vapor Barrier Installation

Vapor barriers shall be applied over gravel fill. Edges shall be lapped not less than 6 inches. All joints shall be sealed with pressure-sensitive adhesive not less than 2 inches wide. The vapor barrier shall be protected at all times to prevent injury or displacement prior to and during concrete placement.

### 3.1.5 Production of Concrete

#### 3.1.5.1 Ready-Mixed Concrete

Ready-mixed concrete shall conform to [ASTM C 94/C 94M](#) except as otherwise specified.

#### 3.1.5.2 Concrete Made by Volumetric Batching and Continuous Mixing

Concrete made by volumetric batching and continuous mixing shall conform to [ASTM C 685](#).

### 3.1.6 Waterstops

Waterstops shall be installed and spliced as directed by the manufacturer.]

## 3.2 **CONVEYING AND PLACING CONCRETE**

Conveying and placing concrete shall conform to the following requirements.

### 3.2.1 General

Concrete placement shall not be permitted when weather conditions prevent proper placement and consolidation without approval. When concrete is mixed and/or transported by a truck mixer, the concrete shall be delivered to the site of the work and discharge shall be completed within 1-1/2 hours or 45 minutes when the placing temperature is 85 degrees F or greater unless a retarding admixture is used. Concrete shall be conveyed from the mixer to the forms as rapidly as practicable by methods which prevent segregation or loss of ingredients. Concrete shall be in place and consolidated within 15

minutes after discharge from the mixer. Concrete shall be deposited as close as possible to its final position in the forms and be so regulated that it may be effectively consolidated in horizontal layers 18 inches or less in thickness with a minimum of lateral movement. The placement shall be carried on at such a rate that the formation of cold joints will be prevented.

### **3.2.2 Consolidation**

Each layer of concrete shall be consolidated by [rodding, spading, or] internal vibrating equipment. Internal vibration shall be systematically accomplished by inserting the vibrator through the fresh concrete in the layer below at a uniform spacing over the entire area of placement. The distance between insertions shall be approximately 1.5 times the radius of action of the vibrator and overlay the adjacent, just-vibrated area by a few inches. The vibrator shall penetrate rapidly to the bottom of the layer and at least 6 inches into the layer below, if such a layer exists. It shall be held stationary until the concrete is consolidated and then withdrawn slowly at the rate of about 3 inches per second.

### **3.2.3 Cold-Weather Requirements**

No concrete placement shall be made when the ambient temperature is below 35 degrees F or if the ambient temperature is below 40 degrees F and falling. Suitable covering and other means as approved shall be provided for maintaining the concrete at a temperature of at least 50 degrees F for not less than 72 hours after placing and at a temperature above freezing for the remainder of the curing period. Salt, chemicals, or other foreign materials shall not be mixed with the concrete to prevent freezing. Any concrete damaged by freezing shall be removed and replaced at the expense of the contractor.

### **3.2.4 Hot-Weather Requirements**

When the rate of evaporation of surface moisture, as determined by use of Figure 1 of **ACI 308**, is expected to exceed 0.2 pound per square foot per hour, provisions for windbreaks, shading, fog spraying, or covering with a light-colored material shall be made in advance of placement, and such protective measures shall be taken as quickly as finishing operations will allow.

## **3.3 FORM REMOVAL**

Forms shall not be removed before the expiration of 24 hours after concrete placement except where otherwise specifically authorized. Supporting forms and shoring shall not be removed until the concrete has cured for at least 5 days. When conditions on the work are such as to justify the requirement, forms will be required to remain in place for longer periods.

## **3.4 FINISHING**

### **3.4.1 General**

No finishing or repair will be done when either the concrete or the ambient temperature is below 50 degrees F.

### **3.4.2 Finishing Formed Surfaces**

All fins and loose materials shall be removed, and surface defects including tie holes shall be filled. All honeycomb areas and other defects shall be repaired. All unsound concrete shall be removed from areas to be repaired. Surface defects greater than 1/2 inch in diameter and holes left by removal of tie rods in all surfaces not to receive additional concrete shall be reamed or chipped and filled with dry-pack mortar. The prepared area shall be brush-coated with an approved epoxy resin or latex bonding compound or with a neat cement grout after dampening and filled with mortar or concrete. The cement used in mortar or concrete for repairs to all surfaces permanently exposed to view shall be a blend of portland cement and white cement so that the final color when cured will be the same as adjacent concrete.

### **3.4.3 Finishing Unformed Surfaces**

All unformed surfaces that are not to be covered by additional concrete or backfill shall be float finished to elevations shown, unless otherwise specified. Surfaces to receive additional concrete or backfill shall be brought to the elevations shown and left as a true and regular surface. Exterior surfaces shall be sloped for drainage unless otherwise shown. Joints shall be carefully made with a jointing tool. Unformed surfaces shall be finished to a tolerance of 3/8 inch for a float finish and 5/16 inch for a trowel finish as determined by a 10 foot straightedge placed on surfaces shown on the plans to be level or having a constant slope. Finishing shall not be performed while there is excess moisture or bleeding water on the surface. No water or cement shall be added to the surface during finishing.

#### **3.4.3.1 Float Finish**

Surfaces to be float finished shall be screeded and darbied or bullfloated to eliminate the ridges and to fill in the voids left by the screed. In addition, the darby or bullfloat shall fill all surface voids and only slightly embed the coarse aggregate below the surface of the fresh concrete. When the water sheen disappears and the concrete will support a person's weight without deep imprint, floating should be completed. Floating should embed large aggregates just beneath the surface, remove slight imperfections, humps, and voids to produce a plane surface, compact the concrete, and consolidate mortar at the surface.

### 3.4.3.2 Trowel Finish

A trowel finish shall be applied where specified. Trowelling shall be done immediately following floating to provide a smooth, even, dense finish free from blemishes including trowel marks. Finished surfaces shall be protected from damage during the construction period.

### 3.4.3.3 Broom Finish

A broom finish shall be applied where specified. The concrete shall be screeded and floated to required finish plane with no coarse aggregate visible. After surface moisture disappears, the surface shall be broomed or brushed with a broom or fiber bristle brush in a direction transverse to that of the main traffic or as directed.

### 3.4.3.4 Expansion and Contraction Joints

Expansion and contraction joints shall be made in accordance with the details shown or as otherwise specified. Provide 1/2 inch thick transverse expansion joints where new work abuts an existing concrete. Expansion joints shall be provided at a maximum spacing of 30 feet on center in sidewalks and as shown in slabs and other concrete pavement. Contraction joints shall be provided at a maximum spacing of 5 linear feet in sidewalks as shown in slabs and other concrete pavement. Contraction joints shall be cut at a minimum of one fourth the depth of the paving with a jointing tool after the surface has been finished. Joints will be true to line.

## 3.5 CURING AND PROTECTION

Beginning immediately after placement and continuing for at least 7 days, all concrete shall be cured and protected from premature drying, extremes in temperature, rapid temperature change, freezing, mechanical damage, and exposure to rain or flowing water. All materials and equipment needed for adequate curing and protection shall be available and at the site of the placement prior to the start of concrete placement. Preservation of moisture for concrete surfaces not in contact with forms shall be accomplished by one of the following methods:

- a. Continuous sprinkling or ponding.
- b. Application of absorptive mats or fabrics kept continuously wet.
- c. Application of sand kept continuously wet.
- d. Application of impervious sheet material conforming to [ASTM C 171](#).
- e. Application of membrane-forming curing compound conforming to [ASTM C 309](#), Type 1-D, on surfaces permanently exposed to view and Type 2 on other surfaces shall be accomplished in accordance with manufacturer's instructions.

The preservation of moisture for concrete surfaces placed against wooden forms shall be accomplished by keeping the forms continuously wet for 7 days. If forms are removed prior to end of the required curing period, other curing methods shall be used for the balance of the curing period. During the period of protection removal, the temperature of the air in contact with the concrete shall not be allowed to drop more than 25 degrees F within a 24 hour period.

## **3.6 TESTS AND INSPECTIONS**

### **3.6.1 General**

Concrete testing will be the responsibility of the Government. The Contractor shall provide specimens for testing when requested by the Contracting Officer. Based upon the results of these inspections and tests, the Contractor shall take required action to correct deficiencies and perform any additional tests to ensure that the requirements of these specifications are met.

### **3.6.2 Inspection Details and Frequency of Testing**

#### **3.6.2.1 Preparations for Placing**

Foundation or construction joints, forms, and embedded items shall be inspected in sufficient time prior to each concrete placement by the Contractor to certify that it is ready to receive concrete.

#### **3.6.2.2 Air Content**

Air content shall be checked at least once during each shift that concrete is placed. Samples shall be obtained in accordance with [ASTM C 172](#) and tested in accordance with [ASTM C 231](#).

#### **3.6.2.3 Slump**

Slump shall be checked once during each shift that concrete is produced. Samples shall be obtained in accordance with [ASTM C 172](#) and tested in accordance with [ASTM C 143/C 143M](#).

#### **3.6.2.4 Consolidation and Protection**

The Contractor shall ensure that the concrete is properly consolidated, finished, protected, and cured.

### **3.6.3 Action Required**

#### **3.6.3.1 Placing**

The placing foreman shall not permit placing to begin until he has verified that an adequate number of acceptable vibrators, which are in working order and have competent operators, are available. Placing shall not be continued if any pile is inadequately consolidated.

#### **3.6.3.2 Air Content**

Whenever a test result is outside the specification limits, the concrete shall not be delivered to the forms and an adjustment shall be made to the dosage of the air-entrainment admixture.

#### **3.6.3.3 Slump**

Whenever a test result is outside the specification limits, the concrete shall not be delivered to the forms and an adjustment should be made in the batch weights of water and fine aggregate. The adjustments are to be made so that the water-cement ratio does not exceed that specified in the submitted concrete mixture proportion.

### **3.6.4 Reports**

The results of all tests and inspections conducted at the project site shall be reported informally at the end of each shift and in writing weekly and shall be delivered within 3 days after the end of each weekly reporting period.

-- End of Section --