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Savannah District

Hunter Army Airfield
Georgia

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Technical Provisions – Divisions 1 and 2
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U.S. ARMY ENGINEER DISTRICT, SAVANNAH
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SECTION 01090

SOURCES FOR REFERENCE PUBLICATIONS
06/99

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1.1 REFERENCES

Various publications are referenced in other sections of the specifications to establish requirements for the work. These references are identified in each section by document number, date and title. The document number used in the citation is the number assigned by the sponsoring organization, e.g. UL 1 (1993; Rev thru Jan 1995) Flexible Metal Conduit. However, when the sponsoring organization has not assigned a number to a document, an identifying number has been assigned for convenience, e.g. UL's unnumbered 1995 edition of their Building Materials Directory is identified as UL-01 (1995) Building Materials Directory. The sponsoring organization number (UL 1) can be distinguished from an assigned identifying number (UL-01) by the lack of a dash mark (-) in the sponsoring organization assigned number.

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Ph: 608-833-5900
Fax: 608-833-4360

TUBULAR EXCHANGE MANUFACTURERS ASSOCIATION (TEMA)

25 N. Broadway
Tarrytown, NY 10591
Ph: 914-332-0040
Fax: 914-332-1541

UNDERWRITERS LABORATORIES (UL)

333 Pfingsten Rd.
Northbrook, IL 60062-2096
Ph: 847-272-8800
Fax: 847-272-8129
Internet: http://www.ul.com/

Note: First price is for the standard only. Second price is for the standard including the Revision Subscription Service.

UNI-BELL PVC PIPE ASSOCIATION (UBPPA)

2655 Villa Creek Dr., Suite 155
Dallas, TX 75234
Ph: 214-243-3902
Fax: 214-243-3907

U. S. ARMY ENVIORNMENTAL HYGIENE AGENCY (USAEHA)

Waste Disposal Engineering Division
Aberdeen Proving Ground, MD 21010-5422
Ph: 410-671-3652

WATER ENVIRONMENT FEDERATION (WEF)

601 Wythe St.
Alexandria, VA 22314-1994
Ph: 703-684-2400
Fax: 703-684-2492
Internet: www.wef.org

WATER QUALITY ASSOCIATION (WQA)

4151 Naperville Rd.
Lisle, IL 60532
Ph: 630-505-0160
Fax: 630-505-9637

WEST COAST LUMBER INSPECTION BUREAU (WCLIB)

P.O. Box 23145
Portland, OR 97281
Ph: 503-639-0651
Fax: 503-684-8928

WESTERN WOOD PRESERVERS INSTITUTE (WWPI)

7017 N.E. Highway 99 # 108
Vancover, WA 98666
Ph: 360-693-9958
Fax: 360-693-9967

WESTERN WOOD PRODUCTS ASSOCIATION (WWPA)

Yeon Bldg.
522 SW 5th Ave.
Portland, OR 97204-2122
Ph: 503-224-3930
Fax: 503-224-3934

WOOD MOULDING AND MILLWORK PRODUCERS ASSOCIATION (WMMPA)

507 First Street
Woodland, CA 95695
Ph: 916-661-9591
Fax: 916-661-9586

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SECTION 01110

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04/98

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CEGS-01110 (04/98)

SECTION 01110

SAFETY, HEALTH, AND EMERGENCY RESPONSE (HTRW)
04/98

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 CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS (ACGIH)

ACGIH	(Most current edition.) Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Z358.1	(1990) Emergency Eyewash and Shower Equipment

CODE OF FEDERAL REGULATIONS (CFR)

CFR 29 Part 1904	Recording and Reporting Occupational Injuries and Illnesses
CFR 29 Part 1910	Occupational Safety and Health Standards
CFR 29 Part 1926	Safety and Health Regulations for Construction

ENGINEERING MANUALS (EM)

EM 385-1-1	(1996) US Army Corps of Engineers Safety and Health Requirements Manual

NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH (NIOSH)

NIOSH Pub No. 85-115	(1985) Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities

1.2 DESCRIPTION OF WORK

1.2.1 Site History

One of the barracks construction areas is located near the area referred to as the "SOF Building" construction site, located at the corner of Lightning (formerly Strachan) and Douglas Streets and at Hunter Army Airfield (HAAF), Savannah, Georgia. This site was environmentally tested. Trichloroethylene (TCE) and tetrachloroethylene (PCE) a TCE breakdown product, were detected in the soil. These contaminants are believed to be

remnants of cleaning solvents used in conjunction with aircraft maintenance. They were detected in part per billion (ppb) quantities (TCE at 100-130 ppb and PCE at 7.7 ppb). These levels are considered low enough so as to not adversely affect human health when inhaled. ACGIH set TCE's time weighted average (TWA) threshold limit at 50 parts per million (ppm) with a short-term exposure limit of 100 ppm. TCE is not readily absorbed by the skin but can irritate it. It is not considered a carcinogen. OSHA set TCE's permissible exposure limit (PEL) at 100 ppm with a 200 ppm ceiling. PCE is considered a carcinogen and has an odor threshold of 47 ppm. PCE's ACGIH TWA TLV is 25 ppm with a short term exposure of 50 ppm. OSHA PEL is 100 ppm with a ceiling of 200 ppm. As the soil-sampling event from which these data are taken is over 1 year old, changes in the contaminant levels may have occurred.

The site contained old WWII CMU barracks and wood frame and CMU offices, parking lots and grassed areas. Both underground and above ground heating fuel storage tanks were attached to some of these buildings. At this writing not all of these tanks had been removed. An UST, believed to be a heating fuel tank, at building 223 shall be removed under this contract following Georgia Underground Storage Tank regulations (GUST). There is no analytical data on fuel contamination from any of the other tank areas. The site is generally flat with a few large oak and palm trees. Several buildings are located around the periphery of the site. Near the construction area is the remnants of the old fuel hydrant system.

Analytical sampling results revealed that there were no volatile (VOC) or semi-volatile (SVOCS) hydrocarbons in the soil from the pipeline. The groundwater sampling has revealed a number of VOCs and SVOCS from unconfirmed sources. All of the following: Trichloroethene (Bldgs 234, 339, near Mitchel Blvd), Methylene Chloride (Bldgs 234, 339), Dichloroethene (Bldgs 312 near Lightning Dr.), and Benzene (Bldg 224), met or exceeded the MCL or a known environmental action level. A hazardous concentration of these contaminants in the breathing zone of the workers performing excavations is not expected, but could be possible. Dermal irritation and skin absorption is a potential hazard.

There is a possibility of contaminated soil being encountered during construction activities. The 300 block will continue the water loop started in the FY-98 barracks. Excavations for water service lines to the new buildings will be needed. Sewage lines will also be excavated. Contaminated soil and possibly water may be encountered during the excavation and de-watering activities.

The other barracks construction area, Block 1200, is located between Wilson Blvd. And Lightning Drive (formerly Strachan), 6th Road and Tubb Street. The existing buildings range from 1940's to a 1990's building. There are /were numerous out buildings and storage sheds associated with them. The majority of the buildings are older and have had significant renovations performed on them. The historic uses of these buildings is not known. What is known is that a limited environmental assessment (for selected volatile and semi-volatile contaminants)was performed (May 8 1998, CESAS-EN-G Memorandum Titled: Hunter AAF Barracks Revitalization, 1200 Block Contamination Assessment) with no significant findings. No underground storage tanks were located and 13 above ground #3 heating fuel tanks were identified. Groundwater was found to be approximately 1.5 to 2.0 meters below land surface. Although no soil or groundwater contaminants were detected, the site's location near an airfield and the presence of a high water table must be taken into consideration during all trenching and excavation operations. Air and waste materials must be

monitored as per Section 02220 and should any contaminants be encountered at the action levels, during any construction activities, work shall be performed in accordance with this specification. Should any Contractor-generated contamination occur, this specification shall also be adhered to for all applicable site work.

In order to insure that contaminated soil is identified correctly and in the interest of construction worker safety at the site, the contractor shall conduct continual on-site air monitoring utilizing at least two of the following real time instruments, making sure that the contaminants identified above will be accurately monitored:

Flame Ionization Detector (FID)
Photo Ionization Detector (PID)
Combination FID/PID Instrument and
Combustible Gas Indicator (CGI) and
Hand pump and detector tubes for TCE and PCE

(The PID will be required for chemical quality assurance for soil sampling purposes for this project.) The Contractor shall also require workers at the site to closely observe standards of personal hygiene in addition to wearing chemically resistant gloves to avoid potential dermal contact.

The following action levels shall be adhered to during air monitoring:

Combustible Gas Indicator (CGI) Action Levels: Taken immediately above (within 6 inches) the excavation (Also note that an excavation may qualify as a confined space and if so, must be treated as such.)

Lower Explosive Limit is 20% and rising. Evacuate area until levels drop below 20%.

Organic Vapors (VOC) Action Levels: 10 ppm (or PID Units) in the breathing zone for 5 minutes, evacuate and perform hand pump and detector tube testing for benzene, TCE, and PCE. At 1 ppm benzene, 25 ppm PCE, and/or 50 ppm TCE, upgrade to level C. If no specific identification of hydrocarbons is available, upgrade to Level C at 5 minute sustained 5 ppm.

Semi-volatile Organic Vapors (SVOC) are either not detected by PID/FIDs, or are poorly detected.

1.3 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-04 Drawings

Drawings shall be submitted which show the following:

Work Zones; GA|F.

Drawings shall include initial work zone boundaries: Exclusion Zone (EZ) including restricted and regulated areas; Contamination Reduction Zone (CRZ) and Support Zone (SZ), and show the layout of the personnel and equipment decontamination areas. These drawings need not be full size and may be submitted separately or appended to the Site Safety and Health Plan

(SSHP). The zones and decontamination areas must be accepted by the Contracting Officer (CO).

Decon Facilities; GA|D.

Representative layout for personnel and equipment decontamination, as specified (see Section 02300 EARTHWORK).

SD-09 Reports

Reports; FIO.

The following types of information generated in the field during execution of this project shall be submitted as attachments to the biweekly report.

Monitoring/Sampling Results; GA|F.

Personnel exposure monitoring/sampling results as generated by direct reading instruments and personal monitoring shall be submitted. Reports shall include date, time, worker name, task and instrument. Negative readings shall also be submitted. This information shall be recorded on the daily safety report and submitted in the Safety & Health Phase-Out Report.

Site Control Log; GA|F.

Record of each entry and exit into the site, as specified.

Inspections/Daily Safety Log; GA|F.

Submit records as specified.

Safety & Health Phase-Out Report; GA|D.

Submit as specified.

Site Safety and Health Plan (SSHP); GA|D.

Draft: a minimum of four copies provided to the Government for review. Final: a minimum of four copies provided to the Government for review. Addendums: a minimum of three copies provided to the Government for review), all as specified.

Training and Medical Certificates; FIO.

Certifications for Contractor and subcontractor personnel to be included with SSHP, as specified. Certifications acquired after submittal and acceptance of the SSHP shall be submitted to the COR under separate cover.

1.4 REGULATORY REQUIREMENTS

Work performed under this contract shall comply with EM 385-1-1, applicable Federal, state, and local safety and occupational health laws and regulations. This includes, but is not limited to, Occupational Safety and Health Administration (OSHA) standards, CFR 29 Part 1910, especially Section .120, "Hazardous Waste Site Operations and Emergency Response" and CFR 29 Part 1926, especially Sections .62 Lead in Construction (if necessary) and .65, "Hazardous Waste Site Operations and Emergency Response". Matters of interpretation of standards shall be submitted to

the appropriate administrative agency for resolution before starting work. Where the requirements of this specification, applicable laws, criteria, ordinances, regulations, and referenced documents vary, the most stringent requirements shall apply.

1.5 PRECONSTRUCTION SAFETY CONFERENCE

Unless otherwise agreed upon by the Contracting Officer, the preconstruction safety conference will be included with the general preconstruction meeting.

1.6 SAFETY AND HEALTH PROGRAM

OSHA Standards CFR 29 Part 1910, Section .120 (b) and CFR 29 Part 1926, Section .65 (b) require employers to develop and implement a written Safety and Health Program for employees involved in hazardous waste operations. These standards will be considered as applicable to the site under this contract. The site-specific program requirements of these OSHA Standards shall be integrated into one site-specific document, the Site Safety and Health Plan (SSHP). The SSHP shall interface with the employer's overall Safety and Health Program. Any portions of the overall Safety and Health Program that are referenced in the SSHP shall be included as appendices to the SSHP.

1.7 SITE SAFETY AND HEALTH PLAN

1.7.1 Preparation and Implementation

A Site Specific Safety and Health Plan (SSHP) shall be prepared (using ER 385-1-92 18 March 1994 in addition to references listed in paragraph 1.1) covering onsite work to be performed by the Contractor and all subcontractors. The Safety and Health Manager (Certified Industrial Hygienist (CIH)) shall be responsible for the development, implementation and oversight of the SSHP. The SSHP shall establish, in detail, the protocols necessary for the anticipation, recognition, evaluation, and control of hazards associated with each task performed. The SSHP shall address site-specific safety and health requirements and procedures based upon site-specific conditions. The level of detail provided in the SSHP shall be tailored to the type of work, complexity of operations to be performed, and hazards anticipated. Details about some activities may not be available when the initial SSHP is prepared and submitted. Therefore, the SSHP shall address, in as much detail as possible, anticipated tasks, their related hazards and anticipated control measures. Additional details shall be included in the activity hazard analyses as described in paragraph 1.10 ACTIVITY HAZARD ANALYSES.

1.7.2 Acceptance and Modifications (SSHP Addendums)

Prior to submittal, the SSHP shall be signed and dated by the Safety and Health Manager (CIH/CSP) and the Site Superintendent. The SSHP shall be submitted for review 15 days after the Notice to Proceed (NTP). Deficiencies in the SSHP shall be addressed. Items corrected in the SSHP shall be annotated by page, section, and change description. Each review comment shall be answered and shall correspond to the original comment, suggestion, or deficiency remark. These responses may be combined in one document for review and acceptance. The document shall include the contract's name, number and date of the submittal. Onsite work shall not begin until the plan has been accepted. A copy of the written SSHP, signed, shall be maintained onsite. As work proceeds, the SSHP shall be

adapted to new situations and new conditions. Changes and modifications to the accepted SSHP shall be made with the knowledge and concurrence of the Safety and Health Manager, the Site Superintendent, and the Contracting Officer. Should any modifications or changes be made that are not included in the original accepted SSHP, sequentially numbered addendums shall be submitted for review and acceptance (GA). All addendums shall be reviewed, dated and signed by the CIH. The addendums, along with the approved SSHP will then comprise the SSHP. Should any unforeseen hazard become evident during the performance of the work, the Site Safety and Health Officer (SSHO) shall bring such hazard to the attention of the Safety and Health Manager, the Site Superintendent, and the Contracting Officer, both verbally and in writing, for resolution as soon as possible. In the interim, necessary action shall be taken to re-establish and maintain safe working conditions in order to safeguard onsite personnel, visitors, the public, and the environment. Disregard for the provisions of this specification or the accepted SSHP shall be cause for stopping of work until the matter has been rectified.

1.7.3 Availability

The SSHP shall be made available in accordance with CFR 29 Part 1910, Section .120 (b)(1)(v) and CFR 29 Part 1926, Section .65 (b)(1)(v).

1.7.4 Elements

Topics required by CFR 29 Part 1910, Section .120 (b)(4) CFR 29 Part 1926, Section .65 (b)(4) and the Accident Prevention Plan as described in Appendix A of EM 385-1-1 and those described in this section shall be addressed in the SSHP. Where the use of a specific topic is not applicable to the project, the SSHP shall include a statement to justify its omission or reduced level of detail and establish that adequate consideration was given the topic.

1.8 SITE DESCRIPTION AND CONTAMINATION CHARACTERIZATION

1.8.1 Project/Site Conditions

The following information is a record of site contaminants and a description of the site. This information is provided to assist in preparing the SSHP.

1.8.1.1 Site Information

There is potential for encountering petroleum hydrocarbon and/or solvent contaminated soils and groundwater during the excavation activities associated with the demolition of old sewer and water lines, excavation for new sewer, water and other utility lines, building footers and other construction requiring excavations. Both spot soil sampling and grid sampling, (spring 1998) have revealed no SVOCs or VOCs in the soil at the 1200 block. However, water table fluctuations can easily change this. A study for the SOF Building construction (Dec. 1996) (near the 300 block) and resulting memo (CESAS-EN-GG) states; "The groundwater contained low concentrations of metals at levels below the state-defined action level; however, elevated levels of solvents above state defined action levels were detected in each ground-water sample." The solvents identified were cis-1,2 dichloroethene (12 ug/l), trichloroethene (73 ug/l) and tetrachloroethene (7.7 ug/l). Statement was also made that during the initial drilling at the site, drill crew personnel identified a strong hydrocarbon odor in the soil borings. Groundwater testing conducted in the

proposed barracks area in the spring of 1998 revealed the following hydrocarbons:

benzene 45 ug/L
toluene 390 ug/L
ethylbenzene 160 ug/L
isopropylbenzene 64 ug/L

n-propylbenzene 98 ug/L
1,3,5-trimethylbenzene 320 ug/L
1,2,4-trimethylbenzene 1200 ug/L
sec-butyl benzene 120 ug/L

p-isopropyltoluene 380 ug/L
n-butylbenzene 150 ug/L
napthalene 660 ug/L

acetone 3100 ug/L
butanone 120 ug/L
xylenes 1200 ug/L

Methylene chloride was detected but is believed to be a laboratory contaminant due to its presence in the blanks. This limited information does not preclude the possibility that other contamination may exist at this site and may not be limited to petroleum hydrocarbons.

1.8.1.2 List of Available Documents

There are studies/investigations available that can provide pertinent information for the soil contamination and concentrations at the proposed construction site. Study/investigation is identified (by subject) in CESAS-EN-GG Memoranda as: HTRW Investigation at SOF Company Administration Facility at Hunter Army Airfield, Savannah, Georgia, 27 January 1997 and Attachment 1 - Chemical Data and Data Review, USACE, 1997, memorandums: "Chemical Data Quality Assessment Report for Hunter Army Airfield Enlisted Barracks Project Soil Samples," 7 May 1998, CESAS-EN-GG, and "Chemical Data Quality Assessment Report for Hunter Army Airfield Enlisted Barracks Project Piezometer Ground-water Samples," 7 May 1998, CESAS-EN-GG.

1.8.2 Plan Requirements

The SSHP shall include a site description and contamination characterization section that addresses the following elements:

a. Description of site location, topography, size and past uses of the site.

b. A list of contaminants which may present occupational health and safety hazards. This list shall be created using the information in this specification and by evaluating and researching sources of information from typical base operations that use solvents, petroleum hydrocarbon sites as well as past site activities. The contamination characterization shall be reviewed and revised if new chemicals are identified as work progresses.

1.8.3 Ordnance and Explosive Waste (OEW)

There is no OEW expected to be at this site. If explosives, chemical surety and warfare materials (CSM/CWM) or unexploded ordnance (UXO) that

are discovered at any time during operations, the Contractor shall immediately stop operations in the affected area, mark the location, and notify the Contracting Officer. The Government will make appropriate arrangements for evaluation and proper disposal of each known or potential encountered material.

1.9 HAZARD/RISK ANALYSIS

The SSHP shall include a safety and health hazard/risk analysis for each site task and operation to be performed. The hazard/risk analysis shall provide information necessary for determining safety and health procedures, equipment, and training to protect onsite personnel, the environment, and the public. Available site information shall be reviewed when preparing the "Hazard/Risk Analysis" section of the SSHP. The following elements, at a minimum, shall be addressed.

1.9.1 Site Tasks and Operations (Work Plan)

The SSHP shall include a comprehensive section that addresses the tasks and objectives of the site operations and the logistics and resources required to reach those tasks and objectives if contamination is discovered. Based on the type of remediation required, the following is a list of anticipated major site tasks and operations to be performed: soil excavation, trenching, de-watering, temporary soil and water storage and disposal, control of stockpiled soil, hauling, backfill, grading, and possibly seeding, mulching and fertilizing of parts of the site that may not be covered by construction. This is not a complete list of site tasks and operations; therefore, it shall be expanded and/or revised, during preparation of the SSHP as necessary.

1.9.2 Hazards

The following potential hazards may be encountered during site work. These are not complete lists, therefore, they shall be expanded and/or revised as necessary during preparation of the SSHP. These hazards may be addressed in text format or in table format.

1.9.2.1 Safety Hazards

Unsafe operation of heavy equipment and machinery, uneven walking/working surfaces, excavation safety (to include possible confined space hazards created by excavation depth or combination of depth and organic vapors etc.), improperly used hand tools, improper lifting techniques.

1.9.2.2 Chemical Hazards

Potential chemical hazards that may be encountered during site work are discussed in paragraph SITE DESCRIPTION AND CONTAMINATION CHARACTERIZATION. The Hazard/Risk Analysis section of the SSHP shall describe the chemical, physical, and toxicological properties of contaminants, sources and pathways of employee exposures, anticipated onsite and off site exposure level potentials, and regulatory (including Federal, state, and local) or recommended protective exposure standards. The SSHP shall also address employee exposure to hazardous substances brought onsite, and shall comply with the requirements of CFR 29 Part 1910, Section .1200 and CFR 29 Part 1926, Section .59, Hazard Communication.

1.9.2.3 Physical Agents

High noise, hand/body vibration hazards from tools and heavy machinery, repetitive motion injury from physical labor, and noise.

1.9.2.4 Radiological Hazards

There are no known radiological hazards at this site.

1.9.2.5 Biological Hazards

Venomous snakes and insects, poisonous plants. Present but probably not a great concern at this site.

1.9.3 Action Levels

1.9.3.1 General

Action levels shall be established for the situations listed below, at a minimum. The action levels and required actions (engineering controls, changes in PPE, etc.) shall be presented in the SSHP in both text and tabular form. It will be the responsibility of the Contractor to determine the type and concentration of contamination.

a. Explanation and implementation of engineering controls and work practices.

b. Upgrade or downgrade in level of personal protective equipment.

c. Work stoppage and/or emergency evacuation of onsite personnel.

d. Prevention and/or minimization of public exposures to hazards created by site activities.

1.9.3.2 Confined Space Entry

There is no confined space entry for this project. Should a need to enter a confine space arise (as mentioned in paragraph 1.9.2.1 of this specification), a Confined Space Entry Plan shall be developed and submitted as an addendum to this SSHP for Government review and acceptance.

1.10 ACTIVITY HAZARD ANALYSIS

Prior to beginning each major phase of work, an Activity Hazard Analysis shall be prepared by the Contractor performing the task and submitted for review and acceptance. The format shall be in accordance with EM 385-1-1, Section 1, figure 1-1. A major phase of work is defined as an operation involving a type of work presenting hazards not experienced in previous operations or where a new subcontractor or work crew is to perform the task. The analysis shall define the activities to be performed and identify the sequence of work, the specific hazards anticipated, and the control measures to be implemented to eliminate or reduce each hazard to an acceptable level. Work shall not proceed on that phase until the activity hazard analysis has been accepted and a preparatory meeting has been conducted by the Contractor to discuss its contents with everyone engaged in the activities, including the government onsite representatives. The activity hazard analyses shall be continuously reviewed and when appropriate, modified to address changing site conditions or operations with the concurrence of the Safety and Health Manager, the Site Superintendent, and the Contracting Officer. Activity hazard analyses shall be attached to and become a part of the SSHP.

1.11 STAFF ORGANIZATION, QUALIFICATIONS, AND RESPONSIBILITIES

A qualified Safety and Health Manager, SSHO, and at least two additional persons certified in first aid and CPR are required.

An organizational structure shall be developed that sets forth lines of authority (chain of command), responsibilities, and communication procedures concerning site safety, health, and emergency response. This organizational structure shall cover management, supervisors and employees of the Contractor and subcontractors. The structure shall include the means for coordinating and controlling work activities of subcontractors and suppliers. The SSHP shall include a description of this organizational structure as well as qualifications and responsibilities of each of the following individuals. The Contractor shall obtain Contracting Officer's acceptance before replacing any member of the Safety and Health Staff. Requests shall include the names, qualifications, duties, and responsibilities of each proposed replacement.

1.11.1 Site Superintendent

A Site Superintendent, who has responsibility to implement the SSHP, the authority to direct work performed under this contract and verify compliance, shall be designated.

1.11.2 Safety and Health Manager

1.11.2.1 Qualifications

The services of an Industrial Hygienist certified by the American Board of Industrial Hygiene (ABIH)or a Certified Safety Professional, certified by the Board of Certified Safety Professionals (BCSP) shall be obtained. The name, qualifications, education summary and documentation, ABIH (BCSP) certificate, and specific work experience summary shall be included in the SSHP. The Safety and Health Manager shall have the following additional qualifications:

a. A minimum of 3 years experience in developing and implementing safety and health programs at hazardous waste sites.

b. Documented experience in supervising professional and technician level personnel.

c. Documented experience in developing worker exposure assessment programs and air monitoring programs and techniques.

d. Documented experience in the development of personal protective equipment programs, including programs for working in and around potentially toxic, flammable and combustible atmospheres and confined spaces.

e. Working knowledge of state and Federal occupational safety and health regulations.

1.11.2.2 Responsibilities

The Safety and Health Manager shall:

a. Be responsible for the development, implementation, oversight, and

enforcement of the SSHP.

b. Sign and date the SSHP (drafts, final document, and addendums) prior to submittal.

c. Be present onsite during some portion, other than mobilization, of intrusive activities.

d. Visit the site as needed and at least once in the duration of activities, to audit the effectiveness of the SSHP.

e. Be available for emergencies.

f. Provide onsite consultation as needed to ensure the SSHP is fully implemented.

g. Coordinate any modifications to the SSHP with the Site Superintendent, the SSHO, and the Contracting Officer.

h. Provide continued support for upgrading/downgrading of the level of personal protection.

i. Be responsible for evaluating air monitoring data and recommending changes to engineering controls, work practices, and PPE.

j. Review accident reports and results of daily inspections.

k. Serve as a member of the Contractor's quality control staff.

1.11.3 Site Safety and Health Officer (SSHO)

1.11.3.1 Qualifications

An individual and one alternate shall be designated the Site Safety and Health Officer (SSHO). The name, qualifications (education and training summary and documentation), and work experience of the Site Safety and Health Officer and alternate shall be included in the SSHP. The SSHO shall have the following qualifications:

a. A minimum of 2 years experience in implementing safety and health programs at hazardous waste sites where Level C personal protective equipment was required.

b. Documented experience in construction techniques and construction safety procedures.

c. Working knowledge of Federal and state occupational safety and health regulations.

d. Specific training in personal and respiratory protective equipment program implementation, and in the proper use of air monitoring instruments, and air sampling methods.

1.11.3.2 Responsibilities

The Site Safety and Health Officer shall:

a. Assist and represent the Safety and Health Manager in onsite training and the day to day onsite implementation and enforcement of the accepted SSHP.

b. Be assigned to the site on a full time basis for the duration of field activities. The SSHO shall have limited duties outside the Safety and Health related duties. If operations are performed during more than one work shift per day, a site Safety and Health Officer shall be present for each shift.

c. Have authority to ensure site compliance with specified safety and health requirements, Federal, state and OSHA regulations and all aspects of the SSHP including, but not limited to, activity hazard analyses, air monitoring, use of PPE, decontamination, site control, standard operating procedures used to minimize hazards, safe use of engineering controls, the emergency response plan, confined space entry procedures, spill containment program, and preparation of records by performing a daily safety and health inspection and documenting results on the Daily Safety Inspection Log.

d. Have authority to stop work if unacceptable health or safety conditions exist, and take necessary action to re-establish and maintain safe working conditions.

e. Consult with and coordinate any modifications to the SSHP with the Safety and Health Manager, the Site Superintendent, and the Contracting Officer.

f. Serve as a member of the Contractor's quality control staff on matters relating to safety and health.

g. Conduct accident investigations and prepare accident reports.

h. Review results of daily quality control inspections and document safety and health findings into the Daily Safety Inspection Log.

i. In coordination with site management and the Safety and Health Manager, recommend corrective actions for identified deficiencies and oversee the corrective actions.

1.11.4 Persons Certified in First Aid and CPR

At least two persons who are currently certified in first aid and CPR by the American Red Cross or other ARC approved agency shall be onsite at all times during site operations. They shall be trained in universal precautions and the use of PPE as described in the Bloodborne Pathogens Standard of CFR 29 Part 1910, Section .1030. These persons may perform other duties but shall be immediately available to render first aid when needed.

1.12 TRAINING

Personnel shall receive training in accordance with the Contractor's written safety and health training program and CFR 29 Part 1910 Section .120, CFR 29 Part 1926 Sections .62 and .65, and CFR 29 Part 1926 Section .21. The SSHP shall include a section describing training requirements.

1.12.1 General Hazardous Waste Operations Training

Personnel entering the exclusion or contamination reduction zones shall have successfully completed 40 hours of hazardous waste instruction off the site; 3 days actual field experience under the direct supervision of a trained, experienced supervisor; and 8 hours refresher training annually. Air sampling crews, heavy equipment operators, and other incidental site personnel shall be considered as having the potential need to enter the exclusion zone and shall be 40 hour trained. Personnel such as electricians and workers with non-soil, or groundwater related tasks may not need to be 40 hour trained. Work should be sequenced so as to keep them out of exclusion areas until hazards are controlled. Onsite supervisors shall have completed the above training and 8 hours of additional, specialized training covering at least the following topics: the employer's safety and health program, personal protective equipment program, spill containment program, and health hazard monitoring procedures and techniques. Copies of current training certification statements or certificates shall be submitted with the SSHP (FIO).

1.12.2 Site-specific Training

Site-specific training sessions shall be documented in the field log and field reports.

1.12.2.1 Initial Session (Pre-entry Briefing)

Should contaminated soil or groundwater be discovered and prior to commencement of onsite field activities to remove such soils or groundwater, all site employees, including those assigned only to the Support Zone, shall attend a site-specific safety and health training session of at least 1 hour duration. This session shall be conducted by the Safety and Health Manager and the Site Safety and Health Officer to ensure that all personnel are familiar with requirements and responsibilities for maintaining a safe and healthful work environment. Procedures and contents of the accepted SSHP and of EM 385-1-1 shall be thoroughly discussed. The Contracting Officer shall be notified at least 5 days prior to the initial site-specific training session so government personnel involved in the project may attend.

1.12.2.2 Periodic Sessions

Periodic onsite training shall be conducted by the SSHO daily for personnel assigned to work at the site during the following day. The training shall address safety and health procedures, work practices, any changes in the SSHP, activity hazard analyses, work tasks, or schedule; results of previous day's air monitoring, review of safety discrepancies and accidents. Should an operational change affecting onsite fieldwork be made, a meeting prior to implementation of the change shall be convened to explain safety and health procedures. Site-specific training sessions for new personnel, visitors, and suppliers shall be conducted by the SSHO using the training curriculum outlines developed by the Safety and Health Manager.

1.12.3 Other required training

Verification of CPR and First Aid Training (in accordance with 385-1-1), Respirator training, including fit testing, and all other health and safety training mandated by paragraph 1.1 References shall be submitted. (GA)

1.13 PERSONAL PROTECTIVE EQUIPMENT

1.13.1 General

In accordance with CFR 29 Part 1910 Section .120 (g)(5) and CFR 29 Part 1926 Section .65 (g)(5), a written Personal Protective Equipment (PPE) program which addresses the elements listed in that regulation, and which complies with respiratory protection program requirements of CFR 29 Part 1910 Section .134, is to be included in the employer's Safety and Health Program. The Site Safety and Health Plan shall detail the minimum PPE ensembles (including respirators) and specific materials from which the PPE components are constructed for each site-specific task and operation to be performed, based upon the hazard/risk analysis. Components of levels of protection (C, D and modifications) must be relevant to site-specific conditions, including heat and cold stress potential and safety hazards. Only respirators approved by NIOSH shall be used. Onsite personnel shall be provided with appropriate personal protective equipment. Protective equipment and clothing shall be kept clean and well maintained. The PPE section of the SSHP shall include site-specific procedures to determine PPE program effectiveness and for onsite fit-testing of respirators, cleaning, maintenance, inspection, and storage of PPE.

1.13.2 Levels of Protection

The Safety and Health Manager shall establish appropriate levels of protection for each work activity based on review of historical site information, existing data, an evaluation of the potential for exposure (inhalation, dermal, and ingestion) during each task, past air monitoring results, and a continuing safety and health monitoring program. The Safety and Health Manager shall also establish action levels for upgrade or downgrade in levels of PPE from the following specified minimum levels of protection. Protocols and the communication network for changing the level of protection shall be described in the SSHP. The PPE reassessment protocol shall address air monitoring results, potential for exposure, changes in site conditions, work phases, job tasks, weather, temperature extremes, individual medical considerations, etc.

1.13.2.1 Components of Levels of Protection

For guidance in determining appropriate components for levels of protection, utilize the following references:

NIOSH, OSHA, USCG, EPA, Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, (latest edition), NIOSH 85-115; EM 385-1-1 Section 5 and Appendix L; CFR 29 Part 1910.120, Appendix B; and CFR 29 Part 1926.65, Appendix B.

Components must be included that provide protection for the respiratory system, skin, eyes, face, hands, feet, head, body, and hearing. Specify the types of materials (e.g., neoprene, nitrile, etc.) for gloves and boots and types of cartridges for air purifying respirators based on site-specific contaminants and the concentrations in which they may occur. No latex gloves shall be worn. Gloves worn must have proof of ratings for the chemicals that may be encountered. The following items constitute minimum protective clothing and equipment ensembles to be utilized during this project:

Level D - Coveralls or work clothes, steel toed safety boots, (leather or impervious), work gloves, safety glasses, ear plugs and/or muffs with documented noise reduction rating, and hard-hat. This level shall be utilized where there are no dusts or contact with contaminated soils

hazards.

Modified Level D - All of the above, plus additional skin and eye protection such as nitrile gloves, steel toe/shank washable safety boots, splash protection face shields and goggles, Tyvek or breathable coveralls. (Note: Surgical latex gloves are not to be used at anytime on this project.) This level shall be utilized where there are no inhalation or ingestion dust hazards, but soil contact is present.

Level C - All of the Modified Level D requirements plus respiratory protection by air purifying respirators (powered or negative pressure respirators).

Level B - It is not expected that Level B work be performed under the scope of this project.

1.13.2.2 Initial Minimum Levels of PPE by Task

The Contractor's CIH shall determine the initial minimum protective equipment requirements for each major task and operation. This information shall be based upon review of potential contaminants found at this site. The information shall be reviewed and applied to the list of tasks and operations and these levels of protection shall be expanded and/or revised during preparation of the SSHP.

1.13.3 PPE for Government Personnel

Two clean sets of personal protective equipment and clothing, per week, at Level C protection level (excluding air-purifying negative-pressure respirators and safety shoes, which will be provided by individual visitors), as required for entry into the Exclusion Zone and/or Contamination Reduction Zone, shall be available for use by the Contracting Officer or official visitors. The items shall be cleaned and maintained by the Contractor and stored on site and clearly marked: "FOR USE BY GOVERNMENT ONLY." The Contractor shall provide basic training in the use and limitations of the PPE provided, and institute administrative controls to check prerequisites prior to issuance. Such prerequisites include meeting minimum training requirements for the work tasks to be performed and medical clearance for site hazards and respirator use.

1.14 MEDICAL SURVEILLANCE

The Safety and Health Manager, in conjunction with an Occupational Physician, shall detail, in the employer's Safety and Health Program and the SSHP, the medical surveillance program that includes scheduling of examinations, certification of fitness for duty, compliance with OSHA requirements, and information provided to the physician. Examinations shall be performed by or under the supervision of a licensed physician, preferably one knowledgeable in occupational medicine, and shall be provided without cost to the employee, without loss of pay and at a reasonable time and place. The Occupational Physician shall review medical surveillance protocols and examination and test results. The medical surveillance program shall contain the requirements specified below. Personnel working in contaminated areas of the site shall have been examined as prescribed in CFR 29 Part 1910 Section .120, and CFR 29 Part 1926 Sections .62 and .65, and determined medically fit to perform their duties.

1.14.1 Frequency of Examinations

Employees shall have been provided with medical examinations as specified, within the past 12 months and shall receive exams annually thereafter (if contract duration exceeds 1 year); on termination of employment; reassignment in accordance with CFR 29 Part 1910 Section .120 (e)(3)(i)(C), and CFR 29 Part 1926 Section .65 (e)(3)(i)(C); if the employee develops signs or symptoms of illness related to workplace exposures; if the physician determines examinations need to be conducted more often than once a year; and when an employee develops a lost time injury or illness during the period of this contract. The supervisor shall be provided with a written statement signed by the physician prior to allowing the employee to return to the work site after injury or illness resulting in a lost workday, as defined in CFR 29 Part 1904 Section .12 (f).

1.14.2 Content of Examinations

The following elements shall be included in the medical surveillance program. Additional elements may be included at the discretion of the occupational physician responsible for reviewing the medical surveillance protocols.

a. Complete medical and occupational history (initial exam only).

b. General physical examination of major organ systems.

c. Pulmonary function testing including FVC and FEV 1.0.

d. CBC with differential.

e. Blood chemistry screening profile (e.g. SMAC 20/25).

f. Urinalysis with microscopic examination.

g. Audiometric testing (as required by Hearing Conservation Program).

h. Visual acuity.

i. Chest X-Ray. (This test should be performed no more frequently than every 4 years, unless directed by Occupational Physician.)

j. Electrocardiogram (as directed by Occupational Physician).

k. Urine heavy metals (arsenic, cadmium, chromium, and mercury).

l. Serum lead.

m. Zinc protoporphyrin.

1.14.3 Information provided to the Occupational Physician

The physician shall be furnished with the following:

a. Site information from paragraph 1.8 SITE DESCRIPTION AND CONTAMINATION CHARACTERIZATION.

b. Information on the employee's anticipated or measured exposure.

c. A description of any PPE used or to be used.

d. A description of the employee's duties as they relate to the employee's exposures (including physical demands on the employee and heat/cold stress).

e. A copy of CFR 29 Part 1910 Section .120, or CFR 29 Part 1926 Section .65.

f. Information from previous examinations not readily available to the examining physician.

g. A copy of Section 5.0 of NIOSH Pub No. 85-115.

h. Information required by CFR 29 Part 1910 Section .134.

1.14.4 Physician's Written Opinion

Before work begins a copy of the physician's written opinion for each employee shall be obtained and furnished to the Safety and Health Manager and the employee. The opinion shall address the employee's ability to perform hazardous remediation work and shall contain the following:

a. The physician's recommended limitations upon the employee's assigned work and/or PPE usage. (GA)

b. The physician's opinion about increased risk to the employee's health resulting from work.

c. A statement that the employee has been informed and advised about the results of the examination.

1.14.5 Medical Records

Documentation of medical exams shall be provided as part of the SSHP. Medical records shall be maintained in accordance with CFR 29 Part 1910 Section 120, and CFR 29 Part 1926 Section 65.

1.15 EXPOSURE MONITORING/AIR SAMPLING PROGRAM

The Safety and Health Manager shall prepare and implement an exposure monitoring/air sampling program to identify and quantify safety and health hazards and airborne levels of hazardous substances in order to assure proper selection of engineering controls, work practices and personal protective equipment for affected site personnel. Minimum initial requirements for the program are delineated below. Available site information shall be reviewed and the exposure monitoring/air sampling program shall be expanded and/or revised for submittal as part of the SSHP.

1.16 HEAT AND COLD STRESS MONITORING

The Safety and Health Manager shall develop a heat stress monitoring program for onsite activities. Details of the monitoring program, including schedules for work and rest, and physiological monitoring requirements, shall be described in the SSHP. Personnel shall be trained to recognize the symptoms of heat. The SSHO and an alternate person shall be designated, in writing, to be responsible for the heat and cold stress monitoring program.

1.16.1 Heat Stress

Physiological monitoring shall commence when the ambient temperature is above 21.1 degrees C (70 degrees F). Monitoring frequency shall increase as the ambient temperature increases or as slow recovery rates are observed. An adequate supply of cool drinking water shall be provided for the workers. NIOSH Pub No. 85-115 may be consulted for guidance in determining protocols for prevention of heat stress.

1.17 SAFETY PROCEDURES, ENGINEERING CONTROLS AND WORK PRACTICES

The SSHP shall describe the standard operating safety procedures, engineering controls and safe work practices to be implemented for the work covered. These shall include, but not be limited to, the following:

1.17.1 General Site Rules/Prohibitions

General site rules/prohibitions (buddy system, eating, drinking, and smoking restrictions, etc.) The SSHP shall document procedures to prevent the spread of contaminants from workers' hands and clothing to break areas, vehicles, or other areas denoted as "clean."

1.17.2 Work Permit Requirements

Excavation, hot work, confined space, etc.

1.17.3 Material Handling Procedures

Soils, liquids, debris, drums, etc.

1.17.3.1 Spill and Discharge Control

Written spill and discharge containment/control procedures shall be developed and implemented. Procedures need to address liquids brought onsite such as kerosene, gasoline, diesel, lubricating oils, cleaning solvents, etc. These procedures shall describe prevention measures, such as building berms or dikes; spill control measures and material to be used (e.g. booms, vermiculite); location of the spill control material; personal protective equipment required to cleanup spills; disposal of contaminated material; and who is responsible to report the spill. Storage of contaminated material or hazardous materials shall be appropriately bermed, diked and/or contained to prevent any spillage of material on uncontaminated soil. If the spill or discharge is reportable and/or human health or the environment are threatened, the National Response Center, the state, and the Contracting Officer shall be notified as soon as possible.

1.17.4 Hot Work

Hot work shall not be permitted except as outlined herein. Prior to conducting hot work, a hot work permit shall be prepared and submitted. An example format for a hot work permit shall be included in the SSHP. The permit shall describe compliance with the following procedures. Hot work shall not be performed unless monitoring indicates it is less than 10% of the LFL/LEL until the hot work is completed. The hot work includes heat cutting and sealing of geosynthetic membranes, welding, cutting, grinding, sawing, or other similar operations which could be expected to potentially generate combustion-producing temperatures or sparks, or which could produce potentially hazardous fumes or vapors. An individual at each hot work site shall be designated as a fire watch. This person's sole responsibility shall be to monitor the hot work and have immediate access to the fire extinguisher located at each hot work site. A new permit shall

be obtained at the start of each work shift during which hot work will be conducted.

1.17.5 Ignition Sources

State how ignition sources will be controlled.

1.17.6 Fire Protection and Prevention

This section may be addressed separately in the Accident Prevention Plan portion or under the spill prevention portion of the SSHP.

1.17.7 Electrical Safety

All sources of electrical hazards shall be identified and controlled prior to start of field work. Electrically operated equipment such as ventilation fans, compressors for spray cleaning, sump pumps, etc. must be addressed. Include use of bonding and grounding in this section.

1.17.8 Excavation and Trench Safety

The SSHP needs to include standard safety practices for personnel as well as equipment.

1.17.9 Guarding of Machinery and Equipment

Address any specific hazards peculiar to the equipment which will be brought onsite.

1.17.10 Lockout/Tagout

Address any specific hazards peculiar to the equipment which will be brought onsite.

1.17.11 Hazard Communication

As per the Hazard Communication Standard, all Contractor and subcontractor employees, shall have received training in the understanding of the hazards associated with their jobs. Material Safety Data Sheets shall be available on location at all times for hazardous materials brought onsite. A list of such materials shall be appended to the SSHP and/or submitted as addendums as phases change.

1.17.12 Illumination

Address any specific needs peculiar to the plan of operations.

1.17.13 Sanitation

Address any specific needs peculiar to the site.

1.17.14 Engineering Controls

Address any specific hazard controls peculiar to the operations which will be performed onsite.

1.17.15 Signs and Labels

Address any specific signs or labels peculiar to the equipment, procedures

or areas onsite as well as leaving the site.

1.17.16 Waste Disposal

Address any specific disposal practices and procedures. This shall include control and handling of decontamination waters and used PPE.

1.18 SITE CONTROL MEASURES

In order to prevent the spread of contamination and control the flow of personnel, vehicles, and materials into and out of work areas, site control measures shall be established and described in the SSHP. The SSHP shall describe the methodology to be used by the Safety and Health Manager and SSHO in determining work zone designations and their modifications, and procedures to limit the spread of contamination. The SSHP shall include procedures for the implementation and enforcement of safety and health rules for all persons on the site, including employers, employees, outside Contractors, government representatives, and visitors.

1.18.1 Work Zones

Initial anticipated work zone boundaries shall be shown on the drawings (GA). Utilizing this guidance, work zone boundaries (exclusion zone, including restricted and regulated areas; contamination reduction zone; and support zone) and access points shall be established and the boundary delineations shall be included on the drawings and in the SSHP. Delineation of work zone boundaries shall be based on the contamination characterization data and the hazard/risk analysis to be performed as described in paragraph: HAZARD/RISK ANALYSIS. As work progresses and field conditions are monitored, work zone boundaries may be modified with approval of the Contracting Officer. Work zones shall be clearly identified and marked in the field (using fences, tape, signs, etc.). A site map, showing work zone boundaries and locations of decontamination facilities, shall be posted in the onsite office. Work zones shall consist of the following:

a. Exclusion Zone (EZ): The exclusion zone is the area where hazardous contamination is either known or expected to occur and the greatest potential for exposure exists. Entry into this area shall be controlled and exit may only be made through the CRZ.

b. Contamination Reduction Zone (CRZ): The CRZ is the transition area between the Exclusion Zone and the Support Zone. The personnel and equipment decontamination areas shall be separate and unique areas located in the CRZ.

c. Support Zone (SZ): The Support Zone is defined as areas of the site, other than exclusion zones and contamination reduction zones, where workers do not have the potential to be exposed to hazardous substances or dangerous conditions resulting from hazardous waste operations. The Support Zone shall be secured against active or passive contamination. Site offices, parking areas, and other support facilities shall be located in the Support Zone.

1.18.2 Site Control Log

A log of personnel visiting, entering, or working on the site shall be maintained (FIO). The log shall include the following: date, name, agency

or company, time entering and exiting site, time entering and exiting the exclusion zone (if applicable), and personal protective equipment utilized. Before visitors are allowed to enter the Contamination Reduction Zone or Exclusion Zone, they shall show proof of current training, medical surveillance and respirator fit testing (if respirators are required for the tasks to be performed) and shall fill out the Certificate of Worker or Visitor Acknowledgment. This visitor information, including date, shall be recorded in the log.

1.18.3 Communication

An employee alarm system that has adequate means of on and off site communication shall be provided and installed in accordance with CFR 29 Part 1910 Section .165. The means of communication shall be able to be perceived above ambient noise or light levels by employees in the affected portions of the workplace. The signals shall be distinctive and recognizable as messages to evacuate or to perform critical operations.

1.18.4 Site Signs

Signs shall be printed in bold large letters on contrasting backgrounds in English or where appropriate in the predominant language of workers unable to read English. Signs shall be visible from all points where entry might occur and at such distances from the restricted area that employees may read the signs and take necessary protective steps before entering.

1.19 PERSONAL HYGIENE AND DECONTAMINATION

Personnel entering the Exclusion or Contamination Reduction Zones or otherwise exposed or subject to exposure to hazardous chemical vapors, liquids, or contaminated solids shall adhere to the following personal hygiene and decontamination provisions. Decontamination shall be performed in the CRZ prior to entering the Support Zone from the Exclusion Zone. Chapter 10.0 of NIOSH Pub No. 85-115 shall be consulted when preparing decontamination procedures. A detailed discussion of personal hygiene and decontamination facilities and procedures to be followed by site workers shall be submitted as part of the SSHP. Employees shall be trained in the procedures and the procedures shall be enforced throughout site operations. Persons disregarding these provisions of the SSHP shall be barred from the site. Dry decontamination shall be done only for those workers involved in perimeter work.

1.19.1 Decontamination Facilities

The following facilities shall be provided: A personnel decontamination facility in the CRZ is required. This facility shall be used by both Contractor personnel and government representatives. The decontamination facility shall provide a secure barrier between the clean decon site and the contaminants, and at no time shall any wash/rinse fluids be allowed to encounter site soil. There shall be set-up a series of wash/rinse basins for coveralls and boots, a separate area for contaminated respirator holding, and contaminated survey/hand equipment holding until they have been certified clean, soap, water and towels for washing hands and face, secure labeled trash receptacles for disposables, and secure, labeled bags or barrels for material to be deconned at a later time (i.e. end of the day). A written decon line procedure with supplies shall be included in the SSHP. Materials shall include a series of wash/rinse containers such as kiddie pools, wash tubs, or other sturdy plastic containers which allow the worker to stand comfortably while undergoing decon. The connecting walking

areas shall be covered with plastic or visquene to control decon water dispersion and mud generation. Disposable or decon-able chairs shall be provided to assist in PPE donning and removal. Other supplies or features such as shade canopies, respirator disinfecting station, monitoring equipment decon, etc., shall be set up as needed. It should be kept in mind that the hazards of this site are possibly contaminated soils and contaminated liquid, volatile, or acutely toxic materials (suspected or confirmed human carcinogens). With appropriate documentation of exposures, PPE downgrades may include double-breathable suits that can be HEPA vacuumed before removal. The decon station designer should keep this in mind.

1.19.2 Procedures

A written decon line procedure with all necessary supplies shall be developed and included in the SSHP. Any contact with contaminated soil or groundwater or waste material shall require that person to go through decontamination procedures. The decon alley shall be the only exit point from the exclusion zone, even when only Level D is in effect.

1.20 EQUIPMENT DECONTAMINATION

Vehicles and equipment used in the EZ shall be decontaminated in the CRZ prior to leaving the site. The procedures for decontamination of vehicles and equipment shall be addressed in the SSHP.

1.20.1 Decontamination Facilities

A vehicle/equipment decontamination station shall be provided within the CRZ for decontaminating vehicles and equipment leaving the EZ. The location shall be included in the zoning map submitted in the SSHP. The design and construction of the decontamination pad shall be included in the SSHP. The decontamination station shall include the following: a continuous, impervious surface, supported by rigid berms or walls designed to capture decontamination water, including overspray, and shall allow for collection and removal of the decontamination water using sumps, dikes and ditches as required. The entrance to the pad shall have a lip or berm a minimum of 4" high to contain heavy rains or decon waters. The decon pad shall be washed down at the end of the shift and waters and soil safely collected and secured for the night. Materials used in construction of the decon pad shall be double wrapped or protected from exposure to contaminated liquids so that the materials themselves (other than the plastic) do not become contaminated wastes.

1.20.2 Procedures

Procedures for equipment decontamination shall be developed and utilized to prevent the spread of contamination into the SZ and off site areas. These procedures shall address disposal of contaminated products and spent materials used on the site, including containers, fluids, oils, etc. Any item taken into the EZ shall be assumed to be contaminated and shall be inspected and/or decontaminated before the item leaves the area. Vehicles, equipment, and materials shall be cleaned and decontaminated prior to leaving the site. Construction material shall be handled in such a way as to minimize the potential for contaminants being spread and/or carried off site. Prior to exiting the site, vehicles and equipment shall be monitored to ensure the adequacy of decontamination.

1.21 EMERGENCY EQUIPMENT AND FIRST AID REQUIREMENTS

The SSHP shall describe the emergency and first aid equipment to be available onsite. The following items, as a minimum, shall be maintained onsite and available for immediate use:

a. First aid equipment and supplies approved by the consulting physician.

b. Emergency eyewashes which comply with ANSI Z358.1. They are to be staged at the area of greatest potential need and not in vehicles or other restricted access areas.

c. Fire extinguishers with a minimum rating of 20-A: 120-B :C shall be provided at site facilities and in all vehicles and at any other site locations where flammable or combustible materials present a fire risk.

1.22 EMERGENCY RESPONSE AND CONTINGENCY PROCEDURES

An Emergency Response Plan, that meets the requirements of CFR 29 Part 1910 Section .120 (l) and CFR 29 Part 1926 Section .65 (l), shall be developed and implemented as a section of the SSHP. In the event of any emergency, the Contractor shall, without delay, alert all onsite employees that there is an emergency situation; take action to remove or otherwise minimize the cause of the emergency; alert the Contracting Officer; and institute measures necessary to prevent repetition of the conditions or actions leading to, or resulting in, the emergency. Employees that are required to respond to hazardous emergency situations shall be trained in how to respond to such expected emergencies. The plan shall be rehearsed regularly as part of the overall training program for site operations. The plan shall be reviewed periodically and revised as necessary to reflect new or changing site conditions or information. The following elements, as a minimum, shall be addressed in the plan:

a. Personnel roles, lines of authority, communications for emergencies.

b. Emergency recognition and prevention.

c. Site topography, layout, and prevailing weather conditions.

d. Criteria and procedures for site evacuation (emergency alerting procedures, employee alarm system, emergency PPE and equipment, safe distances, places of refuge, evacuation routes, site security and control).

e. Specific procedures for decontamination and medical treatment of injured personnel.

f. Route maps to nearest pre-notified medical facility. Site-support vehicles shall be equipped with maps. At the beginning of project operations, drivers of the support vehicles shall become familiar with the emergency route and the travel time required.

g. Emergency alerting and response procedures including posted instructions and a list of names and telephone numbers of emergency contacts (physician, nearby medical facility, fire and police departments, ambulance service, Federal, state, and local environmental agencies; as well as Safety and Health Manager, the

Site Superintendent, the Contracting Officer and/or their alternates).

h. Criteria for initiating community alert program, contacts, and responsibilities.

i. Procedures for reporting incidents to appropriate government agencies. In the event that an incident such as an explosion or fire, or a spill or release of toxic materials occurs during the course of the project, the appropriate government agencies shall be immediately notified. In addition, the Contracting Officer shall be verbally notified immediately and receive a written notification within 24 hours. The report shall include the following items:

(1) Name, organization, telephone number, and location of the Contractor.

(2) Name and title of the person(s) reporting.

(3) Date and time of the incident.

(4) Location of the incident, i.e., site location, or facility name.

(5) Brief summary of the incident giving pertinent details including type of operation ongoing at the time of the incident.

(6) Cause of the incident, if known.

(7) Casualties (fatalities, disabling injuries).

(8) Details of any existing chemical hazard or contamination.

(9) Estimated property damage, if applicable.

(10) Nature of damage, effect on contract schedule.

(11) Action taken to ensure safety and security.

(12) Other damage or injuries sustained, public or private.

k. Procedures for critique of emergency responses and follow-up.

1.23 CERTIFICATE OF VISITOR ACKNOWLEDGMENT

A copy of a Contractor-generated certificate of visitor acknowledgment shall be completed and submitted for each visitor allowed to enter contamination reduction or exclusion zones, and for each employee, following the example certificate at the end of this section.

1.24 INSPECTIONS

The SSHO shall perform daily inspections of the job site and the work in progress to ensure compliance with EM 385-1-1, the Safety and Health Program, the SSHP and other occupational health and safety requirements of the contract, and to determine the effectiveness of the SSHP. Procedures for correcting deficiencies (including actions, timetable and responsibilities) shall be described in the SSHP. Follow-up inspections to

ensure correction of deficiencies shall be conducted and documented. Daily safety inspection logs shall be used to document the inspections, noting safety and health deficiencies, deficiencies in the effectiveness of the SSHP, and corrective actions taken. The SSHO's Daily Inspection Logs shall be attached to and submitted with the Daily Quality Control reports. Each entry shall include the following: date, work area checked, employees present in work area, PPE and work equipment being used in each area, special safety and health issues and notes, and signature of preparer. In the event of an accident, the Contracting Officer shall be notified according to EM 385-1-1. Within 1 day of any reportable accident, an Accident Report shall be completed on ENG Form 3394 and submitted. (FIO)

1.25 SAFETY AND HEALTH PHASE-OUT REPORT

A Safety and Health Phase-Out Report shall be submitted within 12 working days following completion of the work, prior to final acceptance of the work. The following minimum information shall be included:

a. Summary of the overall performance of safety and health (accidents or incidents including near misses, unusual events, lessons learned, etc.).

b. Final decontamination documentation including procedures and techniques used to decontaminate equipment, vehicles, and onsite facilities.

c. Summary of exposure monitoring and air sampling accomplished during the project.

d. Signatures of Safety and Health Manager and SSHO.

e. All certificates required by this section that have not been previously submitted. (FIO)

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

EXAMPLE CERTIFICATE VISITOR ACKNOWLEDGMENT

PROJECT NAME CONTRACT NO.
PROJECT ADDRESS
CONTRACTOR'S NAME
VISITOR'S NAME

The contract for the above project requires the following: that you be provided with and complete formal and site-specific training; that you be supplied with proper personal protective equipment including respirators; that you be trained in its use; and that you receive a medical examination to evaluate your physical capacity to perform your assigned work tasks, under the environmental conditions expected, while wearing the required personal protective equipment. These things are to be done at no cost to you. By signing this certification, you are acknowledging that you have met these obligations.

I HAVE READ, UNDERSTAND AND AGREE TO FOLLOW THE SITE SAFETY AND HEALTH PLAN FOR THIS SITE.

Name Date

--- ---

FORMAL TRAINING: I have completed the following formal training courses that meet OSHA's requirements:

Date Completed

SITE-SPECIFIC TRAINING: I have been provided and have completed the site-specific training required by this Contract. The Site Safety and Health Officer conducted the training. _____

RESPIRATORY PROTECTION: I have been trained in accordance with the criteria in [the Contractor's] [my employer's] Respiratory Protection program. I have been trained in the proper work procedures and use and limitations of the respirator(s) I will wear. I have been trained in and will abide by the facial hair policy. _____

RESPIRATOR FIT-TEST TRAINING: I have been trained in the proper selection, fit, use, care, cleaning, and maintenance, and storage of the respirator(s) that I will wear. I have been fit-tested in accordance with the criteria in [the Contractor's] [my employer's] Respiratory Program and have received a satisfactory fit. I have been taught how to properly perform positive and negative pressure fit-check upon donning negative pressure respirators each time. _____

MEDICAL EXAMINATION: I have had a medical examination within the last 12 months which was paid for by my employer. The examination included: health history, pulmonary function tests and may have included an evaluation of a chest x-ray. A physician made determination regarding my physical capacity to perform work tasks on the project while wearing protective equipment including a respirator. I was personally provided a copy and informed of the results of that examination. My employer's industrial hygienist evaluated the medical certification provided by the physician and checked the appropriate blank below. The physician determined that there:

were no limitations to performing the required work tasks;

EXAMPLE CERTIFICATE VISITOR ACKNOWLEDGMENT

were identified physical limitations to performing the required work tasks.

Date medical exam completed

Visitor's Signature _____
Date _____

Printed Name _____

Social Security Number _____

Contractor's Site Safety and Health Officer Signature _____

Date _____

Printed Name _____

Social Security Number _____

-- End of Section --

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DIVISION 01 - GENERAL REQUIREMENTS

SECTION 01330

SUBMITTAL PROCEDURES

09/97

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-- End of Section Table of Contents --

CEGS-01330/S (September 1997)

SECTION 01330

SUBMITTAL PROCEDURES
09/97

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, as the Contractor under the CQC requirements of this

contract is responsible for dimensions, the design of adequate connections and details, and the satisfactory construction of all work. 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 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) representative and each item shall be stamped, signed, and dated by the CQC representative 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 (ENG FORM 4288)

At the end of this section is one set of ENG Form 4288 listing items of equipment and materials for which submittals are required by the specifications; this list may not be all inclusive and additional submittals may be required. The Contractor will also be given the submittal register as a diskette containing the computerized ENG Form 4288 and instructions on the use of the diskette. Columns "d" through "r" have been completed by the Government; the Contractor shall complete columns "a" and "s" through "u" and submit the forms (hard copy plus associated electronic file) to the Contracting Officer for approval within 30 calendar

days after Notice to Proceed. The Contractor shall keep this diskette up-to-date and shall submit it to the Government together with the monthly payment request. 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 30 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. An additional 10 calendar days shall be allowed and shown on the register for review and approval of submittals for food service equipment and refrigeration and HVAC control systems.

3.4 TRANSMITTAL FORM (ENG FORM 4025)

The sample transmittal form (ENG Form 4025) included in Attachment 1 to Section 00800 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 SUBMITTAL PROCEDURE

Submittals shall be made as follows:

3.5.1 Procedures

The Contractor shall be responsible for the scheduling and control of all submittals. The Contractor is responsible for confirming that the submittal register includes all submittals required by the contract documents.

In addition to those items listed on ENG Form 4288, the Contractor will furnish submittals for any deviation from the plans or specifications. The scheduled need dates must be recorded on the document for each item for control purposes and critical items must be tied to the contractor's approved schedule where applicable.

The Contractor will submit to the Contracting Officer for approval a minimum of five copies of all GA/D or GA/F level submittals. Three copies of all FIO level submittals will be provided. The number of copies of submittals specified in this portion of the contract shall be complied with in lieu of four copies as specified by FAR 52.236-21.

For those contracts requiring Network Analysis System (NAS), the Contractor will schedule on the NAS critical items of equipment submittals and procurement activities which will, or have the potential to, significantly impact project completion. The inclusion or exclusion of critical items shall be subject to the approval of the Contracting Officer.

Where ENG Form 4025 must be submitted prior to approval of the Construction Progress Schedule, the Contractor shall submit an initial annotated ENG Form 4288 upon which dates for submittal, approval and delivery of procurement items shall be included for the first 60 days of the work. Upon approval of the Construction Progress Schedule, or no later than 60 days after Notice to Proceed, the Contractor shall submit final annotated copies of ENG Form 4288. Dates shall be coordinated with the approved Construction Progress Schedule to logically interface with the sequence of construction. Critical item numbers will be shown on the listing if NAS is required.

Furnishing the schedule shall not be interpreted as relieving the Contractor of his obligation to comply with all the specification requirements for the items on the schedule. Contractor's Quality Control representative shall review the listing at least every 30 days and take appropriate action to maintain an effective system. The Contractor shall furnish a list each 30 days of all submittals on which either Government's or Contractor's action is past due. He shall also furnish revised due dates in those cases when the original submittal schedule is no longer realistic. This monthly list of delayed items shall also be annotated by the Contractor to show what corrective action he is taking with regard to slippages in submittal schedule which are attributable to actions by him, his subcontractors, or suppliers.

The Contractor shall provide a complete updated submittal register indicating the current status of all submittals when requested by the Contracting Officer in order to assure himself the schedule is being maintained.

The Contractor shall certify that each submittal is correct and in strict conformance with the contract drawings and specifications. All submittals not subject to the approval of the Contracting Officer will be submitted for information purposes only.

No Corps of Engineers action will be required prior to incorporating these items into the work, but the submittal shall be furnished to the Area/Resident Engineer not less than 2 weeks prior to procurement of Contractor certified material, equipment, etc.

These Contractor approved submittals will be used to verify that material received and used in the job is the same as that described and approved and will be used as record copies. All samples of materials submitted as required by these specifications shall be properly identified and labeled for ready identification, and upon being certified by the Contractor and reviewed by the Contracting Officer, shall be stored at the site of the work for job site use until all work has been completed and accepted by the Contracting Officer. Delegation of this approval authority to Contractor Quality Control does not relieve the Contractor from the obligation to conform to any contract requirement and will not prevent the Contracting Officer from requiring removal and replacement of construction not in contract conformance; nor does it relieve the Contractor from the requirement to furnish "samples" for testing by the Government Laboratory or check testing by the Government in those instances where the technical specifications so prescribe.

Contractor certified drawings will be subject to quality assurance review by the Government at any time during the duration of the contract. No adjustment for time or money will be allowed for corrections required as a

result of noncompliance with plans and specifications.

Submittals Requiring Government Approval (GA/D Level or GA/F Level). Where the review authority is designated to the Government, the Contractor is required to sign the certification on ENG Form 4025 in the box beside the remarks block in Section I. The Government will code the items in block h and sign the approval action block in Section II as the approving authority.

Operating and Maintenance Instructions. Six complete sets of instructions containing the manufacturer's operating and maintenance instructions for each piece of equipment shall be furnished. Each set shall be permanently bound and shall have a hard cover. One complete set shall be furnished at the time test procedures are submitted. Remaining sets shall be furnished before the contract is completed. The following identification shall be inscribed on the covers: The words "OPERATING AND MAINTENANCE INSTRUCTIONS," name and location of the facility, name of the Contractor, and contract number. Fly sheets shall be placed before instructions covering each subject. Instruction sheets shall be approximately 8-1/2 by 11 inches, with large sheets of drawings folded in. Instructions shall include but are not limited to:

(1) System layout showing piping, valves and controls;

(2) Approved wiring and control diagrams;

(3) A control sequence describing startup, operation and shutdown;

(4) Operating and maintenance instructions for each piece of equipment, including lubrication instructions and troubleshooting guide; and

(5) Manufacturer's bulletins, cuts and descriptive data; parts lists and recommended parts.

3.5.2 Deviations

For submittals which include proposed deviations requested by the Contractor, the column "variation" of ENG Form 4025 shall be checked. 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. Four copies of the submittal will be retained by the Contracting Officer and one copy 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 STAMPS

Stamps used by the Contractor on the submittal data to certify that the submittal meets contract requirements shall be similar to the following:

CONTRACTOR

(Firm Name)

_____ Approved

_____ Approved with corrections as noted on submittal data and/or attached sheets(s).

SIGNATURE: _____

TITLE: _____

DATE: _____

-- End of Section --

SUBMITTAL REGISTER
(ER 415 1-10)

CONTRACT NO.

TITLE AND LOCATION
Barracks Complex, Hunter AAF, Georgia

CONTRACTOR

SPECIFICATION SECTION
01110

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			1.3	Work Zones		X										X	F									
			1.3	Decon Facilities		X										X	D									
			1.3	Reports						X					X											
			1.3	Monitoring/Sampling Results						X						X	F									
			1.3	Site Control Log						X						X	F									
			1.3	Inspections/Daily Safety Log						X						X	F									
			1.3	Safety & Health Phase-Out Report						X						X	D									
			1.3	Site Safety and Health Plan (SSHP)						X						X	D									
			1.3	Training and Medical Certificates						X					X											

SUBMITTAL REGISTER
(ER 415 1-10)

CONTRACT NO.

TITLE AND LOCATION
Barracks Complex, Hunter AAF, Georgia

CONTRACTOR

SPECIFICATION SECTION
01411

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			1.3	Laboratory Reports						X					X											
			1.3	Laboratory Certification									X			X	F									
			1.3	Laboratory Quality									X			X	F									
				Assurance/Quality Control Plan																						

SUBMITTAL REGISTER
(ER 415 1-10)

CONTRACT NO.

TITLE AND LOCATION
Barracks Complex, Hunter AAF, Georgia

CONTRACTOR

SPECIFICATION SECTION
01420

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			1.3	Sampling and Analysis Plan (SAP)						X						X	D									
			1.3	Engineering Remediation Report						X						X	D									

SUBMITTAL REGISTER
(ER 415 1-10)

CONTRACT NO.

TITLE AND LOCATION
Barracks Complex, Hunter AAF, Georgia

CONTRACTOR

SPECIFICATION SECTION
01780

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			1.2	As-Built Drawings									X			X										
			1.2	As-Built Record of Equipment and Materials									X			X										

SUBMITTAL REGISTER
(ER 415 1-10)

CONTRACT NO.

TITLE AND LOCATION
Barracks Complex, Hunter AAF, Georgia

CONTRACTOR

SPECIFICATION SECTION
02091

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO. c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			1.4	PCB Articles and Hazardous Waste						X						X	D									
				Lamps Disposition Report																						
			1.4	Certification of Approved Recycling							X					X	D									
				or Transfer Facility																						
			1.4	Receipt of Materials at Transfer or									X			X	D									
				Recycling Facility or TSDF																						
			1.4	Spill Prevention and Response Plan									X			X	D									

SUBMITTAL REGISTER
(ER 415 1-10)

CONTRACT NO.

TITLE AND LOCATION
Barracks Complex, Hunter AAF, Georgia

CONTRACTOR

SPECIFICATION SECTION
02220

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			1.3	Work Plan					X						X											

SUBMITTAL REGISTER
(ER 415 1-10)

CONTRACT NO.

TITLE AND LOCATION
Barracks Complex, Hunter AAF, Georgia

CONTRACTOR

SPECIFICATION SECTION
02230

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			3.4.1	Materials Other Than Salable Timber									X		X											

SUBMITTAL REGISTER
(ER 415 1-10)

CONTRACT NO.

TITLE AND LOCATION
Barracks Complex, Hunter AAF, Georgia

CONTRACTOR

SPECIFICATION SECTION
02300

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			1.5	Earthwork					X						X											
			3.13	Testing						X					X											
			3.13	Testing							X					X	F									
			1.5	Earthwork									X		X											

SUBMITTAL REGISTER
(ER 415 1-10)

CONTRACT NO.

TITLE AND LOCATION
Barracks Complex, Hunter AAF, Georgia

CONTRACTOR

SPECIFICATION SECTION
02315

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO. c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			1.3	Testing					X							X	F									
			1.3	Field Density Tests						X					X											
			1.3	Testing of Backfill Materials						X					X											
			1.3	Inspection, Equipment and						X					X											
				Corrective Action Reports																						
			1.3	Certificates of Compliance							X				X											

SUBMITTAL REGISTER
(ER 415 1-10)

CONTRACT NO.

TITLE AND LOCATION
Barracks Complex, Hunter AAF, Georgia

CONTRACTOR

SPECIFICATION SECTION
02316

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			3.4.3	Field Density Tests						X					X											
			3.4.2	Testing of Backfill Materials						X					X											

SUBMITTAL REGISTER
(ER 415 1-10)

CONTRACT NO.

TITLE AND LOCATION
Barracks Complex, Hunter AAF, Georgia

CONTRACTOR

SPECIFICATION SECTION
02364

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO. c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			2.1	Termiticides			X								X											
			1.1	Equipment				X							X											
			3.2.3	Foundation Exterior					X						X											
			1.1	Utilities and Vents					X						X											
			1.1	Crawl and Plenum Air Spaces					X						X											
			3.3.1	Soil Moisture					X						X											
			3.5	Verification of Measurement					X						X											
			1.1	Equipment Calibration and Tank						X					X											
				Calibration																						
			1.2	Qualifications							X				X											
			2.1	Termiticides								X			X											
			1.1	Termiticide Application Plan									X		X											

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CONTRACT NO.

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Barracks Complex, Hunter AAF, Georgia

CONTRACTOR

SPECIFICATION SECTION
02510

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO. c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			3.1	Installation			X								X											
			1.5	Waste Water Disposal Method					X						X											
			1.5	Satisfactory Installation					X						X											
			3.3.1	Bacteriological Disinfection						X					X											
			1.4	Manufacturer's Representative							X				X											
			3.1	Installation							X				X											
			1.5	Meters							X				X											

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CONTRACT NO.

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Barracks Complex, Hunter AAF, Georgia

CONTRACTOR

SPECIFICATION SECTION
02531

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			1.4	Portland Cement							X				X											
			2.3	Joints							X															

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SPECIFICATION SECTION
02532

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			3.2	Hydrostatic Tests						X					X											

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CONTRACT NO.

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SPECIFICATION SECTION
02550

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO. c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			1.5.1	Equipment and Construction	X										X											
				Operations																						
			1.5.1	Mix Design	X										X											
			1.5.1	Mix Design	X										X											
			1.4	Bituminous Mixes					X						X											
			1.5.1	Aggregates					X						X											
			1.5.1	Mix Design					X						X											
			3.2.2	Sampling and Testing						X					X											
			1.4	Bituminous Material								X			X											
			1.4	Waybills and Delivery Tickets									X		X											

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SPECIFICATION SECTION
02552

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO. c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			1.6	Pipe-Stress and System Expansion	X											X										
				Calculations																						
			3.5.7	Cathodic Protection Installation	X											X										
			3.9	Thermal Performance Testing	X											X										
			1.6	Heat Distribution System		X										X										
			3.1.2	Interruption of Existing Service				X								X										
			3.6.2.3	Operational Test				X								X										
			1.6	Work Plan					X							X										
			1.6	Quality Assurance Plan					X						X											
			3.6	Tests					X							X										
			3.9	Thermal Performance Testing					X							X										
			1.6	Assembly Test of WSL Systems for						X						X										
				Steam Service																						
			1.6	Assembly Test of WSL Systems for						X						X										
				Condensate Return Service																						
			1.2.4	UHDS Manufacturer							X					X										
			1.2.5	UHDS Manufacturer's Representative							X					X										
			1.3.2	UHDS Design							X					X										
			1.6	Certificate of Compliance							X					X										
			1.6	Testing Firm Qualifications							X				X											
			3.4	Welding							X				X											
			3.5.4	UHDS Manufacturer's Representative									X		X											
				Reports																						
			3.1.4	Connecting to Existing Work									X			X										
			1.6	Heat Distribution System										X		X										

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SPECIFICATION SECTION
02555

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			1.3	Distribution System	X											X	D									
			1.3	Distribution System		X										X	D									
			1.3	Distribution System							X					X	D									
			1.3	Welding Procedures and Operators							X				X											
			1.3	Distribution System										X		X	D									

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SPECIFICATION SECTION
02556

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			2.1	Pipe, Fittings, and Associated		X									X											
				Materials																						
			1.3	Equipment and Materials				X							X											
			1.3	Spare Parts Data				X							X											
			1.3	Notification				X							X											
			1.2.1	Welding Steel Piping					X						X											
			1.2.2	Jointing Polyethylene and Fiberglass					X							X	F									
				Piping																						
			1.3	Connection and Abandonment					X							X	F									
				Procedures																						
			1.3	Utility Work							X				X											
			1.3	Training							X				X											
			1.3	Gas Distribution System										X		X	F									

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SPECIFICATION SECTION
02570

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			1.3	Valve Manholes, Pipe, and		X									X											
				Equipment																						
			1.3	Insulated Sections								X				X	D									
			1.3	Valve Manholes, Pipe, and										X	X											
				Equipment																						

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SPECIFICATION SECTION
02630

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO. c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			3.3	Placing Pipe			X								X											
			1.3	Resin Certification							X				X											
			1.3	Pipeline Testing							X				X											
			1.3	Determination of Density							X				X											
			2.3.7	Frame and Cover for Gratings							X				X											
			2.1	Pipe for Culverts and Storm Drains								X			X											

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SPECIFICATION SECTION
02754

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			1.7	Equipment	X											X	F									
			3.4	Paving				X							X											
			2.11	Mixture Proportions					X							X	F									

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SPECIFICATION SECTION
02760

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			1.3	Manufacturer's Recommendations			X									X	F									
			1.3	Construction Equipment List				X							X											
			1.3	Materials								X			X											

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SPECIFICATION SECTION
02770

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			3.8	Field Quality Control						X					X											
			2.1	Concrete									X		X											

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SPECIFICATION SECTION
02870

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO. c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			1.2	Site Furnishings	X										X											
			2.5	Site Furnishing Standards		X									X											
			3.1	Installation			X								X											
			1.2	Materials					X						X											
			1.2	Recycled Material						X					X											
			1.2	Testing						X					X											
			2.4	Finish								X				X	D									

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SPECIFICATION SECTION
02935

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO. c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			1.2	Manufacturer's Literature	X										X											
			1.2	Equipment List				X							X											
			1.4.1	Delivery					X						X											
			3.7	Application of Pesticide					X						X											
			3.10.3.7	Maintenance Report					X						X											
			3.10	Turf Establishment Period					X						X											
			1.2	Seed							X				X											
			1.2	Sod							X				X											
			1.2	Fertilizer							X				X											
			1.2	Agricultural Limestone							X				X											
			1.2	Peat							X				X											
			1.2	Pesticide Material							X				X											
			1.2	Topsoil							X				X											

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SPECIFICATION SECTION
02950

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO. c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			2.8	Edging Material	X										X											
			1.2	Erosion Control Material	X										X											
			3.10	Application of Pesticide Material				X							X											
			1.4.2	Delivery					X						X											
			3.10	Application of Pesticide Material					X						X											
			2.2.1	Soil Test						X					X											
			3.4	Percolation Test						X					X											
			2.2	Topsoil							X				X											
			2.3	Soil Amendments							X				X											
			2.1	Plants							X				X											
			2.13	Pesticide							X				X											
			3.12	Plant Establishment Period									X		X											
			3.12.2.8	Maintenance Report									X		X											
			3.12.2.9	Maintenance Instructions									X		X											

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SPECIFICATION SECTION
03100

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			1.3	Design	X										X											
			2.1	Form Materials	X										X											
			1.2	Concrete Formwork		X									X											
			2.1.7	Form Releasing Agents			X								X											
			2.1.8	Fiber Voids							X				X											
			2.1.8	Fiber Voids								X			X											

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SPECIFICATION SECTION
03150

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO. c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			2.2	Preformed Expansion Joint Filler	X										X											
			2.3	Sealant	X										X											
			2.4	Waterstops	X										X											
			2.4	Waterstops		X									X											
			2.2	Preformed Expansion Joint Filler			X								X											
			2.3	Sealant			X								X											
			2.4	Waterstops			X								X											
			2.2	Preformed Expansion Joint Filler							X				X											
			2.3	Sealant							X				X											
			2.4	Waterstops							X				X											
			1.2	Preformed Compression Seals and								X			X											
				Lubricants																						
			2.3.4	Field-Molded Type								X			X											
			2.4.3	Non-metallic Materials								X			X											

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SPECIFICATION SECTION
03200

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			1.2	Concrete Reinforcement System		X									X											
			1.3	Welding					X						X											
			2.3	Reinforcing Steel							X				X											

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SPECIFICATION SECTION
03300

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			1.9	Mixture Proportions					X							X	F									
			3.4	Lightweight Aggregate Concrete					X						X											
			1.4	Dry Shake Finish					X						X											
			3.17	Testing and Inspection for Contractor						X						X	F									
				Quality Control																						
			1.5	Qualifications							X				X											
			2.3.5	Surface Retarder								X			X											

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CONTRACTOR

SPECIFICATION SECTION
04200

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO. c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			2.2	Clay or Shale Brick	X										X											
			2.17	Insulation	X										X											
			1.2	Masonry Work		X										X	D									
			3.1.2	Cold Weather Installation					X						X											
			3.26.3	Efflorescence Test						X					X											
			3.26.1	Field Testing of Mortar						X					X											
			3.26.2	Field Testing of Grout						X					X											
			1.2	Masonry Cement						X					X											
			2.4.3	Fire-rated CMU						X					X											
			1.2	Special Inspection						X					X											
			2.2	Clay or Shale Brick							X															
			1.2	FI0							X															
			2.4	Concrete Masonry Units (CMU)							X				X											
			2.15	Control Joint Keys							X				X											
			2.12	Anchors, Ties, and Bar Positioners							X				X											
			2.16	Expansion-Joint Materials							X				X											
			2.13	Joint Reinforcement							X				X											
			2.14	Reinforcing Steel Bars and Rods							X				X											
			1.2	Masonry Cement							X				X											
			1.2	Mortar Coloring							X				X											
			2.17	Insulation							X				X		FIO									
			2.17	Insulation							X				X		FIO									
			2.8	Precast Concrete Items							X				X											
			1.2	Mortar Admixtures							X				X											
			1.2	Grout Admixtures							X				X											
			2.4	Concrete Masonry Units (CMU)								X			X											
			2.2	Clay or Shale Brick								X			X											
			2.12	Anchors, Ties, and Bar Positioners								X			X											
			1.2	Expansion-Joint Material								X			X											

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SPECIFICATION SECTION
04200

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			2.13	Joint Reinforcement								X			X											
			2.17	Insulation								X			X											
			1.2	Portable Panel								X			X											

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SPECIFICATION SECTION
04220

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO. c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			1.2	Masonry Veneer/Steel Stud Wall	X											X	D									
				System																						
			1.2	Masonry Veneer/Steel Stud Wall		X										X	D									
				System																						
			1.2	Brick							X				X											
			1.2	Joint Reinforcement							X				X											
			1.2	Expansion Joint Materials							X				X											
			1.2	Insulation							X				X											
			1.2	Gypsum Sheathing							X				X											
			1.2	Moisture Barrier							X				X											
			1.2	Vapor Barrier							X				X											
			1.2	Veneer Anchors							X				X											
			1.2	Welders Qualification							X				X											
			1.2	Expansion Joint Materials								X			X											
			1.2	Brick								X			X											
			1.2	Sample Panel								X			X											

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CONTRACTOR

SPECIFICATION SECTION
04435

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO. c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			1.2	Calculations	X										X											
			1.2	Mix Design	X										X											
			1.2	Cast Stone		X									X											
			1.2	Materials						X					X											
			1.2	Cast Stone Units								X				X										
			1.2	Manufacturer's Qualifications									X		X											

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SPECIFICATION SECTION
05090

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			1.5	Welding Procedure Qualifications					X						X											
			1.6	Welder, Welding Operator, and					X						X											
				Tacker Qualification																						
			1.7	Inspector Qualification					X						X											
			3.2	Quality Control									X		X											

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05091

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			1.4	Ultrasonic Inspection					X						X											
			1.4	Ultrasonic Inspection									X		X											

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SPECIFICATION SECTION
05093

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			1.6	Qualifications	X										X											
			1.5	Pressure Piping		X									X											
			1.6	Qualifications							X				X											
			3.1	Welding Operations									X		X											

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SPECIFICATION SECTION
05120

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO. c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			1.3	Structural Steel System		X									X											
			3.2.1	Structural Connections		X										X	D									
			3.2	Erection					X							X	D									
			1.3	Mill Test Reports							X				X											
			1.3	Welder Qualifications							X				X											
			3.1	Fabrication							X				X											
			2.5	High Strength Bolts and Nuts								X			X											
			2.6	Carbon Steel Bolts and Nuts								X			X											
			2.7	Nuts Dimensional Style								X			X											
			2.8	Washers								X			X											

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SPECIFICATION SECTION
05210

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			1.2	Steel Joists		X										X	D									
			1.2	Steel Joists							X				X											

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SPECIFICATION SECTION
05300

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			2.1	Deck Units	X										X											
			2.1	Deck Units		X										X	D									
			2.5	Accessories		X										X	D									
			3.3	Attachments		X										X	D									
			3.4	Holes and Openings		X										X										
			2.1	Deck Units							X				X											
			3.3	Attachments							X				X											
			2.1	Deck Units								X			X											
			2.5	Accessories								X			X											
			3.3	Attachments									X		X											

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SPECIFICATION SECTION
05450

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			1.4	Product Data	X										X											
			1.4	Shop Drawings		X										X	D									
			1.4	Design Analysis						X						X	D									
			1.4	Certificate of Compliance							X				X											

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SPECIFICATION SECTION
05500

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			1.2	Miscellaneous Metal Items		X									X											
			1.2	Steel Stairs		X									X											
			1.2	Miscellaneous Metal Items								X			X											

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SPECIFICATION SECTION
06100

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			2.1.1	Grading and Marking							X				X											
			2.3	Insulation							X				X											

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SPECIFICATION SECTION
06200

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			2.1	Wood Items	X										X											
			1.2	Finish Carpentry		X									X											
			2.1.10	Moldings								X			X											

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SPECIFICATION SECTION
07131

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			1.2	Waterproofing System		X									X											
			1.2	Installation			X								X											
			2.1	Materials							X				X											

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SPECIFICATION SECTION
07220

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			3.7	Application of Insulation			X								X											
			1.2	Inspection					X						X											
			2.2	Insulation							X				X											
			1.2	Organic Roofing Felt							X				X											

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SPECIFICATION SECTION
07240

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			1.4	Exterior Insulation and Finish System			X									X	F									
			1.4	Manufacturer's Approval and License					X						X											
			1.4	Exterior Insulation and Finish System						X					X											
			1.4	Exterior Insulation and Finish System								X			X											

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SPECIFICATION SECTION
07311

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			1.2	Roofing System	X										X											
			1.2	Finishes								X			X											

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SPECIFICATION SECTION
07416

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			1.5	Design Analysis	X											X	D									
			1.5	Structural Standing Seam Metal Roof		X										X	D									
				System																						
			1.5	Qualifications					X						X											
			1.5	Test Report for Uplift Resistance of						X						X	D									
				the SSSMR																						
			1.5	Structural Standing Seam Metal Roof							X					X	D									
				System																						
			2.7	Insulation							X				X											
			2.3	Accessories								X			X											
			2.1	Roof Panels								X			X											
			2.6	Factory Color Finish								X			X											
			2.4	Fasteners								X			X											
			2.7	Insulation								X			X											
			2.10	Gaskets and Insulating Compounds								X			X											
			2.9	Sealant								X			X											
			2.2	Concealed Anchor Clips								X			X											
			1.5	Subpurlins								X			X											
			2.12	EPDM Rubber Boots								X			X											

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CONTRACT NO.

TITLE AND LOCATION
Barracks Complex, Hunter AAF, Georgia

CONTRACTOR

SPECIFICATION SECTION
07531

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			1.2	Manufacturer's Catalog Data	X										X											
			2.1.1	CSPE sheet	X																					
			2.1.2	Adhesive	X																					
			2.1.7	Welding/primer reactivating agent	X																					
			2.1.3	Lap cleaner	X																					
			2.1.5	Sealant	X																					
			2.1.6	Flashing and flashing accessories	X										X											
			2.1.6	Flashing and flashing accessories	X										X											
			2.1.5	Water cutoff mastic	X																					
			2.1.8	Fasteners and plates	X																					
			1.2	Roof insulation	X										X											
			1.6	warranty	X																					
			2.1.1	CSPE sheet		X									X											
			2.1.1	CSPE sheet			X								X											
			1.2	Cold weather installation			X								X											
			1.3.1	Qualification of applicator					X						X											
			1.3.2	Qualification of manufacturer					X						X											
			1.2	Information card									X		X											
			3.3.2	Instructions to Government									X		X											
				personnel																						
			1.2	Written Instructions to Government									X		X											
				Personnel																						

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CONTRACT NO.

TITLE AND LOCATION
Barracks Complex, Hunter AAF, Georgia

CONTRACTOR

SPECIFICATION SECTION
07600

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			2.1	Materials		X									X											

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CONTRACT NO.

TITLE AND LOCATION
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CONTRACTOR

SPECIFICATION SECTION
07810

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			1.2	Fireproofing Material	X										X											
			1.2	UL Test Assembly						X					X											
			3.5	Field Tests						X					X											
			1.5	Installer Qualifications							X				X											
			1.2	Surface Acceptability							X				X											
			3.5.3	Manufacturer's Inspection							X				X											
			1.2	Spray-Applied Fireproofing								X			X											

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Barracks Complex, Hunter AAF, Georgia

CONTRACTOR

SPECIFICATION SECTION
07840

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			2.1	Firestopping Materials		X									X											
			2.1	Firestopping Materials							X				X											
			1.5	Installer Qualifications							X				X											
			3.3	Inspection							X				X											

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TITLE AND LOCATION
Barracks Complex, Hunter AAF, Georgia

CONTRACTOR

SPECIFICATION SECTION
07900

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			2.1	Backing	X										X											
			2.2	Bond-Breaker	X										X											
			2.5	Sealant	X										X											
			2.5	Sealant							X				X											

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SPECIFICATION SECTION
08110

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			1.2	Steel Doors and Frames		X									X											
			2.2	Fire Rated Doors						X					X											
			2.2	Fire Rated Doors							X				X											
			2.3	Thermal Insulated Doors							X				X											
			1.2	Steel Doors and Frames								X			X											

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CONTRACTOR

SPECIFICATION SECTION
08120

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			1.4	Aluminum Doors and Frames	X										X											
			1.4	Aluminum Doors and Frames		X									X											
			3.1.2	Installation			X								X											
			1.4	Cleaning			X								X											
			1.4	Aluminum Doors						X					X											
			2.1.1	Finishes								X			X											

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Barracks Complex, Hunter AAF, Georgia

CONTRACTOR

SPECIFICATION SECTION
08210

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			1.3	Wood Doors		X									X											
			2.8.1	Factory Coated Natural Finish								X			X											

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SPECIFICATION SECTION
08353

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			2.2	Accordion Partitions	X										X											
			2.4	Operable Partitions	X										X											
			2.2	Accordion Partitions		X									X											
			2.4	Operable Partitions		X									X											
			1.2	Materials							X				X											
			2.2	Accordion Partitions							X				X											
			2.4	Operable Partitions							X				X											
			2.2	Accordion Partitions								X			X											
			2.4	Operable Partitions								X			X											
			2.2	Accordion Partitions										X	X											
			2.4	Operable Partitions										X	X											

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SPECIFICATION SECTION
08520

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			1.3	Aluminum Windows	X										X											
			1.3	Aluminum Windows		X									X											
			2.3	Insect Screens		X									X											
			1.3	Aluminum Windows			X								X											
			1.3	Aluminum Windows						X					X											
			1.3	Aluminum Windows							X				X											
			1.3	Aluminum Windows								X			X											

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SPECIFICATION SECTION
08700

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			1.2	Hardware and Accessories	X										X											
			1.2	Hardware Schedule				X							X											
			1.2	Keying Schedule				X								X	F									
			1.2	Bitting List				X							X											
			1.2	Hardware and Accessories							X				X											

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SPECIFICATION SECTION
08810

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			1.2	Glass	X										X											
			1.2	Glazing Accessories	X										X											
			1.2	Glazing Materials and Accessories		X									X											
			1.2	Glass							X				X											
			1.2	Glass								X			X											

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SPECIFICATION SECTION
08850

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			2.2	Fragment Retention Film	X										X											
			3.3	Cleaning	X										X											
			2.2	Fragment Retention Film			X								X											
			2.2	Fragment Retention Film					X						X											
			2.2	Fragment Retention Film						X					X											
			2.2	Fragment Retention Film							X				X											
			2.2	Fragment Retention Film								X			X											

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CONTRACT NO.

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SPECIFICATION SECTION
09212

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			1.2	Manufacturer's Catalog Data	X										X											
			1.2	Installation Drawings		X									X											
			1.2	Manufacturer's Instructions			X								X											
			1.2	Certificates of Compliance							X				X											
			1.2	Fireproofing Plaster Mix								X			X											

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SPECIFICATION SECTION
09250

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO. c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			1.3	Steel Framing		X									X											
			1.3	Control Joints		X									X											
			3.8	Fire-Resistant Assemblies		X									X											
			1.3	Gypsum Wallboard							X				X											
			2.4.3	Water-Resistant Gypsum Board							X				X											
			1.3	Exterior Gypsum Soffit Board							X				X											
			1.3	Steel Framing							X				X											
			2.4.2	Fire-Rated Gypsum Board							X				X											
			1.3	Cementitious Backer Units							X				X											

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TITLE AND LOCATION
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CONTRACTOR

SPECIFICATION SECTION
09310

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			2.1	Tile	X										X											
			2.2	Setting-Bed	X										X											
			2.4	Mortar, Grout, and Adhesive	X										X											
			2.1	Tile			X								X											
			1.2	Mortar and Grout			X								X											
			2.1	Tile							X				X											
			2.4	Mortar, Grout, and Adhesive							X				X											
			2.1	Tile								X			X											
			2.1.5	Accessories								X			X											
			2.5	Marble Thresholds								X			X											

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SPECIFICATION SECTION
09510

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			1.3	Acoustical Ceiling System	X										X											
			1.3	Acoustical Ceiling System		X									X											
			2.1	Acoustical Units							X				X											
			2.1	Acoustical Units								X			X											

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SPECIFICATION SECTION
09512

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			1.3	Suspended Open Cell Ceiling	X										X											
				System																						
			1.3	Suspended Open Cell Ceiling		X									X											
				System																						
			1.3	Suspension Grid Tees								X			X											

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SPECIFICATION SECTION
09550

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			1.3	Luminous Ceiling	X										X											
			1.3	Luminous Ceiling		X									X											
			1.3	Luminous Ceiling								X			X											

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CONTRACT NO.

TITLE AND LOCATION
Barracks Complex, Hunter AAF, Georgia

CONTRACTOR

SPECIFICATION SECTION
09650

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			1.3	Resilient Flooring and Accessories	X										X											
			1.3	Resilient Flooring and Accessories						X					X											
			1.3	Resilient Flooring and Accessories								X			X											

SUBMITTAL REGISTER
(ER 415 1-10)

CONTRACT NO.

TITLE AND LOCATION
Barracks Complex, Hunter AAF, Georgia

CONTRACTOR

SPECIFICATION SECTION
09670

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			2.1	Flooring		X									X											
			1.6	Qualifications of installer;				X							X											
			3.3	Application					X						X											
			2.1	Flooring											X											

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(ER 415 1-10)

CONTRACT NO.

TITLE AND LOCATION
Barracks Complex, Hunter AAF, Georgia

CONTRACTOR

SPECIFICATION SECTION
09680

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			1.2	Carpet and Accessories	X										X											
			3.4	Installation		X									X											
			1.2	Carpet and Accessories			X								X											
			1.2	Moisture and Alkalinity Tests						X					X											
			1.2	Carpet and Accessories							X				X											
			1.2	Carpet and Accessories								X			X											
			1.2	Carpet and Accessories										X	X											

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(ER 415 1-10)

CONTRACT NO.

TITLE AND LOCATION
Barracks Complex, Hunter AAF, Georgia

CONTRACTOR

SPECIFICATION SECTION
09720

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO. c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			1.2	Wallcovering and Accessories	X										X											
			3.3	Installation			X								X											
			1.2	Maintenance			X								X											
			1.2	Wallcovering							X				X											
			1.2	Wallcovering and Accessories								X			X											

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(ER 415 1-10)

CONTRACT NO.

TITLE AND LOCATION
Barracks Complex, Hunter AAF, Georgia

CONTRACTOR

SPECIFICATION SECTION
09775

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			1.2	Wall Panels	X										X											
			1.2	Trim	X										X											
			1.2	Fasteners	X										X											
			1.2	Ceiling Panels	X										X											
			1.2	Wall Panels		X									X											
			1.2	Trim		X									X											
			1.2	Fasteners		X									X											
			1.2	Ceiling Panels		X									X											
			1.2	Wall Panels								X			X											
			1.2	Trim								X			X											
			1.2	Fasteners								X			X											
			1.2	Ceiling Panels								X			X											

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(ER 415 1-10)

CONTRACT NO.

TITLE AND LOCATION
Barracks Complex, Hunter AAF, Georgia

CONTRACTOR

SPECIFICATION SECTION
09836

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			1.2	Manufacturer's Catalog Data	X										X											
			1.2	Qualifications							X				X											
			1.2	Color Samples								X				X	F									
			1.2	Sample Panel								X				X	F									
			1.2	Maintenance Data										X	X											

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(ER 415 1-10)

CONTRACT NO.

TITLE AND LOCATION
Barracks Complex, Hunter AAF, Georgia

CONTRACTOR

SPECIFICATION SECTION
09900

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO. c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			2.1	Paint	X										X											
			3.3	Mixing and Thinning			X								X											
			3.4	Application			X								X											
			2.1	Paint						X					X											
			2.1.3	Lead							X				X											
			2.1.2	Mildewcide and Insecticide							X				X											
			2.1.5	Volatile Organic Compound (VOC)							X				X											
				Content																						
			2.1	Paint								X			X											

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CONTRACT NO.

TITLE AND LOCATION
Barracks Complex, Hunter AAF, Georgia

CONTRACTOR

SPECIFICATION SECTION
10100

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			1.3	Visual Display Boards	X										X											
			1.3	Visual Display Boards			X								X											
			1.3	Visual Display Boards							X				X											
			2.2.6	Aluminum								X			X											
			2.2.1	Porcelain Enamel								X			X											
			2.2	Materials								X			X											

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TITLE AND LOCATION
Barracks Complex, Hunter AAF, Georgia

CONTRACTOR

SPECIFICATION SECTION
10160

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			1.3	Toilet Partition System	X										X											
			1.3	Toilet Partition System		X									X											
			1.3	Toilet Partition System								X			X											

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TITLE AND LOCATION
Barracks Complex, Hunter AAF, Georgia

CONTRACTOR

SPECIFICATION SECTION
10260

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			2.2	Corner Guards	X										X											
			2.2	Corner Guards		X									X											
			2.2	Corner Guards							X				X											
			2.7	Finish								X			X											

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CONTRACT NO.

TITLE AND LOCATION
Barracks Complex, Hunter AAF, Georgia

CONTRACTOR

SPECIFICATION SECTION
10430

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			1.3	Exterior Signs	X										X											
			1.3	Exterior Signs		X									X											
			1.3	Exterior Signs			X								X											
			1.3	Exterior Signs								X			X											

SUBMITTAL REGISTER
(ER 415 1-10)

CONTRACT NO.

TITLE AND LOCATION
Barracks Complex, Hunter AAF, Georgia

CONTRACTOR

SPECIFICATION SECTION
10440

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			1.3	Interior Signage	X										X											
			1.3	Interior Signage		X									X											
			1.3	Interior Signage								X			X											

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TITLE AND LOCATION
Barracks Complex, Hunter AAF, Georgia

CONTRACTOR

SPECIFICATION SECTION
10550

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			1.2	Manufacturer's Data	X										X											
			1.2	Shop Drawings		X									X											

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TITLE AND LOCATION
Barracks Complex, Hunter AAF, Georgia

CONTRACTOR

SPECIFICATION SECTION
10800

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			2.1.2	Finishes	X										X											
			2.2	Accessory Items	X										X											
			2.1.2	Finishes								X			X											
			2.2	Accessory Items								X			X											

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CONTRACT NO.

TITLE AND LOCATION
Barracks Complex, Hunter AAF, Georgia

CONTRACTOR

SPECIFICATION SECTION
10900

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			1.2	Manaufacturer's Literature	X										X											
			1.2	Shop Drawings											X											
			1.2	Lockers								X			X											

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CONTRACT NO.

TITLE AND LOCATION
Barracks Complex, Hunter AAF, Georgia

CONTRACTOR

SPECIFICATION SECTION
10901

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			1.2	Storage Lockers		X									X											

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CONTRACT NO.

TITLE AND LOCATION
Barracks Complex, Hunter AAF, Georgia

CONTRACTOR

SPECIFICATION SECTION
10902

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			1.2	Storage Lockers		X									X											

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CONTRACT NO.

TITLE AND LOCATION
Barracks Complex, Hunter AAF, Georgia

CONTRACTOR

SPECIFICATION SECTION
10999

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			1.2	Fire Extinguishers	X										X											
			1.2	Adjuncts	X										X											
			1.2	Cabinets	X										X											
			1.2	Wall Brackets	X										X											
			1.2	Replacement Parts	X										X											
			1.2	Fire Extinguishers		X									X											
			1.2	Adjuncts		X									X											
			1.2	Cabinets		X									X											
			1.2	Wall Brackets		X									X											
			1.2	Certificates of Compliance							X				X											
			1.2	Fire Extinguisher								X			X											
			1.2	Cabinet								X			X											
			1.2	Wall Brackets and Accessories								X														

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TITLE AND LOCATION
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SPECIFICATION SECTION
11020

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			1.3	Security Vault Door	X										X											
			1.3	Modular Vault System	X										X											
			1.3	Security Vault Door							X				X											
			1.3	Modular Vault System							X				X											

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TITLE AND LOCATION
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SPECIFICATION SECTION
11162

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			2.1	Loading Dock Levelers	X										X											
			2.1	Loading Dock Levelers		X										X	F									
			2.1	Loading Dock Levelers										X	X											

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TITLE AND LOCATION
Barracks Complex, Hunter AAF, Georgia

CONTRACTOR

SPECIFICATION SECTION
11165

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO. c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			1.2	Fabrication Drawings for Dock		X									X											
				Bumpers																						
			1.2	Installation Drawings		X									X											
			1.2	Certificates of Compliance							X				X											
			1.2	Fastening Materials							X															
			1.2	Rubberized Fabric							X															
			1.2	Steel Angles							X															
			1.2	Hardware Items							X															
			1.2	Fasteners								X			X											
			1.2	Connectors								X			X											
			1.2	Supporting Rods								X			X											
			1.2	Bolts								X														
			1.2	Nuts								X			X											
			1.2	Dock Bumper								X			X											
			1.2	Rubber								X			X											

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Barracks Complex, Hunter AAF, Georgia

CONTRACTOR

SPECIFICATION SECTION
11400

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			1.3	Food Service Equipment	X											X	D									
			1.3	Food Service Equipment		X										X	D									
			3.3	Testing						X					X											
			1.3	Food Service Equipment										X		X	D									

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CONTRACTOR

SPECIFICATION SECTION
12320

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			1.3	Cabinets and Countertops	X										X											
			1.3	Cabinets and Countertops		X									X											
			1.3	Cabinets and Countertops						X					X											
			1.3	Cabinets and Countertops								X			X											

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Barracks Complex, Hunter AAF, Georgia

CONTRACTOR

SPECIFICATION SECTION
12490

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			1.3	Window Treatments and Hardware	X										X											
			1.3	Window Treatments and Hardware		X									X											
			1.3	Window Treatments and Hardware								X			X											

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CONTRACTOR

SPECIFICATION SECTION
13080

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			3.1	Bracing	X											X	F									
			1.4	Equipment Requirements	X											X	F									
			3.1	Bracing		X										X	F									
			3.4	Resilient Vibration Isolation Devices		X										X	F									
			1.4	Equipment Requirements		X										X	F									

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CONTRACTOR

SPECIFICATION SECTION
13100

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			1.3	Lightning Protection System		X									X											
			1.3	Materials and Equipment							X				X											

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CONTRACTOR

SPECIFICATION SECTION
13110

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO. c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			1.3	Materials and Equipment	X											X	F									
			3.9	Spare Parts	X											X	F									
			1.3	Cathodic Protection System		X										X	D									
			1.2.1	Services of 'Corrosion Expert'					X							X	F									
			3.5	Tests and Measurements						X						X	F									
			1.2.2	Cathodic Protection Design						X						X	D									
			1.3	Cathodic Protection System							X					X	F									
			3.6	Training Course									X			X	F									
			1.3	Cathodic Protection System										X		X	F									

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CONTRACT NO.

TITLE AND LOCATION
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CONTRACTOR

SPECIFICATION SECTION
13202

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO. c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			1.3	Fueling System	X											X	F									
			1.5.1	Permitting	X										X											
			1.5.2	Registration	X										X											
			1.3	Spare Parts Data	X										X											
			1.3	Fueling System		X										X	F									
			1.3	Monitoring Systems		X										X	F									
			3.1	Installation			X								X											
			3.1.6	Framed Instructions			X								X											
			1.3	Monitoring Systems			X								X											
			1.3	Filter-Separator Factory Tests				X							X											
			3.2	Tests				X							X											
			3.4	Demonstrations				X								X	F									
			1.4.1	Experience					X						X											
			1.4.2	Welding					X						X											
			1.3	Radiographic Tests for Aviation Fuel					X							X	F									
				Piping																						
			1.7.1	Verification of Dimensions					X						X											
			1.7.2	Fuel Supply					X						X											
			3.2.5	Exterior Coating for Belowground					X						X											
				Steel Piping																						
			1.3	Filter-Separator Factory Tests						X						X	F									
			3.2	Tests						X						X	F									
			1.3	Operation Manuals										X	X											
			1.3	Maintenance Manuals										X	X											

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SPECIFICATION SECTION
13280

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			1.4	Materials and Equipment	X											X	D									
			1.4	Site Layout		X										X	D									
			1.5	Qualifications					X							X	D									
			1.11	Training Program					X							X	D									
			1.10	Medical Requirements					X							X	D									
			2.1	Encapsulants					X							X	D									
			3.9	Exposure Assessment and Air						X						X	D									
				Monitoring																						
			1.20	Local Exhaust Ventilation						X						X	F									
			1.14	Licenses, Permits and Notifications						X						X	F									
			1.4	license, permit and notification.						X																
			1.4	Vacuum, Filtration and Ventilation							X				X											
				Equipment																						
			1.12	Respiratory Protection Program									X			X	D									
			3.11	Cleanup and Disposal									X			X										

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SPECIFICATION SECTION
13851

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			2.2	Storage Batteries	X											X	F									
			1.5	Voltage Drop	X											X	F									
			1.5	Spare Parts	X										X											
			1.4	Technical Data and Computer	X											X	F									
				Software																						
			1.5	Fire Alarm Reporting System		X										X	F									
			3.6	Training			X								X											
			3.5	Testing					X							X	F									
			3.5	Testing						X						X	F									
			1.5	Equipment							X				X											
			1.2.7	Qualifications							X					X	F									
			1.4	Technical Data and Computer										X		X	F									
				Software																						

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SPECIFICATION SECTION
13875

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			1.5	Instruction Manuals	X										X											
			1.5	Metal Shelter System		X										X										
			1.5	Metal Shelter System							X				X											
			1.5	Finishes								X				X										

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CONTRACTOR

SPECIFICATION SECTION
13930

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			1.3	Load Calculations for Sizing Sway	X											X	F									
				Bracing																						
			1.3	Sprinkler System Equipment	X											X	D									
			1.4	Hydraulic Calculations	X											X	D									
			1.3	Spare Parts	X										X											
			1.3	Sprinkler System Shop Drawings		X										X	D									
			1.3	As-Built Drawings		X									X											
			1.3	Test Procedures			X									X	F									
			1.3	Preliminary Tests				X								X	F									
			1.3	Final Test				X								X	F									
			1.6	Installer Qualifications					X							X	F									
			1.5	Submittal Preparer's Qualifications					X							X	F									
			1.3	Contractor's Material & Test							X				X											
				Certificates																						
			1.3	Sprinkler System										X	X											

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SPECIFICATION SECTION
13965

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			1.5	Wet Chemical Fire Extinguishing	X											X	D									
				System																						
			1.5	Wet Chemical Fire Extinguishing		X										X	D									
				System																						
			3.2	Preliminary Tests			X									X	F									
			3.3	Final Acceptance Tests			X									X	F									
			1.5	System Diagrams			X									X	F									
			1.5	Test Schedule				X								X	F									
			3.4	Field Training				X								X	F									
			1.5	Similar Services					X							X	F									
			3.2	Preliminary Tests						X						X	F									
			3.3	Final Acceptance Tests						X						X	F									
			1.2.4	Installation Technician							X					X	F									
			1.2.3	Installation Drawings							X					X	F									
			1.5	Wet Chemical Fire Extinguishing										X	X											
				System																						

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SPECIFICATION SECTION
14240

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO. c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			1.2	Training Data	X										X											
			1.2	Elevator System	X										X											
			1.2	Elevator System		X									X											
			3.7	Framed Instructions			X								X											
			1.2	Qualification Certificates					X						X											
			3.6	Testing						X					X											
			1.2	Finishes								X			X											
			1.2	Test Procedures									X			X	F									
			1.2	Elevator System										X		X	F									

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SPECIFICATION SECTION
15070

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			3.1	Coupling and Bracing	X											X	F									
			1.3	Equipment Requirements	X											X	F									
			1.4	Contractor Designed Bracing	X											X	F									
			3.1	Coupling and Bracing		X										X	F									
			3.3	Flexible Couplings or Joints		X										X	F									
			1.3	Equipment Requirements		X										X	F									
			1.4	Contractor Designed Bracing		X										X	F									
			2.2	Flexible Ball Joints							X					X	F									

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15080

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			1.4	Thermal Insulation Materials								X			X											

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SPECIFICATION SECTION
15190

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			1.3	Qualifications	X										X											
			1.3	Gas Piping System		X									X											
			1.3	Testing						X					X											
			1.3	Pressure Tests						X					X											
			1.3	Pressure Tests for Liquified						X					X											
				Petroleum Gas																						
			1.3	Test With Gas						X					X											

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15400

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO. c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			1.5	Welding	X										X											
			1.5	Vibration-Absorbing Features	X										X											
			1.5	Plumbing System		X									X											
			1.5	Electrical Schematics		X									X											
			1.5	Plumbing System			X								X											
			3.9	Tests, Flushing and Disinfection						X					X											
			1.5	Backflow Prevention Assembly Tests						X					X											
			1.5	Materials and Equipment							X				X											
			1.5	Bolts							X				X											
			1.5	Plumbing System										X	X											

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SPECIFICATION SECTION
15555

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO. c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			1.3	Design Analysis and Calculations	X											X	D									
			1.3	Spare Parts	X										X											
			2.1	High Temperature Water Generators		X										X	D									
			1.3	Posted Operation and Maintenance			X									X	F									
			1.3	Field Training Schedule				X							X											
			1.3	Quality Assurance Plan					X							X	F									
			1.3	Welding Procedures					X							X	F									
			3.7	Tests						X					X											
			2.1	High Temperature Water Generators										X		X	D									

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CONTRACTOR

SPECIFICATION SECTION
15556

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO. c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			1.2	Spare Parts	X										X											
			1.2	Welding Procedures and	X										X											
				Qualifications																						
			1.2	Heating System		X									X											
			3.19	Framed Instructions			X								X											
			1.2	Performance Tests						X					X											
			1.2	Water Treatment Tests						X					X											
			1.2	Bolts							X				X											
			1.2	Heating System										X	X											

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CONTRACT NO.

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CONTRACTOR

SPECIFICATION SECTION
15569

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO. c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			1.3	Manufacturer's Catalog Data	X										X											
			1.3	Spare Parts Data	X										X											
			1.3	Water Treatment Plan	X										X											
			1.3	Heating and Fuel Systems Test	X										X											
				Procedures																						
			1.3	Welding Procedures	X										X											
			1.3	Qualification	X										X											
			1.3	Welding Qualification	X										X											
			1.3	Heating System		X										X	F									
			1.3	Posted Instructions			X								X											
			1.3	Tests				X							X											
			1.3	Heating System and Fuel System						X					X											
				Tests																						
			1.3	Water Treatment Tests						X					X											
			1.3	Bolts							X				X											
			1.3	Boiler Emissions							X				X											
			1.3	Heating System										X	X											
			1.3	Water Treatment System										X	X											

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CONTRACTOR

SPECIFICATION SECTION
15650

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO. c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			1.3	Central Refrigerated Air-Conditioning	X											X	D									
				System																						
			1.3	Water Treatment Systems	X											X	D									
			1.3	Spare Parts	X										X											
			1.4	Qualifications	X										X											
			1.3	Central Refrigerated Air-Conditioning		X										X	D									
				System																						
			1.3	Posted Instructions			X								X											
			2.13	Factory Tests				X							X											
			3.2	Tests				X							X											
			3.6	Demonstrations				X							X											
			1.7.1	Verification of Dimensions					X						X											
			2.13	Factory Tests						X					X											
			3.2.1	Field Tests						X					X											
			3.2.2	System Performance Tests						X					X											
			3.2.3	Condenser Water Quality Tests						X					X											
			3.3	Inspections						X					X											
			1.3	Central Refrigerated Air-Conditioning							X				X											
				System																						
			1.3	Operation Manual										X	X											
			1.3	Maintenance Manual										X	X											
			1.3	Water Treatment System										X	X											

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CONTRACTOR

SPECIFICATION SECTION
15652

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			1.2	Refrigeration System	X											X	F									
			1.2	Spare Parts Data	X										X											
			1.2	Refrigeration System		X										X	F									
			3.1.23	Framed Instructions			X								X											
			1.2	Tests				X							X											
			3.4	Demonstrations				X								X	F									
			1.3	Qualifications					X							X	F									
			1.5.1	Verification of Dimensions					X						X											
			1.2	Tests						X						X	F									
			1.2	Refrigeration System							X				X											
			1.2	Service Organizations							X				X											

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CONTRACTOR

SPECIFICATION SECTION
15895

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO. c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			1.4	Components and Equipment Data	X											X	D									
			1.4	Air Supply, Distribution, Ventilation,		X									X											
				and Exhaust Equipment																						
			1.4	Test Procedures			X								X											
			1.4	Welding Procedures			X								X											
			1.4	System Diagrams			X									X	D									
			1.4	Test Schedules				X							X											
			1.4	Field Training Schedule				X							X											
			1.4	Similar Services					X						X											
			1.4	Welding Qualification					X						X											
			1.4	Test Reports						X					X											
			1.4	Bolts							X				X											
			1.4	Air Supply, Distribution, Ventilation,										X	X											
				and Exhaust Manuals																						

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SPECIFICATION SECTION
15951

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO. c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			1.3	Equipment Compliance Booklet	X											X	D									
			1.3	HVAC Control System		X										X	D									
			1.3	Commissioning Procedures					X							X	F									
			1.3	Performance Verification Test					X							X	F									
				Procedures																						
			1.3	Training Course Materials					X						X											
			1.3	Commissioning Report						X						X	F									
			1.3	Performance Verification Test Report						X						X	F									
			1.3	Service Organizations									X		X											
			1.3	Operation Manual										X		X	D									
			1.3	Maintenance and Repair Manual										X		X	D									

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SPECIFICATION SECTION
15990

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO. c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			1.2	TAB Related HVAC Submittals	X										X											
			1.2	TAB Schematic Drawings and Report		X										X	D									
				Forms																						
			1.2	TAB Procedures			X									X	F									
			1.2	Systems Readiness Check				X							X											
			1.2	TAB Execution				X								X	F									
			1.2	TAB Verification				X								X	F									
			1.2	TAB Firm					X							X	F									
			1.2	TAB Specialist					X							X	F									
			1.2	Instrument Calibration					X						X											
			1.2	Design Review Report						X						X	D									
			1.2	Systems Readiness Check Report						X						X	F									
			1.2	TAB Report						X						X	D									
			1.2	TAB Verification Report						X						X	F									
			1.2	Ductwork Leak Testing							X				X											

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15995

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			1.1	Commissioning Team	X										X											
			1.1	Test Procedures			X									X	F									
			1.1	Test Schedule				X								X	F									
			1.1	Test Reports						X						X	F									

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SPECIFICATION SECTION
16070

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			3.2	Lighting Fixtures in Buildings	X											X	D									
			1.3	Equipment Requirements	X											X	D									
			1.3	Contractor Designed Bracing	X											X	D									
			3.2	Lighting Fixtures in Buildings		X									X											
			1.3	Equipment Requirements		X									X											

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SPECIFICATION SECTION
16370

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO. c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			1.3	Manufacturer's Catalog	X										X											
			1.3	Material, Equipment, and Fixture	X										X											
				Lists																						
			1.3	Installation Procedures	X										X											
			1.3	Electrical Distribution System		X									X											
			1.3	As-Built Drawings		X									X											
			1.3	Factory Test						X					X											
			3.11	Field Testing						X					X											
			1.3	Test Reports						X						X	F									
			1.3	Materials and Equipment							X				X											
			1.3	Electrical Distribution System										X	X											

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SPECIFICATION SECTION
16375

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			1.3	Manufacturer's Catalog Data	X										X											
			1.3	Material, Equipment, and Fixture	X										X											
				Lists																						
			1.3	Installation Procedures	X										X											
			1.3	Electrical Distribution System		X									X											
			1.3	As-Built Drawings		X									X											
			1.3	Factory Test						X					X											
			1.3	Field Testing						X					X											
			1.3	Test Reports						X						X	F									
			1.3	Cable Installation Reports						X						X	F									
			1.3	Materials and Equipment							X				X											
			1.3	Cable Splicer Qualification							X				X											
			1.3	Cable Installer Qualifications							X				X											
			1.3	Electrical Distribution System										X	X											

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SPECIFICATION SECTION
16415

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO. c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			1.3	Fault Current and Protective Device	X											X	D									
				Coordination Study																						
			1.3	Light Fixtures	X											X	D									
			1.3	Manufacturer's Catalog	X										X											
			1.3	Material, Equipment, and Fixture	X										X											
				Lists																						
			1.3	Installation Procedures	X										X											
			1.3	Occupancy Sensor System		X										X	D									
			1.3	Interior Electrical Equipment		X									X											
			1.3	As-Built Drawings		X									X											
			1.3	Onsite Test					X							X	F									
			1.3	Factory Test Reports						X						X	F									
			1.3	Field Test Plan						X						X	F									
			1.3	Field Test Reports						X						X	F									
			1.3	Materials and Equipment							X				X											

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SPECIFICATION SECTION
16528

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO. c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			1.4	Light Fixtures	X											X	D									
			1.4	Equipment and Materials	X										X											
			1.4	Spare Parts	X										X											
			1.4	Lighting System		X										X	F									
			1.4	As-Built Drawings		X									X											
			1.4	Operating Test						X						X	F									
			1.4	Ground Resistance Measurements						X					X											
			1.4	Lighting System										X	X											

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SPECIFICATION SECTION
16710

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			1.5	Spare Parts	X										X											
			1.5	Premises Distribution System		X										X	F									
			1.5	Record Drawings		X										X	F									
			1.5	Manufacturer's Recommendations			X									X										
			1.5	Test Plan					X							X	F									
			1.4	Qualifications					X							X	F									
			1.5	Test Reports						X					X											
			1.5	Premises Distribution System							X				X											
			2.1	Materials and Equipment							X				X											
			1.5	Installers							X															
			1.5	GA/F							X															
			1.5	Record Keeping and Documentation									X			X										

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SPECIFICATION SECTION
16711

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			1.4	Spare Parts and Equipment List	X										X											
			1.4	Telephone System		X										X	F									
			1.4	Record Drawings		X										X	F									
			1.4	Telephone System							X				X											

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SPECIFICATION SECTION
16770

ACTIVITY NO. a.	TRANS-MITTAL NO. b.	ITEM NO c.	SPECIFICATION PARAGRAPH NUMBER d.	DESCRIPTION OF ITEM SUBMITTED e.	TYPE OF SUBMITTAL: DATA f.	DRAWINGS g.	INSTRUCTIONS h.	SCHEDULES i.	STATEMENTS j.	REPORTS k.	CERTIFICATES l.	SAMPLES m.	RECORDS n.	O&M MANUALS o.	CLASSIFICATION: INFORMATION ONLY p.	GOVERNMENT APPROVED q.	REVIEWER r.	CONTRACTOR SCHEDULE DATES: SUBMIT s.	APPROVAL NEEDED BY t.	MATERIAL NEEDED BY u.	CONTRACTOR ACTION: CODE v.	DATE w.	SUBMIT TO GOVERN-MENT x.	GOVERNMENT ACTION: CODE y.	DATE z.	REMARKS aa.
			1.3	Spare Parts	X										X											
			1.3	Radio and Public Address System		X									X											
			1.3	Test Plan						X					X											
			3.3	Acceptance Tests						X					X											
			1.3	Radio and Public Address System										X	X											

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SECTION 01411

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02/00

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SECTION 01411

TESTING LABORATORY SERVICES
02/00

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 basic designation only.

CORPS OF ENGINEERS (COE)

COE EM 200-1-3	(June 1995) Requirements for the Preparation of Sampling and Analysis Plans

ENVIRONMENTAL PROTECTION AGENCY (EPA)

EPA SW-846	(Nov 1986; Rev O) Test Methods for Evaluating Solid Waste (Vol IA, IB, IC, and II) (Test Methods 5030/8260 Volatile Organic Compounds and 601 Purgeable Halocarbons)

1.2 GENERAL REQUIREMENTS

1.2.1 Description

This section covers Contractor-provided laboratory testing services.

1.2.2 Definitions

1.2.2.1 Chemical Testing

Chemical testing includes analyses required on soil, water, free product, tank contents or other matrices to determine constituents or chemical properties. These tests are to be performed in a laboratory approved by the U.S. Army Corps of Engineers, Savannah District.

1.2.2.2 Physical Testing

Physical testing includes tests required to establish the physical properties of a soil. These tests typically include both laboratory and field procedures.

1.3 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-09 Reports

Laboratory Reports; FIO.

Laboratory shall promptly submit two copies of each laboratory report to the Contractor. Include: date issued, project title and number, name of responsible officer, date and time of sampling, type of test, date of test, and results of test, with contract documents. The laboratory shall provide interpretation of test results when requested by the Corps of Engineers.

SD-18 Records

Laboratory Certification; GA|F.

Contractor shall submit with his bid documents the laboratory name, address, telephone number, and name of responsible officer to the Corps of Engineers. The submittal shall include documentation that the laboratory has been certified by the U. S. Army Corps of Engineers within 12 months of the submittal date and also approved by Georgia Department of Natural Resources Environmental Protection Division.

Laboratory Quality Assurance/Quality Control Plan; GA|F.

Laboratory shall furnish a written Quality Assurance/Quality Control Plan as part of the SAP.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.1 SAMPLING AND TESTING PROGRAM

The Contractor shall be responsible for the collection of samples required during this work. In all cases, the Contractor shall follow the requirements of COE EM 200-1-3, and described in the Contractor prepared and submitted SAP. The Contractor shall collect split samples for analysis at a frequency not less than 10 percent of total sample collection and rounded up to the nearest whole number. Contractor may be requested at any time to furnish a replicate or split sample to the Government for QA testing.

3.1.1 Dewatering Water

The Contractor shall collect samples of both treated and untreated water generated during dewatering and decontamination activities. The frequency of sample collection and parameters requiring analysis shall be detailed in the Sampling and Analysis Plan and shall conform to requirements established in the Georgia regulations and by the disposal facility. At a minimum, the analysis shall include testing for purgeable halocarbons (EPA SW-846, Method 601).

3.1.2 Potentially Contaminated Soil

The Contractor shall collect one composited sample for every 250 cubic meters of suspected contaminated material but not to be less than one sample from each day's worth of excavated material. At a minimum, analysis of this sample shall include testing for VOCs (EPA SW-846, Method 5030/8260). The Contractor shall be responsible for any additional requirements identified by the disposal facility.

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SECTION 01415

METRIC MEASUREMENTS

03/97

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SECTION 01415

METRIC MEASUREMENTS
03/97

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 E 380	(1993) Practice for Use of the International System of Units (SI)
ASTM E 621	(1994) Practice for Use of Metric (SI) Units in Building Design and Construction

1.2 GENERAL

This project includes metric units of measurements. The metric units used are the International System of Units (SI) developed and maintained by the General Conference on Weights and Measures (CGPM); the name International System of Units and the international abbreviation SI were adopted by the 11th CGPM in 1960. A number of circumstances require that both metric SI units and English inch-pound (I-P) units be included in a section of the specifications. When both metric and I-P measurements are included, the section may contain measurements for products that are manufactured to I-P dimensions and then expressed in mathematically converted metric value (soft metric) or, it may contain measurements for products that are manufactured to an industry recognized rounded metric (hard metric) dimensions but are allowed to be substituted by I-P products to comply with the law. Dual measurements are also included to indicate industry and/or Government standards, test values or other controlling factors, such as the code requirements where I-P values are needed for clarity or to trace back to the referenced standards, test values or codes.

1.3 USE OF MEASUREMENTS

Measurements shall be either in SI or I-P units as indicated, except for soft metric measurements or as otherwise authorized. When only SI or I-P measurements are specified for a product, the product shall be procured in the specified units (SI or I-P) unless otherwise authorized by the Contracting Officer. The Contractor shall be responsible for all associated labor and materials when authorized to substitute one system of units for another and for the final assembly and performance of the specified work and/or products.

1.3.1 Hard Metric

A hard metric measurement is indicated by an SI value with no expressed correlation to an I-P value, i.e., where an SI value is not an exact mathematical conversion of an I-P value, such as the use of 100 mm in lieu of 4 inches. Hard metric measurements are often used for field data such as distance from one point to another or distance above the floor.

Products are considered to be hard metric when they are manufactured to metric dimensions or have an industry recognized metric designation.

1.3.2 Soft Metric

a. A soft metric measurement is indicated by an SI value which is a mathematical conversion of the I-P value shown in parentheses (e.g. 38.1 mm (1-1/2 inches)). Soft metric measurements are used for measurements pertaining to products, test values, and other situations where the I-P units are the standard for manufacture, verification, or other controlling factor. The I-P value shall govern while the metric measurement is provided for information.

b. A soft metric measurement is also indicated for products that are manufactured in industry designated metric dimensions but are required by law to allow substitute I-P products. These measurements are indicated by a manufacturing hard metric product dimension followed by the substitute I-P equivalent value in parentheses (e.g., 190 x 190 x 390 mm (7-5/8 x 7-5/8 x 15-5/8 inches)).

1.3.3 Neutral

A neutral measurement is indicated by an identifier which has no expressed relation to either an SI or an I-P value (e.g., American Wire Gage (AWG) which indicates thickness but in itself is neither SI nor I-P).

1.4 COORDINATION

Discrepancies, such as mismatches or product unavailability, arising from use of both metric and non-metric measurements and discrepancies between the measurements in the specifications and the measurements in the drawings shall be brought to the attention of the Contracting Officer for resolution.

1.5 RELATIONSHIP TO SUBMITTALS

Submittals for Government approval or for information only shall cover the SI or I-P products actually being furnished for the project. The Contractor shall submit the required drawings and calculations in the same units used in the contract documents describing the product or requirement unless otherwise instructed or approved. The Contractor shall use ASTM E 380 and ASTM E 621 as the basis for establishing metric measurements required to be used in submittals.

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SECTION 01420

SAMPLING AND ANALYSIS PLAN AND ENGINEERING REMEDIATION REPORT FOR COMPLETED HTRW ACTIVTIES

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

The Contractor shall provide appropriate personnel, time, and equipment to provide a detailed plan for sampling and laboratory analysis of potentially contaminated soil and/or ground water along with a complete report of the activities accomplished and findings developed under this contract should contaminated soil and/or ground water be encountered. In general, the work and report shall be completed under the rules and regulations of the Georgia Department of Natural Resources Environmental Protection Division. The plan and report shall be furnished on 8.5" x 11" paper and bound for easy removal and insertion of pages.

1.2 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.

ENVIRONMENTAL PROTECTION AGENCY (EPA

540/G-87/003a	Data Quality Objectives for Remedial Response Activities, (Vol. 1, OSWER Directive No. 9335.0-7B)

CORPS OF ENGINEERS (USACE)

ER 200-1-3	Requirements for Preparation of Sampling and Analysis Plans (June 1995)

ENGINEERING MANUALS (EM)

EM 385-1-1	Safety and Health Requirements (September 1996)

1.3 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-09, Reports

Sampling and Analysis Plan (SAP); GA|D.

The Contractor shall submit an unbound original and eight bound copies of the Final SAP no later than 10 working days after receiving the Government's comments and revisions on the draft document reviewed under

this section.

Engineering Remediation Report; GA|D.

The Contractor shall submit an unbound original and eight bound copies of the Engineering Remediation Report. A draft submittal is not required. Reports shall be submitted to:

Commander
U.S. Army Corps of Engineers
Savannah District
P.O. Box 889
100 W. Oglethorpe Avenue
Savannah, GA 31402-0889

PART 2 PRODUCTS

2.1 SCOPE

The scope of the reporting shall cover all significant construction, testing, and disposal activities which will have potential for long-term monitoring and/or additional reporting related to the life and history of the contaminants removed from the site. The report shall generally commence with the beginning of actions associated with site preparation for remedial activities through the final disposal at the receiving facility.

2.2 ENGINEERING REMEDIATION REPORT

The report shall be formatted by the Contractor as proposed and approved in the work plan. It shall include an Executive Summary, Table of Contents, and narrative chapters or paragraphs for each significant action or operation occurring during the contracted remedial work. The following element shall be included as appendices: Photo documentation of the site work; Quality Control Reports; Visitor Lists; Laboratory analysis; Field Notes; Survey Data; Field Instrument Readings for Chemical Detection; Chain of Custody Documents; Hazardous Waste Manifests; Waste Profile Sheet(s); Land Disposal Restriction Certificates and Notification; Transportation Manifests; Disposal Certificates/Destruction Documents; and a final site map showing the location of the excavated area and cross sections of the pit. The report shall be signed and sealed by a professional engineer or professional geologist registered in the State of Georgia. The report shall be due at the Savannah District office of the Corps of Engineers no later than 45 days after the final site cleanup and departure of the Contractor from the site.

2.3 SAMPLING AND ANALYSIS PLAN

A Sampling and Analysis Plan (SAP) will be developed by the Contractor for the sampling and chemical analysis under this contract. The SAP shall be developed to assure that the Contractor collects, analyzes and evaluates chemical data, which are legally and scientifically defensible. The SAP shall be in accordance with provisions covered in EM 200-1-3. A final SAP must be approved prior to initiation of field work. The Corps of Engineers requires that quality control (QC) samples be collected and analyzed by the contract laboratory. These QC samples include splits and replicates of field samples.

2.3.1 Preparation of the SAP

The SAP shall consist two sections, a Field Sampling Plan and a Quality Assurance Project Plan:

FIELD SAMPLING PLAN
- TITLE PAGE
- TABLE OF CONTENTS
- PROJECT DESCRIPTION
- PROJECT ORGANIZATION AND RESPONSIBILITIES
- SCOPE AND OBJECTIVES
- FIELD ACTIVITIES
- SAMPLE CHAIN OF CUSTODY
- SAMPLE PACKING AND SHIPPING
- REFERENCES

QUALITY ASSURANCE PROJECT PLAN
- TITLE PAGE
- TABLE OF CONTENTS
- PROJECT DESCRIPTION
- PROJECT ORGANIZATION AND RESPONSIBILITIES
- DATA QUALITY OBJECTIVES
- SAMPLING LOCATIONS AND PROCEDURES
- SAMPLE CUSTODY AND HOLDING TIME REQUIREMENTS
- ANALYTICAL PROCEDURES
- CALIBRATION PROCEDURES AND FREQUENCIES
- INTERNAL QC CHECKS
- CALCULATION OF DATA QUALITY INDICATORS
- CORRECTIVE ACTIONS
- DATA REDUCTION, VALIDATION, AND REPORTING

Each of the above topics will contain the information required by Chapter 3 of EM 200-1-3. Required information, in addition to that presented in Chapter 3, is presented in the following paragraphs, along with the corresponding topic under which this information is to appear.

2.3.2 Contract Laboratory Requirements and Analytical Personnel Responsibilities

The information presented under this heading in EM 200-1-3, Appendix B, Section B-3 shall be incorporated into the SAP in addition to any other information the Contractor believes to be appropriate.

a. Analytical Personnel Responsibilities and Experience Requirement

The minimum requirements for the chemical quality control officer and bench chemists shall be a baccalaureate in chemistry and 1 year of appropriate experience in preparations, testing, and analyses. In addition, the GC/MS Special Interpretation Expert shall have 3 years' minimum appropriate experience and the Gas Chromatograph Residue Analyses Expert shall have 2 years' minimum appropriate experience. Technicians shall normally have a minimum of high school chemistry. (Technicians shall work under the close and continuous supervision of a chemist and shall be used primarily for sample preparation.)

2.3.3 Sampling and Preservation Procedures

The Contractor shall develop and submit an independently derived sampling/analysis program in his SAP. Preservation of samples shall meet the requirements contained in Appendix I, EM 200-1-3.

a. Soil Sampling Procedure

This sampling procedure shall be described in detail from the sample's extraction from the stockpiles through its placement in the sample containers. Decontaminated stainless steel, Teflon, Teflon coated, or glass sampling equipment shall be used on all equipment which comes into contact with the actual collected sample. Samples that come in contact with any other materials shall be discarded. All volatiles samples shall be collected as grab samples. All quality control samples for volatiles shall be duplicates. Compositing is required for all other analytes, and the method for doing so shall be described.

b. Ground Water Sampling Procedure

This sampling procedure shall be described in detail from the sample's extraction from the ground through its placement in the sample containers. Decontaminated stainless steel, Teflon, Teflon coated, or glass sampling equipment shall be used on all equipment which comes into contact with the actual collected sample. Samples that come in contact with any other materials shall be discarded. All volatiles samples shall be collected as grab samples. All quality control samples for volatiles shall be duplicates. Compositing is required for all other analytes and the method for doing so shall be described.

2.3.4 Laboratory Analytical Procedures

Section 01411 TESTING LABORATORY SERVICES lists the analytical procedures which shall be used.

2.3.5 Chemical Data Quality Management Deliverables

a. Data Report: The Contractor's analytical data shall be submitted to the USACE as soon as possible after review by the Contractor's chemical QA officer. All raw data shall be stored by the Contractor's or subcontractor's lab for 2 years after project samples have been analyzed. This submittal shall include the below-listed items.

(1) Sample IDs: The Contractor shall prepare a tabular presentation which shall identify all field duplicates and field blanks (including rinsates and trip blanks) as such. This table shall also match all rinsates with their corresponding field samples as well as matching each trip blank with the samples that accompanied it during shipment.

(2) Sample Receipt: The Contractor shall complete and report a "Cooler Receipt Form" for all shipments for purposes of noting problems in sample packaging, chain-of-custody, and sample preservation.

b. Internal Quality Control Reporting: The SAP shall confirm that the following information shall be included:

(1) Laboratory Blanks (Method Blanks and Instrument Blanks): All analytes shall be reported for each laboratory blank. All nonblank sample results shall be designated as corresponding to a particular laboratory blank in terms of analytical batch processing.

(2) Surrogate Spike Samples: Surrogate spike recoveries shall be reported with all organic method reports where appropriate (i.e. when the method requires surrogate spikes). The report shall also specify the control limits for surrogate spike results as well as the spiking concentration.

Any out-of-control recoveries (as defined in the specified method) shall result in the sample being rerun at no additional cost to the Government (both sets of data are to be reported). Should the samples be too old, of insufficient quantity, etc., new samples will be collected and analyzed at no additional cost to the Government.

(3) Matrix Spike Samples: Matrix spike recoveries shall be reported for all organic and inorganic analyses. All general sample results shall be designated as corresponding to a particular matrix spike sample. The report shall indicate what field sample was spiked even if it was not a Corps of Engineers project sample. The report shall also specify the control limits for matrix spike results for each method for each matrix.

(4) Laboratory Duplicates and/or Matrix Spike Duplicate Pairs: Relative percent difference shall be reported for all duplicate pairs as well as analyte/matrix specific control limits.

(5) Laboratory Control Standards (LCS): When run for internal quality control, Laboratory Control Standards results shall be reported with the corresponding field sample data. Control limits for LCSs shall also be specified.

c. Field Duplicates and Field Blanks: These samples shall be identified as such by the Contractor and reported as any other field sample. Relative percent differences shall be reported for all field duplicate pairs.

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SECTION 01451

CONTRACTOR QUALITY CONTROL

04/97

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CEGS-01451/S (April 1997)

SECTION 01451

CONTRACTOR QUALITY CONTROL
04/97

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 D 3740	(1994a) Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction
ASTM E 329	(1995b) Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction

1.2 PAYMENT

Separate payment will not be made for providing and maintaining an effective Quality Control program, and all costs associated therewith shall be included in the applicable unit prices or lump-sum prices contained in the Bidding Schedule.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.1 GENERAL

The Contractor is responsible for quality control and shall establish and maintain an effective quality control system in compliance with the Contract Clause titled "Inspection of Construction." The quality control system shall consist of plans, procedures, and organization necessary to produce an end product which complies with the contract requirements. The system shall cover all construction operations, both onsite and offsite, and shall be keyed to the proposed construction sequence. The project superintendent will be held responsible for the quality of work on the job and is subject to removal by the Contracting Officer for non-compliance with quality requirements specified in the contract. The project superintendent in this context shall mean the individual with the responsibility for the overall management of the project including quality and production.

3.2 QUALITY CONTROL PLAN

3.2.1 General

The Contractor shall furnish for review by the Government, not later than 5

days after receipt of notice to proceed, the Contractor Quality Control (CQC) Plan proposed to implement the requirements of the Contract Clause titled "Inspection of Construction." The plan shall identify personnel, procedures, control, instructions, test, records, and forms to be used. The Government will consider an interim plan for the first 30 days of operation. Construction will be permitted to begin only after acceptance of the CQC Plan or acceptance of an interim plan applicable to the particular feature of work to be started. Work outside of the features of work included in an accepted interim plan will not be permitted to begin until acceptance of a CQC Plan or another interim plan containing the additional features of work to be started.

3.2.2 Content of the CQC Plan

The CQC Plan shall include, as a minimum, the following to cover all construction operations, both onsite and offsite, including work by subcontractors, fabricators, suppliers, and purchasing agents:

a. A description of the quality control organization, including a chart showing lines of authority and acknowledgment that the CQC staff shall implement the three phase control system for all aspects of the work specified. The staff shall include a CQC System Manager who shall report to the project superintendent.

b. The name, qualifications (in resume format), duties, responsibilities, and authorities of each person assigned a CQC function.

c. A copy of the letter to the CQC System Manager signed by an authorized official of the firm which describes the responsibilities and delegates sufficient authorities to adequately perform the functions of the CQC System Manager, including authority to stop work which is not in compliance with the contract. The CQC System Manager shall issue letters of direction to all other various quality control representatives outlining duties, authorities, and responsibilities. Copies of these letters shall also be furnished to the Government.

d. Procedures for scheduling, reviewing, certifying, and managing submittals, including those of subcontractors, offsite fabricators, suppliers, and purchasing agents. These procedures shall be in accordance with Section 01330 SUBMITTAL PROCEDURES.

e. Control, verification, and acceptance testing procedures for each specific test to include the test name, specification paragraph requiring test, feature of work to be tested, test frequency, and person responsible for each test. (Laboratory facilities will be approved by the Contracting Officer.)

f. Procedures for tracking preparatory, initial, and follow-up control phases and control, verification, and acceptance tests including documentation.

g. Procedures for tracking construction deficiencies from identification through acceptable corrective action. These procedures shall establish verification that identified deficiencies have been corrected.

h. Reporting procedures, including proposed reporting formats.

i. A list of the definable features of work. A definable feature of work is a task which is separate and distinct from other tasks, has separate control requirements, and may be identified by different trades or disciplines, or it may be work by the same trade in a different environment. Although each section of the specifications may generally be considered as a definable feature of work, there are frequently more than one definable features under a particular section. This list will be agreed upon during the coordination meeting.

3.2.3 Acceptance of Plan

Acceptance of the Contractor's plan is required prior to the start of construction. Acceptance is conditional and will be predicated on satisfactory performance during the construction. The Government reserves the right to require the Contractor to make changes in his CQC Plan and operations including removal of personnel, as necessary, to obtain the quality specified.

3.2.4 Notification of Changes

After acceptance of the CQC Plan, the Contractor shall notify the Contracting Officer in writing of any proposed change. Proposed changes are subject to acceptance by the Contracting Officer.

3.3 COORDINATION MEETING

After the Preconstruction Conference, before start of construction, and prior to acceptance by the Government of the CQC Plan, the Contractor shall meet with the Contracting Officer or Authorized Representative and discuss the Contractor's quality control system. The CQC Plan shall be submitted for review a minimum of 7 calendar days prior to the Coordination Meeting. During the meeting, a mutual understanding of the system details shall be developed, including the forms for recording the CQC operations, control activities, testing, administration of the system for both onsite and offsite work, and the interrelationship of Contractor's Management and control with the Government's Quality Assurance. Minutes of the meeting shall be prepared by the Government and signed by both the Contractor and the Contracting Officer. The minutes shall become a part of the contract file. There may be occasions when subsequent conferences will be called by either party to reconfirm mutual understandings and/or address deficiencies in the CQC system or procedures which may require corrective action by the Contractor.

3.4 QUALITY CONTROL ORGANIZATION

3.4.1 General

The requirements for the CQC organization are a CQC System Manager and sufficient number of additional qualified personnel to ensure contract compliance. The Contractor shall provide a CQC organization which shall be at the site at all times during progress of the work and with complete authority to take any action necessary to ensure compliance with the contract. All CQC staff members shall be subject to acceptance by the Contracting Officer.

3.4.2 CQC System Manager

The Contractor shall identify as CQC System Manager an individual within the onsite work organization who shall be responsible for overall management of CQC and have the authority to act in all CQC matters for the Contractor. The CQC System Manager shall be a construction person with a minimum of 10 years' experience in related work. This CQC System Manager shall be on the site at all times during construction and shall be employed by the prime Contractor. The CQC System Manager shall be assigned no other duties. An alternate for the CQC System Manager shall be identified in the plan to serve in the event of the System Manager's absence. The requirements for the alternate shall be the same as for the designated CQC System Manager.

3.4.3 CQC Personnel

In addition to CQC personnel specified elsewhere in the contract, the Contractor shall provide as part of the CQC organization specialized personnel for each site (100/200 block & 1200 block) to assist the CQC System Manager for the following areas: assistant CQC, electrical, mechanical, submittals clerk, and masonry. These individuals may be employees of the prime or subcontractor; be responsible to the CQC System Manager; be physically present at the construction site during work on their areas of responsibility; have the necessary education and/or experience in accordance with the experience matrix listed herein. These individuals shall have no other duties other than quality control.

Experience Matrix

Area	Qualifications
a. Assistant CQC	Person with 10 years of related experience
b. Mechanical	Person with 10 years' related experience
c. Electrical	Person with 10 years' experience
d. Submittals	Submittal Clerk with 5 years' experience
e. Masonry	Technician with 5 years' experience for the appropriate area

3.4.4 Additional Requirement

In addition to the above experience and education requirements the CQC System Manager or the principal member of the CQC staff shall have completed the course entitled "Construction Quality Management For Contractors." This course is periodically offered on a quarterly basis within the Savannah District boundaries. CQC System Managers who have not successfully completed this course must attend the next available training session. Failure to successfully complete this training within the next available training date will be grounds for removal as CQC System Manager. There is currently a nominal fee to cover the cost of the training materials for Contractors who have current contracts with the Savannah District.

3.4.5 Organizational Changes

The Contractor shall maintain the CQC staff at full strength at all times. When it is necessary to make changes to the CQC staff, the Contractor shall revise the CQC Plan to reflect the changes and submit the changes to the Contracting Officer for acceptance.

3.5 SUBMITTALS

Submittals shall be made as specified in Section 01330 SUBMITTAL PROCEDURES. The CQC organization shall be responsible for certifying that all submittals are in compliance with the contract requirements.

3.6 CONTROL

Contractor Quality Control is the means by which the Contractor ensures that the construction, to include that of subcontractors and suppliers, complies with the requirements of the contract. At least three phases of control shall be conducted by the CQC System Manager for each definable feature of work as follows:

3.6.1 Preparatory Phase

This phase shall be performed prior to beginning work on each definable feature of work, after all required plans/documents/materials are approved/accepted, and after copies are at the work site. This phase shall include:

a. A review of each paragraph of applicable specifications.

b. A review of the contract drawings.

c. A check to assure that all materials and/or equipment have been tested, submitted, and approved.

d. Review of provisions that have been made to provide required control inspection and testing.

e. Examination of the work area to assure that all required preliminary work has been completed and is in compliance with the contract.

f. A physical examination of required materials, equipment, and sample work to assure that they are on hand, conform to approved shop drawings or submitted data, and are properly stored.

g. A review of the appropriate activity hazard analysis to assure safety requirements are met.

h. Discussion of procedures for controlling quality of the work including repetitive deficiencies. Document construction tolerances and workmanship standards for that feature of work.

i. A check to ensure that the portion of the plan for the work to be performed has been accepted by the Contracting Officer.

j. Discussion of the initial control phase.

k. The Government shall be notified at least 48 hours in advance of beginning the preparatory control phase. This phase shall include a meeting conducted by the CQC System Manager and attended by the superintendent, other CQC personnel (as applicable), and the foreman responsible for the definable feature. The results of the preparatory phase actions shall be documented by separate minutes prepared by the CQC System Manager and attached to the daily CQC report. The Contractor shall instruct applicable workers as to the acceptable level of workmanship required in order to meet contract specifications.

3.6.2 Initial Phase

This phase shall be accomplished at the beginning of a definable feature of work. The following shall be accomplished:

a. A check of work to ensure that it is in full compliance with contract requirements. Review minutes of the preparatory meeting.

b. Verify adequacy of controls to ensure full contract compliance. Verify required control inspection and testing.

c. Establish level of workmanship and verify that it meets minimum acceptable workmanship standards. Compare with required sample panels as appropriate.

d. Resolve all differences.

e. Check safety to include compliance with and upgrading of the safety plan and activity hazard analysis. Review the activity analysis with each worker.

f. The Government shall be notified at least 24 hours in advance of beginning the initial phase. Separate minutes of this phase shall be prepared by the CQC System Manager and attached to the daily CQC report. Exact location of initial phase shall be indicated for future reference and comparison with follow-up phases.

g. The initial phase should be repeated for each new crew to work onsite, or any time acceptable specified quality standards are not being met.

3.6.3 Follow-up Phase

Daily checks shall be performed to assure control activities, including control testing, are providing continued compliance with contract requirements, until completion of the particular feature of work. The checks shall be made a matter of record in the CQC documentation. Final follow-up checks shall be conducted and all deficiencies corrected prior to the start of additional features of work which may be affected by the deficient work. The Contractor shall not build upon nor conceal non-conforming work.

3.6.4 Additional Preparatory and Initial Phases

Additional preparatory and initial phases shall be conducted on the same definable features of work if the quality of on-going work is unacceptable, if there are changes in the applicable CQC staff, onsite production supervision or work crew, if work on a definable feature is resumed after a

substantial period of inactivity, or if other problems develop.

3.7 TESTS

3.7.1 Testing Procedure

The Contractor shall perform specified or required tests to verify that control measures are adequate to provide a product which conforms to contract requirements. Upon request, the Contractor shall furnish to the Government duplicate samples of test specimens for possible testing by the Government. Testing includes operation and/or acceptance tests when specified. The Contractor shall procure the services of a Corps of Engineers approved testing laboratory or establish an approved testing laboratory at the project site. The Contractor shall perform the following activities and record and provide the following data:

a. Verify that testing procedures comply with contract requirements.

b. Verify that facilities and testing equipment are available and comply with testing standards.

c. Check test instrument calibration data against certified standards.

d. Verify that recording forms and test identification control number system, including all of the test documentation requirements, have been prepared.

e. Results of all tests taken, both passing and failing tests, shall be recorded on the CQC report for the date taken. Specification paragraph reference, location where tests were taken, and the sequential control number identifying the test shall be given. If approved by the Contracting Officer, actual test reports may be submitted later with a reference to the test number and date taken. An information copy of tests performed by an offsite or commercial test facility shall be provided directly to the Contracting Officer. Failure to submit timely test reports as stated may result in nonpayment for related work performed and disapproval of the test facility for this contract.

3.7.2 Testing Laboratories

3.7.2.1 Capability Check

The Government reserves the right to check laboratory equipment in the proposed laboratory for compliance with the standards set forth in the contract specifications and to check the laboratory technician's testing procedures and techniques. Laboratories utilized for testing soils, concrete, asphalt, and steel shall meet criteria detailed in ASTM D 3740 and ASTM E 329.

3.7.2.2 Capability Recheck

If the selected laboratory fails the capability check, the Contractor will be assessed a charge to reimburse the Government for each succeeding recheck of the laboratory or the checking of a subsequently selected laboratory. Such costs will be deducted from the contract amount due the Contractor.

3.7.3 Onsite Laboratory

The Government reserves the right to utilize the Contractor's control testing laboratory and equipment to make assurance tests and to check the Contractor's testing procedures, techniques, and test results at no additional cost to the Government.

3.7.4 Furnishing or Transportation of Samples for Testing

Costs incidental to the transportation of samples or materials shall be borne by the Contractor. Samples of materials for test verification and acceptance testing by the Government shall be delivered to the Corps of Engineers.

3.8 COMPLETION INSPECTION

3.8.1 Punch-Out Inspection

Near the completion of all work or any increment thereof established by a completion time stated in the Special Clause entitled "Commencement, Prosecution, and Completion of Work," or stated elsewhere in the specifications, the CQC System Manager shall conduct an inspection of the work and develop a punch list of items which do not conform to the approved drawings and specifications. Such a list of deficiencies shall be included in the CQC documentation, as required by paragraph DOCUMENTATION below, and shall include the estimated date by which the deficiencies will be corrected. The CQC System Manager or staff shall make a second inspection to ascertain that all deficiencies have been corrected. Once this is accomplished, the Contractor shall notify the Government that the facility is ready for the Government Pre-Final inspection.

3.8.2 Pre-Final Inspection

The Government will perform this inspection to verify that the facility is complete and ready to be occupied. A Government Pre-Final Punch List may be developed as a result of this inspection. The Contractor's CQC System Manager shall ensure that all items on this list have been corrected before notifying the Government so that a Final inspection with the customer can be scheduled. Any items noted on the Pre-Final inspection shall be corrected in a timely manner. These inspections and any deficiency corrections required by this paragraph shall be accomplished within the time slated for completion of the entire work or any particular increment thereof if the project is divided into increments by separate completion dates.

3.8.3 Final Acceptance Inspection

The Contractor's Quality Control Inspection personnel, plus the superintendent or other primary management person, and the Contracting Officer's Representative shall be in attendance at this inspection. Additional Government personnel including, but not limited to, those from Base/Post Civil Facility Engineer user groups, and major commands may also be in attendance. The final acceptance inspection will be formally scheduled by the Contracting Officer based upon results of the Pre-Final inspection. Notice shall be given to the Contracting Officer at least 14 days prior to the final acceptance inspection and shall include the Contractor's assurance that all specific items previously identified to the Contractor as being unacceptable, along with all remaining work performed under the contract, will be complete and acceptable by the date scheduled for the final acceptance inspection. Failure of the Contractor to have all

contract work acceptably complete for this inspection will be cause for the Contracting Officer to bill the Contractor for the Government's additional inspection cost in accordance with the contract clause titled "Inspection of Construction".

3.9 DOCUMENTATION

The Contractor shall maintain current records providing factual evidence that required quality control activities and/or tests have been performed. These records shall include the work of subcontractors and suppliers and shall be on an acceptable form that includes, as a minimum, the following information:

a. Contractor/subcontractor and their area of responsibility.

b. Operating plant/equipment with hours worked, idle, or down for repair.

c. Work performed each day, giving location, description, and by whom. When Network Analysis (NAS) is used, identify each phase of work performed each day by NAS activity number.

d. Test and/or control activities performed with results and references to specifications/drawings requirements. The control phase should be identified (Preparatory, Initial, Follow-up). List deficiencies noted along with corrective action.

e. Quantity of materials received at the site with statement as to acceptability, storage, and reference to specifications/drawings requirements.

f. Submittals reviewed, with contract reference, by whom, and action taken.

g. Off-site surveillance activities, including actions taken.

h. Job safety evaluations stating what was checked, results, and instructions or corrective actions.

i. Instructions given/received and conflicts in plans and/or specifications.

j. Contractor's verification statement.

These records shall indicate a description of trades working on the project; the number of personnel working; weather conditions encountered; and any delays encountered. These records shall cover both conforming and deficient features and shall include a statement that equipment and materials incorporated in the work and workmanship comply with the contract. The original and one copy of these records in report form shall be furnished to the Government daily within 24 hours after the date covered by the report, except that reports need not be submitted for days on which no work is performed. As a minimum, one report shall be prepared and submitted for every 7 days of no work and on the last day of a no work period. All calendar days shall be accounted for throughout the life of the contract. The first report following a day of no work shall be for that day only. Reports shall be signed and dated by the CQC System Manager. The report from the CQC System Manager shall include copies of test reports and copies of reports prepared by all subordinate quality

control personnel.

3.10 SAMPLE FORMS

Sample forms are enclosed at the end of Section 00800.

3.11 NOTIFICATION OF NONCOMPLIANCE

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

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CEGS-01500/S (February 1997)

SECTION 01500

TEMPORARY CONSTRUCTION FACILITIES
02/97

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

1.1.1 Site Plan

The Contractor shall prepare a site plan indicating the proposed location and dimensions of any area to be fenced and used by the Contractor, the number of trailers to be used, avenues of ingress/egress to the fenced area and details of the fence installation. Any areas which may have to be graveled to prevent the tracking of mud shall also be identified. The Contractor shall also indicate if the use of a supplemental or other staging area is desired.

1.1.2 Identification of Employees

The Contractor shall be responsible for furnishing to each employee, and for requiring each employee engaged on the work to display, identification as approved and directed by the Contracting Officer. Prescribed identification shall immediately be delivered to the Contracting Officer for cancellation upon release of any employee. When required, the Contractor shall obtain and provide fingerprints of persons employed on the project. Contractor and subcontractor personnel shall wear identifying markings on hard hats clearly identifying the company for whom the employee works.

1.1.3 Employee Parking

Contractor employees shall park privately owned vehicles in an area designated by the Contracting Officer. This area will be within reasonable walking distance of the construction site. Contractor employee parking shall not interfere with existing and established parking requirements of the military installation.

1.2 AVAILABILITY AND USE OF UTILITY SERVICES

1.2.1 Payment for Utility Services

The Government will make all reasonably required utilities available to the Contractor from existing outlets and supplies, as specified in the contract. Unless otherwise provided in the contract, the amount of each utility service consumed shall be charged to or paid for by the Contractor at prevailing rates charged to the Government or, where the utility is produced by the Government, at reasonable rates determined by the Contracting Officer. The Contractor shall carefully conserve any utilities furnished without charge.

1.2.2 Meters and Temporary Connections

The Contractor, at its expense and in a manner satisfactory to the Contracting Officer, shall provide and maintain necessary temporary

connections, distribution lines, and meter bases (Government will provide meters) required to measure the amount of each utility used for the purpose of determining charges. The Contractor shall notify the Contracting Officer, in writing, 5 working days before final electrical connection is desired so that a utilities contract can be established. The Government will provide a meter and make the final hot connection after inspection and approval of the Contractor's temporary wiring installation. The Contractor shall not make the final electrical connection.

1.2.3 Advance Deposit

An advance deposit for utilities consisting of an estimated month's usage or a minimum of $50.00 will be required. The last monthly bills for the fiscal year will normally be offset by the deposit and adjustments will be billed or returned as appropriate. Services to be rendered for the next fiscal year, beginning 1 October, will require a new deposit. Notification of the due date for this deposit will be mailed to the Contractor prior to the end of the current fiscal year.

1.2.4 Final Meter Reading

Before completion of the work and final acceptance of the work by the Government, the Contractor shall notify the Contracting Officer, in writing, 5 working days before termination is desired. The Government will take a final meter reading, disconnect service, and remove the meters. The Contractor shall then remove all the temporary distribution lines, meter bases, and associated paraphernalia. The Contractor shall pay all outstanding utility bills before final acceptance of the work by the Government.

1.2.5 Sanitation

The Contractor shall provide and maintain within the construction area minimum field-type sanitary facilities approved by the Contracting Officer. Government toilet facilities will not be available to Contractor's personnel.

1.2.6 Telephone

The Contractor shall make arrangements and pay all costs for telephone facilities desired.

1.3 BULLETIN BOARD, PROJECT SIGN, AND PROJECT SAFETY SIGN

1.3.1 Bulletin Board

Immediately upon beginning of work, the Contractor shall provide a weatherproof glass-covered bulletin board not less than 915 by 1220 mm in size for displaying the Equal Employment Opportunity poster, a copy of the wage decision contained in the contract, Wage Rate Information poster, and other information approved by the Contracting Officer. The bulletin board shall be located at the project site in a conspicuous place easily accessible to all employees, as approved by the Contracting Officer. Legible copies of the aforementioned data shall be displayed until work is completed. Upon completion of work the bulletin board shall be removed by and remain the property of the Contractor.

1.3.2 Project Signs

For each of the project sites (one for the 100/200/300 blocks and one for the 1200 block), the Contractor shall furnish and install a project sign at the location selected by the Contracting Officer. The project sign shall be painted on 1/2 inch thick exterior grade plywood. The sign layout shall be in accordance with the graphic format shown in Attachment 1 to Section 00800. The 4' by 4' right-hand section shall be painted white (Color No. 37875, Fed. Std. 595a) with black (Color No. 37038, Fed. Std. 595a) lettering. The 2' by 4' left-hand section shall be painted red (Color No. 12199, Fed. Std. 595a) with white lettering. Eight additional signs of similar construction and finish shall be furnished and installed at locations selected by the Contracting Officer. These signs shall be 36 inches wide, 15 inches high, with red letters 2 inches high on a white background and shall read as follows:

"OFF LIMITS TO UNAUTHORIZED PERSONNEL"

1.4 PROTECTION AND MAINTENANCE OF TRAFFIC

During construction the Contractor shall provide access and temporary relocated roads as necessary to maintain traffic. The Contractor shall maintain and protect traffic on all affected roads during the construction period except as otherwise specifically directed by the Contracting Officer. Measures for the protection and diversion of traffic, including the provision of watchmen and flagmen, erection of barricades, placing of lights around and in front of equipment and the work, and the erection and maintenance of adequate warning, danger, and direction signs, shall be as required by the State and local authorities having jurisdiction. The traveling public shall be protected from damage to person and property. The Contractor's traffic on roads selected for hauling material to and from the site shall interfere as little as possible with public traffic. The Contractor shall investigate the adequacy of existing roads and the allowable load limit on these roads. The Contractor shall be responsible for the repair of any damage to roads caused by construction operations.

1.4.1 Haul Roads

The Contractor will be required to use the haul routes shown on the plans unless otherwise permitted in writing by the Contracting Officer. When haul routes are not designated on the plans, the Contractor must obtain approval of the Contracting Officer of haul routes he intends to use. The Contractor shall maintain the haul routes and shall keep the dust problem under control by wetting the surface as needed. Sweeping and cleaning of pavements will be done as necessary to remove spillage resulting from the hauling operations. After all hauling has been completed, the Contractor shall restore the earth areas used for the haul routes to original condition by final grading, shaping, compacting, and grassing, and shall clean and sweep all paved areas as required. Any pavement damaged as a result of hauling operations under this contract for both the earth and other materials shall be promptly repaired by the Contractor, as approved by the Contracting Officer. The cost of maintenance and repair of the haul routes, as mentioned above, shall be considered as a subsidiary obligation of the Contractor. The axle load of earth hauling equipment operating on paved streets shall not exceed 12,000 pounds.

1.4.2 Barricades

The Contractor shall erect and maintain temporary barricades to limit public access to hazardous areas. Such barricades shall be required whenever safe public access to paved areas such as roads, parking areas or

sidewalks is prevented by construction activities or as otherwise necessary to ensure the safety of both pedestrian and vehicular traffic. Barricades shall be securely placed, clearly visible with adequate illumination to provide sufficient visual warning of the hazard during both day and night.

1.5 CONTRACTOR'S TEMPORARY FACILITIES

1.5.1 Administrative Field Offices

The Contractor shall provide and maintain administrative field office facilities within the construction area at the designated site. Government office and warehouse facilities will not be available to the Contractor's personnel.

1.5.2 Storage Area

The Contractor shall construct a temporary 1.8 m high chain link fence around trailers and materials. The fence shall include plastic strip inserts, colored brown, so that visibility through the fence is obstructed. Fence posts may be driven, in lieu of concrete bases, where soil conditions permit. Trailers, materials, or equipment shall not be placed or stored outside the fenced area unless such trailers, materials, or equipment are assigned a separate and distinct storage area by the Contracting Officer away from the vicinity of the construction site but within the military boundaries. Trailers, equipment, or materials shall not be open to public view with the exception of those items which are in support of ongoing work on any given day. Materials shall not be stockpiled outside the fence in preparation for the next day's work. Mobile equipment, such as tractors, wheeled lifting equipment, cranes, trucks, and like equipment, shall be parked within the fenced area at the end of each work day.

1.5.3 Supplemental Storage Area

Upon Contractor's request, the Contracting Officer will designate another or supplemental area for the Contractor's use and storage of trailers, equipment, and materials. This area may not be in close proximity of the construction site but shall be within the military boundaries. Fencing of materials or equipment will not be required at this site; however, the Contractor shall be responsible for cleanliness and orderliness of the area used and for the security of any material or equipment stored in this area. Utilities will not be provided to this area by the Government.

1.5.4 Appearance of Trailers

Trailers utilized by the Contractor for administrative or material storage purposes shall present a clean and neat exterior appearance and shall be in a state of good repair. Trailers which, in the opinion of the Contracting Officer, require exterior painting or maintenance will not be allowed on the military property.

1.5.5 Maintenance of Storage Area

Fencing shall be kept in a state of good repair and proper alignment. Should the Contractor elect to traverse, with construction equipment or other vehicles, grassed or unpaved areas which are not established roadways, such areas shall be covered with a layer of gravel as necessary to prevent rutting and the tracking of mud onto paved or established roadways; gravel gradation shall be at the Contractor's discretion. Grass

located within the boundaries of the construction site shall be mowed for the duration of the project. Grass and vegetation along fences, buildings, under trailers, and in areas not accessible to mowers shall be edged or trimmed neatly.

1.5.6 New Building

In the event a new building is constructed for the temporary project field office, it shall be a minimum 3.6 m in width, 5 m in length and have a minimum of 2.1 m headroom. It shall be equipped with approved electrical wiring, at least one double convenience outlet and the required switches and fuses to provide 110-120 volt power. It shall be provided with a work table with stool, desk with chair, two additional chairs, and one legal size file cabinet that can be locked. The building shall be waterproof, shall be supplied with heater, shall have a minimum of two doors, electric lights, a telephone, a battery operated smoke detector alarm, a sufficient number of adjustable windows for adequate light and ventilation, and a supply of approved drinking water. Approved sanitary facilities shall be furnished. The windows and doors shall be screened and the doors provided with dead bolt type locking devices or a padlock and heavy duty hasp bolted to the door. Door hinge pins shall be non-removable. The windows shall be arranged to open and to be securely fastened from the inside. Glass panels in windows shall be protected by bars or heavy mesh screens to prevent easy access to the building through these panels. In warm weather, air conditioning capable of maintaining the office at 50 percent relative humidity and a room temperature 11 degrees C below the outside temperature when the outside temperature is 35 degrees C, shall be furnished. Any new building erected for a temporary field office shall be maintained by the Contractor during the life of the contract and upon completion and acceptance of the work shall become the property of the Contractor and shall be removed from the site. All charges for telephone service for the temporary field office shall be borne by the Contractor, including long distance charges up to a maximum of $75.00 per month.

1.5.7 Security Provisions

Adequate outside security lighting shall be provided at the Contractor's temporary facilities. The Contractor shall be responsible for the security of its own equipment; in addition, the Contractor shall notify the appropriate law enforcement agency requesting periodic security checks of the temporary project field office.

1.6 OMITTED

1.7 PLANT COMMUNICATION

Whenever the Contractor has the individual elements of its plant so located that operation by normal voice between these elements is not satisfactory, the Contractor shall install a satisfactory means of communication, such as telephone or other suitable devices. The devices shall be made available for use by Government personnel.

1.8 TEMPORARY PROJECT SAFETY FENCING

As soon as practicable, but not later than 15 days after the date established for commencement of work, the Contractor shall furnish and erect temporary project safety fencing at the work site. The safety fencing shall be a high visibility orange colored, high density polyethylene grid or approved equal, a minimum of 1.1 m high, supported and

tightly secured to steel posts located on maximum 3 m centers, constructed at the approved location. The safety fencing shall be maintained by the Contractor during the life of the contract and, upon completion and acceptance of the work, shall become the property of the Contractor and shall be removed from the work site.

1.9 PARTNERING

Following contract award, the Government intends to propose a voluntary partnering relationship with the Contractor. This partnering relationship will attempt to draw on strengths of each organization to facilitate communications and minimize delays to achieve a quality product, within budget, and on schedule. Participation in such partnering activities may include attendance at coordination meetings and cooperation in other efforts to promote the partnering relationship. The Government and the Contractor will each bear their own costs for participation in the partnering relationship, with no change in the contract price. Participation will not result in any change in the terms or price of the contract.

1.10 INSTALLATION REGULATIONS

The employees of the Contractor will be required to abide by all installation regulations as published by the Commanding Officer. A copy of these regulations can be obtained from the Area/Resident Engineer at the installation. All costs in connection therewith shall be included in the contract price for the work. All costs in connection therewith shall be included in the contract price for the work.

1.11 TESTING LABORATORIES

Testing is required to be performed by the Contractor as part of his Quality Control Program to verify contract compliance. This Quality Control Testing is to be conducted by a project or commercial laboratory which has been found adequate and qualified by a Corps of Engineers Division Laboratory Inspection Team.

1.11.1 Approved Testing Laboratories

A composite listing of approved testing laboratories within the South Atlantic Division is available upon request. The Contractor should engage the services of a laboratory contained in the composite list. Contractors may obtain the list by calling (912) 652-5382 or (678) 354-0310. Fax requests can be made to number (678) 354-0330.

1.11.2 Other Laboratory Services

The Contractor may engage the services of a laboratory other than those approved by Corps of Engineers Division Laboratory Inspection Team if they comply with the following:

a. The Contractor identifies and proposes the unapproved laboratory a minimum of 90 days prior to the start of testing. This time is necessary to allow for scheduling an inspection by a Corps of Engineers Division Laboratory team. The time for Government inspection will not be the basis for an increase in the contract performance period.

b. All costs of Government inspection shall be the responsibility

of the Contractor.

c. The Contractor may request Government inspection and approval prior to award by forwarding a written request to:

US Army Engineer District, Savannah
Environmental and Materials Unit
ATTN: Mike Wielputz
200 North Cobb Parkway
Building 400, Suite 404
Marietta, GA 30062

1.12 OMITTED

1.13 ENVIRONMENTAL EVALUATION FOR SITE CONTAMINATION CATEGORY I

1.13.1 Site Evaluation

The job site has been evaluated for potential site contamination. There are two potential sources of contamination at this site. Once source is from storage tank fuels. An underground storage tank (UST) is located in the 200/300 block. Section 02220 DEMOLITION paragraph 3.1.1 and Section 01110 SAFETY, HEALTH AND EMERGENCY RESPONSE (HTRW) detail how the tank is to be removed and the soil sampled in accordance with Georgia UST regulations (GUST). Encountering contamination is not a reason for stopping work, however all notification of conditions must be made by the Contractor to the Contracting Officer so that the Hunter AAF environmental authorities can take appropriate steps. Contamination from above ground storage tanks (ASTs) containing heating oil may also be present. These are not regulated tanks and there are no soil sampling or other Georgia state requirements beyond removing them in an environmentally sound and safe manner. No work stoppage is anticipated.

The second source of contamination may be subsurface contamination from fuels and cleaning solvents from the flight line and hangar areas. Due to the depth of the contamination it is not expected to impact the site construction unless there is a significant change in subsurface water conditions. Encountering the contamination during excavations such as utilities and footers is not a reason to stop work. Details on handling this situation, should it occur, are found in Section 02220 DEMOLITION and Section 01110 SAFETY. HEALTH AND EMERGENCY RESPONSE (HTRW). Again notification of the Contracting Officer is required.

1.14 ENVIRONMENTAL EVALUATION FOR SITE CONTAMINATION - CATEGORY II

1.14.1 Site Evaluation

Specific details on the known contamination can be obtained from the Contracting Officer.

1.14.2 Site Analysis

There are no other known or suspected contaminants at this site beyond the fuel, fuel breakdown products and chlorinated solvents described under Category I. Should contaminants outside of fuel, fuel breakdown products and chlorinated solvents be discovered the options in paragraph 1.14.3 may be exercised.

1.14.3 Contractual Responsibilities of All Parties in the Event of

Encounter with Contamination

If the Contractor encounters materials or conditions which indicate that there may be contamination on the site, the Contractor shall stop all work on the job site and report the discovery of the contaminants to the Contracting Officer's Representative (COR). The COR, will issue a written order to the Contractor to resume work or to suspend, delay, or interrupt all or any part of the work of this contract for the period of time that the Contracting Officer determines appropriate for the convenience of the Government as provided in FAR 52.212-12 - SUSPENSION OF WORK. The Government will be responsible for making an assessment of the contaminated site if this course of action is determined to be appropriate. After the assessment has been completed, the Government reserves the right to the following courses of action:

a. Direct the Contractor to resume work.

b. Clean up the contaminated site prior to directing the Contractor to resume work. The COR will determine whether the cleanup is to be accomplished by others or the Contractor.

c. Relocate the project site.

d. Terminate the contract for the convenience of the Government as provided in FAR 52.249-1 - TERMINATION FOR CONVENIENCE OF THE GOVERNMENT (FIXED-PRICE) (SHORT FORM) or FAR 52.249-2 - TERMINATION FOR CONVENIENCE OF THE GOVERNMENT (FIXED-PRICE) - ALTERNATE I as applicable.

1.15 OMITTED
1.16 OMITTED
1.17 OMITTED
1.18 OMITTED
1.19 OMITTED

1.20 CONSTRUCTION SCHEDULE RESTRAINTS - HUNTER AAF, GA

1.20.1 Occupancy

It is the intent of these provisions to provide for maximum coordination between construction activities pursuant to this contract and concurrent ongoing routine activities of base personnel. Interference with and inconvenience to the occupants or routine of the facility shall be held to an absolute minimum.

1.20.2 Protection

Contractor is responsible to provide such covering, shields and barricades as are required to protect building occupants, equipment, stores, supplies, etc., from dust, debris, weather intrusion, water, moisture or other cause of damage resulting from construction.

1.20.3 Phasing and Sequence

1.20.3.1 General

In addition to the submittals required by clause SCHEDULES FOR CONSTRUCTION CONTRACTS (see SECTION 00700, FAR 52.236-15) the Contractor shall submit for approval a summary work schedule setting forth schedule dates for initiation and completion of construction in each work area. No work shall

be performed prior to approval of this schedule and all work shall be performed in strict adherence thereto. If departures from this schedule appear to be required or desired, the Contracting Officer shall be promptly notified and his approval will be required prior to implementation of said departure(s).

1.20.3.2 Special Work Restraints

a. The work associated with the upgrade of the central energy plant will require the existing plant to be shut down while tie-in connections are accomplished. This will make space heating and cooling unavailable to all buildings being served by the plant. The Contractor shall make the required connections to the existing heating system between the months of May and September. Additionally, the Contractor shall make the required connections to the existing cooling system between the months of November and March. Plant shutdown periods shall be kept at a minimum but in no instance shall any one shutdown period exceed 48 hours. Accordingly, the Contractor shall submit a plan for the approval of the Contracting Officer showing how the intent of this paragraph will be satisfied and the length of time plant operation will be impacted. This plan shall be submitted at least 21 days prior to commencement of work at the existing plant.

b. Building 1236 demolition shall occur 60 days after BOD of the 1200 block battalion headquarters building.

1.20.4 Time of Performance

1.20.4.1 Access to Buildings

All work requiring access to building interiors excluding attics, crawl spaces, etc., and all other work shall be performed between 7:30 a.m. and 4 p.m. (normal working hours for base where project is located) excluding official holidays, unless otherwise indicated or approved by the Contracting Officer. Requests to work during other than these normal hours shall be made in writing at least 36 hours in advance. For example, a request to work on a Saturday shall be submitted no later than Thursday at noon.

1.20.4.2 Work Requiring Outages

Work requiring outages of utilities or building systems will be accomplished during normal working hours in accordance with prior approved schedule(s).

1.20.5 Time of Performance

Contractor's work requiring outages of utility systems or building systems will require 2 weeks' advance notice and will be subject to the approval of the Contracting Officer. Notice shall include type of outage, date, and time outage will commence and estimated duration of outage.

1.20.6 Continuity

All tools, labor and materials required to complete any item of work within a given work area or requiring an outage of any building utility or system, shall be available at the site prior to commencement thereof. Once work has commenced on an item of work, said work shall be continuously and diligently performed to completion and acceptance.

1.20.7 Excavation Permits

Excavation permits will require 2 weeks' advance written notice and will be subject to the Contracting Officer's approval. Notice shall be accompanied with a sketch showing the location of the proposed excavation.

1.20.8 Road and/or Railroad Closures

Road and/or railroad closures will require 2 weeks' advance written notice and be subject to the Contracting Officer's approval. Notice shall state reason for closure, date and time closure will commence and estimated duration of closure. A sketch shall be provided showing location of excavated area and placement of barricades and signs. Closures shall be limited to a maximum of 5 calendar days.

1.20.9 Entry

Entry to all areas to be coordinated with the Provost Marshal's office, Traffic Division, Building 1251.

1.21 OMITTED
1.22 OMITTED
1.23 OMITTED
1.24 OMITTED

1.25 COLOR BOARDS

Five sets of color boards shall be submitted, in addition to samples required elsewhere. Such submittals shall be made not later than 60 days prior to approval date required to achieve compliance with approved project schedule. Each set of boards shall include samples of colors and finishes of all exterior and interior building surfaces such as walls, toilet partitions, floors and ceilings. The samples will be presented on 8-inch by 10-1/2-inch boards (modules) with a maximum spread of 24 inches by 31-1/2 inches for foldouts. The modules shall be designed to fit in a standard looseleaf, three-ring binder. If more space is needed, more than one board per set may be submitted. The Contractor shall certify that he has reviewed the color samples in detail and that they are in strict accordance with the contract drawings and specifications, except as may be otherwise explicitly stated. If multiple material and finish (color) schemes are required, samples shall be identified by scheme and coordinated to room names and numbers shown on the architectural floor plans and room finish and color schedule. Submittal of the color boards shall not relieve the Contractor of the responsibility to submit the samples required by technical specifications.

1.26 OMITTED
1.27 OMITTED

1.28 REQUEST FOR INFORMATION (RFI) SYSTEM

The Government has developed an electronic database, the Request for Information (RFI) System, to track and answer Contractor questions and requests for information and clarification during construction. The use of the RFI System for all requests (the Contractor's as well as the subcontractors'/suppliers') is a contractual requirement for this project. The Contractor will enter the system over the Internet using any WEB browser and any Internet service provider. The Government will provide the Contractor a user identification and password for the system that will only

allow the Contractor to enter and view the requests for this project. The Contractor will provide the Government the E-mail address for the individual(s) inputting into the system in order that E-mail messages can be sent from the Government to the Contractor indicating a response to the request. The Government will provide training in the use of the software, which is a Lotus NOTES application. The Contractor will enter all requests indicating the question, recommended solution (if applicable), and needed response date. The Government will be notified through an E-mail message that the Contractor has entered a request into the system. When the Government has answered the request, an E-mail message will be sent to the Contractor, informing the Contractor that the answer to the request is in the system. The Contractor will enter the system to retrieve the answer using the same procedure to enter the question. The RFI System assigns a unique number to each request. The Contractor will not be reimbursed separately for the required use of this system. The Contractor shall include any costs associated with the use of this system into the appropriate bid item.

1.29 PROGRESS PHOTOGRAPHS

The Contractor shall, during the progress of the project, furnish the Contracting Officer progress photographs and color slides to depict progress of construction. The photographic work shall be performed by a qualified, established, commercial photographer. The photographs and slides shall be taken between the 1st and 5th day of each month and be delivered to the Contracting Officer not later than the 20th day of the same month taken. The photographs and slides shall be taken from not less than six positions for each month as selected by the Contracting Officer. They shall show, inasmuch as practicable, work accomplished during the previous month. The photographs shall be 8-inch by 10-inch color glossy prints and the slides 35 millimeter color slides. Each photograph shall be identified showing date made, contract title and number and a brief description of work depicted and shall be sequentially numbered. The identifying data shall be placed on the back of the prints. Slides shall have a number placed on the frame corresponding to the appropriate identified print, the name of the project, the date and a brief description of work depicted. No identifying data shall appear on the face of prints or in the viewing area of slides. One copy of each photograph and the corresponding negative and slide shall be furnished to the Contracting Officer by the time stipulated above. No separate payment will be made for these services and all costs in connection therewith shall be considered incidental to costs of the overall project.

1.30 CLEANUP

Construction debris, waste materials, packaging material and the like shall be removed from the work site daily. Any dirt or mud which is tracked onto paved or surfaced roadways shall be cleaned away. Materials resulting from demolition activities which are salvageable shall be stored within the fenced area described above or at the supplemental storage area. Stored material not in trailers, whether new or salvaged, shall be neatly stacked when stored.

1.31 RESTORATION OF STORAGE AREA

Upon completion of the project and after removal of trailers, materials, and equipment from within the fenced area, the fence shall be removed and will become the property of the Contractor. Areas used by the Contractor for the storage of equipment or material, or other use, shall be restored

to the original or better condition. Gravel used to traverse grassed areas shall be removed and the area restored to its original condition, including top soil and seeding as necessary.

PART 2 PRODUCTS (NOT APPLICABLE)
PART 3 EXECUTION (NOT APPLICABLE)

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SECTION 01780

AS-BUILT DRAWINGS SUBMITTALS

01/99

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CEGS-01780 (January 1999)

SECTION 01780

AS-BUILT DRAWINGS SUBMITTALS
01/99

PART 1 GENERAL

1.1 OMITTED

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES.

SD-18 Records

As-Built Drawings; GA.

Drawings showing final as-built conditions of the project. The CADD drawings shall consist of two sets of completed final as-built drawings on separate media. One set of media shall be CADD drawing files. The other set of media shall consist of one set of mylars, two sets of blue line prints of the mylars, and the approved marked working as-built prints.

As-Built Record of Equipment and Materials; GA.

Two copies of the record listing the as-built materials and equipment incorporated into the construction of the project.

1.3 PROJECT RECORD DOCUMENTS

1.3.1 As-Built Drawings

This paragraph covers as-built drawings complete, as a requirement of the contract. The terms "drawings," "contract drawings," "drawing files," "working as-built drawings" and "final as-built drawings" refer to contract drawings which are revised to be used for final as-built drawings.

1.3.1.1 Government Furnished Materials

One set of electronic CADD files in the specified software and format revised to reflect all bid amendments will be provided by the Government at the preconstruction conference for projects requiring CADD file as-built drawings.

1.3.1.2 Working As-Built and Final As-Built Drawings

The Contractor shall revise two sets of paper drawings by red-line process to show the as-built conditions during the prosecution of the project. These working as-built marked drawings shall be kept current on a weekly basis and available on the job site at all times. Changes from the contract plans which are made in the work or additional information which might be uncovered in the course of construction shall be accurately and

neatly recorded as they occur by means of details and notes. Final as-built drawings shall be prepared after the completion of specific phases of work (foundations, utilities, structural steel, etc., as appropriate for the project). The working as-built marked prints and final as-built drawings will be jointly reviewed for accuracy and completeness by the Contracting Officer and the Contractor prior to incremental submission of each monthly pay estimate. If the Contractor fails to maintain the working and finalas-built drawings as specified herein, the Contracting Officer will deduct from the monthly progress payment an amount representing the estimated cost of maintaining the as-built drawings. This monthly deduction will continue until an agreement can be reached between the Contracting Officer and the Contractor regarding the accuracy and completeness of updated drawings. Noncompliance with regard to maintaining as-built drawings will be consideration for an interim unsatisfactory Contractor performance evaluation. The working and final as-built drawings shall show the following information, but not be limited thereto:

a. The actual location, kinds and sizes of all sub-surface utility lines. In order that the location of these lines and appurtenances may be determined in the event the surface openings or indicators become covered over or obscured, the as-built drawings shall show, by offset dimensions to two permanently fixed surface features, the end of each run including each change in direction. Valves, splice boxes and similar appurtenances shall be located by dimensioning along the utility run from a reference point. The average depth below the surface of each run shall also be recorded.

b. The location and dimensions of any changes within the building structure.

c. Correct grade, elevations, cross section, or alignment of roads, earthwork, structures or utilities if any changes were made from contract plans.

d. Changes in details of design or additional information obtained from working drawings specified to be prepared and/or furnished by the Contractor; including but not limited to fabrication, erection, installation plans and placing details, pipe sizes, insulation material, dimensions of equipment foundations, etc.

e. The topography, invert elevations and grades of drainage installed or affected as part of the project construction.

f. Changes or modifications which result from the final inspection.

g. Where contract drawings or specifications present options, only the option selected for construction shall be shown on the final as-built prints.

h. If borrow material for this project is from sources on Government property, or if Government property is used as a spoil area, the Contractor shall furnish a contour map of the final borrow pit/spoil area elevations.

i. Systems designed or enhanced by the Contractor, such as, HVAC controls, fire alarm, fire sprinkler, and irrigation systems.

j. Modifications (change order price shall include the Contractor's cost to change working and final as-built drawings to reflect modifications) and comply with the following procedures.

(1) Directions in the modification for posting descriptive changes shall be followed.

(2) A modification circle shall be placed at the location of each deletion.

(3) For all new details or sections which are added to a drawing, a modification circle shall be placed by the detail or section title.

(4) For minor changes, a modification circle shall be placed by the area changed on the drawing (each location).

(5) For major changes to a drawing, place a modification circle by the title of the affected plan, section, or detail at each location.

(6) For changes to schedules or drawings, a modification circle shall be placed either by the schedule heading or by the change in the schedule.

(7) The modification circle size shall be 12.7 mm diameter unless the area where the circle is to be placed is crowded. Smaller size circle shall be used for crowded areas.

1.3.1.3 Drawing Preparation

The as-built drawings shall be modified as may be necessary to correctly show the features of the project as it has been constructed by bringing the contract set into agreement with approved working as-built prints, adding such additional drawings as may be necessary. At the time of final inspection, 1 copy of the working as-built prints shall be delivered to the Contracting Officer for review and approval. These working as-built marked prints shall be neat, legible and accurate. These drawings are part of the permanent records of this project and shall be returned to the Contracting Officer. Any drawings damaged or lost by the Contractor shall be satisfactorily replaced by the Contractor at no expense to the Government.

1.3.1.4 Computer Aided Design and Drafting (CADD) Drawings

Only personnel proficient in the preparation of CADD drawings shall be employed to modify the contract drawings or prepare additional new drawings. Additions and corrections to the contract drawings shall be equal in quality and detail to that of the originals. Line colors, line weights, lettering, layering conventions, and symbols shall be the same as the original line colors, line weights, lettering, layering conventions, and symbols. If additional drawings are required, they shall be prepared using the specified electronic file format applying the same guidance specified for original drawings. The title block and drawing border to be used for any new final as-built drawings shall be identical to that used on the contract drawings. Additions and corrections to the contract drawings shall be accomplished using CADD files . The Contractor will use the most current version of Microstation software using Windows NT operating system. The electronic files will be supplied on ISO 9660 Format compact dics, read-only memory (CD-ROM). The Contractor shall be responsible for providing all program files and hardware necessary to prepare final as-built drawings. The Contracting Officer will review final as-built drawings for accuracy and the Contractor shall make all required corrections, changes, additions, and deletions.

a. When final revisions have been completed, the cover sheet drawing

shall show the wording "RECORD DRAWING AS-BUILT" followed by the name of the Contractor in letters at least 5 mm high. All other contract drawings shall be marked either "AS-Built" drawing denoting no revisions on the sheet or "Revised As-Built" denoting one or more revisions. Original contract drawings shall be dated in the revision block.

b. After receipt by the Contractor of the approved working as-built prints and approval of completed sections of final as-builts the Contractor shall, within 10 days for each specific phase of work for contracts less than $5 million, or 20 days for each specific phase of work for contracts $5 million and above, make the final as-built submittal. This submittal shall consist of one ISO 9660 compact disc, read-only memory (CD-ROM), one set of mylars, and two sets of prints of these drawings and the return of the approved marked working as-built prints. They shall be complete in all details and identical in form and function to the contract drawing files supplied by the Government. Any transactions or adjustments necessary to accomplish this are the responsibility of the Contractor. The Government reserves the right to reject any drawing files it deems incompatible with the customer's CADD system. All paper prints, drawing files and storage media submitted will become the property of the Government upon final approval. Failure to submit final as-built drawing files and marked prints as specified shall be cause for withholding any payment due the Contractor under this contract and shall be grounds for a final unsatisfactory Contractor performance evaluation. Approval and acceptance of final as-built drawings shall be accomplished before final payment is made to the Contractor.

1.3.1.5 Omitted

1.3.1.6 Payment

No separate payment will be made for as-built drawings required under this contract, and all costs in connection therewith shall be considered a subsidiary obligation of the Contractor.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

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SAVH-02091

SECTION 02091

PCB BALLASTS, TRANSFORMERS AND HAZARDOUS WASTE LAMP REMOVAL AND RECYLING

PART 1 GENERAL

Buildings S-223, T-1213, S-1214, T-1215, P-1216, T-1217, S-1218, S-1227, S-1229, S-1230, S-1231, S-1235, S-1236, S-1248, S-1251, S-1259 and S-1260 are scheduled for demolition. Electrical fixtures, classed as 'Hazardous Waste Lamps' (HWL) found in these buildings include (but may not be limited to) fluorescent downlight with compact fluorescence, troffers with 2 and 4 lamp fluorescents ranging in length from 20 inches to 8 feet, and exterior high intensity direct (HID) fixtures. These fixtures are to be removed prior to demolition after all asbestos containing materials have been removed. Fixtures are regulated based upon the presence of PCB containing electrical equipment. HWLs are regulated due to the mercury contained in the lamps. Not all buildings and all rooms of the buildings were available for inspection. All ballasts were assumed PCB ballast without inspection. Lighted exit signs, when found, were assumed to be fluorescent replacements, although some may be incandescent. Numbers provided here are estimates based upon the type of building and building usage. Incidental spare bulbs found in utility rooms and closets are included in this estimate. Utility (streetlight) metal halide lamps are not included in this estimate. The Contractor shall verify number and type of HWLs and ballasts to be removed and recycled. Estimated quantities are as follows:

S- 223, 3 to 4-ft Fluorescent tubes, 65
Fluorescent exit sign lights 2
Ballasts (assumed PCB containing) 32

T-1213, 3 to 4-ft Fluorescent tubes, 90
Fluorescent exit sign lights 2
Ballasts (assumed PCB containing) 24

S-1214, 3 to 4-ft Fluorescent tubes, 25
Fluorescent exit sign lights 2
Metal Halide exterior lights 4
Ballasts (assumed PCB containing) 6

T-1215, 3 to 4-ft Fluorescent tubes, 122
20-inch Fluorescent tubes 12
Fluorescent exit sign lights 2
Ballasts (assumed PCB containing) 36

P-1216, 3 to 4-ft Fluorescent tubes, 50
8-ft Fluorescent tubes, 48
Fluorescent exit sign lights 2
Ballasts (assumed PCB containing) 72

T-1217, 3 to 4-ft Fluorescent tubes, 154
6-ft Fluorescent tubes 4
Fluorescent exit sign lights 2
Ballasts (assumed PCB containing) 40

S-1218, 3 to 4-ft Fluorescent tubes, 50
Fluorescent exit sign lights

Ballasts (assumed PCB containing) 50

S-1227, 3 to 4-ft Fluorescent tubes, 32
20-inch Fluorescent tubes 16
Fluorescent exit sign lights 2
Ballasts (assumed PCB containing) 12

S-1229, 3 to 4-ft Fluorescent tubes, 154
2-ft Fluorescent tubes 16
Fluorescent exit sign lights 2
Ballasts (assumed PCB containing) 64

S-1230, 3 to 4-ft Fluorescent tubes, 52
Fluorescent exit sign lights, none
Ballasts (assumed PCB containing) 50

S-1231, 3 to 4-ft Fluorescent tubes, 62
Fluorescent exit sign lights 2
Ballasts (assumed PCB containing) 24

S-1235, 3 to 4-ft Fluorescent tubes, 94
Fluorescent exit sign lights 2
Ballasts (assumed PCB containing) 40

S-1236, 3 to 4-ft Fluorescent tubes, 92
Fluorescent exit sign lights 2
Ballasts (assumed PCB containing) 23

S-1248, 3 to 4-ft Fluorescent tubes, 52
Fluorescent exit sign lights 2
Ballasts (assumed PCB containing) 12

S-1251, 3 to 4-ft Fluorescent tubes, 67
Fluorescent exit sign lights 2
Ballasts (assumed PCB containing) 32

S-1259 3 to 4-ft Fluorescent tubes, 92
Fluorescent exit sign lights 2
Ballasts (assumed PCB containing) 46

S-1260 3 to 4-ft Fluorescent tubes, 90
20-inch Fluorescent tubes 2
Fluorescent exit sign lights 2
Ballasts (assumed PCB containing) 23

Total: 3 to 4-ft Fluorescent tubes, 1,343
20-inch /2 foot Fluorescent tubes 30
Fluorescent exit sign lights
6-ft Fluorescent tubes 4
8-ft Fluorescent tubes, 48
Ballasts (assumed PCB containing) 586

The State of Georgia and the Federal EPA considers unbroken mercury containing lamps as universal waste. Unbroken lamps shall be packed and shipped with applicable Department of Transportation Labeling. They do not need full hazardous materials manifesting. They do require a Universal Waste "Bill of Lading" and a state of Georgia "Universal Waste" (GAU) number. Broken HWL are considered "Hazardous Waste" and RCRA and DOT requirements apply.

Transformers, capacitors, electrical light ballasts, electromagnets, switches, and voltage regulators are considered PCB Articles, subclassed as PCB Equipment. They shall also be removed and recycled or disposed of as required by local, state and federal regulations. All capacitors are assumed to contain PCBs unless a label or chemical analysis states that they do not. PCB ballasts must be disposed of as hazardous wastes and may not be re-sold to subsequent users.

1.1 WORK REQUIREMENTS

The Contractor shall provide all personnel, transportation, services, materials, equipment, technical and management support required to perform the requirements as defined in this specification. The Contractor shall document the results of all recycling efforts.

1.2 DEFINITIONS

1.2.1 Certified Recycling Facility (CRF)

A facility that can validate that recyclable materials received are manufactured into new materials for commercial sale or are reused onsite by the facility.

1.2.2 Georgia EPD

Georgian Environmental Protection Division of the Department of Natural Resources.

1.2.3 Hazardous Materials Transporter

A person engaged in the off-site transportation of waste mercury-containing lamps, or PCB ballasts and transformers by air, rail, highway or water.

1.2.4 PCB Ballasts

Light ballasts weighing less than 50 pounds that may contain polychlorinated biphenyls (PCBs).

1.2.5 Hazardous Waste Lamps (HWL)

Any type of high or low pressure lighting device that is unprocessed, contains mercury and generated light through the discharge of electricity either directly or indirectly through a fluorescing coating. Includes fluorescent lamps, mercury lamps, metal halide lamps and high-pressure sodium lamps.

1.2.6 Waste Mercury-Containing Lamp Transfer Facility

Any transportation-related facility including loading docks, parking areas, storage areas and other similar areas where shipments of waste mercury-containing lamps are held during the normal course of transportation for 10 days or less.

1.3 REFERENCES, PUBLICATIONS AND FORMS

The Contractor shall comply with the issue or version (including all changes and amendments) of Federal, State and local environmental statutes and regulations in effect on the day of issuance of this contract,

including the applicable portions of the documents cited in the basic contract. References include but are not limited to the following.

Environmental Protection Agency 40 CFR Parts 260, 261, 264, 265, 268, 270 and 273

Environmental Protection Agency, Resource Conservation and Recovery Act (RCRA) (40 CFR 266).

Environmental Protection Agency, Disposal of Polychlorinated Biphenyls (PCBs) Federal Register vol. 63 29 June 1998, p. 25283 together with 40 CFR 761.

Hazardous Waste Management System: Modification of the Hazardous Waste Program; Hazardous Waste Lamps, Final Rule Federal Register Vol. 64 No. 128, July 6 1999 Rules and Regulations

Hazardous Waste and Emergency Responder 29 CFR 1926.65

1.4 SUBMITTALS

SD-09 Reports

PCB Articles and Hazardous Waste Lamps Disposition Report; GA|D.

Three separately bound copies of all logs, invoices, forms, notices, manifests, bills of lading or other shipping documents shall be submitted at the completion of the removal operations specified in this section.

SD-13 Certificates

Certification of Approved Recycling or Transfer Facility; GA|D.

To be submitted 30 days prior to the removal of recyclable from the site (reference paragraph 3.1.e. 3.1.f) and any time the Contractor changes facilities.

SD-18 Records

Receipt of Materials at Transfer or Recycling Facility or TSDF; GA|D.

To be submitted no later than 30 days from the date of shipment (reference paragraph 3.1.e. 3.1.f)..

Spill Prevention and Response Plan; GA|D.

Three separately bound copies including the names of workers responsible for handling of PCB articles and HWLs. Submittal shall include the requirements of 29 CFR 1926.65 Emergency Responders and all applicable training and certifications.

PART 2 PRODUCTS

2.1 GOVERNMENT-FURNISHED ITEMS AND SERVICES

The Government shall not provide any materials or services under this specification.

2.2 CONTRACTOR-FURNISHED ITEMS AND SERVICES

The Contractor shall furnish everything required to meet the conditions of this specification.

2.2.1 Equipment, Materials and Tools

The Contractor shall furnish all labor, equipment, materials, supplies, containers, labels, tools, vehicles and supervision necessary to perform the work defined in this specification.

2.2.2 Equipment

All equipment which is used by the Contractor to collect, transfer, transport, containerize and otherwise handle waste mercury-containing lamps, PCB ballasts and transformers shall meet all applicable federal and state requirements. Appropriate and permitted vehicles must be used to collect and transport the recyclable hazardous materials to the appropriate transfer and recycling/reclaim facilities.

2.2.3 Materials

The Contractor shall provide appropriate collection containers for the safe collection and shipment of waste mercury-containing lamps that will accommodate 4 foot and 8 foot tube lengths as well as other sized and shaped lamps, and for the collection and shipment of small PCB ballasts and transformers. Containers provided by the Contractor shall meet the requirements of the receiving certified recycling facility and the Department of Transportation (DOT). The Contractor shall also provide appropriate shipping labels for these containers.

2.2.4 Labeling Collection Containers

Logo decals and descriptive labels (i.e. "Used Mercury-Containing lamps" or "PCB Ballasts") shall initially be placed by the Contractor on all containers used to collect these materials respectively. Used Mercury-containing lamps shall not be considered hazardous waste while intact.

2.2.5 Transportation

The Contractor shall provide permitted transportation for the collection, transfer, removal and transport of waste mercury-containing lamps, PCB ballasts and transformers from Hunter Army Airfield to appropriate recycling and reclamation facilities.

2.2.6 Forms and Notifications

It is the responsibility of the Contractor to determine which forms must be completed for compliance with State, Federal, and local requirements complete and submit these forms. Copies of all notification forms shall be included in the PCB ARTICLES AND HAZARDOUS WASTE LAMPS DISPOSITION REPORT.

PART 3 EXECUTION

3.1 SPECIFIC TASKS

a. The Contractor shall perform mercury-containing fluorescent light, HID light and PCB ballast/transformer recycling/disposal. These materials are to be recycled within the United States.

b. The Contractor, along with the Contracting Officer or his designated representative, shall determine a fixed quantity of said materials to be removed from the buildings prior to commencement of work. Broken HWL shall be noted at this time. Estimates provided here are to be verified by the Contractor prior to bid submittal.

c All waste mercury-containing lamps shall be delivered to a certified recycling facility (CRF), which has been approved prior to use by the Contracting Officer or his representative, where they shall be disassembled, reclaimed and prepared for marketing as a raw material in a manner that constitutes recycling as defined in the Resource Conservation and Recovery Act (RCRA) (40 CFR 266).

d. PCB ballasts and transformers shall be delivered to a certified recycling facility (CRF) which has been approved prior to use by the Contracting Officer, where they shall be disassembled. PCB-contaminated liquids shall be incinerated in accordance with 40 CFR 720. All other parts of the ballast shall be reclaimed, reused or prepared for marketing as a raw material in a manner that constitutes recycling as defined in RCRA (40 CFR 266).

e. The Contractor must submit copies of manifests, bills of lading and other receipts for every shipment transported off-site from Hunter Army Airfield, to a transfer facility or recycling facility. All copies must show name, address and phone number of receiving facility, as well as weight in pounds of materials being received. Receipts must be only for materials removed at Hunter Army Airfield under this contract. The Contractor, in accordance with RCRA regulations and the newly adopted State and Federal standards for mercury-containing lamps, must fulfill all applicable transportation and record keeping requirements.

f. The Contractor shall ensure that all mercury-containing lamps, PCB ballasts, and transformers are transported by a permitted hazardous materials transporter directly to a permitted transfer facility or permitted recycling facility, completing proper DOT shipping documentation and obtaining signature of transfer on shipping documentation from the Contracting Officer prior to leaving the site.

g. The Contractor shall take all precautions against breakage of mercury-containing lamps. If any mercury-containing lamps are broken during handling by the Contractor, they are considered to be hazardous waste and handled in accordance RCRA regulation. The Contractor shall be responsible for all costs associated with the cleanup and disposal of hazardous waste generated by the Contractor's employees if intact lamps are broken while being collected and transported.

h. It is the Contractor's responsibility to clean up any pre-existing broken HWL. This material is to be treated, shipped and disposed of as hazardous waste and shall meet all of the requirements (personal protective equipment, hazard posting, site control, emergency responder training, medical clearance to wear a respirator, etc., as stated in OSHA's Hazardous Waste Site and Emergency Responder, 29 CFR 1926.65). Prior to removal activities, the Contractor shall walk the buildings scheduled for demolition with the Contracting Officer to determine the number of broken HWLs. The Contractor shall submit an estimate for the clean-up and disposal costs of broken HWL and will be reimbursed by the Government. All other breakage caused by the removal and handling of the HWLs shall be the Contractor's responsibility and will not be reimbursable, as the Government

will not have generated it.

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12/97

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CEGS-02220 (December 1997)

SECTION 02220

DEMOLITION
12/97

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.

ENGINEERING MANUALS (EM)

EM 385-1-1	(1996) U.S. Army Corps of Engineers Safety and Health Requirements Manual

1.2 GENERAL REQUIREMENTS

The work includes demolition, salvage of identified items and materials, and removal of resulting rubbish and debris. 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; salvaged items and materials shall be disposed of as specified.

1.3 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-08 Statements

Work Plan; FIO.

The procedures proposed for the accomplishment of the work. The procedures shall provide for safe conduct of the work, including procedures and methods to provide necessary supports, lateral bracing and shoring when required, careful removal and disposition of materials specified to be salvaged, protection of property which is to remain undisturbed, coordination with other work in progress, and timely disconnection of utility services. The procedures shall include a detailed description of the methods and equipment to be used for each operation, and the sequence of operations in accordance with EM 385-1-1.

1.4 DUST CONTROL

The amount of dust resulting from demolition shall be controlled to prevent

the spread of dust to occupied portions of the construction site and to avoid creation of a nuisance in the surrounding area. Use of water will not be permitted when it will result in, or create, hazardous or objectionable conditions such as ice, flooding, erosion and pollution. Extensive lead-based paint (LBP) testing has not been performed on these buildings. Dusts from LBP may occur during demolition.

1.5 PROTECTION

1.5.1 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. It is the responsibility of the Contractor to protect his workers from all hazardous demolition generated dusts, particularly those which may contain lead particles. The protection provided by the Contractor is considered standard safety and health protection similar to protection requiring hearing protection, safety glasses, hard hat and safety boots. Dust inhalation protection is not considered a separate, reimbursable or additional expense.

1.5.2 Protection of Structures

Floors, roofs, walls, columns, pilasters, and other structural components that are designed and constructed to stand without lateral support or shoring, and are determined to be in stable condition, shall remain standing without additional bracing, shoring, of lateral support until demolished, unless directed otherwise by the Contracting Officer. The Contractor shall ensure that no elements determined to be unstable are left unsupported and shall be responsible for placing and securing bracing, shoring, or lateral supports as may be required as a result of any cutting, removal, or demolition work performed under this contract.

1.5.3 Protection of Existing Property

Before beginning any demolition work, the Contractor shall survey the site and examine the drawings and specifications to determine the extent of the 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. The Contractor shall ensure that structural elements are not overloaded and shall be responsible for increasing structural supports or adding new supports as may be required as a result of any cutting, removal, or demolition work performed under this contract.

1.5.4 Protection From the Weather

Salvageable materials and equipment shall be protected from the weather at all times.

1.5.5 Protection of 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 1.8 m (6 foot) high fence. The fence shall be securely erected a minimum of 1.5 m 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.

1.5.6 Environmental Protection

The work shall comply with the requirements of Section 01410 ENVIRONMENT PROTECTION.

1.6 BURNING

The use of burning at the project site for the disposal of refuse and debris will not be permitted unless authorized by the Contracting Officer.

1.7 USE OF EXPLOSIVES

Use of explosives will not be permitted.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION

3.1 EXISTING STRUCTURES

Existing structures indicated shall be removed completely.

3.1.1 Heating Oil Tanks

There is one underground heating oil tank within the 200/300 blocks that shall be removed. This tank is located at building 223. It is 1500 gallons in capacity. This tank shall be removed in accordance with the Georgia Underground Storage Tank regulations (Underground Storage Tank (UST) Closure Guidance, GUST-9, Georgia Department of Natural Resources). The Contractor shall empty any remaining heating oil before tank removal begins. Soil samples shall be collected from the UST excavation at a depth of 2 feet below the bottom of the excavation (See GUST-9 for specifics). Each soil sample must be analyzed for benzene, toluene, etheylbenzene and xylenes (BTEX), Polynuclear Aromatic Hydrocarbons (PAHs), and Total Petroleum Hydrocarbons Diesel Range Organics (TPH-DRO). If ground water is encountered in the excavation, soil and ground-water samples must be collected. Ground water shall be analyzed for BTEX and PAHs. The tank itself shall be inerted, cleaned, transported and the steel recycled as per all State and Federal regulations. The information collected must be compiled into a closure report formatted to Underground Storage Tank Management Program specifications and submitted to Fort Stewart/HAAF Environmental Branch.

In addition to the UST, there is one aboveground heating oil tank at building 223 and thirteen aboveground heating oil tanks within the 1200 block that shall be removed. These other tanks are located at buildings 1213, 1215, 1217, 1218, 1227, 1229, 1231, 1235, 1236, 1248, 1251, 1259, and 1260. Two of the tanks are 1000 gallons in capacity. The remaining tanks are 550 gallons or less in capacity. These tanks shall be removed in an environmentally sound method (inerted, cleaned, transported and the steel

recycled as per all State and Federal regulations). The collection of soil and ground-water sampling is NOT required for these tanks nor is a report.

3.2 UTILITIES

Existing utilities shall be removed as indicated. 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. As this area is close to and in some instances above contaminated groundwater and subsurface soil there is the potential that contamination may be encountered during utility removal and new installation. Should the Contractor encounter soil staining, petroleum or solvent-like odors, or other questionable odors during subsurface work, he is to stop work and contact the Contracting Officer immediately.

Further work at the site may require the development of a site safety and health plan (SSHP) in order to perform site activities safely. The specification on how to prepare a SSHP and the types of contaminants known to be in the area are contained in Section 01110. Only one SSHP shall be developed, by the prime Contractor, for all work on this project. Changes or additions to the SSHP shall be made, by the Contractor, utilizing approved addendums.

3.3 FILLING

Holes and other hazardous openings shall be filled in accordance with Section 02315, EXCAVATION, FILLING AND BACKFILLING FOR BUILDINGS.

3.4 DISPOSITION OF MATERIAL

Title to material and equipment to be demolished, except Government salvage and historical items, is vested in the Contractor upon receipt of notice to proceed. The Government will not be responsible for the condition, loss or damage to such property after notice to proceed.

3.4.1 Salvageable Items and Material

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

3.4.1.1 Material Salvaged for the Contractor

Material salvaged for the Contractor shall be stored as approved by the Contracting Officer and shall be removed from Government property before completion of the contract. Material salvaged for the Contractor shall not be sold on the site.

3.4.1.2 Items Salvaged for the Government

Salvaged items to remain the property of the Government shall be removed in a manner to prevent damage, and packed or crated to protect the items from damage while in storage or during shipment. Items damaged during removal or storage shall be repaired or replaced to match existing items. Containers shall be properly identified as to contents.

3.4.1.3 Disposal of Materials

The Contractor shall dispose of demolition debris in an approved manner in accordance with Federal, State and local requirements. Copies of landfill receipts shall be submitted to the COR within 3 days of debris delivery.

Due to the age of the buildings, a representative sample of construction debris materials was taken from 5 buildings, representing each of the different ages of the site buildings. They were tested by total characteristic leaching procedure (TCLP) to determine if there is any leachable lead. Buildings S1230, S-1260, T-1213, S-223, and S-1218 were tested with all results being <0.5000ug/l (Specialized Assays, Inc. 18 Feb 2000). Although no LBP was abated from these buildings, under Georgia State lead requirements, none of the debris is considered a hazardous waste. All other hazardous materials, (such as asbestos, fluorescent light bulbs and PCB containing ballasts) are to be removed from the buildings prior to demolition. Should the Contractor note any hazardous materials remaining in the buildings, he is to contact the Contracting Officer immediately.

3.4.1.4 Historical Items

Historical items shall be removed in a manner to prevent damage. The following historical items shall be delivered to the Government for disposition: Corner stones, contents of corner stones, and document boxes wherever located on the site.

3.4.2 Unsalvageable Material

Concrete, masonry, and other noncombustible material, except concrete permitted to remain in place, shall be disposed of in the disposal area identified on the drawings. No concrete, masonry or other noncombustible materials covered with paint may be used for riprap or clean fill unless the Contractor, at his own expense, tests each paint type to ensure that the paint does not contain lead above the regulatory limit. Untested, painted noncombustible materials must be disposed of in a C&D landfill. Combustible material shall be disposed of in the sanitary fill area located off the installation.

3.5 CLEAN UP

Debris and rubbish shall be removed from basement and similar 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.

3.6 PAVEMENTS

Existing pavements designated for removal shall be saw cut and removed in accordance with the details shown on the drawings and to the limits and indicated on the drawing.

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SECTION 02226

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SAVH-02226

SECTION 02226

EQUIPMENT AND STRUCTURE DECONTAMINATION

PART 1 GENERAL

1.1 SCOPE

In the event that contaminated soil and/or ground water are discovered during construction activities, decontamination will be required to prevent movement of contaminants to clean areas off site, and shall be performed prior to demobilizing the equipment or moving equipment beyond designated limits as identified by the Contracting Officer.

1.2 GENERAL

The Contractor shall be responsible for constructing an equipment decontamination station in a location as approved by the Contracting Officer for removing contamination from all vehicles and removal equipment leaving the work area. The decontamination facility shall consist of the following minimum construction features:

Impermeable liner of 30 mil minimum thickness (PVC, HDPE, or other material approved by Contracting Officer).

Curbing at least 6 inches in height around the lined area to control rinse water.

Sloping construction to promote rinse water drainage to a central collection sump or area for removal.

Additional protective cover material as approved by Contracting Officer, (plywood, grating, etc.) to prevent puncture of the liner by vehicle tracking or placement of equipment during decontamination.

A special "clean area" shall be established on the decontamination pad for performing equipment maintenance. This area should be used when personnel are required by normal practices to expose themselves to contact with the ground soil, e.g., crawling under vehicle to change engine oil. All equipment being decontaminated by washdown shall be located in the decontamination area prior to maintenance work.

The decontamination area shall be considered a contaminated work area. Personnel engaged in vehicle decontamination shall wear protective equipment as required in the Contractor's Site Safety and Health Plan.

Any item taken into the contaminated area must be assumed to be contaminated and must be decontaminated before the item leaves the area. Vehicles, equipment, and/or materials brought into the contaminated area will remain there until no longer necessary to complete the work. The only travel allowed the Contractor in transportation of contaminated vehicles, equipment, and/or materials will be the direct route between the site of the work and the decontamination area as designated by the Contracting Officer.

Decontamination rinse water shall be handled as specified in the

Contractor's Plan of Operations and Health and Safety Plan in accordance with Section 01110 SAFETY, HEALTH, AND EMERGENCY RESPONSE.

PART 2 PRODUCTS (NOT APPLICABLE)
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SECTION 02230

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06/97

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CEGS-02230 (June 1997)

SECTION 02230

CLEARING AND GRUBBING
06/97

PART 1 GENERAL

1.1 DEFINITIONS

1.1.1 Clearing

Clearing shall consist of the felling, trimming, and cutting of trees into sections and the satisfactory disposal of the trees and other vegetation designated for removal, including down timber, snags, brush, and rubbish occurring in the areas to be cleared.

1.1.2 Grubbing

Grubbing shall consist of the removal and disposal of stumps, roots larger than 75 mm in diameter, and matted roots from the designated grubbing areas.

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-18 Records

Materials Other Than Salable Timber; FIO.

Written permission to dispose of such products on private property shall be filed with the Contracting Officer.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.1 CLEARING

Trees, stumps, roots, brush, and other vegetation in areas to be cleared shall be cut off flush with or below the original ground surface, except such trees and vegetation as may be indicated or directed to be left standing. Trees designated to be left standing within the cleared areas shall be trimmed of dead branches 40 mm or more in diameter and shall be trimmed of all branches the heights indicated or directed. Limbs and branches to be trimmed shall be neatly cut close to the bole of the tree or main branches. Cuts more than 40 mm in diameter shall be painted with an approved tree-wound paint. Trees and vegetation to be left standing shall be protected from damage incident to clearing, grubbing, and construction operations by the erection of barriers or by such other means as the circumstances require. Clearing shall also include the removal and disposal of structures that obtrude, encroach upon, or otherwise obstruct the work.

3.2 GRUBBING

Material to be grubbed, together with logs and other organic or metallic debris not suitable for foundation purposes, shall be removed to a depth of not less than 450 mm below the original surface level of the ground in areas indicated to be grubbed and in areas indicated as construction areas under this contract, such as areas for buildings, and areas to be paved. Depressions made by grubbing shall be filled with suitable material and compacted to make the surface conform with the original adjacent surface of the ground.

3.3 TREE REMOVAL

Where indicated or directed, trees and stumps that are designated as trees shall be removed from areas outside those areas designated for clearing and grubbing. This work shall include the felling of such trees and the removal of their stumps and roots as specified in paragraph GRUBBING. Trees shall be disposed of as specified in paragraph DISPOSAL OF MATERIALS.

3.4 DISPOSAL OF MATERIALS

3.4.1 Salable Timber

All felled timber from which saw logs, pulpwood, posts, poles, ties, mine props, or cordwood can be produced shall be considered as salable timber, and shall be trimmed of limbs and tops, sawed into salable lengths and stockpiled at locations as directed. The disposal of the stockpiled timber will be by the Government.

3.4.1 Materials Other Than Salable Timber

Logs, stumps, roots, brush, rotten wood, and other refuse from the clearing and grubbing operations, except for salable timber, shall be disposed of outside the limits of Government-controlled land at the Contractor's responsibility, except when otherwise directed in writing. Such directive will state the conditions covering the disposal of such products and will also state the areas in which they may be placed.

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CEGS-02300 (December 1997)

SECTION 02300

EARTHWORK
12/97

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	(1996) Sieve Analysis of Fine and Coarse Aggregates
ASTM D 422	(1963; R 1990) Particle-Size Analysis of Soils
ASTM D 1140	(1992) Amount of Material in Soils Finer than the No. 200 (75-micrometer) Sieve
ASTM D 1556	(1990; R 1996) Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D 1557	(1991) Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/cu. ft. (2,700 kN-m/cu. m.))
ASTM D 2216	(1992) Laboratory Determination of Water (Moisture) Content of Soil and Rock
ASTM D 2487	(1993) Classification of Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D 4318	(1995a) Liquid Limit, Plastic Limit, and Plasticity Index of Soils

1.2 OMITTED
1.3 OMITTED

1.4 DEFINITIONS

1.4.1 Satisfactory Materials

Satisfactory materials shall comprise any materials classified by ASTM D 2487 as GW, GP, GM, GP-GM, GW-GM, GC, GP-GC, GM-GC, SW, SP, SM, SW-SM, SC, SW-SC, SP-SM, SP-SC, CL, ML, and CL-ML. Satisfactory materials for grading shall be free from roots and other organic matter, trash, debris, frozen material, and stones larger than 75 mm in any dimension.

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; demolition debris; 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 is expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM D 1557abbreviated as a percent of laboratory maximum density.

1.4.5 Omitted

1.4.6 Topsoil

Material suitable for topsoils shall be obtained from required stripping of the project site and/or offsite areas. Requirements for topsoil are specified in Section 02935 TURF.

1.5 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-08 Statements

Earthwork; FIO.

Procedure and location for disposal of unused satisfactory material. Proposed source of borrow material.

SD-09 Reports

Testing; FIO.

Within 24 hours of conclusion of physical tests, three copies of test results.

SD-13 Certificates

Testing; GA|F.

Qualifications of the commercial testing laboratory.

SD-18 Records

Earthwork; FIO.

Notification of encountering rock in the project. Advance notice on the opening of excavation or borrow areas. Advance notice on shoulder construction for rigid pavements.

1.6 SUBSURFACE DATA

Locations of Standard Penetration Tests (SPT) and Cone Penetrometer Tests (CPT) are shown in the civil plates of the drawings. Subsurface soil boring logs and laboratory soil test results are shown in the geotechincal plates of the drawings. CPT soundings are shown in Appendix A. SPT and CPT surface elevations and water level readings are found in Appendix B. These data represent the best subsurface information available; however, variations may exist in the subsurface between boring locations. Two ground water level readings are generally shown for the CPTs. One reading was recorded immediately after the sounding was complete and the second was taken 24 hours after completion of the sounding. The 24-hour reading is considered the true groundwater depth. The groundwater elevations are for the dates indicated. Seasonal fluctuations of the ground water table are expected.

1.7 CLASSIFICATION OF EXCAVATION

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

1.8 BLASTING

Blasting will not be permitted.

1.9 UTILIZATION OF EXCAVATED MATERIALS

Unsatisfactory materials removed from excavations shall be disposed off site. 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. Satisfactory material authorized to be wasted shall be disposed of in designated areas approved for surplus material storage or designated waste areas as directed. No excavated material shall be disposed of to obstruct the flow of any stream, endanger a partly finished structure, impair the efficiency or appearance of any structure, or be detrimental to the completed work in any way.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.1 STRIPPING OF TOPSOIL

Where indicated, specified, or directed, topsoil shall be stripped to full depth. 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 50 mm 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 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 1 meter 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. 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.

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 shown or from other approved sources, either private or within the limits of the project site, selected by the Contractor. 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. Borrow material from

approved sources on Government-controlled land may be obtained without payment of royalties. Unless specifically provided, no borrow shall be obtained within the limits of the project site without prior written approval. Necessary clearing, grubbing, and satisfactory drainage of borrow pits and the disposal of debris thereon shall be considered related operations to the borrow excavation.

3.4 OPENING AND DRAINAGE OF EXCAVATION AND BORROW PITS

Except as otherwise permitted, borrow pits and other excavation areas shall be excavated providing adequate drainage. Overburden and other spoil material shall be transported to designated spoil areas or otherwise disposed of as directed. Borrow pits shall be neatly trimmed and drained after the excavation is completed. The Contractor shall ensure that excavation of any area, operation of borrow pits, or dumping of spoil material results in minimum detrimental effects on natural environmental conditions.

3.5 GRADING AREAS

Where indicated, work will be divided into grading areas within which satisfactory excavated material shall be placed in embankments, fills, and required backfills. The Contractor shall not haul satisfactory material excavated in one grading area to another grading area except when so directed in writing.

3.6 BACKFILL

Backfill adjacent to any and all types of structures shall be placed and compacted to at least 95 percent laboratory maximum density. Care shall be taken to prevent wedging action or eccentric loading upon or against the structure. Ground surface on which backfill is to be placed shall be prepared as specified in paragraph PREPARATION OF GROUND SURFACE FOR EMBANKMENTS. Compaction requirements for backfill materials shall also conform to the applicable portions of paragraphs PREPARATION OF GROUND SURFACE FOR EMBANKMENTS, EMBANKMENTS, and SUBGRADE PREPARATION, and Section 02630 STORM-DRAINAGE SYSTEM; and Section 02316 EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS. Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment.

3.7 PREPARATION OF GROUND SURFACE FOR EMBANKMENTS

3.7.1 General Requirements

Ground surface on which fill is to be placed shall be stripped of live, dead, or decayed vegetation, rubbish, debris, and other unsatisfactory material; plowed, disked, or otherwise broken up to a depth of 150 mm; pulverized; moistened or aerated as necessary to plus or minus 2.5 percent of optimum moisture; thoroughly mixed; and compacted to at least 95 percent laboratory maximum density. Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment. The prepared ground surface shall be scarified and moistened or aerated as required just prior to placement of embankment materials to assure adequate bond between embankment material and the prepared ground surface.

3.7.2 Frozen Material

Embankment shall not be placed on a foundation which contains frozen material, or which has been subjected to freeze-thaw action. This prohibition encompasses all foundation types, including the natural ground, all prepared subgrades (whether in an excavation or on an embankment) and all layers of previously placed and compacted earth fill which become the foundations for successive layers of earth fill. All material that freezes or has been subjected to freeze-thaw action during the construction work, or during periods of temporary shutdowns, such as, but not limited to, nights, holidays, weekends, winter shutdowns, or earthwork operations, shall be removed to a depth that is acceptable to the Contracting Officer and replaced with new material. Alternatively, the material will be thawed, dried, reworked, and recompacted to the specified criteria before additional material is placed. The Contracting Officer will determine when placement of fill shall cease due to cold weather. The Contracting Officer may elect to use average daily air temperatures, and/or physical observation of the soils for his determination. Embankment material shall not contain frozen clumps of soil, snow, or ice.

3.8 EMBANKMENTS

3.8.1 Earth Embankments

Earth embankments shall be constructed from satisfactory materials free of organic or frozen material and rocks with any dimension greater than 75 mm. The material shall be placed in successive horizontal layers of loose material not more than 200 mm 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 95 percent laboratory maximum density. Compaction requirements for the upper portion of earth embankments forming subgrade for pavements shall be identical with those requirements specified in paragraph SUBGRADE PREPARATION. Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment.

3.8.2 Moisture Content

Satisfactory materials in each layer of fill shall contain the amount of moisture within the limits specified below. Materials that are not within the specified limits after compaction shall be reworked regardless of density. The moisture content after compaction shall be as uniform as practicable throughout any one layer and shall be within the limits of 2.5 percentage points above optimum moisture content and 2.5 percentage points below optimum moisture content. Materials which are too wet shall be disced, harrowed, plowed, bladed, or otherwise manipulated to reduce the moisture content to within the specified limits. Materials which are too dry shall be broken up, sprinkled, and thoroughly mixed to bring the moisture content uniformly up to within specified limits. In the event that materials reach the fill which are not within the limits of moisture content specified above, the Contractor shall either adjust the moisture content to bring it within the specified limits or remove it from the fill.

3.9 SUBGRADE PREPARATION

3.9.1 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. Materials shall be moistened or aerated as necessary to plus or minus 2.0 percent of optimum moisture content. Soft or otherwise unsatisfactory material shall be removed and replaced with satisfactory excavated material or other approved material as directed. Low areas resulting from removal of unsatisfactory material 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. The elevation of the finish subgrade shall not vary more than 15 mm from the established grade and cross section.

3.9.2 Moisture Content

Satisfactory materials in the subgrade shall contain the amount of moisture within the limits specified below. Materials that are not within the specified limits after compaction shall be reworked regardless of density. The moisture content after compaction shall be as uniform as practicable throughout the subgrade and shall be within the limits of 2.0 percentage points above optimum moisture content and 2.0 percentage points below optimum moisture content. Materials which are too wet shall be disced, harrowed, plowed, bladed, or otherwise manipulated to reduce the moisture content to within the specified limits. Materials which are too dry shall be broken up, sprinkled, and thoroughly mixed to bring the moisture content uniformly up to within specified limits. When the subgrade is in cut, the top 200 mm of subgrade shall be scarified, windrowed, moistened or aerated as necessary to plus or minus 2.0 percent laboratory maximum density.

3.9.3 Compaction

Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment.

3.9.3.1 Omitted

3.9.3.2 Subgrade for Pavements

Subgrade for pavements shall be compacted to at least 95 percent laboratory maximum density for a depth of 150 mm below the surface of the subgrade.

3.9.3.3 Subgrade for Shoulders

Subgrade for shoulders shall be compacted to at least 95 percentage laboratory maximum density for the full depth of the shoulder.

3.10 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. Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment. 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.

3.11 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 30 mm 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.

3.12 PLACING TOPSOIL

On areas to receive topsoil, the compacted subgrade soil shall be scarified to a 50 mm depth for bonding of topsoil with subsoil. Topsoil then shall be spread evenly to a thickness of 100 mm 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.

3.13 TESTING

Testing shall be performed by an approved commercial testing laboratory at no additional cost to the Government. Field in-place density shall be determined in accordance with ASTM D 1556. When test results indicate, as determined by the Contracting Officer, that compaction is not as specified, the material shall be removed, replaced and recompacted to meet specification requirements. Tests on recompacted 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. The following number of tests, if performed at the appropriate time, will be the minimum acceptable for each type operation.

3.13.1 Fill and Backfill Material Gradation, Classification, and Moisture Content

One test per 250 cubic meters stockpiled or in-place source material. Gradation of fill and backfill material shall be determined in accordance with ASTM D 422. Liquid limit and plasticity index shall be determined in accordance with ASTM D 4318. Classification of soils shall be in accordance with ASTM D 2487. Moisture content shall be determined in accordance with ASTM D 2216.

3.13.2 In-Place Densities

a. One test per 400 square meters, or fraction thereof, of each lift of fill or backfill areas compacted by other than hand-operated machines.

b. One test per 75 square meters, or fraction thereof, of each lift of fill or backfill areas compacted by hand-operated machines.

c. One test per 50 linear meters, or fraction thereof, of each lift of embankment or backfill for roads.

3.13.3 Omitted

3.13.4 Moisture Contents

In the stockpile, excavation, or borrow areas, a minimum of two tests per day per type of material or source of material being placed during stable weather conditions shall be performed. During unstable weather, tests shall be made as dictated by local conditions and approved by the Contracting Officer.

3.13.5 Optimum Moisture and Laboratory Maximum Density

Tests shall be made for each type material or source of material including borrow material to determine the optimum moisture and laboratory maximum density values. Test procedures and frequency shall be as specified in paragraph TESTING of Section 02315 EXCAVATION, FILLING AND BACKFILLING FOR BUILDINGS.

3.13.6 Compaction Control

The tests required on materials prior to placement and the compaction control procedures and methods specified in Section 02315 EXCAVATION, FILLING AND BACKFILLING FOR BUILDINGS, paragraph TESTING (with exception of paragraph Frequency of Testing During Construction) in regard to compaction control of soils, and utilizing the one-point or two-point compaction methods to relate field density data to laboratory test values, shall fully apply to and be considered a part of this specification section.

3.13.7 Tolerance Tests for Subgrades

Continuous checks on the degree of finish specified in paragraph SUBGRADE PREPARATION shall be made during construction of the subgrades.

3.14 SUBGRADE AND EMBANKMENT PROTECTION

During construction, embankments and excavations shall be kept shaped and drained. Ditches and drains along subgrade shall be maintained to drain effectively at all times. The finished subgrade shall not be disturbed by traffic or other operation and shall be protected and maintained by the Contractor in a satisfactory condition until ballast, subbase, base, or pavement is placed. The storage or stockpiling of materials on the finished subgrade will not be permitted. No subbase, base course, ballast, or pavement shall be laid until the subgrade has been checked and approved, and in no case shall subbase, base, surfacing, pavement, or ballast be placed on a muddy, spongy, or frozen subgrade.

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SECTION 02315

EXCAVATION, FILLING AND BACKFILLING FOR BUILDINGS
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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	(1996) Sieve Analysis of Fine and Coarse Aggregates
ASTM D 422	(1963; R 1990) Particle-Size Analysis of Soils
ASTM D 1556	(1990; R 1996) Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D 1557	(1991) Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/cu. ft. (2,700 kN-m/cu.m.))
ASTM D 2216	(1992) Laboratory Determination of Water (Moisture) Content of Soil, and Rock
ASTM D 2487	(1993) Classification of Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D 4318	(1995a) Liquid Limit, Plastic Limit, and Plasticity Index of Soils

1.2 DEFINITIONS

1.2.1 Degree of Compaction

Degree of compaction required is expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM D 1557 abbreviated hereinafter as percent laboratory maximum density.

1.2.2 Maximum Dry Density

The maximum dry density is expressed as the maximum density obtained when the soil is compacted in accordance with ASTM D 1557, abbreviated hereinafter as laboratory maximum dry density.

1.2.3 Optimum Moisture Content

The optimum moisture content is the moisture content corresponding to the maximum dry density obtained by the test procedure presented in ASTM D 1557.

1.2.4 Subsurface Data

Locations of Standard Penetration Tests (SPT) and Cone Penetrometer Tests (CPT) are shown in the civil plates of the drawings. Subsurface soil boring logs and laboratory soil test results are shown in the geotechnical plates of the drawings. CPT soundings are shown in Appendix A. SPT and CPT surface elevations and water level readings are found in Appendix B. These data represent the best subsurface information available; however, variations may exist in the subsurface between boring locations. Two ground water level readings are generally shown for the CPTs. One reading was recorded immediately after the sounding was complete and the second was taken 24 hours after completion of the sounding. The 24-hour reading is considered the true groundwater depth. The groundwater elevations are for the dates indicated. Seasonal fluctuations of the ground water table are expected.

1.2.5 Related Work

1.2.5.1 Protection of Existing Vegetation and Improvement

Protection of existing vegetation, structures, utilities, work and improvements is specified in the CONTRACT CLAUSES.

1.2.5.2 Site Grading and Excavation and Backfilling

Site grading and excavation and backfilling for utilities beyond the 1.5 m building line are covered under Section 02300 EARTHWORK and Section 02316 EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS.

1.2.5.3 Termite Protection

Termite protection is specified under Section 02364 SOIL TREATMENT FOR SUBTERRANEAN TERMITE CONTROL.

1.3 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-08, Statements

Testing; GA|F.

Testing facilities for the performance of laboratory soil tests must be approved by the Contracting Officer prior to work being performed.

SD-09 Reports

Field Density Tests; FIO. Testing of Backfill Materials; FIO.

Copies of all laboratory and field test reports within 24 hours of the completion of the test. Each report shall be properly identified. Test methods used and compliance with specified test standards shall be described. Summary sheets specified herein shall be submitted as indicated.

Inspection, Equipment and Corrective Action Reports; FIO.

Copies of inspection reports, equipment specifications, and records of corrective action taken shall be submitted.

SD-13 Certificates

Certificates of Compliance; FIO.

Certificates of compliance indicating conformance with specified requirements shall be furnished for capillary water barrier materials.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Satisfactory Materials

2.1.1.1 Natural Insitu Soil

Satisfactory materials for natural insitu soil supporting building foundations and/or slabs shall be limited to materials classified in ASTM D 2487 as GW, GP, GM, GP-GM, GW-GM, GC, GP-GC, GM-GC, SW, SP, SM, SW-SM, SC,SW-SC, SP-SM, SP-SC, CL, ML, CL-ML, CH, MH and shall be free of trash, debris, roots or other organic matter, or stones larger than 75 mm in any dimension.

2.1.1.2 Foundation Fill or Backfill

Satisfactory material for fill or backfill supporting building foundations and/or slabs shall be limited to materials classified in ASTM D 2487 as GW, GP, GM, GP-GM, GW-GM, GC, GP-GC, GM-GC, SW, SP, SM, SW-SM, SC,SW-SC, SP-SM, SP-SC, CL, ML, CL-ML.

2.1.1.3 Fill or Backfill Adjacent to Walls

Satisfactory materials for fill or backfill adjacent to walls shall be limited to cohesionless, free draining materials classified in ASTM D 2487 as GW, GP, GM, SW, SP and SM.

2.1.2 Unsatisfactory Materials

2.1.2.1 Natural Insitu Soil

Unsatisfactory materials for fill or backfill supporting building foundations and/or slabs shall be materials classified in ASTM D 2487 as Pt, OH and OL and any other materials not defined as satisfactory.

2.1.2.2 Foundation Fill or Backfill

Unsatisfactory material for fill or backfill supporting building foundations and/or slabs shall be materials classified in ASTM D 2487 as Pt, OH, OL, CH and MH.

2.1.2.3 Fill or Backfill Adjacent to Walls

Unsatisfactory materials for fill or backfill adjacent to walls shall be materials classified in accordance with ASTM D 2487 as Pt, OH, OL, GC, SC,

CL, CH, ML and MH, GP-GM, GW-GM, GC, GP-GC, GM-GC, SM, SW-SM, SC, SW-SC, SP-SC, CL, ML, CL-ML.

2.1.2.4 Wet or Soft Materials

Materials determined by the Contracting Officer as too wet or too soft to provide a stable subgrade, foundation, or fill will be classified as unsatisfactory regardless of classification. However, if such materials do meet the appropriate ASTM D 2487 classification, the Contractor shall at no additional cost to the Government, recondition the materials.

2.1.3 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 . Cohesive materials also include the unsatisfactory organic materials Pt, OL and OH. Materials classified as GM, GP-GM, GW-GM, SW-SM, SP-SM and SM will be identified as cohesionless only when the fines have a plasticity index of zero; otherwise they will be considered cohesive.

2.2 CAPILLARY WATER BARRIER

Capillary water barrier shall consist of clean, crushed, nonporous rock, crushed gravel, or uncrushed gravel. The maximum particle size shall be 37.5 mm and no more than 2 percent by weight shall pass the 4.75 mm size sieve.

PART 3 EXECUTION

3.1 CLEARING AND GRUBBING

Clearing and grubbing is specified in Section 02230 CLEARING AND GRUBBING.

3.2 TOPSOIL

Topsoil shall be stripped to a depth as specified in Section 02300 EARTHWORK.

3.3 EXCAVATION

Excavation shall conform to the dimensions and elevations indicated for each building, structure, and footing except as specified, and shall include trenching for utility and foundation drainage systems to a point 1.5 m beyond the building line of each building and structure. Excavation shall extend a sufficient distance from walls and footings to allow for placing and removal of forms. Excavations below indicated depths will not be permitted except to remove unsatisfactory material. Unsatisfactory material encountered below the grades shown shall be removed as directed and replaced with satisfactory material; and payment will be made in conformance with the CHANGES clause of the CONTRACT CLAUSES. Satisfactory material removed below the depths indicated, without specific direction of the Contracting Officer, shall be replaced, at no additional cost to the Government, with satisfactory materials to the indicated excavation grade. Satisfactory material shall be placed and compacted as specified in paragraph FILLING AND BACKFILLING. Determination of elevations and measurements of approved overdepth excavation of unsatisfactory material below grades indicated shall be done under the direction of the Contracting Officer.

Excavated soils shall be screened at the time of excavation and separated into uncontaminated and contaminated stockpiles. Field screening shall consist of real-time organic vapor monitoring using a PID to obtain a vapor reading from every third backhoe or excavator bucket of excavated material. Organic vapors shall be measured 2 to 3 inches above the soil in the bucket of the excavation equipment as soon as it is excavated. Excavated material that has an obvious petroleum odor, visual petroleum staining, or a PID response of greater than 10 PID units shall be considered contaminated and stockpiled for analytical testing. Uncontaminated soil shall be stockpiled separately from the contaminated soil, a safe distance away from but adjacent to, the excavation. Uncontaminated soils, if suitable, shall be used as backfill. If soil screening results in readings above the 10 PID unit threshold, the contractor shall implement SECTION 01110 SAFETY, HEALTH, AND EMERGENCY RESPONSE (HTRW) of this specification.

Excavated soils screened as contaminated shall be stockpiled in the area designated on the plans for storage of contaminated material in quantities of no more than 250 cubic meters per stockpile. Contaminated soils shall be placed onto an impermeable geomembrane groundcover having a minimal thickness of 6 mils, and subsequently covered from atmospheric exposure using a 6-mil polyethylene cover. These geomembranes shall be placed to prevent the stockpiled soils from coming into contact with rain or surface water run-off and to limit the escape of volatile organic compounds from the soil.

Material stockpiled as contaminated shall be sampled and analyzed as per the approved Sampling and Analysis Plan. At a minimum, one sample shall be collected for every 250 cubic meters of material stockpiled as contaminated. Samples shall be collected from the interior of the stockpiles on the same day the stockpile was started. Samples should be analyzed by EPA method 8260, Volatile Organic Compounds. Stockpiles shall be managed in such a way to ensure correct correlation with laboratory results. All contaminants above laboratory detection limits should be compared against the risk based Type I media criteria as per Georgia Hazardous Site Response Regulations (HSRA). For samples exceeding these standards, the corresponding stockpile shall be considered contaminated and shall become the responsibility of the Contracting Officer. For samples testing below these values, the corresponding stockpile shall be considered uncontaminated and shall, if suitable, be used as fill material.

3.4 DRAINAGE AND DEWATERING

3.4.1 Drainage

Surface water shall be directed away from excavation and construction sites to prevent erosion and undermining of foundations. Diversion ditches, dikes and grading shall be provided and maintained as necessary during construction. Excavated slopes and backfill surfaces shall be protected to prevent erosion and sloughing. Excavation shall be performed so that the site, the area immediately surrounding the site, and the area affecting operations at the site shall be continually and effectively drained.

3.4.2 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 900 mm 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. While the excavation is open, the water level shall be maintained continuously, at least 0.6 m below the working level. Refer to general notes on Plate C-2 of contract drawings regarding "perched water" conditions at projected site and Section 02316 EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS, paragraph EXCAVATION FOR APPURTENANCES.

Dewatering for the Dining Facility and Building 315 is required when excavating for footings. The water being removed shall be considered contaminated with Trichloroethylene (TCE) and Tetrachloroethylene (PCE) and shall be pumped through piping to a storage tank. The tank shall be suitable for the storage of contaminated water and shall be located in the area designated on the Plans for storage of contaminated material. The minimum volume of the tank shall be 20,000 gallons. A sample representative of the total volume of the tank shall be collected and analyzed as per the approved Sampling and Analysis Plan for determining the proper disposal method prior to the removal of any of the storage tank contents. Chemical analyses of contaminated water shall conform to the requirements of the Hunter Army Airfield Waste Water Treatment Plant with documentation of all analyses performed furnished to the Contracting Officer. If test results indicate the contamination is below acceptable discharge levels required for the Hunter Army Airfield Treatment Plant, the water shall be disposed of into the sewage manhole closest to the construction site at a rate acceptable to the treatment works. If it is determined that the water in the storage tank is contaminated at levels exceeding the limits of the Hunter Army Airfield Treatment Plant, it shall be the responsibility of the Contracting Officer to properly dispose of the water. In no case shall any water pumped from any excavation be returned to the ground water or discharged to local drainage features or surface waters. Savannah District personnel conducted an environmental investigation of ground water at the site. The report of findings of this investigation is included as an Appendix of these Specifications. The raw laboratory data from the investigation can be viewed at the Savannah District office, 100 W. Oglethorpe Ave. To view the data contact the Project Manager, Robert Smith, at (912) 652-5706.

3.5 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.

3.6 CLASSIFICATION OF EXCAVATION

Excavation will be unclassified regardless of the nature of material encountered.

3.7 BLASTING

Blasting will not be permitted.

3.8 UTILITY AND DRAIN TRENCHES

Trenches for underground utilities systems and drain lines shall be excavated to the required alignments and depths. The bottoms of trenches

shall be graded to secure the required slope and shall be tamped if necessary to provide a firm pipe bed. Recesses shall be excavated to accommodate bells and joints so that pipe will be uniformly supported for the entire length.

3.9 BORROW

Where satisfactory materials are not available in sufficient quantity from required excavations, approved materials shall be obtained as specified in Section 02300 EARTHWORK.

3.10 EXCAVATED MATERIALS

Satisfactory excavated material required for fill or backfill shall be placed in the proper section of the permanent work required under this section or shall be separately stockpiled if it cannot be readily placed. Satisfactory material in excess of that required for the permanent work and all unsatisfactory material shall be disposed of as specified in Section 02300 EARTHWORK. No satisfactory material shall be wasted or used for the convenience of the Contractor unless so authorized. Stockpiles and wasted materials shall be placed, graded, and shaped for proper drainage, giving due consideration to drainage from adjacent property.

3.11 FINAL GRADE OF SURFACES TO SUPPORT CONCRETE

Excavation to final grade shall not be made until just before the capillary water barrier and concrete is to be placed.

3.12 SUBGRADE PREPARATION

3.12.1 General

Unsatisfactory material in surfaces to receive fill or in excavated areas shall be removed and replaced with satisfactory materials as directed by the Contracting Officer. The surface shall be scarified to a depth of 150 mm 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 150 mm, 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 300 mm and compacted as specified for the adjacent fill. Material shall not be placed on surfaces that are muddy, frozen, or contain frost. Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, or other approved equipment well suited to the soil being compacted. Material shall be moistened or aerated as necessary to plus or minus 2.5 percent of optimum moisture. Minimum subgrade density shall be as specified in paragraph FILLING AND BACKFILLING.

3.12.2 Special Foundation Preparation

Several borings made during the site investigation indicated the presence of loose foundation soils throughout the upper one meter of the project site. After any demolition, clearing, grubbing, and/or stripping operations and prior to the placement of any new structures, retaining walls, or fill materials, the entire site to the limits of construction shall be compacted using a minimum of six complete coverage passes with a vibratory roller.

3.12.3 Vibratory Rollers

The vibratory roller used for this site shall be equipped with a smooth steel compaction drum and shall be operated at a frequency of vibration during compaction operations between 1,200 and 1,800 vpm. Vibratory rollers may be either towed or self-propelled and shall have an unsprung drum weight that is a minimum of 60 percent of the rollers' static weight. Towed rollers shall have at least 90 percent of their weight transmitted to the ground through the compaction drum when the roller is standing in a level position hitched to the towing vehicle. Rollers shall have a minimum static weight of 9,100 kilograms, a minimum dynamic force of 18,200 kilograms and a total applied force not less than 13,100 kilograms per meter of compaction drum length. The level of amplitude and vibration frequency during compaction will be maintained uniform throughout the construction area. The Contractor shall furnish sufficient equipment manufacturer data, drawings, and computation for verification of the above specifications, and the character and efficiency of this equipment shall be subject to the approval of the Contracting Officer. Self-propelled vibratory rollers conforming with these requirements may be used, if approved by the Contracting Officer. Vibratory compaction rollers shall be operated at speeds not exceeding 3.2 kilometers per hour. Equipment used for towing shall not be considered compaction equipment. Compaction of materials, in areas where it is impracticable to use large equipment shall be performed by the use of hand guided power-driven compactors, approved by the Contractor Officer. The hand guided compactor shall have a minimum static weight of 455 kilograms.

3.13 FILLING AND BACKFILLING

3.13.1 General

Filling and backfilling shall not begin until construction below finish grade has been approved, underground utilities systems have been inspected, tested and approved, forms removed and the excavation cleaned of trash and debris. Backfill shall not be placed in areas that are wet, muddy, contain organic materials or are otherwise unacceptable to the Contracting Officer. Satisfactory materials shall be used in bringing fills and backfills to the lines and grades indicated and for replacing unsatisfactory materials. Satisfactory material shall be free from roots and other organic matter, trash, debris, frozen materials, and stones larger than 75 mm in any dimension. Where pipe and or utility lines are coated or wrapped for protection against corrosion, the backfill material up to an elevation of 600 mm above sewer lines and 300 mm above other utility lines shall be free from stones larger than 25 mm in any dimension.

3.13.2 Placement

Satisfactory materials shall be placed in horizontal layers not exceeding 200 mm in loose thickness, or 100 mm when hand-operated compactors are used. After placing, each layer shall be plowed, disked, or otherwise broken up, moistened or aerated as necessary, thoroughly mixed and compacted as specified. Backfill shall be brought to the indicated finish grade. Heavy equipment for spreading and compacting backfill shall not be operated closer to foundation or retaining walls than a distance equal to the height of backfill above the top of footing; the area remaining shall be compacted in layers not more than 100 mm in loose thickness with power-driven hand tampers suitable for the material being compacted. Backfill shall be placed carefully around pipes or tanks to avoid damage to

coatings, wrappings, or tanks. Backfill shall not be placed against foundation walls prior to 7 days after completion of each side of the wall and sloped to drain away from the wall. Prior to compaction, each layer shall be thoroughly and uniformly blended throughout its entire thickness by discing.

3.13.3 Moisture Content

Satisfactory materials in each layer of fill or backfill shall contain the amount of moisture within the limits specified below. Materials that are not within the specified limits after compaction shall be reworked regardless of density. The moisture content after compaction shall be as uniform as practicable throughout any one layer and shall be within the limits of 2.5 percentage points above optimum moisture content and 2.5 percentage points below optimum moisture content. Materials which are too wet shall be disced, harrowed, plowed, bladed, or otherwise manipulated to reduce the moisture content to within the specified limits. Materials which are too dry shall be broken up, sprinkled, and thoroughly mixed to bring the moisture content uniformly up to within specified limits. In the event that materials reach the fill which are not within the limits of moisture content specified above, the Contractor shall either adjust the moisture content to bring it within the specified limits or remove it from the fill.

3.13.4 Compaction

Compaction shall be accomplished by sheepsfoot roller, pneumatic-tired rollers, smooth-drum vibratory rollers or other approved equipment well suited to the soil being compacted. Generally, sheepsfoot rollers are best suited for compacting cohesive material while smooth-drum vibratory rollers are best suited for compacting cohesionless materials. In areas inaccessible to heavy equipment, or where in the opinion of the Contracting Officer, use of heavy equipment may cause damage to pipes, conduits, or structures, approved power-driven hand tampers suitable for the material being compacted shall be used. Each layer of fill and backfill shall be compacted to not less than the percentage of maximum density specified below.

	Percent Laboratory Maximum density
Fill embankment, and backfill	
Under structures, building slabs, steps, paved areas, around footings, and in trenches	95
Under sidewalks and grassed areas	85
Subgrade	
Under building slabs, steps, and paved area, top 300 mm	95
Under sidewalks, top 150 mm	90

Percent Laboratory
Maximum density
_____

Approved compacted subgrades that are disturbed by the Contractor's operations or adverse weather shall be scarified and compacted as specified herein before to the required density prior to further construction thereon. Recompaction over underground utilities and heating lines shall be by hand tamping. For compacted subgrades and/or any lift of fill or backfill that fails to meet the specified density requirement, the entire subgrade and/or entire lift of fill shall be broken up to a minimum depth of 225 mm, pulverized, and recompacted to the specified density, even if this action requires the removal and replacement of subsequently placed satisfactory lifts of fill. Lifts of fill placed without being field density tested will not be accepted as satisfactory under any circumstances.

3.14 TESTING

Testing shall be the responsibility of the Contractor and shall be performed at no additional cost to the Government. An approved commercial testing laboratory shall perform testing. Frequency of tests shall be as specified hereinafter. Copies of test results shall be promptly furnished to the Contracting Officer. The following number of tests, if performed at the appropriate time, shall be the minimum acceptable.

3.14.1 Types of Tests

3.14.1.1 Classification Tests

Classification of soils shall be determined in accordance with ASTM D 2487.

a. Liquid Limit and Plasticity Index: Liquid limit and plasticity index shall be determined in accordance with ASTM D 4318.

b. Sieve Analysis: Sieve analysis shall be made as specified in ASTM C 136 or ASTM D 422.

3.14.1.2 Moisture Content

Moisture content shall be determined in accordance with ASTM D 2216.

3.14.1.3 Compaction Tests

Compaction tests shall be performed by the test procedure presented in ASTM D 1557. Adequate testing shall be conducted to establish at least five points with at least one point falling within plus or minus 1.5 percentage points of the plotted optimum moisture content.

3.14.1.4 Field Density Tests

Field in-place densities shall be determined by the sand displacement method in accordance with ASTM D 1556. The Contracting Officer reserves the right to direct the locations where field density tests are to be performed. Daily density tests shall be recorded on CESAS Form 1177-Summary of Field Density Tests and an updated copy furnished to the Contracting Officer weekly. The Contracting Officer will furnish government forms to the Contractor.

3.14.2 Tests Required on Material Prior to Placement

3.14.2.1 General

All material from required excavations and borrow shall be tested prior to incorporation into the permanent work. The tests shall be representative of the various materials to be utilized. Samples shall be carefully selected to represent the full range of materials to be used as fill and/or backfill. The following minimum number of tests shall be performed on the materials prior to the placement of the materials in the work. Additional tests of these types shall be performed when materials of different classification or compaction characteristics are encountered to determine the properties of the materials. The Contracting Officer reserves the right to direct additional testing as required.

3.14.2.2 Classification Tests

Classification tests shall be performed to determine the acceptability of materials in accordance with paragraph Satisfactory Materials. Such tests on materials proposed for use as fill and/or backfill shall be performed prior to their use. Sufficient classification tests shall be performed to define the full range of all materials proposed for use. A minimum of two classification tests shall be performed on each material classified as satisfactory for use. The Contracting Officer may at any time require additional classification tests to confirm material acceptability.

3.14.2.3 Compaction Tests

Compaction tests shall be performed prior to commencement of construction in order to determine the moisture-density relationships of all satisfactory materials proposed for use as fill and/or backfill. For each compaction test performed, an associated or companion classification test and moisture content test shall be performed. Compaction tests shall be performed in sufficient number to establish the full range of maximum dry density and optimum water content. A minimum of 15 compaction tests shall be performed on materials classified as satisfactory for use. Samples for these tests shall not be obtained from the same locations. The Contracting Officer reserves the right to direct where samples for additional compaction tests are obtained. In the event that the compaction characteristics of materials having the same classification vary appreciably, additional compaction tests will be required.

3.14.2.4 Moisture Content Tests

Moisture content tests shall be performed on all materials proposed for use as fill and/or backfill to determine their suitability for use in accordance with paragraph Moisture Content. Moisture content tests shall be performed in sufficient number to determine the full range of moisture contents. Moisture content test shall be performed for each compaction test and as required to determine acceptability of material prior to placement. Not less than two moisture content tests shall be performed on each material classified as satisfactory for use.

3.14.3 Frequency of Testing During Construction

3.14.3.1 Minimum Number of Tests

The minimum number of tests required during placement and compaction of fill and/or backfill, for each lift per building or structure, shall be as specified in the following:

Square Meters in Lift to be Compacted	Minimum Tests Required Per Lift Field Density and Moisture Content
Up to 500	1
500 to 2000	2
2000 to 6000	3
Each additional 2500 square meters or portion thereof, but not to exceed more than 10 tests per lift	1

3.14.3.2 Other Testing

In addition to the above, where other areas or subareas are compacted separately, such as areas enclosed by interior grade beams, areas of long narrow fills, and/or areas compacted by hand operated compaction equipment, a minimum of one field density test shall be performed for every 50 square meters of fill placed per 0.3 meter of depth.

3.14.3.3 Time and Location Tests

The Government reserves the right to designate the location of any test. Whenever there is doubt as to the adequacy of the testing or validity of results, the Contracting Officer may direct that additional tests be performed, at no additional cost to the Government. The field density tests shall be performed at times and locations which will assure the specified compaction is being obtained throughout each lift for all materials placed. Field density tests shall also be performed in areas where the Contracting Officer determines there is reason to doubt the adequacy of the natural subgrade.

3.14.3.4 Field Density Control

The results of field density tests shall be compared to results of compaction tests performed as required elsewhere in these specifications by the use of the appropriate procedures described in paragraph Compaction Control. The above described comparison of these results shall be made in order to determine the percent compaction of the sample. For calculating field densities and percent compaction, SAS Form 865 dated 04 Aug 78 shall be used and shall be submitted with density results.

3.14.4 Compaction Control

For fine grained (clayey and silty) soils and for sands with appreciable fines such that normal shaped compaction curves are obtained, results of all compaction tests shall be plotted on a common plot as a family of curves. For each field density test performed, a one-point compaction test, with additional points as needed, shall be performed on the same material on which the field density test was conducted. The one-point compaction test shall be performed on the dry side of the optimum moisture content. For comparison of field density data, to the proper laboratory compaction test results, the procedures for the one-point and/or two-point compaction control methods as described in paragraph Compaction Procedure, shall be used. Compaction curves plotted on the family of curves shall be

of such a scale that the optimum moisture content can be interpreted to the nearest 0.1 percent and the maximum dry density can be interpreted to the nearest 0.2 kN/m^3. When a one-point test plots outside the range of the family of curves, an additional five-point compaction test shall be performed.

3.14.5 Compaction Procedure

3.14.5.1 General

The following paragraphs describe methods of relating field density data to desired or specified values. Compaction control of soils requires comparison of fill water content and/or dry density values obtained in field density tests with optimum water content and/or maximum dry density. For fine grained soils or sandy materials with appreciable fines, field results are to be compared with results of laboratory compaction tests performed in accordance with procedure specified elsewhere in this specification section. Insofar as possible, control shall be in accordance with the One-point Compaction Method. Where conditions require, the Two-Point Compaction Method shall be used.

3.14.5.2 One-Point Compaction Method

The material from the field density tests is allowed to dry to a water content on the dry side of estimated optimum, and then compacted using the same equipment and procedures used in the five-point compaction test. Thorough mixing is required to obtain uniform drying; otherwise, results obtained may be erroneous. The water content and dry density of the compacted sample are determined and then used to estimate its optimum water content and maximum dry density as illustrated in Figure 1 at the end of this section. In Figure 1, the line of optimums is well defined and the compaction curves are approximately parallel to each other, consequently, the one-point compaction method could be used with a relatively high degree of confidence. However, in Figure 2 at the end of this section, the curves are not parallel to each other and in several instances will cross if extended on the dry side. Consequently, the correct curve cannot be determined from the one-point method; therefore, the two-point compaction method should be used. The one-point method should be used only when the data define a relatively good line of optimums.

3.14.5.3 Two-Point Compaction Method

In the two-point test, one sample of material from the location of the field density test is compacted at the fill water content if thought to be at or on the dry side of optimum water content (otherwise, reduced by drying to this condition) using the same equipment and procedures used in the five-point compaction test. A second sample of material is allowed to dry back about 2 to 3 percentage points dry of the water content of the first sample and then compacted in the same manner. At least one point shall fall within 3 percent of the line of optimus. After compaction, the water contents and dry densities for the two samples are determined. The results are used to identify the appropriate compaction curve for the material being tested as shown in Figure 2 at the end of this section. The data shown in Figure 2 warrant the use of the two-point compaction test because the five-point compaction curves are not parallel. Using point A only, as in the one-point test method, would result in appreciable error as the shape of the curve would not be defined. The estimated compaction curve can be more accurately defined by two compaction points.

3.15 CAPILLARY WATER BARRIER

Capillary water barrier under concrete floor and area-way slabs on grade shall be placed directly on the subgrade and shall be compacted with a minimum of two passes of a hand-operated plate-type vibratory compactor.

3.16 GRADING

Areas within 1.5 m outside of each building and structure line shall be constructed true-to-grade, shaped to drain, and shall be maintained free of trash and debris until final inspection has been completed and the work has been accepted.

3.17 SPREADING TOPSOIL

Areas outside the building lines from which topsoil has been removed shall be topsoiled. Requirements for placing topsoil shall be as specified in Section 02300 EARTHWORK.

3.18 PROTECTION

Settlement or washing that occurs in graded, topsoiled, or backfilled areas prior to acceptance of the work, shall be repaired and grades reestablished to the required elevations and slopes.

-- End of Section --

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CEGS-02316 (November 1997)

Includes changes through Notice 3 (August 1999)

SECTION 02316

EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS
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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 D 1556	(1990; R 1996) Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D 1557	(1998) Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/cu. ft. (2,700 kN-m/cu. m.))
ASTM D 2487	(1998) Classification of Soils for Engineering Purposes (Unified Soil Classification System)

1.2 OMITTED

1.3 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.

1.4 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-09 Reports

Field Density Tests; FIO. Testing of Backfill Materials; FIO.

Copies of all laboratory and field test reports within 24 hours of the completion of the test.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Satisfactory Materials

Satisfactory materials shall comprise any materials classified by ASTM D 2487 as GW, GP, GM, GP-GM, GW-GM, GC, GP-GC, GM-GC, SW, SP, SM, SW-SM, SC, SW-SC, SP-SM, SP-SC, CL, ML, and CL-ML.

2.1.2 Unsatisfactory Materials

Materials which do not comply with the requirements for satisfactory materials are unsatisfactory. Unsatisfactory materials also include man-made fills, trash, refuse, or backfills from previous construction. Unsatisfactory material also includes material classified as satisfactory which contains root and other organic matter, frozen material, and stones larger than 75 mm. The Contracting Officer shall be notified of any contaminated materials.

2.1.3 Cohesionless and Cohesive Materials

Cohesionless materials shall include materials classified in ASTM D 2487 as GW, GP, SW, and SP. Cohesive materials shall include materials classified as GC, SC, ML, CL, MH, and CH. Materials classified as GM and SM shall be identified as cohesionless only when the fines are nonplastic.

2.1.4 Omitted
2.1.5 Omitted

2.1.6 Unstable Material

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

2.1.7 Select Granular Material

Select granular material shall consist of well-graded sand, gravel, crushed gravel, crushed stone or crushed slag composed of hard, tough and durable particles, and shall contain not more than 10 percent by weight of material passing a 0.075 mm mesh sieve and no less than 95 percent by weight passing the 25 mm sieve. The maximum allowable aggregate size shall be 30 mm, or the maximum size recommended by the pipe manufacturer, whichever is smaller.

2.1.8 Initial Backfill Material

Initial backfill shall consist of select granular material or satisfactory materials free from rocks 75 mm or larger in any dimension or free from rocks of such size as recommended by the pipe manufacturer, whichever is smaller. When the pipe is coated or wrapped for corrosion protection, the initial backfill material shall be free of stones larger than 25 mm in any dimension or as recommended by the pipe manufacturer, whichever is smaller.

2.2 PLASTIC MARKING TAPE

Plastic marking tape shall be acid and alkali-resistant polyethylene film, 152 mm (6 inches) wide with minimum thickness of 0.102 mm (0.004 inch). Tape shall have a minimum strength of 12.1 MPa (1750 psi) lengthwise and 10.3 MPa (1500 psi) crosswise. The tape shall be manufactured with integral wires, foil backing or other means to enable detection by a metal detector when the tape is buried up to 1 meter deep. The tape shall be of a type specifically manufactured for marking and locating underground utilities. The metallic core of the tape shall be encased in a protective jacket or provided with other means to protect it from corrosion. Tape

color shall be as specified in TABLE 1 and shall bear a continuous printed inscription describing the specific utility.

TABLE 1. Tape Color

Red:	Electric
Yellow:	Gas, Oil, Dangerous Materials
Orange:	Telephone, Telegraph, Television, Police, and Fire Communications
Blue:	Water Systems
Green:	Sewer Systems

PART 3 EXECUTION

3.1 EXCAVATION

Excavation of every description, regardless of material encountered shall be performed to the lines and grades indicated. Excavated soils shall be screened at the time of excavation and separated into uncontaminated and contaminated stockpiles. Field screening shall consist of real-time organic vapor monitoring using a PID to obtain a vapor reading from every third backhoe or excavator bucket of excavated material. Organic vapors shall be measured 2 to 3 inches above the soil in the bucket of the excavation equipment as soon as it is excavated. Excavated material that has an obvious petroleum odor, visual petroleum staining, or a PID response of greater than 10 PID units shall be considered contaminated and stockpiled for analytical testing. Uncontaminated soil shall be stockpiled separately from the contaminated soil, a safe distance away from but adjacent to, the excavation. Uncontaminated soils, if suitable, shall be used as backfill. If soil screening results in readings above the 10 PID unit threshold, the Contractor shall implement SECTION 01110 SAFETY, HEALTH, AND EMERGENCY RESPONSE (HTRW) of this specification.

Excavated soils screened as contaminated shall be stockpiled in the area designated on the Plans for storage of contaminated material in quantities of no more than 250 cubic meters per stockpile. Contaminated soils shall be placed onto an impermeable geomembrane groundcover having a minimal thickness of 6 mils, and subsequently covered from atmospheric exposure using a 6-mil polyethylene cover. These geomembranes shall be placed to prevent the stockpiled soils from coming into contact with rain or surface water run-off and to limit the escape of volatile organic compounds from the soil.

Material stockpiled as contaminated shall be sampled and analyzed as per the approved Sampling and Analysis Plan. At a minimum, one sample shall be collected for every 250 cubic meters of material stockpiled as contaminated. Samples shall be collected from the interior of the stockpiles on the same day the stockpile was started. Samples should be analyzed by EPA method 8260, Volatile Organic Compounds. Stockpiles shall be managed in such a way to ensure correct correlation with laboratory results. All contaminants above laboratory detection limits should be compared against the risk based Type I media criteria as per Georgia Hazardous Site Response Regulations (HSRA). For samples exceeding these standards, the corresponding stockpile shall be considered contaminated and shall become the responsibility of the Contracting Officer. For samples testing below these values, the corresponding stockpile shall be considered uncontaminated and shall, if suitable, be used as fill material.

During excavation, material satisfactory for backfilling shall be

stockpiled in an orderly manner at a distance from the banks of the trench equal to 1/2 the depth of the excavation, but in no instance closer than 600 mm. Excavated material not required or not satisfactory for backfill shall be removed. Grading shall be done as may be necessary to prevent surface water from flowing into the excavation, and any water accumulating shall be removed to maintain the stability of the bottom and sides of the excavation. Unauthorized overexcavation shall be backfilled in accordance with paragraph BACKFILLING AND COMPACTION at no additional cost to the Government.

3.1.1 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 sloped, or made vertical, and of such width as recommended in the manufacturer's installation manual. Where no manufacturer's installation manual is available, trench walls shall be made vertical. Trench walls more than 1.2 meters 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. Vertical trench walls more than 1.2 meters high shall be shored. Trench walls which are cut back shall be excavated to at least the angle of repose of the soil. 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 600 mm (24 inches) plus pipe outside diameter (O.D.) for pipes of less than 600 mm (24 inches) inside diameter and shall not exceed 900 mm (36 inches) plus pipe outside diameter for sizes larger than 600 mm (24 inches) inside diameter. Where recommended trench widths are exceeded, redesign, stronger pipe, or special installation procedures shall be utilized by the Contractor. The cost of redesign, stronger pipe, or special installation procedures shall be borne by the Contractor without any additional cost to the Government.

3.1.1.1 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 75 mm or greater in any dimension, or as recommended by the pipe manufacturer, whichever is smaller, shall be removed to avoid point bearing.

3.1.1.2 Dewatering

Dewatering of the excavation is anticipated in the lower elevations (north side) of the site. The water being removed shall be considered contaminated with Trichloroethylene (TCE) and Tetrachloroethylene (PCE) and shall be pumped through piping to a storage tank. The tank shall be suitable for the storage of contaminated water and shall be located in the area designated on the Plans for storage of contaminated material. The minimum volume of the tank shall be 20,000 gallons. A sample representative of the total volume of the tank shall be collected and analyzed as per the approved Sampling and Analysis Plan for determining the proper disposal method prior to the removal of any of the storage tank contents. Chemical analyses of contaminated water shall conform to the requirements of the Hunter Army Airfield Waste Water Treatment Plant with documentation of all analyses performed furnished to the Contracting Officer. If test results indicate the contamination is below acceptable discharge levels required for the Hunter Army Airfield Treatment Plant, the

water shall be disposed of into the sewage manhole closest to the construction site at a rate acceptable to the treatment works. If it is determined that the water in the storage tank is contaminated at levels exceeding the limits of the Hunter Army Airfield Treatment Plant, it shall be the responsibility of the Contracting Officer to properly dispose of the water. In no case shall any water pumped from any excavation be returned to the ground water or discharged to local drainage features or surface waters. Savannah District personnel conducted an environmental investigation of ground water at the site. The report of findings of this investigation is included as an Appendix of these Specifications. The raw laboratory data from the investigation can be viewed at the Savannah District office, 100 W. Oglethorpe Ave. To view the data contact the Project Manager, Robert Smith, at (912) 652-5706.

3.1.1.3 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. When removal of unstable material is required due to the Contractor's fault or neglect in performing the work, the resulting material shall be excavated and replaced by the Contractor without additional cost to the Government.

3.1.1.4 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. Groundwater will be encountered in construction of some of the electrical, storm drain, sanitary sewer manholes and possibly in the lines as well as in the Dining Facility and Building 315. At least 45 days prior to beginning any excavations for the manholes, the Contractor shall submit for review and comment a plan describing and showing his proposed method(s) of dewatering to permit excavations for and construction of the manholes to be performed in the dry. The information to be submitted in the plan and the Contractor's responsibility shall include, but not necessarily be limited to the following:

a. Drawings indicating locations for interceptor underdrain trenches, sumps, well points, pumps and discharge lines.

b. Details of interceptor underdrain trench or well points, if used.

c. Description of drainage pipe or tubing and gradations of filter materials.

d. Types and capacities of pumps.

e. The impact of pump, power supply or other failures and proposed backup plan or system for such failures.

Comments by the Contracting Officer on the dewatering method(s) proposed by the Contractor will only be with respect to the basic principles of the

method(s) the Contractor intends to employ. Approval by the Contracting Officer of the plans submitted shall not in any way be considered to relieve the Contractor from full responsibility for complete and adequate design and performance of the dewatering method(s) employed.

3.1.1.5 Jacking, Boring, and Tunneling

Unless otherwise indicated, excavation shall be by open cut except that sections of a trench may be jacked, bored, or tunneled if, in the opinion of the Contracting Officer, the pipe, cable, or duct can be safely and properly installed and backfill can be properly compacted in such sections.

3.1.2 Stockpiles

Stockpiles of satisfactory, unsatisfactory and wasted materials shall be placed and graded as specified. Stockpiles shall be kept in a neat and well drained condition, giving due consideration to drainage at all times. The ground surface at stockpile locations shall be cleared, grubbed, and sealed by rubber-tired equipment, excavated satisfactory and unsatisfactory materials shall be separately stockpiled. Stockpiles of satisfactory materials shall be protected from contamination which may destroy the quality and fitness of the stockpiled material. If the Contractor fails to protect the stockpiles, and any material becomes unsatisfactory, such material shall be removed and replaced with satisfactory material from approved sources at no additional cost to the Government. Locations of stockpiles of satisfactory materials shall be subject to prior approval of the Contracting Officer.

3.2 BACKFILLING AND COMPACTION

Backfill material shall consist of satisfactory material, select granular material, or initial backfill material as required. Backfill shall be placed in layers not exceeding 150 mm loose thickness for compaction by hand operated machine compactors, and 200 mm loose thickness for other than hand operated machines, unless otherwise specified. Each layer shall be compacted to at least 95 percent maximum density, unless otherwise specified.

3.2.1 Trench Backfill

Trenches shall be backfilled to the grade shown. The trench shall be backfilled to 600 mm above the top of pipe prior to performing the required pressure tests. The joints and couplings shall be left uncovered during the pressure test.

3.2.1.1 Omitted

3.2.1.2 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 150 mm loose thickness.

3.2.1.3 Bedding and Initial Backfill

Initial backfill material shall be placed and compacted with approved tampers to a height of at least 300 mm 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.

3.2.1.4 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 elevation at which the requirements in Section 02300 EARTHWORK control. 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 300 mm loose thickness, and compacted to 85 percent maximum density. The top 150 mm under sidewalks shall be compacted to 90 percent maximum density.

3.2.2 Backfill for Appurtenances

After the manhole, catchbasin, inlet, or similar structure has been constructed and the concrete has been allowed to cure for 4 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.

3.3 SPECIAL REQUIREMENTS

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

3.3.1 Gas Distribution

Trenches shall be excavated to a depth that will provide not less than 600 mm of cover in the excavation. Trenches shall be graded as specified for pipe-laying requirements in Section 02556 GAS DISTRIBUTION SYSTEM.

3.3.2 Water Lines

Trenches shall be of a depth to provide a minimum cover of 600 mm from the existing ground surface, or from the indicated finished grade, whichever is lower, to the top of the pipe.

3.3.3 Heat Distribution System

Initial backfill material shall be free of stones larger than 6.3 mm in any dimension.

3.3.4 Electrical Distribution System

Direct burial cable and conduit or duct line shall have a minimum cover of 600 mm from the finished grade, unless otherwise indicated. Special trenching requirements for direct-burial electrical cables and conduits if included are specified in Section 16375 ELECTRICAL DISTRIBUTION SYSTEM, UNDERGROUND.

3.3.5 Plastic Marking Tape

Warning tapes shall be installed directly above the pipe, at a depth of 450 mm below finished grade unless otherwise shown.

3.4 TESTING

Testing shall be the responsibility of the Contractor and shall be performed at no additional cost to the Government.

3.4.1 Testing Facilities

Tests shall be performed by an approved commercial testing laboratory. No work requiring testing will be permitted until the facilities have been inspected and approved by the Contracting Officer.

3.4.2 Testing of Backfill Materials

Classification of backfill materials shall be determined in accordance with ASTM D 2487 and the moisture-density relations of soils shall be determined in accordance with ASTM D 1557. A minimum of one soil classification and one moisture-density relation test shall be performed on each different type of material used for bedding and backfill.

3.4.3 Field Density Tests

Tests shall be performed in sufficient numbers to ensure that the specified density is being obtained. A minimum of one laboratory moisture-density relation test and companion classification test shall be performed on each different type of material used for backfills. Under areas to be paved, one sand cone density test shall be performed for each lift of backfill in the trenches at increments of 30 m or fraction thereof. In other areas, one sand cone density test shall be performed on each alternate lift of backfill at an interval spacing of 60 linear meters of trench, or fraction thereof. One moisture density relationship shall be determined for every 800 cubic meters of material used. Field in-place density shall be determined in accordance with ASTM D 1556. Copies of test results shall be furnished to the Contracting Officer within 24 hours of conclusion of the test. In addition, daily density tests shall be recorded by the Contractor on CESAS Form 1177, Summary of Field Density Test. An updated copy of the form shall be furnished to the Contracting Officer weekly. Government forms will be furnished to the Contractor. Trenches improperly compacted shall be reopened to the depth directed, then refilled and compacted to the density specified at no additional cost to the Government.

3.4.4 Compaction Control

The tests required on materials prior to placement and the compaction control procedures and methods specified in Section 02315 EXCAVATION, FILLING, AND BACKFILLING FOR BUILDINGS, Paragraph TESTING (with the exception of paragraph Frequency of Testing During Construction,) in regard to compaction control of soils, and utilizing the one-point or two-point compaction methods to relate field density data to laboratory test values, shall fully apply to and be considered a part of this specification section. 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.

3.4.5 Displacement of Sewers

After other required tests have been performed and the trench backfill compacted to 600 mm above the top of the pipe, 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 900 mm (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 judgement 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.

3.5 REPLACEMENT OF EXISTING PAVEMENT

The replacement shall be made as shown on the contract drawings.

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SECTION 02364

TERMITICIDE TREATMENT MEASURES FOR SUBTERRANEAN TERMITE CONTROL
06/98

PART 1 GENERAL

1.1 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-06 Instructions

Termiticides; FIO.

Manufacturer's label and Material Safety Data Sheet (MSDS) for termiticides proposed for use.

SD-07 Schedules

Equipment; FIO.

A listing of equipment to be used.

SD-08 Statements

Foundation Exterior; FIO.

Written verification that other site work will not disturb the treatment.

Utilities and Vents; FIO.

Written verification that utilities, vents have been located.

Crawl and Plenum Air Spaces; FIO.

Written verification that crawl spaces and plenum air spaces have been located.

Soil Moisture; FIO.

Soil moisture test result.

Verification of Measurement; FIO.

Written verification that the volume of termiticide used meets the application rate.

SD-09 Reports

Equipment Calibration and Tank Calibration; FIO.

Certification of calibration tests conducted on the equipment used in the termiticide application

SD-13 Certificates

Qualifications; FIO.

Qualifications and state license number of the termiticide applicator.

SD-14 Samples

Termiticides; FIO.

Termiticide samples obtained during application, upon request.

SD-18 Record

Termiticide Application Plan; FIO.

Termiticide application plan with proposed sequence of treatment work with dates and times. The termiticide trade name, EPA registration number, chemical composition, formulation, concentration of original and diluted material, application rate of active ingredients, method of application, area/volume treated, amount applied; and the name and state license number of the state certified applicator shall be included.

1.2 QUALIFICATIONS

The Contractor's principal business shall be pest control. The Contractor shall be licensed and the termiticide applicators certified in the state where the work is to be performed. Termiticide applicators shall also be certified in the U.S. Environmental Protection Agency (EPA) pesticide applicator category which includes structural pest control.

1.3 SAFETY REQUIREMENTS

The Contractor shall formulate, treat, and dispose of termiticides and their containers in accordance with label directions. Use the clothing and personal protective equipment specified on the labeling for use during all phases of the application.

1.4 DELIVERY, STORAGE, AND HANDLING

1.4.1 Delivery

Termiticide material shall be delivered to the site in the original unopened containers bearing legible labels indicating the EPA registration number and manufacturer's registered uses. All other materials to be used on site for the purpose of termite control shall be delivered in new or otherwise good condition as supplied by the manufacturer or formulator.

1.4.2 Storage

Materials shall be stored in designated areas and in accordance with manufacturer's labels. Termiticides and related materials shall be kept under lock and key when unattended.

1.4.3 Handling

Termiticides shall be handled in accordance with manufacturer's labels. Manufacturer's warnings and precautions shall be observed. Materials shall be handled preventing contamination by dirt, water, and organic material. Protect termiticides from sunlight as recommended by the manufacturer.

1.5 INSPECTION

Termiticides shall be inspected upon arrival at the job site for conformity to type and quality in accordance with paragraph TERMITICIDE. Each label shall bear evidence of registration under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), as amended. Other materials shall be inspected for conformance with specified requirements. Unacceptable materials shall be removed from the job site.

1.6 WARRANTY

The Contractor shall provide a 3-year written warranty against infestations or reinfestations by subterranean termites of the buildings or building additions constructed under this contract. Warranty shall include annual inspections of the buildings or building additions.

PART 2 PRODUCTS

2.1 TERMITICIDES

Termiticides shall be currently registered by the EPA. Termiticide shall be selected for maximum effectiveness and duration after application. The selected termiticide shall be suitable for the soil and climatic conditions at the project site.

PART 3 EXECUTION

3.1 TECHNICAL REPRESENTATIVE

The certified installation pest management coordinator shall be the technical representative, and shall be present at all meetings concerning treatment measures for subterranean termites. They may be present during treatment application.

3.2 SITE PREPARATION

Site preparation shall be in accordance with Sections 02230 CLEARING AND GRUBBING, 02300 EARTHWORK, 02315 EXCAVATION, FILLING AND BACKFILLING FOR BUILDINGS, 02935 TURF,and 02950 TREES< SHRUBS, GROUNDCOVERS AND VINES. Work related to final grades, landscape plantings, foundations, or any other alterations to finished construction which might alter the condition of treated soils, shall be coordinated with this specification.

3.2.1 Ground Preparation

Food sources shall be eliminated by removing debris from clearing and grubbing and post construction wood scraps such as ground stakes, form boards, and scrap lumber from the site, before termiticide application begins.

3.2.2 Verification

Before work starts, the Contractor shall verify that final grades are as indicated and smooth grading has been completed in accordance with Section

02300 EARTHWORK. Soil particles shall be finely graded with particles no larger than 25 mm and compacted to eliminate soil movement to the greatest degree.

3.2.3 Foundation Exterior

The Contractor shall provide written verification that final grading and landscape planting operations will not disturb treatment of the soil on the exterior sides of foundation walls, grade beams, and similar structures.

3.2.4 Utilities and Vents

The Contractor shall provide written verification that the location and identity of HVAC ducts and vents, water and sewer lines, and plumbing have been accomplished prior to the termiticide application.

3.2.5 Crawl and Plenum Air Spaces

The Contractor shall provide written verification that the location and identity of crawl and plenum air spaces have been accomplished prior to the termiticide application.

3.3 SITE CONDITIONS

The following conditions shall determine the time of application.

3.3.1 Soil Moisture

Soils to be treated shall be tested immediately before application. Soil moisture content shall be tested to a minimum depth of 75 mm. The soil moisture shall be as recommended by the termiticide manufacturer. The termiticide will not be applied when soil moisture exceeds manufacturer's recommendations because termiticides do not adhere to the soil particles in saturated soils.

3.3.2 Runoff and Wind Drift

Termiticide shall not be applied during or immediately following heavy rains. Applications shall not be performed when conditions may cause runoff or create an environmental hazard. Applications shall not be performed when average wind speed exceeds 16 km per hour. The termiticide shall not be allowed to enter water systems, aquifers, or endanger humans or animals.

3.3.2.1 Vapor Barriers and Waterproof Membranes

Termiticide shall be applied prior to placement of a vapor barrier or waterproof membrane.

3.3.2.2 Utilities and Vents

Prior to application, HVAC ducts and vents located in treatment area shall be turned off and blocked to protect people and animals from termiticide.

3.3.3 Placement of Concrete

Concrete covering treated soils shall be placed as soon as the termiticide has reached maximum penetration into the soil. Time for maximum penetration shall be as recommended by the manufacturer.

3.4 TERMITICIDE TREATMENT

3.4.1 Equipment Calibration and Tank Measurement

Immediately prior to commencement of termiticide application, calibration tests shall be conducted on the application equipment to be used and the application tank shall be measured to determine the volume and contents. These tests shall confirm that the application equipment is operating within the manufacturer's specifications and will meet the specified requirements. The Contractor shall provide written certification of the equipment calibration test results within 1 week of testing.

3.4.2 Mixing and Application

Formulating, mixing, and application shall be performed in the presence of the Contracting Officer or the technical representative. A closed system is recommended as it prevents the termiticide from coming into contact with the applicator or other persons. Water for formulating shall only come from designated locations. Filling hoses shall be fitted with a backflow preventer meeting local plumbing codes or standards. Overflow shall be prevented during the filling operation. Prior to each day of use, the equipment used for applying termiticides shall be inspected for leaks, clogging, wear, or damage. Any repairs are to be performed immediately.

3.4.3 Treatment Method

For areas to be treated, the Contractor shall establish complete and unbroken vertical and/or horizontal soil poison barriers between the soil and all portions of the intended structure which may allow termite access to wood and wood related products. Application shall not be made to areas which serve as crawl spaces or for use as a plenum air space.

3.4.3.1 Surface Application

Surface application shall be used for establishing horizontal barriers. Surface applicants shall be applied as a coarse spray and provide uniform distribution over the soil surface. Termiticide shall penetrate a minimum of 25 mm into the soil, or as recommended by the manufacturer.

3.4.3.2 Rodding and Trenching

Rodding and trenching shall be used for establishing vertical soil barriers. Trenching shall be to the depth of the foundation footing. Width of trench shall be as recommended by the manufacturer, or as indicated. Rodding or other approved method may be implemented for saturating the base of the trench with termiticide. Immediately after termiticide has reached maximum penetration as recommended by the manufacturer, backfilling of the trench shall commence. Backfilling shall be in 150 mm rises or layers. Each rise shall be treated with termiticide.

3.4.4 Sampling

The Contracting Officer may draw from stocks at the job site, at any time and without prior notice, samples of the termiticides used to determine if the amount of active ingredient specified on the label is being applied.

3.5 VERIFICATION OF MEASUREMENT

Once termiticide application has been completed, tank contents shall be measured to determine the remaining volume. The total volume measurement of used contents for the application shall equal the established application rate for the project site conditions. The Contractor shall provide written verification of the measurements.

3.6 CLEAN UP, DISPOSAL, AND PROTECTION

Once application has been completed, the Contractor shall proceed with clean up and protection of the site without delay.

3.6.1 Clean Up

The site shall be cleaned of all material associated with the treatment measures, according to label instructions, and as indicated. Excess and waste material shall be removed and disposed off site.

3.6.2 Disposal of Termiticide

The Contractor shall dispose of residual termiticides and containers off Government property, and in accordance with label instructions and EPA criteria.

3.6.3 Protection of Treated Area

Immediately after the application, the area shall be protected from other use by erecting barricades and providing signage as required or directed. Signage shall be in accordance with Section 10430 EXTERIOR SIGNAGE. Signage shall be placed inside the entrances to crawl spaces and shall identify the space as treated with termiticide and not safe for children and animals.

3.7 CONDITIONS FOR SATISFACTORY TREATMENT

3.7.1 Equipment Calibrations and Measurements

Where results from the equipment calibration and tank measurements tests are unsatisfactory, re-treatment will be required.

3.7.2 Testing

Should an analysis, performed by a third party, indicate that the samples of the applied termiticide contain less than the amount of active ingredient specified on the label, and/or if soils are treated to a depth less than specified or approved, re-treatment will be required.

3.7.3 Disturbance of Treated Soils

Soil and fill material disturbed after treatment shall be re-treated before placement of slabs or other covering structures.

3.7.4 Termites Found Within the Warranty Period

If live subterranean termite infestation or termite damage is discovered during the warranty period, the Contractor shall re-treat the site.

3.8 RE-TREATMENT

Where re-treatment is required, the Contractor shall:

a. Re-treat the soil and/or perform other treatment as necessary for prevention or elimination of subterranean termite infestation.

b. Repair damage caused by termite infestation.

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SECTION 02510

WATER DISTRIBUTION SYSTEM
04/98

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 B 88	(1996) Seamless Copper Water Tube
ASTM D 1599	(1988; R 1995) Short-Time Hydraulic Failure Pressure of Plastic Pipe, Tubing, and Fittings
ASTM D 1784	(1996) Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
ASTM D 1785	(1996a) Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
ASTM D 2241	(1996a) Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series)
ASTM D 2464	(1996a) Threaded Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80
ASTM D 2466	(1996a) Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40
ASTM D 2467	(1996a) Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80
ASTM D 2564	(1996a) Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems
ASTM D 2657	(1996) Heat Fusion Joining Polyolefin Pipe and Fittings
ASTM D 2774	(1994) Underground Installation of Thermoplastic Pressure Piping
ASTM D 2855	(1996) Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings
ASTM D 2996	(1995) Filament-Wound "Fiberglass" (Glass-Fiber-Reinforced

	Thermosetting-Resin) Pipe
ASTM D 2997	(1995) Centrifugally Cast "Fiberglass" (Glass-Fiber-Reinforced-Thermosetting-Resin) Pipe
ASTM D 3139	(1996a) Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
ASTM D 3839	(1994a) Underground Installation of "Fiberglass" (Glass-Fiber-Reinforced Thermosetting Resin) Pipe
ASTM F 477	(1995) Elastomeric Seals (Gaskets) for Joining Plastic Pipe
ASTM F 1483	(1993) Oriented Poly(Vinyl Chloride), PVCO, Pressure Pipe

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME B1.20.1	(1983; R 1992) Pipe Threads, General Purpose (Inch)
ASME B16.26	(1988) Cast Copper Alloy Fittings for Flared Copper Tubes

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA B300	(1992) Hypochlorites
AWWA B301	(1992) Liquid Chlorine
AWWA ANSI/AWWA C104/A21.4	(1995) Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water
AWWA ANSI/AWWA C105/A21.5	(1993) Polyethylene Encasement for Ductile-Iron Pipe Systems
AWWA ANSI/AWWA C110/A21.10	(1993) Ductile-Iron and Gray-Iron Fittings, 3 In. Through 48 In. (75# mm through 1200# mm), for Water and Other Liquids
AWWA ANSI/AWWA C111/A21.11	(1995) Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
AWWA ANSI/AWWA C115/A21.15	(1994) Flanged Ductile-Iron Pipe With Ductile-Iron or Gray-Iron Threaded Flanges
AWWA ANSI/AWWA C151/A21.51	(1996) Ductile-Iron Pipe, Centrifugally Cast, for Water or Other Liquids
AWWA ANSI/AWWA C153/A21.53	(1994; Errata Nov 1996) Ductile-Iron Compact Fittings, 3 In. Through 24 In. (76 mm through 610 mm) and 54 In. through 64 In. (1,400 mm through 1,600 mm) for Water Service Liquids

AWWA C300	(1989) 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 ANSI/AWWA C303	(1995) Concrete Pressure Pipe, Bar-Wrapped, Steel Cylinder Type
AWWA C500	(1993; C500a) Metal-Sealed Gate Valves for Water Supply Service
AWWA ANSI/AWWA C502	(1994; C502a) Dry-Barrel Fire Hydrants
AWWA C509	(1994) Resilient-Seated Gate Valves for Water Supply Service
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; C900a) Polyvinyl Chloride (PVC) Pressure Pipe, 4 In. Through 12 In., for Water Distribution
AWWA C901	(1996) Polyethylene (PE) Pressure Pipe and Tubing, 1/2 In. Through 3 In., for Water Service
AWWA C905	(1988) Polyvinyl Chloride (PVC) Water Transmission Pipe, Nominal Diameters 14 In. Through 36 In.
AWWA C950	(1995) Fiberglass Pressure Pipe
AWWA M23	(1980) Manual: PVC Pipe - Design and Installation

ASBESTOS CEMENT PIPE PRODUCERS ASSOCIATION (ACPPA)

ACPPA-01	(1988) Recommended Work Practices for A/C Pipe

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

MSS SP-80	(1997) Bronze Gate, Globe, Angle and Check Valves

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 24	(1995) Installation of Private Fire Service Mains and Their Appurtenances
NFPA 49	(1994) Hazardous Chemicals Data
NFPA 325-1	(1994) Fire Hazard Properties of Flammable Liquids, Gases, and Volatile Solids
NFPA 704	(1996) Identification of the Fire Hazards of Materials for Emergency Response

NSF INTERNATIONAL (NSF)

NSF ANSI/NSF 14	(1996) Plastics Piping Components and Related Materials

STEEL STRUCTURES PAINTING COUNCIL (SSPC)

SSPC Paint 21	(1991) White or Colored Silicone Alkyd Paint
SSPC Paint 25	(1991) Red Iron Oxide, Zinc Oxide, Raw Linseed Oil and Alkyd Primer (Without Lead and Chromate Pigments)

1.2 PIPING

This section covers water distribution service lines, and connections to building service at a point approximately 1.5 m outside buildings and structures to which service is required. The Contractor shall have a copy of the manufacturer's recommendations for each material or procedure to be utilized available at the construction site at all times.

1.2.1 Service Lines

Piping for water service lines less than 80 mm (3 inches)in diameter shall be polyvinyl chloride (PVC) plastic, oriented PVC plastic polyethylene, or copper tubing, unless otherwise shown or specified. Piping for water service lines 80 mm (3 inches)and larger shall be ductile iron, polyvinyl chloride (PVC) plastic, filament-wound or centrifugally cast reinforced thermosetting resin, reinforced plastic mortar pressure pipe or steel, unless otherwise shown or specified.

1.2.2 Distribution Lines 80 mm (3 Inches) or Larger

Piping for water distribution lines 80 mm (3 inches) or larger shall be ductile iron, polyvinyl chloride (PVC) through 900 mm (36 inch) nominal diameter plastic, Oriented PVC plastic filament-wound or centrifugally cast reinforced thermosetting resin, or reinforced plastic mortar pressure pipe, unless otherwise shown or specified.

1.2.3 Omitted

1.2.4 Sprinkler Supply Lines

Piping for water lines supplying sprinkler systems for building fire protection shall conform to NFPA 24 from the point of connection with the water distribution system to the building 1.5 m line.

1.2.5 Omitted

1.2.6 Plastic Piping System

Plastic piping system components (PVC, polyethylene, thermosetting resin and reinforced plastic mortar pressure) intended for transportation of potable water shall comply with NSF ANSI/NSF 14 and be legibly marked with their symbol.

1.2.7 Excavation, Trenching, and Backfilling

Excavation, trenching, and backfilling shall be in accordance with the applicable provisions of Section 02316 EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS, except as modified herein.

1.3 OMITTED

1.4 MANUFACTURER'S REPRESENTATIVE

The Contractor shall have a manufacturer's field representative present at the jobsite during the installation and testing of PE, RTRP, and/or RPMP pipe to provide technical assistance and to verify that the materials are being installed in accordance with the manufacturer's prescribed procedures. When the representative feels that the Contractor is installing and testing the PE, RTRP, and/or RPMP pipe in a satisfactory manner, certification shall be written to note which individuals employed by the Contractor are capable of properly installing the pipe. The field representative shall advise the Contractor of unsatisfactory conditions immediately when they occur. Such conditions include improper diameter of pipe ends, damaged interior liner, poorly prepared joints, improper curing of joints, moving pipe before joints are cured, bending pipe to follow abrupt changes in trench contours, leaving pipe ends open in trench overnight, not properly drying joints after rain storms, exceeding effective adhesive life, sharp objects in trench bed, backfill that could damage pipe, improper procedure for concrete encasement of pipe, omission of thrust blocks at changes in direction or any other condition which could have an adverse effect on the satisfactory completion and operation of the piping system.

1.5 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-06 Instructions

Installation; FIO.

The manufacturer's recommendations for each material or procedure to be utilized.

SD-08 Statements

Waste Water Disposal Method; FIO.

The method proposed for disposal of waste water from hydrostatic tests and disinfection, prior to performing hydrostatic tests.

Satisfactory Installation; FIO.

A statement signed by the principal officer of the contracting firm stating that the installation is satisfactory and in accordance with the contract drawings and specifications, and the manufacturer's prescribed procedures and techniques, upon completion of the project and before final acceptance.

SD-09 Reports

Bacteriological Disinfection; FIO.

Test results from commercial laboratory verifying disinfection.

SD-13 Certificates

Manufacturer's Representative; FIO.

The name and qualifications of the manufacturer's representative and written certification from the manufacturer that the representative is technically qualified in all phases of PE, RTRP, and/or RPMP pipe laying and jointing and experienced to supervise the work and train the Contractor's field installers, prior to commencing installation.

Installation; FIO.

A statement signed by the manufacturer's field representative certifying that the Contractor's personnel are capable of properly installing the pipe on the project.

Meters; FIO.

Manufacturer's certificate stating that each meter furnished has been tested for accuracy of registration and compliance with the accuracy and capacity requirements of the appropriate AWWA standard.

1.6 HANDLING

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

1.6.1 Omitted

1.6.2 Polyethylene (PE) Pipe Fittings and Accessories

PE pipe, fittings, and accessories shall be handled in conformance with AWWA C901.

1.6.3 Miscellaneous Plastic Pipe and Fittings

Polyvinyl Chloride (PVC), Reinforced Thermosetting Resin Pipe (RTRP), and Reinforced Plastic Mortar Pressure (RPMP) pipe and fittings shall be handled and stored in accordance with the manufacturer's recommendations. Storage facilities shall be classified and marked in accordance with NFPA 704, with classification as indicated in NFPA 49 and NFPA 325-1.

PART 2 PRODUCTS

2.1 PIPE

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

2.1.1 Omitted

2.1.2 Plastic Pipe

2.1.2.1 PE Plastic Pipe

Pipe, tubing, and heat-fusion fittings shall conform to AWWA C901.

2.1.2.2 PVC Plastic Pipe

Pipe, couplings and fittings shall be manufactured of material conforming to ASTM D 1784, Class 12454B.

a. Pipe Less Than 100 mm (4 inch) Diameter:

(1) Screw-Joint: Pipe shall conform to dimensional requirements of ASTM D 1785 Schedule 80, with joints meeting requirements of 1.03 MPa (150 psi) working pressure, 1.38 MPa (200 psi) hydrostatic test pressure, unless otherwise shown or specified. Pipe couplings when used, shall be tested as required by ASTM D 2464.

(2) Elastomeric-Gasket Joint: Pipe shall conform to dimensional requirements of ASTM D 1785 Schedule 40, with joints meeting the requirements of 1.03 MPa (150 psi) working pressure, 1.38 MPa (200 psi) hydrostatic test pressure, unless otherwise shown or specified, or it may be pipe conforming to requirements of ASTM D 2241, elastomeric joint, with the following applications:

SDR	Maximum Working Pressure MPa	Minimum Hydrostatic Pressure MPa
26	0.689	0.917
21	0.827	1.103
17	1.034	1.379
13.5	1.379	1.834

(3) Solvent Cement Joint: Pipe shall conform to dimensional requirements of ASTM D 1785 or ASTM D 2241 with joints meeting the

requirements of 1.03 MPa (150 psi) working pressure and 1.38 MPa (200 psi) hydrostatic test pressure.

b. Pipe 100 through 300 mm Diameter: Pipe, couplings and fittings shall conform to AWWA C900, Class 150, CIOD pipe dimensions, elastomeric-gasket joint, unless otherwise shown or specified.

c. Pipe 350 through 900 mm Diameter: Pipe shall conform to AWWA C905 unless otherwise shown or specified.

2.1.2.3 Oriented Polyvinyl Chloride (PVCO) Plastic Pipe

Pipe, couplings, and fittings shall be manufactured of material conforming to ASTM D 1784, Class 1245B. Pipe shall conform to AWWA C900, Class 150, and to ASTM F 1483 and shall have an outside diameter equal to cast iron outside diameter.

2.1.3 Reinforced Plastic Mortar Pressure (RPMP) Pipe

AWWA C950.

2.1.4 Reinforced Thermosetting Resin Pipe (RTRP)

Pipe shall have a quick-burst strength greater than or equal to four times the normal working pressure of the pipe. The quick-burst strength test shall conform to the requirements of ASTM D 1599.

2.1.4.1 RTRP-I

RTRP-I shall conform to ASTM D 2996, except pipe shall have an outside diameter equal to cast iron outside diameter or standard weight steel pipe. The pipe shall be suitable for a normal working pressure of 1.03 MPa (150 psi) at 23 degrees C. The inner surface of the pipe shall have a smooth uniform continuous resin-rich surface liner conforming to ASTM D 2996.

2.1.4.2 RTRP-II

RTRP-II shall conform to ASTM D 2997. Pipe shall have an outside diameter equal to standard weight steel pipe.

2.1.5 Ductile-Iron Pipe

Ductile-iron pipe shall conform to AWWA ANSI/AWWA C151/A21.51, working pressure not less than 1.03 MPa (150 psi), unless otherwise shown or specified. Pipe shall be cement-mortar lined in accordance with AWWA ANSI/AWWA C104/A21.4. Linings shall be standard. When installed underground, pipe shall be encased with 4 mm thick polyethylene in accordance with AWWA ANSI/AWWA C105/A21.5. Flanged ductile iron pipe with threaded flanges shall be in accordance with AWWA ANSI/AWWA C115/A21.15.

2.1.6 Omitted

2.1.7 Copper Tubing

Copper tubing shall conform to ASTM B 88, Type K, annealed.

2.2 FITTINGS AND SPECIALS

2.2.1 Omitted

2.2.2 PVC Pipe System

a. For pipe less than 100 mm (4 inch) diameter, fittings for threaded pipe shall conform to requirements of ASTM D 2464, threaded to conform to the requirements of ASME B1.20.1 for use with Schedule 80 pipe and fittings; fittings for solvent cement jointing shall conform to ASTM D 2466 or ASTM D 2467; and fittings for elastomeric-gasket joint pipe shall be iron conforming to AWWA ANSI/AWWA C110/A21.10 or AWWA ANSI/AWWA C111/A21.11. Iron fittings and specials shall be cement-mortar lined (standard thickness) in accordance with AWWA ANSI/AWWA C104/A21.4.

b. For pipe 100 mm (4 inch) diameter and larger, fittings and specials shall be iron, bell end in accordance with AWWA ANSI/AWWA C110/A21.10, 1.03 MPa (150 psi) pressure rating unless otherwise shown or specified, except that profile of bell may have special dimensions as required by the pipe manufacturer; or fittings and specials may be of the same material as the pipe with elastomeric gaskets, all in conformance with AWWA C900. Iron fittings and specials shall be cement-mortar lined (standard thickness) in accordance with AWWA ANSI/AWWA C104/A21.4. Fittings shall be bell and spigot or plain end pipe, or as applicable. Ductile iron compact fittings shall be in accordance with AWWA ANSI/AWWA C153/A21.53.

2.2.3 RTRP and RPMP Pipe

Fittings and specials shall be compatible with the pipe supplied. Filament wound or molded fittings up to 150 mm (6 inches) shall conform to AWWA C950. Iron fittings shall be cement-mortar lined in accordance with AWWA ANSI/AWWA C104/A21.4 and shall conform to AWWA ANSI/AWWA C110/A21.10 and AWWA ANSI/AWWA C111/A21.11. Fittings shall be suitable for working and testing pressures specified for the pipe.

2.2.4 Ductile-Iron Pipe System

Fittings and specials shall be suitable for 1.03 MPa (150 psi) pressure rating, unless otherwise specified. Fittings and specials for mechanical joint pipe shall conform to AWWA ANSI/AWWA C110/A21.10. Fittings and specials for use with push-on joint pipe shall conform to AWWA ANSI/AWWA C110/A21.10 and AWWA ANSI/AWWA C111/A21.11. Fittings and specials for grooved and shouldered end pipe shall conform to AWWA C606. Fittings and specials shall be cement-mortar lined (standard thickness) in accordance with AWWA ANSI/AWWA C104/A21.4. Ductile iron compact fittings shall conform to AWWA ANSI/AWWA C153/A21.53.

2.2.5 Omitted

2.2.6 Copper Tubing System

Fittings and specials shall be flared and conform to ASME B16.26.

2.3 JOINTS

2.3.1 Gaskets for Reinforced Concrete Pipe

Rubber-gasket joints shall be of the type using a bell-and-spigot joint design of steel. The gaskets shall conform to AWWA C300, AWWA C301, or

AWWA ANSI/AWWA C303, as applicable.

2.3.2 Plastic Pipe Jointing

2.3.2.1 PE Pipe

Joints for pipe fittings and couplings shall be strong tight joints as specified for PE in Paragraph INSTALLATION. Joints connecting pipe of differing materials shall be made in accordance with the manufacturer's recommendation, and as approved by the Contracting Officer.

2.3.2.2 PVC Pipe

Joints, fittings, and couplings shall be as specified for PVC pipe. Joints connecting pipe of differing materials shall be made in accordance with the manufacturer's recommendations, and as approved by the Contracting Officer.

2.3.2.3 PVCO Pipe

Joints shall conform to ASTM D 3139. Elastomeric gaskets shall conform to ASTM F 477.

2.3.3 RPMP Pipe

Joints shall be mechanical or bell and spigot type with elastomeric gasket.

2.3.4 RTRP Pipe

2.3.4.1 RTRP-I, Grade 1 and 2

Joints shall be bell and spigot with elastomeric gasket, mechanical coupling with elastomeric gasket, threaded and bonded coupling, or tapered bell and spigot with compatible adhesive. All RTRP-I materials shall be products of a single manufacturer.

2.3.4.2 RTRP-II, Grade 1 and 2

Joints shall be the bell and spigot type with elastomeric gasket, bell and spigot with adhesive, butt-jointed with adhesive bonded reinforced overlay, mechanical, flanged, threaded or commercially available proprietary joints, provided they are capable of conveying water at the pressure and temperature of the pipe.

2.3.5 Ductile-Iron Pipe Jointing

a. Mechanical joints shall be of the stuffing box type and shall conform to AWWA ANSI/AWWA C111/A21.11.

b. Push-on joints shall conform to AWWA ANSI/AWWA C111/A21.11.

c. Rubber gaskets and lubricants shall conform to the applicable requirements of AWWA ANSI/AWWA C111/A21.11.

2.3.6 Omitted

2.3.7 Bonded Joints

For all ferrous pipe, a metallic bond shall be provided at each joint, including joints made with flexible couplings, caulking, or rubber gaskets,

of ferrous metallic piping to effect continuous conductivity. The bond wire shall be Size 1/0 copper conductor suitable for direct burial shaped to stand clear of the joint. The bond shall be of the thermal weld type.

2.3.8 Isolation Joints

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

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

b. Split-sleeve type couplings may be used in aboveground installations when approved in special situations and shall consist of gaskets and a housing in two or more sections with the necessary bolts and nuts.

2.3.9 Copper Tubing Jointing

Joints shall be compression-pattern flared and shall be made with the specified fittings.

2.4 VALVES

2.4.1 Omitted

2.4.2 Gate Valves

Gate valves shall be designed for a working pressure of not less than 1.03 MPa (150 psi). Valve connections shall be as required for the piping in which they are installed. Valves shall have a clear waterway equal to the full nominal diameter of the valve, and shall be opened by turning counterclockwise. The operating nut or wheel shall have an arrow, cast in the metal, indicating the direction of opening.

a. Valves smaller than 80 mm (3 inches) shall be all bronze and shall conform to MSS SP-80, Type 1, Class 150.

b. Valves 80 mm (3 inches) and larger shall be iron body, bronze mounted, and shall conform to AWWA C500. Flanges shall not be buried. An approved pit shall be provided for all flanged connections.

c. Resilient-Seated Gate Valves: For valves 80 to 300 mm (3 to 12 inches) in size, resilient-seated gate valves shall conform to AWWA C509.

2.4.3 Omitted
2.4.4 Omitted
2.4.5 Omitted

2.4.6 Indicator Post for Valves

Each valve shown on the drawings with the designation "P.I.V." shall be equipped with indicator post conforming to the requirements of NFPA 24. Operation shall be by a wrench which shall be attached to each post.

2.5 VALVE BOXES

Valve boxes shall be cast iron or concrete, except that concrete boxes may be installed only in locations not subjected to vehicular traffic. Cast-iron boxes shall be extension type with slide-type adjustment and with flared base. The minimum thickness of metal shall be 5 mm. Concrete boxes shall be the standard product of a manufacturer of precast concrete equipment. The word "WATER" shall be cast in the cover. The box length shall adapt, without full extension, to the depth of cover required over the pipe at the valve location.

2.6 OMITTED

2.7 FIRE HYDRANTS

Hydrants shall be dry-barrel type conforming to AWWA ANSI/AWWA C502 with valve opening at least 125 mm (5 inches) in diameter and designed so that the flange at the main valve seat can be removed with the main valve seat apparatus remaining intact, closed and reasonably tight against leakage and with a breakable valve rod coupling and breakable flange connections located no more than 200 mm above the ground grade. Hydrants shall have a 150 mm (6 inch) bell connection, two 65 mm (2-1/2 inch) hose connections and one 115 mm (4-1/2 inch) pumper connection. Outlets shall have American National Standard fire-hose coupling threads. Working parts shall be bronze. Design, material, and workmanship shall be equal to the latest stock pattern ordinarily produced by the manufacturer. Hydrants shall be painted with 1 coat of red iron oxide, zinc oxide primer conforming to SSPC Paint 25 and 2 finish coats of silicone alkyd paint conforming to SSPC Paint 21, of the installation's standard colors or as directed by the Contracting Officer. Suitable bronze adapter for the 115 mm (4-1/2 inch) outlet, with caps, shall be furnished.

2.8 OMITTED

2.9 MISCELLANEOUS ITEMS

2.9.1 Service Clamps

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

2.9.2 Corporation Stops

Corporation stops shall have standard corporation stop thread conforming to AWWA C800 on the inlet end, with flanged joints, compression pattern flared tube couplings, or wiped joints for connections to goosenecks.

2.9.3 Goosenecks

Copper tubing for gooseneck connections shall conform to the applicable

requirements of ASTM B 88, Type K, annealed. Length of cable requirement connections shall be in accordance with standard practice.

2.9.4 Service Stops

Service stops shall be water-works inverted-ground-key type, oval or round flow way, tee handle, without drain. Pipe connections shall be suitable for the type of service pipe used. All parts shall be of bronze with female iron-pipe-size connections or compression-pattern flared tube couplings, and shall be designed for a hydrostatic test pressure not less than 1.375 MPa (200 psi).

2.9.5 Tapping Sleeves

Tapping sleeves of the sizes indicated for connection to existing main shall be the cast gray, ductile, or malleable iron, split-sleeve type with flanged or grooved outlet, and with bolts, follower rings and gaskets on each end of the sleeve. Construction shall be suitable for a maximum working pressure of 1.03 MPa. Bolts shall have square heads and hexagonal nuts. Longitudinal gaskets and mechanical joints with gaskets shall be as recommended by the manufacturer of the sleeve. When using grooved mechanical tee, it shall consist of an upper housing with full locating collar for rigid positioning which engages a machine-cut hole in pipe, encasing an elastomeric gasket which conforms to the pipe outside diameter around the hole and a lower housing with positioning lugs, secured together during assembly by nuts and bolts as specified, pretorqued to 67.8 Newton meters (50 foot-pound).

2.9.6 Service Boxes

Service boxes shall be cast iron or concrete and shall be extension service boxes of the length required for the depth of the line, with either screw or slide-type adjustment. The boxes shall have housings of sufficient size to completely cover the service stop or valve and shall be complete with identifying covers.

2.9.7 Disinfection

Chlorinating materials shall conform to the following:

Chlorine, Liquid: AWWA B301.

Hypochlorite, Calcium and Sodium: AWWA B300.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Cutting of Pipe

Cutting of pipe shall be done in a neat and workmanlike manner without damage to the pipe. Unless otherwise recommended by the manufacturer and authorized by the Contracting Officer, cutting shall be done with an approved type mechanical cutter. Wheel cutter shall be used when practicable. Copper tubing shall be cut square and all burrs shall be removed. Squeeze type mechanical cutters shall not be used for ductile iron.

3.1.2 Adjacent Facilities

3.1.2.1 Sewer Lines

Where the location of the water pipe is not clearly defined in dimensions on the drawings, the water pipe shall not be laid closer horizontally than 3 m from a sewer except where the bottom of the water pipe will be at least 300 mm above the top of the sewer pipe, in which case the water pipe shall not be laid closer horizontally than 1.8 m from the sewer. Where water lines cross under gravity-flow sewer lines, the sewer pipe, for a distance of at least 3 m each side of the crossing, shall be fully encased in concrete or shall be made of pressure pipe with no joint located within 900 mm horizontally of the crossing. Water lines shall in all cases cross above sewage force mains or inverted siphons and shall be not less than 600 mm above the sewer main. Joints in the sewer main, closer horizontally than 900 mm to the crossing, shall be encased in concrete.

3.1.2.2 Water Lines

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

3.1.2.3 Copper Tubing Lines

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

3.1.2.4 Nonferrous Metallic Pipe

Where nonferrous metallic pipe, e.g. copper tubing, crosses any ferrous piping material, a minimum vertical separation of 300 mmshall be maintained between pipes.

3.1.2.5 Omitted

3.1.2.6 Structures

Where water pipe is required to be installed within 1 m of existing structures, the water pipe shall be sleeved as required in Paragraph "Casing Pipe". The Contractor shall install the water pipe and sleeve ensuring that there will be no damage to the structures and no settlement or movement of foundations or footings.

3.1.3 Joint Deflection

3.1.3.1 Omitted

3.1.3.2 Offset for Flexible Plastic Pipe

Maximum offset in alignment between adjacent pipe joints shall be as recommended by the manufacturer and approved by the Contracting Officer, but shall not exceed 5 degrees.

3.1.3.3 Allowable for Ductile-Iron Pipe

The maximum allowable deflection shall be as given in AWWA C600. If the alignment requires deflection in excess of the above limitations, special bends or a sufficient number of shorter lengths of pipe shall be furnished to provide angular deflections within the limit set forth.

3.1.4 Placing and Laying

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

3.1.4.1 Omitted

3.1.4.2 Plastic Pipe Installation

RTRP shall be installed in accordance with ASTM D 3839. RPMP shall be installed in accordance with the manufacturer's recommendations. PE Pipe shall be installed in accordance with ASTM D 2774. PVC pipe shall be installed in accordance with AWWA M23.

3.1.4.3 Piping Connections

Where connections are made between new work and existing mains, the connections shall be made by using specials and fittings to suit the actual conditions. When made under pressure, these connections shall be installed using standard methods as approved by the Contracting Officer. Connections to existing asbestos-cement pipe shall be made in accordance with ACPPA-01.

3.1.4.4 Penetrations

Pipe passing through walls of valve pits and structures shall be provided with ductile-iron or Schedule 40 steel wall sleeves. Annular space between walls and sleeves shall be filled with rich cement mortar. Annular space between pipe and sleeves shall be filled with mastic.

3.1.5 Jointing

3.1.5.1 Omitted

3.1.5.2 PE Pipe Requirements

Jointing shall comply with ASTM D 2657, Technique I-Socket Fusion or Technique II-Butt Fusion.

3.1.5.3 PVC Plastic Pipe Requirements

a. Pipe less than 100 mm (4 inch) diameter: Threaded joints shall be made by wrapping the male threads with approved thread tape or applying an approved lubricant, then threading the joining members together. The joint shall be tightened using strap wrenches to

prevent damage to the pipe and/or fitting. To avoid excessive torque, joints shall be tightened no more than one thread past hand-tight. Preformed rubber-ring gaskets for elastomeric-gasket joints shall be made in accordance with ASTM F 477 and as specified. Pipe ends for push-on joints shall be beveled to facilitate assembly and marked to indicate when the pipe is fully seated. The gasket shall be prelubricated to prevent displacement. The gasket and ring groove in the bell or coupling shall match. The manufacturer of the pipe or fitting shall supply the elastomeric gasket. Couplings shall be provided with stops or centering rings to assure that the coupling is centered on the joint. Solvent cement joints shall use sockets conforming to ASTM D 2467. The solvent cement used shall meet the requirements of ASTM D 2564; the joint assembly shall be made in accordance with ASTM D 2855 and the manufacturer's specific recommendations.

b. Pipe 100 through 300 mm diameter: Joints shall be elastomeric gasket as specified in AWWA C900. Jointing procedure shall be as specified for pipe less than 100 mm (4 inch) diameter with configuration using elastomeric ring gasket.

c. Pipe 350 through 900 mm diameter: Joints shall be elastomeric gasket push-on joints made in accordance with AWWA M23.

3.1.5.4 RTRP I, RTRP II and RPMP Pipe

a. RTRP I: Assembly of the pipe shall be done in conformance with the manufacturer's written instruction and installation procedures. Field joints shall be prepared as specified by the pipe manufacturer. Several pipe joints having interference-fit type couplings may be field bonded and cured simultaneously. However, the pipe shall not be moved and additional joints shall not be made until the previously laid joints are completely cured. Joints not having interference-fit type coupling shall be fitted with a clamp which shall hold the joint rigidly in place until the joint cement has completely cured. The clamps shall have a protective material on the inner surface to prevent damage to the plastic pipe when the clamp is tightened in place. The pipe manufacturer shall provide a device or method to determine when the joint is pulled against the pipe stop. Additionally, the pipe manufacturer shall furnish a gauge to measure the diameter of the spigot ends to ensure the diameter conforms to the tolerances specified by the manufacturer. All pipe ends shall be gauged. Factory certified tests shall have been satisfactorily performed to verify that short-term rupture strength is 10.3 MPa (1,500 psi) or greater when carried out in accordance with ASTM D 1599. At any ambient temperature, field bonded epoxy-cemented joints shall be cured with a self-regulating, thermostatically temperature controlled, electrical heating blanket for the time and temperature recommended by the manufacturer for the applicable size and type of joint, or by an alternate heating method recommended by the manufacturer and approved by the Contracting Officer. The joint sections shall not be moved during heating, or until the joint has cooled to ambient temperature.

b. RTRP II: A reinforced overlay joint shall be used to join sections together through a placement of layers of reinforcement fiberglass roving, mat, tape or fabric thoroughly saturated with compatible catalyzed resin.

c. Fittings and Specials for RTRP and RPMP Pipe: Metal to RTRP and RPMP pipe connections shall be made by bolting steel flanges to RTRP and RPMP pipe flanges. Cast-iron fitting with gasket bell or mechanical joint may be used with RTRP if pipe has cast iron outside diameter. Steel flanges shall be flat-faced type. Where raised-face steel flanges are used, spacer rings shall be used to provide a flat-face seat for RTRP and RPMP pipe flanges. A full-face Buna "N" gasket 3 mm (1/8 inch) thick with a shore hardness of 50-60 shall be used between all flanged connections. The RTRP and RPMP pipe flange shall have raised sealing rings. Flat washers shall be used under all nuts and bolts on RTRP and RPMP pipe flanges. Bolts and nuts shall be of noncorrosive steel and torqued to not more than 135 Newton meters.Flanges shall not be buried. A concrete pit shall be provided for all flanged connections.

3.1.5.5 Ductile-Iron Pipe Requirements

Mechanical and push-on type joints shall be installed in accordance with AWWA C600 for buried lines or AWWA C606 for grooved and shouldered pipe above ground or in pits.

3.1.5.6 Omitted
3.1.5.7 Omitted

3.1.5.8 Copper Tubing Requirements

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

3.1.5.9 Bonded Joints Requirements

Bonded joints shall be installed in accordance with details specified for joints in paragraph JOINTS.

3.1.5.10 Isolation Joints and Dielectric Fittings

Isolation joints and dielectric fittings shall be installed in accordance with details specified in paragraph JOINTS. Dielectric unions shall be encapsulated in a field-poured coal-tar covering, with at least 3 mm thickness of coal tar over all fitting surfaces.

3.1.5.11 Transition Fittings

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

3.1.6 Installation of Service Lines

Service lines shall include the pipeline connecting building piping to water distribution lines to the connections with the building service at a point approximately 1.5 m outside the building where such building service exists. Where building services are not installed, the Contractor shall terminate the service lines approximately 1.5 m from the site of the proposed building at a point designated by the Contracting Officer. Such service lines shall be closed with plugs or caps. All service stops and valves shall be provided with service boxes. Service lines shall be

constructed in accordance with the following requirements:

3.1.6.1 Service Lines 50 mm (2 Inches) and Smaller

Service lines 50 mm (2 inches) and smaller shall be connected to the main by a directly-tapped corporation stop or by a service clamp. A corporation stop and a copper gooseneck shall be provided with either type of connection. Maximum sizes for directly-tapped corporation stops and for outlets with service clamps shall be as in TABLE I. Where 2 or more gooseneck connections to the main are required for an individual service, such connections shall be made with standard branch connections. The total clear area of the branches shall be at least equal to the clear area of the service which they are to supply.

TABLE I. SIZE OF CORPORATION STOPS AND OUTLET

Pipe Size mm	Corporation Stops, mm For Ductile-Iron Pipe	Outlets w/Service Clamps, mm Single & Double Strap
80	--	25
100	25	25
150	32	40
200	40	50
250	40	50
300 & larger	50	50

NOTE:

a. Service lines 40 mm (1-1/2 inches) and smaller shall have a service stop.

b. Service lines 50 mm (2 inches) in size shall have a gate valve.

3.1.6.2 Service Lines Larger than 50 mm (2 Inches)

Service lines larger than 50 mm (2 inches) shall be connected to the main by a tapped saddle, tapping sleeve and valve, service clamp or reducing tee, depending on the main diameter and the service line diameter, and shall have a gate valve. Lines 80 mm (3 inches) and larger may use rubber-seated butterfly valves as specified above, or gate valves.

3.1.6.3 Service Lines for Sprinkler Supplies

Water service lines used to supply building sprinkler systems for fire protection shall be connected to the water distribution main in accordance with NFPA 24.

3.1.7 Omitted

3.1.8 Setting of Fire Hydrants, Valves and Valve Boxes

3.1.8.1 Location of Fire Hydrants

Fire hydrants shall be located and installed as shown. Each hydrant shall be connected to the main with a 150 mm (6 inch) branch line having at least as much cover as the distribution main. Hydrants shall be set plumb with pumper nozzle facing the roadway, with the center of the lowest outlet not less than 450 mm above the finished surrounding grade, and the operating nut not more than 1.2 m above the finished surrounding grade. Fire hydrants designated on the drawings as low profile shall have the lowest outlet not less than 450 mm above the finished surrounding grade, the top of the hydrant not more than 600 mm above the finished surrounding grade. Except where approved otherwise, the backfill around hydrants shall be thoroughly compacted to the finished grade immediately after installation to obtain beneficial use of the hydrant as soon as practicable. The hydrant shall be set upon a slab of concrete not less than 100 mm thick and 400 mmsquare. Not less than 2 cubic meters of free-draining broken stone or gravel shall be placed around and beneath the waste opening of dry barrel hydrants to ensure drainage.

3.1.8.2 Omitted

3.1.8.3 Location of Valves

After delivery, valves, including those in hydrants, shall be drained to prevent freezing and shall have the interiors cleaned of all foreign matter before installation. Stuffing boxes shall be tightened and hydrants and valves shall be fully opened and fully closed to ensure that all parts are in working condition. Check, pressure reducing, vacuum, and air relief valves shall be installed in valve pits. Valves and valve boxes shall be installed where shown or specified, and shall be set plumb. Valve boxes shall be centered on the valves. Boxes shall be installed over each outside gate valve unless otherwise shown. Where feasible, valves shall be located outside the area of roads and streets. Earth fill shall be tamped around each valve box or pit to a distance of 1.2 m on all sides of the box, or the undisturbed trench face if less than 1.2 m.

3.1.8.4 Location of Service Boxes

Where water lines are located below paved streets having curbs, the boxes shall be installed directly back of the curbs. Where no curbing exists, service boxes shall be installed in accessible locations, beyond the limits of street surfacing, walks and driveways.

3.1.9 Tapped Tees and Crosses

Tapped tees and crosses for future connections shall be installed where shown.

3.1.10 Thrust Restraint

Plugs, caps, tees and bends deflecting 11.25 degrees or more, either vertically or horizontally, on waterlines 100 mm (4 inches) in diameter or larger, and fire hydrants shall be provided with thrust restraints. Valves shall be securely anchored or shall be provided with thrust restraints to prevent movement. Thrust restraints shall be either thrust blocks or, for ductile-iron pipes, restrained joints.

3.1.10.1 Thrust Blocks

Thrust blocking shall be concrete of a mix not leaner than: 1 cement,

2-1/2 sand, 5 gravel; and having a compressive strength of not less than 14 MPa after 28 days. Blocking shall be placed between solid ground and the hydrant or fitting to be anchored. Unless otherwise indicated or directed, the base and thrust bearing sides of thrust blocks shall be poured directly against undisturbed earth. The sides of thrust blocks not subject to thrust may be poured against forms. The area of bearing shall be as shown or as directed. Blocking shall be placed so that the fitting joints will be accessible for repair. Steel rods and clamps, protected by galvanizing or by coating with bituminous paint, shall be used to anchor vertical down bends into gravity thrust blocks.

3.2 HYDROSTATIC TESTS

Where any section of a water line is provided with concrete thrust blocking for fittings or hydrants, the hydrostatic tests shall not be made until at least 5 days after installation of the concrete thrust blocking, unless otherwise approved.

3.2.1 Pressure Test

After the pipe is laid, the joints completed, fire hydrants permanently installed, and the trench partially backfilled leaving the joints exposed for examination, the newly laid piping or any valved section of piping shall, unless otherwise specified, be subjected for 1 hour to a hydrostatic pressure test of 1.38 MPa. Water supply lines designated on the drawings shall be subjected for 1 hour to a hydrostatic pressure test of 1.38 MPa. Each valve shall be opened and closed several times during the test. Exposed pipe, joints, fittings, hydrants, and valves shall be carefully examined during the partially open trench test. Joints showing visible leakage shall be replaced or remade as necessary. Cracked or defective pipe, joints, fittings, hydrants and valves discovered in consequence of this pressure test shall be removed and replaced with sound material, and the test shall be repeated until the test results are satisfactory. The requirement for the joints to remain exposed for the hydrostatic tests may be waived by the Contracting Officer when one or more of the following conditions is encountered:

a. Wet or unstable soil conditions in the trench.

b. Compliance would require maintaining barricades and walkways around and across an open trench in a heavily used area that would require continuous surveillance to assure safe conditions.

c. Maintaining the trench in an open condition would delay completion of the project.

The Contractor may request a waiver, setting forth in writing the reasons for the request and stating the alternative procedure proposed to comply with the required hydrostatic tests. Backfill placed prior to the tests shall be placed in accordance with the requirements of Section 02316 EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS.

3.2.2 Leakage Test

Leakage test shall be conducted after the pressure tests have been satisfactorily completed. The duration of each leakage test shall be at least 2 hours, and during the test the water line shall be subjected to not less than 1.38 MPa pressure. Water supply lines designated on the drawings shall be subjected to a pressure equal to 1.38 MPa. Leakage is defined as

the quantity of water to be supplied into the newly laid pipe, or any valved or approved section, necessary to maintain pressure within 34.5 kPa (5 psi) of the specified leakage test pressure after the pipe has been filled with water and the air expelled. Piping installation will not be accepted if leakage exceeds the allowable leakage which is determined by the following formula:

L = 0.0001351ND(P raised to 0.5 power)

L = Allowable leakage in gallons per hour
N = Number of joints in the length of pipeline tested
D = Nominal diameter of the pipe in inches
P = Average test pressure during the leakage test, in psi gauge

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

3.2.3 Time for Making Test

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

3.2.4 Concurrent Hydrostatic Tests

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

a. Pressure test and leakage test may be conducted concurrently.

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

3.3 DISINFECTION

3.3.1 Bacteriological Disinfection

Before acceptance of potable water operation, each unit of completed waterline shall be disinfected as prescribed by AWWA C651. From several points in the unit, the Contracting Officer will take samples of water in proper sterilized containers for bacterial examination. The disinfection shall be repeated until tests indicate the absence of pollution for at least 2 full days. The unit will not be accepted until satisfactory bacteriological results have been obtained.

3.3.2 Lead Residual

Following the bacteriological disinfection and testing, the system shall be flushed with a sufficient velocity of water and sufficient tests performed at each hot and cold water discharge point until no more than 15 ppb lead residuals remain in the system. All tests and samples shall be performed in accordance with state and, if applicable, Federal regulations. Samples for testing are to be collected after a 6 hour continuous period of no flushing, and will be considered first draw samples. The commercial laboratory shall be certified by the state's approving authority for examination of potable water. Lead residual test results shall be submitted to the Contracting Officer. The system will not be accepted until satisfactory bacteriological results and lead residual test results have been obtained. All flushing and testing for lead residuals, including all costs, are the responsibility of the Contractor.

3.4 CLEANUP

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

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SECTION 02516

CONCRETE INTERLOCKING PAVERS

PART 1 GENERAL

1.1 GENERAL

Areas to recieve pavers are in the parking lots in the dripzone of a large trees. The area in the parking lot shall use a paver with voids created by their notched design such as UNI Eco-Stone or equal. These are porous pavers.

1.1.1 Conformity

Conform to the requirements of the general conditions of the contract.

1.2 WORK INCLUDED

Preparation to site.

Supply and place base course as per drawings.

Supply and place laying course.

Supply and install paver system, or approved equal, interlocked concrete paver stones, as manufactured on multi-layer equipment, in quality, shape, thickness and color as specified.

Supply and install all accessary items as required to totally complete this installation.

1.3 SITE WORK

1.3.1 Preparation

Special care should be taken in the preparatory steps to ensure best results. Load factors and soil conditions will determine the extent and depth of excavation.

1.3.2 Excavation

Unsuitable, unstable or unconsolidated subgrade material shall be excavated to reach a solid subgrade. The Contracting Officer's representative shall inspect subgrade prior to compaction and addition of granular base. This will not be done in areas using porous pavers.

a. Where edge restraint is to be used, the area under such restraint shall be excavated. This will not be done in areas using porous pavers.

b. Excavation should exceed the perimeter of the paved area by a minimum of 75 mm (3 inches). This will not be done in areas using porous pavers.

c. Paver stones shall be delivered and unloaded at job site with or

without pallets and bound in such a manner that no damage occurs to the product during handling, hauling and unloading.

1.4 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 33	(1993) Concrete Aggregates
ASTM C 67	(1996) Sampling and Testing Brick and Structural Clay Tile
ASTM C 140	(1996b) Sampling and Testing Concrete Masonry Units
ASTM C 150	(1996) Portland Cement
ASTM C 207	(1991; R 1992) Hydrated Lime for Masonry Purposes
ASTM C 331	(1994) Lightweight Aggregates for Concrete Masonry Units
ASTM C 418	(1976) Abrasion Resistance of Concrete by Sandblasting
ASTM C 618	(1997) Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete
ASTM C 595	(1995a) Blended Hydraulic Cements
ASTM D 1557	(1991) Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/cu. ft. (2,700 kN-m/cu.m.))

PART 2 PRODUCTS

2.1 MATERIALS

The shape, thickness, color and laying pattern shall be in accordance with the drawings. Color of porous paving will be charcoal.

2.1.1 Cementitious Materials

Materials shall conform to the following:

a. Portland Cements: ASTM C 150.

b. Blended Cements: ASTM C 595.

c. Hydrated Lime, Type S: ASTM C 207.

d. Pozzolans: ASTM C 618.

e. Calcium Stearates - added to mix to prevent efflorescence of pavers.

2.1.2 Aggregates

Aggregates shall conform to the following, except that grading requirements shall not necessarily apply:

a. Normal Weight: ASTM C 33 for concrete aggregates.

b. Lightweight: ASTM C 331 for lightweight aggregates for concrete masonry units.

2.1.3 Other Constituents

Air-entraining agents, coloring pigments (iron oxide natural pigment), integral water repellents, finely ground silica, etc., shall be previously established as suitable for use in concrete and either shall conform to ASTM Standards where applicable, or shall be shown by test or experience not to be detrimental to the concrete.

2.1.4 Physical Requirements

a. Compressive Strength: At the time of delivery to the work site, the average compressive strength shall be not less than 55.2 MPa with no individual unit less than 49.6 MPa when tested in accordance with ASTM C 140.

b. Absorption: The average absorption shall not be greater than 5 percent, with no individual unit greater than 7 percent.

c. Durability: The manufacturer shall show either by proven field performance or the laboratory freeze-thaw test that the paving units have adequate durability if they are to be subjected to a freeze-thaw environment.

d. Proven Field Performance: Satisfactory field performance is indicated when units similar in composition, and made with the same manufacturing process as those to be supplied to the Contractor, do not exhibit objectionable deterioration after at least 5 years. The units used as the basis for proven field performance shall have been exposed to the same general type environment, temperature range, and traffic volume as is contemplated for the units supplied to the Contractor.

e. Freeze-Thaw Test: When tested in accordance with Section 8 of ASTM C 67, specimens shall have no breakage and not greater than 1.0 percent loss in dry weight of any individual unit when subjected to 50 cycles of freezing and thawing. This test shall be conducted not more than 12 months prior to delivery of units.

f. Abrasion Resistance: When tested in accordance with ASTM C 418, secimens shall not have greater volume loss than 15 cubic cm per 50 square cm. The average thickness loss shall not exceed 3 mm.

g. Porous pavers shall be equal to UNI-Eco-Stone or equal.

2.1.5 Permissible Variation in Dimensions

Length or widths of units shall not differ by more than 1.5 mm (1/16 inch)

from approved samples. Heights of units shall not differ by more than 3 mm (1/8 inch) from the specified standard dimension.

2.1.6 Visual Inspection

All units shall be sound and free of defects that would interfere with the proper placing of unit or impair the strength or permanence of the construction. Cracks or chipping resulting from rough methods of handling in shipment and delivery, shall be deemed grounds for rejection.

2.1.7 Sampling and Testing

a. The Contractor or his authorized representative shall be accorded proper facilities to inspect and sample the units on site from the lots ready for installation.

b. Sample and test units in accordance with ASTM C 140, except as required in Section 3.3.

2.1.8 Expense of Tests

The expense of the initial inspection and testing shall be borne by the Contractor. Upon test failure, all additional testing will be paid by the manufacturer.

2.1.9 Rejection

In case the shipment fails to conform to the specified requirements, the manufacturer may sort it, and new specimens shall be selected by the Contractor from the retained lots and tested at the expense of the manufacturer. In case the second set of specimens fails to conform to the test requirements, the entire lot shall be rejected.

2.2 BASE COURSE AGGREGATE

The base course aggregate shall consist of sound, durable particles, free from clay, organic material or other deleterious matter and shall be 100 percent crushed with fines, graded with the following limits:

Sieve Size	Percent Passing
l"	100
3/4"	70-100
3/8"	70-100
4	35-65
10	25-50
40	15-30
240	5-12

2.3 LAYING COURSE

The laying course shall consist of clean, coarse, concrete sand or granite screenings, not mason sand, with the following gradation limits:

Sieve Size	Percent Passing
1/8"	100
4	90 - 100
8	60 - 95
16	55 - 85

50	10 - 35
200	0 - 5

2.4 EDGE RESTRAINT

a. All edges of the paver stone installation shall be restrained. The type of edge restraint shall be approved and locations noted on the plans prior to installation.

b. This edge restraint can be:

- Buildings, concrete curb or sidewalk, or concrete edging (precast or cast-in-place). For the area using porous pavers, railroad ties shall be used as the edge between the pavers and the grass/tree. The ties shall be held in with 2 to 3 foot, #6 rebars going through each one.

- Edge restraint should be in place and secure before paver stones are compacted.

PART 3 EXECUTION

3.1 EXECUTION

The Contractor must have a minimum of 3 years' experience installing interlocking pavers. His experience must also include jobs of comparable size and scope. Documentation will be required.

3.2 CONSTRUCTION OF THE BASE COURSE (For on-grade installations only)

The finished subgrade shall be approved before placement of any base course. Base course shall be placed only in areas as shown on the plans and details. Areas using porous pavers shall not be compacted. All work will be done so as to least impact the root zone of the tree.

The base course shall be spread in layers which when compacted will not exceed 100 mm (4 inches).

The base course shall be compacted with suitable compaction equipment that will ensure a minimum 95 percent of ASTM D 1557.

The base course shall be shaped to grade and cross section with an allowable local tolerance of 5 mm (1/4 inch).

When installing 6 cm paver stones, the compacted base shall be 85.73 mm (3-3/8 inches) below final grade.

When installing 8 cm paver stones, the compacted base shall be 104.75 mm (4-1/8 inches) below final grade.

Compacted base should exceed perimeter of paved area by a minimum of 75 mm (3 inches).

Base shall be 150 mm (6 inches) for the porous pavers of #89 stone. A reinforcement fabric will be installed between ground and base (Amoco Geotextile 2002 or equal).

3.3 CONSTRUCTION OF THE LAYING COURSE

The finished base course shall be approved before the placement of the laying course.

The laying course shall be spread evenly over the area to be paved and screeded to a level that will produce the required 25 mm (1 inch) thickness when the paving stones have been placed and vibrated.

Once screeded and leveled, this laying course shall not be disturbed in any way.

The laying course should exceed perimeter of paved area by a minimum of 75 mm (3 inches).

For the porous paver area, a filter fabric (Amoco Geotextile 2002 or equal) shall be installed between the base stone and the laying course of 25 mm of sand.

3.4 LAYING OF CONCRETE PAVER STONES

The paver stones shall be laid in the approved pattern as noted on the drawings.

The paver stones shall be laid in such a manner that the desired pattern is maintained and the joints between the stones do not exceed 3 mm (1/8 inch), except for porous pavers, they shall have 50 mm by 60 mm void to be filled with pea gravel.

The gaps at the edge of the paved surface shall be filled with standard edge pieces or with stones saw cut to fit. The stones shall be cut to a straight even surface without cracks or chips.

The paver stones shall be vibrated to their final level by two or three passes of a vibrating plate compactor. This shall not occur with porous pavers.

After first vibration, sand containing at least 30 percent - 3mm (1/8 inch) particles shall be brushed over the surface and vibrated into the joints with additional passes of the plate vibrator so as to completely fill the joints. This shall not occur with porous pavers.

Surplus materials shall then be swept from the surface and the entire site left clean.

After final vibrating, the surface shall be true to grade and shall not vary by more than 5 mm (1/4 inch) when tested with a 3 m (10-foot) board at any location on the surface. No vibrating in porous pavement areas.

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SECTION 02531

SANITARY SEWERS
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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 A 74	(1996) Cast Iron Soil Pipe and Fittings
ASTM A 123	(1989a) Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM C 14M	(1995) Concrete Sewer, Storm Drain, and Culvert Pipe (Metric)
ASTM C 76M	(1996) Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe (Metric)
ASTM C 94	(1996) Ready-Mixed Concrete
ASTM C 150	(1997) Portland Cement
ASTM C 270	(1997) Mortar for Unit Masonry
ASTM C 425	(1996) Compression Joints for Vitrified Clay Pipe and Fittings
ASTM C 443M	(1994) Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets (Metric)
ASTM C 478	(1996) Precast Reinforced Concrete Manhole Sections
ASTM C 478M	(1996) Precast Reinforced Concrete Manhole Sections (Metric)
ASTM C 564	(1995a) Rubber Gaskets for Cast Iron Soil Pipe and Fittings
ASTM C 700	(1996) Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated
ASTM C 828	(1991, R 1996) Low-Pressure Air Test of Vitrified Clay Pipe Lines
ASTM C 924	(1989) Concrete Pipe Sewer Lines by

	Low-Pressure Air Test Method
ASTM C 972	(1995) Compression-Recovery of Tape Sealant
ASTM D 412	(1992) Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers - Tension
ASTM D 624	(1991; R 1996) Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers
ASTM D 1784	(1996) Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
ASTM D 2680	(1995a)Acrylonitrile-Butadiene-Styrene (ABS) and Poly(Vinyl Chloride) (PVC) Composite Sewer Piping
ASTM D 2751	(1996) Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings
ASTM D 2996	(1995) Filament-Wound "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe
ASTM D 2997	(1995) Centrifugally Cast "Fiberglass" (Glass-Fiber-Reinforced-Thermosetting-Resin) Pipe
ASTM D 3034	(1994) 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 3262	(1996) "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Sewer Pipe
ASTM D 3350	(1996) Polyethylene Plastics Pipe and Fittings Materials
ASTM D 3753	(1981; R 1991) Glass-Fiber-Reinforced Polyester Manholes
ASTM D 3840	(1988) "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe Fittings for Nonpressure Applications
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

ASTM F 714	(1994) Polyethylene (PE) Plastic pipe (SDR-PR) Based on Outside Diameter
ASTM F 794	(1995a) Poly(Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter
ASTM F 894	(1995) Polyethylene (PE) Large Diameter Profile Wall Sewer and Drain Pipe
ASTM F 949	(1994) Poly(Vinyl Chloride) (PVC) Corrugated Sewer Pipe with a Smooth Interior and Fittings

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA ANSI/AWWA C105/A21.5	(1993) Polyethylene Encasement for Ductile-Iron Pipe Systems
AWWA ANSI/AWWA C110/A21.10	(1993) Ductile-Iron and Gray-Iron Fittings, 3 In. Through 48 In. (75 mm through 1200 mm), for Water and Other Liquids
AWWA ANSI/AWWA C111/A21.11	(1995) Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
AWWA ANSI/AWWA C115/A21.15	(1994) Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges
AWWA ANSI/AWWA C151/A21.51	(1996) Ductile-Iron Pipe, Centrifugally Cast, for Water or Other Liquids

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 49	(1994) Hazardous Chemicals Data
NFPA 325-1	(1994) Fire Hazard Properties of Flammable Liquids, Gases, and Volatile Solids
NFPA 704	(1996) Identification of the Fire Hazards of Materials for Emergency Response

UNI-BELL PVC PIPE ASSOCIATION (UBPPA)

UBPPA UNI-B-6	(1990) Recommended Practice for the Low-Pressure Air Testing of Installed Sewer Pipe
UBPPA UNI-B-9	(1990; Addenda 1994) Recommended Performance Specification for Polyvinyl Chloride (PVC) Profile Wall Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter (Nominal Pipe Sizes 4-48 inch)

1.2 GENERAL REQUIREMENTS

The construction required herein shall include appurtenant structures and

building sewers to points of connection with the building drains 1.5 m 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 02316 EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS. Backfilling shall be accomplished after inspection by the Contracting Officer. Force mains and inverted siphons are specified in Section 02532 FORCE MAINS AND INVERTED SIPHONS; SEWER. 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.

1.3 OMITTED

1.4 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-13 Certificates

Portland Cement; FIO.

Certificates of compliance stating the type of cement used in manufacture of concrete pipe, fittings and precast manholes.

Joints.

Certificates of compliance stating that the fittings or gaskets used for waste drains or lines designated on the plans as sanitary sewer are oil resistant.

PART 2 PRODUCTS

2.1 PIPE

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

2.1.1 Concrete Pipe

Concrete pipe 600 mm (24 inches) or less in diameter, unless otherwise shown or specified, shall be nonreinforced and conform to ASTM C 14M, Class [1] [2]. Pipe less than 900 mm (36 inches) in diameter shall be bell and spigot type.

2.1.2 Plastic Pipe

Acrylonitrile-butadiene-styrene (ABS) and polyvinyl chloride (PVC) composite sewer piping shall conform to ASTM D 2680. Size 200 mm (8 inch)

through 380 mm (15 inch) diameter.

2.1.2.1 ABS Pipe

ASTM D 2751.

2.1.2.2 PVC Pipe

ASTM D 3034, Type PSM with a maximum SDR of 35, Size 380 mm (15 inch) or less in diameter. ASTM F 949 for corrugated sewer pipes with a smooth interior. UBPPA UNI-B-9 and ASTM F 794, Series 46, for ribbed sewer pipe with smooth interior, size 200 mm (8 inch) through 1200 mm (48 inch) diameters. PVC shall be certified by the compounder as meeting the requirements of ASTM D 1784, cell Class 12454B. The pipe stiffness shall be greater than or equal to 735/D for cohesionless material pipe trench backfills.

2.1.2.3 High Density Polyethylene Pipe

ASTM F 894, Class 63, size 450 mm (18 inch) through 3000 mm (120 inch). ASTM F 714, size 100 mm (4 inch)) through 1200 mm (48 inch). The polyethylene shall be certified by the resin producer as meeting the requirements of ASTM D 3350, cell Class 334433C. The pipe stiffness shall be greater than or equal to 1170/D for cohesionless material pipe trench backfills.

2.1.3 Reinforced Plastic Mortar Pipe (RPMP)

ASTM D 3262.

2.1.4 Reinforced Thermosetting Resin Pipe (RTRP)

ASTM D 3262.

2.1.4.1 Filament Wound RTRP-I

RTRP-I shall conform to ASTM D 2996, except pipe shall have an outside diameter equal to cast iron outside diameter or standard weight steel pipe. The pipe shall be suitable for a normal working pressure of 1.03 MPa (150 psi) at 22.8 degrees C (73 degrees F).The inner surface of the pipe shall have a smooth uniform continuous resin-rich surface liner conforming to ASTM D 2996.

2.1.4.2 Centrifugally Cast RTRP-II

RTRP-II shall conform to ASTM D 2997. Pipe shall have an outside diameter equal to standard weight steel pipe.

2.1.5 Ductile Iron Pipe

Pipe shall conform to AWWA ANSI/AWWA C151/A21.51 unless otherwise shown or specified.

2.1.6 Cast Iron Soil Pipe

Cast iron soil pipe shall conform to ASTM A 74, Class SV, except where Class XH is indicated. When installed underground, pipe shall be encased with 4 mm thick polyethylene in accordance with AWWA ANSI/AWWA C105/A21.5.

2.1.7 Clay Pipe

ASTM C 700.

2.2 REQUIREMENTS FOR FITTINGS

Fittings shall be compatible with the pipe supplied and shall have a strength not less than that of the pipe. Fittings shall conform to the respective specifications and other requirements specified below.

2.2.1 Fittings for Concrete Pipe

ASTM C 14M for pipe 600 mm (24 inches) or less in diameter. ASTM C 76M for pipe greater than 600 mm (24 inches) in diameter.

2.2.2 Fittings for Plastic Pipe

ABS and PVC composite sewer pipe fittings shall conform to ASTM D 2680.

2.2.2.1 Fittings for ABS Pipe

ASTM D 2751.

2.2.2.2 Fittings for PVC Pipe

ASTM D 3034 for type PSM pipe. ASTM F 949 for corrugated sewer pipe with a smooth interior. UBPPA UNI-B-9 and ASTM F 794, Series 46, for ribbed sewer pipe with smooth interior.

2.2.2.3 Fittings for High Density Polyethylene Pipe

ASTM F 894.

2.2.3 Fittings for RPMP

ASTM D 3840.

2.2.4 Fittings for RTRP

ASTM D 3262.

2.2.5 Fittings for Ductile Iron Pipe

Mechanical fittings shall conform to AWWA ANSI/AWWA C110/A21.10, rated for 1.03 MPa (150 psi). Push-on fittings shall conform to AWWA ANSI/AWWA C110/A21.10and AWWA ANSI/AWWA C111/A21.11, rated for 10.3 MPa (150 psi).

2.2.6 Fittings for Cast Iron Soil Pipe

ASTM A 74.

2.2.7 Fittings for Clay Pipe

ASTM C 700.

2.3 JOINTS

Joints installation shall comply with the manufacturer's instructions. Fittings and gaskets utilized for waste drains or industrial waste lines

shall be certified by the manufacturer as oil resistant.

2.3.1 Concrete Pipe Jointing

Joints and gaskets shall conform to ASTM C 443M.

2.3.2 Plastic Pipe Jointing

Flexible plastic pipe (PVC or high density polyethylene pipe) gasketed joints shall conform to ASTM D 3212.

2.3.2.1 ABS Pipe Jointing

ASTM D 2751, solvent weld or bell and spigot O-ring joint, size 300 mm (12 inches) or less in diameter, dimensions and tolerances in accordance with Table 2 of ASTM D 2751.

2.3.2.2 High Density Polyethylene Pipe Jointing

Rubber gasket joints shall conform to ASTM C 443M.

2.3.3 RPMP Jointing

Joints shall be bell and spigot type utilizing an elastomeric gasket in accordance with ASTM F 477.

2.3.4 RTRP Jointing

Joints shall be bell and spigot type utilizing an elastomeric gasket in accordance with ASTM F 477.

2.3.5 Ductile Iron Pipe Jointing

Push-on joints shall conform to AWWA ANSI/AWWA C111/A21.11. Mechanical joints shall conform to AWWA ANSI/AWWA C111/A21.11 as modified by AWWA ANSI/AWWA C151/A21.51. Flanged joints shall conform to AWWA ANSI/AWWA C115/A21.15.

2.3.6 Cast Iron Soil Pipe Jointing

Rubber gaskets for compression joints shall conform to ASTM C 564. Packing material for caulked joints shall be twisted jute or oakum, tarred type, or asphalt-saturated cellulose-fiber. Joints for acid resisting cast iron soil pipe shall be made with acid resistant non-asbestos packing. The packing shall not contain material which would affect adhesion of the joint sealing material to the pipe. Lead shall be suitable for caulking of joints.

2.3.7 Clay Pipe Jointing

Compression joints shall conform to ASTM C 425.

2.4 BRANCH CONNECTIONS

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; saddles for ABS pipe shall comply with Table 3 of ASTM D 2751; and saddles for PVC pipe shall conform to Table 4 of ASTM D 3034.

2.5 FRAMES AND COVERS

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 181.4 kg (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.

2.6 STEEL LADDER

A steel ladder shall be provided where the depth of a manhole exceeds 3.6 m (12 feet). The ladder shall not be less than 406 mm (16 inches) in width, with 19 mm (3/4 inch) diameter rungs spaced 305 mm (12 inches) apart. The two stringers shall be a minimum 10 mm (3/8 inch) thick and 51 mm (2 inch) wide. Ladders and inserts shall be galvanized after fabrication in conformance with ASTM A 123.

2.7 CEMENT MORTAR

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

2.7.1 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.

2.7.2 Portland Cement Concrete

Portland cement concrete shall conform to ASTM C 94, compressive strength of 28 MPa 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 17 MPaminimum at 28 days. Concrete in place shall be protected from freezing and moisture loss for 7 days.

2.8 STRUCTURES

2.8.1 Precast Reinforced Concrete Manhole Sections

Precast reinforced concrete manhole sections shall conform to ASTM C 478, except that portland cement shall be as specified herein. Joints shall be cement mortar, an approved mastic, rubber gaskets, a combination of these types; or the use of external preformed rubber joint seals and extruded rolls of rubber with mastic adhesive on one side.

2.8.2 Glass-Fiber-Reinforced Polyester Manholes

Glass-fiber-reinforced polyester manholes shall conform to ASTM D 3753.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Adjacent Facilities

3.1.1.1 Water Lines

Where the location of the sewer is not clearly defined by dimensions on the drawings, the sewer shall not be closer horizontally than 3 m to a water-supply main or service line, except that where the bottom of the water pipe will be at least 300 mm above the top of the sewer pipe, the horizontal spacing may be a minimum of 2 m. Where gravity-flow sewers cross above water lines, the sewer pipe for a distance of 3 m on each side of the crossing shall be fully encased in concrete or shall be acceptable pressure pipe with no joint closer horizontally than 1 m to the crossing. The thickness of the concrete encasement including that at the pipe joints shall be not less than 100 mm.

3.1.1.2 Omitted

3.1.1.3 Structural Foundations

Where sewer pipe is to be installed within 1 m of an existing or proposed building or structural foundation such as a retaining wall, control tower footing, water tank footing, or any similar structure, the sewer pipe shall be sleeved as specified above. Contractor shall ensure there is no damage to these structures, and no settlement or movement of foundations or footing.

3.1.2 Pipe Laying

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

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

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

d. ABS composite pipe ends with exposed truss and filler material shall be coated with solvent weld material before making the joint to prevent water or air passage at the joint between the inner and outer wall of the pipe.

e. Installations of solvent weld joint pipe, using ABS or PVC pipe and fittings shall be in accordance with ASTM F 402. The Contractor shall ensure adequate trench ventilation and protection for workers installing the pipe.

3.1.2.1 Caulked Joints

The packing material shall be well packed into the annular space to prevent the entrance of lead into the pipe. The remainder of the space shall be filled with molten lead that is hot enough to show a rapid change in color when stirred. Scum shall be removed before pouring. The lead shall be

caulked to form a tight joint without overstraining the bell and shall have a minimum depth of 25 mm after caulking.

3.1.2.2 Trenches

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

3.1.2.3 Backfill

As soon as possible after the joint is made, sufficient backfill material shall be placed along the pipe to prevent pipe movement off line or grade. Plastic pipe shall be completely covered to prevent damage from ultraviolet light.

3.1.2.4 Width of Trench

If the maximum width of the trench at the top of the pipe, as specified in Section 02316 EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS, is exceeded for any reason other than by direction, the Contractor shall install, at no additional cost to the Government, concrete cradling, pipe encasement, or other bedding required to support the added load of the backfill.

3.1.2.5 Jointing

Joints between different pipe materials shall be made as specified, using approved jointing materials.

3.1.2.6 Handling and Storage

Pipe, fittings and joint material shall be handled and stored in accordance with the manufacturer's recommendations. Storage facilities for plastic pipe, fittings, joint materials and solvents shall be classified and marked in accordance with NFPA 704, with classification as indicated in NFPA 49 and NFPA 325-1.

3.1.3 Leakage Tests

Lines shall be tested for leakage by low pressure air testing, infiltration tests or exfiltration tests, as appropriate. Low pressure air testing for vitrified clay pipes shall be as prescribed in ASTM C 828. Low pressure air testing for concrete pipes shall be as prescribed in ASTM C 828. Low pressure air testing for PVC pipe shall be as prescribed in UBPPA UNI-B-6. Low pressure air testing procedures for other pipe materials shall use the pressures and testing times prescribed in ASTM C 828 and ASTM C 924, after consultation with the pipe manufacturer. Prior to infiltration or 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 600 mm 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. When the Contracting Officer determines that infiltration cannot be properly tested,

an exfiltration test shall be made by filling the line to be tested with water so that a head of at least 600 mm 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 re-established. The amount of water required to maintain this water level during a 2-hour test period shall be measured. Leakage as measured by either the infiltration test or exfiltration test shall not exceed 50 mL per 5 mm diameter per 100 m of pipeline per hour. When leakage exceeds the maximum amount specified, satisfactory correction shall be made and retesting accomplished. Testing, correction, and retesting shall be made at no additional cost to the Government.

3.1.4 Test for Deflection

When flexible pipe is used, a deflection test shall be made on the entire length of the installed pipeline not less than 30 days after the completion of all work including the leakage test, backfill, and placement of any fill, grading, paving, concrete, or superimposed loads. Deflection shall be determined by use of a deflection device or by use of a spherical, spheroidal, or elliptical ball, a cylinder, or circular sections fused to a common shaft. The ball, cylinder, or circular sections shall have a diameter, or minor diameter as applicable, of 92.5 percent of the inside diameter of the pipe, but 95 percent for RPMP and RTRP. A tolerance of plus 0.5 percent will be permitted. The ball, cylinder, or circular sections shall be of a homogeneous material throughout, shall have a density greater than 1.0 as related to water at 4.0 degrees C (39.2 degrees F), and shall have a surface brinell hardness of not less than 150. The device shall be center bored and through bolted with a 6 mm (1/4 inch) minimum diameter steel shaft having a yield strength of 480 MPa (70,000 psi) or more, with eyes at each end for attaching pulling cables. The eye shall be suitably backed with flange or heavy washer; a pull exerted on the opposite end of the shaft shall produce compression throughout the remote end of the ball, cylinder or circular section. Circular sections shall be spaced so that the distance from the external faces of the front and back sections shall equal or exceed the diameter of the circular section. Failure of the ball, cylinder, or circular section to pass freely through a pipe run, either by being pulled through or by being flushed through with water, shall be cause for rejection of that run. When a deflection device is used for the test in lieu of the ball, cylinder, or circular sections described, such device shall be approved prior to use. The device shall be sensitive to 1.0 percent of the diameter of the pipe being measured and shall be accurate to 1.0 percent of the indicated dimension. Installed pipe showing deflections greater than 7.5 percent of the normal diameter of the pipe, or 5 percent for RTRP and RPMP, shall be retested by a run from the opposite direction. If the retest also fails, the suspect pipe shall be replaced at no cost to the Government.

3.2 CONCRETE CRADLE AND ENCASEMENT

The pipe shall be supported on a concrete cradle, or encased in concrete where indicated or directed.

3.3 INSTALLATION OF WYE BRANCHES

Wye branches shall be installed where sewer connections are indicated or where directed. Cutting into piping for connections shall not be done except in special approved cases. When the connecting pipe cannot be adequately supported on undisturbed earth or tamped backfill, the pipe

shall be encased in concrete backfill or supported on a concrete cradle as directed. Concrete required because of conditions resulting from faulty construction methods or negligence by the Contractor shall be installed at no additional cost to the Government. The installation of wye branches in an existing sewer shall be made by a method which does not damage the integrity of the existing sewer. One acceptable method consists of removing one pipe section, breaking off the upper half of the bell of the next lower section and half of the running bell of wye section. After placing the new section, it shall be rotated so that the broken half of the bell will be at the bottom. The two joints shall then be made with joint packing and cement mortar.

3.4 MANHOLE DETAILS

3.4.1 General Requirements

Manholes shall be constructed of glass-fiber-reinforced polyester, prefabricated plastic, concrete, or precast concrete manhole sections. The invert channels shall be smooth and semicircular in shape conforming to the inside of the adjacent sewer section. Changes in direction of flow shall be made with a smooth curve of as large a radius as the size of the manhole will permit. Changes in size and grade of the channels shall be made gradually and evenly. The invert channels shall be formed directly in the concrete of the manhole base, or shall be built up with brick and mortar, or shall be half tile laid in concrete, or shall be constructed by laying full section sewer pipe through the manhole and breaking out the top half after the surrounding concrete has hardened. Pipe connections shall be made to manhole using water stops, standard O-ring joints, special manhole coupling, or shall be made in accordance with the manufacturer's recommendation. The Contractor's proposed method of connection, list of materials selected, and specials required, shall be approved prior to installation. The floor of the manhole outside the channels shall be smooth and shall slope toward the channels not less than 100 mm per meter nor more than 200 mm per meter. Free drop inside the manholes shall not exceed 500 mm, measured from the invert of the inlet pipe to the top of the floor of the manhole outside the channels; drop manholes shall be constructed whenever the free drop would otherwise be greater than 500 mm.

3.4.2 Steel Ladder Anchorage

Ladder shall be adequately anchored to the wall by means of steel inserts spaced not more than 1850 mm apart vertically, and shall be installed to provide at least 150 mm of space between the wall and the rungs. The wall along the line of the ladder shall be vertical for its entire length.

3.4.3 Jointing, Plastering and Sealing

Mortar joints shall be completely filled and shall be smooth and free from surplus mortar on the inside of the manhole. Mortar and mastic joints between precast rings shall be full-bedded in jointing compound and shall be smoothed to a uniform surface on both the interior and exterior of the manhole. Installation of rubber gasket joints between precast rings shall be in accordance with the recommendations of the manufacturer. Precast rings may also be sealed by the use of extruded rolls of rubber with mastic adhesive on one side.

3.4.4 Setting of Frames and Covers

Unless otherwise indicated, tops of frames and covers shall be set flush

with finished grade in paved areas or 50 mm higher than finished grade in unpaved areas. Frame and cover assemblies shall be sealed to manhole sections using external preformed rubber joint seals that meet the requirements of ASTM D 412 and ASTM D 624, or other methods specified in paragraph Jointing, Plastering and Sealing, unless otherwise specified.

3.4.5 External Preformed Rubber Joint Seals

External preformed rubber joint seals and extruded rolls of rubber with mastic adhesive shall meet the requirements of ASTM D 412 and ASTM C 972 to ensure conformance with paragraph Leakage Tests. The seal shall be multi-section with neoprene rubber top section and all lower sections made of Ethylene Propylene Di Monomer (EPDM) rubber with a minimum thickness of 1.5 mm. Each unit shall consist of a top and a 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 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. One unit shall seal a casting and up to six, 50 mm adjusting rings. The bottom section shall be 305 mm in height. A 152 mm high top section will cover up to two, 50 mmadjusting rings. A 305 mm high bottom section will cover up to six, 50 mm adjusting rings. Extension sections shall cover up to two more adjusting rings. Each extension shall overlap the bottom section by 50 mm and shall be overlapped by the top section by 50 mm.

3.5 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.

3.6 BUILDING CONNECTIONS

Building connections shall include the lines to and connection with the building waste drainage piping at a point approximately 1.5 m outside the building, unless otherwise indicated. Where building drain piping is not installed, the Contractor shall terminate the building connections approximately 1.5 m from the site of the building at a point and in a manner designated.

3.7 CLEANOUTS AND OTHER APPURTENANCES

Cleanouts and other appurtenances shall be installed where shown on the drawings or as directed by the Contracting Officer, and shall conform to the detail of the drawings.

-- End of Section --

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CEGS-02532 (July 1998)

SECTION 02532

FORCE MAINS; SEWER
07/98

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 A 53	(1997) Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM D 1784	(1996) Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
ASTM D 1785	(1996a) Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
ASTM D 2122	(1995) Determining Dimensions of Thermoplastic Pipe and Fittings
ASTM D 2241	(1996a) Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series)
ASTM D 2464	(1996a) Threaded Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80
ASTM D 2564	(1996a) Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems
ASTM D 2657	(1996) Heat Fusion Joining Polyolefin Pipe and Fittings
ASTM D 2774	(1994) Underground Installation of Thermoplastic Pressure Piping
ASTM D 2996	(1995) Filament-Wound "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe
ASTM D 3035	(1995) Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter
ASTM D 3139	(1996a) Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
ASTM D 3308	(1991a) PTFE Resin Skived Tape

ASTM D 3350	(1996) Polyethylene Plastics Pipe and Fittings Materials
ASTM D 3517	(1996) "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pressure Pipe
ASTM D 4101	(1996a) Propylene Plastic Injection and Extrusion Materials
ASTM F 477	(1995) Elastomeric Seals (Gaskets) for Joining Plastic Pipe
ASTM F 1483	(1993) Oriented Poly(Vinyl Chloride), PVCO, Pressure Pipe

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME B16.1	(1989) Cast Iron Pipe Flanges and Flanged Fittings
ASME B16.3	(1992) Malleable Iron Threaded Fittings

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA ANSI/AWWA C105/A21.5	(1993) Polyethylene Encasement for Ductile-Iron Pipe Systems
AWWA ANSI/AWWA C110/A21.10	(1993) Ductile-Iron and Gray-Iron Fittings, 3 In. Through 48 In. (75 mm through 1200 mm), for Water and Other Liquids
AWWA ANSI/AWWA C111/A21.11	(1995) Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
AWWA ANSI/AWWA C115/A21.15	(1994) Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges
AWWA ANSI/AWWA C151/A21.51	(1996) Ductile-Iron Pipe, Centrifugally Cast, for Water or Other Liquids
AWWA C200	(1991) Steel Water Pipe - 6 In. (150 mm) and Larger
AWWA C203	(1991) Coal-Tar Protective Coatings and Linings for Steel Water Pipelines - Enamel and Tape - Hot-Applied
AWWA C207	(1994) Steel Pipe Flanges for Waterworks Service - Sizes 4 In. Through 144 In. (100 mm through 3,600 mm)
AWWA ANSI/AWWA C208	(1996) Dimensions for Fabricated Steel Water Pipe Fittings
AWWA C210	(1992) Liquid-Epoxy Coating Systems for the Interior and Exterior of Steel Water

	Pipelines
AWWA C600	(1993) Installation of Ductile-Iron Water Mains and Their Appurtenances
AWWA C900	(1989; C900a) Polyvinyl Chloride (PVC) Pressure Pipe, 4 In. Through 12 In., for Water Distribution

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-09 Reports

Hydrostatic Tests; FIO.

Copies of test results.

1.3 DELIVERY AND STORAGE

Pipe, fittings and accessories, and pipe coatings shall not be damaged during delivery, handling, and storage.

PART 2 PRODUCTS

2.1 PIPE AND FITTINGS

Piping for force mains less than 100 mm (4 inches) in diameter shall be galvanized steel, polyvinyl chloride (PVC) plastic, polyethylene (PE) plastic or polypropylene plastic. Piping less than 100 mm (4 inches) in diameter inside pump stations shall be galvanized steel. Piping for force mains 100 mm (4 inches) in diameter and larger shall be ductile iron, steel, concrete pressure pipe, PVC plastic, Oriented PVC PE plastic, or reinforced thermosetting resin pipe (RTRP). Piping 100 mm (4 inches) in diameter and larger inside pump stations shall be ductile iron pipe with bolted flange joints. Pipe shall conform to the respective specifications and other requirements specified below.

2.1.1 Omitted

2.1.2 Plastic Pipe

2.1.2.1 PE Pipe

ASTM D 3350 and ASTM D 3035, minimum pressure rating of 689 kPa (100 psi) at 23 degrees C (73.4 degrees F).

2.1.2.2 Polypropylene Pipe

ASTM D 2122 and ASTM D 4101.

2.1.2.3 PVC Pipe

a. PVC Pipe and Fittings Less Than 100 mm (4 inches) Diameter: ASTM

D 1785, Schedule 40, or ASTM D 2241, SDR 21, with screw joints, push-on joints, or solvent weld joints.

b. PVC Pipe and Fittings 100 mm (4 inches) Diameter and Larger: ASTM D 2241, SDR 21, or AWWA C900, Class 100, with push-on joints.

2.1.2.4 Oriented Polyvinyl Chloride (PVCO) Plastic Pipe

Pipe, couplings, and fittings shall be manufactured of material conforming to ASTM D 1784, Class 1245B. Pipe shall conform to AWWA C900, Class 150, and to ASTM F 1483 and shall have an outside diameter equal to cast iron outside diameter.

2.1.3 RPMP Pipe

ASTM D 3517. Fittings shall be compatible with the pipe supplied and shall be suitable for working and testing pressures specified for the pipe.

2.1.4 RTRP Lines

ASTM D 2996, 2413 kPa (350 psi) rated, cast iron pipe dimensions only, with elastomeric gasket joints. Fittings: AWWA ANSI/AWWA C110/A21.10, rated 1034 kPa (150 psi). When mechanical joint fittings are used, inside sleeves provided by the manufacturer shall be used.

2.1.5 Ductile Iron Pipe

a. Ductile Iron Pipe: AWWA ANSI/AWWA C151/A21.51, working pressure not less than 1034 kPa (150 psi), unless otherwise shown or specified.

b. River Crossing Pipe: AWWA ANSI/AWWA C151/A21.51, minimum thickness Class 54 with joints in compliance with applicable requirements of AWWA ANSI/AWWA C110/A21.10.

c. Fittings, Mechanical: AWWA ANSI/AWWA C110/A21.10, rated for 1034 kPa (150 psi).

d. Fittings, Push-On: AWWA ANSI/AWWA C110/A21.10 and AWWA ANSI/AWWA C111/A21.11, rated for 1034 kPa (150 psi).

2.1.6 Steel Pipe

a. Steel Pipe, 150 mm (6 inches) Diameter and Larger: AWWA C200.

b. Steel Pipe Less Than 150 mm (6 inches) Diameter: ASTM A 53, standard weight, threaded end, galvanized.

c. Fittings, 150 mm (6 inches) Diameter and Larger: AWWA C200, fabricated in compliance with AWWA ANSI/AWWA C208.

d. Fittings Less Than 150 mm (6 inches) Diameter: ASME B16.3, galvanized.

2.2 JOINTS

2.2.1 PE Piping

a. Heat Fusion Joints: ASTM D 2657.

b. Flanged Joints: ASME B16.1 or AWWA C207.

c. Mechanical Joints: ASME B16.1.

2.2.2 Polypropylene Piping

Heat Fusion Joints: ASTM D 2657.

2.2.3 PVC Piping

a. Screw Joint Fittings: ASTM D 2464, Schedule 80.

b. Push-On Joint Fittings: ASTM D 3139, with ASTM F 477gaskets.

c. Solvent Cement: ASTM D 2564.

d. Couplings for use with plain end pipe shall have centering rings or stops to ensure the coupling is centered on the joint.

2.2.4 PVCO Pipe

Joints shall conform to ASTM D 3139. Elastomeric gaskets shall conform to ASTM F 477.

2.2.5 Ductile Iron Piping

a. Push-on Joints: AWWA ANSI/AWWA C111/A21.11.

b. Mechanical Joints: AWWA ANSI/AWWA C111/A21.11 as modified by AWWA ANSI/AWWA C151/A21.51.

c. Flanged Joints: AWWA ANSI/AWWA C115/A21.15.

2.2.6 Steel Piping

a. Push-on Joints: AWWA C200.

b. Mechanical Joints: AWWA C200.

c. Flanged Joints: AWWA C207.

2.3 OMITTED
2.4 OMITTED
2.5 OMITTED

2.6 MISCELLANEOUS MATERIALS

Miscellaneous materials shall comply with the following requirements:

2.6.1 Pipe Coatings and Linings

a. Steel, interior: AWWA C203 or AWWA C210.

b. Steel, exterior, buried: AWWA C203.

c. Steel, exterior, exposed: AWWA C210.

2.6.2 Joint Lubricants

Joint lubricants shall be as recommended by the pipe manufacturer.

2.6.3 Bolts, Nuts and Glands

AWWA ANSI/AWWA C111/A21.11.

2.6.4 Joint Compound

A stiff mixture of graphite and oil or inert filler and oil.

2.6.5 Joint Tape

ASTM D 3308.

2.6.6 Bond Wire

Bond wire type RHW or USE, Size 1/0 AWG, neoprene jacketed copper conductor shaped to stand clear of the joint.

PART 3 EXECUTION

3.1 INSTALLATION

Pipe, pipe fittings, and appurtenances shall be installed at the locations indicated. Excavation, trenching, and backfilling shall be as specified in Section 02316 EXCAVATION, TRENCHING AND BACKFILLING FOR UTILITIES SYSTEMS.

3.1.1 Adjacent Facilities

Installation of force mains and inverted siphons near adjacent facilities shall be as specified in Section 02531 SANITARY SEWERS.

3.1.2 Cutting

Pipe shall be cut in a neat manner with mechanical cutters. Wheel cutters shall be used where practicable. Sharp and rough edges shall be ground smooth and loose material removed from the pipe before laying.

3.1.3 Laying

Except where otherwise authorized, pipe shall be laid with bells facing the direction of laying. Before lowering and while suspended, the pipe shall be inspected for defects. Defective material shall be rejected. Pipe shall be laid in compliance with the following:

a. Ductile Iron: AWWA C600.

b. Steel: AWWA C600.

c. Concrete: Manufacturer's instructions.

d. Polyvinyl Chloride: Manufacturer's instructions.

e. Polyethylene: ASTM D 2774.

f. Polypropylene: ASTM D 2774.

g. Reinforced Thermosetting Resin: Manufacturer's instructions.

h. Reinforced Plastic Mortar: Manufacturer's Instructions.

3.1.4 Jointing

3.1.4.1 Omitted

3.1.4.2 Joints for PE Pipe

Heat fusion joints shall comply with the manufacturer's instructions concerning equipment, temperature, melt time, heat coat, and joining time. Flanged and mechanical joints shall be made in compliance with the manufacturer's instructions.

3.1.4.3 Joints for Polypropylene Pipe

Heat fusion joints shall comply with the manufacturer's instructions concerning equipment, temperature, melt time, heat coat, and joining time.

3.1.4.4 Joints for PVC Pipe

a. Threaded joints shall be made by wrapping the male threads with joint tape or by applying an approved thread lubricant, then threading the joining members together. The joint shall be tightened with strap wrenches which will not damage the pipe and fittings. The joint shall be tightened no more than 2 threads past hand-tight.

b. Push-on joints: The ends of pipe for push-on joints shall be beveled to facilitate assembly. Pipe shall be marked to indicate when the pipe is fully seated. The gasket shall be lubricated to prevent displacement. The gasket shall remain in proper position in the bell or coupling while the joint is made.

c. Solvent-weld joints shall comply with the manufacturer's instructions.

3.1.4.5 Joints for RPMP Pipe

Elastomeric gasket joints shall comply with the manufacturer's instructions.

3.1.4.6 Joints for RTRP Lines

Elastomeric gasket joints shall comply with the manufacturer's instructions.

3.1.4.7 Joints for Ductile Iron Pipe

Installation of mechanical and push-on type joints shall comply with AWWA C600 and the manufacturer's instructions. Installation of flanged joints shall comply with manufacturer's instructions.

3.1.4.8 Joints for Steel Pipe

Screw joints shall be made tight with joint tape or joint compound applied with a brush to the male threads only. Installation of mechanical joints, push-on joints, and flanged joints shall comply with the manufacturer's instructions.

3.1.5 Coating and Lining

Field coating of non-galvanized steel pipe shall comply with AWWA C203. The applied materials shall be tested by means of a spark-type electrical device in compliance with AWWA C203. Flaws and holidays in the coating or lining of the pipe and the pipe joints shall be repaired; the repaired areas shall be at least equal in thickness to the minimum required for the pipe.

3.1.6 PE Pipe Encasement

When installed underground, pipe shall be encased with 4 mm thick polyethylene in accordance with AWWA ANSI/AWWA C105/A21.5. Encasement shall be in accordance with AWWA ANSI/AWWA C105/A21.5.

3.1.7 Omitted
3.1.8 Omitted
3.1.9 Omitted
3.1.10 Omitted
3.1.11 Omitted

3.1.12 Grout

Grout for exterior joint protection on concrete pipes shall be a mix of 1 part portland cement, 2 parts sand, and of sufficient liquid consistency to flow into the joint recess beneath the diaper. Grout for interior joint protection shall be a mix of 1 part portland cement and 1 part sand. A polyurethane foam loop, impregnated with portland cement, may be substituted for grout for exterior joints.

3.1.13 Bonded Joints

Where indicated, a metallic bond shall be provided at each joint, including joints made with flexible couplings or rubber gaskets, of ferrous-metallic piping to effect continuous conductivity. The bond shall be of the thermal-weld type.

3.2 HYDROSTATIC TESTS

The pipeline shall be subjected to both a pressure test and a leakage test. The method proposed for disposal of waste water from hydrostatic tests shall be approved by the Contracting Officer. The test may be witnessed by the Contracting Officer. The Contracting Officer shall be notified at least 7 days in advance of equipment tests. The final test report shall be delivered to the Contracting Officer within 30 days of the test.

3.2.1 Pressure Test

After the pipe has been installed, joints completed, thrust blocks have been in place for at least five days, and the trench has been partially backfilled, leaving the joints exposed for examination, the pipe shall be filled with water to expel all air. The pipeline shall be subjected to a test pressure of 700 kPa (100 psi) or 150 percent of the working pressure, whichever is greater, for a period of at least one hour. Each valve shall be opened and closed several times during the test. The exposed pipe, joints, fitting, and valves shall be examined for leaks. Visible leaks shall be stopped or the defective pipe, fitting, joints, or valve shall be replaced.

3.2.2 Leakage Test

The leakage test may be conducted subsequent to or concurrently with the pressure test. The amount of water permitted as leakage for the line shall be placed in a sealed container attached to the supply side of the test pump. No other source of supply will be permitted to be applied to the pump or line under test. The water shall be pumped into the line by the test pump as required to maintain the specified test pressure as described for pressure test for a 2 hour period. Exhaustion of the supply or the inability to maintain the required pressure will be considered test failure. PE pipe can experience diametric expansion and pressure elongation during initial testing. The manufacturer shall be consulted prior to testing for special testing considerations. Allowable leakage shall be determined by the following I-P formula:

L = NDP/K Where:

L = Allowable leakage in gallons per hour.

N = Number of joints in length of pipeline tested.

D = Nominal diameter of the pipe in inches.

P = Square root of the test pressure in psig.

K = 7400 for pipe materials.

At the conclusion of the test, the amount of water remaining in the container shall be measured and the results recorded in the test report.

3.2.3 Retesting

If any deficiencies are revealed during any test, such deficiencies shall be corrected and the tests shall be reconducted until the results of the tests are within specified allowances, without additional cost to the Government.

-- End of Section --

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DIVISION 02 - SITE WORK

SECTION 02550

BITUMINOUS PAVEMENT

01/98

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-- End of Section Table of Contents --

CEGS-02555 (April 1989)

SECTION 02550

BITUMINOUS PAVEMENT
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 OFFICIAL (AASHTO)

AASHTO T 201	(1980); Kinematic Viscosity of Asphalts
AASHTO T 202	(1980); Viscosity of Asphalts by Vacuum Capillary Viscometer

1.2 DESCRIPTION OF WORK

The work specified herein comprises the construction of a bituminous pavement consisting of a graded aggregate base course, bituminous prime coat, bituminous tack coat, and bituminous surface course (central plant hot mix). The subgrade for the base course shall be prepared in accordance with Section 02300 EARTHWORK. The construction of the bituminous pavement shall conform to the requirements of the "Department of Transportation, State of Georgia, Standard Specifications, Construction of Roads and Bridges, 1993 Edition," except for the modifications or additions specified herein.

1.3 DEFINITIONS

Wherever in the Department of Transportation, State of Georgia Standard Specifications, hereinafter referred to in this section as the "Standard Specifications," the following terms are used, the intent shall be understood as follows:

"State" ---------- U.S. Government

"Department" ---------- Corps of Engineers, Party of the First Part

"Engineer" ---------- Contracting Officer, Corps of Engineers

"Proposal Form" --------- General Clauses, Special Clauses or Technical Specifications

1.4 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01, Data

Equipment and Construction Operations; FIO. Mix Design; FIO.

List of proposed equipment to be used in performance of construction work, including descriptive data.

Mix Design at least 10 days before it is to be used.

SD-08, Statements

Bituminous Mixes; FIO. Aggregates; FIO. Mix Design; FIO.

Notification upon selection of bituminous material and aggregate sources.

SD-09, Reports

Sampling and Testing; FIO.

Calibration curves and related test results, prior to using the device or equipment being calibrated. Copies of field tests results within 24 hours after the tests are performed. Certified copies of test results, not less than 30 days before material is required for the work.

Submit test results of samples taken from the pavement and from control testing.

SD-14, Samples

Bituminous Material; FIO.

Bituminous material used in the job; finished pavement samples. Submit samples in quantities as indicated for verification purposes, to be performed by the Government.

SD-18, Records

Waybills and Delivery Tickets; FIO.

Copies of waybills and delivery tickets during the progress of the work. Certified waybills and delivery tickets for all materials actually used.

1.5 QUALITY ASSURANCE

1.5.1 Quality Control

During construction an established system of quality control shall be maintained. To assure compliance with contract requirements and the maintenance of records of all materials, equipment and construction operations, quality control shall include but not be limited to the following:

Condition of existing surface
Gradation of aggregates
Percentage of fractured faces of aggregate
Mix design properties - Marshall tests complete
Safety requirements
Grade control
Preparation of bituminous mixes
Density and thickness of compacted mixture

Straightedge requirements
Test of plant mixtures
Determination of quantities
Correction of defective pavement

a. A copy of all records and test data required in this section and the records of all corrective action taken shall be furnished the Contracting Officer.

b. Copies of specifications: During the performance of all work covered in this section, the Contractor shall keep two copies of the referenced "Standard Specifications" at the job site.

PART 2 PRODUCTS

2.1 GENERAL

The work specified in this section is comprised of a bituminous pavement consisting of a graded aggregate base course, bituminous prime coat, bituminous tack coat, and bituminous surface course (central plant hot mix). Comply with requirements of Section 02300 EARTHWORK for base course subgrade preparation. The construction of the bituminous pavement shall conform to the requirements of the "Department of Transportation, State of Georgia, Standard Specifications, Construction of Roads and Bridges, 1993 Edition", except for the modifications or additions as specified in this section.

2.2 MATERIALS

Base for the paving shall be graded aggregate base course as shown on the drawings. The construction of the base course shall adhere to the requirements of Section 310 of the Standard Specifications. Coarse aggregate shall be Class A, Group II. Bituminous prime coat shall be applied in accordance with Section 412 of the Standard Specifications. The prime coat shall be Grade RC 30 or MC 30 or RC 70 or MC 70, applied at the rate of 7.8 to 13.7 ml per square meter. Emulsified asphalt may be used upon approval of the Contracting Officer.

2.2.1 Bituminous Tack Coat

If the prime coat is not fresh, clean, and free of traffic marks, a bituminous tack coat shall be applied immediately prior to application of the asphaltic concrete surface course. The tack coat shall be applied in accordance with Section 413 of the Standard Specifications using 3.1 to 5.9 ml per square meter of emulsified asphalt Grade SS-1. Cutback asphalt may be used upon approval of the Contracting Officer.

2.2.2 Bituminous Plant Mix Surface Course

Bituminous plant mix surface course(s) shall be applied in accordance with Section 400 of the Standard Specifications using asphaltic concrete Type "E" and type "B" as listed below. Mix designs shall be approved by the Contracting Officer before being used in the work, as specified in paragraph "Establishment of Job-Mix Formula".

2.2.2.1 Composition

Asphaltic Concrete	Type "E"
Coarse Aggregate Size	78 and screenings

*Asphalt Cement, Penetration Grade	85 - 100

2.2.2.2 Percent Passing by Weight

	Type "E"	Type "B"
25 mm	-	100
19 mm	100	85 - 100
13 mm	85 - 100	---
10 mm	70 - 85	55 - 75
2.36 mm	44 - 48	30 - 36
0.30 mm	10 - 25	11 - 19
0.075 mm	4 - 7	4 - 7

2.2.2.3 Additional Requirements

	Type "E"	Type "B"
Flow	8 - 16	8 - 16
Minimum stability based on 50-blow Marshall Test (kg)	680	680
Temperature of mixture prior to compaction (degrees C)	118 - 124	118 - 124
Percentage of voids in mixture	4 - 5	4 - 5
Percentage aggregate voids filled with asphalt cement	70 - 82	70 - 82

2.2.2.4 Aggregate Proportions of Asphaltic Concrete Type "E"

40 percent Size No. 78 Stone
60 percent Screenings

2.2.2.5 Approximate Job Mix Asphaltic Concrete

Sieve Size	Percent Passing Type "E"	
19 mm	100	
13 mm	98	
10 mm	82	Percent bitumen by
4.75 mm	62	weight of total
2.36 mm	45	mixture is 5.75 for
0.30 mm	18	Type "E"
0.075 mm	8	

*The Contractor has the option of using asphalt cement meeting the following viscosity grade requirements:

PROPERTIES FOR PETROLEUM ASPHALT CEMENTS

	Viscosity Grade AC-20	
	Minimum	Maximum
Viscosity, 60 degrees C, poises	2,000 +/- 400	
Viscosity, 135 degrees C), Cs	300	-
Penetration, 25 degrees C, 100g., 5 sec.	60	-
Flash Point, COC, C	232	-
Solubility in trichlorethylene, %	99.0	-
Tests on Residue from Thinfilm Oven Test:		
Viscosity, 60 degrees C, poises	-	10,000
Ductility, 25 degrees C, 5cm per min., cm	50	-
Spot Test	Negative	-

Kinematic Viscosity	AASHTO T 201
Absolute Viscosity	AASHTO T 202

PART 3 EXECUTION

3.1 TRIAL OPERATION

A trial operation of the bituminous mixing plant will be required. However, this requirement may be waived by the Contracting Officer if the Contractor obtains the bituminous mixture from a plant that is already in operation and producing a mixture meeting these specifications. The waiver will be based on the Contractor furnishing plant records verifying that the test requirements listed below are being met.

3.1.1 Batching, Mixing and Testing

Not less than 2 days prior to commencement of paving, a test of the batching and mixing plant shall be made in order to check operational efficiency. The number of full scale bituminous batches required will be determined by the Contracting Officer. All of these batches will be wasted or used for purposes other than paving covered by these specifications.

The following are tests to be performed on each test batch:

Computation of theoretical specific gravity
Mix temperature
One extraction (bitumen content and sieve analysis of extracted aggregate)
One set of Marshall specimens* (set of three)

(*Temperature of mixtures immediately prior to compaction shall be 120 degrees C, plus or minus 2.7 degrees.)

Perform the following tests on each of the three Marshall specimens:

Stability
Flow
Unit weight
Percent voids total mix
Percent voids filled

3.1.2 Hot Bin Proportioning

Before the "trial operation" begins, the Contractor will "charge" the separate hot bins of each size aggregate through the rescreening plant at the Mixing Plant in the manner the Contractor proposes to use during paving operations. A sieve analysis will be made on each hot bin to determine proportions which will produce a combined gradation conforming to the job-mix formula. This process should be repeated a minimum of three sets on each hot bin to check the consistency of the rescreening plant and the aggregates for conformance to the job-mix formula. All labor and facilities shall be provided by the Contractor and the testing will be under the supervision of the Contracting Officer.

Results of tests shall be compared to test results from the approved job-mix formula for compliance. Necessary adjustments, corrections, etc., will be made at this time. The entire cost of the "trial operation," including labor, equipment, materials, and testing facilities will be at the expense of the Contractor without any additional cost to the Government.

3.2 ESTABLISHMENT OF JOB-MIX FORMULA INCLUDING SAMPLING AND TESTING

The bituminous plant mix binder and surface course (hot plant mix) shall be applied in accordance with the Standard Specifications using asphaltic concrete Type E and type B for roads and streets.

3.2.1 Establishment

The job-mix formula together with all pertinent laboratory and field test data shall be furnished the Contracting Officer for review and approval at least 45 days prior to beginning paving operations. Simultaneously, the same job-mix formula and test data together with sufficient sized samples and source of materials shall be furnished the Contracting Officer for review and check testing by the Government.

3.2.2 Sampling and Testing

The above mentioned samples and test data concerning the satisfactoriness of all materials in the mixture to be used in this work, including the Marshall test properties, shall be furnished for approval by the Contracting Officer as specified above. The Contracting Officer's laboratory will notify the Contracting Officer of the satisfactoriness of the proposed mix design prior to the Contractor beginning placement of pavement. The Contractor shall perform the necessary density tests of the compacted base course and the compacted bituminous surface course as directed at no additional cost to the Government.

3.3 SAMPLING PAVEMENTS AND MIXTURES

Samples of finished pavement, including samples that span the longitudinal joint, shall be obtained by the Contractor. Sizes of samples shall be adequate to determine conformance to density, thickness, and other specified requirements. Tests shall be the responsibility of the Contractor. The Contractor shall furnish a power saw or core drill and labor for cutting samples, and shall backfill the holes with fresh paving mixture thoroughly compacted to the finished surface and grade. Samples shall be taken at start of paving operations and at intervals throughout paving operations as directed. Samples of plant mixtures shall also be taken from the truck and tested by the Contractor to determine conformance to specified pavement test properties, bitumen content, and gradation

requirements. When possible, the finished pavement sample shall be located in the paved area representative of the plant mixture previously sampled from the truck.

3.3.1 Compaction of Pavement

The bituminous plant mix shall be compacted to a density of at least 95 percent of the laboratory density, as determined by the Marshall method of test specified herein.

3.4 TESTING

Tests shall be required of samples taken from the pavement as specified above in paragraph SAMPLING PAVEMENTS AND MIXTURES, and for control testing as specified below. All test reports will be maintained by the Contractor Quality Control Team. Any test that fails to meet the specified requirements shall be immediately reported to the Contracting Officer with their recommended corrective action.

3.4.1 Control Testing

Listed below are the minimum number and types of field tests required for job control. The frequency of tests will be increased as ordered by the Contracting Officer in the event proper control of the bituminous plant and placing operation are not being maintained with the minimum number of tests specified.

Type of Test	Number of Tests
Stability, flow, unit weight, percent voids, total mix, and percent voids filled.	Determine from set of three Marshall* specimens prepared from each 4 hours of plant operation
In-place density and thickness	From set (three sawed or cored samples) for each 4 hours of plant operation; one-half should be obtained at joints
Extractions (D 2172)	2 per day
Sieve analysis (C 136)	1 per shipment
Percentage of fractured faces of aggregate	1 per shipment

(*Mechanical Marshall hammer may be used, provided it is periodically calibrated against the results obtained by the hand hammer.)

3.4.2 Additional Tests for Dryer-Drum Mixing Process

For a period of 2 days and within 1 hour of the start of the mixing operations, the Contractor shall sample and perform tests as follows in addition to the normal tests specified above.

One set of Marshall specimens
One 9 kg bag of mixture for extractions

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CEGS-02552 (March 1998)

Includes changes through Notice 1 (April 1999)

SECTION 02552

PRE-ENGINEERED UNDERGROUND HEAT DISTRIBUTION SYSTEM
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 300	(1998) Inorganic Zinc Rich Primer

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI MC96.1	(1975) Thermocouples, Temperature Measurement

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 36/A 36M	(1997a) Carbon Structural Steel
ASTM A 53	(1998) Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A 106	(1997a) Seamless Carbon Steel Pipe for High-Temperature Service
ASTM A 134	(1996) Pipe, Steel, Electric-Fusion (Arc)-Welded (NPS 16 and over)
ASTM A 135	(1997) Electric-Resistance-Welded Steel Pipe
ASTM A 139	(1996) Electric-Fusion (Arc)-Welded Steel Pipe (NPS 4 and over)
ASTM A 167	(1996) Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
ASTM A 234/A 234M	(1997) Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures
ASTM D 2487	(1993) Classification of Soils for Engineering Purposes (Unified Soil Classification System)

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME B16.9	(1993) Factory Made Wrought Steel Buttwelding Fittings
ASME B16.11	(1996) Forged Fittings, Socket-Welding and Threaded
ASME B31.1	(1998) Power Piping
ASME B40.1	(1991) Gauges - Pressure Indicating Dial Type - Elastic Element

1.2 DEFINITIONS

The following definitions shall apply to the work.

1.2.1 Pre-engineered System

A complete underground heat distribution system including all required components such as carrier pipes, medium temperature hot water supply pipe, medium temperature hot water return pipe, and fittings, anchors, pipe supports, insulation, protective casing, and cathodic protection, for the system supplied. The pre-engineered system does not include valve manholes and the piping and equipment inside the valve manholes; Section 02570 VALVE MANHOLES AND PIPING AND EQUIPMENT IN VALVE MANHOLES shall be used for pertinent requirements. The pre-engineered system shall include all piping and components to a point at least 150 mm inside the building and valve manhole walls. The UHDS shall not use any part of the building or valve manhole structure as an anchor point.

1.2.2 Direct-Buried

A system which is buried, without the need for a field-fabricated protective enclosure such as a concrete trench or tunnel.

1.2.3 UHDS Types

1.2.3.1 Drainable-Dryable-Testable (DDT) Direct-Buried System

A factory-fabricated system including an air and water-tight outer protective casing, air space and an insulated carrier pipe. Drains and vents are provided at the end plates of the system (in manholes or buildings). The drains are normally capped but the caps can be removed to drain water which may leak into the air space if there is a failure in the casing or the carrier pipe. The vents allow water vapor to escape and provide a tell-tale sign of leakage.

1.2.3.2 Water Spread Limiting (WSL) Direct-Buried System

A factory fabricated system including an outer protective casing and an insulated carrier pipe. The system is fabricated in sections which are independent from each other; ground water or condensate which leaks from or into one section cannot travel into the next section. Field-assembly of the sections requires no welding as the sections push together and are sealed with a system of couplings and seals.

1.2.4 UHDS Manufacturer

The UHDS manufacturer is the company responsible for the design and manufacture of the pre-engineered system. The UHDS manufacturer directs the installation of the system and has a representative on the jobsite.

1.2.5 UHDS Manufacturer's Representative

The UHDS manufacturer's representative shall be a person who regularly performs the duties specified is certified in writing by the UHDS manufacturer to be technically qualified and experienced in the installation of the system, and shall be authorized by the manufacturer to make and sign the daily reports specified. The UHDS manufacturer's representative shall be under the direct employ and supervision of the UHDS manufacturer.

1.2.6 Corrosion Engineer

Corrosion engineer refers to a person who by knowledge of the physical sciences and the principles of engineering and mathematics, acquired by professional education and related practical experience, is qualified to engage in the practice of corrosion control. Such person may be a licensed professional corrosion engineer or certified as being qualified by the National Association of Corrosion Engineers (NACE), if such licensing or certification includes 3 years experience in corrosion control on underground metallic surfaces of the type under this contract. NACE certification shall be technologist, corrosion specialist, or cathodic protection specialist. The corrosion engineer shall make at least 3 visits to the project site. The first of these visits shall include obtaining soil resistivity data, acknowledging the type of pipeline coatings to be used and reporting to the Contractor the type of cathodic protection required. Once the submittals are approved and the materials delivered, the corrosion engineer shall revisit the site to ensure the Contractor understands installation practices and laying out the components. The third visit shall involve testing the installed cathodic protection systems and training applicable personnel on proper maintenance techniques. The corrosion engineer shall supervise, inspect, and test the installation and performance of the cathodic protection system.

1.3 WORK DESCRIPTION

1.3.1 Scope

The work shall include the design and fabrication; furnishing; installing, and testing of a direct buried underground insulated heat-distribution system consisting of piping as indicated, cathodic protection system (where required by this specification), together with fittings and appurtenances necessary for a complete and operable system. Gland type end seals will not be permitted. DDT systems with fiberglass casings shall not be provided.

1.3.2 UHDS Design

The UHDS manufacturer shall be responsible for the complete design of the UHDS, the product to be supplied, fabrication, witnessing installation and testing of the system within the design parameters established by the contract drawings and specifications, and in compliance with the detailed design. The complete design of the UHDS shall be sealed by a Professional Engineer in the employ of the UHDS manufacturer.

1.3.3 Contract drawings

The contract drawings accompanying this specification provide information on:

a. The size of carrier pipes, approximate length, and site location of the system.

b. The routing and elevation of the piping along the route.

c. Location and design of manholes.

d. The obstacles that must be avoided along the path.

e. Location of piping anchors (anchors will be no closer than 1 m or further than 1.5 m from entrance to manholes or buildings) at manholes and/or buildings. The UHDS manufacturer shall incorporate anchors as needed for the system.

f. Operating pressure and temperature of system.

1.4 SYSTEM REQUIREMENTS

1.4.1 Cathodic Protection

Cathodic protection shall be provided for systems with coated steel casings in accordance with paragraph Cathodic Protection Installation.

1.4.2 Operating Characteristics

The medium temperature hot water supply system shall have an operating temperature of 125 degrees C and an operating pressure of 400 kPa. Return system shall have an operating temperature of 110 degrees C and an operating pressure of 400 kPa.

1.4.3 Rated Characteristics

Thermal expansion calculations shall be computed for the supply and return piping using the following design characteristics and installation temperature. The system design conditions for medium temperature hot water supply and/or return shall be a temperature of 232 degrees C and a pressure of 4.58 kPa. For calculation purposes, the installation temperature shall not be higher than the ambient temperature at the site: -3 degrees C.

1.5 STANDARD PRODUCTS

The designed system and equipment provided for this project shall be of current production and shall essentially duplicate systems that have been in satisfactory use for at least 5 years prior to bid opening at 3 locations. The systems shall have been operated under pressure, temperature and site characteristics that are equal to or more severe than the operating conditions in this specification and shall have distributed the same medium. The system shall be supported by a service organization that can reach the site after a service call within 2 hours.

1.6 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The

following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Data

Pipe-Stress and System Expansion Calculations; GA.

Pipe-stress and system-expansion calculations for each expansion compensation elbow using a finite element computer generated 3 dimensional analysis, not later than 7 days after notice to proceed. Calculations shall demonstrate that pipe stresses from temperature changes are within the allowable requirements in ASME B31.1 and that the anchors and the guides will withstand the resultant forces. Detailed design layout drawings shall include all analysis node points. As a minimum, computer analysis results shall include node stresses, forces, moments and displacements. Calculations shall be stamped by a registered Professional Engineer in the employ of the UHDS manufacturer.

Cathodic Protection Installation; GA.

Design life calculations for the cathodic protection system, not later than 7 days after notice to proceed. Calculations shall be stamped by an NACE qualified corrosion engineer.

Thermal Performance Testing; GA.

Manufacturer's data sheets on all UHDS components and the instrumentation required for thermal performance testing; and data sheets for all coatings and carrier pipe insulation indicating thicknesses, 21 days after notice to proceed.

SD-04 Drawings

Heat Distribution System; GA.

A complete description of the design and assembly of the system, materials of construction and field installation instructions, not later than 21 days prior to the start of field measurements. Submittal shall also include sufficient system details to show that the specified minimum insulation thickness has been met. A detailed design layout of the system (plan and elevation views) showing size, type, elevations and location of each component to be used in the system, the design and location of anchors, pipe guides, pipe supports, expansion loops, Z-bends, L-bends, end seals, leak plates, joint locations, pipe and insulation thickness and sizes, types, and movements, connection to manhole and building wall penetrations, and including, if applicable, details of transition point to aboveground or other type systems. Also, if applicable, type and details of the cathodic protection system to be used. Detailed design layout drawings shall be stamped by a registered Professional Engineer.

SD-07 Schedules

Interruption of Existing Service; GA.

Schedule of proposed outages and interruptions of existing services, 14 days in advance.

Operational Test; GA.

Schedule of testing, 14 days in advance.

SD-08 Statements

Work Plan; GA.

A proposed schedule of activities indicating when various items of work and tests are to be carried out and when the representative of the UHDS manufacturer shall be present at job site, not later than 14 days after notice to proceed. A list of characteristics from the UHDS manufacturer shall be submitted indicating what defects or damage will necessitate replacement.

Quality Assurance Plan; FIO.

Manufacturer's quality assurance plan for fabrication, delivery, storage, installation and testing of system, not later than 14 days after notice to proceed.

Tests; GA. Thermal Performance Testing; GA.

A proposed test procedure and proposed samples of test data sheets for each required test, 30 days prior to the proposed test date. The procedure shall contain a complete description of the proposed test with calibration curves or test results furnished by an independent testing laboratory of each instrument, meter, gauge, and thermometer to be used in the tests. The test shall not commence until the procedure has been approved.

SD-09 Reports

Assembly Test of WSL Systems for Steam Service; GA. Assembly Test of WSL Systems for Condensate Return Service; GA.

Test reports in booklet form showing all factory and field tests performed to prove compliance with the specified performance criteria, upon completion and testing of the installed system.

SD-13 Certificates

UHDS Manufacturer; GA.

Certification stating that the UHDS manufacturer regularly and currently manufactures direct-buried systems, and that the designs of the system and equipment to be provided for this project conform to specification requirements. This certification shall be an original signed by a principal officer of the UHDS manufacturer and shall be submitted at least 2 weeks prior to the start of work.

UHDS Manufacturer's Representative; GA.

A letter from the system manufacturer, at least 2 weeks prior to the start of work, listing the experience and training of the manufacturer's representative.

UHDS Design; GA.

A Certificate of Satisfactory Operation certifying that at least 3 systems installed by the UHDS manufacturer within the previous 5 years are operating satisfactorily, not later than 7 days after notice to proceed.

The certificate shall indicate the location, type of system, size of system, point of contact (POC) including phone number, for information verification. This certificate of satisfactory operation shall be an original signed by a principal officer of the UHDS manufacturer.

Certificate of Compliance; GA.

Upon completion of the work, and before final acceptance, a notarized statement signed by a principal officer of both the UHDS manufacturer and the Contractor, certifying that the system has been installed satisfactorily and in accordance with the contract drawings, specifications, UHDS manufacturer's detailed design layout drawings and with the UHDS manufacturer's recommendations.

Testing Firm Qualifications; FIO.

A Certificate of Qualification from the independent testing firm or firms, not later than 7 days after notice to proceed, certifying that: weld examination methods and procedures, and the interpretation of radiographic films will be performed in accordance with ASME B31.1; the firm intends to utilize the proper film exposure, techniques, and penetrameter to produce density and geometric sharpness in sufficient clarity to determine presence of defects; and that all radiographic films will be reviewed and interpreted, and reading reports signed, by not less than a Certified American Society for Nondestructive Testing Level III Radiographer.

Welding; FIO.

Certification of Acceptability of all welds made in the field, upon completion of the project. This certification shall consist of a letter, signed by an official of the independent testing firm or firms examining welds, stating that all provisions of this specification have been complied with, and that all welds inspected radiographically have met the specified acceptability standards.

SD-18 Records

UHDS Manufacturer's Representative Reports; FIO.

A daily written report from the representative of the UHDS manufacturer, whenever the representative is required to be on the jobsite.

Connecting to Existing Work; GA.

Changes required to the UHDS design due to interferences or conflicts, upon realization of interferences or conflicts.

SD-19 Operation and Maintenance Manuals

Heat Distribution System; GA.

Operation and maintenance manual listing routine maintenance procedures, possible breakdowns and repairs, procedures for recording conduit temperatures biannually, and troubleshooting guides, before completion of work. Manual shall include as-built piping layout of the system including final elevations.

1.7 SITE CLASSIFICATION

Classification of the site conditions for the UHDS shall be based on ASTM D 2487 and the following criteria: severe.

PART 2 PRODUCTS

2.1 FACTORY FABRICATED, DIRECT-BURIED DDT SYSTEMS

2.1.1 DDT Steam and High Temperature Hot Water Carrier Pipes

Requirements shall be in accordance with paragraph HEAT DISTRIBUTION PIPING.

2.1.2 DDT Condensate Carrier Pipes

Carrier piping for condensate return systems shall be steel, schedule 80. Pipe requirements shall be in accordance with paragraph HEAT DISTRIBUTION PIPING. Condensate carrier pipes shall not be located in conduit casings which contain steam pipes or any other piping.

2.1.3 DDT Carrier Pipe Insulation

Carrier pipe insulation shall conform to minimum thicknesses and type listed in Tables 1 and 2 as required for temperature specified under paragraph Rated Characteristics.

2.1.4 Insulation Banding and Scrim

Stainless steel bands and clips, at least 13 mm wide, conforming to ASTM A 167 (304 stainless steel), at a maximum spacing of 460 mm shall be used over the scrim to secure the insulation onto the carrier pipe; a minimum of 2 bands shall be used for each 1300 mm section of insulation. Scrim shall be vinyl-coated fiberglass with 18 x 16 mesh (number of filaments per 25 mm) and made of 0.335 mm diameter vinyl-coated fibrous glass yarn.

2.1.5 Casing

Casing shall be smooth-wall steel, electric resistance spiral welded, conforming to ASTM A 134, ASTM A 135, or ASTM A 139 and the values tabulated below. Eccentric connectors shall be provided between casing sections as needed to provide drainage of casing section between manholes and between manholes and buildings.

Casing Diameter (mm)	Minimum Thickness (mm)
150 - 660	6.35
675 - 900	6.35
940 - 1050	6.35
1170	6.35

2.1.6 Casing End Plates, Vents, and Drains

End plates shall be made of ASTM A 36/A 36M steel, minimum thickness 13 mm for conduit pipe sizes above 300 mm and 9.5 mm for conduit pipe sizes 300 mm and less. A 25 mm ASTM A 53, Sch 40, galvanized vent riser pipe shall be provided on end plate vent opening. Vent pipe shall extend to top of manhole and terminate 300 mm above grade with a 180 degree bend. A 25 mm drain shall be provided at the bottom and vent at the top. Brass plugs and half coupling, constructed with welded steel and welded to the end plate, shall be furnished; drains shall be plugged; vents shall not be plugged.

2.1.7 Air Space

Continuous 25 mm minimum air space shall be provided between carrier pipe insulation and casing.

2.1.8 Casing Coating

Coating shall be rated by manufacturer for continuous service for at least 25 years at temperatures of 110 degrees C. Coating shall be applied in accordance with the coating manufacturer's instructions, shall be factory inspected for holidays and repaired as necessary.

2.1.8.1 Fusion-Bonded Epoxy

Casing coating shall be fusion-bonded epoxy, minimum thickness 1 mm.

2.1.8.2 Urethane Elastomer

Coating shall be urethane elastomer, minimum thickness 1 mm.

2.1.9 Coating of End Plates and Conduit Extending into Manholes

End plates and conduit extending into manholes shall be coated with a zinc-rich coating conforming to AASHTO M 300 Type IA, except that volatile organic compounds shall not exceed 0.34 kg/L. The zinc-rich coating shall be applied in accordance with the coating manufacturer's requirements including surface preparation. No additional top coat shall be applied.

2.1.10 Carrier Pipe Guides

Carrier pipe guides shall be spaced 3 m on centers maximum, no more than 1.5 m from pipe ends, with a minimum of 3 guides per elbow section. Guides shall be designed to allow thermal expansion without damage, to provide proper pipe guiding, and to allow horizontal movement in 2 directions as required at expansion loops and bends. Design of supports shall permit flow of water through the support. Pipe insulation shall extend through the pipe guides and be protected by steel sleeves. Design of guides shall negate metal-to-metal contact between the casing and the carrier pipe. Insulation or non-metallic material used to ensure no metal-to-metal contact shall not be compressed by the weight of the carrier pipe when full of water.

2.1.11 Anchor Plates

Anchor plate shall be ASTM A 36/A 36M steel, welded to carrier pipe and casing, 13 mm minimum thickness, with passages for air flow and water drainage thru the annular air space in the system. Exterior surface of the anchor plate shall be coated with the same coating material as the casing.

2.1.12 Field Connection of Casing Sections

Field connection of casing shall be made using a compatible steel section, welded to casing sections, coated on all surfaces with UHDS manufacturer's coating field repair compound, and covered with a 1.3 mm minimum thickness polyethylene shrink sleeve designed for a service temperature exceeding 80 degrees C.

2.1.13 Manufacturer's Identification

Embossed brass or stainless steel tag, hung by brass or stainless steel chain at each end of each conduit or insulated piping in the manholes and buildings, shall be provided. The tag shall identify UHDS manufacturer's name, date of installation, Government contract, and manufacturer's project number.

2.2 FACTORY FABRICATED, DIRECT-BURIED WSL SYSTEM

2.2.1 WSL Medium Temperature Hot Water Carrier Pipes

Pipe material requirements shall be in accordance with paragraph HEAT DISTRIBUTION PIPING. The pipe shall be steel with the ends machined and metallized to provide a satisfactory sealing surface for the sealing rings. The metallizing shall be a high nickel alloy applied to an excess thickness and then machined to the required OD.

2.2.2 Omitted
2.2.3 Omitted
2.2.4 Omitted
2.2.5 Omitted

2.2.6 WSL Carrier Pipe Insulation

Insulation shall conform to minimum thicknesses and type listed for WSL systems in Tables 1 and 2 as required for temperature in carrier pipe. Insulation shall consist of an inner layer of high temperature calcium silicate and an outer layer of polyurethane foam.

2.2.6.1 Omitted
2.2.6.2 Omitted

2.2.6.3 Insulation Concentricity

Carrier pipe shall be concentric in relation to the casing pipe. The allowable maximum deviation from center line of the carrier pipe shall be plus or minus 6 mm at the casing center point and plus or minus 1.5 mm at the end seals.

2.2.6.4 Insulated Fittings

Fittings shall be pre-insulated by manufacturer using the same insulation thickness and casing as the straight sections.

2.2.7 Manufacturer's Identification

The Contractor shall provide an embossed brass tag hung by a brass chain, or a stainless steel tag hung by a stainless steel chain, at each end of each casing or insulated piping in the manholes and buildings. The tags shall identify UHDS manufacturer's name and date of installation.

2.2.8 End Seals

Each preinsulated section of piping shall completely seal the insulation, providing a permanent water and vapor seal at each end. Preinsulated factory fabricated sections of piping modified in the field shall be provided with an end seal which is equivalent to the end seals furnished with the preinsulated section of piping. Tests shall be conducted by the UHDS manufacturer to demonstrate that casings, couplings and end seals are

capable of resisting penetration of water into the casing and insulation under rated conditions. The tests shall be performed on each type of pre-fabricated system to be furnished, and the test results shall be verified by an independent testing laboratory. The steam and condensate return systems shall be tested and certified in accordance with paragraph Assembly Test of WSL Systems for Condensate Return Service.

2.3 PIPE INSULATION TYPE AND MINIMUM THICKNESS

Materials containing asbestos will not be permitted. The minimum thickness of insulation for the heat distribution system shall be in accordance with Table 1 in which the insulations listed have passed the 96 hour boiling water test.

TABLE 1
MINIMUM PIPE INSULATION THICKNESS (mm)

Medium Temperature
Hot Water Supply and Return (120 to 175 degrees C).

	INSULATIONS For Drainable/Dryable Systems			INSULATIONS For other Pre-Engineered Systems	
Nominal Pipe Diameter (mm)	Paroc	Epitherm Delta	Kaylo-10 Thermo-12 Super Caltemp	Calcium Silicate	WSL Polyurethane
25	50	63	100	N/A	N/A
40	50	63	100	N/A	N/A
50	63	85	110	N/A	N/A
65	63	85	110	N/A	N/A
80	75	100	125	25	+31
100	75	100	125	25	+31
125	75	100	125	N/A	N/A
150	85	110	135	35	+34
200	85	110	135	50	+30
250	100	125	150	63	+33
300	100	125	150	50	+32
350	100	125	150	N/A	N/A
400	100	125	150	N/A	N/A
450	100	125	150	N/A	N/A

2.4 HEAT DISTRIBUTION PIPING

2.4.1 Medium Temperature Hot Water Pipe

Pipe material shall be steel; seamless ASTM A 53, Grade B or ASTM A 106, Grade B; or electric resistance welded ASTM A 53, Grade B; Schedule 40. Standard weight will be permitted for pipe sizes 300 mm and above. ASTM A 53, Type F furnace butt welded pipe will not be allowed. Joints will not be allowed in the factory fabricated straight section of the carrier pipe. Factory fabricated piping sections, as part of an expansion loop or bend, shall have all welded joints 100% radiographically inspected in accordance with ASME B31.1. Radiographs shall be reviewed and interpreted by a Certified American Society for Nondestructive Testing (ASNT) Level III radiographer, employed by the testing firm, who shall sign the reading report.

2.4.1.1 Condensate Pipe

Pipe shall be steel; seamless ASTM A 53, Grade B or ASTM A 106, Grade B, schedule 80; electric resistance welded ASTM A 53, Grade B; Schedule 80. ASTM A 53, Type F furnace butt welded pipe will not be allowed. Joints will not be allowed in the factory fabricated section of the carrier pipe. Factory fabricated piping sections, as part of an expansion loop or bend shall have all welded joints 100% radiographically inspected in accordance with ASME B31.1. Radiographs shall be reviewed and interpreted by an ASNT Certified Level III radiographer, employed by the testing firm, who shall sign the reading report.

2.4.1.2 Joints

Joints shall be butt-weld except socket-weld joints will be permitted for pipe sizes 50 mm and smaller. Dye penetrant may be used in place of 100% radiographic inspection for pipe sizes 50 mm and below. Location and elevation of all field joints shall be indicated on detailed design layout drawings. Split-ring welding rings may be used.

2.4.2 Fittings

Welds in factory fittings shall be radiographically inspected. Radiographs shall be reviewed and interpreted by a Certified ASNT Level III radiographer, employed by the testing firm, who shall sign the reading report. The Contracting Officer may review all inspection records, and if any welds inspected are found unacceptable in accordance with ASME B31.1, the fitting shall be removed, replaced, and radiographically reexamined at no cost to the Government.

2.4.2.1 Butt-Welded

Fittings shall be steel; ASTM A 234/A 234M, Grade B or ASME B16.9, same schedule as adjoining pipe. Elbows shall be long radius unless otherwise indicated. Tees shall be full size or reducing as required, having interior surfaces smoothly contoured. Split-ring welding rings may be used.

2.4.2.2 Socket-Welded

Fittings shall be forged steel ASME B16.11; 13,800 kPa class shall be used for pipe sizes 50 mm and below. Dye penetrant inspection may be used in lieu of radiographic inspection of welded fittings for pipe sizes 50 mm and below.

2.5 EXPANSION LOOPS AND BENDS

Stresses shall be less than the maximum allowable stress from the Power Piping Code (ASME B31.1). Detailed design layout drawings and stress and anchor force calculations shall be provided for all loops and bends. Locations of all anchors, guides and supports shall be shown. The calculations shall be based on design characteristics (pressures and temperatures) specified for both the supply and return lines.

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

3.1.1 Job Conditions

Phasing of construction shall be as shown on contract drawings.

3.1.2 Interruption of Existing Service

The Contractor shall arrange, phase and perform work and provide temporary facilities, materials, equipment, and connections to utilities, to ensure adequate heat distribution service for existing installations at all times. Only necessary interruptions required for making connections will be permitted, and only at times when approval is obtained from the Contracting Officer. All interruptions shall be as approved by the Contracting Officer.

3.1.3 Grading

Unless otherwise shown on the contract drawings or the detailed design layout drawings, steam/condensate and high temperature hot water supply/return lines shall be graded uniformly downward not less than 40 mm in 10 meters to the lower point of entry between manholes and/or building entries.

3.1.4 Connecting to Existing Work

New work shall be connected to existing work in a neat and workmanlike manner. Connections shall be made only in manholes. Where an existing structure must be cut or existing utilities interfere, such obstructions shall be bypassed, removed, replaced or relocated, restored and repaired. Any changes required to the UHDS design as a result of interferences or conflicts shall be approved by the UHDS designer and the Contracting Officer. Work disturbed or damaged shall be replaced to its prior condition.

3.1.5 Coordination

The location of all items of equipment and work of all trades shall be coordinated. Operability and maintainability of the equipment and systems shall be maintained.

3.1.6 Variations

Any variations from the approved, detailed design layout drawings shall be submitted to the Contracting Officer for approval. Variations shall be signed and sealed by the UHDS manufacturers' professional engineer responsible for the complete design of the UHDS.

3.1.7 Storage and Handling During Installation

Equipment and material placed on the job shall remain in the custody of the Contractor until final acceptance whether or not the Contractor has been reimbursed for the equipment and material by the Government. The Contractor shall be solely responsible for the protection of the equipment and material against damage from any source while stored or during installation. Materials shall be protected against damage from UV light, and entry of water and mud, by installing watertight protection on open ends at all times. Sections of the casing or carrier piping found to have been subjected to full or partial submergence in water (which would allow the insulation to become wet) shall be immediately replaced. Materials awaiting installation shall be covered to protect from UV degradation.

3.2 DEMOLITION

3.2.1 Demolition Procedures

Work shall be performed in accordance with requirements for phasing. Pipe, valves, fittings, insulation, and hangers, including the connection to the structure and any fastenings, shall be removed. Openings in manhole or building walls shall be sealed after removal of piping. Material and equipment removed shall become the property of the Contractor and shall be removed from Government property within 1 week and shall not be stored in operating areas. Flame cutting shall be performed with adequate fire protection facilities available as required by safety codes and Contracting Officer.

3.2.2 Asbestos Removal

Asbestos removal shall conform to Section 13280 ASBESTOS ABATEMENT.

3.3 PIPE, PIPING JOINTS AND FITTINGS

3.3.1 Joint Preparation

Pipe and fittings shall be cleaned inside and outside before and after assembly. Dirt, scale, and other foreign matter shall be removed from inside the piping by use of a pipe swab or pipe pig before connecting pipe sections, valves, equipment or fittings. Eccentric connectors shall be used as needed between casing sections to provide drainage of casing section between manholes and between manholes and buildings.

3.3.2 Direction Changes

Changes in direction shall be made with factory-built reinforced fittings. Field-fabricated fittings and miters will not be permitted.

3.4 WELDING

The Contractor shall be responsible for welding quality and shall:

a. Conduct tests of the welding procedures used in the work, determine the suitability of the procedures used, determine that the welds made will meet the required tests, and determine that the welding operators have the ability to make sound welds under standard conditions.

b. Comply with ASME B31.1.

c. Perform all welding operations required for construction and installation of the heat distribution system.

3.4.1 Qualification of Welders

Rules of procedure for qualification of all welders and general requirements for fusion welding shall conform with the applicable portions of ASME B31.1, and as outlined below.

3.4.2 Examining Welders

The Contractor shall examine each welder to determine the ability of the welder to meet the required qualifications. Welders shall be tested for welds in all positions, including welds with the axis horizontal (not rolled) and with the axis vertical. Each welder shall:

a. Weld only in positions in which they have qualified.

b. Identify welds with the specific code marking signifying name and number assigned.

3.4.3 Examination Results

The Contractor shall furnish a list of welder's names and corresponding code markings. Welders which fail to meet the prescribed welding qualifications shall be retested. Welders who fail the second test shall be disqualified for work on this project.

3.4.4 Beveling

Field and shop bevels shall be done by mechanical means or by flame cutting. Where beveling is done by flame cutting, surfaces shall be thoroughly cleaned of scale and oxidation just prior to welding.

3.4.5 Alignment

Split welding rings shall be used for field joints on carrier pipes above 50 mm to assure proper alignment, complete weld penetration, and prevention of weld spatter reaching the interior of the pipe. Field joints 50 mm and smaller shall be made with welding sockets.

3.4.6 Erection

Piping shall not be split, bent, flattened, or otherwise damaged before, during, or after installation. Where the pipe temperature falls to 0 degrees C or lower, the pipe shall be heated to approximately 38 degrees C for a distance of 300 mm on each side of the weld before welding, and the weld shall be finished before the pipe cools to 0 degrees C.

3.4.7 Defective Welds

Defective welds shall be replaced and reinspected in accordance with ASME B31.1. Repairing defective welds by adding weld material over the defect or by peening will not be permitted. Welders responsible for defective welds shall be tested for qualification.

3.4.8 Electrodes

Electrodes shall be stored in a dry, heated area, and shall be kept free of moisture and dampness during fabrication operations. Electrodes that have lost part of their coating shall not be used.

3.4.9 Radiographic Testing

An approved independent testing firm regularly engaged in radiographic testing shall perform radiographic examination of 100% of the field welds in the carrier piping of direct-buried systems in accordance with ASME B31.1. The following shall be furnished: a set of films showing each weld inspected, a reading report evaluating the quality of each weld, and a location plan showing the physical location where each weld is to be found in the completed project, prior to installing casing field joints, backfilling and hydrostatic testing. All radiographs shall be reviewed and interpreted by a Certified American Society for Nondestructive Testing Level III radiographer, employed by the testing firm, who shall sign the

reading report. The Contracting Officer may review all inspection records, and if any welds inspected are found unacceptable they shall be removed, rewelded, and radiographically reexamined at no cost to the Government.

3.5 HEAT DISTRIBUTION SYSTEM INSTALLATION

The UHDS manufacturer's representative shall oversee the delivery, storage, installation and testing of the system. Work shall be in accordance with the requirements specified and with the printed instructions of the manufacturer. These specifications shall take precedence over the printed instructions if conflicts arise. Printed instructions shall be submitted to the Contracting Officer prior to system installation.

3.5.1 Verification of Final Elevations

Prior to covering the top of the casing with backfill material, but after all temporary supports have been removed and initial backfilling of the conduit system has been accomplished, the Contractor shall measure and record the elevation of the top of the casing in the trench. Elevations shall be taken at every completed field joint, 1/3 points along each pipe section and top of elbows. These measurements shall be checked against the contract drawings and shall confirm that the conduit system has been installed to the elevations shown on the contract drawings. Slope shall be uniform to within 0.1%. These measurements shall be recorded by the Contractor, included in the UHDS manufacturer's representative daily report, and given to the Contracting Officer prior to covering the casing with backfill material.

3.5.2 Excavation, Trenching, and Backfilling

Excavation, trenching, and backfilling shall be performed as required by the UHDS manufacturer's design and as specified in Section 02316 EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS. Pipe shall lay on a 305 mm minimum sand bed and shall be backfilled with sand on all sides to a minimum of 150 mm as measured from outside of casing. Foundation for system shall be firm and stable. Foundation and backfill shall be free from rocks or substances which could damage the system coating. Concrete anchor and thrust blocks shall be installed in undisturbed earth. Backfilling shall not commence until system has been satisfactorily pressure tested (both hydrostatic test of carrier and air test of casing). Minimum depth of burial to the top of the casing shall be 1 meter. Maximum depth of burial to the top of the casing shall be 3 meters.

3.5.3 UHDS Manufacturer's Representative Responsibilities

The UHDS Manufacturer's representative shall be present at the job site and witness when the following types of work are being performed:

a. Inspection and unloading.

b. Inspection of trench prior to commencing installation of system.

c. Inspection of concrete anchors and thrust blocks.

d. Pneumatic and Hydrostatic testing.

e. Field joint closure work.

f. Air test of casing.

g. Holiday test of conduit coating.

h. Repair of any coating.

i. Installation of cathodic protection system.

j. Initial backfill up to 250 mm above the top of the casing.

k. Verification of final elevations. Elevation readings shall be witnessed and recorded.

l. Testing of cathodic protection system.

m. Operational tests.

The UHDS manufacturer's representative shall notify the Contractor immediately of any problems. The UHDS manufacturer's representative shall notify the Contracting Officer of problems requiring immediate action; otherwise, the daily reports shall note any problems encountered and indicate the corrective actions taken.

3.5.4 UHDS Manufacturer's Representative Reports

The UHDS manufacturer's representative shall: prepare and sign a written daily report; present the original daily report to the Contracting Officer no later than one working day after it is prepared; and forward 1 copy to the manufacturer's main office. The report shall state whether or not the condition and quality of the materials used and the delivery, storage, installation and testing of the system are in accordance with the drawings, specifications, and manufacturer's printed instructions and are satisfactory in all respects. When any work connected with the installation is unsatisfactory, the report shall state what corrective action has been taken or shall contain the UHDS manufacturer's recommendations for corrective action. The report shall identify any condition that could result in an unsatisfactory installation, including such items as open conduit ends left in the trench overnight and improper manhole entries. The daily reports shall be reviewed, signed and sealed, on a weekly basis, by the registered engineer responsible for the system design. Signed and sealed copies of the daily reports shall be submitted with the payment request. Requests for payment will be denied if the weekly review is not accomplished. Upon completion of the work and before final acceptance, a notarized Certificate of Compliance, signed by a principal officer of both the manufacturing and the contracting firms, stating that the installation is satisfactory and in accordance with drawings, specifications, and manufacturer's instructions shall be delivered to the Contracting Officer. The UHDS manufacturer shall retain a copy of all daily reports and the Certificate of Compliance for 5 years after final acceptance of the system by the Government.

3.5.5 Protection

Casing coating shall be protected from damage during unloading, storage, rigging and installation. Casing and carrier pipe ends shall be protected from water intrusion during unloading, storage, rigging and installation. Piping and accessories shall be protected from damage due to exposure to UV light.

3.5.6 Defective Material

The UHDS manufacturer's representative shall take prompt action to remove from the site all damaged or defective material, subject to rejection in accordance with the quality assurance provisions included in the manufacturer's submittals and printed instructions, and shall order prompt replacement of such material.

3.5.7 Cathodic Protection Installation

Provide cathodic protection for all steel casing systems and all buried exposed metal. Assume that 25 percent of the exterior of the UHDS is exposed metal. Cathodic protection systems shall have a minimum design life of 25 years and shall conform to Section 13110 CATHODIC PROTECTION SYSTEM (SACRIFICIAL ANODE). Dielectric pipe flanges and unions, and isolation devices shall be provided at all points necessary. Test stations at grade shall be provided on each section of the piping system. Isolation flanges and unions shall be rated for the service temperature and pressure.

3.6 TESTS

Leak-tightness of all piping systems shall be demonstrated by performing pressure tests (hydrostatic, pneumatic) and operational tests. Heat distribution system shall be pressure tested in conformance with specified requirements and printed instructions for the system supplied; tests shall include carrier piping and casing. The carrier pipe shall be hydrostatically tested. Casings of DDT systems shall be pneumatically tested. Casing and end seals of WSL system shall be tested for intrusion of water into the casing and insulation.

3.6.1 Holiday Testing of Direct-buried System Steel Casings

Entire exterior surface of the casing, including the bottom exterior surface, shall be tested for faults in coating after installation in trench, prior to backfilling, using test method and voltage recommended by coating manufacturer. If any holidays are found, they shall be repaired and the coating retested. System shall not be backfilled until all holidays are eliminated.

3.6.2 Pneumatic, Hydrostatic and Operational Tests

Before conducting heat distribution system tests, lines shall be flushed with high pressure water until discharge shows no foreign matter.

3.6.2.1 Pneumatic Test

The casing of DDT systems shall be pneumatically tested after welding and before field coating using air as the test medium. The test pressure shall be 103 kPa. 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 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 casing 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. 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 (1) and final (2) readings. Pressure shall be measured with a pressure gauge conforming to ASME B40.1. A throttling type needle valve or a pulsation dampener and shutoff valve may be included. The diameter of the face shall be at least 114 mm with a measurable range of 0 to 103 kPa and graduations of at least 0.5 kPa. During the test, the entire system shall be completely isolated from all compressors and other sources of air pressure. Each joint shall be tested while under test pressure by means of soap and water or an equivalent nonflammable solution prior to backfilling or concealing any work. 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 proper safety precautions for air pressure testing at all times during the tests.

3.6.2.2 Hydrostatic Test

Carrier piping shall be tested hydrostatically before insulation is applied at field joints and shall be proved tight at a pressure 1.5 times the heat distribution supply pressure of 400 kPa for 2 hours. There shall be no indication of reduction of pressure during the test. Pressure shall be measured with a device calibrated to be read in increments not greater than 1 kPa.

3.6.2.3 Operational Test

Prior to acceptance of the installation, Contractor shall subject system to operating tests simulating actual operating conditions to demonstrate satisfactory functional and operating efficiency. These operating tests shall cover a period of not less than 6 hours for each portion of system tested. Contractor shall submit for approval a schedule of the tests to be performed. The contractor shall provide calibrated instruments, equipment, facilities and labor, at no additional cost to the Government. When failures occur, problems shall be repaired and test repeated.

3.6.3 Deficiencies

Deficiencies discovered shall be corrected at the Contractor's expense. Major deficiencies, or failure to correct deficiencies, may be considered cause for rejecting the entire installation.

3.7 VALVE MANHOLES

Valve manholes, piping, and equipment in valve manholes shall be in accordance with the contract drawings and Section 02570 VALVE MANHOLES AND PIPING AND EQUIPMENT IN VALVE MANHOLES.

3.8 BURIED UTILITY WARNING AND IDENTIFICATION

3.8.1 Plastic Marking Tape

Polyethylene plastic tape manufactured specifically for warning and identifying buried utility lines shall be supplied and installed. Tape shall be buried above the pipe during the trench backfilling operation and shall be buried approximately 300 mm below grade. Tape shall be polyethylene with a metallic core. Tape shall be acid- and alkali-resistant and shall have a minimum strength of 12 MPa lengthwise and

10.3 MPa crosswise with an elongation factor of 350 percent. The tape shall be manufactured with integral wires, foil backing or other means to enable detection by a metal detector when the tape is buried up to 1 m deep. The metallic core of the tape shall be encased in a protective jacket or provided with other means to protect it from corrosion. The tape shall be of a type specifically manufactured for marking and locating metallic underground utilities. Tape shall be 150 mm wide and printed with a caution and identification of the piping system over the entire tape length. Tape shall be yellow with bold black letters. Tape color and lettering shall be unaffected by moisture and other substances contained in the backfill material.

3.8.2 Markers for Underground Piping

Markers for underground piping shall be located along the distribution and service lines. Markers shall be placed as indicated approximately 600 mm to the right of the distribution system when facing in direction of flow in the supply line. The marker shall be concrete 150 mm square or round section 600 mm long. The top edge of the marker shall have a minimum 13 mm chamfer all around. The letters MTHW shall be impressed or cast on the top, and on one side of the markers to indicate the type of system that is being identified. Each letter shall be formed with a V-shaped groove and shall have a width of stroke at least 6 mm at the top and depth of 6 mm. The top of the marker shall protrude not more than 25 mm above finished grade.

3.9 THERMAL PERFORMANCE TESTING

The equipment and procedures specified shall be used to ensure acceptable thermal performance of the installed system. The test results shall be submitted for approval. All materials and procedures described for this test shall be included as deliverables of the construction contract for the system, unless otherwise noted.

3.9.1 Equipment

3.9.1.1 Casing Temperature Measurement

Before backfilling, and after field joint closures have been welded to the casing and the coating has been applied and cured, temperature sensors shall be attached to the exterior of every other field joint closure. The sensors shall be attached with epoxy suitable for use at 260 degrees C. A sensor shall be adhered with epoxy to the coated casing near the midpoint of every other pipe section between field joints. The sensor shall not be located closer than 1.5 m from any guide in the interior of the casing. After the sensors have been adhered to the casing, 2 complete wraps of duct tape shall be used to secure and protect the sensor. The radial position of the sensors shall be located 45 degrees from the top center of the casing, at either the 1:30 or 10:30 position, away from the adjacent heat distribution system pipe if present. All sensors shall be type T thermocouples in accordance with ANSI MC96.1 copper constantan 20 gauge thermocouples, made from special limits grade thermocouple wire, 0.5 degrees C or 0.4 percent maximum error, with each conductor insulated and an overall jacket on both conductors. Insulation on the thermocouple wires shall be suitable for service at 260 degrees C. The thermocouple wire between sensor location and termination point shall be continuous with no splicing or other connections. Each sensor shall be shown with a special symbol on the detailed design layout drawings and shall be identified by a number and/or letter code, starting from the upstream manhole.

3.9.1.2 Carrier Pipe Temperature Measurement

Carrier pipe temperature shall be measured within the manhole where the panel box is located. Carrier pipe temperature shall be measured by a sensor adhered with epoxy directly to the exterior of the carrier pipe. All sensors shall be type T thermocouples in accordance with ANSI MC96.1 copper constantan 20 gauge thermocouples, made from special limits grade thermocouple wire, 0.5 degrees C or 0.4 percent maximum error, with each conductor insulated and an overall jacket on both conductors. Insulation on the thermocouple wires shall be suitable for service at 260 degrees C. The thermocouple wire between sensor location and termination point shall be continuous with no splicing or other connections. The location of this sensor shall be at either the 1:30 or 10:30 position. At the location of the sensor, the carrier pipe shall be insulated with calcium silicate insulation at least 125 mm thick. This insulation shall extend at least 150 mm on each side of the actual sensor location and shall be clad with an aluminum jacket.

3.9.1.3 Terminals

The wires from each casing or carrier pipe temperature sensor shall be extended into the nearest manhole and terminated in a panel box. The panel box shall be a NEMA Type 4 waterproof enclosure, of suitable size, mounted near the top of the manhole at a location near the manhole entrance, accessible without entrance into the manhole, where possible. The termination of the sensor wires shall be with an approved connector of type OMEGA Miniature Jack Panel (MJP-*-*-T). The thermocouple jack panel shall be mounted to the back plate of the panel box. The temperature sensors shall be labeled at their termination within the panel box; a drawing showing the location of each temperature sensor shall be laminated and attached to the inside of the panel box. All temperature sensors shall be verified as operational by an independent laboratory, hired by the Contractor, after backfilling is complete but before the system is accepted.

3.9.2 Thermal Performance Test

After the system construction is complete, including backfilling, and the system has reached operating condition for at least 30 days, all of the temperature sensors shall be read by an independent laboratory with experience and equipment appropriate for the sensors used. The temperature shall be recorded for each sensor. The temperatures shall be tabulated and submitted in accordance with specified requirements. If temperatures exceed values in Table 3, that portion shall be repaired and temperatures again measured and recorded.

TABLE 3

Carrier Pipe Temperat. TP (degrees C)	Carrier Pipe Temperat. TP (degrees F)	Acceptable Casing Temperature TC (degrees C)	Acceptable Casing Temperature TC (degrees F)
121	250	43	110
135	275	47	116
149	300	50	123
163	325	54	129
177	350	58	136

TABLE 3

Carrier Pipe Temperat. TP (degrees C)	Carrier Pipe Temperat. TP (degrees F)	Acceptable Casing Temperature TC (degrees C)	Acceptable Casing Temperature TC (degrees F)
204	400	65	149
218	425	68	155
232	450	72	162

The following equations were used to calculate the above values:

T@ <(0.261) X (TP) + 44.3 (for English units)
T, <(0.261) X (TP) + 11.5 (for Metric units)

For carrier pipe temperatures between those given in Table 3, the maximum acceptable casing temperature may be either interpolated from the values in Table 3 or calculated using the equations above.

-- End of Section --

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CEGS-02555 (December 1997)

Includes changes through Notice 1 (July 1999)

SECTION 02555

PREFABRICATED UNDERGROUND HEATING/COOLING DISTRIBUTION SYSTEM
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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 A 53	(1998) Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless
ASTM A 105/A 105M	(1998) Carbon Steel Forgings for Piping Applications
ASTM A 106	(1997a) Seamless Carbon Steel Pipe for High-Temperature Service
ASTM A 234/A 234M	(1997) Piping Fittings of Wrought Carbon Steel for Moderate and High Temperature Service
ASTM B 88	(1996) Seamless Copper Water Tube
ASTM C 518	(1991) Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus
ASTM C 591	(1994) Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation
ASTM D 1248	(1984; R 1989) Polyethylene Plastics Molding and Extrusion Materials
ASTM D 1384	(1997a) Corrosion Test for Engine Coolants in Glassware
ASTM D 2241	(1996b) Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series)
ASTM D 2564	(1996a) Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems
ASTM D 3139	(1998) Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
ASTM D 5686	(1995) "Fiberglass"

	(Glass-Fiber-Reinforced Thermosetting-Resin) Pipe and Pipe Fittings, Adhesive Bonded Joint Type Epoxy Resin, for Condensate Return Lines
ASTM F 477	(1996) Elastomeric Seals (Gaskets) for Joining Plastic Pipe

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME B1.20.1	(1983; R 1992) Pipe Threads, General Purpose (Inch)
ASME B16.9	(1993) Factory-Made Wrought Steel Buttwelding Fittings
ASME B16.11	(1996) Forged Fittings, Socket-Welding and Threaded
ASME B31.1	(1998) Power Piping

COPPER DEVELOPMENT ASSOCIATION (CDA)

CDA Tube Handbook	(1995) Copper Tube Handbook

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

MSS SP-73	(1991; R 1996) Brazing Joints for Copper and Copper Alloy Pressure Fittings

1.2 SYSTEM DESCRIPTION

This specification applies to chilled water distribution piping on all sites and heating water distribution piping in the 100 and 300 block areas. The system consists of a buried prefabricated chilled water and low temperature hot water distribution system including service connections to a point 150 mm inside of the building. The contract drawings show the specific arrangement of piping, sizes and grades of pipe, and other details. The system is designed for an operating pressure of 630 kPa and an operating temperature of 100 degrees C for hot water and 5 degrees C for chilled water.

1.3 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Data

Distribution System; GA|D.

Data composed of catalog cuts, brochures, circulars, specifications and product data, and printed information in sufficient detail and scope to verify compliance with the requirements of the contract documents.

SD-04 Drawings

Distribution System; GA|D.

Detail drawings consisting of fabrication and assembly drawings, for all parts of the work in sufficient detail to check conformity with the requirements of the contract documents, prior to installation. Detail drawings shall also contain complete piping, wiring and schematic diagrams and any other details to demonstrate that the system has been coordinated and will properly function as a unit. Drawings shall show proposed layout, method of compensation for pipe expansion and contraction, anchorage of equipment and appurtenances, and equipment relationship to other parts of the work including clearances required for maintenance and operation. The drawings shall clearly identify any proposed deviations from the requirements of the contract documents.

SD-13 Certificates

Distribution System; GA|D.

The manufacturer's or system fabricator's written certification stating that the distribution system furnished meets all the requirements of this specification.

Welding Procedures and Operators; FIO.

Prior to welding operations, a copy of qualified procedures and a list of names and identification symbols of qualified welders and welding operators.

SD-19 Operation and Maintenance Manuals

Distribution System; GA|D.

Eight copies of operation and eight copies of maintenance manuals for the equipment furnished, 1 complete set prior to performance testing and the remainder upon acceptance. Operation manuals shall detail the step-by-step procedures required for equipment startup, operation, and shutdown. Operation manuals shall include the manufacturer's name, model number, parts list, and brief description of all equipment and their basic operating features. Maintenance manuals shall list routine maintenance procedures, possible breakdowns and repairs, and troubleshooting guides. Maintenance manuals shall include piping and equipment layout and simplified wiring and control diagrams of the equipment system as installed. Manuals shall be approved prior to the field performance testing.

1.4 DELIVERY AND STORAGE

After delivery to the jobsite, all materials and equipment shall be protected from anything which could cause damage to the material or equipment. Pipe shall be sealed at each end to keep the interior clean and free of dirt and debris. Fittings shall be kept together and their interior surfaces shall remain clean. Insulation shall be kept dry and clean.

1.5 FIELD MEASUREMENTS

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.

1.6 WELDING

Welding and nondestructive testing procedures are specified in Section 05093 WELDING PRESSURE PIPING.

PART 2 PRODUCTS

2.1 STANDARD PRODUCTS

System components shall be standard products of a manufacturer regularly engaged in the manufacture of the product and shall essentially duplicate items that have been in satisfactory use for at least 2 years prior to bid opening. The system shall be supported by a service organization that is, in the opinion of the Contracting Officer, reasonably convenient to the site.

2.2 PIPING AND CASING MATERIALS

2.2.1 General

Metallic pressure pipe, fittings, and piping accessories shall conform to the requirements of ASME B31.1 and shall be types suitable for the temperature and pressure of the water.

2.2.2 Piping

2.2.2.1 Steel Pipe

Piping shall conform to ASTM A 53, Grade B, standard weight, black or to ASTM A 106, Grade B, standard weight.

2.2.2.2 Copper Tubing

Copper tubing shall conform to ASTM B 88, Type K or L.

2.2.2.3 Omitted

2.2.2.4 Polyvinyl Chloride (PVC) Pipe

PVC pipe shall conform to ASTM D 2241 with a Standard Thermoplastic Pipe Dimension Ratio (SDR) of 26 and PVC 1120 or 1220 as the material. PVC pipe shall be limited to use on chilled water systems only.

2.2.3 Casings

2.2.3.1 Omitted

2.2.3.2 Polyethylene (PE) Casing

Polyethylene casings shall conform to ASTM D 1248, Type III, Class C, Category 3 or 4, Grade P 34 with thickness as follows:

Casing Diameter (in mm)	Minimum Thickness (in mm)
250 and smaller	3
250 to 450	4
450 to 600	5

Casing Diameter (in mm)	Minimum Thickness (in mm)
over 600	6

2.2.3.3 Reinforced Thermosetting Resin Pipe (RTRP) Casing

RTRP casing shall be of the same material as the pipe, with casing thickness as follows:

Casing Diameter (in mm)	Minimum Thickness (in mm)
200 and smaller	1.2
250	2
300	2.7
350	2.9
400 to 450	3
500	3.2
600	3.9

2.3 PIPING CONNECTIONS

2.3.1 Steel Pipe

Steel pipe smaller than 20 mm (3/4 inch) may be threaded; otherwise, all steel pipe shall be welded. Steel welding fittings shall conform to the requirements of ASTM A 105/A 105M or ASTM A 234/A 234M. Welding fittings shall also conform to ASME B16.9 for buttweld fittings and ASME B16.11 for socket-weld fittings. Long radius buttwelding elbows conforming to ASME B16.9 shall be used whenever space permits. Pipe Threads shall conform to ASME B1.20.1. Pipe to be threaded shall be schedule 80.

2.3.2 Copper Pipe

Copper pipe shall be brazed or connected using an insulated pipe coupling. Wrought copper or cast copper alloy solder joint pressure fittings shall conform to MSS SP-73. Insulated pipe couplings for copper pipe shall be cast bronze containing an O-ring seal on each end and shall be jacketed and sealed to act as an expansion joint.

2.3.3 Plastic Pipe

a. Pipe, fittings, flanges, and couplings shall have end connections of the adhesive bell and spigot type. Threaded piping, including pipe, fittings, flanges, and couplings, will not be permitted.

b. Flanged Connections: Flat face flanged connections shall be provided between plastic piping and metal piping. Plastic flanges shall be suitable for connection to ASME Class 150 flanges.

2.3.3.1 General

Plastic fittings shall be made of the same type and grade of material as the piping to which they will be connected and shall be furnished by the manufacturer who supplies the pipe. Fittings shall have temperature and pressure ratings not less than those of the connecting piping.

2.3.3.2 Polyvinyl Chloride (PVC)

Polyvinyl chloride (PVC) pipe shall be solvent welded or connected using bell and spigot connections. The solvent used to connect fittings and pipe shall conform to the requirements of ASTM D 2564. Bell and spigot joints utilizing elastomeric seals shall conform to the requirements of ASTM D 3139. The elastomeric seals shall conform to ASTM F 477.

2.3.3.3 Reinforced Thermosetting Resin Plastic (RTRP)

Reinforced thermosetting resin plastic pipe shall be joined using fittings and adhesive furnished by the pipe manufacturer in accordance with ASTM D 5686.

2.4 END SEALS

2.4.1 General

Each preinsulated section of piping shall have a complete sealing of the insulation to provide a permanent water and vapor seal at each end of the preinsulated section of piping. Preinsulated sections of piping modified in the field shall be provided with an end seal which is equivalent to the end seals furnished with the preinsulated section of piping. End seals must be tested and certified in accordance with paragraph Casing and End Seal Testing and Certification.

2.4.2 Types

End seals provided shall be one of the following types:

a. Carrying the outer casing over tapered pipe insulation ends and extending it to the carrier pipe. Sufficient surface bonding area shall be provided between the casing and the carrier pipe.

b. Using specially designed molded caps made of polyethylene or rubber of standard manufactured thickness. A minimum 40 mmsurface bonding area shall be provided between the cap and both the casing and carrier pipe.

c. Using elastomer-ring end seals designed and dimensioned to fit in the annular space between the casing and the carrier pipe.

d. Using a waterproof mastic seal vapor barrier over the exposed insulation ends.

e. Shrink sleeves.

2.4.3 Casing and End Seal Testing and Certification

Testing and certification procedures by an independent testing laboratory shall demonstrate that casings and end seals are capable of resisting penetration of water into the casing and insulation. The test shall be performed on the type of prefabricated system to be furnished. If more than one type of prefabricated system is to be used, then the tests shall be performed on each type. The test shall consist of hot and cold cycle testing followed by immersion in a water filled chamber with a head pressure. The hot and cold cycle testing shall consist of 14 days of temperature cycling. A fluid with a temperature of 5 degrees C shall circulate through the carrier pipe alternating every 24-hours with a fluid with a temperature of 95 degrees C circulating through the carrier pipe for

a low temperature hot water or dual temperature service or 24 degrees for a chilled water service. While the hot and cold cycle test is being performed, the test sample is either buried or encased in dry bedding sand with a minimum of 300 mm of sand all around the test sample. The carrier pipe size of the test sample shall be 80 mm (3 inches) in diameter and shall be restrained during the test period. The insulation thickness shall not exceed the maximum thickness provided for the piping in the project. Transition time for temperature cycle testing shall not exceed 15 minutes in going from cold to hot and 30 minutes in going from hot to cold. The fluid in the carrier pipe may be water, oil or heat transfer fluid. Following the hot and cold cycling test, the test sample shall be immersed in a water filled chamber. The pressure on the highest point of the test sample shall not be less than 60 kPa subjected over the entire length of the 2.4 m test sample of prefabricated pipe. The water shall contain a dye penetrant, which will be used to check for end seal leakage. The pressure in the chamber must be held for not less than 48 hours. Upon completion of this pressure test, the test sample shall be cut open. With the use of a light that will readily show the presence of the dye that was in the water, the test sample shall be inspected. Evidence of the dye inside the test sample shall indicate that the end seal is not acceptable and cannot be certified.

2.5 INSULATION

2.5.1 Factory Applied Insulation

Prefabricated pipe and fittings shall be insulated in the factory. Foam insulation for prefabricated insulated pipe and fittings shall be polyurethane foam meeting the requirements of ASTM C 591 having a density not less than 32 kg per cubic meter. The polyurethane foam shall completely fill the annular space between the carrier pipe and the casing. Insulation thickness shall be a minimum of 20 mm. The insulation thermal conductivity factor shall not exceed the numerical value of 0.02 W/mK (0.15 Btu-inch/square foot-degree F-hour) at 24 degrees C, when tested in accordance with ASTM C 518. Manufacturer shall certify that the insulated pipe is free of insulation voids.

2.5.2 Field Applied Insulation

Field applied insulation for fittings, and field casing closures, if required, and other piping system accessories shall be polyurethane matching the pipe insulation. Thickness shall match adjacent piping insulation thickness. Buried fittings and accessories shall have field applied polyurethane insulation to match adjacent piping and shall be protected with a covering matching the pipe casing. Shrink sleeves with a minimum thickness of 1.3 mm shall be provided over casing connection joints.

2.6 CONCRETE VALVE MANHOLES

Concrete valve manholes shall be provided in accordance with Section 02570 VALVE MANHOLES AND PIPING AND EQUIPMENT IN VALVE MANHOLES.

2.7 PIPING AND EQUIPMENT IN VALVE MANHOLES

Piping and equipment in valve manholes shall be provided in accordance with Section 02570 VALVE MANHOLES AND PIPING AND EQUIPMENT IN VALVE MANHOLES.

2.8 TREATED WATER

A 30 percent concentration by volume of industrial grade ethylene glycol shall be provided for the system in the 300 and 100 block areas. Glycol shall be tested in accordance with ASTM D 1384 with less than 0.013 mm penetration per year for all system metals. The glycol shall contain corrosion inhibitors. Silicate based inhibitors shall not be used. The solution shall be compatible with pump seals, other elements of the system, and water treatment chemicals used within the system.

PART 3 EXECUTION

3.1 INSTALLATION

For all preinsulated, prefabricated systems, the Contractor shall obtain the services of a trained representative of the pipe system manufacturer to instruct the Contractor's work forces in the installation procedures to ensure that the system is installed in accordance with the manufacturer's published instructions and the plans and specifications. The manufacturer's representative shall be a person who regularly performs such duties for the manufacturer. The Contractor shall furnish the Contracting Officer a list of names of personnel trained and certified by the pipe system manufacturer in the installation of this system. Only personnel whose names appear on the list will be allowed to install the system. The list shall not be more than 1 year old.

3.2 PIPING SYSTEMS

3.2.1 Buried Insulated Systems

Buried insulated systems shall consist of carrier pipe, insulation, casing, end seals, fittings and accessories as specified.

3.3 VALVE MANHOLES AND PIPING EQUIPMENT IN VALVE MANHOLES

Valve manholes and piping and equipment in valve manholes shall be installed in accordance with Section 02570 VALVE MANHOLES AND PIPING AND EQUIPMENT IN VALVE MANHOLES.

3.4 THRUST BLOCKS

Thrust blocks shall be installed at the locations shown or recommended by the pipe system manufacturer. Thrust blocks may not be required on all systems, and the need for thrust blocks shall be as recommended by the system manufacturer. Thrust blocks, if necessary, shall be installed at all changes in direction, changes in size, valves and terminal ends, such as plugs, caps and tees. Thrust blocks shall be concrete having a compressive strength of not less than 14 MPa (2000 psi)after 28 days and shall be in accordance with Section 03300 CAST-IN-PLACE STRUCTURAL CONCRETE. Thrust blocks shall be placed between solid ground and the fitting to be anchored. Unless otherwise indicated or directed, the base and the thrust bearing sides of the thrust blocks shall be poured directly against undisturbed earth. The sides of the thrust blocks not subject to thrust may be poured against forms. Thrust blocks shall be placed so that the joints for all fittings will be accessible for repair wherever possible. No pipe joint shall be embedded in concrete unless the assembly has previously been hydrostatically tested. The thrust blocks shall provide for transfer of thrusts and reactions without exceeding the allowable stress of the concrete and shall be installed in accordance with pipe manufacturer's instructions. In muck or peat, all thrusts shall be resisted by piles or tie rods to solid foundations or by removal of peat or

muck which shall be replaced with ballast of sufficient stability to resist thrusts.

3.5 INSTALLATION OF PIPING SYSTEMS

The piping system furnished shall be installed in accordance with the piping system manufacturer's instructions. Piping shall be installed without springing or forcing other than what has been calculated for cold spring. Pipe ends shall have burrs removed by reaming and shall be installed to permit free expansion and contraction without damage to joints or hangers. Nonmetallic pipe cut in the field shall be machined to fit couplings or joints and shall be coated or treated to match standard factory coated ends. Copper tubing shall not be installed in the same trench with ferrous piping materials. When nonferrous metallic pipe (e.g., copper tubing) crosses any ferrous piping material, a minimum vertical separation of 300 mm shall be maintained between pipes. Connections between different types of pipe and accessories shall be made with transition fittings approved by the manufacturer of the piping system.

3.5.1 Pitching of Horizontal Piping

Horizontal piping shall be pitched at a grade of not less than 40 mm in 1 m toward the drain points unless otherwise indicated.

3.5.2 Open Ends

Open ends of pipelines and equipment shall be properly capped or plugged during installation to keep dirt and other foreign matter out of the system.

3.5.3 Cutting Prefabricated Piping Sections

Where prefabricated pipe sections are field cut, new end seals similar to the factory applied end seal shall be provided and installed in accordance with the manufacturer's instructions.

3.5.4 Joints

3.5.4.1 Welded Joints

Welded joints between sections of pipe and between pipe and fittings shall be provided where specified or indicated.

3.5.4.2 Threaded Joints

Threaded joints shall not be used belowground. Joints shall be made tight with polytetrafluoroethylene tape applied to the male threads only. Not more than 3 threads shall show after the joint is made up.

3.5.4.3 Brazed Joints

Brazed joints for copper pipe and fittings shall conform to CDA Tube Handbook. Brazing alloys melting above 593.3 degrees C (1100 degrees F) shall be utilized.

3.5.4.4 Nonmetallic Pipe Joints

Nonmetallic pipe joints shall be installed in accordance with the written instructions of the manufacturer.

3.5.5 Expansion Loops

If expansion compensation is needed, expansion loops and expansion bends (Z- and L- type) shall be factory fabricated of casing, insulation, and carrier piping identical to that furnished for straight runs. Expansion loops and bends shall be properly designed in accordance with the allowable stress limits indicated in ASME B31.1 for the type of pipe used. Expansion loops and bends shall be shipped to the jobsite in the maximum size sections feasible to minimize the number of field joints. The expansion loops and bends casing and insulation where applicable, shall be suitably sized to accommodate pipe movement. Field joints shall be made in straight runs of the expansion loops and bends, and the number shall be kept to a minimum. For steel pipe, cold springing shall not be allowed when sizing the expansion loops and bends, but piping shall be cold sprung one-half the calculated maximum operational expansion during field assembly. Pipe stress in expansion loops and bends shall conform to the requirements for expansion loops specified in ASME B31.1.

3.5.6 Anchors

Anchor design shall be in accordance with the published data of the manufacturer and for prefabricated systems shall be factory fabricated by the prefabricated system manufacturer. In all cases, the design shall be such that water penetration, condensation, or vapor transmission will not wet the insulation.

3.5.7 Field Casing Closures

Field insulation and encasement of joints shall be accomplished after the visual and pressure tests specified are completed. Field insulation and encasement shall be in accordance with the manufacturer's written instructions. Thickness dimensions of the insulation and casing materials shall not be less than those of the adjoining prefabricated section. Insulating material shall be foamed in place polyurethane. Care should be taken to ensure that field closures are made under conditions of temperature and cleanliness required to produce a sound, continuous vapor barrier. A standard polyethylene heat shrink sleeve shall be installed over the casing and shall have a 150 mm minimum overlap at each end.

3.5.8 Underground Warning Tape

Underground warning tape shall be buried above the piping during the trench backfilling and shall be buried approximately 300 mm deep. Tape shall be polyethylene tape with metallic core. Tape shall be 150 mm wide and be printed with repetitive caution warnings along its length. Tapes shall be yellow in color with black letters. Tape color and lettering shall not be affected by moisture or other substances contained in the backfill material.

3.5.9 Markers for Underground Piping

Markers for underground piping shall be placed as indicated approximately 600 mm to the right of the distribution system and referenced to the flow direction in the supply line. The marker shall be concrete 150 mm square or round section 600 mm long. The top edge of the marker shall have a minimum 10 mm chamfer all around. The letters CHW and LHW shall be impressed or cast on the top of the markers to indicate the type of system that is being identified. Each letter shall be formed with a V-shaped groove and shall have a width of stroke at least 6 mm at the top and depth of 6 mm. The top of the marker shall protrude not more than 25 mm above

finished grade.

3.6 EARTHWORK

Earthwork shall be performed in accordance with Section 02316EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS.

3.7 ELECTRICAL WORK

Electrical work shall be performed in accordance with either Section 16375 ELECTRICAL DISTRIBUTION SYSTEM, UNDERGROUND or Section 16370ELECTRICAL DISTRIBUTION SYSTEM, AERIAL.

3.8 TESTING

Tests shall be conducted before, during, and after installation of the system. All instruments, equipment, facilities, and labor required to properly conduct the tests shall be provided by the Contractor. Test pressure gauges for a specific test shall have dials indicating not less than 1-1/2 times nor more than 2 times the test pressure. It shall be the Contractor's responsibility to make the pipe system workable at his expense.

3.8.1 Metallic Pipe Welds

An approved independent testing firm or firms regularly engaged in radiographic testing shall perform a radiographic examination of the field welds. The radiographic testing shall be performed in accordance with ASME B31.1 on 10 percent of the welds. All radiographs shall be reviewed and interpreted by a Certified Level III Radiographer employed by the testing firm. Any welds found to be unacceptable shall be removed, rewelded and radiographically reexamined in accordance with the above criteria. Such repair and reexamination shall be accomplished at no cost to the Government.

3.8.2 Carrier Pipe Cleaning and Testing

Distribution piping shall be tested as required before backfilling and with all joints exposed. The area between joints may be backfilled as necessary to prevent pipe movement.

3.8.2.1 Cleaning Carrier Pipe

Prior to testing, the interior of the carrier pipe shall be cleaned of foreign materials by thorough flushing with clean water. Water shall be circulated at a velocity between 2 and 3 m/s (7 and 10 feet per second) for a minimum of 4 hours. If required, temporary and/or supplementary pumps shall be provided to ensure that required velocity is achieved. System strainers shall be cleaned after the flushing operation is complete. Temporary strainers shall be installed as required. After flushing, the water shall remain in the piping system for testing of the system. All air shall be removed from the system prior to starting the tests.

3.8.2.2 Hydrostatic Pressure Cycling and Tests

Hydrostatic pressure cycling shall have 4 cycles. Each cycle shall consist of a 10 minute period at 1000 kPa followed by a 5 minute period at a pressure less than 350 kPa. The next cycle shall begin immediately following the completion of the previous cycle. Pressure rise and drop shall not exceed 690 kPa per minute. The pressure gauge shall be located and the pressure measured at the opposite end of the system from where the

pressure is applied. After completion of the hydrostatic pressure cycling, the first hydrostatic pressure test shall be performed. During the first hydrostatic pressure test, the system shall be proven tight at a pressure of 1-1/2 times the working pressure up to 1000 kPa. This pressure shall be held for a minimum of 1 hour. The method of pressurizing the system shall be disconnected from the system before starting the 1 hour pressure holding period. If the pressure cannot be held for the specified length of time, the cause of pressure loss shall be determined, corrected and the hydrostatic pressure cycling and first hydrostatic pressure test shall be repeated until the system can hold the required pressure for at least 1 hour. After successful completion of the first hydrostatic pressure test, the water shall be drained out of the piping system and the piping system filled with treated water as defined in paragraph TREATED WATER for the remaining tests and for permanent operation of the system. The hydrostatic pressure cycling and tests shall be repeated after the system has been filled with treated water, using the same test conditions and criteria.

3.8.2.3 Operational Test

Operational test shall be performed on the complete system or testable portions thereof. The test shall be conducted with full design flows and operating temperatures in all runs of piping as if in service, to demonstrate satisfactory function and operating effectiveness. The operational test will have two cycles. Each cycle shall consist of a 6-hour period with treated water in the system at the maximum operating temperature of 68 degrees C for chilled water and 120 degrees C for low tempature hot water and maximum flow rate, and a period of at least 6-hours with no flow. The Contractor shall supply temporary pumps, piping connections, boilers, chillers and the gauges required to circulate the water at the desired temperatures and flow rates. Water shall be circulated through supply lines and returned through the return piping to demonstrate that the pressure drop is compatible with the flow rate and size of pipe and to show that obstructions do not exist in the piping system. Any unusual indicated pressure drop will be investigated and any obstructions removed. Any leaks found shall be repaired. After any obstructions have been removed and any leaks repaired, the operational test shall be repeated until successfully passed.

3.8.2.4 Final Hydrostatic Test

After successful completion of the operational test, the system shall be pressurized to 1-1/2 times the working pressure up to 1000 kPa. This pressure shall be held for a minimum of 4 hours. Means of pressurizing shall be disconnected prior to the start of the 4-hour pressure holding period. If the pressure cannot be held for the specified length of time, the cause of the pressure loss shall be determined, corrected, and all of the hydrostatic pressure cycling and tests repeated.

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SECTION 02556

GAS DISTRIBUTION SYSTEM
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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 GAS ASSOCIATION (AGA)

AGA Manual	(1994; addenda/correction Jan 1996) A.G.A. Plastic Pipe Manual for Gas Service

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI B109.2	(1992) Diaphragm Type Gas Displacement Meters (500 Cubic Feet per Hour Capacity and Over)

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 2513	(1996a) Thermoplastic Gas Pressure Pipe, Tubing, and Fittings
ASTM D 2683	(1995) Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing
ASTM D 3261	(1996) Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing
ASTM D 3350	(1996) Polyethylene Plastics Pipe and Fittings Materials

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME B16.40	(1985; R 1994) Manually Operated Thermoplastic Gas Shutoffs and Valves in Gas Distribution Systems
ASME B31.8	(1995) Gas Transmission and Distribution Piping Systems
ASME BPV VIII Div 1	(1998) Boiler and Pressure Vessel Code; Section VIII, Pressure Vessels Division 1 - Basic Coverage

CODE OF FEDERAL REGULATIONS (CFR)

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

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

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

NACE INTERNATIONAL (NACE)

NACE RP0185	(1996) Extruded, Polyolefin Resin Coating Systems with Soft Adhesives for Underground or Submerged Pipe
NACE RP0274	(1993) High Voltage Electrical Inspection of Pipeline Coatings Prior to Installation

STEEL STRUCTURES PAINTING COUNCIL (SSPC)

SSPC SP 6	(1994) Commercial Blast Cleaning

1.2 GENERAL REQUIREMENTS

1.2.1 Welding Steel Piping

Welding and nondestructive testing procedures for pressure piping are specified in Section 05093 WELDING PRESSURE PIPING. Structural members shall be welded in accordance with Section 05090 WELDING, STRUCTURAL.

1.2.2 Jointing Polyethylene and Fiberglass Piping

Piping shall be joined by performance qualified joiners using qualified procedures in accordance with AGA Manual. Manufacturer's prequalified joining procedures shall be used. Joints shall be inspected by an inspector qualified in the joining procedures being used and in accordance with AGA Manual. Joiners and inspectors shall be qualified at the jobsite by a person who has been trained and certified by the manufacturer of the pipe, to train and qualify joiners and inspectors in each joining procedure to be used on the job. Training shall include use of equipment, explanation of the procedure, and successfully making joints which pass tests specified in AGA Manual. The Contracting Officer shall be notified at least 24 hours in advance of the date to qualify joiners and inspectors.

1.2.3 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.

1.2.4 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.

1.2.5 Handling

Pipe and components shall be handled carefully to ensure a sound, undamaged condition. Particular care shall be taken not to damage pipe coating. No pipe or material of any kind shall be placed inside another pipe or fitting after the coating has been applied, except as specified in paragraph INSTALLATION. Plastic pipe shall be handled in conformance with AGA Manual.

1.3 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-04 Drawings

Pipe, Fittings, and Associated Materials; FIO.

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-07 Schedules

Equipment and Materials; FIO.

A complete list of equipment and materials, including manufacturer's descriptive and technical literature, performance charts and curves, catalog cuts, and installation instructions, including, but not limited to the following:

a. Dielectric Unions and Flange Kits.

b. Meters.

c. Pressure Reducing Valves.

d. Regulators.

Spare Parts Data; FIO.

Spare parts lists for each different item of material and equipment specified, after approval of the detail drawings and not later than 2 months prior to the date of beneficial occupancy. The data shall include a complete list of parts and supplies, with current unit prices and source of supply.

Notification; FIO.

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

SD-08 Statements

Welding Steel Piping; FIO.

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; GA|F.

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

Connection and Abandonment Procedures; GA|F.

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

SD-13 Certificates

Utility Work; FIO.

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

Training; FIO.

A copy of each inspector's and jointer's training certificate with respective test results.

SD-19 Operation and Maintenance Manuals

Gas Distribution System; GA|F.

Eight copies, in booklet form and indexed, of site specific natural gas operation and maintenance manual for each gas distribution system including system operation, system maintenance, equipment operation, and equipment maintenance manuals described below. If operation and maintenance manuals are provided in a common volume, they shall be clearly differentiated and separately indexed.

The System Operation Manual shall include but not be limited to the following:

a. Maps showing piping layout and locations of all system valves and gas line markers.

b. Step-by-step procedures required for system startup, operation, and shutdown. System components and equipment shall be indexed to the gas maps.

c. Isolation procedures and valve operations to shut down or isolate each section of the system. Valves and other system components shall be indexed to the gas maps.

d. Descriptions of Site Specific Standard Operation Procedures including permanent and temporary pipe repair procedures, system restart and test procedures for placing repaired lines back in service, and procedures for abandoning gas piping and system components.

e. Descriptions of Emergency Procedures including: isolation procedures including required valve operations with valve locations indexed to gas map, recommended emergency equipment, checklist for major emergencies and procedures for connecting emergency gas supply.

The Equipment Operation Manual shall include, but not be limited to, detail drawings, equipment data, and manufacturer supplied operation manuals for all equipment, valves and system components.

The System Maintenance Manuals shall include, but not be limited to:

a. Maintenance check list for entire gas distribution system.

b. Descriptions of site specific standard maintenance procedures.

c. Maintenance procedures for installed cathodic protection systems.

d. Piping layout, equipment layout, and control diagrams of the systems as installed.

e. Identification of pipe materials and manufacturer by location, pipe repair procedures, and jointing procedures at transitions to other piping materials or piping from different manufacturer.

The Equipment Maintenance Manuals shall include but not be limited to the following:

a. Identification of valves and other equipment by materials, manufacturer, vendor identification and location.

b. Maintenance procedures and recommended maintenance tool kits for all valves and equipment.

c. Recommended repair methods, either field repair, factory repair, or whole-item replacement for each valve component or piece of equipment or component item.

d. Routine maintenance procedures, possible breakdowns and repairs, and troubleshooting guide.

PART 2 PRODUCTS

2.1 PIPE, FITTINGS, AND ASSOCIATED MATERIALS

2.1.1 Omitted
2.1.2 Omitted
2.1.3 Omitted
2.1.4 Omitted
2.1.5 Omitted
2.1.6 Omitted

2.1.7 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 13.5 or less, as specified in ASME B31.8. Pipe sections shall be marked as required by ASTM D 2513. Butt fittings shall conform to ASTM D 3261 and socket fittings shall conform to ASTM D 2683. Fittings shall match the

service rating of the pipe.

2.1.8 Omitted
2.1.9 Omitted

2.1.10 Identification

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

2.1.11 Insulating Joint Materials

Insulating joint materials shall be provided between flanged or threaded metallic pipe systems where shown to isolate galvanic or electrolytic action.

2.1.11.1 Threaded Joints

Joints for threaded pipe shall be steel body nut type dielectric type unions with insulating gaskets.

2.1.11.2 Flanged Joints

Joints for flanged pipe shall consist of full face sandwich-type flange insulating gasket of the dielectric type, insulating sleeves for flange bolts and insulating washers for flange nuts.

2.1.12 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 Manual 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 Omitted
2.2.2 Omitted

2.2.3 Polyethylene Valves

Polyethylene valves shall conform to ASME B16.40. Polyethylene valves, in sizes 15 mm to 150 mm (1/2 inch to 6 inches), may be used with polyethylene distribution and service lines, in lieu of steel valves, for underground installation only.

2.3 PRESSURE REGULATORS

Regulators shall have ferrous bodies, shall provide backflow and vacuum protection, and shall be designed to meet the pressure, load and other service conditions.

2.3.1 Gas Main Regulators

Pressure regulators for main distribution lines, supplied from a source of gas which is at a higher pressure than the maximum allowable operating

pressure for the system, and shall be equipped with pressure regulating devices of adequate capacity. In addition to the pressure regulating devices, a suitable method shall be provided to prevent overpressuring of the system in accordance with ASME B31.8. Suitable protective devices are as follows:

a. Spring-loaded relief valve meeting the provisions of ASME BPV VIII Div 1.

b. Pilot-loaded back pressure regulator used as relief valve, so designed that failure of the pilot system will cause the regulator to open.

c. Weight-loaded relief valves.

d. Monitoring regulator installed in series with the primary pressure regulator.

e. Series regulator installed upstream from the primary regulator, set to limit the pressure on the inlet of the primary regulator continuously to the maximum allowable operating pressure of the system, or less.

f. Automatic shutoff device installed in series with the primary regulator, set to shut off when the pressure on the distribution system reaches the maximum allowable operating pressure of the system, or less. This device shall remain closed until manually reset.

g. Spring-loaded, diaphragm type relief valves.

2.3.2 Service Line Regulators

Pressure regulators for individual service lines shall have ferrous bodies. Regulator shall be capable of reducing distribution line pressure to pressures required for users. Regulators shall be provided where gas will be distributed at pressures in excess of 2.5 kPa (10 inches of water column). Pressure relief shall be set at a lower pressure than would cause unsafe operation of any connected user. Regulators for liquified petroleum gas shall be adjusted to 2.5 to 3 kPa (10 to 12 inches of water column). Pressure relief for liquified petroleum gas shall be set at 4 kPa (16 inches of water column). Regulator shall have single port with orifice diameter no greater than that recommended by the manufacturer for the maximum gas pressure at the regulator inlet. Regulator valve vent shall be of resilient materials designed to withstand flow conditions when pressed against the valve port. Regulator shall be capable of regulating downstream pressure within limits of accuracy and shall be capable of limiting the buildup of pressure under no-flow conditions to 50 percent or less of the discharge pressure maintained under flow conditions. Regulator shall have a self contained service regulator. Regulator pipe connections shall not exceed 50 mm (2 inch)size.

2.4 METERS

Meters shall conform to ANSI B109.2. Meters shall be pedestal mounted and be provided with a strainer immediately upstream. Meters shall be suitable for accurately measuring and handling gas at pressures, temperatures, and flow rates indicated. Meters shall have a pulse switch initiator capable of operating up to speeds of 500 pulses per minute with no false pulses and shall require no field adjustments. Initiators shall provide the maximum number of pulses up to 500 per minute that is obtainable from the

manufacturer. It shall provide not less than one pulse per 2.83 cubic meter (100 cubic feet) of gas. Meter shall be connected to the DDC control system.

2.5 OMITTED
2.6 OMITTED

2.7 PROTECTIVE COVERING MATERIALS

Continuously extruded polyethylene and adhesive coating system materials shall conform to NACE RP0185, Type A.

2.8 TELEMETERING OR RECORDING GAUGES

Each distribution system supplied by more than one district pressure regulating station shall be equipped with telemetering or recording pressure gauges to indicate the gas pressure in the district line.

PART 3 EXECUTION

3.1 EXCAVATION AND BACKFILLING

Earthwork shall be as specified in Section 02316 EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS.

3.2 GAS MAINS

Pipe for gas mains shall be polyethylene. Polyethylene mains shall not be installed aboveground.

3.3 SERVICE LINES AND EMERGENCY GAS SUPPLY CONNECTION

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 1.5 meters (5 feet) of the building. The point of delivery is the meter set assembly. The service lines shall be connected to the gas mains as indicated. Where indicated, service line shall be provided with an isolation valve of the same size as the service line. 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. Shorter lengths shall be used only for closures. Polyethylene or fiberglass service lines shall not be installed aboveground except as permitted in ASME B31.8.

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 PROTECTIVE COVERING

3.5.1 Protective Covering for Underground Steel Pipe

3.5.1.1 Thermoplastic Resin Coating System

The coating system shall conform to NACE RP0185, Type A. The exterior of the pipe shall be cleaned to a commercial grade blast cleaning finish in accordance with SSPC SP 6. Adhesive compound shall be applied to the pipe. Immediately after the adhesive is applied, a seamless tube of polyethylene shall be extruded over the adhesive to produce a bonded seamless coating. The nominal thickness of the pipe coating system shall be 0.25 mm (10 mils) (plus or minus 10 percent) of adhesive and 1.0 mm (40 mils) (plus or minus 10 percent) of polyethylene for pipes up to 400 mm (16 inches) in diameter. For pipes 450 mm (18 inches) and larger in diameter, the pipe coating system thickness shall be 0.25 mm (10 mils) (plus or minus 10 percent) adhesive and 1.5 mm (60 mils) (plus or minus 10 percent) polyethylene. Joint coating and field repair material shall be applied as recommended by the coating manufacturer and shall be one of the following:

a. Heat shrinkable polyethylene sleeves.

b. Polyvinyl chloride pressure-sensitive adhesive tape.

c. High density polyethylene/bituminous rubber compound tape.

The coating system shall be inspected for holes, voids, cracks, and other damage during installation.

3.5.1.2 Inspection of Pipe Coatings

Any damage to the protective covering during transit and handling shall be repaired before installation. After field coating and wrapping has been applied, the entire pipe shall be inspected by an electric holiday detector with impressed current set at a value in accordance with NACE RP0274 using a full-ring, spring-type coil electrode. The holiday detector shall be equipped with a bell, buzzer, or other type of audible signal which sounds when a holiday is detected. All holidays in the protective covering shall be repaired immediately upon detection. The Contracting Officer reserves the right to inspect and determine the suitability of the detector. Labor, materials, and equipment necessary for conducting the inspection shall be furnished by the Contractor.

3.5.2 Protective Covering for Aboveground Piping Systems

Finish painting shall conform to the applicable paragraphs of Section 09900 PAINTING, GENERAL and as follows:

3.5.2.1 Omitted

3.5.2.2 Nonferrous Surfaces

Nonferrous surfaces shall not be painted.

3.5.3 Protective Covering for Piping in Valve Boxes and Manholes

Piping in valve boxes or manholes shall receive protective coating as specified for underground steel pipe.

3.6 INSTALLATION

Gas distribution system and equipment shall be installed in conformance with the manufacturer's recommendations and applicable sections of ASME B31.8, AGA Manual 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 150 mm (6 inches and larger, an approved gas-cutting-and-beveling machine may be used. Cutting of plastic pipe shall be in accordance with AGA Manual. 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.

3.6.1 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 600 mm minimum cover; service lines shall have 485 mm 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. After laying of pipe and testing, trench shall be backfilled in accordance with Section 02316 EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITY SYSTEMS.

3.6.2 Installing Pipe Aboveground

Aboveground piping shall be protected against dirt and other foreign matter as specified for underground piping. Joints in steel pipe shall be welded; however, joints in pipe 40 mm (1-1/2 inches) in diameter and smaller may be threaded; joints may also be threaded to accommodate the installation of valves. Flanges shall be of the weld neck type to match wall thickness of pipe.

3.7 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.

3.7.1 Threaded Steel Joints

Threaded joints in steel pipe shall have tapered threads evenly cut and shall be made with UL approved graphite joint sealing compound for gas

service or polytetrafluoroethylene tape applied to the male threads only. Caulking of threaded joints to stop or prevent leaks will not be permitted.

3.7.2 Welded Steel Joints

Gas pipe weldments shall be as indicated. Changes in direction of piping shall be made with welding fittings only; mitering or notching pipe to form elbows and tees or other similar type construction will not be permitted. Branch connection may be made with either welding tees or forged branch outlet fittings. Branch outlet fittings shall be forged, flared for improvement of flow where attached to the run, and reinforced against external strains. Beveling, alignment, heat treatment, and inspection of weld shall conform to ASME B31.8. Weld defects shall be removed and repairs made to the weld, or the weld joints shall be entirely removed and rewelded. After filler metal has been removed from its original package, it shall be protected or stored so that its characteristics or welding properties are not affected adversely. Electrodes that have been wetted or have lost any of their coating shall not be used.

3.7.3 Polyethylene and Fiberglass Pipe Jointing Procedures

Jointing procedures shall conform to AGA Manual. 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. The method of heat fusion joining dissimilar polyethylene resins shall be tested in accordance with paragraph TESTS, subparagraph Destructive Tests of Plastic Pipe Joints.

3.7.4 Connections Between Metallic and Plastic Piping

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

3.8 VALVE BOXES

Valve boxes of cast iron not less than 4.7 mm (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 1 square meter. When in a sidewalk, the top of the box shall be in a concrete slab 600 mm 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.

3.9 DRIPS

Drips shall be installed at locations where indicated. Drips shall conform to the details shown or may be commercial units of approved type and capacity. A blow off pipe 32 mm (1-1/4 inches) or larger shall be connected to each drip at its lowest point and shall extend to or near the ground surface at a convenient location away from traffic. Discharge for each drip terminal (outlet) shall be provided with a reducing fitting, a plug valve, and a 15 mm (1/2 inch nipple turned down. The discharge

terminal (outlet) shall be inside a length of 300 mm or larger vitrified clay pipe, concrete sewer pipe or concrete terminal box set vertically on a bed of coarse gravel 300 mm thick and 1 m square, and closed at the ground surface with a suitable replacement cover.

3.10 PRESSURE REGULATOR INSTALLATION

3.10.1 Main Distribution Line Regulators

Pressure regulators shall be installed where shown. A valve shall be installed on each side of the regulator for isolating the regulator for maintenance. A bypass line with bypass valves or 3 way valves and an overpressurization pressure regulating device shall be provided. Regulators and valves shall be installed in rectangular reinforced concrete boxes. Boxes shall be large enough so that all required equipment can be properly installed, operated, and maintained. Sidewalls shall extend above ground line. The boxes shall be provided with steel door covers with locking provisions and 100 mm (4 inch) diameter vents. One key or other unlocking device shall be furnished with each cover. Discharge stacks, vents, or outlet ports of all pressure relief devices shall be located where gas can be discharged into the atmosphere without undue hazard. Stacks and vents shall be provided with fittings to preclude entry of water.

3.10.2 Service Line Regulators

A shutoff valve, meter set assembly, and service regulator shall be installed on the service line outside the building, 450 mm above the ground on the riser. An insulating joint shall be installed on the inlet side of the meter set assembly and service regulator and shall be constructed to prevent flow of electrical current. A 10 mm (3/8 inch) tapped fitting equipped with a plug shall be provided on both sides of the service regulator for installation of pressure gauges for adjusting the regulator. All service regulator vents and relief vents shall terminate in the outside air in rain and insect resistant fittings. The open end of the vent shall be located where gas can escape freely into the atmosphere, away from any openings into the building and above areas subject to flooding.

3.11 METER INSTALLATION

Meters shall be installed in accordance with ASME B31.8. Permanent gas meters shall be installed with provisions for isolation and removal for calibration and maintenance, and shall be suitable for operation in conjunction with an energy monitoring and control system.

3.12 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.

3.12.1 Omitted

3.12.2 Connection to Government Owned/Operated Gas Lines

The Contractor shall provide connections to the existing gas lines in accordance with approved procedures. Deactivation of any portion of the existing system shall only be done at the valve location shown on the drawings. Reactivation of any existing gas lines will only be done by the

Government. The Contractor's Connection and Abandonment Plan shall be submitted and approved prior to making any connections to existing gas lines. This plan shall include the Operating Agency's required procedures which may be obtained from the Contracting Officer's representative. The Contractor shall notify the Contracting Officer, in writing, 10 days before connections to existing lines are to be made.

a. If facilities are abandoned in place, they shall be physically disconnected from the piping system. The open ends of all abandoned facilities shall be purged, capped, plugged or otherwise effectively sealed. Abandonment shall not be completed until it has been determined that the volume of gas or liquid hydrocarbons contained within the abandoned section poses no potential hazard. Air or inert gas may be used for purging, or the facility may be filled with water or other inert material. If air is used for purging, the Contractor shall ensure that a combustible mixture is not present after purging.

b. When a main is abandoned, together with the service lines connected to it, only the customer's end of such service lines is required to be sealed as stipulated above.

c. Service lines abandoned from the active mains shall be disconnected as close to the main as practicable.

d. All valves left in the abandoned segment shall be closed.

e. All abovegrade valves, risers, and vault and valve box covers shall be removed. Vault and valve box voids shall be filled with suitable compacted backfill material.

3.13 CATHODIC PROTECTION

Cathodic protection shall be provided for all metallic gas piping installed underground and shall be installed as specified in Section 13110 CATHODIC PROTECTION SYSTEM (SACRIFICIAL ANODE).

3.14 TESTS

3.14.1 Destructive Tests of Plastic Pipe Joints

Each day, prior to making polyethylene heat fusion joints or fiberglass adhesive joints, a joint of each size and type to be installed that day shall be made by each person performing joining of plastic pipe that day and destructively tested. At least 3 longitudinal straps shall be cut from each joint. Each strap shall be visually examined, shall not contain voids or discontinuities on the cut surfaces of the joint area, and shall be deformed by bending, torque, or impact, and if failure occurs, it must not initiate in the joint area. If a joint fails the visual or deformation test, the qualified joiner who made that joint shall not make further field joints in plastic pipe on this job until that person has been retrained and requalified. The results of the destructive tests shall be recorded to include the date and time of the tests, size and type of the joints, ambient conditions, fusion iron temperature and names of inspectors and joiners.

3.14.2 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 normal operating pressure for the system is 205 kPa. The test pressure is 300 kPa. 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.

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SECTION 02570

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SECTION 02570

VALVE MANHOLES AND PIPING AND EQUIPMENT IN VALVE MANHOLES
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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 designations only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI H35.1	(1993) Alloy and Temper Designation Systems for Aluminum

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 53	(1997) Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless
ASTM A 106	(1997a) Seamless Carbon Steel Pipe for High-Temperature Service
ASTM A 123/A 123M	(1997a) Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A 193/A 193M	(1997a) Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service
ASTM A 194/A 194M	(1997) Carbon and Alloy Steel Nuts for Bolts for High-Pressure and High-Temperature Service
ASTM A 234/A 234M	(1997) Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service
ASTM A 733	(1993) Welded and Seamless Carbon Steel and Austenitic Stainless Steel Pipe Nipples
ASTM B 209M	(1996) Aluminum and Aluminum-Alloy Sheet and Plate (Metric)
ASTM C 449/C 449M	(1995) Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement
ASTM C 533	(1995) Calcium Silicate Block and Pipe Thermal Insulation
ASTM C 547	(1995) Mineral Fiber Pipe Insulation

ASTM C 552	(1991) Cellular Glass Thermal Insulation
ASTM C 647	(1995) Properties and Tests of Mastics and Coating Finishes for Thermal Insulation
ASTM D 2822	(1991; R 1997) Asphalt Roof Cement
ASTM D 3278	(1996) Test Methods for Flash Point of Liquids by Small Scale Closed-Cup Apparatus
ASTM E 84	(1996a) Surface Burning Characteristics of Building Materials
ASTM E 96	(1995) Water Vapor Transmission of Materials

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME B1.20.1	(1983; R 1992) Pipe Threads, General Purpose (Inch)
ASME B16.5	(1996) Pipe Flanges and Flanged Fittings NPS 1/2 thru NPS 24
ASME B16.9	(1993) Factory-Made Wrought Steel Buttwelding Fittings
ASME B16.11	(1996) Forged Fittings, Socket-Welding and Threaded
ASME B16.21	(1992) Nonmetallic Flat Gaskets for Pipe Flanges
ASME B16.34	(1996) Valves - Flanged, Threaded, and Welding End
ASME B31.1	(1995; B31.1a; B31.1b; B31.1c) Power Piping
ASME B40.1	(1991) Gauges - Pressure Indicating Dial Type - Elastic Element

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

MSS SP-25	(1998) Standard Marking System for Valves, Fittings, Flanges, and Unions
MSS SP-45	(1992) Bypass and Drain Connections
MSS SP-58	(1993) Pipe Hangers and Supports - Materials, Design and Manufacture
MSS SP-69	(1996) Pipe Hangers and Supports - Selection and Application
MSS SP-72	(1992) Ball Valves with Flanged or Butt-Welding Ends for General Service
MSS SP-80	(1997) Bronze Gate, Globe, Angle and Check

	Valves
MSS SP-83	(1995) Class 3000 Steel Pipe Unions Socket-Welding and Threaded
MSS SP-110	(1996) Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(1996; Errata 96-4) National Electrical Code
NFPA 90A	(1996) Installation of Air Conditioning and Ventilating Systems

SSPC: THE SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC Paint 16	(1991) Coal-Tar Epoxy-Polyamide Black (or Dark Red) Paint
SSPC SP 10/NACE 2	(1994) Near-White Blast Cleaning

UNDERWRITERS LABORATORIES (UL)

UL 723	(1996) Test for Surface Burning Characteristics of Building Materials

1.2 DESCRIPTION

This specification covers valve manholes and the valves and equipment shown in the manholes on the drawings.

1.3 SUBMITTALS

Government approval is required for submittals having a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-04 Drawings

Valve Manholes, Pipe, and Equipment; FIO.

Detail drawings for valve manholes and the piping and equipment in the valve manholes, such as steam traps, valves, sump pumps, pressure gauges, thermometers and insulation, including a complete list of equipment and materials, including manufacturer's descriptive and technical literature, performance charts and curves, catalog cuts, and installation instructions. Drawings shall also contain complete wiring and schematic diagrams. Drawings shall show pipe anchors and guides, and layout and anchorage of equipment and appurtenances in valve manholes, and equipment relationship to other parts of the work including clearances for maintenance and operation.

SD-14 Samples

Insulated Sections; GA|D.

Display sample sections for insulation of pipe, elbow, tee, valve, support point, and terminating points. After approval of materials and prior to insulation of piping, a display shall be prepared of insulated sections showing compliance with specifications including showing fastening, sealing, jacketing, straps, waterproofing, supports, hangers, anchors, and saddles. Approved display sample sections shall remain on display at the jobsite during the construction period until no longer needed by Contracting Officer, then removed.

SD-19 Operation and Maintenance Manuals

Valve Manholes, Pipe, and Equipment; FIO.

Eight copies of operation and eight copies of maintenance manuals shall be provided for the equipment furnished. Operation manuals shall detail the step-by-step procedures required for equipment startup, operation, and shutdown. Operation manuals shall include the manufacturer's name, model number, parts list, and brief description of all equipment and their basic operating features. Maintenance manuals shall list routine maintenance procedures, possible breakdowns and repairs, and troubleshooting guides. Maintenance manuals shall include piping and equipment layout and simplified wiring and control diagrams indicating location of electrical components with terminals designated for wiring, as installed.

1.4 DELIVERY AND STORAGE

All materials and equipment delivered and placed in storage shall be stored with protection from the weather, excessive humidity and excessive temperature variation; and dirt, dust, or other contaminants.

1.5 FIELD MEASUREMENTS

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.

PART 2 PRODUCTS

2.1 STANDARD PRODUCTS

Materials and equipment shall be the standard products of a manufacturer regularly engaged in the manufacture of such products and shall essentially duplicate items that have been in satisfactory use for at least 2 years prior to bid opening. Equipment shall be supported by a service organization that is, in the opinion of the Contracting Officer, reasonably convenient to the site.

2.2 NAMEPLATES

Each major item of equipment such as sump pump, motor, steam trap, and pressure reducing valve shall have the manufacturer's name, address, type or style, model or serial number, and catalog number on a plate secured to the item of equipment.

2.3 ASBESTOS PROHIBITION

Asbestos and asbestos-containing products shall not be used.

2.4 ELECTRICAL WORK

Motors, manual or automatic motor control equipment, and protective or signal devices required for the operation specified shall be provided under this section in accordance with NFPA 70 and Section 16375 ELECTRICAL DISTRIBUTION SYSTEM, UNDERGROUND.

2.5 PIPING AND FITTINGS

2.5.1 General Requirements

Piping, fittings and piping accessories inside the valve manholes shall conform to the requirements of ASME B31.1 and shall be suitable for the working pressure and temperature requirements of the system. To the greatest extent possible, the piping and fittings inside the valve manholes shall match the piping and fittings located on the outside of the valve manhole. All piping in valve manholes shall be steel with joints welded except that joints 20 mm (3/4 inch) and smaller may be threaded. When threaded joints are used on High Temperature Water Systems, the interface area where the pipe threads meet the threaded fittings shall be seal welded (continuous fillet weld) to preclude any water leakage. No supports, anchors, or stays shall be attached to any piping system in places where either the installation of or the movement of the pipe and its contents will cause damage to the construction.

2.5.2 Steel Pipe

Pipe shall be black steel, seamless or electric-resistance welded, conforming to the requirements of ASTM A 53, Grade B or ASTM A 106, Grade B. Pipe up to and including 250 mm (10 inches) in diameter shall be schedule 40. Pipe 300 mm (12 inches) in diameter and greater shall be 10 mm (0.375 inch) nominal wall thickness.

2.5.2.1 Nipples

Nipples shall conform to ASTM A 733 as required to match adjacent piping.

2.5.2.2 Pipe Threads

Pipe threads shall conform to ASME B1.20.1. Pipe threads may be used only on pipe 20 mm (3/4 inch) or smaller. All pipe which is to be threaded shall be schedule 80.

2.5.3 Fittings

All fittings, valves, flanges and unions shall have the manufacturer's trademark affixed in accordance with MSS SP-25 so as to permanently identify the manufacturer.

2.5.3.1 Welded Fittings

Welded fittings shall conform to ASTM A 234/A 234M, buttwelded or socket welded, as required to match connecting piping. Buttwelded fittings shall conform to ASME B16.9, and socket welded fittings shall conform to ASME B16.11.

2.5.3.2 Unions

Unions shall conform to MSS SP-83 as required to match adjacent piping.

2.5.3.3 Ball Valves

Ball valves shall conform to MSS SP-72 for flanged or buttwelded valves or MSS SP-110 for threaded ball valves.

2.5.4 Insulating Flanges and Dielectric Unions

2.5.4.1 Insulating Flanges

For systems in which cathodic protection is provided, insulating flanges or flange gasket kits shall be installed in the valve manhole at the pipe connection to or from the heat distribution system and at dissimilar metals and when the carrier pipe and appurtenances are supported in such a way as to electrically ground or alter the cathodic protection system voltages or currents. The kit shall consist of flanges, a flange gasket, nuts and bolts, bolt sleeves, and one insulating washer and one steel washer for both ends of each bolt. The manufacturer shall certify that the gasket kits are capable of electrically isolating the pipe at the 630 kPa pressure and 120 degrees C for the 1200 block and 630 kPa and 100 degrees C for the 300 and 100 blocks. Evidence of satisfactory installations operating not less than 2 years shall be submitted in accordance with paragraph SUBMITTALS before materials are delivered. The Contractor shall ensure that these kits are provided and properly installed according to manufacturer's published instructions. Bolts shall be torqued to the correct tightness and in the correct bolt pattern as recommended by the manufacturer's published instructions. Steel flanges shall conform to ASME B16.5 Class 150 and shall match valves or flanged fittings on which used. Steel flanges shall be flat faced. Gaskets shall be non-asbestos compressed material in accordance with ASME B16.21, 2 mm (1/16 inch) thickness, full face or self centering flat ring type. Bolts shall conform to the requirements of ASTM A 193/A 193M, Grade B7. The bolt head shall be marked to identify the manufacturer and the standard to which the bolt complies. Lengths of bolts shall be such that not less than two full threads extend beyond the nut with the bolt tightened to the required tension and the washer seated. Nuts shall conform to the requirements of ASTM A 194/A 194M, Grade 7.

2.5.4.2 Dielectric Unions

Dielectric unions, pressure rated to match the pressure on the system used, shall be used for joining dissimilar metals on 20 mm (3/4 inch) and smaller threaded pipe.

2.6 VALVES

Unless otherwise specified, valves shall comply with the material, fabrication, and operating requirements of ASME B31.1. Valves shall be suitable for the temperature and pressure requirements of the system on which used. Valves for hot water shall conform to ASME B31.1 Class 150 or 300, as suitable for the application. Valves 20 mm (3/4 inch) and smaller may be bronze where seal welding is not required. Valves 150 mm (6 inches) and larger shall have a 25 mm (1 inch) minimum gate or globe bypass valve sized in conformance with MSS SP-45.

2.6.1 Steel Valves

Steel globe, gate, angle, and check valves shall conform to the requirements of ASME B16.34 and ASME B31.1 for the temperature and pressure

requirements of the system. Gate valves 65 mm (2-1/2 inches) and smaller shall be rising stem. Gate valves 80 mm (3 inches) and larger shall be outside screw and yoke.

2.6.2 Bronze Valves

2.6.2.1 Globe, Gate, and Angle Valves

Bronze globe, gate, and angle valves shall conform to requirements of MSS SP-80, union bonnet type.

2.6.2.2 Check Valves

Bronze check valves shall conform to the requirements of MSS SP-80.

2.6.3 Packing

Packing used with valves shall not contain asbestos. Valve stem packing shall be die-formed, ring type specifically designated as suitable for the temperature and pressure of the service and compatible with the fluid in the system. Packing shall be polytetrafluoroethylene with minimum 50 percent graphite filament. Valves 40 mm (1-1/2 inches) and smaller shall have four or five packing rings and valves 50 mm (2 inches) and larger shall have at least six packing rings. Spiral or continuous packing will not be acceptable. A metal insert shall be provided having proper clearance around the valve stem at the bottom of the stuffing box and acting as a base for the packing material. Packing glands shall be furnished with a liner of noncorrosive material and shall be of one piece construction with provisions for not less than two bolts for packing adjustment.

2.7 OMITTED

2.8 STRAINERS

Strainers shall be basket or y-type with connections the same size as the pipe lines in which the connections are installed. The strainer bodies for steam systems shall be heavy and durable, of cast steel, with bottoms drilled and plugged. The strainers shall be suitable for the temperature and pressure requirements of the system on which they are installed. The bodies shall have arrows clearly cast on the sides to indicate the direction of flow. Each strainer shall be equipped with an easily removable cover and sediment basket. The body or bottom opening shall be equipped with nipple and gate valve for blowdown. The basket for steam systems shall be not less than 0.6350 mm (0.025 inch) thick stainless steel, Monel or sheet brass, with small perforations of sufficient number to provide a net free area through the basket of at least 2.5 times that of the entering pipe. The flow shall be into the basket and out through the perforations. For high temperature hot water systems, only cast steel bodies and stainless or Monel baskets shall be used.

2.9 PRESSURE GAUGES

Gauges shall conform to ASME B40.1, and shall be provided with throttling type needle valve or a pulsation dampener and shut-off valve. Minimum dial size shall be 110 mm (4-1/4 inches).

2.10 DIAL THERMOMETERS

Dial type thermometer shall be 90 mm (3-1/2 inches) in diameter with stainless steel case, remote-type bulb or direct-type bulb as required. The thermometer shall have an accuracy of plus or minus 1 degree C (2 degrees F). Thermometer wells of the separable socket type shall be provided for each thermometer with direct-type bulb. The thermometer shall have a white face with black digits graduated in 1 degree C (2 degrees F) increments.

2.11 INSULATION AND JACKETING

2.11.1 General Provisions

All piping, fittings, valves, etc., in the valve manholes shall be insulated. Insulation shall be premolded, precut or job fabricated to fit and shall be removable and reusable. Thickness of insulation shall be in accordance with Tables 1 and 2. Insulation jackets shall be provided for all pipe and fitting insulation.

2.11.2 Insulation

Insulation for all piping, fittings, and valves shall be molded calcium silicate conforming to ASTM C 533, Type I, or molded mineral fiber insulation conforming to ASTM C 547, Class 2, or cellular glass insulation conforming to ASTM C 552. All insulation shall be asbestos free. The insulation shall be approved by the Federal Agency Committee on Underground Heat Distribution Systems as having passed their boiling test. Laminated construction shall not be used unless the thickness exceeds 100 mm (4 inches). Manufacturers and their calcium silicate and mineral fiber insulation products passing the Federal Agency Committee's boiling test and approved for use are:

a. Fibrex Inc., Epitherm 1200 (Dark).

b. Owens-Corning Fiberglass Corporation, Kaylo 10.

c. Manville Products Group, Thermo-12.

d. Partek Insulations, Limited, Paroc UHDS.

e. Pabco, division of Fibreboard Corporation, Super Caltemp.

f. Delta, Rock Wool Manufacturing Company.

g. Cellular Glass, Pittsburgh Corning Corporation.

2.11.3 Aluminum Jackets

Aluminum jackets shall be smooth sheet, 0.4064 mm (0.016 inch) nominal thickness and conform to the requirements of ASTM B 209M, Type 3003, 3105, or 5005. Aluminum jackets shall be supplied with a factory installed moisture barrier. This moisture barrier shall consist of at least 18.1 kg (40 pound) kraft paper coated on one side with a 0.025 mm (1 mil) thick polyethylene film. The moisture barrier shall be adhered to the aluminum jacket over the entire area of the aluminum jacket surface.

2.11.4 Bands

Bands for aluminum jacket shall be 10 mm (3/8 inch) wide and 32 gauge thickness made of aluminum or annealed stainless steel. Bands for

insulation shall be 15 mm (1/2 inch) wide and 32 gauge thickness made of annealed stainless steel.

2.11.5 Insulation for Flanges, Unions, Valves, and Fittings

Flanges, unions, valves, and fittings shall be insulated with premolded prefabricated, or field fabricated segments of insulation of the same material and thickness as the manhole pipe insulation. Insulation shall be removable and reusable and shall have essentially the same thermal characteristics and thickness as the adjoining piping.

2.11.6 Vapor Barrier Coating

The vapor barrier coating shall be fire and water resistant and appropriately selected for either outdoor or indoor service. Color shall be white. The water vapor permeance of the compound shall not exceed 0.05 perm and shall be determined according to Procedure B of ASTM E 96. The coating shall be a nonflammable, fire resistant type conforming to ASTM E 84, NFPA 90A and UL 723. The flash point of the compound shall not be less than 26.7 degrees C and shall be determined in accordance with ASTM D 3278. All other application and service properties shall be in accordance with ASTM C 647.

2.11.7 Finishing Cement

Mineral fiber hydraulic-setting thermal insulating cement in accordance with ASTM C 449/C 449M.

2.11.8 Glass Tape

Glass tape shall meet the requirements of UL 723 and ASTM E 84.

2.11.9 Plain Weave, Untreated

The ends shall be properly interlocked with the picks to ensure that there shall be no raveling of the tape edges. The tape shall have an average weight of 196.7 plus or minus 10 percent grams per square meter. An average thickness of 0.1778 plus or minus 0.0254 mm. Warp ends/wales of 17 plus or minus 1 per centimeter or filling picks/courses of 13 plus or minus 1 per centimeter, a minimum breaking strength of 2679 grams per mm of width, and after heating to 482 degrees C for 2 hours. A minimum breaking strength of 714 grams per mm of width.

2.11.10 Knitted, Untreated

The wales shall be properly interlocked with the courses to ensure that there shall be no raveling of the tape edges. The tape shall have an average weight of 153 plus or minus 10 percent grams per square meter. An average thickness of 0.1778 plus or minus 0.0254 mm, warp ends/wales of 6 plus or minus per 1 centimeter. A minimum breaking strength of 714 grams per mm of width and, after heating to 482 degrees C for 2 hours. A minimum breaking strength of 375 grams per mm of width.

2.11.11 Distortion Requirements

There shall be no distortion of the tape when a sample 610 mm in length is spread across a flat horizontal surface and observed for evidence of distortion (such as tendency to curl rather than lie flat). The width tolerance is plus or minus 3.175 mm.

2.12 SUMP PUMPS

Sump pumps with the capacities indicated shall be installed in the valve manholes as shown. The sump pumps furnished shall be a manufacturer's standard commercial product. Sump pumps shall be electrically driven and submersible, capable of operating while completely submerged. The pumps and motors shall be capable of continuously pumping liquids at a temperature of 93 degrees C. The pumps and motors shall be capable of running without damage when not submerged. Sump pumps shall have permanently lubricated bearings, monel shafts, bronze impellers, screened inlets and housings of bronze. Each sump pump shall be capable of passing a 10 mm sphere. The motors shall have the wattage (horsepower) indicated and shall have overload protection. The discharge piping shall be schedule 80 or shall be protected from corrosion. The pumps shall be automatically controlled by a submersible switch assembly with pump wiring and switch suitable for submersion in 93 degrees liquids. Motors shall be 120 volts, 60 Hz, single phase. All controllers, water level switches, and electrical connections shall be suitable for service at 100 percent humidity, at 93 degrees C temperature, and occasional water submersion. The sump pumps automatic control switches shall have demonstrated 200,000 cycles at 93 degrees C and 100 percent relative humidity and shall withstand total submersion in water at 93 degrees C. Another switch shall be provided to indicate high water level, and shall be connected to an emergency warning light mounted on or adjacent to the valve manhole as indicated. This high water level alarm shall be set at a level which is below the bottom of any pipe in the valve manhole. Auxiliary contacts in a separate junction box shall be provided to permit connection to an Energy Monitoring and Control System (EMCS) for monitoring the operation of each pump motor and the high water level alarm system.

2.13 CONCRETE VALVE MANHOLES AND ACCESSORIES

2.13.1 Valve Manhole Construction

Valve manhole dimensions shall be as indicated. The valve manholes shall be constructed of reinforced concrete as indicated and in accordance with Section 03300 CAST IN PLACE STRUCTURAL CONCRETE. Valve manholes shall be provided with a 762 mm standard cast iron frame and removable cover as a minimum, or a 900 by 900 mm watertight, hinged steel cover not less than 13 mm thick. Valve manholes shall be drained as shown. Concrete sections shall not be less than 150 mm thick. The top shall be solid plate cover (8 mm thick checker pattern) conforming to ANSI H35.1. When concrete covers are used for direct buried conduit systems, the top of the concrete cover shall be designed to be flush with the surrounding grade. Concrete requirements for this cover shall be similar to those required for valve manhole construction. Concrete cover shall be designed to support anticipated loadings. A 1220 by 1220 mm (4 by 4 foot) aluminum access door (Bilco model JD-2AL or equal with slip resistant finish) shall be provided in the concrete top. Two 150 mm gooseneck pipes shall be used to allow the manhole to vent. One shall extend to just below the top of the manhole cover and the other shall extend to within 600 mm of the manhole floor to allow for natural ventilation. Valve manhole sides shall be constructed by one monolithic pour and shall extend not less than 150 mm above grade unless otherwise stated. Valve manholes shall be waterproofed in accordance with Section 07131 ELASTOMERIC MEMBRANE WATERPROOFING. All steel components shall be protected from corrosion.

2.13.2 Ladders

Valve manhole ladders shall be steel, shall have neoprene covered rungs and shall consist of uprights with steps or rungs. Ladders shall not be less than 406.4 mm in width, with 19.1 mm diameter rungs, spaced 304.8 mm apart. The two stringers shall be a minimum 9.5 mm thick and 63.5 mm wide. Ladders shall be adequately anchored to the wall by means of steel inserts spaced not more than 2 m apart vertically, and installed to provide at least 150 mm of space between the wall and rungs. Ladders and inserts shall be galvanized after fabrication in conformance with ASTM A 123/A 123M.

2.13.3 Pipe Sleeves

Pipe sleeves of sufficient length to pass through valve manhole or building walls shall be provided. Pipe sleeves shall be zinc-coated steel pipe, conforming to the requirement of ASTM A 53, Schedule 40 or standard weight. The pipe sleeves shall be secured in the proper position and location during construction of the valve manhole or building wall. For manhole top penetrations, the diameter of the pipe sleeve will be large enough to allow at least 6 mm of clearance between the pipe insulation and the sleeve, and, the sleeve will be sized to accommodate the specific mechanical seal size used for the conduit penetration. The space between the sleeve and the pipe casing, and the caulking and sealing materials shall be selected so there shall be NO electrical continuity between the pipe sleeve and the pipe casing when finished.

2.13.3.1 Pipe Sleeves Through Valve Manhole Cover

Insulation shall be continuous through sleeves as shown on the drawings. Aluminum jacket shall be provided over the insulation. Aluminum jacket shall be smooth sheet 0.4064 mm (0.016 inch) nominal thickness, ASTM B 209M. Where penetrating valve manhole top, pipe shall be insulated as required for valve manhole service up to a point flush with the top of the flashing and the end of the insulation shall be sealed with waterproof coating. Insulation exposed to the weather shall butt tightly against the flashing and valve manhole insulation, and the aluminum jacket required for piping exposed to the weather shall extend 50 mm beyond the insulation to form a counterflashing. The entire valve manhole top penetration shall be flashed and counterflashed as shown on the drawings. Waterproof coating shall conform to ASTM D 2822, Type I.

2.13.3.2 Pipe Sleeves for Conduit Penetrations

A modular mechanical type sealing assembly will be used between the valve manhole pipe sleeve and the conduit casing or uninsulated chilled water pipe. The mechanical seal shall consist of interlocking elastomeric links shaped to continuously fill the annular space between the casing or uninsulated chilled water pipe and sleeve. The link material shall be a synthetic elastomeric capable of withstanding long term exposure at 205 degrees C (400 degrees F) without deterioration. The links shall be attached to each other with corrosion resistant steel bolts, nuts and pressure plates. The link, bolts, nuts and pressure plates shall be the product of single manufacturer and shall be furnished as the product of single manufacturer and shall be furnished as a package or kit. The links shall be loosely assembled with bolts to form a continuous rubber belt around the casing or uninsulated chilled water pipe with a pressure plate under each bolt head and each nut. After the seal assembly is properly positioned in the sleeve, tightening of the bolt shall cause the rubber sealing elements to expand and provide a watertight seal between the casing or the uninsulated chilled water pipe and the sleeve. The pipe sleeve

diameter shall be sized so that no more than one half of the seal assembly's expansion capability is used to achieve a water seal.

2.13.4 Pipe Supports

Pipe Supports shall be in accordance with MSS SP-58 and MSS SP-69, type as shown. All pipe supports, including structural cross support members, shall be galvanized in accordance with Section 05500 MISCELLANEOUS METAL. Chains, straps, or single point supports shall not be used.

2.14 MISCELLANEOUS METAL

Miscellaneous metal not otherwise specified, shall conform to Section 05500 MISCELLANEOUS METAL. Miscellaneous metal bolted together, shop welded, or assembled in the field, and pipe supports, including structural cross support members and anchors, shall be hot-dip galvanized in accordance with Section 05500 MISCELLANEOUS METAL.

PART 3 EXECUTION

3.1 SITE WORK

3.1.1 Excavation, Trenching, and Backfilling

Excavation, trenching, and backfilling of the valve manholes shall be as shown and in accordance with Section 02316 EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS.

3.1.2 Electric Work

Any wiring required for the operation of the equipment specified, but not shown on the electrical drawings, shall be provided under this section in accordance with Section 16370 ELECTRICAL DISTRIBUTION SYSTEM, AERIAL, and Section 16375 ELECTRICAL DISTRIBUTION SYSTEM, UNDERGROUND.

3.1.3 Painting

The heat affected zone of field welded galvanized surfaces and other galvanized surfaces damaged during installation shall be cleaned in compliance with SSPC SP 10/NACE 2, and painted in accordance with Section 09900 PAINTING, GENERAL. Steel and iron appurtenances, piping, and supports shall be cleaned in compliance with SSPC SP 10/NACE 2, and painted in accordance with SSPC Paint 16, coal-tar epoxy-polyamide.

3.2 PIPING

3.2.1 General

All piping in valve manholes shall be steel and insulated. Insulation shall be protected with an aluminum jacket. Pipe shall be accurately cut to measurements established at the site and shall be worked into place without springing or forcing. Pipe and insulation shall clear all openings and equipment. Excessive cutting or other weakening of structural members to facilitate piping installation will not be permitted. Burrs shall be removed from ends of pipe by reaming. Installation shall permit free expansion and contraction without damage to joints or hangers. Piping shall be installed in accordance with ASME B31.1. Joints for piping in valve manholes shall be welded or flanged except joints at traps, strainers, and at valves and piping 20 mm (3/4 inch) and smaller which may

be threaded. Supports, anchors, or stays shall not be attached where either expansion or the weight of the pipe will cause damage to permanent construction. The method of attaching supports shall not interfere with the operation of the cathodic protection system.

3.2.2 Welded Joints

Joints between sections of pipe, between sections of pipe and valves, and between sections of pipe and fittings shall be welded except where joints are allowed to be screwed for pipe sizes 20 mm (3/4 inch) and smaller. The welding shall conform to the requirements specified in paragraph WELDING.

3.2.3 Flanged and Threaded Joints

3.2.3.1 Flanged Joints

Flanged joints shall be faced true, provided with gaskets, and made perfectly square and tight. Flanged joints shall be used only for electrical isolation and in other special cases where connected equipment is available with only flanged joints, or when specifically shown on the drawings. Electrically isolated flange joints shall be provided at all connections to or from the heat distribution system and between dissimilar metals.

3.2.3.2 Threaded Joints

Threaded joints shall have graphite or inert filler and oil, graphite compound, or polytetrafluoroethylene tape applied to the male threads only. Unions shall be provided at all screwed valves, strainers and connections to equipment 20 mm (3/4 inch) and smaller. Dielectric unions shall be used at connections of dissimilar metals in 20 mm (3/4 inch) and smaller piping. When used on High Temperature Water Systems, threaded joints shall be seal welded.

3.2.4 Reducing Fittings

Eccentric reducers in horizontal runs shall be installed with the straight side down. Changes in horizontal piping sizes shall be made through eccentric reducing fittings.

3.2.5 Branch Connections

Branches from mains shall branch off top of mains as indicated or as approved. Connections shall ensure unrestricted circulation, elimination of air pockets, and shall permit the complete drainage of the system. Branch connections may be made with either welding tees or forged branch outlet fittings. Branch outlet fittings where used shall be forged and shall be no larger than two nominal pipe sizes smaller than the main run. Branch outlet fittings shall be reinforced to withstand external strains and designed to withstand full pipe bursting strength.

3.2.6 Pipe Supports in Valve Manholes

Horizontal and vertical runs of pipe in valve manholes shall be securely supported.

3.3 WELDING

Welding and nondestructive testing procedures for piping shall be as

specified in Section 05093 WELDING PRESSURE PIPING. Structural members shall be welded in accordance with Section 05090 WELDING, STRUCTURAL.

3.4 INSULATION

The insulation shall be installed so that it will not be damaged by pipe expansion or contraction. Insulation shall not become wet before, during, or after installation. Insulation installed over welds shall be grooved to assure a snug fit. Insulation shall be held in place with stainless steel straps. A minimum of 2 bands shall be installed on each individual length of insulation and maximum spacing shall not exceed 450 mm centers.

3.4.1 Installation

Material shall be installed in accordance with published installation instructions of the manufacturer. Insulation materials shall not be applied until piping tests are completed. Prior to application, surfaces shall be thoroughly cleaned of moisture, grease, dirt, rust, and scale, and painted where required.

3.4.2 Insulation on Pipes Passing Through Sleeves

Insulation shall be continuous, as required by paragraph Pipe Sleeves Through Valve Manhole Cover. Aluminum jackets shall be provided over the insulation. When penetrating valve manhole walls, aluminum jacket shall extend not less than 50 mm beyond the sleeve on each side of the wall and shall be secured with an aluminum band on each side of the wall. Where flashing is provided, the jacket shall be secured with not less than one band located not more than 25 mm from the end of the jacket. When penetrating valve manhole tops, pipe shall be insulated as required for valve manhole service as indicated.

3.4.3 Covering of Insulation in Valve Manholes

The insulation for pipe, flanges, valves, and fittings shall be covered with aluminum jackets.

3.4.4 Insulation of Piping Accessories in Valve Manholes

Flanges, couplings, unions, valves, fittings, and other pipe accessories, unless otherwise shown or approved, shall be insulated with removable and reusable factory premolded, prefabricated, or field fabricated insulation. For accessories in valve manholes, aluminum sheet shall be applied over the insulation. Where accessories are designated not to be insulated, the adjoining insulation and jacket shall terminate neatly. The terminations for the chilled water systems shall provide a complete vapor seal.

3.4.5 Insulation Sealing for Chilled Water Systems

The ends of insulation shall be sealed with vapor barrier. Penetrations shall be caulked. Caulking shall be applied to parting line between equipment and removable section insulation. Upon completion of installation of the insulation, including removable sections, two coats of vapor barrier coating shall be applied with a layer of glass cloth embedded between the coats. The total dry thickness of the finish shall be 1.6 mm (1/16 inch). The coating shall be applied so that the removable sections are coated separate from the body of the equipment so these sections remain removable. Coating shall be applied to flanges, unions, valves, anchors, fittings and accessories, all terminations, and all insulation not

protected by factory vapor barrier jackets or PVC fitting covers. Tape seams shall overlap 25 mm. The coating shall extend out onto the adjoining pipe insulation 50 mm. Insulation terminations shall be tapered to unions at a 45-degree angle.

3.4.6 Insulation Thickness

The minimum thickness of insulation for each section of pipe shall be in accordance with Tables 1 and 2.

TABLE 1
Minimum Pipe Insulation Thickness (In millimeters)

For Hot Water Supply and Return (121 degrees C to 232 degrees C)

Nominal Pipe Diameter (mm)	Paroc	Epitherm Delta	Kaylo-10 Thermo-12 Super Caltemp	Foamglas
25	50	63	100	110
40	50	63	100	110
50	63	85	110	125
65	63	85	110	125
80	75	100	125	150
100	75	100	125	150
125	75	100	125	150
150	85	110	135	150
200	85	110	135	150
250	100	125	150	165
300	100	125	150	165
350	100	125	150	165
400	100	125	150	165
450	100	125	150	165

NOTES: Delta mineral wool board insulation V-grooved by NOVA Group.

TABLE 2
Minimum Pipe Insulation Thickness (In millimeters)

Low Temperature Hot Water (less than 121 degrees C)
Supply and Return

Nominal Pipe Diameter (mm)	Paroc	Epitherm	Foamglas Kaylo-10 Thermo-12 Super Caltemp
25	35	50	75
40	35	50	75
50	35	50	75
65	35	50	75
80	50	63	85
100	50	63	85
125	50	63	85
150	63	76	110
200	63	76	110
250	76	100	125

Nominal Pipe Diameter (mm)	Paroc	Epitherm	Foamglas Kaylo-10 Thermo-12 Super Caltemp
300	76	100	125
350	76	100	125
400	76	100	125
450	76	100	125

3.5 VALVE MANHOLES AND ACCESSORIES

3.5.1 Piping and Equipment in Valve Manholes

Piping and equipment in valve manholes shall be installed to provide easy access without stepping on piping or equipment, and to provide sufficient working room. Piping and equipment in valve manholes shall be installed and supported as shown on the drawings. All globe, angle and gate valves shall be installed with the stems horizontal or above.

3.5.2 Sump Pumps Installation

Sump pumps shall be installed as indicated. Pumps shall be connected to a dedicated electrical service. All electrical connections shall be hard wired. Monitoring of each pump motor and the high water alarm shall be connected to the Energy Monitoring and Control System (EMCS). Coordinate electrical requirements of EMCS with Section 16415 ELECTRICAL WORK, INTERIOR. Electrical circuits to the sump pumps shall be dedicated circuits. All circuit breakers and switches in the electrical power distribution to the sump pumps shall be capable of being locked in the "ON" position and will be signed as follows:

THIS CIRCUIT SUPPLIES POWER TO THE ELECTRIC SUMP PUMPS IN THE UNDERGROUND DISTRIBUTION SYSTEM. THIS CIRCUIT MUST BE "ON" AT ALL TIMES; OTHERWISE EXTENSIVE DAMAGE WILL OCCUR TO THE UNDERGROUND HEAT DISTRIBUTION SYSTEM AND PREMATURE FAIL WILL OCCUR.

The words on the sign shall be stamped on a corrosion resistant metal plate with letters 10 mm (3/8 inch) high, and the plate shall be affixed permanently near the switch or circuit breaker.

3.6 TESTS

Tests of piping in the valve manholes will be performed as part of the testing of the direct buried conduit system. These tests shall include the piping in the valve manhole and shall be in accordance with the system supplier's Approved Brochure or the contract specifications.

-- End of Section --

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SECTION 02630

STORM-DRAINAGE SYSTEM
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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 190	(1988) Bituminous Coated Corrugated Metal Culvert Pipe and Pipe Arches
AASHTO M 198	(1994) Joints for Circular Concrete Sewer and Culvert Pipe Using Flexible Watertight Gaskets
AASHTO M 243	(1994) Field Applied Coating of Corrugated Metal Structural Plate for Pipe, Pipe-Arches, and Arches

AMERICAN RAILWAY ENGINEERING ASSOCIATION (AREA)

AREA-01	(1997) 1997-1998 Manual for Railway Engineering 4 Vol., Volume 1

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 48	(1994a) Gray Iron Castings
ASTM A 123/A 123M	(1997a) Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A 536	(1984; R 1993) Ductile Iron Castings
ASTM A 716	(1995) Ductile Iron Culvert Pipe
ASTM A 760/A 760M	(1997) Corrugated Steel Pipe, Metallic-Coated for Sewers and Drains
ASTM A 798/A 798M	(1997) Installing Factory-Made Corrugated Steel Pipe for Sewers and Other Applications
ASTM B 26/B 26M	(1997) Aluminum-Alloy Sand Castings
ASTM C 32	(1993) Sewer and Manhole Brick (Made from Clay or Shale)

ASTM C 55	(1997) Concrete Building Brick
ASTM C 62	(1997) Building Brick (Solid Masonry Units Made from Clay or Shale)
ASTM C 76M	(1997) Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe (Metric)
ASTM C 139	(1997) Concrete Masonry Units for Construction of Catch Basins and Manholes
ASTM C 231	(1997) Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C 270	(1997a) Mortar for Unit Masonry
ASTM C 425	(1997) Compression Joints for Vitrified Clay Pipe and Fittings
ASTM C 443	(1994) Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets
ASTM C 478M	(1997) Precast Reinforced Concrete Manhole Sections (Metric)
ASTM C 877	(1994) External Sealing Bands for Noncircular Concrete Sewer, Storm Drain, and Culvert Pipe
ASTM D 1056	(1991) Flexible Cellular Materials - Sponge or Expanded Rubber
ASTM D 1171	(1994) Rubber Deterioration - Surface Ozone Cracking Outdoors or Chamber (Triangular Specimens)
ASTM D 1556	(1990; R 1996) Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D 1557	(1991) Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/cu. ft. (2,700 kN-m/cu.m.))
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 1784	(1997) Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
ASTM D 2216	(1992) Laboratory Determination of Water (Moisture) Content of Soil and Rock

ASTM D 2321	(1989; R 1995) Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications
ASTM D 3034	(1994) Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings

1.2 OMITTED

1.3 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-06 Instructions

Placing Pipe; FIO.

Printed copies of the manufacturer's recommendations for installation procedures of the material being placed, prior to installation.

SD-13 Certificates

Resin Certification; FIO. Pipeline Testing; FIO. Determination of Density; FIO. Frame and Cover for Gratings; FIO.

Certified copies of test reports demonstrating conformance to applicable pipe specifications, before pipe is installed. Certification on the ability of frame and cover or gratings to carry the imposed live load.

SD-14 Samples

Pipe for Culverts and Storm Drains; FIO.

Samples of the following materials, before work is started.

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. 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 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 Concrete Pipe

ASTM C 76M, Class III or V, as specified on drawings.

2.1.2 Omitted

2.1.3 Corrugated Steel Pipe

2.1.3.1 Omitted
2.1.3.2 Omitted
2.1.3.3 Omitted

2.1.3.4 Fully Bituminous Coated, Fully Paved

AASHTO M 190 Type D and ASTM A 760/A 760M aluminum-zinc alloy coated Type I corrugated steel pipe with helical corrugations.

2.1.4 Corrugated Aluminum Alloy Pipe

ASTM B 745/B 745M corrugated aluminum alloy pipe, Type I with helical or angular corrugations.

2.1.5 Omitted
2.1.6 Omitted

2.1.7 Ductile Iron Culvert Pipe

ASTM A 716.

2.1.8 PVC Pipe

2.1.8.1 Type PSM PVC Pipe

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.

2.2 DRAINAGE STRUCTURES

2.2.1 Flared End Sections

Sections shall be precast concrete of a standard design.

2.3 MISCELLANEOUS MATERIALS

2.3.1 Concrete

Unless otherwise specified, concrete and reinforced concrete shall conform to the requirements for 24 MPa concrete under Section 03300 CAST-IN-PLACE STRUCTURAL CONCRETE. 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 37.5 mm. Air content shall be determined in accordance with ASTM C 231. The concrete covering over steel reinforcing shall not be less than 25 mm thick for covers and not less than 40 mm thick for walls and flooring. Concrete covering deposited directly against the ground shall have a thickness of at least 75 mm 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.

2.3.2 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.

2.3.3 Precast Concrete Segmental Blocks

Precast concrete segmental block shall conform to ASTM C 139, not more than 200 mm (8 inches) thick, not less than 200 mm (8 inches) long, and of such shape that joints can be sealed effectively and bonded with cement mortar.

2.3.4 Brick

Brick shall conform to ASTM C 62, Grade SW; ASTM C 55, Grade S-I or S-II; or ASTM C 32, Grade MS. Mortar for jointing and plastering shall consist of one part portland cement and two parts fine sand. Lime may be added to the mortar in a quantity not more than 25 percent of the volume of cement. The joints shall be filled completely and shall be smooth and free from surplus mortar on the inside of the structure. Brick structures shall be plastered with 10 mm of mortar over the entire outside surface of the walls. For square or rectangular structures, brick shall be laid in stretcher courses with a header course every sixth course. For round structures, brick shall be laid radially with every sixth course a stretcher course.

2.3.5 Precast Reinforced Concrete Manholes

Precast reinforced concrete manholes shall conform to ASTM C 478M. Joints between precast concrete risers and tops shall be made with flexible watertight, rubber-type gaskets meeting the requirements of paragraph JOINTS.

2.3.6 Omitted

2.3.7 Frame and Cover for Gratings

Frame and cover for gratings shall be cast gray iron, ASTM A 48, Class 35B; cast ductile iron, ASTM A 536, Grade 65-45-12; or cast aluminum, ASTM B

26/B 26M, Alloy 356.OT6. Weight, shape, size, and waterway openings for grates and curb inlets shall be as indicated on the plans.

2.3.8 Joints

2.3.8.1 Flexible Watertight Joints

Materials: Flexible watertight joints shall be made with plastic or rubber-type gaskets for concrete 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 1.35 m (54 inches).

2.3.8.2 External Sealing Bands

Requirements for external sealing bands shall conform to ASTM C 877.

2.3.8.3 Flexible Watertight, Gasketed Joints

a. Gaskets: When infiltration or exfiltration is a concern for pipe lines, the couplings may be required to have gaskets. The closed-cell expanded rubber gaskets shall be a continuous band approximately 178 mm (7 inches) wide and approximately 10 mm (3/8 inch) thick, meeting the requirements of ASTM D 1056, Type 2 A1, and shall have a quality retention rating of not less than 70 percent when tested for weather resistance by ozone chamber exposure, Method B of ASTM D 1171. Rubber O-ring gaskets shall be 21 mm (13/16 inch) in diameter for pipe diameters of 914 mm (36 inches) or smaller and 22 mm (7/8 inch) in diameter for larger pipe having 13 mm (1/2 inch) deep end corrugation. Rubber O-ring gaskets shall be 35 mm (1-3/8 inches) in diameter for pipe having 25 mm (1 inch) deep end corrugations. O-rings shall meet the requirements of AASHTO M 198 or ASTM C 443. Flexible plastic gaskets shall conform to requirements of AASHTO M 198, Type B.

b. Connecting Bands: Connecting bands shall be of the type, size and sheet thickness of band, and the size of angles, bolts, rods and lugs as indicated or where not indicated as specified in the applicable standards or specifications for the pipe. Exterior rivet heads in the longitudinal seam under the connecting band shall be countersunk or the rivets shall be omitted and the seam welded.

2.3.8.4 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.

2.3.8.5 Omitted
2.3.8.6 Omitted
2.3.8.7 Omitted

2.3.8.8 Ductile Iron Pipe

Couplings and fittings shall be as recommended by the pipe manufacturer.

2.4 STEEL LADDER

Steel ladder shall be provided where the depth of the manhole exceeds 3.66 m (12 feet). These ladders shall be not less than 406 mm (16 inches) in width, with 19 mm (3/4 inch) diameter rungs spaced 305 mm (12 inches) apart. The two stringers shall be a minimum 10 mm (3/8 inch) thick and 63 mm (2-1/2 inches) wide. Ladders and inserts shall be galvanized after fabrication in conformance with ASTM A 123/A 123M.

2.5 DOWNSPOUT BOOTS

Boots used to connect exterior downspouts to the storm-drainage system shall be of gray cast iron conforming to ASTM A 48, Class 30B or 35B. Shape and size shall be as required to match the downspouts shown on the drawings.

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 02316 EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS and 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 600 mm to permit satisfactory jointing and thorough tamping of the bedding material under and around the pipe. Sheeting and bracing, where required, shall be placed within the trench width as specified. 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.

3.1.2 Omitted

3.1.3 Removal of Unstable Material

Where wet or otherwise unstable soil incapable of properly supporting the pipe, as determined by the Contracting Officer, is unexpectedly encountered in the bottom of a trench, such material shall be removed to the depth required and replaced to the proper grade with select granular material, compacted as provided in paragraph BACKFILLING. When removal of unstable material is due to the fault or neglect of the Contractor in his performance of shoring and sheeting, water removal, or other specified requirements, such removal and replacement shall be performed at no 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 for the entire length of the pipe. 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.

3.2.2 Omitted

3.2.3 Corrugated Metal Pipe

Bedding for corrugated metal pipe shall be in accordance with ASTM A 798/A 798M. It is not required to shape the bedding to the pipe geometry.

3.2.4 Ductile Iron Pipe

Bedding for ductile iron pipe shall be as shown on the drawings.

3.2.5 Plastic Pipe

Bedding for PVC 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. Deflection of installed flexible pipe shall not exceed the following limits:

TYPE OF PIPE	MAXIMUM ALLOWABLE DEFLECTION (%)
Corrugated Steel	5
Ductile Iron Culvert	3
Plastic	7.5

Not less than 30 days after the completion of backfilling, the Government may perform a deflection test on the entire length of installed flexible pipe using a mandrel or other suitable device. Installed flexible pipe showing deflections greater than those indicated above shall be retested by a run from the opposite direction. If the retest also fails, the suspect pipe shall be replaced at no cost to the Government.

3.3.1 Concrete, PVC, and Ductile 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 Omitted
3.3.3 Omitted

3.3.4 Corrugated Metal Pipe

Laying shall be with the separate sections joined firmly together, with the outside laps of circumferential joints pointing upstream, and with longitudinal laps on the sides. Fully paved steel pipe shall have a painted or otherwise applied label inside the pipe indicating sheet thickness of pipe. Any unprotected metal in the joints shall be coated with bituminous material as specified in AASHTO M 190 or AASHTO M 243. Interior coating shall be protected against damage from insertion or removal of struts or tie wires. Lifting lugs shall be used to facilitate moving pipe without damage to exterior or interior coatings. During installation, pipe shall be handled with care to preclude damage to the bituminous coating or paving. Prior to placing backfill, damaged areas of coupling bands and pipe shall be given a coating of bituminous material, as specified in AASHTO M 190 or AASHTO M 243. Pipe on which bituminous coating has been damaged to such an extent that satisfactory field repairs cannot be made shall be removed and replaced. Vertical elongation, where indicated, shall be accomplished by factory elongation. Suitable markings or properly placed lifting lugs shall be provided to ensure placement of factory elongated pipe in a vertical plane.

3.3.5 Omitted
3.3.6 Omitted

3.3.7 Multiple Culverts

Where multiple lines of pipe are installed, adjacent sides of pipe shall be at least half the nominal pipe diameter or 1 meter apart, whichever is less.

3.3.8 Jacking Pipe Through Fills

Methods of operation and installation for jacking pipe through fills shall conform to requirements specified in Volume 1, Chapter 1, Part 4 of AREA-01.

3.4 JOINTING

3.4.1 Concrete Pipe

3.4.1.1 Omitted
3.4.1.2 Omitted
3.4.1.3 Omitted
3.4.1.4 Omitted
3.4.1.5 Omitted
3.4.1.6 Omitted

3.4.1.7 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.

3.4.2 Corrugated Metal Pipe

3.4.2.1 Omitted

3.4.2.2 Flexible Watertight, Gasketed Joints

Installation shall be as recommended by the gasket manufacturer for use of lubricants and cements and other special installation requirements. The gasket shall be placed over one end of a section of pipe for half the width of the gasket. The other half shall be doubled over the end of the same pipe. When the adjoining section of pipe is in place, the doubled-over half of the gasket shall then be rolled over the adjoining section. Any unevenness in overlap shall be corrected so that the gasket covers the end of pipe sections equally. Connecting bands shall be centered over adjoining sections of pipe, and rods or bolts placed in position and nuts tightened. Band Tightening: The band shall be tightened evenly, even tension being kept on the rods or bolts, and the gasket; the gasket shall seat properly in the corrugations. Watertight joints shall remain uncovered for a period of time designated, and before being covered, tightness of the nuts shall be measured with a torque wrench. If the nut has tended to loosen its grip on the bolts or rods, the nut shall be retightened with a torque wrench and remain uncovered until a tight, permanent joint is assured.

3.5 DRAINAGE STRUCTURES

3.5.1 Manholes and Inlets

Construction shall be of reinforced concrete, plain concrete, brick, precast reinforced concrete or precast concrete segmental blocks; 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 1.83 m (6 feet) vertically, and shall be installed to provide at least 152 mm (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 100 mm in loose 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 300 mm 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 150 millimeters in loose thickness. 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 150 mm in loose thickness, 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 300 mm 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 4 m, whichever is less. After the backfill has reached at least 300 mm above the top of the pipe, the remainder of the fill shall be placed and thoroughly compacted in layers not exceeding 200 mm in loose thickness.

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 and Determination of Density

Compaction and determination of density shall be in accordance with Section 02316 EXCAVATION, TRENCHING AND BACKFILLING FOR UTILITIES SYSTEMS.

3.7.5 Determination of Density

Testing shall be the responsibility of the Contrator and performed at no additional cost to the Government. Testing shall be performed by an approved commercial testing laboratory. Tests shall be performed in sufficient numbr 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 1556. Moisture content shall be determined in accordance with ASTM D 2216. Tests required on materials prior to placement and tests and testing procedures to control compaction and to relate field density data to laboratory test values shall be as specified in Section 02315 EXCAVATION, FILLING AND BACKFILLING FOR BUILDINGS, paragraph TESTING. Test results shall be furnished to the Contracting Officer.

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SECTION 02754
CONCRETE PAVEMENTS FOR SMALL PROJECTS
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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 211.1	(1991) Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete
ACI 301	(1996) Standard Specification for Structural Concrete
ACI 305R	(1991) Hot Weather Concreting

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 615	(1996) Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
ASTM C 31	(1996) Making and Curing Concrete Test Specimens in the Field
ASTM C 33	(1993) Concrete Aggregates
ASTM C 39	(1996) Compressive Strength of Cylindrical Concrete Specimens
ASTM C 94	(1996) Ready-Mixed Concrete
ASTM C 123	(1994) Lightweight Pieces in Aggregate
ASTM C 143	(1990a) Slump of Hydraulic Cement Concrete
ASTM C 150	(1996) Portland Cement
ASTM C 192	(1990a) Making and Curing Concrete Test Specimens in the Laboratory
ASTM C 231	(1991b) Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C 260	(1995) Air-Entraining Admixtures for Concrete
ASTM C 494	(1992) Chemical Admixtures for Concrete

ASTM C 618	(1996a) Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete
ASTM C 881	(1990) Epoxy-Resin-Base Bonding Systems for Concrete
ASTM C 1077	(1995a) Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation
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 1992) Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction

ARMY CORPS OF ENGINEERS (COE)

COE CRD-C 130	(1989) Scratch Hardness of Coarse Aggregate Particles
COE CRD-C 300	(1990) Specifications for Membrane-Forming Compounds for Curing Concrete

NATIONAL READY-MIXED CONCRETE ASSOCIATION (NRMCA)

NRMCA CPMB 100	(1990) Concrete Plant Standards

1.2 SYSTEM DESCRIPTION

This section is intended to stand alone for construction of concrete (rigid) pavement. However, where the construction covered herein interfaces with other sections, the construction at each interface shall conform to the requirements of both this section and the other section, including tolerances for both.

1.3 OMITTED

1.4 ACCEPTABILITY OF WORK

The pavement will be accepted on the basis of tests made by the Government and by the Contractor or its suppliers, as specified herein. The Government may, at its discretion, make check tests to validate the results of the Contractor's testing. Concrete samples shall be taken by the Contractor at the placement to determine the slump, air content, and strength of the concrete. Test cylinders shall be made for determining conformance with the strength requirements of these specifications and, when required, for determining the time at which pavements may be placed into service. All air content measurements shall be determined in accordance with ASTM C 231. All slump tests shall be made in accordance with ASTM C 143. All test cylinders shall be 150 by 300 mm cylinders and shall be fabricated in accordance with ASTM C 192, using only steel molds, cured in accordance with ASTM C 31, and tested in accordance with ASTM C 39. A strength test shall be the average of the strengths of two cylinders

made from the same sample of concrete and tested at 28 days. The Contractor shall furnish all materials, labor, and facilities required for molding, curing, testing, and protecting test specimens at the site and in the laboratory.

1.4.1 Evaluation Sampling

Sampling, testing, and mixture proportioning shall be performed by a commercial Testing Laboratory, conforming with ASTM C 1077. The individuals who sample and test concrete and concrete constituents shall be certified as American Concrete Institute (ACI) Concrete Field Testing Technicians, Grade I. The individuals who perform the inspection of concrete shall be certified as ACI Concrete Construction Inspector, Level II. All mix design, weekly quality control reports, smoothness reports, and project certification reports shall be signed by a Registered Engineer.

1.4.2 Surface Testing

Surface testing for surface smoothness and plan grade shall be performed as indicated below by the Testing Laboratory. The measurements shall be properly referenced in accordance with paving lane identification and stationing, and a report given to the Government within 24 hours after measurement is made. A final report of surface testing, signed by a Registered Engineer, containing all surface measurements and a description of all actions taken to correct deficiencies, shall be provided to the Government upon conclusion of surface testing.

1.4.2.1 Surface Smoothness Requirements

The finished surfaces of the pavements shall have no abrupt change of 3 mm or more, and all pavements shall be within the tolerances specified in Table 1 when checked with the straightedge.

TABLE 1
STRAIGHTEDGE SURFACE SMOOTHNESS--PAVEMENTS

Pavement Category	Direction of Testing	Tolerances mm
Roads and Streets	Longitudinal	5
	Transverse	6.5
Tank Hardstands, Parking Areas, Open Storage Areas	Longitudinal	6.5
	Transverse	6.5

1.4.2.2 Surface Smoothness Testing Method

The surface of the pavement shall be tested with the straightedge to identify all surface irregularities exceeding the tolerances specified above. The entire area of the pavement shall be tested in both a longitudinal and a transverse direction on parallel lines approximately 4.5 m apart. The straightedge shall be held in contact with the surface and moved ahead one-half the length of the straightedge for each successive measurement. The amount of surface irregularity shall be determined by placing the straightedge on the pavement surface and allowing it to rest upon the two highest spots covered by its length and measuring the maximum gap between the straightedge and the pavement surface, in the area between these two high points.

1.4.3 Omitted

1.4.4 Plan Grade Testing and Conformance

The finished surface of the pavements shall conform, within the tolerances shown in Table 1, to the lines, grades, and cross sections shown. The finished surface of new abutting pavements shall coincide at their juncture. The surfaces of pavements shall vary not more than 18 mm above or below the plan grade line or elevation indicated. Each pavement category shall be checked by the Contractor for conformance with plan grade requirements by running lines of levels at intervals to determine the elevation at each joint intersection.

1.5 PRECONSTRUCTION TESTING OF MATERIALS

The Contractor shall not be entitled to any additional payment or extension of time because of delays caused by sampling and testing additional sources, or samples, necessitated by failure of any samples. Aggregates shall be sampled and tested by the Test Laboratory and shall be representative of the materials to be used for the project. Test results, signed by a Registered Engineer, shall be submitted 45 days before commencing paving. No aggregate shall be used unless test results show that it meets all requirements of these specifications, including compliance with ASTM C 33 and deleterious materials limitations.

1.6 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Data

*9
Equipment; GA|F.

Manufacturer's literature on the concrete plant; mixing equipment; hauling equipment; placing and finishing, and curing equipment; at least 7 days prior to start of paving.

SD-07 Schedules

Paving; FIO.

Paving Schedules at least 7 days prior to start of paving.

SD-08 Statements

*9
Mixture Proportions; GA|F.

The report of the Contractor's mixture proportioning studies showing the proportions of all ingredients and supporting information on aggregate and other materials that will be used in the manufacture of concrete, at least 14 days prior to commencing concrete placing operations.

1.7 EQUIPMENT

1.7.1 Batching and Mixing

The batching plant shall conform to NRMCA CPMB 100, the equipment requirements in ASTM C 94, and as specified. Water shall not be weighed or measured cumulatively with another ingredient. All concrete materials batching shall meet ASTM C 94 requirements. Mixers shall be stationary mixers or truck mixers. Batching, mixers, mixing time, permitted reduction of mixing time, and concrete uniformity shall meet the requirements of ASTM C 94, and shall be documented in the initial weekly QC Report.

1.7.2 Transporting Equipment

Transporting equipment shall be in conformance with ASTM C 94 and as specified herein. Concrete shall be transported to the paving site in rear-dump trucks, in truck mixers designed with extra large blading and rear opening specifically for low slump concrete, or in agitators. Bottom-dump trucks shall not be used for delivery of concrete.

1.7.3 Delivery Equipment

When concrete transport equipment cannot operate on the paving lane, side-delivery transport equipment consisting of self-propelled moving conveyors shall be used to deliver concrete from the transport equipment and discharge it in front of the paver. Front-end loaders, dozers, or similar equipment shall not be used to distribute the concrete.

1.7.4 Paver-Finisher

The paver-finisher shall be a heavy-duty, self-propelled machine designed specifically for paving and finishing high quality pavement. The paver-finisher shall spread, consolidate, and shape the plastic concrete to the desired cross section in one pass. The paver-finisher shall be equipped with a full width "knock-down" auger, capable of operating in both directions, which will evenly spread the fresh concrete in front of the screed or extrusion plate. Immersion vibrators shall be gang mounted at the front of the paver on a frame equipped with suitable controls so that all vibrators can be operated at any desired depth within the slab or completely withdrawn from the concrete. The vibrators shall be automatically controlled so that they will be immediately stopped as forward motion of the paver ceases. The spacing of the immersion vibrators across the paving lane shall be as necessary to properly consolidate the concrete, but the clear distance between vibrators shall not exceed 750 mm, and the outside vibrators shall not exceed 300 mm from the edge of the lane. The paver-finisher shall be equipped with a transversely oscillating screed or an extrusion plate to shape, compact, and smooth the surface.

1.7.4.1 Paver-Finisher with Fixed Forms

The paver-finisher shall be equipped with wheels designed to ride the forms, keep it aligned with the forms, and to spread the preventing deformation of the forms.

1.7.4.2 Omitted

1.7.4.3 Other Types of Finishing Equipment

Bridge deck finishers shall be used for pavements 250 mm or less in thickness, where longitudinal and transverse surface smoothness tolerances are 6.5 mm or greater. Clary screeds or other rotating tube floats will not be allowed on the project.

1.7.5 Curing Equipment

Equipment for curing is specified in paragraph CURING.

1.7.6 Texturing Equipment

Texturing equipment shall be as specified below.

1.7.6.1 Fabric Drag

A fabric drag shall consist of a piece of fabric material as wide as the lane width securely attached to a separate wheel mounted frame spanning the paving lane or to one of the other similar pieces of equipment. The material shall be wide enough to provide 300 to 450 mm dragging flat on the pavement surface. The fabric material shall be clean, reasonably new burlap, kept clean and saturated during use.

1.7.7 Sawing Equipment

Equipment for sawing joints and for other similar sawing of concrete shall be standard diamond-tip-bladed concrete saws mounted on a wheeled chassis.

1.7.8 Straightedge

The Contractor shall furnish and maintain at the job site one 4 m straightedge for testing concrete surface smoothness. The straightedge shall be constructed of aluminum or magnesium alloy and shall have blades of box or box-girder cross section with flat bottom, adequately reinforced to insure rigidity and accuracy. Straightedges shall have handles for operation on the pavement.

PART 2 PRODUCTS

2.1 CEMENTITIOUS MATERIALS

Cementitious materials shall be portland cement and pozzolan and shall conform to appropriate specifications listed below.

2.1.1 Portland Cement

Portland cement shall conform to ASTM C 150 Type II, low-alkali.

2.1.2 Omitted
2.1.3 Omitted

2.1.4 Pozzolan (Fly Ash)

Fly ash shall conform to ASTM C 618 Class F, including all the supplementary optional physical requirements.

2.2 AGGREGATES

Aggregates shall consist of clean, hard, uncoated particles meeting the requirements of ASTM C 33, including deleterious materials, abrasion loss and soundness requirements of ASTM C 33, and other requirements specified herein.

2.2.1 Coarse Aggregate

Coarse aggregate shall consist of crushed gravel, crushed stone, or a combination thereof. The nominal maximum size of the coarse aggregate shall be 37.5 mm. When the nominal maximum size is greater than 25.0 mm, the aggregates shall be furnished in two ASTM C 33 size groups, No. 67 and No. 4. The amount of deleterious material in each size of coarse aggregate shall not exceed the limits shown in ASTM C 33 Class 1N, 4M or 4S, depending on the weathering region, and the following limits:

a. Lightweight particles 1.0 max. percent by mass (ASTM C 123).

b. Other soft particles 2.0 max. percent by mass (COE CRD-C 130).

c. Total of all deleterious 5.0 max. percent by mass (substances listed in ASTM C 33 and above, exclusive of material finer than 0.075 mm sieve).

d. The separation medium for lightweight particles shall have a density of 2.0 Mg/cubic meters.

2.2.2 Fine Aggregate

Fine aggregate shall consist of natural sand, manufactured sand, or a combination of the two, and shall be composed of clean, hard, durable particles. All fine aggregate shall be composed of clean, hard, durable particles meeting the requirements of ASTM C 33 and the requirements herein. The amount of deleterious material in the fine aggregate shall not exceed the limits in ASTM C 33and shall not exceed the following limits:

a. Lightweight particles (ASTM C 123) 1.0 percent max. by mass using a medium with a density of 2.0 Mg/cubic meter.

b. The total of all deleterious material types, listed in ASTM C 33 and above, shall not exceed 3.0 percent of the mass of the fine aggregate.

2.3 CHEMICAL ADMIXTURES

Air-entraining admixture shall conform to ASTM C 260. An accelerator shall be used only when specified in paragraph SPECIFIED CONCRETE STRENGTH AND OTHER PROPERTIES and shall not be used to reduce the amount of cementitious material used. Accelerator shall conform to ASTM C 494Type C. Calcium chloride and admixtures containing calcium chloride shall not be used. A water-reducing or retarding admixture shall meet the requirements of ASTM C 494. Type G or H admixtures are not allowed.

2.4 CURING MATERIALS

Membrane forming curing compound shall be a white pigmented compound conforming to COE CRD-C 300. Burlap shall be new or shall be clean material never used for anything other than curing concrete.

2.5 WATER

Water for mixing and curing shall be clean, potable, and free of injurious amounts of oil, acid, salt, or alkali.

2.6 JOINT MATERIALS

2.6.1 Expansion Joint Material

Expansion joint filler shall be a preformed material conforming to ASTM D 1751. Expansion joint filler shall be 20 mm thick.

2.6.2 Slip Joint Material

Slip joint material shall be 6 mm thick expansion joint filler conforming to ASTM D 1751 or ASTM D 1752.

2.7 REINFORCING

2.7.1 General

Reinforcement shall be free from loose, flaky rust, loose scale, oil, grease, mud, or other coatings that might reduce the bond with concrete.

2.8 DOWELS AND TIE BARS

2.8.1 Dowels

Dowels shall be single piece, plain (non-deformed) steel bars conforming to ASTM A 615 Grade 60 or higher. Dowels shall be free of loose, flaky rust and loose scale and shall be clean and straight.

2.8.2 Tie Bars

Tie bars shall be deformed steel bars conforming to ASTM A 615, Grade 60. Grade 60 or higher shall not be used for bars that are bent and straightened during construction.

2.9 EPOXY RESIN

All epoxy-resin materials shall be two-component materials conforming to ASTM C 881, Class as appropriate for each application temperature to be encountered; except, that in addition, the materials shall meet the following requirements:

a. Material for use for embedding dowels and anchor bolts shall be Type IV, Grade 3.

b. Material for use as patching for complete filling of spalls, wide cracks, and other voids and for use in preparing epoxy resin mortar shall be Type III, Grade as approved.

c. Material for injecting cracks shall be Type IV, Grade 1.

d. Material for bonding freshly mixed portland cement concrete, mortar, or freshly mixed epoxy resin concrete to hardened concrete shall be Type V, Grade as approved.

2.10 SPECIFIED CONCRETE STRENGTH AND OTHER PROPERTIES

Specified compressive strength, f'c, for concrete is 35 MPa at 28 days. Maximum allowable water-cementitious material ratio is 0.50. The water-cementitious material ratio is based on absolute volume equivalency, where the ratio is determined using the weight of cement for a cement only mix, or using the total volume of cement plus pozzolan converted to an equivalent weight of cement by the absolute volume equivalency method

described in ACI 211.1. The concrete shall be air-entrained with a total air content of 6 plus or minus 1 percent. The maximum allowable slump of the concrete shall be 75 mmfor pavement constructed with fixed forms. The strength of the concrete will be considered satisfactory so long as the average of all sets of three consecutive test results equals or exceeds the specified compressive strength f'c and no individual test result falls below the specified strength f'c by more than 3.5 MPa. Additional analysis or testing, including taking cores and/or load tests may be required at the Contractor's expense when the strength of the concrete in the structure is considered potentially deficient.

2.11 MIXTURE PROPORTIONS

2.11.1 Composition Concrete

Composition concrete shall be composed of cementitious material, water, fine and coarse aggregates, and admixtures. Fly ash, if used, shall be used only at a rate between 15 and 35 percent by mass of the total cementitious material. Admixtures shall consist of air entraining admixture. High range water-reducing admixtures and admixtures to produce flowable concrete shall not be used. No substitutions shall be made in the materials used in the mixture proportions without additional tests to show that the quality of the concrete is satisfactory.

2.11.2 Concrete Mixture Proportioning Studies

Trial design batches, mixture proportioning studies, and testing shall be the responsibility of the Contractor, and shall be performed by the Test Laboratory and signed by a Registered Engineer. No concrete pavement shall be placed until the Contracting Officer has approved the Contractor's mixture proportions. All materials used in mixture proportioning studies shall be representative of those proposed for use on the project. If there is a change in materials, additional mixture design studies shall be made using the new materials. Trial mixtures having proportions, slumps, and air content suitable for the work shall be based on methodology described in ACI 211.1. At least three different water-cementitious ratios, which will produce a range of strength encompassing that required on the project, shall be used. Laboratory trial mixtures shall be proportioned for maximum permitted slump and air content. Maximum sand content shall be 40 percent of the total aggregate SSD weight. Aggregate quantities shall be based on the mass in a saturated surface dry condition.

2.11.3 Mixture Proportioning Procedure

The Contractor shall perform the following:

a. Fabricate, cure and test 6 test cylinders per age for each mixture at 7 and 28 days.

b. Using the average strength for each w/(c+p), plot the results from each of the three mixtures on separate graphs for w/(c+p) versus 28-day strength.

c. From the graphs select a w/(c+p) which will produce a mixture giving a 28-day strength equal to the required strength determined in accordance with the following paragraph.

2.11.4 Average Strength Required for Mixtures

In order to ensure meeting, during production, the strength requirements specified, the mixture proportions selected shall produce a required average strength, f'cr, exceeding the specified strength, f'c, in accordance with procedures in Chapter 3 of ACI 301, "Proportioning."

PART 3 EXECUTION

3.1 CONDITIONING OF UNDERLYING MATERIAL

Underlying material, subgrade, upon which concrete is to be placed shall be clean, damp, and free from debris, waste concrete or cement, frost, ice, and standing or running water. After the underlying material has been prepared for concrete placement, no equipment shall be permitted thereon.

3.2 WEATHER LIMITATIONS

3.2.1 Hot Weather Paving

The temperature of concrete shall not exceed 32 degrees C. Steel forms, dowels and reinforcing shall be cooled prior to concrete placement when steel temperatures are greater than 49 degrees C.

3.2.2 Cold Weather Paving

The ambient temperature of the air at the placing site and the temperature of surfaces to receive concrete shall be not less 5 degrees C. The temperature of the concrete when placed shall be not less than 10 degrees C. Materials entering the mixer shall be free from ice, snow, or frozen lumps. Salt, chemicals or other materials shall not be incorporated in the concrete to prevent freezing. Calcium chloride shall not be used at any time. Covering and other means shall be provided for maintaining the concrete at a temperature of at least 10 degrees C for not less than 72 hours after placing, and at a temperature above freezing for the remainder of the curing period. Pavement damaged by freezing shall be completely removed and replaced at the Contractor's expense as specified in paragraph, REPAIR, REMOVAL, AND REPLACEMENT OF SLABS.

3.3 CONCRETE PRODUCTION

3.3.1 General Requirements

Concrete shall be deposited in front of the paver within 45 minutes from the time cement has been charged into the mixing drum, except that if the ambient temperature is above 32 degrees C, the time shall be reduced to 30 minutes. Every load of concrete delivered to the paving site shall be accompanied by a batch ticket from the operator of the batching plant. Tickets shall show at least the mass, or volume, of all ingredients in each batch delivered, the water meter and revolution meter reading on truck mixers and the time of day. Tickets shall be delivered to the placing foreman who shall keep them on file and deliver them to the Government daily.

3.3.2 Transporting and Transfer-Spreading Operations

Non-agitating equipment shall be used only on smooth roads and for haul time less than 15 minutes. Equipment shall be allowed to operate on the underlying material only if no damage is done to the underlying material and its degree of compaction. Any disturbance to the underlying material that does occur shall be corrected before the paver-finisher reaches the

location of the disturbance and the equipment shall be replaced or procedures changed to prevent any future damage. Additional water may be added to truck mixers to bring the slump within the specified range provided the mixture water-cement ratio is not exceeded.

3.4 PAVING

Pavement shall be constructed with paving and finishing equipment utilizing fixed forms.

3.4.1 Consolidation

The paver vibrators shall be inserted into the concrete not closer to the underlying material than 50 mm. The vibrators or any tamping units in front of the paver shall be automatically controlled so that they shall be stopped immediately as forward motion ceases. Excessive vibration shall not be permitted. Concrete in small, odd-shaped slabs or in locations inaccessible to the paver mounted vibration equipment shall be vibrated with a hand-operated immersion vibrator. Vibrators shall not be used to transport or spread the concrete.

3.4.2 Operation

When the paver is operated between or adjacent to previously constructed pavement (fill-in lanes), provisions shall be made to prevent damage to the previously constructed pavement, including keeping the existing pavement surface free of any debris, and placing rubber mats beneath the paver tracks. Transversely oscillating screeds and extrusion plates shall overlap the existing pavement the minimum possible, but in no case more than 200 mm.

3.4.3 Required Results

The paver-finisher shall be operated to produce a thoroughly consolidated slab throughout, true to line and grade within specified tolerances. The paver-finishing operation shall produce a surface finish free of irregularities, tears, voids of any kind, and any other discontinuities. It shall produce only a very minimum of paste at the surface. Multiple passes of the paver-finisher shall not be permitted. The equipment and its operation shall produce a finished surface requiring no hand finishing, other than the use of cutting straightedges, except in very infrequent instances. No water, other than true fog sprays (mist), shall be applied to the concrete surface during paving and finishing.

3.4.4 Fixed Form Paving

Forms shall be steel, except that wood forms may be used for curves having a radius of 45 m or less, and for fillets. Forms may be built up with metal or wood, added only to the base, to provide an increase in depth of not more than 25 percent. The base width of the form shall be not less than eight-tenths of the vertical height of the form, except that forms 200 mm or less in vertical height shall have a base width not less than the vertical height of the form. Wood forms for curves and fillets shall be adequate in strength and rigidly braced. Forms shall be set on firm material cut true to grade so that each form section when placed will be firmly in contact with the underlying layer for its entire base. Forms shall not be set on blocks or on built-up spots of underlying material. Forms shall remain in place at least 12 hours after the concrete has been placed. Forms shall be removed without injuring the concrete.

3.4.5 Omitted

3.4.6 Placing Reinforcing Steel

Reinforcement shall be positioned on suitable chairs securely fastened to the subgrade prior to concrete placement, or may be placed on an initial layer of consolidated concrete, with the subsequent layer placed within 30 minutes of the first layer placement.

3.4.7 Placing Dowels and Tie Bars

Dowels shall be installed with alignment not greater than 1 mm per 100 mm. Except as otherwise specified below, location of dowels shall be within a horizontal tolerance of plus or minus 15 mm and a vertical tolerance of plus or minus 5 mm. The portion of each dowel intended to move within the concrete or expansion cap shall be painted with one coat of rust inhibiting primer paint, and then oiled just prior to placement. Dowels and tie bars in joints shall be omitted when the center of the dowel and tie bar is located within a horizontal distance from an intersecting joint equal to or less than one-fourth of the slab thickness.

3.4.7.1 Contraction Joints

Dowels and tie bars in longitudinal and transverse contraction joints within the paving lane shall be held securely in place by means of rigid metal basket assemblies. The dowels and tie bars shall be welded to the assembly or held firmly by mechanical locking arrangements that will prevent them from becoming distorted during paving operations. The basket assemblies shall be held securely in the proper location by means of suitable anchors.

3.4.7.2 Construction Joints-Fixed Form Paving

Installation of dowels and tie bars shall be by the bonded-in-place method, supported by means of devices fastened to the forms. Installation by removing and replacing in preformed holes will not be permitted.

3.4.7.3 Dowels Installed in Hardened Concrete

Installation shall be by bonding the dowels into holes drilled into the hardened concrete. Holes approximately 3 mm greater in diameter than the dowels shall be drilled into the hardened concrete. Dowels shall be bonded in the drilled holes using epoxy resin injected at the back of the hole before installing the dowel and extruded to the collar during insertion of the dowel so as to completely fill the void around the dowel. Application by buttering the dowel shall not be permitted. The dowels shall be held in alignment at the collar of the hole, after insertion and before the grout hardens, by means of a suitable metal or plastic collar fitted around the dowel. The vertical alignment of the dowels shall be checked by placing the straightedge on the surface of the pavement over the top of the dowel and measuring the vertical distance between the straightedge and the beginning and ending point of the exposed part of the dowel.

3.4.7.4 Expansion Joints

Dowels in expansion joints shall be installed by the bonded-in-place method or by bonding into holes drilled in hardened concrete, using procedures specified above.

3.5 FINISHING

Clary screeds, "bridge deck" finishers, or other rotating pipe or tube type equipment shall not be permitted. The sequence of machine operations shall be transverse finishing, longitudinal machine floating if used, straightedge finishing, texturing, and then edging of joints. Hand finishing shall be used only infrequently and only on isolated areas of odd slab shapes and in the event of a breakdown of the mechanical finishing equipment. Supplemental hand finishing for machine finished pavement shall be kept to an absolute minimum. Equipment to be used for supplemental hand finishing shall primarily be 3 to 4 m cutting straightedges; only very sparing use of bull floats shall be allowed. At no time shall water be added to the surface of the slab in any way, except for fog (mist) sprays to prevent plastic shrinkage cracking.

3.5.1 Machine Finishing With Fixed Forms

The machine shall be designed to ride the forms. Machines that cause displacement of the forms shall be replaced. The machine shall make only one pass over each area of pavement. If the equipment and procedures do not produce a surface of uniform texture, true to grade, in one pass, the operation shall be immediately stopped and the equipment, mixture, and procedures adjusted as necessary.

3.5.2 Omitted

3.5.3 Surface Correction

While the concrete is still plastic, irregularities and marks in the pavement surface shall be eliminated by means of cutting straightedges, 3 to 4 m in length. Depressions shall be filled with freshly mixed concrete, struck off, consolidated, and refinished. Projections above the required elevation shall also be struck off and refinished. Long-handled, flat "bull floats" shall be used sparingly and only as necessary to correct minor, scattered surface defects. Finishing with hand floats and trowels shall be held to the absolute minimum necessary. Joints and edges shall not be overfinished.

3.5.4 Hand Finishing

Hand finishing operations shall be used only for those unusual slabs as specified previously. Grate tampers (jitterbugs) shall not be used. As soon as placed and vibrated, the concrete shall be struck off and screeded. The surface shall be tamped with a strike-off and tamping screed, or vibratory screed. Immediately following the final tamping of the surface, the pavement shall be floated longitudinally. Long-handled, flat bull floats shall be used sparingly and only as necessary to correct surface defects. Finishing with hand floats and trowels shall be held to the absolute minimum necessary. Joints and edges shall not be overfinished. No water shall be added to the pavement during finishing operations.

3.5.5 Texturing

Before the surface sheen has disappeared and before the concrete hardens, the surface of the pavement shall be given a texture as described herein. After curing is complete, all textured surfaces shall be thoroughly power broomed to remove all debris.

3.5.5.1 Fabric-Drag Surface Finish

Surface texture shall be applied by dragging the surface of the pavement, in the direction of the concrete placement, with a moist fabric drag. The dragging shall produce a uniform finished surface having a fine sandy texture without disfiguring marks.

3.5.6 Edging

After texturing has been completed, the edge of the slabs along the forms shall be carefully finished with an edging tool to form a smooth rounded surface of 3 mm radius. No water shall be added to the surface during edging.

3.6 CURING

Concrete shall be continuously protected against loss of moisture and rapid temperature changes for at least 7 days from the completion of finishing operations. Unhardened concrete shall be protected from rain and flowing water. During hot weather with low humidity and/or wind, the Contractor shall institute measures to prevent plastic shrinkage cracks from developing. ACI 305R contains means of predicting plastic shrinkage cracking and preventative measures. Plastic shrinkage cracks that occur shall be filled by injection of epoxy resin after the concrete hardens. Plastic shrinkage cracks shall never be troweled over or filled with slurry. Curing shall be accomplished by one of the following methods.

3.6.1 Membrane Curing

A uniform coating of white-pigmented membrane-forming curing compound shall be applied to the entire exposed surface of the concrete including pavement edges as soon as the free water has disappeared from the surface after finishing. If evaporation is high and no moisture is present on the surface even though bleeding has not stopped, fog sprays shall be used to keep the surface moist until setting of the cement occurs. Curing compound shall then be immediately applied. Curing compound shall be applied to the finished surfaces by means of a self-propelled automatic spraying machine, equipped with multiple spraying nozzles with wind shields, spaning the newly paved lane. The curing compound shall be applied at a maximum application rate of 5 square meters per L. The application of curing compound by hand-operated, mechanical powered pressure sprayers will be permitted only on odd widths or shapes of slabs where indicated and on concrete surfaces exposed by the removal of forms. The compound shall form a uniform, continuous, cohesive film that will not check, crack, or peel and that will be free from pinholes and other discontinuities. Areas where the curing compound develops the above defects or is damaged by heavy rainfall, sawing or other construction operations within the curing period, shall be immediately resprayed.

3.6.2 Moist Curing

Concrete to be moist-cured shall be maintained continuously wet for the entire curing period, commencing immediately after finishing. Surfaces shall be cured by ponding, by continuous sprinkling, by continuously saturated burlap or cotton mats, or by continuously saturated plastic coated burlap. Impervious sheet curing shall not be used.

3.7 JOINTS

No deviation from the jointing pattern shown on the drawings shall be made without written approval of the Design District Pavement or Geotechnical Engineer. All joints shall be straight, perpendicular to the finished grade of the pavement, and continuous from edge to edge or end to end of the pavement with no abrupt offset and no gradual deviation greater than 13 mm.

3.7.1 Longitudinal Construction Joints

Dowels, keys and tie bars shall be installed in the longitudinal construction joints, or the edges shall be thickened as indicated. The dimensions of the keyway shall not vary more than plus or minus 3 mm from the dimensions indicated and shall not deviate more than plus or minus 6 mm from the mid-depth of the pavement. If any length of completed keyway of 1.5 m or more fails to meet the above tolerances, dowels shall be installed.

3.7.2 Transverse Construction Joints

Transverse construction joints shall be installed at a planned transverse joint, at the end of each day's placing operations and when concrete placement is interrupted. Transverse construction joints shall be constructed either by utilizing headers and hand placement and finishing techniques, or by placing concrete beyond the transverse construction joint location and then saw cutting full depth and removing concrete back to the transverse construction joint location. For the latter case, dowels shall be installed using methods for dowels installed in hardened concrete described above. All transverse construction joints shall be dowelled.

3.7.3 Expansion Joints

Expansion joints shall be formed where indicated, and about any structures and features that project through or into the pavement, using preformed joint filler of the type, thickness, and width indicated, and shall extend the full slab depth. Edges of the concrete at the joint face shall be edged. The joint filler strips shall be installed to form a recess at the pavement surface to be filled with joint sealant. Expansion joints shall be constructed with dowels or thickened edges for load transfer.

3.7.4 Omitted

3.7.5 Contraction Joints

Transverse and longitudinal contraction joints shall be of the weakened-plane or dummy type. Longitudinal contraction joints shall be constructed by sawing a groove in the hardened concrete with a power-driven saw. Transverse contraction joints shall be constructed in conformance with requirements for sawed joints.

3.7.5.1 Sawed Joints

Sawed contraction joints shall be constructed by sawing a groove in the concrete with a 3 mm blade to the indicated depth. The time of initial sawing shall vary depending on existing and anticipated weather conditions and shall be such as to prevent uncontrolled cracking of the pavement. Sawing of the joints shall commence as soon as the concrete has hardened sufficiently to permit cutting the concrete without chipping, spalling, or tearing. The joints shall be sawed at the required spacing consecutively in the sequence of the concrete placement. Sawing at a given joint location shall be discontinued when a crack develops ahead of the saw cut.

Immediately after the joint is sawed, the saw cut and adjacent concrete surface shall be thoroughly flushed with water until all waste from sawing is removed from the joint. The surface shall be resprayed with curing compound as soon as free water disappears. The top of the joint opening and the joint groove at exposed edges shall be tightly sealed with cord or backer rod before the concrete in the region of the joint is resprayed with curing compound.

3.7.6 Thickened Edge Joints

Underlying material in the transition area shall meet the requirements for smoothness and compaction specified for all other areas of the underlying material.

3.8 REPAIR, REMOVAL, AND REPLACEMENT OF SLABS

New pavement slabs that contain full-depth cracks shall be removed and replaced, as specified herein at no cost to the Government. Removal and replacement shall be full depth, shall be full width of the paving lane, and the limit of removal shall be from each original transverse joint . The Contracting Officer will determine whether cracks extend full depth of the pavement and may require minimum 150 mm diameter cores to be drilled on the crack to determine depth of cracking. Cores shall be drilled and the hole later filled by the Contractor with a well consolidated concrete mixture bonded to the walls of the hole with epoxy resin. Drilling of cores and refilling holes shall be at no expense to the Government. Cracks that do not extend full depth of slab shall be cleaned and then pressure injected with epoxy resin, Type IV, Grade 1. The Contractor shall ensure that the crack is not widened during epoxy resin injection. Where a full depth crack intersects the original transverse joint, the slab(s) containing the crack shall be removed and replaced, with dowels installed, as required below. Spalls along joints shall be repaired as specified.

3.8.1 Removal and Replacement of Full Slabs

Unless there are keys or dowels present, all edges of the slab shall be sawcut full depth. If keys, dowels, or tie bars are present along any edges, these edges shall be sawed full depth 150 mm from the edge if only keys are present, or just beyond the end of dowels or tie bars if they are present. These joints shall then be carefully sawed on the joint line to within 25 mm of the depth of the dowel or key. The main slab shall be further divided by sawing full depth, at appropriate locations, and each piece lifted out and removed. The narrow strips along keyed or doweled edges shall be carefully broken up and removed. Care shall be taken to prevent damage to the dowels, tie bars, or keys or to concrete to remain in place. Protruding portions of dowels shall be painted and lightly oiled. The joint face below keys or dowels shall be suitably trimmed so that there is no abrupt offset. If underbreak occurs at any point along any edge, the area shall be hand-filled with concrete, producing an even joint face from top to bottom, before replacing the removed slab. If underbreak over 100 mm deep occurs, the entire slab containing the underbreak shall be removed and replaced. Where there are no dowels, tie bars, or keys on an edge, or where they have been damaged, dowels of the size and spacing as specified for other joints in similar pavement shall be installed by epoxy grouting them into holes drilled into the existing concrete. Original damaged dowels or tie bars shall be cut off flush with the joint face. All four edges of the new slab shall thus contain dowels or original keys or original tie bars. Prior to placement of new concrete, the underlying material shall be graded and recompacted, and the surfaces of all four

joint faces shall be cleaned of all loose material and contaminants, and coated with a double application of membrane forming curing compound as bond breaker. Placement of concrete shall be as specified for original construction. The resulting joints around the new slab shall be prepared and sealed as specified.

3.8.2 Repairing Spalls Along Joints

Spalls along joints and cracks shall be repaired by first making a vertical saw cut at least 25 mm outside the spalled area and to a depth of at least 50 mm. Saw cuts shall be straight lines forming rectangular areas. The concrete between the saw cut and the joint, or crack, shall be chipped out to remove all unsound concrete. The cavity shall be thoroughly cleaned with high pressure water jets supplemented with compressed air to remove all loose material. Immediately before filling the cavity, a prime coat shall be applied to the dry cleaned surface of all sides and bottom of the cavity, except any joint face. The prime coat shall be applied in a thin coating and scrubbed into the surface with a stiff-bristle brush. Prime coat for portland cement repairs shall be a neat cement grout and for epoxy resin repairs shall be epoxy resin, Type III, Grade 1. The cavity shall be filled with low slump portland cement concrete or mortar, or with epoxy resin concrete or mortar. Portland cement concrete shall be used for larger spalls, those more than 0.009 cubic meter in size after removal operations; portland cement mortar shall be used for spalls between 0.00085 and 0.009 cubic meter; and epoxy resin mortar or Type III, Grade 3 epoxy resin for those spalls less than 0.00085 cubic meter in size after removal operations. Portland cement concretes and mortars shall be very low slump mixtures, proportioned, mixed, placed, tamped, and cured. Epoxy resin mortars shall be made with Type III, Grade 1, epoxy resin, using proportions, mixing, placing, tamping and curing procedures as recommended by the manufacturer. Any repair material on the surrounding surfaces of the existing concrete shall be removed before it hardens. Where the spalled area abuts a joint, an insert or other bond-breaking medium shall be used to prevent bond at the joint face. A reservoir for the joint sealant shall be sawed to the dimensions required for other joints. In lieu of sawing, spalls not adjacent to joints, and popouts, both less than 150 mm in maximum dimension, may be prepared by drilling a core 50 mm in diameter greater than the size of the defect, centered over the defect, and 50 mm deep or 13 mm into sound concrete, whichever is greater. The core hole shall be repaired as specified above for other spalls.

3.8.3 Areas Defective in Plan Grade or Smoothness

In areas not meeting the specified limits for surface smoothness and plan grade, high areas shall be reduced to attain the required smoothness and grade, except as depth is limited below. High areas shall be reduced by grinding the hardened concrete with a surface grinding machine after the concrete is 14 days or more old. The depth of grinding shall not exceed 6 mm. All pavement areas requiring plan grade or surface smoothness corrections in excess of the specified limits, shall be removed and replaced. In pavement areas given a wire comb or tined texture, areas exceeding 2 square meters that have been corrected by rubbing or grinding shall be retextured by grooving machine sawn grooves meeting the requirements for the wire comb or tined texture. All areas in which grinding has been performed will be subject to the thickness tolerances specified in paragraph Thickness. Any grinding performed on individual slabs with excessive deficiencies shall be performed at the Contractor's own decision without entitlement to additional compensation if eventual removal of the slab is required.

3.9 OMITTED

3.10 PAVEMENT PROTECTION

The Contractor shall protect the pavement against all damage prior to final acceptance of the work. Traffic shall be excluded from the new pavement. As a construction expedient in paving intermediate lanes between newly paved pilot lanes, operation of the hauling equipment will be permitted on the new pavement after the pavement has been cured for 7 days and the joints have been sealed or otherwise protected. All new and existing pavement carrying construction traffic or equipment shall be continuously kept completely clean. Special cleaning and care shall be used where Contractor's traffic uses or crosses active airfield pavement.

3.11 TESTING AND INSPECTION FOR CONTRACTOR QUALITY CONTROL (CQC)

Paragraph ACCEPTABILITY OF WORK contains additional CQC requirements. The Contractor shall perform the inspection and tests described below and, based upon the results of these inspections and tests, shall take the action required and submit reports as specified. When, in the opinion of the Contracting Officer, the paving operation is out of control, concrete placement shall cease.

3.11.1 Batch Plant Control

A daily report shall be prepared indicating checks made for scale accuracy with test weights, checks of batching accuracy, and corrective action taken prior to and during placement for weighing or batching, type and source of cement used, type and source of pozzolan or slag used, amount and source of admixtures used, aggregate source, the required aggregate and water masses per cubic meter, amount of water as free moisture in each size of aggregate, and the batch aggregate and water masses per cubic meter for each class of concrete batched during each day's plant operation.

3.11.2 Concrete Mixture

a. Air Content Testing. Air content tests shall be made when test specimens are fabricated. In addition, at least two other tests for air content shall be made on randomly selected batches of each separate concrete mixture produced during each 8-hour period of paving. Whenever air content reaches specified limits, an immediate confirmatory test shall be made. If the second test also shows air content at or exceeding specified limits, an adjustment shall immediately be made in the amount of air-entraining admixture batched to bring air content within specified limits. If the next adjusted batch of concrete is not within specified limits, concrete placement shall be halted until concrete air content is within specified limits.

b. Slump Testing. Slump tests shall be made when test specimens are fabricated. Additional tests shall be made when excessive variation in workability is reported by the placing foreman or Government inspector. Whenever slump approaches the maximum limit, an adjustment shall immediately be made in the batch masses of water and fine aggregate, without exceeding the maximum w/(c+p). When a slump result exceeds the specification limit, no further concrete shall be delivered to the paving site until adjustments have been made and slump is again within the limit.

c. Temperature. The temperature of the concrete shall be measured when strength specimens are fabricated.

d. Concrete Strength Testing. Four (4) cylinders from the same batch shall be fabricated, cured and tested for compressive strength, testing two cylinders at 7-day and two cylinders at 28-day age. Control charts for strength, showing the 7-day and 28-day CQC compressive strengths, and the 28-day required compressive strength, shall be maintained and submitted with weekly CQC Reports.

3.11.3 Inspection Before Placing

Underlying materials, joint locations and types, construction joint faces, forms, reinforcing, dowels, and embedded items shall be inspected by a Registered Engineer in sufficient time prior to each paving operation in order to certify to the Contracting Officer that they are ready to receive concrete. The results of each inspection shall be reported in writing, and the certification signed by the Registered Engineer, prior to each days' paving.

3.11.4 Paving Operations

The placing foreman shall supervise all placing and paving operations, shall determine that the correct quality of concrete is placed in each location as shown, shall insure that the concrete is consolidated full depth and that finishing is performed as specified. The placing foreman shall be responsible for measuring and recording concrete temperatures and ambient temperature hourly during placing operations, weather conditions, time of placement, volume of concrete placed, and method of paving and any problems encountered.

3.11.5 Curing Inspection

a. Moist Curing Inspections. Each day on both work and non-work days, an inspection shall be made of all areas subject to moist curing. The surface moisture condition shall be noted and recorded. When any inspection finds an area of inadequate curing, immediate corrective action shall be taken, and the required curing period for the area shall be extended by 1 day.

b. Membrane Curing Inspection. At the end of each day's placement, the CQC Representative shall determine the quantity of compound used by measurement of the container; shall determine the area of concrete surface covered; shall then compute the rate of coverage in square meters per L and shall also note whether or not coverage is uniform. When the coverage rate of the curing compound is less than that specified or when the coverage is not uniform, the entire surface shall be sprayed again.

3.11.6 Cold-Weather Protection

At least once per day, an inspection shall be made of all areas subject to cold-weather protection. Any deficiencies shall be noted, corrected, and reported.

3.11.7 Reports

All results of tests or inspections conducted shall be reported informally as they are completed and in writing daily. A weekly report, signed by a registered engineer, shall be prepared for the updating of control charts and test data, and all CQC inspections and actions covering the entire period from the start of the construction through the current week. Reports of failures and the action taken shall be confirmed in writing in the routine reports. The Contracting Officer has the right to examine all CQC records. A copy of weekly reports shall be faxed to the Design District Pavement or Geotechnical Engineer. At the completion of concrete placement, a certification report shall be prepared containing mix designs, all updated control charts and concrete test data, quality control reports, smoothness reports, and other pertinent data on the concrete, with a certification by a registered engineer that the concrete placed meets all specification requirements. A copy of the certification report shall be mailed to the Design District pavement or Geotechnical Engineer.

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CEGS-02760 (March 1997)

Includes changes through Notice 1 (July 1997)

SECTION 02760

FIELD MOLDED SEALANTS FOR SEALING JOINTS IN RIGID PAVEMENTS
03/97

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 this text by the basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 509	(1994) Elastomeric Cellular Preformed Gasket and Sealing Material
ASTM D 789	(1994) Determination of Relative Viscosity, Melting Point, and Moisture Content of Polyamide (PA)
ASTM D 3405	(1994) Joint Sealants, Hot-Applied, for Concrete and Asphalt Pavements
ASTM D 5893	(1996) Cold Applied, Single Component Chemically Curing Silicon Joint Sealant for Portland Cement Concrete Pavement

CORPS OF ENGINEERS (COE)

COE CRD-C 525	(1989) Corps of Engineers Test Method for Evaluation of Hot-Applied Joint Sealants for Bubbling Due to Heating

1.2 OMITTED

1.3 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-06 Instructions

*9
Manufacturer's Recommendations; GA|F.

Where installation procedures, or any part thereof, are required to be in accordance with the manufacturer's recommendations, printed copies of these recommendations, 30 days prior to use on the project. Installation of the material will not be allowed until the recommendations are received. Failure to furnish these recommendations can be cause for rejection of the

material.

SD-07 Schedules

Construction Equipment List; FIO.

List of proposed equipment to be used in performance of construction work including descriptive data, 30 days prior to use on the project.

SD-14 Samples

Materials; FIO.

Samples of the materials (sealant, primer if required, and backup material), in sufficient quantity for testing and approval 30 days prior to the beginning of work. No material will be allowed to be used until it has been approved.

1.4 OMITTED

1.5 TEST REQUIREMENTS

The joint sealant and backup or separating material shall be tested for conformance with the referenced applicable material specification. Testing of the materials shall be performed in an approved independent laboratory and certified copies of the test reports shall be submitted and approved 30 days prior to the use of the materials at the job site. Samples will be retained by the Government for possible future testing should the materials appear defective during or after application. Conformance with the requirements of the laboratory tests specified will not constitute final acceptance of the materials. Final acceptance will be based on the performance of the in-place materials.

1.6 EQUIPMENT

Machines, tools, and equipment used in the performance of the work required by this section shall be approved before the work is started and shall be maintained in satisfactory condition at all times.

1.6.1 Joint Cleaning Equipment

1.6.1.1 Tractor-Mounted Routing Tool

The routing tool used for removing old sealant from the joints shall be of such shape and dimensions and so mounted on the tractor that it will not damage the sides of the joints. The tool shall be designed so that it can be adjusted to remove the old material to varying depths as required. The use of V-shaped tools or rotary impact routing devices will not be permitted. Hand-operated spindle routing devices may be used to clean and enlarge random cracks.

1.6.1.2 Concrete Saw

A self-propelled power saw with water-cooled diamond or abrasive saw blades will be provided for cutting joints to the depths and widths specified or for refacing joints or cleaning sawed joints where sandblasting does not provide a clean joint.

1.6.1.3 Sandblasting Equipment

Sandblasting equipment shall include an air compressor, hose, and long-wearing venturi-type nozzle of proper size, shape and opening. The maximum nozzle opening should not exceed 6.4 mm (1/4 inch). The air compressor shall be portable and shall be capable of furnishing not less than 71 liters per second (150 cubic feet per minute) and maintaining a line pressure of not less than 621 kPa (90 psi) at the nozzle while in use. Compressor capability under job conditions must be demonstrated before approval. The compressor shall be equipped with traps that will maintain the compressed air free of oil and water. The nozzle shall have an adjustable guide that will hold the nozzle aligned with the joint approximately 1 inch above the pavement surface. The height, angle of inclination and the size of the nozzle shall be adjusted as necessary to secure satisfactory results.

1.6.1.4 Waterblasting Equipment

Waterblasting equipment shall include a trailer-mounted water tank, pumps, high-pressure hose, wand with safety release cutoff control, nozzle, and auxiliary water resupply equipment. The water tank and auxiliary resupply equipment shall be of sufficient capacity to permit continuous operations. The nozzle shall have an adjustable guide that will hold the nozzle aligned with the joint approximately 1 inch above the pavement surface. The height, angle of inclination and the size of the nozzle shall be adjustable as necessary to obtain satisfactory results. A pressure gauge mounted at the pump shall show at all times the pressure in pounds per square inch at which the equipment is operating.

1.6.1.5 Hand Tools

Hand tools may be used, when approved, for removing defective sealant from a crack and repairing or cleaning the crack faces.

1.6.2 Sealing Equipment

1.6.2.1 Hot-Poured Sealing Equipment

The unit applicators used for heating and installing ASTM D 3405 joint sealant materials shall be mobile and shall be equipped with a double-boiler, agitator-type kettle with an oil medium in the outer space for heat transfer; a direct-connected pressure-type extruding device with a nozzle shaped for inserting in the joint to be filled; positive temperature devices for controlling the temperature of the transfer oil and sealant; and a recording type thermometer for indicating the temperature of the sealant. The applicator unit shall be designed so that the sealant will circulate through the delivery hose and return to the inner kettle when not in use.

1.6.2.2 Omitted
1.6.2.3 Omitted

1.6.2.4 Cold-Applied, Single-Component Sealing Equipment

The equipment for installing ASTM D 5893 single component joint sealants shall consist of an extrusion pump, air compressor, following plate, hoses, and nozzle for transferring the sealant from the storage container into the joint opening. The dimension of the nozzle shall be such that the tip of the nozzle will extend into the joint to allow sealing from the bottom of the joint to the top. The initially approved equipment shall be maintained

in good working condition, serviced in accordance with the supplier's instructions, and shall not be altered in any way without obtaining prior approval. Small hand-held air-powered equipment (i.e., caulking guns) may be used for small applications.

1.7 TRIAL JOINT SEALANT INSTALLATION

Prior to the cleaning and sealing of the joints for the entire project, a test section of at least 60 m long shall be prepared using the specified materials and approved equipment, so as to demonstrate the proposed joint preparation and sealing of all types of joints in the project. Following the completion of the test section and before any other joint is sealed, the test section shall be inspected to determine that the materials and installation meet the requirements specified. If it is determined that the materials or installation do not meet the requirements, the materials shall be removed, and the joints shall be recleaned and resealed at no cost to the Government. When the test section meets the requirements, it may be incorporated into the permanent work and paid for at the contract unit price per linear foot for sealing items scheduled. All other joints shall be prepared and sealed in the manner approved for sealing the test section.

1.8 DELIVERY AND STORAGE

Materials delivered to the job site shall be inspected for defects, unloaded, and stored with a minimum of handling to avoid damage. Storage facilities shall be provided by the Contractor at the job site for maintaining materials at the temperatures and conditions recommended by the manufacturer.

1.9 ENVIRONMENTAL CONDITIONS

The ambient air temperature and the pavement temperature within the joint wall shall be a minimum of 10 degrees C and rising at the time of application of the materials. Sealant shall not be applied if moisture is observed in the joint.

PART 2 PRODUCTS

2.1 SEALANTS

Materials for sealing cracks in the various paved areas indicated on the drawings shall be as follows:

Area	Sealing Material
All	ASTM D 3405 and COE CRD-C 525
All	ASTM D 5893

2.2 PRIMERS

Primers, when their use is recommended by the manufacturer of the sealant, shall be as recommended by the manufacturer of the sealant.

2.3 BACKUP MATERIALS

The backup material shall be a compressible, nonshrinking, nonstaining, nonabsorbing material and shall be nonreactive with the joint sealant. The material shall have a melting point at least 3 degrees C greater than the

pouring temperature of the sealant being used when tested in accordance with ASTM D 789. The material shall have a water absorption of not more than 5 percent of the sample weight when tested in accordance with ASTM C 509. The backup material shall be 25 plus or minus 5 percent larger in diameter than the nominal width of the crack.

2.4 BOND BREAKING TAPES

The bond breaking tape or separating material shall be a flexible, nonshrinkable, nonabsorbing, nonstaining, and nonreacting adhesive-backed tape. The material shall have a melting point at least 3 degrees C greater than the pouring temperature of the sealant being used when tested in accordance with ASTM D 789. The bond breaker tape shall be approximately 3 mm wider than the nominal width of the joint and shall not bond to the joint sealant.

PART 3 EXECUTION

3.1 PREPARATION OF JOINTS

Immediately before the installation of the sealant, the joints shall be thoroughly cleaned to remove all laitance, curing compound, filler, and protrusions of hardened concrete.

3.1.1 Omitted

3.1.2 Sawing

3.1.2.1 Facing of Joints

Facing of joints shall be accomplished using a concrete saw as specified in paragraph EQUIPMENT. The blade shall be stiffened with a sufficient number of suitable dummy (used) blades or washers. Immediately following the sawing operation, the joint opening shall be thoroughly cleaned using a water jet to remove all saw cuttings and debris.

3.1.3 Sandblasting

The newly exposed concrete joint faces and the pavement surfaces extending a minimum of 13 mm from the joint edges shall be sandblasted or waterblasted clean. A multiple-pass technique shall be used until the surfaces are free of dust, dirt, curing compound, filler, old sealant residue, or any foreign debris that might prevent the bonding of the sealant to the concrete. After final cleaning and immediately prior to sealing, the joints shall be blown out with compressed air and left completely free of debris and water.

3.1.4 Back-Up Material

When the joint opening is of a greater depth than indicated for the sealant depth, the lower portion of the joint opening shall be plugged or sealed off using a back-up material to prevent the entrance of the sealant below the specified depth. Care shall be taken to ensure that the backup material is placed at the specified depth and is not stretched or twisted during installation.

3.1.5 Bond Breaking Tape

Where inserts or filler materials contain bitumen, or the depth of the

joint opening does not allow for the use of a backup material, a bond breaker separating tape will be inserted to prevent incompatibility with the filler materials and three-sided adhesion of the sealant. The tape shall be securely bonded to the bottom of the joint opening so it will not float up into the new sealant.

3.1.6 Rate of Progress of Joint Preparation

The stages of joint preparation which include sandblasting, air pressure cleaning and placing of the back-up material shall be limited to only that lineal footage that can be sealed during the same day.

3.2 PREPARATION OF SEALANT

3.2.1 Hot-Poured Sealants

Sealants conforming to ASTM D 3405 shall not be heated in excess of the safe heating temperature recommended by the manufacturer as shown on the sealant containers. Sealant that has been overheated or subjected to application temperatures for over 4 hours or that has remained in the applicator at the end of the day's operation shall be withdrawn and wasted.

3.2.2 Omitted
3.2.3 Omitted

3.2.4 Single-Component, Cold-Applied Sealants

The ASTM D 5893 sealant and containers shall be inspected prior to use. Any materials that contain water, hard caking of any separated constituents, nonreversible jell, or materials that are otherwise unsatisfactory shall be rejected. Settlement of constituents in a soft mass that can be readily and uniformly remixed in the field with simple tools will not be cause for rejection.

3.3 INSTALLATION OF SEALANT

3.3.1 Time of Application

Joints shall be sealed immediately following final cleaning of the joint walls and following the placement of the separating or backup material. Open joints that cannot be sealed under the conditions specified, or when rain interrupts sealing operations shall be recleaned and allowed to dry prior to installing the sealant.

3.3.2 Sealing Joints

Immediately preceding, but not more than 15 m ahead of the joint sealing operations, a final cleaning with compressed air shall be performed. The joints shall be filled from the bottom up to 6 mm plus or minus 1.5 mm below the pavement surface. Excess or spilled sealant shall be removed from the pavement by approved methods and shall be discarded. The sealant shall be installed in such a manner as to prevent the formation of voids and entrapped air. In no case shall gravity methods or pouring pots be used to install the sealant material. Traffic shall not be permitted over newly sealed pavement until authorized by the Contracting Officer. When a primer is recommended by the manufacturer, it shall be applied evenly to the joint faces in accordance with the manufacturer's instructions. Joints shall be checked frequently to ensure that the newly installed sealant is cured to a tack-free condition within the time specified.

3.4 INSPECTION

3.4.1 Joint Cleaning

Joints shall be inspected during the cleaning process to correct improper equipment and cleaning techniques that damage the concrete pavement in any manner. Cleaned joints shall be approved prior to installation of the separating or back-up material and joint sealant.

3.4.2 Joint Sealant Application Equipment

The application equipment shall be inspected to ensure conformance to temperature requirements, proper proportioning and mixing (if two-component sealant) and proper installation. Evidences of bubbling, improper installation, failure to cure or set shall be cause to suspend operations until causes of the deficiencies are determined and corrected.

3.4.3 Joint Sealant

The joint sealant shall be inspected for proper rate of cure and set, bonding to the joint walls, cohesive separation within the sealant, reversion to liquid, entrapped air and voids. Sealants exhibiting any of these deficiencies at any time prior to the final acceptance of the project shall be removed from the joint, wasted, and replaced as specified herein at no additional cost to the Government.

3.5 CLEAN-UP

Upon completion of the project, all unused materials shall be removed from the site and the pavement shall be left in a clean condition.

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SECTION 02770

CONCRETE SIDEWALKS AND CURBS AND GUTTERS
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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	(1994) Steel Welded Wire Fabric, Plain, 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	(1990) 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 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

1.2 OMITTED
1.3 OMITTED

1.4 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-09 Reports

Field Quality Control; FIO.

Copies of all test reports within 24 hours of completion of the test.

SD-18 Records

Concrete; FIO.

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 be discontinued when the air temperature reaches 5 degrees C and is falling. Placement may begin when the air temperature reaches 2 degrees C and is rising. Provisions shall be made to protect the concrete from freezing during the specified curing period. If necessary to place concrete when the temperature of the air, aggregates, or water is below 2 degrees C, placement shall be approved in writing. Approval will be contingent upon full conformance with the following provisions. The underlying material shall be prepared and protected so that it is entirely free of frost when the concrete is deposited. Mixing water and aggregates shall be heated as necessary to result in the temperature of the in-place concrete being between 10 and 30 degrees C. Methods and equipment for heating shall be approved. The aggregates shall be free of ice, snow, and frozen lumps before entering the mixer. Covering and other means shall be provided for maintaining the concrete at a temperature of at least 10 degrees C for not less than 72 hours after placing, and at a temperature above freezing for the remainder of the curing period.

1.5.2 Placing During Warm Weather

The temperature of the concrete as placed shall not exceed 30 degrees C 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 35 degrees C.

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 03300 CAST-IN-PLACE STRUCTURAL CONCRETE except as otherwise specified. Concrete shall have a minimum compressive strength of 24 MPa at 28 days. Maximum size of aggregate shall be 37.5 mm.

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 50 mm plus or minus 25 mm for slip formed where determined in accordance with ASTM C 143.

2.1.3 Reinforcement Steel

Wire mesh shall be in mats, not rolled. 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, 9.5 mm (3/8 inch) thick, unless otherwise indicated.

2.5 OMITTED

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, 50 mm (2-inch) nominal thickness, straight and free from warp, twist, loose knots, splits or other defects. Wood forms shall have a nominal length of 3 m (10 feet). Radius bends may be formed with 19 mm (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 3 m (10 feet) with a minimum of 2 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 3 m 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 38 mm (1-1/2 inch) benders, for the full height of the curb, cleated together.

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.

3.1.3 Maintenance of Subgrade

The subgrade shall be maintained in a smooth, compacted condition in conformity with the required section and established grade until the concrete is placed. The subgrade shall be in a moist condition when concrete is placed. The subgrade shall be prepared and protected to produce a subgrade free from frost when the concrete is deposited.

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 1.2 meters. 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 3 mm in any 3 m long section. After forms are set, grade and alignment shall be checked with a 3.05 m (10 foot) straightedge. Forms shall have a transverse slope as indicated 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 wood float, bull float, or darby, edged

and broom finished.

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 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. Provide 6 mm deep scoring to form 600 mm square grid at areas as indicated on the drawings.

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 3 mm.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 7.9 mm (5/16 inch) from the testing edge of a 3.05 m (10-foot)straightedge. Permissible deficiency in section thickness will be up to 6.4 mm (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 13 mm. 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 6.4 mm (1/4 inch) from the testing edge of a 3.05 m (10-foot)straightedge. Permissible deficiency in section thickness will be up to 6.4 mm (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 1.5 m on centers, whichever is less, and shall be continuous across the slab. Longitudinal contraction joints shall be constructed along the centerline of all sidewalks 3 m 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 3 mm (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 12.7 mm joint filler strips. Joint filler shall be placed with top edge 6 mm 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 3 mm, and concrete over the joint filler shall be removed.

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 1.5 m nor greater than 4.5 m in length. Contraction joints shall be constructed by means of 3 mm 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 12.7 mm in width shall be provided at intervals not exceeding 15 meters. Expansion joints shall be provided in nonreinforced concrete gutter at locations indicated.

3.7 CURING AND PROTECTION

3.7.1 General Requirements

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.

3.7.1.1 Mat Method

The entire exposed surface shall be covered with 2 or more layers of burlap. Mats shall overlap each other at least 150 mm.The mat shall be thoroughly wetted with water prior to placing on concrete surface and shall be kept continuously in a saturated condition and in intimate contact with concrete for not less than 7 days.

3.7.1.2 Impervious Sheeting Method

The entire exposed surface shall be wetted with a fine spray of water and then covered with impervious sheeting material. Sheets shall be laid directly on the concrete surface with the light-colored side up and overlapped 300 mm when a continuous sheet is not used. The curing medium shall not be less than 450 mm wider than the concrete surface to be cured, and shall be securely weighted down by heavy wood planks, or a bank of moist earth placed along edges and laps in the sheets. Sheets shall be satisfactorily repaired or replaced if torn or otherwise damaged during curing. The curing medium shall remain on the concrete surface to be cured for not less than 7 days.

3.7.1.3 Membrane Curing Method

A uniform coating of white-pigmented membrane-curing compound shall be applied to the entire exposed surface of the concrete as soon after finishing as the free water has disappeared from the finished surface. Formed surfaces shall be coated immediately after the forms are removed and in no case longer than 1 hour after the removal of forms. Concrete shall not be allowed to dry before the application of the membrane. If any drying has occurred, the surface of the concrete shall be moistened with a fine spray of water and the curing compound applied as soon as the free

water disappears. Curing compound shall be applied in two coats by hand-operated pressure sprayers at a coverage of approximately 5 square meters per liter (200 square feet per gallon) for both coats. The second coat shall be applied in a direction approximately at right angles to the direction of application of the first coat. The compound shall form a uniform, continuous, coherent film that will not check, crack, or peel and shall be free from pinholes or other imperfections. If pinholes, abrasion, or other discontinuities exist, an additional coat shall be applied to the affected areas within 30 minutes. Concrete surfaces that are subjected to heavy rainfall within 3 hours after the curing compound has been applied shall be resprayed by the method and at the coverage specified above. Areas where the curing compound is damaged by subsequent construction operations within the curing period shall be resprayed. Necessary precautions shall be taken to insure that the concrete is properly cured at sawed joints, and that no curing compound enters the joints. The top of the joint opening and the joint groove at exposed edges shall be tightly sealed before the concrete in the region of the joint is resprayed with curing compound. The method used for sealing the joint groove shall prevent loss of moisture from the joint during the entire specified curing period. Approved standby facilities for curing concrete pavement shall be provided at a location accessible to the jobsite for use in the event of mechanical failure of the spraying equipment or other conditions that might prevent correct application of the membrane-curing compound at the proper time. Concrete surfaces to which membrane-curing compounds have been applied shall be adequately protected during the entire curing period from pedestrian and vehicular traffic, except as required for joint-sawing operations and surface tests, and from any other possible damage to the continuity of the membrane.

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.

3.7.4 Protective Coating

3.7.4.1 Application

Curing and backfilling operation shall be completed prior to applying protective coating. Concrete shall be surface dry and clean before each application. Coverage shall be not more than 11 square meters per liter (50 square yards per gallon) for first application and not more than 15.5 square meters per liter (70 square yards per gallon) for second application, except that the number of applications and coverage for each application for commercially prepared mixture shall be in accordance with the manufacturer's instructions. Coated surfaces shall be protected from vehicular and pedestrian traffic until dry.

3.7.4.2 Precautions

Protective coating shall not be heated by direct application of flame or electrical heaters and shall be protected from exposure to open flame, sparks, and fire adjacent to open containers or applicators. Material shall not be applied at temperatures lower than 10 degrees C.

3.8 FIELD QUALITY CONTROL

3.8.1 General Requirements

The Contractor shall perform the inspection and tests described and meet the specified requirements for inspection details and frequency of testing. Based upon the results of these inspections and tests, the Contractor shall take the action and submit reports as required below, and any additional tests to insure 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 190 cubic meters 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 4 MPa.

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 190 cubic meters, 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 6 mm 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 6 mm. 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.

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SECTION 02870

SITE FURNISHINGS
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PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 36/A 36M	(1996) Carbon Structural Steel
ASTM A 48M	(1994) Gray Iron Castings (Metric)
ASTM A 123	(1989a) Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A 153	(1996) Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A 500	(1993) Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
ASTM A 501	(1993) Hot-Formed Welded and Seamless Carbon Steel Structural Tubing
ASTM A 615/A 615M	(1996a) Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
ASTM B 26/B 26M	(1996a) Aluminum-Alloy Sand Castings
ASTM B 108	(1996a) Aluminum-Alloy Permanent Mold Castings
ASTM C 150	(1996) Portland Cement
ASTM D 648	(1996) Deflection Temperature of Plastics Under Flexural Load
ASTM D 2990	(1995) Tensile, Compressive, and Flexural Creep and Creep-Rupture of Plastics

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Data

Site Furnishings; FIO.

Manufacturer's descriptive data and catalog cuts.

SD-04 Drawings.

Site Furnishing Standards; FIO.

Drawings showing scaled details of proposed site furnishings, elevations for each type of site furnishing; dimensions, details, and methods of mounting or anchoring; shape and thickness of materials; and details of construction.

SD-06 Instructions

Installation; FIO.

Manufacturer's installation and maintenance instructions.

SD-08 Statements

Materials; FIO.

A listing indicating the furnishings provided have been in proven satisfactory use for at least 2 years.

SD-09 Reports

Recycled Material; FIO.

A report of site furnishing parts consisting of recycled materials. Product specification data shall provide test information for deflection and creep in accordance with ASTM D 648 and ASTM D 2990 for site furnishings which use plastic lumber as a component, shall be submitted. The data shall provide a comparison of deflection and creep measurements to other comparable materials.

Testing; FIO.

A report of post-installation test results.

SD-14 Samples

Finish; GA|D.

Two sets of color data for each furnishing displaying manufacturer's color selections and finishes, and identifying those colors and finishes proposed for use.

1.3 DELIVERY, STORAGE, AND HANDLING

Materials shall be delivered, handled, and stored in accordance with the manufacturer's recommendations. The storage area shall be as designated. The materials shall be stored in a dry, covered area until installed.

1.4 INSPECTION

Site furnishings shall be inspected upon arrival at the job site for conformity to specifications and quality in accordance with paragraph MATERIALS. Unacceptable items shall be removed from the job site.

PART 2 PRODUCTS

2.1 MATERIALS

Materials shall be the standard products of a manufacturer regularly engaged in the manufacture of such products. The materials provided shall be of a type with proven satisfactory use for at least 2 years.

2.1.1 Concrete

Portland cement shall conform to ASTM C 150 Types I, II, or III.

2.1.1.1 Pre-cast Concrete

Pre-cast concrete material and products shall conform to Section 03413 PRECAST ARCHITECTURAL CONCRETE.

2.1.1.2 Cast-in-Place Concrete

Cast-in-place concrete materials and products shall conform to Section 03300 CAST-IN-PLACE STRUCTURAL CONCRETE.

2.1.2 Omitted

2.1.3 Metal

Metallic materials and products shall conform to Section 05500 MISCELLANEOUS METAL. Metal components shall be furnished with factory drilled holes. Components shall be free of excess weld and spatter. Metal components with holes that will not be filled by hardware or hidden by other components will be rejected.

2.1.3.1 Steel

Structural steel products shall conform to ASTM A 36/A 36M, ASTM A 500 and ASTM A 501.

2.1.3.2 Reinforcing Steel

Steel used for reinforcement shall be deformed billet steel Grade 40. Steel shall conform to ASTM A 615/A 615M.

2.1.3.3 Cast Iron

Cast iron shall conform to ASTM A 48M Class 35 or better. The Contractor shall provide castings manufactured true to pattern and component parts that fit together in a satisfactory manner. Castings shall be of uniform quality, free from blowholes, porosity, hard spots, shrinkage, distortion, or other defects. Smooth castings shall be well-cleaned by sand or shot blasting.

2.1.3.4 Cast Aluminum

Cast aluminum shall conform to ASTM B 26/B 26M and ASTM B 108. The Contractor shall provide castings manufactured true to pattern and

component parts that fit together in a satisfactory manner. Castings shall be of uniform quality, free from blowholes, porosity, hard spots, shrinkage, distortion, or other defects. Smooth castings shall be well-cleaned by sand or shot blasting.

2.1.4 Wood

The Contractor shall provide premium grade wood free of knots; boards with eased edges and ends; and wood components with factory drilled holes. Components with holes that will not be filled by hardware or hidden by other components will be rejected.

2.1.4.1 Omitted

2.1.4.2 Selection

Wood products shall be as indicated.

2.1.5 Recycled Material

2.1.5.1 General Requirements

Recycled materials shall contain a minimum 85 percent recycled post-consumer product. Recycled materials shall be constructed or manufactured with a maximum 6 mm deflection or creep in any member in conformance with ASTM D 648 and ASTM D 2990.

2.1.5.2 High Density Polyethylene

The Contractor shall provide panels and components molded of ultraviolet (UV) and color stabilized polyethylene, with minimum 6 mm wall thickness; exposed edges shall be smoothed, rounded, and free of burrs and points; and the material shall be resistant to fading, cracking, fogging, and shattering. The material shall be non-toxic and have no discernible contaminates such as paper, foil, or wood. The material shall contain no more than 3 percent air voids. Material shall be resistant to deformation from solar radiation heat gain.

2.1.5.3 Structural Component

Recycled materials to include plastic lumber will not be used as structural components of site furnishings.

2.2 HARDWARE

Hardware shall be stainless steel in accordance with ASTM A 153 and compatible with the material to which applied. All exposed hardware shall match in color and finish. Mounting hardware shall be concealed, recessed, and plugged.

2.3 ANCHORS

Anchors shall be provided, where necessary, for fastening site furnishings securely in place and in accordance with approved manufacturer's instructions. Anchoring devices that may be used, when no anchors are otherwise specified or indicated, include anchor bolts, slotted inserts, expansion shields for concrete; toggle bolts and through bolts for masonry; machine carriage bolts for steel; and lag bolts and screws for wood.

2.4 FINISH

Finish shall be as indicated. Exposed surfaces and edges shall be rounded, polished, or sanded. Finish shall be non-toxic, non-glare, and resistant to corrosion. Exposed surfaces shall be smooth and splinter-free exposed surfaces.

2.4.1 Coatings

2.4.1.1 Galvanizing

Galvanized components shall be hot-dipped in zinc after fabrication in accordance with ASTM A 123. Tailings and sharp protrusions formed as a result of the hot-dip process shall be removed and exposed edges burnished.

2.4.1.2 Polyester Powder

Powder-coated surfaces shall receive electrostatic zinc coating prior to painting. Powder coating shall be electrostatically applied and oven cured. Polyester powder coating shall be resistant to ultraviolet (UV) light.

2.4.1.3 Polyvinyl-chloride (PVC)

PVC coating shall be primed with a clear acrylic thermosetting solution. The primed parts shall be preheated prior to dipping. The liquid polyvinyl chloride shall be ultraviolet (UV) stabilized and mold-resistant. The coated parts shall be cured. The coating shall be a minimum 2 mm thick plus or minus 0.5 mm and shall have an 85 durometer hardness with a slip-resistant finish.

2.4.2 Wood Sealants

Exposed wood surfaces shall have, as a minimum, two shop coats of paint, varnish, sealer, or other approved preservative. Sealants shall seal all applied surfaces from air.

2.4.3 Paint

Paint shall be factory applied with a minimum of 2 coats. Paint shall be weather-resistant and resistant to cracking, peeling and fading.

2.4.4 Color

Color of site furnishing components shall be in accordance with Section 09000 BUILDING COLOR AND FINISH SCHEDULE.

2.5 SITE FURNISHING STANDARDS

Site furnishings shall be furnished with the dimensions and requirements indicated.

2.5.1 Omitted

2.5.2 Benches and Chairs

Benches and chairs shall be furnished with no sharp edges or protruding hardware.

2.5.2.1 Height of Benches and Chairs

The height above finished grade or specified surface shall be between 450-500 mm and level.

2.5.2.2 Seat

The seat surface shall be pitched or slotted to shed water; the seat depth shall be between 300-460 mm and pitched down at the back at a 0-5 degree angle. Seat shall have a minimum width of 610 mm per person, and shall overhang the support base by a minimum of 100 mm for heel space and to facilitate rising from a seating position.

2.5.2.3 Back Rest

When back rests are required, the height shall be between 380-460 mm from the top of the seat and the connection shall be at a 90-110 degree angle to the seat.

2.5.2.4 Omitted

2.5.2.5 Weight Limit

Seats shall support a minimum 136 kg for each person they are designed to accommodate.

2.5.3 Tables

Picnic tables shall be furnished with attached benches that have no backrests. Table's exposed edges and corners shall be rounded, eased or chamfered.

2.5.3.1 Table Height

The table height shall be between 750-1200 mm from the finished grade to the lowest surface of the top, or as noted.

2.5.3.2 Clearance

A minimum vertical clearance of 230 mm between the seat top and the bottom edge of the table top shall be provided. A minimum of 460 mm of leg space under tables, measured from the inside edge of the seat top to the nearest table support, shall be provided. A minimum of 460 mm from the end of the table top to the nearest support leg shall be provided.

2.5.3.3 Top

Table top surfaces shall not contain recesses that might hold water or food particles. The table top dimensions shall be as indicated.

2.5.3.4 Wheelchair Accessibility

A minimum clear space of 740 mm from the finished grade to the underside of the table shall be provided for persons with disability to be able to pull a wheelchair beneath the table top at the end of the table; the minimum clear width shall be 860 mm.

2.5.4 Trash and Litter Receptacles

Trash and litter receptacles shall be furnished with weather protection, odor containment, and insect/animal-proofing. Container size shall be as indicated.

2.5.4.1 Height

Trash and litter deposit openings shall be as indicated.

2.5.4.2 Liners

Trash and litter receptacles shall be furnished with removable/reusable inner containers. Self-dumping type designs to include hinged bottom, top or sides will be rejected.

2.5.4.3 Anchors

Trash and litter receptacles that can be anchored to resist overturning by typical use, high winds, or animals shall be furnished and anchored in accordance with the manufacturer's recommendations.

2.5.4.4 Openings

Openings for trash and litter insertion shall be as indicated. Edges of the openings shall be crimped, rounded and smoothed.

2.5.5 Ash Receptacles

The Contractor shall provide ash receptacles with a fireproof metal bowl or screen or sand-filled containers for ash containment. Ash receptacles shall have a minimum diameter of 200 mm; ash containers shall have a fire-proof metal bowl or screen and shall be easily removable for cleaning.

2.5.6 Bicycle Racks

Bicycle racks shall accommodate locking devices and secure, as a minimum, one wheel and part of the frame simultaneously. Profile shall be as indicated.

2.5.7 Omitted

2.5.8 Tree Grates

Tree grates cast iron shall be supplied complete with matching frame. Grate shall be ADA-compliant starburst pattern with 6.4 mm slots and shall have a 400 mm diameter tree opening configured for knock-out expansion to 460 mm and 710 mm. Tree grates and frames shall have factory applied finish.

2.5.9 Pedestal Grill

Pedestal grill shall have a steel firebox minimum 500 mm wide, 380 mm deep, 250 mm high, fabricated of 4.75 mm thick steel with radiused exposed corners and drainage holes in bottom rear corners. Cooking grate shall be nonremovable, adjustable to four heights and shall be fabricated from 12 mm diameter steel bars 28 mm on center. Cooking area shall be not less than 1935 cm^2. Spring coil handles shall extend outside firebox for safe adjustment while firebox is hot. Pedestal shall be stationary, mounted on concrete and shall be heavy duty iron pipe, minimum 60 mm diameter, 1000 mm high. Firebox shall be mounted on pedestal so that it is nonremovable but

can be rotated 360 degrees. All components shall be finished with manufacturer's standard non-toxic rustproof baked on powder coat. Color shall be black.

PART 3 EXECUTION

3.1 INSTALLATION

The Contractor shall verify that finished grades and other operations affecting mounting surfaces have been completed prior to the installation of site furnishings. Site furnishings shall be installed plumb and true in accordance with the approved manufacturer's instructions.

3.1.1 Omitted
3.1.2 Omitted
3.1.3 Omitted

3.1.4 Parts

New parts shall be acquired from the manufacturer. Substitute parts will not be accepted unless approved by the manufacturer.

3.1.5 Assembly

When the inspection of parts has been completed, the site furnishings shall be assembled and anchored according to manufacturer's instructions or as indicated. When site furnishings are assembled at the site, assembly shall not interfere with other operations or pedestrian and vehicular circulation.

3.1.6 Testing

Each site furnishing shall be tested to determine a secure and correct installation. A correct installation shall be according to the manufacturer's recommendations and by the following procedure: The Contractor shall measure the physical dimensions and clearance of each installed site furnishing for compliance with manufacturer's recommendations and as indicated. Site furnishings which do not comply shall be reinstalled. Fasteners and anchors determined to be non-compliant shall be replaced. A written report describing the results of the testing shall be provided.

3.2 RESTORATION AND CLEAN UP

When the installation has been completed, the Contractor shall clean up and protect the site. Existing areas that have been damaged from the installation operation shall be restored to original condition at Contractor's expense.

3.2.1 Clean Up

The site shall be cleaned of all materials associated with the installation. Site furnishing surfaces shall be cleaned of dirt, stains, filings, and other blemishes occurring from shipment and installation. Cleaning methods and agents shall be according to manufacturer's instructions or as indicated.

3.2.2 Protection

The area shall be protected as required or directed by providing barricades

and signage. Signage shall be in accordance with Section 10430 EXTERIOR SIGNAGE.

3.2.3 Disposal of Materials

Excess and waste material shall be removed and disposed of as indicated on civil drawings.

3.3 RE-INSTALLATION

Where re-installation is required, the following shall be accomplished:

a. Re-install the product as specified. Material acquisition of replacement parts is the responsibility of the Contractor. Provide replacement materials that are new and supplied by the original manufacturer to match.

b. Damage caused by the failed installation shall be repaired.

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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.

AGRICULTURAL MARKETING SERVICE (AMS)

AMS-01	(Amended thru: Aug 1988) Federal Seed Act Regulations (Part 201-202)

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 2607	(1969) Peats, Mosses, Humus, and Related Products

COMMERCIAL ITEM DESCRIPTIONS (CID)

CID A-A-1909	(Basic; Notice 1) Fertilizer

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Data

Manufacturer's Literature; FIO.

Manufacturer's literature discussing physical characteristics, application and installation instructions for erosion control material, and for chemical treatment material.

SD-07 Schedules

Equipment List; FIO.

A list of proposed pesticide application, seeding and mulching equipment to be used in performance of turfing operation, including descriptive data and calibration tests.

SD-08 Statements

Delivery; FIO.

Delivery schedule, at least 10 days prior to the intended date of the first delivery.

Application of Pesticide; FIO.

Pesticide treatment plan with proposed sequence of pesticide treatment work. The pesticide trade name, chemical composition, formulation, concentration, application rate of active ingredients and method of application for all materials; and the name and state license number of the state certified applicator shall be included.

Maintenance Report; FIO.

Written record of maintenance work performed.

Turf Establishment Period; FIO.

Written calendar time period for the turf establishment period. When there is more than one turf establishment period, the boundaries of the turfed area covered for each period shall be described.

SD-13 Certificates

Certificates of compliance certifying that materials meet the requirements specified, prior to the delivery of materials. Certified copies of the reports for the following materials shall be included:

Seed; FIO.

For mixture, percent pure live seed, minimum percent germination and hard seed, maximum percent weed seed content, date tested and state certification.

Sod; FIO.

For species, mixture percentage, percent purity, field location.

Fertilizer; FIO.

For chemical analysis, composition percent.

Agricultural Limestone; FIO.

For calcium carbonate equivalent and sieve analysis.

Peat; FIO.

For compliance with ASTM D 2607.

Pesticide Material; FIO.

For EPA registration number and registered uses.

Topsoil; FIO.

For pH, particle size, chemical analysis and mechanical analysis.

1.3 SOURCE INSPECTIONS

Sod material will be subject to inspection by the Contracting Officer at the growing site.

1.4 DELIVERY, INSPECTION, STORAGE, AND HANDLING

1.4.1 Delivery

1.4.1.1 Protection

Sod shall be protected from drying out and contamination during delivery.

1.4.1.2 Topsoil

If not available onsite, topsoil shall be provided by the Contractor from approved offsite sources. Topsoil shall be a sandy loam with a dark gray to grayish brown color and be very friable, with a minimum organic content of 1 percent, a pH of 4.5 to 6.0 and be taken from the top 12 inches of its site location. The soil shall be free of brush, weeds, stones, roots, stumps or any other substance that might harm plant growth. A soil test shall be provided for topsoil delivered to the site.

1.4.1.3 Soil Amendments

Soil amendments shall be delivered to the site in the original, unopened containers bearing the manufacturer's chemical analysis. In lieu of containers, soil amendments may be furnished in bulk. A chemical analysis shall be provided for bulk deliveries.

1.4.1.4 Pesticide

Pesticide material shall be delivered to the site in the original, unopened containers bearing legible labels indicating the Environmental Protection Agency (EPA) registration number and the manufacturer's registered uses.

1.4.2 Inspection

Seed and sod shall be inspected upon arrival at the job site by the Contracting Officer for conformity to type and quality in accordance with paragraph MATERIALS. Other materials shall be inspected for meeting specified requirements and unacceptable materials shall be removed from the job site.

1.4.3 Storage

Materials shall be stored in areas designated by the Contracting Officer. Sod shall be lightly sprinkled with water, covered with moist burlap, straw, or other covering and protected from exposure to wind and direct sunlight until planted. Covering for sod shall allow air to circulate and prevent internal heat from building up. Seed, lime and fertilizer shall be stored in cool, dry locations away from contaminants. Chemical treatment materials shall not be stored with other landscape materials.

1.4.4 Handling

1.4.4.1 Materials

Care shall be taken to avoid injury to sod. Except for bulk deliveries,

materials shall not be dropped or dumped from vehicles.

1.4.4.2 Time Limitation

a. Sod: Limitation of the time between harvesting and placing of sod shall be 36 hours.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Seed

2.1.1.1 Seed Classification

State-certified seed of the latest season's crop shall be provided in original sealed packages bearing the producer's guaranteed analysis for percentages of mixture, purity, germination, hard seed, weed seed content, and inert material. Labels shall be in conformance with AMS-01 and applicable State seed laws.

2.1.1.2 Seed Mixtures

Seed mixtures shall be proportioned by weight as follows:

Botanical Name	Common Name	Mixture Percent by Weight	Percent Pure Live Seed
Cynodon dactylon	Bermuda Grass	100%	82.45%

2.1.1.3 Quality

Weed seed shall not exceed 1 percent by weight of the total mixture. Wet, moldy, or otherwise damaged seed shall be rejected.

2.1.1.4 Omitted

2.1.1.5 Temporary Seed

The temporary seed for erosion control shall be as follows:

Botanical Name	Common Name	Percent Pure Live Seed
Lolium multiflorum	Annual Rygrass	99%

2.1.1.6 Seed Mixing

The field mixing of seed shall be performed on site in the presence of the Contracting Officer.

2.1.2 Sod

2.1.2.1 Sod Classification

State-certified sod shall be provided as classified by applicable state laws. Each individual sod section shall be of a size to permit rolling and lifting without breaking.

2.1.2.2 Grass Species

Grass species shall be one of the following as indicated on the drawings:

Botanical Name	Common Name	Mixture Percent
Eremochloa ophiuroides	Centipede grass	100%

2.1.2.3 Quality

The sod shall be relatively free of thatch, diseases, nematodes, soil-borne insects, weeds or undesirable plants, stones larger than 50 mm in any dimension, woody plant roots and other material detrimental to a healthy stand of turf. Sod that has become dry, moldy, or yellow from heating, or has irregularly shaped pieces of sod and torn or uneven ends shall be rejected.

2.1.2.4 Thickness

Sod shall be machine cut to a uniform thickness of 30 mm within a tolerance of 5 mm, excluding top growth and thatch. Measurement for thickness shall exclude top growth and thatch.

2.1.2.5 Anchors

Sod anchors shall be as recommended by the sod supplier.

2.1.3 Omitted

2.1.4 Soil Amendments

Soil amendments shall consist of lime, fertilizer, organic soil amendments and soil conditioners meeting the following requirements.

2.1.4.1 Lime

Lime shall be agricultural limestone and shall have a minimum calcium carbonate equivalent of 90 percent and shall be ground to such a fineness that at least 90 percent will pass a 10-mesh sieve and at least 50 percent will pass a 60-mesh sieve.

2.1.4.2 Fertilizer

Fertilizer shall be commercial grade, free flowing, uniform in composition and conforming to CID A-A-1909. Granular Fertilizer: As recommended by the soil test.

2.1.4.3 Organic Soil Amendments

a. Topsoil: The existing surface soil shall be stripped and stockpiled on the site in accordance with Section 02300 EARTHWORK. When required beyond that available from stripping, the topsoil

shall be delivered. Delivered topsoil shall conform to topsoil requirements specified in paragraph Topsoil and shall be amended as recommended by soil test.

b. Peat: Hypnum moss peat derived from a bog, swampland or marsh shall conform to ASTM D 2607.

c. Sand: Clean, free of toxic materials; 95 percent by weight shall pass a No. 10 sieve and 10 percent by weight shall pass a No. 16 sieve.

d. Rotted Manure: Well rotted, horse or cattle manure containing a maximum 25 percent by volume of straw, sawdust, or other bedding materials, free of stones, sticks, soil and containing no chemicals or ingredients harmful to plants.

e. Decomposed Wood Derivatives: Ground bark, sawdust, or other wood waste material free of stones, sticks, soil, and toxic substances harmful to plants, stabilized with nitrogen and having the following properties:

Particle Size: Minimum percent by weight passing:

Sieve Size	Percent
No. 4	95
No. 4	80

Nitrogen Content: Minimum percent based on dry weight:

Material	Percent
Redwood Sawdust	0.5
Fir Sawdust	0.7
Fir or Pine Bark	1.0

f. Calcined Clay: Granular particles produced from montmorillonite clay calcined to minimum temperature of 650 degrees C to the following gradation: minimum 90 percent passing No. 8, 99 percent retained on No. 60 sieve and maximum 2 percent passing No. 100 sieve. Bulk density: maximum 640 kg per cubic m.

2.1.4.4 Soil Conditioner

Soil conditioner shall be for single use or in combination to meet requirements for topsoil. Gypsum shall be commercially packaged, free flowing, minimum 95 percent calcium sulfate by volume.

2.1.5 Mulch

Mulch shall be free from weeds, mold, and other deleterious materials.

2.1.5.1 Straw

Straw shall be stalks from oats, wheat, rye, barley, or rice furnished

in air-dry condition and with a consistency for placing with commercial mulch-blowing equipment.

2.1.5.2 Hay

Hay shall be native hay, sudan-grass hay, broomsedge hay, or other herbaceous mowings furnished in an air-dry condition suitable for placing with commercial mulch-blowing equipment.

2.1.5.3 Wood Cellulose Fiber

Wood cellulose fiber shall not contain any growth or germination-inhibiting factors and shall be dyed an appropriate color to facilitate visual metering during application. Composition on air-dry weight basis: 9 to 15 percent moisture, pH range from 4.5 to 6.0.

2.1.5.4 Wood Chips

Wood chips shall be chips or shredded bark with maximum particle size of 5 mm.

2.1.6 Omitted

2.1.7 Water

Water shall not contain elements toxic to plant life.

2.1.8 Pesticide

Pesticide shall be insecticide, herbicide, fungicide, nematocide, rodenticide and miticide. For the purpose of this specification, soil fumigant shall have the same requirements as a pesticide. The pesticide material shall be EPA registered and approved.

2.1.9 Erosion Control Material

Soil erosion control shall conform to the following:

2.1.9.1 Soil Erosion Control Blanket

Machine produced mat of straw covered on one side with biodegradable plastic mesh and stitched with cotton thread. Width shall be 2 m, length 25.5m, and weight 13.6 kg.

2.1.9.2 Omitted
2.1.9.3 Omitted
2.1.9.4 Omitted
2.1.9.5 Omitted

2.1.9.6 Anchors

Erosion control anchor material shall be as recommended by the manufacturer.

PART 3 EXECUTION

3.1 SEEDING AND SODDING TIMES AND CONDITIONS

3.1.1 Seeding Time

Seed shall be sown from 1 March to 31 August for spring and summer planting. Temporary seeding shall be from 1 September to 30 April.

3.1.2 Sodding Time

Sod shall be placed from 1 April to 1 September for spring and summer planting.

3.1.3 Omitted

3.1.4 Turfing Conditions

Turf operations shall be performed only during periods when beneficial results can be obtained. When drought, excessive moisture or other unsatisfactory conditions prevail, the work shall be stopped when directed. When special conditions warrant a variance to the turf operations, proposed times shall be submitted to and approved by the Contracting Officer.

3.2 SITE PREPARATION

3.2.1 Grading

The Contracting Officer shall verify that finished grades are as indicated on drawings, and the placing of topsoil and the smooth grading has been completed in accordance with Section 02300 EARTHWORK.

3.2.2 Application of Soil Amendments

3.2.2.1 Soil Test

A soil test shall be performed for pH, chemical analysis and mechanical analysis to establish the quantities and type of soil amendments required to meet local growing conditions for the type and variety of turf specified.

3.2.2.2 Lime

Lime shall be applied at the rate recommended by the soil test. Lime shall be incorporated into the soil to a minimum depth of 100 mm or may be incorporated as part of the tillage operation.

3.2.2.3 Fertilizer

Fertilizer shall be applied at the rate recommended by the soil test. Fertilizer shall be incorporated into the soil to a minimum depth of 100 mm and may be incorporated as part of the tillage or hydroseeding operation. Note that Bermuda grass needs more fertilizer than centipede (about twice as much).

3.2.2.4 Soil Conditioner

Soil conditioner shall be spread uniformly over the soil and thoroughly incorporated by tillage into the soil to a minimum depth of 100 mm.

3.2.3 Tillage

3.2.3.1 Minimum Depth

Soil on slopes gentler than 3-horizontal-to-1-vertical shall be tilled to a

minimum depth of 100 mm. On slopes between 3-horizontal-to-1-vertical and 1-horizontal-to-1 vertical, the soil shall be tilled to a minimum depth of 50 mm by scarifying with heavy rakes, or other method. Rototillers shall be used where soil conditions and length of slope permit. On slopes 1-horizontal-to-1 vertical and steeper, no tillage is required.

3.2.4 Finished Grading

3.2.4.1 Preparation

Turf areas shall be filled as needed or have surplus soil removed to attain the finished grade. Drainage patterns shall be maintained as indicated on drawings. Turf areas compacted by construction operations shall be completely pulverized by tillage. Soil used for repair of erosion or grade deficiencies shall conform to topsoil requirements specified in Section 02300 EARTHWORK. Finished grade shall be 25 mm below the adjoining grade of any surfaced area. New surfaces shall be blended to existing areas.

3.2.4.2 Lawn Area Debris

Lawn areas shall have debris and stones larger than 25 mm in any dimension removed from the surface.

3.2.4.3 Field Area Debris

Field areas shall have debris and stones larger than 75 mm in any dimension removed from the surface.

3.2.4.4 Protection

Finished graded areas shall be protected from damage by vehicular or pedestrian traffic and erosion.

3.3 SEEDING

3.3.1 General

Prior to seeding, any previously prepared seedbed areas compacted or damaged by interim rain, traffic or other cause, shall be reworked to restore the ground condition previously specified. Seeding operations shall not take place when the wind velocity will prevent uniform seed distribution.

3.3.2 Equipment Calibration

The equipment to be used and the methods of turfing shall be subject to the inspection and approval of the Contracting Officer prior to commencement of turfing operations. Immediately prior to the commencement of turfing operations, the Contractor shall conduct turfing equipment calibration tests in the presence of the Contracting Officer.

3.3.3 Applying Seed

3.3.3.1 Broadcast Seeding

Permanent seed shall be uniformly broadcast at the rate of 48 kilograms per hectare, temporary seed shall be broadcast at a rate of 240 kilograms per per hectare using broadcast seeders. Half of seed shall be broadcast in one direction, and the remainder at right angles to the first direction.

Seed shall be covered to an average depth of 5 mm by disk harrow, steel mat drag, cultipacker, or other approved device.

3.3.3.2 Drill Seeding

Permanant seed shall be uniformly drilled to an average depth of 15 mm and at the rate of 48 kilograms per hectare using equipment having drills not more than 160 mm apart. Row markers shall be used with the drill seeder.

3.3.3.3 Rolling

Immediately after seeding, except for slopes 3-horizontal-to-1 vertical and greater, the entire area shall be firmed with a roller not exceeding 130 kg for each meter of roller width. Areas seeded with seed drills equipped with rollers shall not be rolled.

3.3.4 Hydroseeding

Seed and fertilizer shall be added to water and thoroughly mixed at the rates specified. Wood cellulose fiber mulch shall be added at the rates recommended by the manufacturer after the seed, fertilizer and water have been thoroughly mixed, to produce a homogeneous slurry. Slurry shall be uniformly applied under pressure over the entire area. The hydroseeded area shall not be rolled.

3.3.5 Mulch

3.3.5.1 Straw or Hay Mulch

Straw or hay mulch shall be spread uniformly at the rate of 4.5 metric tons per hectare. Mulch shall be spread by hand, blower-type mulch spreader or other approved method. Mulching shall be started on the windward side of relatively flat areas or on the upper part of a steep slope and continued uniformly until the area is covered. The mulch shall not be bunched. All seeded areas shall be mulched on the same day as the seeding.

3.3.5.2 Mechanically Anchoring

Immediately following spreading, the mulch shall be anchored to the soil by a V-type-wheel land packer, a scalloped-disk land packer designed to force mulch into the soil surface, or other suitable equipment.

3.3.5.3 Omitted

3.3.5.4 Non-Asphaltic Tackifier

Hydrophilic colloid shall be applied at rate recommended by manufacturer. Apply with hydraulic equipment suitable for mixing and applying uniform mixture of tackifier.

3.3.5.5 Omitted

3.3.5.6 Wood Cellulose Fiber

Wood cellulose fiber mulch for use with the hydraulic application of seed and fertilizer shall be applied as part of the hydroseeding operation.

3.3.6 Water

Watering shall be started within 7 days after completing the seeded area. Water shall be applied at a rate sufficient to ensure moist soil conditions to a minimum depth of 25 mm. Run-off and puddling shall be prevented.

3.4 SODDING

3.4.1 General

Areas shall be sodded as indicated. Adequate soil moisture shall be ensured prior to sodding by spraying water on the area to be sodded and wetting the soil to a minimum depth of 25 mm.

3.4.2 Placing Sod

Rows of sod shall be placed parallel to and tightly against each other. Joints shall be staggered laterally. The sod strips shall not be stretched or overlapped. All joints shall be butted tight. Voids and air drying of roots shall be prevented. On long slopes, sod shall be laid at right angles to slopes. In ditches, sod shall be laid at right angles to the flow of water. When required, the sod shall be anchored by placing anchors a minimum distance of 600 mm on center with a minimum of 2 anchors per sod section.

3.4.3 Finishing

Air pockets shall be eliminated and a true and even surface shall be provided by tamping or rolling the sod in place. Displacement of the sod shall be assured by knitting of sod to the soil. Frayed edges shall be trimmed and holes or missing corners shall be patched in the sod.

3.4.4 Watering Sod

Watering shall be started immediately after completing each day of sodding. Water shall be applied at a rate sufficient to ensure moist soil conditions to a minimum depth of 25 mm. Run-off and puddling shall be prevented.

3.5 OMITTED

3.6 EROSION CONTROL

3.6.1 Erosion Control Material

Erosion control material, where indicated or required, shall be installed in accordance with manufacturer's instructions. Placement of the erosion control material shall be accomplished without damage to installed material or without deviation to finished grade.

3.6.2 Temporary Turf Cover

3.6.2.1 General

When there are contract delays in the turfing operation or a quick cover is required to prevent erosion, the areas designated for turf shall be seeded with a temporary seed as directed by the Contracting Officer.

3.6.2.2 Application

When no other turfing materials have been applied, the quantity of one half of the required soil amendments shall be applied and the area tilled in

accordance with paragraph SITE PREPARATION. Seed shall be uniformly broadcast and applied at the rate of 200 kilograms per hectare. The area shall be watered as required.

3.7 APPLICATION OF PESTICIDE

When pesticide becomes necessary to remove a pest or disease, a state-certified applicator shall apply required pesticides in accordance with EPA label restrictions and recommendations. Hydraulic equipment shall be provided for the liquid application of pesticides with a leak-proof tank, positive agitation methods, controlled application pressure and metering gauges. A pesticide plan shall be provided to the Contracting Officer as stated in paragraph SUBMITTALS.

3.8 RESTORATION AND CLEAN UP

3.8.1 Restoration

Existing turf areas, pavements and facilities that have been damaged from the turfing operation shall be restored to original condition at Contractor's expense.

3.8.2 Clean Up

Excess and waste material shall be removed from the planting operation and shall be disposed of off the site. Adjacent paved areas shall be cleaned.

3.9 PROTECTION OF TURFED AREAS

Immediately after turfing, the area shall be protected against traffic or other use by erecting barricades and providing signage as required, or as directed by the Contracting Officer.

3.10 TURF ESTABLISHMENT PERIOD

3.10.1 Commencement

The Turf Establishment Period for establishing a healthy stand of turf shall begin on the first day of work under this contract and shall end three (3) months after the last day of turfing operations required by this contract. Written calendar time period shall be furnished to the Contracting Officer for the Turf Establishment Period. When there is more than one turf establishment period, describe the boundaries of the turfed area covered for each period.

3.10.2 Satisfactory Stand of Turf

3.10.2.1 Seeded Area

a. Lawn Area: A satisfactory stand of turf from the seeding operation for a lawn area is defined as a minimum of 160 grass plants per square meter. Bare spots shall be no larger than 150 mm square. The total bare spots shall not exceed 2 percent of the total seeded area

b. Field Area: A satisfactory stand of turf from the seeding operation for a field area is defined as a minimum of 100 grass plants per square meter. The total bare spots shall not exceed 2 percent of the total seeded area.

3.10.2.2 Sodded Area

A satisfactory stand of turf from the sodding operation is defined as living sod uniform in color and leaf texture. Bare spots shall be no larger than 50 mm square.

3.10.3 Maintenance During Establishment Period

3.10.3.1 General

Maintenance of the turfed areas shall include eradicating weeds, eradicating insects and diseases, protecting embankments and ditches from erosion, maintaining erosion control materials and mulch, protecting turfed areas from traffic, mowing, watering, and post-fertilization.

3.10.3.2 Mowing

a. Lawn Areas: Centipede lawn areas shall be mowed to a minimum height of 76 mm when the average height of the turf becomes 100 mm. Bermuda lawn areas wull be cut lower to 50 mm when it gets to 80 mm. Clippings shall be removed when the amount of cut turf is heavy enough to damage the turfed areas.

b. Field Areas: Field areas shall be mowed once during the season to a minimum height of 100 mm.

3.10.3.3 Watering

Watering shall be at intervals to obtain a moist soil condition to a minimum depth of 25 mm. Frequency of watering and quantity of water shall be adjusted in accordance with the growth of the turf. Run-off, puddling and wilting shall be prevented.

3.10.3.4 Post-Fertilization

Nitrogen carrier fertilizer shall be applied at the rate recommended by soil test. Provide no more than 25 kilograms per hectare after the first month and again in 3 months prior to the final acceptance. The application shall be timed prior to the advent of winter dormancy and shall avoid excessively high nitrogen levels. Keep in mind that centipede gets 1/2 the fertilizer Bermuda gets (i.e. Bermuda sod would get 48 kilograms per hectare).

3.10.3.5 Pesticide

Treatment for disease or pest shall be in accordance with paragraph APPLICATION OF PESTICIDE.

3.10.3.6 Repair

The Contractor shall re-establish as specified herein, eroded, damaged or barren areas. Mulch shall also be repaired or replaced as required.

3.10.3.7 Maintenance Report

A written record shall be furnished to the Contracting Officer of the maintenance work performed.

3.11 FINAL ACCEPTANCE

3.11.1 Preliminary Inspection

Prior to the completion of the Turf Establishment Period, a preliminary inspection shall be held by the Contracting Officer. Time for the inspection shall be established in writing. The acceptability of the turf in accordance with the Turf Establishment Period shall be determined. An unacceptable stand of turf shall be repaired as soon as turfing conditions permit.

3.11.2 Final Inspection

A final inspection shall be held by the Contracting Officer to determine that deficiencies noted in the preliminary inspection have been corrected. Time for the inspection shall be established in writing.

-- End of Section --

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CEGS-02950 (June 1990)

Includes changes through Notice 3 (May 1994)

SECTION 02950

TREES, SHRUBS, GROUND COVERS, AND VINES

06/90

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 NURSERYMEN (AAN)

AAN-01	(1990) American Standard for Nursery Stock

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 2607	(1969) Peats, Mosses, Humus, and Related Products

COMMERCIAL ITEM DESCRIPTIONS (CID)

CID A-A-1909	(Basic; Notice 1) Fertilizer

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Data

Edging Material; FIO. Erosion Control Material; FIO.

Manufacturer's literature discussing physical characteristics, application and installation instructions for edging material and erosion control material.

SD-07 Schedules

Application of Pesticide Material; FIO.

A list of the proposed pesticide application equipment to be used in performance of the planting work, including descriptive data and calibration tests.

SD-08 Statements

Delivery; FIO. Application of Pesticide Material; FIO.

The following work plans, before work is started.

a. Delivery Schedule at least 10 days prior to the intended date of the first delivery.

b. Pesticide Treatment Plan, giving proposed sequence of pesticide treatment work, before work is started. The pesticide trade name, chemical composition, formulation, concentration, application rate of active ingredients and methods of application for all materials furnished, and the name and state license number of the state certified applicator shall be included.

SD-09 Reports

Soil Test; FIO. Percolation Test; FIO.

Certified reports of inspections and laboratory tests, prepared by an independent testing agency, including analysis and interpretation of test results. Each report shall be properly identified. Test methods used and compliance with recognized test standards shall be described.

SD-13 Certificates

Topsoil; FIO. Soil Amendments; FIO. Plants; FIO. Pesticide; FIO.

Certificates of compliance certifying that materials meet the requirements specified, prior to the delivery of materials. Reports for the following materials shall be included.

a. Topsoil: For pH, chemical analysis, mechanical analysis and particle size.

b. Fertilizer: For chemical analysis and composition percent.

c. Agricultural Limestone: For sieve analysis and calcium carbonate equivalent.

d. Peat: For compliance with ASTM D 2607.

e. Plant Materials: For botanical and common name, size, quantity by species, grade, nursery grown.

f. Pesticide Material: For EPA registration number and registered uses.

SD-18 Records

Plant Establishment Period; FIO. Maintenance Report; FIO. Maintenance Instructions; FIO.

a. Maintenance Report. Written record of maintenance work performed and quantity of plant losses and replacements.

b. Plant Establishment Period. Written calendar time period for the beginning of the plant establishment period. When there is more than one establishment period, the boundaries of the planted areas covered for each period shall be described.

c. Maintenance Instruction. Written instructions for year-round care of installed plants.

1.3 SOURCE INSPECTIONS

1.3.1 Plant Materials

Plant materials shall be subject to inspection at the growing site by the Contracting Officer.

1.3.2 Delivered Topsoil

The source of topsoil shall be subject to inspection by the Contracting Officer.

1.4 SHIPMENT, DELIVERY, INSPECTION, STORAGE, AND HANDLING

1.4.1 Shipment

1.4.1.1 Preparation

Digging and preparation for shipment shall be done in a manner that will not cause shock or damage to branches, trunk, or root systems.

a. Balled and Burlapped (BB) Plants: Ball size and ratio shall be provided as recommended by AAN-01. The ball shall be of a diameter and depth to encompass enough fibrous and feeding root system necessary for the full recovery of the plant. Removal shall be accomplished by hand digging or mechanical devices. Center the plant stem or trunk in the ball and clean cut all roots at the ball surface. No roots shall be pulled from the ground. The root ball shall be completely wrapped with burlap or other suitable material and securely laced with twine.

b. Balled and Potted (Pot) Plants: Ball size and ratio shall be provided as recommended by AAN-01. The ball shall be of a diameter and depth to encompass enough fibrous and feeding root system necessary for the full recovery of the plant. Removal shall be accomplished by hand digging or mechanical devices. The plant stem or trunk shall be centered in the ball and all roots shall be clean cut at the ball surface. No roots shall be pulled from the ground. Containers shall be used to retain the ball unbroken. Container shall be sufficiently rigid to hold ball shape and protect root mass during shipping.

c. Balled and Platform (BP) Plants: Ball size and ratio shall be provided as recommended by AAN-01. Plants shall be prepared as BB plants and securely fastened to wood platform for shipping.

d. Omitted.

e. Container-Grown (C) Plants: Container size shall be provided as recommended by AAN-01. Plants shall be grown in a container sufficiently long for new fibrous roots to have developed and for root mass to retain its shape and hold together when removed from container. Container shall be sufficiently rigid to hold ball shape and protect root mass during shipping.

1.4.1.2 Antidesiccant Application

Plants shall be sprayed with an antidesiccant as leaf budding occurs or when plant material has soft growth.

1.4.2 Delivery

1.4.2.1 Identification

Plants shall be identified with durable waterproof labels and weather-resistant ink. Plants shall have attached labels stating the correct plant name and size.

1.4.2.2 Protection During Delivery

Plants shall be protected during delivery to prevent desiccation of the plant or damage to the roots or balls. Branches of plants shall be protected by tying-in the branches and covering all exposed branches.

1.4.2.3 Topsoil

A soil test shall be provided for topsoil delivered to the site.

1.4.2.4 Soil Amendments

Soil amendments shall be delivered to the site in the original, unopened containers bearing the manufacturer's chemical analysis. In lieu of containers, soil amendments may be furnished in bulk. A chemical analysis shall be provided for bulk deliveries.

1.4.2.5 Pesticide

Pesticide materials shall be delivered to the site in the original unopened containers bearing legible labels indicating the Environmental Protection Agency (EPA) registration numbers and the registered uses.

1.4.3 Inspection

Plant material shall be inspected upon arrival at the jobsite by the Contracting Officer for conformity to the paragraph PLANTS and paragraph Shipment, and any unacceptable plant material shall be removed from the jobsite.

1.4.4 Storage

1.4.4.1 Plant Storage

Plants not installed on the day of arrival at the site shall be stored and protected in areas designated by the Contracting Officer. Plants shall be protected from exposure to wind and shall be shaded from the sun. Covering that will allow air to circulate and prevent internal heat from building up shall be provided. All plants shall be kept in a moist condition by watering with a fine mist spray until planted.

1.4.4.2 Storage of Other Materials

Soil amendments shall be stored in dry locations away from contaminants. Pesticide materials shall not be stored with other landscape materials. Storage of materials shall be in areas designated or as approved by the Contracting Officer.

1.4.5 Handling

Care shall be taken to avoid injury to plants. Materials shall not be dropped from vehicles. Balled and burlapped plants shall be handled carefully to avoid cracking or breaking the earth ball and container-grown plants shall be handled by the container. Plants shall not be handled by the trunk or stems.

1.4.5.1 Time Limitation

a. Mulch: Limitation of time between installing plant and placing mulch is 48 hours.

b. Omitted.

c. Transplanting Existing Plants: Limitation of time between digging and replanting existing plant material is one hour.

1.5 WARRANTY

Furnished plants shall be guaranteed to be in a vigorous growing condition for a period of 12 months regardless of the contract time period. A plant shall be replaced one time under this guarantee. Transplanted existing plants require no guarantee. A written calendar time period for the guarantee of plant growth shall be furnished to the Contracting Officer.

PART 2 PRODUCTS

2.1 PLANTS

2.1.1 Varieties

Plants shall be nursery grown or plantation grown stock conforming to AAN-01 and shall be of the varieties specified in the plant list bearing botanical names listed in one or more of the publications listed under "Nomenclature" in AAN-01.

2.1.2 Substitutions

Substitutions will not be permitted without written request from the Contractor for approval by the Contracting Officer.

2.1.3 Growing Conditions

Plants shall be grown under climatic conditions similar to those in the locality of the project.

2.1.4 Quality

Well shaped, well grown, vigorous, healthy plants having healthy and well branched root systems shall be provided. Plants shall be provided free from disease, harmful insects and insect eggs, sun-scald injury, disfigurement and abrasion. Plants shall be provided that are typical of the species or variety and conforming to standards as set forth in AAN-01 and as specified herein.

2.1.4.1 Shade and Flowering Trees

A height relationship to caliper shall be provided as recommended by AAN-01. Height of branching should bear a relationship to the size and variety of tree specified and with the crown in good balance with the trunk. Trees shall not be "poled" or the leader removed.

a. Single stem: Trunk shall be reasonably straight and symmetrical with crown and have a persistent main leader.

b. Multi-stem: All countable stems, in aggregate, shall average the size specified. To be considered a stem, there should be no division of the trunk which branches more than 150 mm from ground level.

c. Specimen: A plant shall be provided that is well branched and pruned naturally according to the species. The form of growth desired, which may not be in accordance with natural growth habit, shall be as indicated.

2.1.4.2 Deciduous Shrub

Plants shall be provided that have the height and number of primary stems as recommended by AAN-01. An acceptable plant shall be well shaped with sufficient well-spaced side branches recognized by the trade as typical for the variety grown in the region.

2.1.4.3 Coniferous Evergreen

Trees shall be provided that have the height-to-spread ratio as recommended by AAN-01. Trees shall not be "poled" or the leader removed. An acceptable plant shall be exceptionally heavy, well shaped and trimmed to form a symmetrical and tightly knit plant. The form of growth desired shall be as indicated.

2.1.4.4 Broadleaf Evergreen

Plants shall be provided that have ratio of height-to-spread as recommended by AAN-01. An acceptable plant shall be well shaped and recognized by the trade as typical for the variety grown in the region.

2.1.4.5 Groundcovers and Vines

Plants shall be provided with the minimum number of runners and length of runner as recommended by AAN-01. Plants shall be furnished that have heavy, well developed and balanced top with vigorous well developed root system and shall be furnished in containers.

2.1.5 Size

Plants shall be furnished in sizes indicated. Plants larger in size than specified may be provided at no additional cost to the Government.

2.1.6 Measurement

Plant measurements shall be in accordance with AAN-01.

2.2 TOPSOIL

Topsoil shall be the existing surface soil stripped to the depth indicated and stockpiled on the site in accordance with Section 02300 EARTHWORK.

Additional topsoil, if required, beyond that available from stripping operations, shall be delivered. Delivered topsoil shall conform to topsoil requirement specified in Section 02935 TURF and shall be amended as recommended by soil tests for the plants specified.

2.2.1 Soil Test

A soil test shall be performed for pH, particle size, chemical analysis and mechanical analysis to establish the quantities and type of soil amendments required to meet local growing conditions for the type and variety of plants specified.

2.3 SOIL AMENDMENTS

Soil amendments consist of lime, fertilizer, bonemeal, organic soil amendments and soil conditioner.

2.3.1 Lime

Lime shall be agricultural limestone and shall have a minimum calcium carbonate equivalent of 90 percent and shall be ground to such a fineness that at least 90 percent will pass a 10-mesh sieve and at least 50 percent will pass a 60-mesh sieve.

2.3.2 Fertilizer

Fertilizer shall be commercial grade, free flowing, uniform in composition and conforming to CID A-A-1909.

2.3.2.1 Dry Fertilizer

a. Granular fertilizer : Consists of nitrogen-phosphorous-potassium ratio: 10 percent nitrogen, 10 percent phosphorous, and 10 percent potassium.

b. Controlled-Release Fertilizer: Consists of nitrogen-phosphorous-potassium ratio: 10 percent nitrogen, 10 percent phosphorous, and 10 percent potassium. Controlled-release fertilizer may be in packet or tablet form.

2.3.2.2 Liquid Fertilizer

Commercially available liquid fertilizer shall consist of completely soluble plant foods suitable for application as foliage spray.

2.3.3 Bonemeal

Bonemeal shall be a finely ground, steamed bone product containing from 2 to 4 percent nitrogen and 16 to 40 percent phosphoric acid.

2.3.4 Organic Soil Amendments

2.3.4.1 Peat

Peat shall be a natural product of hypnum moss peat or peat humus derived from a bog, swampland or marsh and shall conform to ASTM D 2607.

2.3.4.2 Sand

Sand shall be clean and free of toxic materials and at least 95 percent by weight shall pass a 10-mesh sieve, and 10 percent by weight shall pass a 16-mesh sieve.

2.3.4.3 Rotted Manure

Rotted manure shall be unleached stable or cattle manure containing not more than 25 percent by volume of straw, sawdust, or other bedding materials and containing no chemicals or ingredients harmful to plants. The manure shall be heat treated to kill weed seeds and be free of stones, sticks, and soil.

2.3.4.4 Decomposed Wood Derivatives

Decomposed wood derivatives shall be ground bark, sawdust, or other wood waste material free of stones, sticks, and toxic substances harmful to plants and stabilized with nitrogen and having the following properties:

Particle size	Minimum percent by weight passing
No. 4 mesh screen	95
No. 8 mesh screen	80

Nitrogen Content	Minimum percent based on dry weight
Redwood Sawdust	0.5
Fir Sawdust	0.7
Fir or Pine Bark	1.0

2.3.5 Soil Conditioner

For single use or in combination to meet requirements for topsoil.

2.3.5.1 Gypsum

Gypsum shall be commercially packaged, free flowing, and a minimum of 95 percent calcium sulfate by volume.

2.3.5.2 Aluminum Sulfate

Aluminum sulfate shall be commercial grade.

2.4 MULCH

Mulch shall be free from weeds, mold and other deleterious materials.

2.4.1 Omitted

2.4.2 Organic Mulch Material

Organic mulch materials shall be fresh, clean, new pine needles free from sticks, pine cones or other material.

2.5 OMITTED
2.6 OMITTED
2.7 OMITTED

2.8 EDGING MATERIAL

2.8.1 Steel

Steel edging shall be galvanized with slots provided for stakes and shall be at least 3 mm thick and 100 mm wide, and supplied in at least 4800 mm lengths. It shall be painted black by the manufacturer.

2.8.2 Omitted
2.8.3 Omitted

2.8.4 Anchors

Edging material anchors shall be as recommended by the manufacturer.

2.9 WATER AND PORTABLE DRIP IRRIGATION

Water shall not contain elements toxic to plant life. Twelve ml woven polyethylene drip irrigation bags shall be designed to hold 75 L of water to be released over 10-16 hours, and 4-6 hours for the 15 cm all square bags. In areas which are irrigated with installed, working irrigation system, the drip irrigation bags will be removed in consultation with the Corps Landscape Architect.

2.10 ANTIDESICCANT

Antidesiccant shall be an emulsion that will provide a film over plant surfaces permeable enough to permit transpiration, and shall not damage the plant.

2.11 OMITTED
2.12 OMITTED

2.13 PESTICIDE

Pesticide shall be insecticide, herbicide, fungicide, nematocide, rodenticide, and miticide. Pesticide material shall be labeled for use and applied only as registered by EPA and approved herbicide or insecticide.

PART 3 EXECUTION

3.1 EXAMINATION

3.1.1 Verify Grades

The Contracting Officer shall verify the finished grades are as indicated on drawings, and the placing of topsoil and smooth grading has been completed in accordance with Section 02300 EARTHWORK.

3.1.2 Underground Obstructions to Planting

The location of underground utilities and facilities shall be verified. Damage to underground utilities and facilities shall be repaired at the Contractor's expense.

3.2 SITE PREPARATION

3.2.1 Layout

Plant material locations and bed outlines shall be staked on the project site before any excavation is made. Plant material locations may be adjusted by the Contracting Officer to meet field conditions.

3.2.2 Protection of Existing Vegetation

If lawns have been established prior to planting operations, the surrounding turf shall be covered before excavations are made in a manner that will protect turf areas. Existing trees, shrubbery, and beds that are to be preserved shall be barricaded in a manner that will effectively protect them during planting operations. Follow the tree protection detail provided on the landscape drawing.

3.2.2.1 Tree Barriers

Prior to the beginning of demolition, barriers are to be installed as shown on the demolition and layout plan. See the detail of the barrier on the Landscape Detail Sheet L-4 and tree protection plan notes. Tree barriers shall be left up until all the landscaping is finished.

3.2.2.2 Root Support Products for Existing Trees

Before construction begins (4 weeks) and for trees which have cuts or tunneling through their roots, right after that work, the following root product will be injected into their dripline root zone:

2 liters shall be injected in centers every 80 cm (2-1/2 feet) apart of the following mix:

375 liters of water, 112 grams of Mycor Tree Saver PT Injectable (a PT Ectomycorrhizal mature tree innoculant by Plant Health Care, Inc., or equal)

0.5 kilograms (1 pound) of PHC Bio Pak - Organic Bio Stimulant with growth promoting bacteria by Plant Health Care or equal

1.5 lbs of nitrogen fertilizer of a (28.8.8)

3.2.2.3 Root Protection

Do not allow cement or other wastes to be deposited under or drain to the trees. Do not allow the burning of wastes under trees. Do not drive or park vehicles near trees.

3.2.2.4 Trenching

All utilities shall be routed around the dripline or critical radius of the tree. When a utility line must pass inside the critical radius, it shall be bored under the roots at a minimum depth of 50 cm.

3.3 EXCAVATION

3.3.1 Obstructions Below Ground or Poor Drainage

When obstructions below ground or poor drainage affect the contract operation, proposed adjustments to plant location, type of plant and

planting method or drainage correction shall be submitted to and approved by the Contracting Officer.

3.3.2 Turf Removal

Where planting beds occur in existing turf areas, the turf shall be removed to a depth that will ensure the removal of the entire root system.

3.3.3 Plant Pits

Plant pits shall be dug to produce vertical sides and flat, uncompacted bottoms. When pits are dug with an auger and the sides of the pits become glazed, the glazed surface shall be scarified. The size of plant pits shall be as shown.

3.3.4 Subsoil Drainage for Plant Pits and Beds

Subsoil drainage shall be provided as indicated.

3.4 PERCOLATION TEST

Test for percolation shall be done to determine positive drainage of plant pits and beds. The Contracting Officer shall be notified in writing of all soil and drainage conditions detrimental to growth of plant material and shall submit proposal for correcting the condition.

3.5 PLANTING TIMES AND CONDITIONS

3.5.1 Deciduous Planting Time

Install deciduous plants from November 1 to March 1.

3.5.2 Evergreen Planting Time

Install evergreen plants from November 1 to March 1.

3.5.3 Existing Plant Transplanting Time

Existing plants shall be transplanted from October 1 to February 15.

3.5.4 Planting Conditions

Planting operations shall be performed only during periods when beneficial results can be obtained. When drought, excessive moisture or other unsatisfactory conditions prevail, the work shall be stopped when directed. When special conditions warrant a variance to the planting operations, proposed planting times shall be submitted to and approved by the Contracting Officer.

3.6 INSTALLATION

3.6.1 Erosion Control

Where erosion control material is indicated or required, material shall be installed in accordance with manufacturer's instructions. Placement of the erosion control material shall be accomplished without damage to installed material or without deviation to finished grade.

3.6.2 Backfill Soil Mixture

The backfill soil mixture shall be a proportioned mixture thoroughly mixed by volume of topsoil and selected soil amendments as follows:

Three parts topsoil to one part amendment.

3.6.3 Setting Plants

Plants shall be set plumb and held in position until sufficient soil has been firmly placed around roots or ball. Plants shall be set in relation to surrounding grade so that they are even with the depth at which they were grown in the nursery, or container.

3.6.4 Controlled-Release Fertilizer

Controlled-release fertilizer shall be placed in packet or tablet form in the plant pit in the immediate vicinity of the feeding roots in accordance with the manufacturer's recommendations.

3.6.5 Balled and Burlapped Plants

Materials shall be removed that are metal, plastic, nylon or treated burlap, prior to backfilling. Balled and burlapped stock shall be backfilled with topsoil to approximately half the depth of the ball and then tamped and watered. Biodegradable burlap and tying material shall be carefully opened and folded back. The backfill shall be completed, tamped and watered. A 100 mm high earth saucer shall be formed around individual plants.

3.6.6 Omitted
3.6.7 Omitted

3.6.8 Groundcover Bed

3.6.8.1 Plant Beds in Existing Soil

Bed shall be tilled to a minimum depth of 150 mm where existing soil is to be used in-place. Selected soil amendments shall be spread uniformly over the bed. Selected soil amendments shall be a proportioned mixture as follows:

Peat 1 part to 3 parts topsoil.

The mixture shall be thoroughly incorporated into the soil to a minimum depth of 150 mm using a roto-tiller or other method to obtain a uniform and well pulverized soil mix. All sticks, stones, roots and other objectionable materials shall be removed from the surface. The bed shall be brought to a smooth and even surface blending to existing areas.

3.6.8.2 Plant Beds in Replaced Soil

When soil replacement is required, the existing soil shall be excavated and removed to a minimum depth of 150 mm and topsoil shall be placed on previously scarified subsoil to a minimum depth of 150 mm. The bed shall be brought to a smooth and even surface blending to existing areas. Settlement shall be allowed for.

3.6.8.3 Groundcover

Groundcover may be planted after the mulch is in place. Contaminating the mulch with soil shall be avoided.

3.6.9 Transplanting Existing Plants

Existing plant material to be transplanted shall be tagged on the site and/or as indicated. Existing plants shall be removed from the ground by means of mechanical devices or other method with a ball attached, meeting the requirements of paragraph SHIPMENT. The three transplanted palms shall be planted according to the palm planting detail provided on the landscape plans.

3.6.10 Omitted
3.6.11 Omitted

3.6.12 Edging Material

Edging material shall be installed in accordance with the manufacturer's recommendations and/or as indicated.

3.7 FINISHING

3.7.1 Plant Beds

Planted areas shall be uniformly edged to provide a clear-cut division line between the planted area and the adjacent turf area and to provide a shape as indicated. The entire planted area shall be raked and smoothed while maintaining the earth saucers.

3.7.2 Omitted

3.7.3 Mulch

Mulch shall be spread to a uniform thickness of 100 mm within 48 hours after planting. Mulch shall be kept out of the crowns of shrubs and off buildings, sidewalks and other facilities. Eight cm of mulch will be added under trees to be saved and transplanted palms to cover their protected root zone.

3.7.4 Omitted
3.7.5 Omitted

3.7.6 Water

Existing trees and palms to be saved and new plants shall be watered as necessary to maintain an adequate supply of moisture within the root zone. Run-off, puddling and wilting shall be prevented. For trees follow the water guide for 3-1/2 months; then gradually taper off the number of waterings per week unless a period of 2 weeks without rain occurs. Then watering will resume. Portable drip irrigation bags shall be provided for all new trees and new large evergreen shrubs. Sabal Palmettos will be watered with individual temporary hoses slowly releasing water to the rootball over the first 3 months after planting. See detail on Sheet L-6.

DAILY TREE WATERING GUIDE FOR NEW AND EXISTING TREES TO BE SAVED
(For Sandy and Loam Soils)*

Tree Caliper	Water Amount

2.5 cm	19 L
5 cm	38 L
8 cm	57 L
10 cm	76 L
13 cm	114 L
30 cm	225 L
90 cm	684 L

3.8 MAINTENANCE DURING PLANTING OPERATION

Installed plants shall be maintained in a healthy growing condition. Maintenance operations shall begin immediately after each plant is installed and shall continue until the plant establishment period commences. The maintenance includes watering, pruning, wound dressing, straightening and other necessary operations. Plant beds and earth saucers shall be kept free of weeds, grass and other undesired vegetation. Plants shall be checked for settlement and shall be reset proper grade as necessary. Run-off, puddling and wilting shall be prevented.

3.9 CARE OF EXISTING PLANT MATERIAL

3.9.1 Identification

Existing plant material to be treated shall be tagged on the site and/or as indicated. See notes on L-4 on the tree protection plan.

3.9.2 Root Support Product

Mycorrhiza product for existing trees to be saved shall be applied as described in paragraph 3.2.2.2.

3.9.2.1 Omitted
3.9.2.2 Omitted

3.9.2.3 Backfill

Topsoil shall be used as backfill in the hole and shall be blended to the surrounding grade.

3.10 APPLICATION OF PESTICIDE MATERIAL

When pesticide becomes necessary to remove a disease or pest, a state-certified applicator shall apply required pesticide in accordance with State EPA label restrictions and recommendations. Hydraulic equipment shall be provided for the liquid application of pesticides with a leak-proof tank, positive agitation methods, controlled application pressure and metering gauges. A pesticide treatment plan shall be provided to the Contracting Officer as specified in paragraph SUBMITTALS.

3.11 RESTORATION AND CLEAN UP

3.11.1 Restoration

Turf areas, pavements and facilities that have been damaged from the planting operation shall be restored to original condition at the Contractor's expense.

3.11.2 Clean Up

Excess and waste material from the planting operation shall be removed and disposed of off the site. Adjacent paved areas shall be cleared.

3.12 PLANT ESTABLISHMENT PERIOD

3.12.1 Commencement

On completion of the last day of the planting operation, the plant establishment period for maintaining installed plants in a healthy growing condition shall commence and shall be in effect until October of the following year. When the planting operation extends over more than one season or there is a variance to the planting times, plant establishment periods shall be established for the work completed, as directed. Written calendar time period shall be furnished to the Contracting Officer for the beginning of the plant establishment period. When there is more than one plant establishment period, describe the boundaries of the planted area covered for each period.

3.12.2 Maintenance During Establishment Period

3.12.2.1 General

Maintenance of plants shall include straightening plants, protecting plant areas from erosion, supplementing mulch, removing dead or broken tip growth by pruning, maintaining edging of beds, and maintaining plant labels, watering, weeding, removing and replacing unhealthy plants.

3.12.2.2 Water

The plants shall be watered as necessary to maintain an adequate supply of moisture within the root zone. An adequate supply of moisture is estimated to be the equivalent of one inch of absorbed water per week delivered in the form of natural rain or augmented as required by periodic waterings. Run-off, puddling and wilting shall be prevented. Water drip bags for the trees will be filled as often as required by the soil and tree.

3.12.2.3 Weeding

Grass and weeds in earth saucers and plant beds shall not be allowed to reach a height of 80 mm before being completely removed, including the root growth.

3.12.2.4 Unhealthy Plants

A plant shall be considered unhealthy or dead when the main leader has died back, or 25 percent of the crown is dead. Determine the cause for an unhealthy plant. Unhealthy or dead plants shall be removed immediately and shall be replaced as soon as seasonal conditions permit.

3.12.2.5 Fertilizing

The plants shall be topdressed at least once during the period of establishment with dry fertilizer at the rate of 1 kilograms per square meter of plant pit or bed area or foliar feed plants with liquid fertilizer. Dry fertilizer adhering to plants shall be flushed off. The application shall be timed prior to the advent of winter dormancy.

3.12.2.6 Settlement

Topsoil shall be added to maintain grade and to maintain earth saucers. Serious settlement affecting the setting of the plant in relation to the depth at which it was grown requires replanting in accordance with paragraph INSTALLATION.

3.12.2.7 Pesticide Treatment

Treatment for diseases or pest shall be in accordance with paragraph APPLICATION OF PESTICIDE MATERIAL.

3.12.2.8 Maintenance Report

A written record shall be furnished to the Contracting Officer of the maintenance work performed, the quality of plant losses, cause for plant loss and replacements made on each site visit.

3.12.2.9 Maintenance Instructions

Written instructions shall be furnished to the Contracting Officer for year-round care of installed plants.

3.12.3 Replacement Plants

Plants shall be provided for replacement in accordance with paragraph PLANTS. Replacement plants shall be installed in accordance with paragraph INSTALLATION. No extended plant establishment period shall be required for replacement plants. A plant will be replaced in accordance with paragraph WARRANTY.

3.13 FINAL ACCEPTANCE

3.13.1 Preliminary Inspection

Prior to the completion of the contract, the plant establishment period or whichever occurs first a preliminary inspection shall be held by the Contracting Officer. Time for the inspection will be established in writing. The quantity and type of plants installed and the acceptability of the plants in accordance with the plant establishment period shall be determined.

3.13.2 Final Inspection

A final inspection shall be held by the Contracting Officer to determine that deficiencies noted in the preliminary inspection have been corrected. Time for the inspection shall be established in writing. Acceptance of the planting operation is subject to the guarantee of plant growth.

-- End of Section --