Attachment A

SPECIFICATIONS FOR

FY 09 REPAIR NATURAL GAS, GRC PHASE 5

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
GLENN RESEARCH CENTER
21000 BROOKPARK ROAD, CLEVELAND, OHIO 44135

11423 March 30, 2009

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SECTION 01 11 00.98

SUMMARY OF WORK

PART 1 GENERAL

1.1 SUMMARY

The work to be performed under this project consists of providing the labor, equipment, and materials necessary to modify and repair the natural gas distribution system located at the National Aeronautics and Space Administration, Glenn Research Center, 21000 Brookpark Road, Cleveland, Ohio 44135.

The repair of the Natural Gas system, Phase V project impacts several distinct areas of the Glenn Research Center. The primary focus for this project will be repairs and replacement of the main high pressure (50 psig) underground natural gas distribution network. Included in the scope of work for this project (Phase V) is the replacement and re-lining of underground steel piping with high-density polyethylene (HDPE) piping that runs along Taylor Road, between Building No. 14 and Building No. 105 and extending new piping to the Building No. 35 Complex. Also included in the project scope is the installation of natural gas meters and regulator stations.

The work shall consist of installing new High Density Polyethylene (HDPE) Natural Gas Distribution piping, inserting HDPE pipe into existing steel pipe; removal of sections of existing carbon steel piping, removal of steel valves and replacement with HDPE valves with gear operators. The excavation and restoration of roads, parking lots, sidewalks and grass areas, and cathodic protection on distribution piping is also included.

The work includes all construction necessary to complete this job in a satisfactory manner according to the drawings and these specifications. The work consists of the following items:

a. Civil
   - Demolition
   - Excavation / Backfill
   - Site Restoration

b. Mechanical
   - Demolition
   - Piping & Valves

c. Electrical
   - Cathodic Protection

d. Environmental
   - Contaminated Soil Abatement
   - Asbestos Abatement
   - Lead Paint Abatement

1.1.1 Base Bid - Taylor Road North

Replacement and Re-lining of underground steel piping with HDPE piping along Taylor Road beginning at STA 1+550 and continues to STA 2+059 as

shown on drawings and specifications.

Drawings: C-101
C-102
C-103

1.1.2 Option #1 - Building #35 Complex

Extend new Underground HDPE and repair existing above ground piping for gas service to Building 35 Complex as shown on drawings and specification. All excavated soil shall be handled per contract drawings. Unit prices for this option shall be provided per contract drawings.

Drawings: C-106

1.1.3 Option #2 - Taylor Road South

Replacement and Re-lining of underground steel piping with HDPE piping along Taylor Road beginning at STA 2+066 and continues to STA 2+250 as shown on drawings and specifications.

Drawings: C-103
C-104

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Upon receipt of Government Furnished Equipment, the Contractor shall submit records in accordance with the paragraph entitled, "Government Furnished Property," of this section.

Submit the following items to the Contracting Officer:

Site Specific Health and Safety Plan (HASP) G
Utility Outages G
Confined Space Permits G
Connection Requests G
Borrow Permits G
Excavation Permits G
Welding Permits G
Burning Permits G

1.3 CONTRACT DRAWINGS

The following drawings accompany this specification and are a part thereof.

Sheet No.	Drawing Title
G-001	Title Sheet
G-002	General Site Plan General Notes and Drawing Key Sheet
C-001	NASA Grid Coordinate System Horizontal and Vertical

	Control Schedule of Monuments and Bench Marks
C-101	Repair Plan and Profile Taylor Road STA 1+550 to 1+750
C-102	Repair Plan and Profile Taylor Road STA 1+750 to 1+950
C-103	Repair Plan and Profile Taylor Road STA 1+950 to 2+150
C-104	Repair Plan and Profile Taylor Road STA 2+150 to 2+315
C-105	Repair Plan and Profile Taylor Road Lateral Supply to Building #15 and Building #21
C-106	Replacement Plan - Building #35 Area and Building #94
C-107	Replacement Profiles - Building #35 Area and Building #94 Sheet 1
C-500	Standard Civil Details for Trenching and Repair and Replacement of Curbs, Walks and Pavement
C-501	Storm Water Pollution Prevention Control Plan and Details
C-600	Detour Plan Building #21 Loading Dock and North End Parking Area
M-500	Typical Mechanical Details and Valve and Handhold Schedule
M-501	Mechanical Details - Pit Removal and Piping and Valve Configuration
M-502	Mechanical Details - Pit Removal and Piping and Valve Configuration
E-500	Cathodic Protection Installation Details

Contractor shall immediately check furnished drawings and notify the Government of any discrepancies.

1.4 IMPLEMENTATION PLAN

For the Implementation plan refer to Attachment "A" entitled "Implementation Plan for FY 09 Repair of Natural Gas System, GRC, Phase 5"

1.5 WORK RESCHEDULING

Contractor shall allow for a maximum of 14 calendar days where construction activity is prohibitive. Government will provide 24 hour notification each time the restrictions are invoked.

Normal duty hours for work shall be from 6:00 a.m. to 6:30 p.m., Monday through Friday. Requests for additional work shall require written approval from the Contracting Officer 7 days in advance of the proposed work period. Special permission will be given in other circumstances on a case by case basis.

1.6 OCCUPANCY OF PREMISES

Building(s) will be occupied during performance of work under this Contract. Occupancy notifications will be posted in a prominent location in the work area.

Before work is started, the Contractor shall arrange with the Contracting Officer a sequence of procedure, means of access, space for storage of materials and equipment, and use of approaches, corridors, and stairways.

1.7 ON-SITE PERMITS

1.7.1 Utility Outages and Connection Requests

Work shall be scheduled to hold outages to a minimum.

Utility outages and connections required during the prosecution of work that affect existing systems shall be arranged for at the convenience of

the Government and shall be scheduled outside the regular working hours or on weekends.

Contractor shall not be entitled to additional payment for utility outages and connections required to be performed outside the regular work hours.

Requests for utility outages and connections shall be made in writing to the Contracting Officer at least 10 working days in advance of the time required. Each request shall state the system involved, area involved, approximate duration of outage, and the nature of work involved.

1.7.2 Hot Work, Excavation and Confined Space Permits

ACTIVITY	SUBMISSION DATE	SUBMISSION FORM
Hot Work Permits	7 days prior to work	NASA Form C-7A & NASA Form C-7B
Confined Space	7 days prior to work	NASA Form C-199
Excavation Permit	21 days prior to work	NASA Form C-927

Permits shall be posted at a conspicuous location in the construction area.

Burning of trash or rubbish is not permitted.

1.8 SALVAGE MATERIAL AND EQUIPMENT

Items of material designated by the Contracting Officer to be salvage shall remain the property of the Government.

Contractor shall maintain property control records for material or equipment designated as salvage. Contractor's system of property control may be used if approved by the Contracting Officer. Contractor shall be responsible for storage and protection of salvaged materials and equipment until disposition by the Contracting Officer.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

-- End of Section --

SECTION 01 31 19.98

PROJECT MEETINGS

PART 1 GENERAL

1.1 SUMMARY

The requirements of this Section apply to, and are a component part of, each section of the specifications.

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

A Project Submittal Schedule shall be submitted in accordance with paragraph entitled, "Project Meetings," of this section.

The Contractor shall submit a Monthly Progress Report at the first meeting of each month.

1.3 PRECONSTRUCTION CONFERENCE

The Contractor shall attend a preconstruction conference scheduled by the Contracting Officer. Work shall not commence prior to the conference. Subcontractor representatives shall attend.

Discussion shall address project orientation, personnel contact, safety issues, permits, deficiencies, and the location of the Contractor's office.

1.4 PROJECT MEETINGS

The Contractor shall attend weekly project meetings scheduled by the Government. Subcontractor representatives shall attend.

Prepare a Two-Week Planning Schedule for each weekly project meeting. highlighting utility outages, material deliveries, subcontractors onsite, equipment on site, coordination issues and updates to the master schedule described in Section 01 33 00, "Submittal Procedures".

Meeting Minutes shall be kept by the COTR and distributed after concurrence by the COTR.

A Monthly Progress Report shall be submitted which addresses the progress schedule, potential factors of delay, deficiencies, material delivery schedules, submittals, and safety issues.

A Project Submittal Schedule shall be submitted showing full coordination with the project schedule. All products and tests under each submittal number shall be prioritized and linked to the progress schedule.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

-- End of Section --

SECTION 01 33 00

SUBMITTAL PROCEDURES

PART 1 GENERAL

1.1 SUMMARY

Requirements of this Section apply to, and are a component part of, each section of the specifications.

1.2 SUBMITTALS

A standard transmittal form provided by the Government shall be used to transmit each submittal.

Submittal Description (SD): Drawings, diagrams, layouts, schematics, descriptive literature, illustrations, schedules, performance and test data, and similar materials to be furnished by the Contractor explaining in detail specific portions of the work required by the contract.

The following items, SD-01 through SD-11, are descriptions of data to be submitted for the project. The requirements to actually furnish the applicable items will be called out in each specification.

However, as a minimum, provide test reports, installation, operation and maintenance submittals and manuals as original data bound in three ring binders. Equipment actually installed will be clearly marked.

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Submittals which are required prior to a notice to proceed on a new contract. Submittals required prior to the start of the next major phase of the construction on a multi-phase contract. Schedules or tabular list of data or tabular list including location, features, or other pertinent information regarding products, materials, equipment, or components to be used in the work, submitted prior to contract notice to proceed or next major phase of construction.

SD-02 Shop Drawings

Submittals which graphically show relationship of various components of the work, schematic diagrams of systems, detail of fabrications, layout of particular elements, connections, and other relational aspects of the work. Upon approval by the Government, shop drawings shall be provided in an electronic pdf file format on compact disc(s).

SD-03 Product Data

Data composed of catalog cuts, brochures, circulars, specifications and product data, and printed information in sufficient detail and scope to verify compliance with requirements of the contract documents. Upon approval by the Government, this data shall be provided in an

electronic pdf file format on compact disc(s).

SD-04 Samples

Samples, including both fabricated and unfabricated physical examples of materials, products, and units of work as complete units or as portions of units of work.

SD-05 Design Data

Design calculations, mix design analyses, or other data, written in nature, and pertaining to a part of the work.

SD-06 Test Reports

Written reports of a manufacturer's findings of his product during field inspections, attesting that the products are installed in accordance with the manufacturer's installation instructions, shop drawings, or other manufacturer's requirements. Written reports by a general contractor or his subcontractors including daily logs reporting on the progress of daily activities or attesting that the work has been installed in accordance with the contract plans and specifications.

SD-07 Certificates

A document, required of the Contractor, or through the Contractor by way of a supplier, installer, manufacturer, or other Lower Tier Contractor, the purpose of which is to further the quality or orderly progression of a portion of the work by documenting procedures, acceptability of methods or personnel, qualifications, or other verification of quality.

Statements signed by responsible officials of a manufacturer of a product, system, or material attesting that the product, system or material meet specified requirements. Statements must be dated after the award of this contract, name the project, and list the specific requirements which it is intended to address.

SD-08 Manufacturer's Instructions

Preprinted material describing installation of a product, system, or material, including special notices and material safety data sheets, if any concerning impedances, hazards, and safety precautions. These materials shall be provided in an electronic pdf file format on compact disc(s).

SD-10 Operation and Maintenance Data

Data intended to be incorporated in an operations and maintenance manual. Operation and Maintenance Data shall be provided in an electronic pdf file format on compact disc(s).

For each new mechanical or electrical equipment provided, a completed NASA Form C-134 "CMMS Request for Modifications" shall be submitted.

SD-11 Closeout Submittals

Special requirements necessary to properly close out a construction contract. For example, as-built record drawings, manufacturer's help

and product lines necessary to maintain and install equipment. Also, submittal requirements necessary to properly close out a major phase of construction on a multi-phase contract.

1.3 PREPARATION

1.3.1 Marking

Prepare, review and stamp with Contractor's approval all specified submittals.

Permanently mark each submittal to identify it by contract number; NASA Project I.D. number; transmittal date; Contractor's, Subcontractor's, and supplier's name, address(es) and telephone number(s); submittal name; specification or drawing reference; and similar information to distinguish it from other submittals. Submittal identification shall include space to receive the review action by the Contracting Officer.

1.3.2 Drawing Format

Drawing submittals shall be prepared on translucent, reproducible sheets, not less than 210 by 279 millimeter nor larger than 841 by 1189 millimeter in size, except for full size patterns or templates. Drawings shall be prepared to accurate size, with scale indicated, unless other form is required. Drawing reproducibles shall be suitable for microfilming and reproduction on the Diazo or Ozalid machines and shall be of a quality to produce clear, distinct lines and letters. Drawings shall have dark lines on a white background.

Copies of each drawing shall have the following information clearly marked thereon:

a. Job name, which shall be the general title of the contract drawings.

b. Date of the drawings and revisions.

c. Name of Contractor.

d. Name of Subcontractor.

e. Name of the item, material, or equipment detailed thereon.

f. Submittal number (e.g., first submittal to last submittal) in a uniform location adjacent to the title block.

g. Specification section to which submittal applies.

h. Government contract number shall appear in the margin, immediately below the title block.

Drawings shall be numbered in logical sequence. Contractor may use his own number system. Each drawing shall bear the number of the submittal in a uniform location adjacent to the title block. Government contract number shall appear in the margin, immediately below the title block, for each drawing.

A blank space, no smaller than 50 millimeter shall be reserved on the right hand side of each sheet for the Government disposition stamp.

1.3.3 Data Format

Required data submittals for each specific material, product, unit of work, or system shall be collected into a single submittal and marked for choices, options, and portions applicable to the submittal. Marking of each copy of product data submitted shall be identical. Partial submittals will not be accepted for expedition of construction effort.

1.3.4 Samples

Samples shall be physically identical with the proposed material or product to be incorporated in the work, fully fabricated and finished in the specified manner, and full scale. Where variations in color, finish, pattern, or texture are inherent in the material or product represented by the sample, multiple units of the sample, showing the near-limits of the variations and the "average" of the whole range (not less than 3 units), shall be submitted. Each unit shall be marked to describe its relation to the range of the variation. Where samples are specified for selection of color, finish, pattern, or texture, the full set of available choices shall be submitted for the material or product specified. Sizes and quantities of samples shall represent their respective standard unit.

1.4 SUBMISSION REQUIREMENTS

1.4.1 Schedules

Within 15 calendar days of notice to proceed provide, for approval by the Contracting Officer, the following schedule of submittals:

a. A schedule of shop drawings and technical submittals required by the specifications and drawings. Indicate the specification or drawing reference requiring the submittal; the material, item, or process for which the submittal is required; the "SD" number and identifying title of the submittal; the Contractor's anticipated submission date and the approval need date.

b. A separate schedule of other submittals required under the contract but not listed in the specifications or drawings. Schedule will indicate the contract requirement reference; the type or title of the submittal; the Contractor's anticipated submission date and the approved need date (if approval is required).

c. Submittals called for by the contract documents will be listed on one of the above schedules. If a submittal is called for but does not pertain to the contract work, the Contractor shall include the submittal in the applicable schedule and annotate it "N/A" with a brief explanation. Approval of the schedules by the Contracting Officer does not relieve the Contractor of supplying submittals required by the contract documents but which have been omitted from the schedules or marked "N/A".

d. Re-submit copies of both schedules and annotate monthly by the Contractor with actual submission and approval dates. When all items on a schedule have been fully approved, no further re-submittal of the schedule is required.

1.4.2 Drawings Submittals

Submit 1 translucent reproducible copy(s) and 6 blackline or blueline opaque print(s) of each drawing. 3 prints, marked with review notations by the Contracting Officer, will be returned to the Contractor. All required installation, fabrication and connection drawings shall be submitted and approved prior to the start of work detailed on these drawings.

1.4.3 Data Submittals

Submit Five complete sets of indexed and bound product data. Three sets, marked with review notations by the Contracting Officer, will be returned to the Contractor.

At the completion of the project the Contractor shall submit 2 sets of bound data along with 2 CDs containing PDF files of all data submitted.

1.4.4 Samples

Submit one set of identified samples. A copy of the transmittal form, marked with review notations including selections by the Contracting Officer, will be returned to the Contractor.

Samples that are intended or permitted to be returned and actually incorporated in the work are so indicated in the individual technical sections. These samples will be returned to the Contractor, at his expense, to be clearly labeled, with installation location recorded. Samples shall be in undamaged condition at the time of installation.

Where mockups and similar large samples are required by individual technical sections, it is recognized that these are a special type of sample which cannot be readily "transmitted" as specified for submittal of samples. Otherwise, and except as indicated in the individual technical sections, the requirements for samples shall be complied with and a transmittal form shall be processed for each mockup, to provide a record of the activity.

1.5 GOVERNMENT'S REVIEW

1.5.1 Review Notations

Contracting Officer will review submittals and provide pertinent notation within 14 calendar days after date of submission. Submittals will be returned to the Contractor with the following notations:

a. Submittals marked "approved" authorize the Contractor to proceed with the work covered.

b. Submittals marked "approved as noted" authorize the Contractor to proceed with the work covered provided he takes no exception to the corrections. Notes shall be incorporated prior to submission of the final submittal.

c. Submittals marked "return for correction" require the Contractor to make the necessary corrections and revisions and to re-submit them for approval in the same routine as before, prior to proceeding with any of the work depicted by the submittal.

d. Submittals marked "not approved" or "disapproved" indicate

noncompliance with the contract requirements and shall be re-submitted with appropriate changes. No item of work requiring a submittal shall be accomplished until the submittals are approved or approved as noted.

e. Contractor shall make corrections required by the Contracting Officer. If the Contractor considers any correction or notation on the returned submittals to constitute a change to the contract drawings or specifications; notice as required under the clause entitled, "Changes" shall be given to the Contracting Officer. Approval of the submittals by the Contracting Officer shall not be construed as a complete check, but will indicate only that the general method of construction and detailing is satisfactory. Contractor shall be responsible for the dimensions and design of connection details and construction of work. Failure to point out deviations may result in the Government requiring rejection and removal of such work at the Contractor's expense.

f. If changes are necessary to approved submittals, the Contractor shall make such revisions and submission of the submittals in accordance with the procedures above. No item of work requiring a submittal change shall be accomplished until the changed submittals are approved.

1.5.2 Sample Approval

Furnish, for the approval of the Contracting Officer, samples required by the specifications or by the Contracting Officer. Shipping charges shall be paid by the Contractor. Materials or equipment requiring sample approval shall not be delivered to the site or used in the work until approved in writing by the Contracting Officer.

Each sample shall have a label indicating:

a. Name of project

b. Name of Contractor

c. Material or equipment

d. Place of origin

e. Name of producer and brand

f. Specification section to which samples applies

g. Samples of furnished material shall have additional markings that will identify them under the finished schedules.

Contractor shall submit to the Contracting Officer two samples of materials where samples are requested. Transmit to the Contracting Officer with each sample a letter, original and two copies, containing the above information.

Approval of a sample shall be only for the characteristics or use named in such approval and shall not be construed to change or modify any contract requirements. Before submitting samples, the Contractor shall assure that the materials or equipment will be available in quantities required in the project. No change or substitution will be permitted after a sample has been approved.

Materials and equipment incorporated in the work shall match the approved samples. If requested, approved samples, including those which may be damaged in testing, will be returned to the Contractor, at his expense, upon completion of the contract. Samples not approved will also be returned to the Contractor at its expense, if so requested.

Failure of any materials to pass the specified tests will be sufficient cause for refusal to consider, under this contract, any further samples of the same brand or make of that material. Government reserves the right to disapproved any material or equipment which previously has proved unsatisfactory in service.

Variations from contract requirements shall be specifically pointed out in transmittal letters. Failure to point out deviations may result in the Government requiring rejection and removal of such work at no additional cost to the Government.

Samples of various materials or equipment delivered on the site or in place may be taken by the Contracting Officer for testing. Samples failing to meet contract requirements will automatically void previous approvals. Contractor shall replace such materials or equipment to meet contract requirements.

Approval of the Contractor's samples by the Contracting Officer shall not relieve the Contractor of his responsibilities under the contract.

1.6 PROGRESS SCHEDULE

1.6.1 Bar Chart

a. Submit the progress chart, for approval by the Contracting Officer, at the Preconstruction Conference in one reproducible and 4 copies.

b. Prepare the progress chart in the form of a bar chart utilizing form "Construction Progress Chart" or comparable format acceptable to the Contracting Officer.

c. Include no less than the following information on the progress chart:

(1) Break out by major headings for primary work activity.

(2) A line item break out under each major heading sufficient to track the progress of the work.

(3) A line item showing contract finalization task which includes punch list, clean-up and demolition, and final construction drawings.

(4) A materials bar and a separate labor bar for each line item. Both bars will show the scheduled percentage complete for any given date within the contract performance period. Labor bar will also show the number of men (man-load) expected to be working on any given date within the contract performance period.

(5) The estimated cost and percentage weight of total contract cost for each materials and labor bar on the chart.

(6) Separate line items for mobilization and drawing submittal and approval. (These items are to show no associated costs.)

d. Update the progress schedule in one reproduction and 4 copies every 30 calendar days throughout the contract performance period.

1.6.2 Project Network Analysis

Submit the initial progress schedule within 21 calendar days of notice to proceed. Schedule shall be updated and resubmitted monthly beginning 7 calendar days after return of the approved initial schedule. Updating shall entail complete revision of the graphic and data displays incorporating changes in scheduled dates and performance periods. Redlined updates will only be acceptable for use as weekly status reviews.

Contractor shall provide a single point contact from his on-site organization as his Schedule Specialist. Schedule Specialist shall have the responsibility of updating and coordinating the schedule with actual job conditions. Schedule Specialist shall participate in weekly status meetings and present current information on the status of purchase orders, shop drawings, off-site fabrication, materials deliveries, Subcontractor activities, anticipated needs for Government furnished equipment, and any problem which may impact the contract performance period.

Include the following in the project network analysis:

a. Graphic display shall be a standard network or arrow diagram capable of illustrating the required data. Drafting shall be computer generated on standard 609 by 914 millimeter drafting sheets or on small (279 by 432 millimeter minimum) sheets with separate overview and detail breakouts. Provide a project network analysis that is legible with a clear, consistent method for continuations and detail referencing. Clearly delineate the critical path on the display. Clearly indicate the contract milestone date on the project network analysis graphic display.

b. Data shall be presented as a separate printout on paper or, where feasible, may be printed on the same sheet as the graphic display. Data shall be organized in a logical coherent display capable of periodic updating.

c. Data shall include verbal activity descriptions with a numerical ordering system cross referenced to the graphic display. Additionally, costs (broken down into separate materials and labor costs), duration, early start date, early finish date, late start date, late finish date, and float shall be detailed for each activity. A running total of the percent completion based on completed activity costs versus total contract cost shall be indicated. A system for indicating scheduled versus actual activity dates and durations shall be provided.

d. Schedule shall be of sufficient detail to facilitate the Contractor's control of the job and to allow the Contracting Officer to readily follow progress for portions of the work.

1.7 STATUS REPORT ON MATERIALS ORDERS

Within 30 calendar days after notice to proceed, submit, for approval by

the Contracting Officer, an initial material status report on all materials orders. This report will be updated and re-submitted every 30 calendar days as the status on material orders changes.

Report shall list, in chronological order by need date, materials orders necessary for completion of the contract. The following information will be required for each material order listed:

a. Material name, supplier, and invoice number.

b. Bar chart line item or CPM activity number affected by the order.

c. Delivery date needed to allow directly and indirectly related work to be completed within the contract performance period.

d. Current delivery date agreed on by supplier.

e. When item d exceeds item c, the effect that delayed delivery date will have on contract completion date.

f. When item d exceeds item c, a summary of efforts made by the Contractor to expedite the delayed delivery date to bring it in line with the needed delivery date, including efforts made to place the order (or subcontract) with other suppliers.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

-- End of Section --

SECTION 01 35 26.98

GENERAL SAFETY REQUIREMENTS

PART 1 GENERAL

1.1 SUMMARY

The requirements of this Section apply to, and are a component part of, each section of the specifications.

1.2 REFERENCES

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

CODE OF FEDERAL REGULATIONS (CFR)

10 CFR 20	(1991) Standards for Protection Against Radiation
29 CFR 1910	(1996) Occupational Safety and Health Standards
29 CFR 1926	(1996) Safety and Health Regulations for Construction

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION (NASA)

NASA NHB 1700.1	(1993) (V1-B) NASA Safety Policy and Requirements Documents
GRC-MQSA.001	Glenn Safety Manual

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-06 Test Reports

Records shall be submitted in accordance with paragraph entitled, " Gas Protection," of this section.

SD-07 Certificates

Statements shall be submitted for the following items in accordance with paragraphs entitled, "Safety Plan" and "Protection Plan," of this section.

Site Specific Health and Safety Plan G
Protection Plan G

License Certificates for radiation materials and equipment shall be submitted by the Contracting Officer prior to the start of work.

1.3.1 Site Specific Health and Safety Plan

Contractor shall submit a site specific safety plan to the Contracting Officer for approval within 10 working days after award of contract and it must be approved prior to notice to proceed. Compliance to the safety plan is mandatory. A copy of this approved plan shall be maintained in the Contractor's field office. This document will be made available upon request from the Contracting Officer's Technical Representative and the Safety Assurance Office.

The Site Specific Health and Safety plan shall include, as a minimum, the following:

a. Safety program objectives.

b. Methods to attain safety objectives.

c. Responsibility of key personnel for the Contractor.

d. Safety meetings, surveys, inspections, and reports.

e. Identification of unusual safety hazards and mitigation plan to allow for safe conduct of work.

f. Disaster and emergency programs.

g. Lists of key personnel to be contacted in times of emergency.

h. Program to show compliance with Federal OSHA Safety and Health Standards 29 CFR 1910 and 29 CFR 1926 and various safety requirements of NASA NHB 1700.1.

i. Methods to comply with the requirement for immediate reporting of mishaps to the Contracting Officer in accordance with NPD 8621.1G.

j. Statement that the Contractor will not invalidate the integrity of safety systems without proper authorization.

j. Procedures for emergency actions to be taken to secure dangerous conditions, to protect personnel, and secure work areas in the event of accident or an act of nature.

l. Procedures for securing the mishap site so that the area remains secure until arrival of a safety investigator. Mishap site will remain secured until released by the Contracting Officer.

l. Provide MSDS sheets for all hazardous materials which will be used. Methods for handling and storage shall be identified.

1.3.2 Protection Plan

Structures, utilities, sidewalks, pavements, and other facilities immediately adjacent to excavations shall be protected against damage.

1.4 GENERAL SAFETY PROVISIONS

The GRC Safety Manual, GRC-MQSA.001, is available online at http://smad-ext.grc.nasa.gov/gso/manual/chapter_index.shtml

Contractor shall take safety and health measures in performing work under this Contract. Contractor shall meet with the Contracting Officer to develop a mutual understanding relative to administration of the safety plan. Contractor is subject to applicable federal, state, and local laws, regulations, ordinances, codes, and orders relating to safety and health in effect on the date of this Contract.

During the performance of work under this Contract, the Contractor shall comply with procedures prescribed for control and safety of persons visiting the project site. Contractor is responsible for his personnel and for familiarizing each of his subcontractors with safety requirements. Contractor shall advise the Contracting Officer of any special safety restriction he has established so that Government personnel can be notified of these restrictions.

1.5 SAFETY LOCKOUT/TAGOUT PROCEDURES

Contractor shall ensure that each employee is familiar with and complies with these procedures and 29 CFR 1910.147.

Contracting Officer will, at the Contractor's request, apply lockout/tagout tags and take other actions that, because of experience and knowledge, are known to be necessary to make the particular equipment safe to work on.

No person, regardless of position or authority, shall operate any switch, valve, or equipment that has an official lockout/tagout tag attached to it, nor shall such tag be removed except as provided in this section.

No person shall work on any equipment that requires a lockout/tagout tag unless he, his immediate supervisor, project leader, or a subordinate has in his possession the stubs of the required lockout/tagout tags.

When work is to be performed on electrical circuits, the work shall be performed only by personnel qualified observing the required safety clearance.

A supervisor who is required to enter an area protected by a lockout/tagout tag will be considered a member of the protected group provided he notifies the holder of the tag stub each time he enters and departs from the protected area.

Identification markings on building light and power distribution circuits shall not be relied on for established safe work conditions.

Before clearance will be given on any equipment other than electrical (generally referred to as mechanical apparatus), the apparatus, valves, or systems shall be secured in a passive condition with the appropriate vents, pins, and locks.

Pressurized or vacuum systems shall be vented to relieve differential pressure completely.

Vent valves shall be tagged open during the course of the work.

Where dangerous gas or fluid systems are involved, or in areas where the environment may be oxygen deficient, system or areas shall be purged, ventilated, or otherwise made safe prior to entry.

1.5.1 Tag Placement and Removal

Lockout/tagout tags shall be completed in accordance with the regulations in Chapter 9 of the GRC Safety Manual, GRC-MQSA.001 and attached to any device which, if operated, could cause an unsafe condition to exist.

1.6 ACCIDENT TREATMENT AND RECORDS

Contractor shall post emergency first aid and ambulance information at project site.

Emergency response shall require the Contractor to call 911 on a NASA phone or 216 433-2088 on an outside line.

1.7 FIRE PREVENTION AND PROTECTION

Open-flame heating devices will not be permitted except by approval in writing from the Contracting Officer. Approval for the use of open fires and open-flame heating devices will not relieve the Contractor from the responsibility for any damage incurred because of fires.

Burning trash, brush, or wood on the project site shall not be permitted.

1.8 ELECTRICAL

Contractor shall appoint an individual responsible for the electrical safety of each work team to restrict entry to dangerous locations to those authorized by him jointly with the Government.

1.9 UNDERGROUND UTILITIES

Safety clearance from the Contracting Officer is required before any Contractor personnel enters a manhole. Contractor shall contact the Contracting Officer for support services by calling (216) 433-2088 at least 24 hours in advance.

Contractor shall be responsible for removing water and debris before commencement and during execution of work in manholes.

1.10 RADIATION SAFETY REQUIREMENTS

License Certificates for radiation materials and equipment shall be submitted by the Contracting Officer for all specialized material and equipment that could cause fatal harm to construction personnel or to the construction project.

Workers shall be protected from radiation exposure in accordance with 10 CFR 20. Standards for Protection Against Radiation

Loss of radioactive material shall be reported immediately to the Contracting Officer.

Actual exposure of the radiographic film or unshielding the source shall not be initiated until after 5 p.m. on weekdays.

In instances where radiography is scheduled near or adjacent to buildings or areas having limited access or one-way doors, no assumptions shall be made as to building occupancy. Where necessary, the Contracting Officer

will direct the Contractor to conduct an actual building entry, search, and alert. Where removal of personnel from such a building cannot be accomplished and it is otherwise safe to proceed with the radiography, a fully instructed employee shall be positioned inside such building or area to prevent exiting while external radiographic operations are in process.

1.11 FACILITY OCCUPANCY CLOSURE

Streets, walks, and other facilities occupied and used by the Government shall not be closed or obstructed without written permission from the Contracting Officer.

1.12 PROTECTION OF WORK

Prior to performing any excavation work or any surface penetrations 150 millimeter or deeper (such as driving stakes more than 150 millimeter in the ground) on any ground surface, the Contractor shall obtain from the inspection office the current subsurface utility drawing of the particular area to be worked on. Contractor shall stake out subsurface high voltage cables, communication cables, and pipe lines indicated within the scope of the work contemplated. After exposure, the Contractor shall obtain agreement from the Contracting Officer on how much closer to cable or pipe the excavations can be permitted.

Contractor shall notify the Contracting Officer, 48 hours prior to the start of excavation work or surface penetration, to enable the Contracting Officer to review measures being taken to prevent hazard to employees and possible damage to subsurface utilities. Where emergency conditions preclude the 48 hours advance notification, the Contractor shall immediately inform the Contracting Officer of his intention to initiate work prior to actual start of activity.

After obtaining clearance from the Contracting Officer, the Contractor shall proceed with excavating work, or other surface penetration work. Contractor, however, shall temporarily halt any machine excavation work or other surface penetration when approaching within 3 meter of the staked-out cable or pipe line until the Contractor has exposed the cable or pipe by hand excavation to fix its location.

1.13 GAS PROTECTION

Contractor shall have one or more employees properly trained in operation of gas testing equipment and formally qualified as gas inspectors who shall be on duty during times workmen are in confined spaces. Their primary functions shall be to test for gas and operate testing equipment. Unless equipment of constant supervisory type with automatic alarm is employed, gas tests shall be made at least every 2 hours or more often when character of ground or experience indicates gas may be encountered. A gas test shall be made before workmen are permitted to enter the excavation after an idle period exceeding one-half hour.

Readings shall be permanently recorded daily, indicating the concentration of gas, number and location of drilled piers, point of test, date, and time of test.

Special requirements, coordination, and precautions will apply to areas that contain a hazardous atmosphere or, by virtue of their use or physical character, may be oxygen deficient. A check by Government is required prior to entering confined space. Surveillance and monitoring shall be

required in these types of work spaces by both Contractor and Government personnel.

1.14 ROOFING AND COATING

At the beginning of each work day the Contractor shall check with the Contracting Officer before proceeding to work on the roof to ensure safe work conditions.

1.15 WELDING, FLAME CUTTING, AND MELTING

Contractor shall clear welding and cutting operations with the Contracting Officer before operations begin.

Contractor shall discontinue burning, welding, or cutting operations 1 hour prior to the end of the normal work day. A workman shall remain at the site for 1 hour after discontinuing these operations to make thorough inspection of the area for possible sources of latent combustion. He shall be equipped with two full 6.8 kilogram carbon dioxide fire extinguishers. Any unsafe conditions shall be reported to the Safety Branch. (Telephone: (216) 433-2088)

During operations involving possible fire hazard, the Contractor shall notify the Contracting Officer and not proceed until clearance is obtained in writing. Contracting Officer may request a standby from the Safety Branch. This requirement does not relieve the Contractor of his responsibility for welding and cutting safety.

1.16 HIGH NOISE LEVEL PROTECTION

Operations performed by the Contractor that involve the use of equipment with output of high noise levels (jackhammers, air compressors, and explosive device activated tools) shall be approved in writing by the Contracting Officer prior to commencement of work.

1.17 SEVERE STORM PLAN

In the event of a severe storm warning, the Contractor shall:

a. Secure outside equipment and materials and place materials possible to damage in protected locations.

b. Check surrounding area, including roof, for loose material, equipment, debris, and other objects that could be blown away or against existing facilities.

c. Ensure that temporary erosion controls are adequate.

1.18 CONFINED SPACE

Comply with the requirements in Chapter 16 of the GRC Safety Manual, 29 CFR 1910.146 and NHS/IHS 1845.2. Any potential for a hazard in the confined space requires a permit system to be used. NHS/IHS 1845.2 is available on the internet at

a. Entry Procedures. Prohibit entry into a confined space by personnel for any purpose, including hot work, until the qualified person has conducted appropriate tests to ensure the confined or enclosed space is safe for the work intended and that all

potential hazards are controlled or eliminated and documented. All hazards pertaining to the space shall be reviewed with each employee during review of the AHA.

b. Forced air ventilation is required for all confined space entry operations and the minimum air exchange requirements must be maintained.

c. Ensure the use of rescue and retrieval devices in confined spaces greater than 1500 mm in depth.

d. Manholes and excavations require continuous atmosphere monitoring with audible alarm for toxic gas detection and low oxygen levels.

e. Include training information for employees who will be involved as entrant attendants for the work.

f. Entry Permit. Use C-199 , completed by the qualified person. Post the permit in a conspicuous place close to the confined space entrance.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

-- End of Section --

SECTION 01 35 43.98

ENVIRONMENTAL PROTECTION PROCEDURES

PART 1 GENERAL

1.1 SUMMARY

The pollution prevention, environmental compliance, and sustainability provisions described in this section apply to all work under this contract.

1.2 REFERENCES

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

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

29 CFR 1910.120	(2002) Hazardous Waste Operations and Emergency Response
29 CFR 1910.1200	(1996) Hazard Communication
29 CFR 1910	(2001) Occupational Safety and Health Standards
40 CFR 82	(2003) Protection of Stratospheric Ozone
40 CFR 112	(2005) Subpart B Requirements for Petroleum Oils and Non-Petroleum Oils
40 CFR 261	(2005) Identification and Lists of Hazardous Wastes
40 CFR 265.16	(2003) Personnel Training
40 CFR 273.2	(2003) Batteries
40 CFR 273.3	(2003) Pesticides
40 CFR 273.4	(2003) Mercury Thermometers
40 CFR 273.5	(2003) Lamps
40 CFR 173	(2005) Shippers -- general requirements for shipments and packagings
40 CFR 177	(2005) Carriage by public highway
40 CFR 178	(2005) Specifications for packagings
40 CFR 761	(2005) Polychlorinated biphenyls (PCBs) manufacturing, processing, distribution in commerce, and use prohibitions

49 CFR 100-185	(2002) Transportation
50 CFR 17	(2002) Endangered and Threatened Wildlife and Plants

1.3 SUBMITTALS

The following shall be submitted in accordance with Section 01 33 00, "SUBMITTAL PROCEDURES," in sufficient detail to show full compliance with the specification:

SD-01 Preconstruction Submittals

Environmental protection plan; G

Dirt and dust control plan; G

Request for Wastewater Discharge Form, at least 7 days before commencement of discharge. The request shall include the estimated discharge volume, discharge rate, source of the wastewater and the duration of discharge. Analysis of the wastewater might be needed to obtain the discharge approval.

Hazardous Materials Inventories Statement (HMIS) and Material Safety Data Sheets (MSDS), at project commencement and as necessary to reflect changes in materials stored.

A copy of the Hazard Communication Written Program per 29 CFR 1910.1200(e).

MSDSs of all products before bringing these materials on-site.

List of Solid Waste, Hazardous Waste, Construction Debris (CD) and Commercial/Industrial Fill (CIF) Subcontractors four weeks prior to removal from site.

Storm Water Pollution Prevention Plan. See section 01 57 23.98.

Treatment, Storage and Disposal Facility List: The Contractor shall submit a list of storage and disposal facilities (TSDF) that perform treatment, storage, or disposal services under this contract. Each facility shall have, as a minimum, EPA RCRA interim status or state approval as a treatment of disposal facility and be in good standing with regulatory community. Recycling facilities shall meet all federal, state and local regulations. The Contractor shall not use a facility other than those initially approved for use under this contract without first obtaining the written approval of the COTR.

SD-06 Test Reports

Site Inspection Checklists, every week for projects handling hazardous materials.

RCRA 90-Day Waste Accumulation Site Inspection Checklists, weekly for all hazardous waste storage areas for the duration of the on-site project work.

Hazardous Waste Profiles, and supporting analytical data three weeks prior to disposal for NASA GRC Waste Management Team (WMT)

to review prior to Environmental Management Branch (EMB) signature.

Laboratory analysis

Disposal Requirements

SD-07 Certificates

TSDF Letter of Acceptance and Hazardous Waste Manifests one week prior to shipment and for review by WMT and signature by NASA GRC Environmental Management Branch immediately prior to shipment.

Final, signed hazardous waste manifests completed by the contractor and disposal facility in accordance with 40 CFR 261. The NASA Waste Management Team shall receive the final signed manifest directly from the disposal facility. In the event the contractor receives the final signed manifest, it shall be immediately forwarded to the NASA Waste Management Team. For Solid Waste/CD/CIF all documents shall be forwarded to the Contracting Officer by the Contractor.

SD-11 Closeout Submittals

Some of the records listed below are also required as part of other submittals. For the "Records" submittal, maintain on-site a separate three-ring Environmental Records binder and submit at the completion of the project. Make separate parts to the binder corresponding to each of the applicable sub items listed below.

Preconstruction survey

Waste determination documentation

Disposal documentation for solid, hazardous, and regulated waste

Contractor employee training records in compliance with 40 CFR 265.16, 29 CFR 1910.120, 29 CFR 1910.1200 and 40 CFR 82.

Regulatory notification

Erosion and sediment control inspection reports

Solid waste disposal report

Contractor Hazardous Material Inventory Log; G

Hazardous Waste/Debris Management

Reclamation of Equipment Containing Hazardous Waste Residues: The Contractor shall submit to the COTR the facility to which equipment containing hazardous material residues are shipped for reclamation, such as electrical wrapped with asbestos and electrical panels containing asbestos. The disclosure shall be documented on the Bill of Lading or by other written means. This process shall be managed by the WMT.

Disposal of Non-Hazardous Waste Containing Hazardous Material Residue: The Contractor shall submit to the COTR the facility to which equipment containing hazardous material residues are shipped

for disposal, such as steel coated with lead paint. The disclosure shall be documented on the Bill of Lading or by other written means. Supporting analytical data shall be included to document the equipment is not hazardous waste.

1.4 GENERAL RESPONSIBILITIES

Conduct project activities in a manner that protects surface/ground water and air quality, conserves resources, and minimizes the use of toxic chemicals and hazardous materials.

Minimize environmental pollution and damage that may occur as the result of construction and demolition operations. The environmental resources within the project boundaries and those affected outside the limits of permanent work shall be protected during the entire duration of this contract.

The Contracting Officer will notify the Contractor in writing of any observed noncompliance with Federal, State, or local environmental laws or regulations, permits, GRC Environmental Policy, and Federal Executive Orders. The Contractor shall, after receipt of such notice, inform the Contracting Officer of the proposed corrective action and take such action when approved by the Contracting Officer in consultation with the Environmental Management Branch. The Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No time extension shall be granted or equitable adjustments allowed to the Contractor for any such suspensions. This is in addition to any other actions the Contracting Officer may take under the contract, or in accordance with the Federal Acquisition Regulation of Federal Law.

The Contractor shall be responsible for payment of all fines/fees for violation or non-compliance with Federal, State, Regional and local environmental laws and regulations.

1.5 CONSTRUCTION AND DEMOLITION DEBRIS (C&DD) MANAGEMENT

Any removed or demolished item that meets the definition of C&DD shall be evaluated for reuse and/or recycling. The Contractor shall reuse or recycle any item that can be segregated from the waste stream and reused or recycled in a cost effective manner. The WMT manages the Construction Waste Management Program. All reuse, recycling and disposal activities shall be coordinated with the WMT. The Contractor shall submit a manifest for any C&DD materials that will be reused off site, recycled or disposed of to the COTR, which will then be reviewed and approved by the WMT for transportation off-site. Materials that will be reused or recycled shall be segregated and manifested individually. NASA has specifically targeted the following materials for reuse or recycling: Asphalt, Concrete, Gravel/Stone, Commercial/Industrial Fill Soil, Topsoil, Trees/Bushes, Ferrous and Non-Ferrous Metals, Concrete Block, Bricks, Carpeting, and Ceramic Tiles.

1.6 DEFINITIONS

Construction and Demolition Debris - Those materials resulting from the alteration, construction, destruction, rehabilitation, or repair of any manmade physical structure, including, without limitation, houses, buildings, industrial or commercial facilities, or roadways. "Construction and demolition debris" does not include materials identified or listed as solid wastes, infectious wastes, or hazardous wastes pursuant to Chapter

3734 of the Revised Code and rules adopted under it; or materials from mining operations, nontoxic fly ash, spent nontoxic foundry sand, and slag; or reinforced or non-reinforced concrete, asphalt, building or paving brick, or building or paving stone that is stored for a period of less than two years for recycling into a usable construction material. For the purpose of this definition, "materials resulting from the alteration, construction, destruction, rehabilitation, or repair of any manmade physical structure," are those structural and functional materials comprising the structure and surrounding site improvements, such as brick, concrete and other masonry materials, stone, glass, wall coverings, plaster, drywall, framing and finishing lumber, roofing materials, plumbing fixtures, heating equipment, electrical wiring and components containing no hazardous fluids or refrigerants, insulation, affixed carpeting, asphalt substances, metals incidental to any of the above, and weathered railroad ties and utility poles. "Materials resulting from the alteration, construction, destruction, rehabilitation, or repair" do not include materials whose removal has been required prior to demolition, and materials which are otherwise contained within or exist outside the structure such as solid wastes, yard wastes, furniture, and appliances. Also excluded in all cases are liquids including containerized or bulk liquids, fuel tanks, drums and other closed or filled containers, tires, and batteries.

"Clean hard fill" - C&DD which consists only of reinforced or non-reinforced concrete, asphalt concrete, brick, block, tile, and/or stone which can be reutilized as construction material. Brick in clean hard fill includes but is not limited to refractory brick and mortar. Clean hard fill does not include materials contaminated with solid wastes, hazardous wastes, or infectious wastes.

Hazardous Material - Any material that poses a significant present or potential hazard to human health and safety or to the environment if released into the workplace or the environment. Common examples are oil, fuel, caustic and acid cleaners, mineral spirits, petroleum distillate based solvents, oil based paints, aerosol spray paints, coolants and antifreeze, and solvents/cleaners containing chlorinated compounds.

Hazardous Waste - As defined in 40 CFR 261.3.

Non-Hazardous Solid Waste - Includes rubbish, debris, garbage, and other discarded solid materials resulting from industrial, commercial, construction, and agricultural operations, and from community activities. Also includes soil with contaminant levels above Voluntary Action Program (VAP) commercial/industrial fill standards.

Non-Sewerable - Wastewater that contains at least one contaminant above the allowable discharge limit set by the Publicly Owned Treatment Works (POTWs) for discharge to the sanitary sewer.

Reclamation - A process to recover or regenerate a usable product. Examples are recovery of lead from spent batteries and regeneration of spent solvents.

Recycling - In general, the use of discarded materials and objects in original or changed form rather than disposing of them. Examples include paper, cardboard boxes, empty containers and certain elements of Construction and Demolition Debris, including but not limited to metal building materials, piping, electrical, wiring, concrete, and masonry building materials, gypsum products and various floor coverings.

Solid Waste - As defined in 40 CFR 261.2.

Surface Discharge - implies that the water is discharged with possible sheeting action and subsequent soil erosion may occur. Waters that are surface discharged may terminate in drainage ditches, storm sewers, creeks, and/or "waters of the United States" and may require a permit to discharge water from the State of Ohio.

Universal Waste - Universal Waste means any of the following hazardous wastes that are subject to the universal waste requirements of 40 CFR part 273:

(1) Batteries as described in 40 CFR 273.2
(2) Pesticides as described in 40 CFR 273.3
(3) Thermostats as described in 40 CFR 273.4; and
(4) Lamps as described in 40 CFR 273.5.

1.7 NATURAL AND CULTURAL RESOURCES

The Contractor shall conduct activities in a manner that does not unnecessarily negatively impact fauna or flora, and in accordance with 50 CFR 17. The Contractor shall minimize interference with, disturbance to, and damage to all fish, wildlife, and plants including their habitat. The Contractor shall be responsible for the protection of threatened and endangered animal and plant species including their habitat in accordance with Federal, State, and local laws and regulations.

If during excavation or other construction activities any previously unidentified or unanticipated historical, archaeological, and cultural resources are discovered or found, all activities that may damage or alter such resources shall be temporarily suspended. Resources covered by this paragraph include but are not limited to any human skeletal remains or burials, artifacts, shell, midden (refuse heap), bone, charcoal, or other deposits, rock or coral alignments, pavings, wall, or other constructed features, and any indication of agricultural or other human activities. Upon such discovery or find, the Contractor shall immediately notify the Contracting Officer so that the appropriate authorities may be notified and a determination made as to their significance. The Contractor shall cease all activities that may result in impact to or the destruction of these resources. The Contractor shall secure the area and prevent employees or other persons form trespassing on, removing, or otherwise disturbing such resources. The Contractor may proceed with work in areas devoid of cultural resources.

1.8 WASTEWATER DISCHARGE PERMITS

In accordance with the Clean Water Act and State of Ohio regulations, a specific Incidental Sewer Discharge permit is required before discharging wastewaters to the sanitary sewer system from project activities such as excavation dewatering, cleaning operations, and decontamination water.

The Contractor shall complete and submit a Request for Incidental Sewer Discharge form to the Contracting Officer at least 7 days prior to the planned discharge of contaminated groundwater or other wastewater. The Contracting Officer will inform the GRC Environmental Management Branch (EMB) of this request and obtain approval for discharge. The request shall include the estimated discharge volume, discharge rate, source of the wastewater and the duration of discharge. Analyses may be needed to obtain

discharge approval from EMB.

1.8.1 Wastewater Discharge

With the exception of non-contaminated groundwater from an excavation, wastewater from Contractor operations shall be containerized by the Contractor until the Contractor is notified of discharge approval.

The Contractor shall record and submit information specified in the discharge permit issued to the project including, but not limited to, the location of discharge, dates of discharge, quantity of water discharged, source of the wastewater, dates wastewater was sampled and analyzed (if required), and filtering method (if required).

Non-sewerable wastewater that is hazardous waste shall be managed and disposed of properly by the Contractor. Non-sewerable wastewater that is nonhazardous waste shall be treated, managed, and disposed of properly by the Contractor.

1.9 AIR QUALITY

Construction operations and materials used on the project shall be in compliance with federal, state, and local air pollution standards, rules and regulations.

Chlorofluorocarbons (CFCs), Hydrochlorofluorocarbon (HCFC), Other Ozone Depleting Substances (ODS) and their substitutes.

Class I Ozone Depleting Substances shall not be used in the performance of this contract, nor be provided as part of the equipment without prior written permission from the Environmental Management Branch. This prohibition shall prevail over any other provision, specification, drawing, or referenced documents. A list of Class I ODS may be obtained from US EPA or their web page at http://www.epa.gov/ozone/ods.html.

Class II Ozone Depleting Substances shall not be used in the performance of this contract, nor be provided as part of the equipment without prior written permission from the Environmental Management Branch. This prohibition shall prevail over any other provision, specification, drawing, or referenced documents. A list of Class II ODS may be obtained from US EPA or their web page at http://www.epa.gov/ozone/ods2.html.

Chemicals used in lieu of ozone depleting substances (Substitutes or alternatives) must conform with US EPA's Significant New Alternatives Policy (SNAP) program. These rules are summarized on the US EPA web page at http://www.epa.gov/ozone/snap/lists/index.html.

Service, maintain, renovate, and demolish ODS and ODS Substitute containing equipment in accordance with 40 CFR 82. The Contractor shall ensure that ODS refrigerants and their substitutes are handled by a certified technician. The recovery equipment shall meet applicable EPA requirements and be certified with US EPA.

Hazardous Air Pollutants (HAPs).

The list of specific chemicals and compounds defined as HAPs in Section 112b of the 1990 Clean Air Act Amendments is available from Ohio EPA

on-line at: http://www.epa.state.oh.us/dapc/general/haplist.html. This listing is subject to change and only the currently listed items require tracking.

The use of HAPs and materials containing HAPs is allowed at GRC however the airborne release of HAPs shall be minimized at all times.

Records of the use of HAPs and materials containing HAPs must be provided to the CO for forwarding to the Environmental Management Branch. At a minimum, this should include Material Safety Data Sheets and quantities of each HAP and materials containing HAPs used.

Product and waste HAPs and materials containing HAPs must be stored in such a way as to prevent their release to the atmosphere.

Prohibition of Air Pollution Nuisances

No air pollution generating activity shall be allowed if it is expected to cause an air pollution nuisance.

No air pollution generating activity shall be allowed to continue if it is found to be an air pollution nuisance.

1.10 HAZARDOUS WASTE LIABILITY

Hazardous Waste Liability - For the purpose of this contract, the Contractor shall be responsible for any release or threatened release of the materials or substances handled under this contract, as well as any liabilities resulting or arising from or related to this contract, and shall bear all costs pertaining to such releases including, but not limited to, responses, remediation, testing, or disposal costs, and further shall defend and indemnify the Government for any costs including, but not limited to, any judgments, penalties, assessments, litigation, or attorney fees.

1.11 HAZARDOUS WASTE TRANSPORTATION

Certified Waste Haulers shall be utilized. Government directed waste shall be transported to the disposal facility or interim storage facility without delay, in accordance with Department of Transportation (DOT) manifest regulations. The Contractor shall notify the Government if 10 days or more have a elapsed during shipment.

1.12 SUSTAINABILITY

The Contractor shall conduct its activities in a manner that conserves resources and minimizes pollution in accordance with Executive Order 13101 "Greening the Government Through Waste Prevention, Recycling and Federal Acquisition" and Executive Order 13123 "Greening the Government Through Efficient Energy Management".

Minimize the amount of energy required during construction and operation by using resource efficient construction techniques, building systems (including HVAC, heating, electrical, water, lighting, heat-pumps and boilers), insulation, fixtures, appliances, and controls.

Whenever possible, utilize energy efficient office equipment through the Environmental Protection Agency's Energy Star labeling program (@

http://www.epa.gov/energystar/).

Use automated monitors and controls for energy, water, waste, temperature, moisture, and ventilation.

Conserve water with systems that reduce consumption and recycle water through reclamation and treatment systems.

Maximize the reduction, reuse, recycling or composting of waste and scrap materials.

Minimize waste, spillage, pilferage, spoil, and misuse of building materials.

Follow federal Comprehensive Procurement Guidelines (@ http://www.epa.gov/epaoswer/non-hw/procure/) for building materials and products, and select materials that have a long-life cycle; select least toxic materials; select recyclable materials; select materials that are resource-efficient; select materials with the maximum recycled content; select materials harvested on a sustained yield basis; select products causing the least pollution during their manufacture, use and reuse.

1.13 TRAINING REQUIREMENTS

Personnel handling hazardous materials shall have received Hazard Communication Training per 29 CFR 1910.1200(h), and personnel handling hazardous waste shall have received appropriate DOT and Hazardous Waste and Emergency Response Operations (HAZWOPER) Emergency Response Awareness Level Training per 29 CFR 1910.120. Employee training documents shall be kept at the jobsite.

Personnel containing spills or conducting cleanup of small spills shall have received First Responder Operators level training per 29 CFR 1910.120. (Note: Personnel with First Responder Operators level training can contain a spill to stop its spread from a safe distance. Their function is to contain the release from a safe distance, keep it from spreading, and prevent exposures.

Personnel generating hazardous waste shall have receive training on the proper management of hazardous waste per 40 CFR 265.16.

Personnel Handling Refrigerants shall have training in accordance with 40 CFR 82.

1.14 CHEMICAL USAGE, STORAGE, AND HANDLING

Hazardous material shall be used only as described on the Material Safety Data Sheet and/or Contractor's written instructions. The Contractor shall wear the protective equipment recommended by the manufacturer of the hazardous material. Containers of hazardous materials and hazardous wastes shall be kept closed except when in use. Containers of liquid hazardous materials shall be stored in secondary containment at the end of each work shift.

1.14.1 Hazardous Materials Storage

Hazardous materials storage shall be in accordance with Federal, State, and local regulations, and the General Storm Water Permit. Hazardous materials

shall be handled in a manner that minimizes the potential for releases. All liquid hazardous materials must be secondarily contained. Adequate spill response equipment shall be readily available.

Hazardous materials and hazardous wastes shall be labeled, handled properly, and stored in secondary containment at the end of each work day. Secondary containment shall be of adequate size and compatible with the materials stored. Storage areas shall be properly labeled and secured. Storage areas shall be in accordance with Section 01 57 23.98, Storm Water Pollution Prevention.

At the beginning of the project, an accurate inventory of hazardous materials and hazardous wastes to be generated including the estimated maximum quantity of each hazardous material to be brought on-site shall be provided to the COTR. Material Safety Data Sheets (MSDSs) for hazardous materials shall be maintained by the Contractor so they are immediately available to assist emergency response personnel in the event of a hazardous materials incident. Copies of the MSDSs shall be provided in the Health and Safety Plan (HASP).

1.14.2 Refuse Bins

Refuse bins shall not be overloaded. Liquid materials shall not be placed in dumpsters or bins. Leaking dumpsters shall be replaced. Dumpsters and bins shall not be cleaned on-site. Dumpsters shall remain covered except when actively being loaded.

1.14.3 Site Inspections

The project site and storage areas shall be inspected weekly to ensure compliance. Compliance status shall be verified by the Contractor. The checklists shall be submitted to the COTR, within 48 hours following the inspection.

1.14.4 Labeling

Containers, drums, vessels, tanks, and associated piping containing hazardous materials shall be labeled in accordance with 29 CFR 1910.1200 (f).

Hazardous material labels must have a description of the contents (including percentages of components for compounds), an appropriate hazard warning and the name and address of the manufacturer or other responsible party.

Hazardous waste and solid waste containers shall be appropriately marked, pending analysis, in accordance with 40 CFR 262 with, at a minimum, accumulation start date and contents and documented during weekly inspections.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.1 SITE OPERATIONS AND MAINTENANCE

Site Operations shall be conducted in accordance with the Clean Water Act

and GRC Storm Water Pollution Prevention Plan. For projects over 1 acre (total) in size, a Storm Water Pollution Prevention Plan must be submitted to the GRC Environmental Management Branch 2 months prior to project commencement for review and approval. (See Storm Water Pollution Prevention Section 01 57 23.98.)

Equipment Fueling and Maintenance - Equipment fluid changes and fueling shall be conducted over drip pans to prevent spilled materials from contacting the ground surface. The operator of leaking equipment shall contain and control the leak. The Contractor shall contact the EMB Waste Management Team through the Contracting Officer to coordinate proper disposal of waste materials generated during equipment maintenance.

3.1.1 Paint Clean-up

Painting operations must be conducted in accordance with GRC Storm Water Pollution Prevention Plan and applicable State of Ohio requirements.

Water Based Paints:

The Contractor shall paint out as much excess paint as possible from brushes, rollers, and equipment before starting clean up. Rinse brushes, rollers, and other tools over a sink that drains to the sanitary sewer using water only. Tools and equipment shall not be cleaned into streets, gutters, storm drains, or creeks. Dispose of dry brushes, rollers, rags, and drop cloths as solid waste.

Disposal of containers with any liquids as a solid waste is prohibited. These materials must be used elsewhere or handled as a regulated waste and disposed of in accordance with paragraph entitled Contractor Disposal.

All empty paint containers shall be turned over to NASA Waste Management. Paint containers shall have secured lids and a copy of the Material Data Safety Sheet (MSDS).

Oil Based Paints:

The Contractor shall paint out as much excess paint as possible from brushes, rollers, and equipment before starting clean up. Cleaning solutions shall be containerized and disposed of as hazardous waste. Reuse thinners and solvents by pouring back into original container through a filter.

Dispose of waste thinners, solvents, paint sludge, and solutions from cleaning of equipment and tools as hazardous waste. Containers with residual product shall be managed as a hazardous waste and disposed of.

All empty paint containers shall be turned over to NASA Waste Management. Paint containers shall have secured lids and a copy of the Material Data Safety Sheet (MSDS).

3.1.2 Concrete/Asphalt Cutting and Core Drilling

The Contractor shall prevent not allow slurry run-off from saw cutting or core drilling to enter the storm or sanitary sewer collection systems. Catch basins and drains shall be protected.

3.1.3 Sweeping

Roadways and on-site paved areas impacted by the project shall be cleaned to the satisfaction of the COTR and swept at the end of each phase or at project completion. Hosing down paved areas and streets is prohibited.

3.1.4 Sewage Sludge

Sewage Sludge and Compost Materials containing human waste is prohibited from use at GRC.

3.1.5 Draining, Tanks, Piping, and Equipment

Tanks, piping, and equipment shall be drained as required. Devices to properly contain the product shall be provided by the Contractor. Storm drains in the vicinity shall be covered during drainage operations.

The Government will obtain the necessary sanitary sewer discharge permits if the discharge is sewerable. Non-sewerable water shall be treated to a level to allow discharge to the sanitary sewer or managed and disposed of properly by the Government.

3.1.6 Monitoring Wells

Monitoring Wells shall not be disturbed for any reason. If they are disturbed, inadvertently or not, the contractor shall incur all costs associated with the abandonment (i.e. removal) of the well in accordance with Ohio EPA requirements.

3.2 CONTAMINATED SOIL MANAGEMENT

Contaminated soil shall be managed in accordance with Section 02 61 00.98.

The Contractor shall immediately stop work and notify the COTR if soil appears discolored or has an odor different from what is expected.

3.3 PCBs/PCB CONTAMINATED EQUIPMENT

All PCB-contaminated material shall be handled in accordance with 40 CFR 761.

The Contractor shall dial 911 from any NASA phone or 216-433-8888 from an outside phone to inform Emergency Dispatch of any spills or leaks of PCB-contaminated material.

The contractor shall notify the Contracting Officer of any PCB-contaminated material that needs disposal.

3.4 SPILL PREVENTION, CONTROL AND REPORTING

All liquid petroleum products must be secondarily contained in accordance with Annex Q of GRC's Emergency Preparedness Plan and 40 CFR 112. Spill clean-up materials (such as rags, absorbent booms/pads), and tools (such as shovels and brooms) shall be maintained at the project site and be readily accessible. Releases of hazardous materials to the environment shall be contained and measures implemented to prevent leaks and spills from entering storm drains.

Dial 911 from any NASA phone or 216-433-8888 from an outside phone to inform Emergency Dispatch of any spills or leaks

3.5 HAZARDOUS WASTE DISPOSAL

The Contractor shall label, package, and secondarily contain hazardous waste in accordance with 49 CFR 171, 40 CFR 173, 40 CFR 177, and 40 CFR 178. Refer to Section 02 61 00.98 for hazardous waste soils disposal.

Storage of hazardous waste shall not exceed 90 days from the date of generation in accordance with 40 CFR 262. Hazardous waste shall be shipped for disposal no later than 90 days from the date of generation/accumulation start date.

No hazardous material or waste shall remain at the worksite upon completion of the project unless specified otherwise.

3.5.1 Hazardous Waste Manifest

NASA Glenn Research Center shall be designated as the generator on the manifest and only approved GRC Environmental Management Branch personnel shall sign any shipping documents, including Uniform Hazardous Waste Manifests.

NASA Glenn Research Center Environmental Management Branch shall be designated as the emergency contact.

The Contractor shall perform transportation services in compliance with 49 CFR 100-185.

The Contractor shall use only disposal facilities that have a valid permit to manage hazardous waste, and shall be responsible for determining that permit allows for the type of management and disposal intended for that waste. The Contractor shall be responsible for ensuring that any party handling hazardous waste, including subcontractors, transporters, and TSDFs are in compliance with applicable federal, state, and local regulations. GRC EMB shall have final approval of TSDFs.

3.5.2 Containerized Hazardous Waste

Hazardous wastes and other materials shipped by the Contractor with wastes from other facilities shall not be commingled.

3.5.3 Bulk Hazardous Waste

Bulk hazardous waste shipments shall be weighed to confirm shipping weight.

3.5.4 Miscellaneous Hazardous Waste

Fluorescent light tubes, mercury containing and PCB lighting ballasts and thermostats shall be turned over to the Government for recycling.

-- End of Section --

SECTION 01 42 00

REFERENCES

PART 1 GENERAL

1.1 REFERENCES

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

Reference publications are cited in other sections of the specifications along with identification of their sponsoring organizations. The addresses of the sponsoring organizations are listed below, and if the source of the publications is different from the address of the sponsoring organization, that information is also provided.

ACI INTERNATIONAL (ACI)
P.O. Box 9094
Farmington Hills, MI 48333-9094
Ph: 248-848-3700
Fax: 248-848-3701
Internet: http://www.aci-int.inter.net

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)
444 N. Capital St., NW, Suite 249
Washington, DC 20001
Ph: 800-231-3475 or 202-624-5800
Fax: 800-525-5562 or 202-624-5806
Internet: www.aashto.org

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)
11 West 42nd St
New York, NY 10036
Ph: 212-642-4900
Fax: 212-302-1286
Internet: http://www.ansi.org/

AMERICAN WATER WORKS ASSOCIATION (AWWA)
6666 West Quincy
Denver, CO 80235
Ph: 800-926-7337
Fax: 303-795-2114
Internet: www.awwa.org

AMERICAN WELDING SOCIETY (AWS)
550 N.W. LeJeune Road
Miami, FL 33126
Ph: 800-443-9353
Fax: 305-443-7559
Internet: www.amweld.org

AMERICAN WOOD-PRESERVERS' ASSOCIATION (AWPA)
3246 Fall Creek Highway, Suite 1900
Grandbury, TX 76049-7979

Ph: 817-326-6300
Fax: 817-326-6306

ASME INTERNATIONAL (ASME)
Three Park Avenue
New York, NY 10016-5990
Ph: 212-591-7722
Fax: 212-591-7674
Internet: www.asme.org

ASTM INTERNATIONAL (ASTM)
100 Barr Harbor Drive
West Conshohocken, PA 19428-2959
Ph: 610-832-9500
Fax: 610-832-9555
Internet: www.astm.org

HYDRAULIC INSTITUTE (HI)
9 Sylvan Way, Suite 180
Parsippany, NJ 07054-3802
Ph: 888-786-7744 or 973-267-9700
Fax: 973-267-9053

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)
445 Hoes Ln, P. O. Box 1331
Piscataway, NJ 08855-1331
Ph: 732-981-0060 OR 800-701-4333
Fax: 732-981-9667
Internet: http//www.standards.ieee.org
E-mail: customer.service@ieee.org

INTERNATIONAL CODE COUNCIL (ICC)
5203 Leesburg Pike, Suite 708
Falls Church, VA 22041
Ph: 703-931-4533
Fax: 703-379-1546

MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY (MSS)
127 Park St., NE
Vienna, VA 22180-4602
Ph: 703-281-6613
Fax: 703-281-6671
Internet: //cssinfo.com/info/mss/html

NACE INTERNATIONAL (NACE)
1440 South Creek Drive
Houston, TX 77084-4906
Ph: 221-228-6200
Fax: 281-228-6300
Internet: www.nace.org

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION (NASA)
Publication(s) Available From
Superintendent of Documents
U.S. Government Printing Office
Washington, DC 20402
Ph: 202-783-3238

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)
1300 N. 17th St., Suite 1847
Rosslyn, VA 22209
Ph: 703-841-3200
Fax: 202-841-3300
Internet: http//www.nema.org/

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)
One Batterymarch Park
P.O. Box 9101
Quincy, MA 02269-9101
Ph: 800-344-3555
Fax: 800-593-6372
Internet: http://www.nfpa.org

UNDERWRITERS LABORATORIES (UL)
333 Pfingsten Rd.
Northbrook, IL 60062-2096
Ph: 847-272-8800
Fax: 847-272-8129
Internet: http://www.ul.com/
Order from:
Global Engineering Documents
15 Inverness Way East
Englewood, CO 80112-5776
Ph: 800-569-7128
Fax: 303-397-7945
Internet: http://global.ihs.com
E-mail: global@ihs.com

U.S. DEPARTMENT OF DEFENSE (DOD)
Order DOD Documents from:
National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161
Ph: 703-605-6000
FAX: 703-605-6900
Internet: http://www.ntis.gov
Order Military Specifications, Standards and Related Publications from:

Department of Defense Single Stock Point for (DODSSP)
Defense Automation and Production Service (DAPS)
Bldg 4D
700 Robbins AV
Philadelphia, PA 19111-5094
Ph: 215-697-2179
Fax: 215-697-1462
Internet: http://www.dodssp.daps.mil

U.S. FEDERAL AVIATION ADMINISTRATION (FAA)
Order for sale documents from:
Superintendant of Documents
P.O. Box 371954
Pittsburgh, PA 15250-7954
PH: 202-512-1800 (order desk)
Internet: http://www.gpo.gov
Order free documents from:
Federal Aviation Administration

Dept. of Transportation
Ardmore East Business Center
33410 75th Avenue
Landover, MD 20785
Ph:
FAX: 301-386-5394
Internet: http://www.faa.gov

U.S. GENERAL SERVICES ADMINISTRATION (GSA)
General Services Administration
1800 F Street, NW
Washington, DC 20405
PH: 202-501-0705
Order from:
General Services Administration
Federal Supply Service Bureau
1941 Jefferson Davis Highway
Arlington, VA 22202
PH: 703-605-5400
Internet: http://www.fss.gsa.gov/pub/fed-specs.cfm

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)
700 Pennsylvania Avenue, N.W.
Washington, D.C. 20408
Phone: 866-325-7208
Internet: http://www.archives.gov
Order documents from:
Superintendent of Documents
U.S.Government Printing Office
732 North Capitol Street, NW
Washington, DC 20401
Mailstop: SDE
Ph: 866-512-1800 or 202-512-1800
Fax: 202-512-2250
Internet: http://www.gpo.gov
E-mail: gpoaccess@gpo.gov

-- End of Section --

SECTION 01 45 00.98

QUALITY CONTROL

PART 1 GENERAL

1.1 SUMMARY

The requirements of this Section apply to, and are a component part of, each section of the specifications.

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-06 Test Reports

Contractor shall submit the following items in accordance with the paragraph entitled, "Records," of this section.

Quality Control Data
Quality Control Coordinating Actions
Quality Control Training
Inspection Records
Letters of Authority or Delegation
Field Tests
Factory Tests

SD-07 Certificates

Contractor shall submit a detailed written statement describing procedures that will be implemented to achieve quality on the project according to the paragraph entitled, "Quality Assurance (QA) Plan," of this section.

Contractor shall submit the following in accordance with the paragraph entitled, "Qualifications," of this section.

Contractor's Quality Representative Qualifications
Special Certifications

1.2.1 Quality Assurance (QA) Plan

QA plan shall address the following:

Description of the authority, responsibilities and coordinating procedures, of on-site/off-site quality assurance personnel, including those QA personnel not under direct control of the Contractor.

QA plan shall list personnel designated by the Contractor to accomplish the work required by the contract.

QA plan shall also contain an appendix with a copy of each form, report format, or similar record to be used in the QA program.

Contractor's organization that handles construction contract activities.

Contractor's operational plan for accomplishing and reviewing work controls, fabrication controls, certifications, and documentation of quality control operations, inspections, and test records, including those for subcontractors.

These provisions shall include the methods to be used during the procurement cycle (order to delivery) for those materials or equipment that require source inspections, shop fabrications, or similar operations located separately from the work site.

Description of on-site personnel training.

Certification(s) of personnel, procedures, processes, and equipment.

Nondestructive testing requirements.

Identification of independent certifying and testing laboratories.

1.2.2 Records

Records shall include all quality control data; factory tests or

manufacturer's certifications, quality control coordinating actions; records of quality control training/certifications as well as routine hydrostatic, electrical continuity, grounding, welding, line cleaning, field tests and similar tests. Quality records shall be available for examination by the Contracting Officer.

Legible copies of the test and inspection records shall be furnished to the Contracting Officer. Records shall cover work placement traceable to the contract schedule, specifications and drawings, and shall be verified by the Contractor.

Contractor shall submit for approval, the narrative description of an inspection system which provides for compliance with the quality requirements and technical criteria of the contract within 7 calendar days after notice to proceed.

Contractor shall submit a monthly performance report that summarizes the quality operations. This report shall identify inspections made, tests performed, nonconformances, corrective actions taken, status of plans/procedures being developed, and status of open items/problems in work.

Contractor shall submit Letters of Authority or Delegation outlining the authority and responsibilities of quality control personnel along with a copy of the letter of delegation to the Contracting Officer that defines delegated duties and responsibilities.

1.3 QUALITY ASSURANCE

1.3.1 Qualifications

Contractor's Quality Representative Qualifications shall be submitted to the Contracting Officer for approval. Quality Representative may be assigned to more than one contract provided that the assigned contracts are located at the same site.

When approval or certification of special processes, operating personnel, and special equipment or procedures is required by the specifications, the Contractor shall obtain necessary approvals or special certifications prior to starting the work.

1.3.2 Quality Control Requirements

Contractor shall provide a quality control program encompassing: selection of construction materials and sources; suppliers; subcontractors; on-site and off-site fabrication of Contractor-furnished assemblies; on-site and off-site assembly; erection; work procedures; workmanship; inspection; and testing.

Contractor's program shall provide document systems ensuring that quality provisions of contract schedule, specifications, and drawings have been performed.

1.3.2.1 Management and Organization

Contractor shall designate an individual within the on-site organization whose sole responsibility shall be the day-to-day on-site management and direction of the Quality Program.

The Quality Program Manager shall report to the Contractor's management and shall have the necessary authority to discharge contractual responsibilities.

1.3.2.2 Identification and Data Retrieval

Contractor shall have an identification and data retrieval system.

Records, drawings, submittals, and equipment shall be identified by referencing the Contract Number; Contract Specification Number; Contract Drawing Number; Submittal Document Number; Contract Change Number; and the Contractor's Drawing Number System.

1.3.2.3 Procurement

Contractor shall be responsible for controlling procurement sources and those of his subcontractors to ensure that each purchase meets quality requirements.

1.3.2.4 Receiving Inspection System

Contractor shall maintain a site receiving inspection system that ensures procured materials and equipment are inspected and tested.

Receiving inspection records shall accompany each procurement delivery to the construction site. Records of site receiving inspections shall be maintained by the Contractor.

Records shall show defects, discrepancies, dispositions, and waivers, including evidence of Government source inspection.

1.3.2.5 Nonconforming Articles and Material Control

The Contractor shall control nonconformances discovered by the Contractor, subcontractors, suppliers or Government quality representatives to prevent their use and to correct deficient operations.

a. Contractor shall prepare a "nonconformance" report for each instance comprising:

(1) A unique and traceable number.

(2) Identification of the nonconforming article or material.

(3) A description of the nonconformance and the applicable requirement.

(4) Cause or reason for the nonconformance.

(5) Remedial actions taken or recommended.

(6) Disposition of the nonconforming article or material.

b. The Contractor shall identify and mark each nonconforming article for removal from the work area.

c. The Contractor shall monitor and correct deficient operations.

1.3.2.6 Fabrication, Process, and Work Control

Contractor's procedures and controls shall ensure compliance with requirements in contract specifications and drawings.

Contractor shall establish in-process inspections, to ensure compliance with quality requirements.

Special processes may include, but are not limited to, plating, anodizing, nondestructive testing, welding, and soldering.

1.3.2.7 Quality Control Records

Quality control records shall be maintained at a central on-site location.

Maintenance of quality control records shall not relieve the Contractor from submitting samples, test data, detail drawings, material certificates, or other information required by each section in the specification.

Contractor shall ensure each record is identified and traceable to specific requirements in the specifications and drawings.

1.3.2.8 Drawings and Change Control

Drawing-control system shall be maintained to provide revised drawings and ensure continuous removal of obsolete drawings from work areas. Changes involving interface with other work areas, or affecting materials controlled by others shall be controlled by the Contractor. This system shall be integrated with the document requirements of the contract.

Drawing changes shall be clearly annotated. Implemented changes shall be clearly identified and associated drawings shall be revised accordingly. Drawings that have been approved, or approved as noted, by the Contracting Officer shall be used for fabrication and inspection.

1.3.3 Quality Inspections

1.3.3.1 Government Inspections

Work performed under this contract will be subject to inspection by the Contracting Officer. Changes to the specifications or drawings will not be allowed without written authorization of the Contracting Officer.

When the Contracting Officer determines that inspected work needs to be corrected, the Contracting Officer will be allowed hours to complete reinspection of the corrected work.

Contracting Officer shall also be notified in writing before backfilling or encasing any underground utility so that work may be inspected. Failure to notify the Contracting Officer before backfill or encasement occurs shall require the work be uncovered at no additional cost to the Government.

Contractor's program is subject to continuous evaluation, review, and verification by the Contracting Officer. Contractor will be notified in writing of any noncompliance and will be given calendar days to correct identified deficiencies.

1.3.3.2 Contractor's Quality Inspections

Contractor shall implement an inspection system. Documentation shall indicate quality control through records of inspections, tests, and procedures.

Contractor's quality assurance system shall include the following:

a. Single Contractor's representative responsible for on-site communication and operation of the inspection program.

b. Purchasing control system documenting project procurement to drawings, specifications, and approved submittals.

c. Receiving inspection system documenting inspections for each procurement.

d. Documentation for handling and disposing of nonconforming components and materials.

e. Inspection records for each specific section of the specification and drawings.

f. Identification of test(s) to be performed, test procedures, records, and independent organizations used.

g. Documenting and maintaining certification or re-certification of procedures.

h. Management of government-furnished equipment, components, and materials.

i. Calibration of gages, tools, measuring instruments, and independent laboratories used.

Contractor shall establish a system of scheduled or random audits to ensure task completion.

1.3.4 Field Services

1.3.4.1 Responsibility for Inspection and Testing

Contractor shall be responsible for all inspections and tests, and the accompanying documentation for each inspection and test. Contractor may utilize independent inspection and testing laboratories or services as approved by the Contracting Officer.

Contractor shall also be responsible for tests of construction materials utilizing the services of an approved independent testing laboratory.

1.3.4.2 Inspection and Test Records

Contractor shall provide on-site records of each inspection and test performed throughout the life of the contract. Records shall include, but not be limited to, factual evidence that the required inspections or tests have been performed, including type and number of inspections or tests involved, identification of operators and inspectors, result of inspections or tests, nature of defects, causes for rejection, proposed remedial action, and corrective actions taken.

Inspection records, test procedures, test results, and associated forms be verified by and provided to the Contracting Officer.

1.4 HANDLING AND STORAGE

Contractor shall provide controls, procedures and documentation with each shipment, that meet requirements of each section of the specifications.

The Contractor shall include documentation with each shipment. The data shall consist of documentation required by the contract along with specifications required to identify, store, preserve, operate, and maintain the items shipped.

1.5 SEQUENCING AND SCHEDULING

Contractor shall notify the Government at least hours prior to scheduled inspections and tests.

Contractor shall provide hour notice to the Government of the date when the contract work will begin at the site.

Contracting Officer shall be notified at least hours in advance of backfilling or encasing any underground utility.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

-- End of Section --

SECTION 01 50 00.98

TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.1 SUMMARY

Requirements of this Section apply to, and are a component of, each section of the specifications.

1.2 REFERENCES

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

FEDERAL AVIATION ADMINISTRATION (FAA)

FAA AC 70/7460-1	(Rev H; Change 1 - 2) Obstruction Marking and Lighting

1.3 SUBMITTALS

Not Used

PART 2 PRODUCTS

2.1 CONSTRUCTION SIGN

Contractor shall provide a construction identification sign.

Sign shall comprise a face sheet of 1200 by 2400 millimeter exterior grade plywood, 13 millimeter thick, mounted on a substantial frame of treated lumber. Frame and sign shall be given one coat of lead-free alkyd primer paint and two coats of an exterior type white enamel.

2.2 CONSTRUCTION DETAILS

Lettering and further details of construction shall be in accordance with the drawings.

PART 3 EXECUTION

3.1 TEMPORARY UTILITIES

Contractor shall provide temporary utilities required for construction. Materials may be new or used, shall be adequate for the required usage, shall not create unsafe conditions, and shall not violate applicable codes and standards.

Contractor shall provide a minimum of 2 aviation red or high intensity white obstruction lights on temporary structures (including cranes) over 30 meter above ground level. Light construction and installation shall comply with FAA AC 70/7460-1. Lights shall be operational during periods of reduced visibility, darkness, and as directed by the Contracting Officer.

3.1.1 Electricity

Contractor shall provide connections, sized to provide service required for power and lighting. Feeder and branch wiring with area distribution boxes shall be located so that power is available throughout the project site by use of power cords. 120/240 electrical volt feeder service is available. Lighting shall be provided by the Contractor. Electricity used will be furnished by the Government.

3.1.2 Water

Contractor shall make connections to existing facilities to provide water for construction purposes. Water used will be furnished by the Government. Hose connections shall be fitted with anti-syphon devices. Domestic water shall not be discharged to the storm sewer system without approval of the Contracting Officer.

3.1.3 Telephone Service

Contractor shall provide telephone service. Contractor shall pay costs of service.

3.1.4 Sanitary Facilities

Contractor shall provide temporary sanitary facilities and shall service, clean, and maintain these facilities and enclosures. Temporary facilities shall be removed from the site at the completion of the work.

3.1.5 Fire Protection

Contractor shall provide temporary fire protection equipment for the protection of personnel and property during construction. Debris and flammable materials shall be removed daily to minimize potential hazards.

3.2 SIGNS

3.2.1 Construction Sign

Within 30 days after notice to proceed, the Contractor shall install the construction identification sign at the location designated by the Contracting Officer.

3.2.2 Other Signs and Advertisements

Only signs necessary to expedite deliveries, maintain traffic flow, promote safety (e.g. caution, danger, blasting, hardhat area), and prevent interference with Government operations shall be erected.

3.3 TRAFFIC PROVISIONS

3.3.1 Maintenance of Traffic

Contractor shall conduct his operations in a manner that will not close any thoroughfare or interfere in any way with traffic on railways or highways except with written permission of the Contracting Officer. Contractor may move oversized and slow-moving vehicles to the worksite provided requirements of the highway authority have been met.

Work shall be conducted so as to minimize obstruction of traffic, and

traffic shall be maintained on at least half of the roadway width at all times. Approval shall be obtained from the Contracting Officer prior to starting any activity that will obstruct traffic.

Contractor shall provide, erect, and maintain, at his own expense, lights, barriers, signals, passageways, detours, etc., that may be required.

3.3.2 Rush Hour Restrictions

Contractor shall not interfere with the peak traffic flows preceding and during normal operations without notification to and approval by the Contracting Officer.

3.3.3 Dust Control

Contractor's dust control methods and procedures shall be approved by the Contracting Officer. Dust abatement on access roads shall be treated with applications of calcium chloride, water sprinklers, or similar methods or treatment.

3.4 WASTE MANAGEMENT

3.4.1 Refuse Bins

Refuse bins shall not be overloaded. Liquid materials shall not be placed in dumpsters or bins. Leaking dumpsters shall be replaced. Dumpsters and bins shall not be cleaned on-site. Dumpsters shall remain covered except when actively being loaded.

3.5 PROTECTION OF EXISTING SYSTEMS

3.5.1 Utility

Connection to existing utilities, identified on the drawings to the Contractor, shall be protected from damage during construction activity.

3.5.2 Safety

Contractor shall protect the integrity of any installed safety systems or personnel safety devices.

If entrance into systems serving safety devices is required, the Contractor shall obtain prior approval from the Contracting Officer. If it is temporarily necessary to remove or disable personnel safety devices in order to accomplish contract requirements, the Contractor shall provide alternative means of protection prior to removing or disabling any permanently installed safety devices or equipment and shall obtain prior approval from the Contracting Officer.

-- End of Section --

SECTION 01 57 23.98

TEMPORARY STORM WATER POLLUTION CONTROL

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 4439	(1997) Standard Terminology for Geosynthetics
ASTM D 4491	(1996) Water Permeability of Geotextiles by Permittivity
ASTM D 4533	(1991; R 1996) Trapezoid Tearing Strength of Geotextiles
ASTM D 4632	(1991; R 1996)) Grab Breaking Load and Elongation of Geotextiles
ASTM D 4751	(1995) Determining Apparent Opening Size of a Geotextile
ASTM D 4873	(1995) Identification, Storage, and Handling of Geosynthetic Rolls

1.2 GENERAL

The Contractor shall implement the storm water pollution prevention measures specified in this section in a manner which will meet the requirements of Section 01 35 43 98 ENVIRONMENTAL PROTECTION PROCEDURES, and the requirements of the National Pollution Discharge Elimination System (NPDES) permit attached to that Section.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-07 Certificates

Certificate attesting that the Contractor has met all specified requirements.

1.4 EROSION AND SEDIMENT CONTROLS

The controls and measures required by the Contractor are described below.

1.4.1 Stabilization Practices

The stabilization practices to be implemented shall include temporary seeding, mulching, geotextiles, sod stabilization, vegetative buffer strips, erosion control mats, protection of trees, preservation of mature vegetation, etc. On his daily CQC Report, the Contractor shall record the dates when the major grading activities occur, (e.g., clearing and grubbing, excavation, embankment, and grading); when construction activities temporarily or permanently cease on a portion of the site; and when stabilization practices are initiated. Except as provided in paragraphs UNSUITABLE CONDITIONS and NO ACTIVITY FOR LESS THAN 21 DAYS, stabilization practices shall be initiated as soon as practicable, but no more than 14 days, in any portion of the site where construction activities have temporarily or permanently ceased.

1.4.1.1 Unsuitable Conditions

Where the initiation of stabilization measures by the fourteenth day after construction activity temporarily or permanently ceases is precluded by unsuitable conditions caused by the weather, stabilization practices shall be initiated as soon as practicable after conditions become suitable.

1.4.1.2 No Activity for Less Than 21 Days

Where construction activity will resume on a portion of the site within 21 days from when activities ceased (e.g., the total time period that construction activity is temporarily ceased is less than 21 days), then stabilization practices do not have to be initiated on that portion of the site by the fourteenth day after construction activity temporarily ceased.

1.4.2 Structural Practices

Structural practices shall be implemented to divert flows from exposed soils, temporarily store flows, or otherwise limit runoff and the discharge of pollutants from exposed areas of the site. Structural practices shall be implemented in a timely manner during the construction process to minimize erosion and sediment runoff. Structural practices shall include the following devices. Location and details of installation and construction are shown on the drawings.

1.4.2.1 Silt Fences

The Contractor shall provide silt fences as a temporary structural practice to minimize erosion and sediment runoff. Silt fences shall be properly installed to effectively retain sediment immediately after completing each phase of work where erosion would occur in the form of sheet and rill erosion (e.g. clearing and grubbing, excavation, embankment, and grading). Silt fences shall be installed in the locations indicated on the drawings. Final removal of silt fence barriers shall be upon approval by the Contracting Officer.

1.4.2.2 Diversion Dikes

Diversion dikes shall have a maximum channel slope of 2 percent and shall be adequately compacted to prevent failure. The minimum height measured from the top of the dike to the bottom of the channel shall be 0.5 m. The minimum base width shall be 1.8 m and the minimum top width shall be 0.6 m.

The Contractor shall ensure that the diversion dikes are not damaged by construction operations or traffic. Diversion dikes shall be located as

shown on the drawings.

PART 2 PRODUCTS

2.1 COMPONENTS FOR SILT FENCES

2.1.1 Filter Fabric

The geotextile shall comply with the requirements of ASTM D 4439, and shall consist of polymeric filaments which are formed into a stable network such that filaments retain their relative positions. The filament shall consist of a long-chain synthetic polymer composed of at least 85 percent by weight of ester, propylene, or amide, and shall contain stabilizers and/or inhibitors added to the base plastic to make the filaments resistance to deterioration due to ultraviolet and heat exposure. Synthetic filter fabric shall contain ultraviolet ray inhibitors and stabilizers to provide a minimum of six months of expected usable construction life at a temperature range of -18 to 49 degrees C. The filter fabric shall meet the following requirements:

FILTER FABRIC FOR SILT SCREEN FENCE

PHYSICAL PROPERTY	TEST PROCEDURE	STRENGTH REQUIREMENT
Grab Tensile	ASTM D 4632	445 N min.
Elongation (%)		30 % max.
Trapezoid Tear	ASTM D 4533	245 N min.
Permittivity	ASTM D 4491	0.2 sec-1
AOS (U.S. Std Sieve)	ASTM D 4751	20-100

2.1.2 Silt Fence Stakes and Posts

The Contractor may use either wooden stakes or steel posts for fence construction. Wooden stakes utilized for silt fence construction, shall have a minimum cross section of 50 mm by 50 mm when oak is used and 100 mm by 100 mm when pine is used, and shall have a minimum length of 1.5 m. Steel posts (standard "U" or "T" section) utilized for silt fence construction, shall have a minimum mass of 1.98 kg per linear meter and a minimum length of 1.5 m.

2.1.3 Mill Certificate or Affidavit

A mill certificate or affidavit shall be provided attesting that the fabric and factory seams meet chemical, physical, and manufacturing requirements specified above. The mill certificate or affidavit shall specify the actual Minimum Average Roll Values and shall identify the fabric supplied by roll identification numbers. The Contractor shall submit a mill certificate or affidavit signed by a legally authorized official from the company manufacturing the filter fabric.

2.1.4 Identification Storage and Handling

Filter fabric shall be identified, stored and handled in accordance with ASTM D 4873.

PART 3 EXECUTION

3.1 INSTALLATION OF SILT FENCES

Silt fences shall extend a minimum of 400 mm above the ground surface and shall not exceed 860 mm above the ground surface. Filter fabric shall be from a continuous roll cut to the length of the barrier to avoid the use of joints. When joints are unavoidable, filter fabric shall be spliced together at a support post, with a minimum 150 mm overlap, and securely sealed. A trench shall be excavated approximately 100 mm wide and 100 mm deep on the upslope side of the location of the silt fence. The 100 mm by 100 mm trench shall be backfilled and the soil compacted over the filter fabric. Silt fences shall be removed upon approval by the Contracting Officer.

3.2 MAINTENANCE

The Contractor shall maintain the temporary and permanent vegetation, erosion and sediment control measures, and other protective measures in good and effective operating condition by performing routine inspections to determine condition and effectiveness, by restoration of destroyed vegetative cover, and by repair of erosion and sediment control measures and other protective measures. The following procedures shall be followed to maintain the protective measures.

3.2.1 Silt Fence Maintenance

Silt fences shall be inspected in accordance with paragraph INSPECTIONS. Any required repairs shall be made promptly. Close attention shall be paid to the repair of damaged silt fence resulting from end runs and undercutting. Should the fabric on a silt fence decompose or become ineffective, and the barrier is still necessary, the fabric shall be replaced promptly. Sediment deposits shall be removed when deposits reach one-third of the height of the barrier. When a silt fence is no longer required, it shall be removed. The immediate area occupied by the fence and any sediment deposits shall be shaped to an acceptable grade. The areas disturbed by this shaping shall be seeded in accordance with Section 02930.

3.2.2 Diversion Dike Maintenance

Diversion dikes shall be inspected in accordance with paragraph INSPECTIONS. Close attention shall be paid to the repair of damaged diversion dikes and necessary repairs shall be accomplished promptly. When diversion dikes are no longer required, they shall be shaped to an acceptable grade. The areas disturbed by this shaping shall be seeded in accordance with Section 02930.

3.3 INSPECTIONS

3.3.1 General

The Contractor shall inspect disturbed areas of the construction site, areas used for storage of materials that are exposed to precipitation that have not been finally stabilized, stabilization practices, structural practices, other controls, and area where vehicles exit the site at least once every seven (7) calendar days and within 24 hours of the end of any storm that produces 13 mm or more rainfall at the site. Where sites have been finally stabilized, such inspection shall be conducted at least once

every month.

3.3.2 Inspections Details

Disturbed areas and areas used for material storage that are exposed to precipitation shall be inspected for evidence of, or the potential for, pollutants entering the drainage system. Erosion and sediment control measures identified in the Storm Water Pollution Prevention Plan shall be observed to ensure that they are operating correctly. Discharge locations or points shall be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to receiving waters. Locations where vehicles exit the site shall be inspected for evidence of offsite sediment tracking.

3.3.3 Inspection Reports

For each inspection conducted, the Contractor shall prepare a report summarizing the scope of the inspection, name(s) and qualifications of personnel making the inspection, the date(s) of the inspection, major observations relating to the implementation of the Storm Water Pollution Prevention Plan, maintenance performed, and actions taken. The report shall be furnished to the Contracting Officer within 24 hours of the inspection as a part of the Contractor's daily CQC REPORT. A copy of the inspection report shall be maintained on the job site.

3.3.4 Monthly Inspection Report and Certification Form for Erosion and Sediment Controls

On the first working day of each month the Contractor shall complete, sign, and submit the original form to the Contracting Officer.

Unless otherwise notified by the OEPA, the Contractor shall submit the Monthly Inspection Report and Certification Forms for an additional two months after the final completion of all storm water pollution prevention measures required in this contract have been implemented.

-- End of Section --

SECTION 01 60 00.98

PRODUCT REQUIREMENTS

PART 1 GENERAL

1.1 SUMMARY

Requirements of this Section apply to, and are a component part of, each section of the specifications.

1.2 SUBMITTALS

Not Used

1.3 SHIPMENT AND PROTECTION OF MATERIAL AND EQUIPMENT

Shipments shall be addressed to the Contractor who shall be responsible for their receipt, unloading, handling, and storage at the site. Government will not accept deliveries on behalf of the Contractor or his subcontractors or assume responsibility for security of materials, equipment, or supplies delivered to the site.

Contractor shall protect and preserve materials, supplies, and equipment of every description (including property which may be Government-furnished or -owned) and work performed.

1.4 STORAGE AND PROTECTION OF MATERIAL

1.4.1 Salvage Material

Material to be salvaged and reinstalled by the Contractor shall be protected during removal and stored to prevent damage.

1.4.2 New Material and Construction Equipment

Only material and construction equipment designated for performance of contract work may be stored at the construction site or located in Government-controlled warehouses or shop facilities.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

Materials and equipment to be provided under this contract shall be standard catalogue products of manufacturers regularly engaged in the manufacture of the products. All material "cut sheets" and factory acceptance test data shall be provided to the Contracting Officer. Information and data shall have a cover letter/sheet clearly marked with the system name, date, and the words "Final Test Data - Forward to the Systems Engineer/Condition Monitoring Office/Predictive Testing Group for inclusion in the Maintenance Database."

Material and equipment shall be installed in accordance with the requirements of the contract drawings , contract specifications and referenced standards and specifications.

PART 3 EXECUTION

Not Used

-- End of Section --

SECTION 01 75 00.98

STARTING AND ADJUSTING

PART 1 GENERAL

1.1 SUMMARY

Requirements of this Section apply to, and are a component part of, each section of the specifications.

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-06 Test Reports

Test reports shall be submitted in accordance with the paragraphs entitled, "Factory Tests", "Functional Test" and "Final Acceptance Test," of this section.

Test procedures and the recording forms shall be submitted according to paragraph entitled, "Test Procedures."

1.2.1 Tests Required

Tests shall be performed to verify proper functioning of fire protection, fire suppression, HVAC, compressed air, electrical switchgear, protective relaying, fluid and gas systems, pump/motor combinations, boiler systems, hydraulic and pneumatic control, condition/performance monitoring systems, energy control and monitoring systems, and other assemblies and components that need to be tested as an interrelated whole.

1.2.2 Factory Tests

Tests shall be performed at the factory to verify proper build. These test results will be used in the "Final Acceptance Test" section to verify no shipping damage and proper installation.

1.2.3 Functional Test

Contractor shall perform an "in-house" test to verify that the system and components have been properly installed and are functioning properly. Test shall be performed in the presence of the Contracting Officer. Test shall be completed and found acceptable when system has performed per other sections and referenced industry standards.

1.2.4 Final Acceptance Test

Contractor shall perform a formal test with full documentation using the approved recording form. Contracting Officer will witness this test and issue a written final acceptance. Final test data shall be provided to the Contracting Officer. Data shall have a cover letter/sheet clearly marked with the system name, date, and the words "Final Test Data - Forward to the Systems Engineer/Condition Monitoring Office/Predictive Testing Group for

inclusion in the Maintenance Database."

1.2.5 Test Procedures

Test procedure and recording forms that document the test steps shall be submitted for approval to the Contracting Officer 21 calender days prior to the proposed test date. Procedure shall consist of step by step instruction to verify system parameters, components, and functions.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

-- End of Section --

SECTION 01 78 00.98

CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.1 SUMMARY

The requirements of this Section apply to, and are a component part of, each section of the specifications.

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

The following shall be submitted in accordance with paragraph entitled, "General," of this section.

Reproducible Drawings
CAD System Drawings

SD-02 Shop Drawings

As-Built Drawings shall be submitted in accordance with paragraph entitled, "General," of this section.

SD-03 Product Data

Spare Parts Data shall indicate manufacturer's name, part number, nomenclature, and stock level recommended for maintenance and repair. List those items that may be standard to the normal maintenance of the system.

SD-07 Certificates

A Work Plan shall be submitted in accordance with paragraph entitled, "General," of this section.

SD-08 Manufacturer's Instructions

The following shall be submitted in accordance with paragraph entitled, "General," of this section.

Preventative Maintenance and Condition Monitoring (Predictive Testing) and Inspection schedules shall be submitted by the Contractor with instructions that state when systems should be retested.

Schedule shall define the anticipated length of each test, test apparatus, number of personnel identified by responsibility, and a testing validation procedure permitting the record operation capability requirements. Each test feature; e.g., liter per second, rpm, kilopascal, shall have a signoff blank for the

Contractor and Contracting Officer. A remarks column of the testing validation procedure shall include references to operating limits of time, pressure, temperature, volume, voltage, current, acceleration, velocity, alignment, calibration, adjustments, cleaning, or special system notes. Procedures for preventative maintenance, condition monitoring (predictive testing) and inspection, adjustment, lubrication and cleaning necessary to prevent failure shall be delineated.

Posted Instructions

SD-10 Operation and Maintenance Data

Operation and Maintenance Manuals shall be submitted in accordance with paragraph entitled, "Operation and Maintenance," of this section. Equipment data sheets will be included for each piece of equipment purchased and/or installed, with specific model numbers and optional equipment or features listed. Equipment data shall be provided on NASA Form C-134: "CMMS Request for Modification" by the Contractor or their designated subcontractor.

All O&M data shall be submitted on CD in a Adobe Acrobat version 6.0 or greater, PDF Format. The COTR will provide the Contractor with a structured file format for the purposes of archiving PDF files on the CD.

1.3 GENERAL

As-Built Drawings shall be submitted under the following criteria:

In order to minimize the time for final payment at the completion of the project, the Contractor shall update the as-built drawings every month with the Contracting Officer's authorized representative. This update will be a part of "the monthly request for payment meeting," and payment--or a portion of the payment, including final payment--may be withheld until the as-built drawings have been updated, and accepted by the Contracting Officer.

After completion of all construction and before final payment is made under this contract, the Contractor shall provide the Contracting Officer with one complete set of full size blue line contract drawings with alterations shown in red pencil.

Preventative Maintenance and Condition Monitoring (Predictive Testing) and Inspection schedules shall be submitted by the Contractor with instructions that state when systems should be retested.

Schedule shall define the anticipated length of each test, test apparatus, number of personnel identified by responsibility, and a testing validation procedure permitting the record operation capability requirements. Each test feature; e.g., liter per second, rpm, kilopascal, shall have a signoff blank for the Contractor and Contracting Officer. A remarks column of the testing validation procedure shall include references to operating limits of time, pressure, temperature, volume, voltage, current, acceleration, velocity, alignment, calibration, adjustments, cleaning, or special system notes. Procedures for preventative maintenance, inspection, adjustment, lubrication and cleaning necessary to minimize corrective maintenance and repair shall be delineated.

Repair requirements shall inform operators how to check out, troubleshoot, repair, and replace components of the system. Instructions shall include electrical and mechanical schematics and diagrams and diagnostic techniques necessary to enable operation and troubleshooting of the system after acceptance.

A Work Plan shall be submitted to the Contracting Officer for project closeout. Plan shall include all scheduled inspections, instruction classes, items, closeout dates for all functions, and shall list the required Government and Contractor personnel that will be taking part in these functions.

Posted Instructions shall be submitted by the Contractor with labels, signs, and templates of operating instructions that are required to be mounted or installed on or near the product for normal, safe operation.

Contractor shall submit 6 copies of the project operation and maintenance manuals 30 days prior to testing the system involved. Data shall be updated and resubmitted for final approval no later than 30 days prior to contract completion.

1.4 WARRANTY OF CONSTRUCTION

In accordance with FAR clause 52.246-12 the Contractor shall provide a 1-year warranty from "acceptance of the work". NASA Glenn Research Center interprets this as 1-year from the completion date. Subcontracts or Supply Purchase Orders shall include these provisions. The following clarifications are made to assure complete understanding of warranty provisions:

The prime Contractor shall operate and maintain all equipment and systems installed until the contract completion date. This includes maintenance service inspections, filter replacements and other work as recommended by the manufacturer. Following completion, the Government will assume O&M responsibilities in accordance with the manufacturer's recommendations.

The prime Contractor shall provide a written 1 -year warranty from the contract completion date to the Government covering all materials, labor and workmanship. Warranty repairs may require the services of subcontractors or suppliers, but shall be managed and coordinated by the prime.

The prime COntractor shall provide a 1-year certificate of warranty from each supplier or provider for all purchased equipment or systems. Requests for warranty repairs shall be made will be made directly to the manufacturer or supplier.

This provision is not affected by the Government's benefical use or occupancy prior to the final completion. The waranty date may be adjusted throughout the course of his contract as required to include contract time extensions with an equitable adjustment to the contract. Should the contractor complete the work ahead of schedule, the warranty provisions will be revised to reflect the actual completion.

The warranty start date for this contract is calculated as the bid guarantee date plus the awarded period of performance.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.1 OPERATION AND MAINTENANCE

Operation and Maintenance Manuals shall be consistent with the manufacturer's standard brochures, schematics, printed instructions, general operating procedures, and safety precautions. Information shall be bound in manual format and grouped by technical sections. Test data shall be legible and of good quality. Light-sensitive reproduction techniques are acceptable provided finished pages are clear, legible, and not subject to fading. Pages for vendor data and manuals shall have 10 millimeter holes and be bound in 3-ring, loose-leaf binders. Data shall be organized by separate index and tabbed sheets, in a loose-leaf binder. Binder shall lie flat with printed sheets that are easy to read. Caution and warning indications shall be clearly labeled.

Contractor shall submit classroom and field instructions in the operation and maintenance of systems equipment where required by the technical provisions. These services shall be directed by the Contractor, using the manufacturer's factory-trained personnel or qualified representatives. Contracting Officer shall be given 7 days written notice of scheduled instructional services. Instructional materials belonging to the manufacturer or vendor, such as lists, static exhibits, and visual aids, shall be made available to the Contracting Officer.

-- End of Section --

SECTION 02 41 00.98

DEMOLITION

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)

AASHTO M 145	(1991; R 2003) Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes
AASHTO T 180	(2001) Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop

U.S. FEDERAL AVIATION ADMINISTRATION (FAA)

FAA AC 70/7460-1	(Rev k; Change 1) Obstruction Marking and Lighting

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Contractor shall record Existing Conditions prior to starting work in accordance with the paragraph entitled, "Existing Conditions," of this section.

Interruption of the following shall be submitted:

Utility Outages
Traffic Interruptions

SD-07 Certificates

Contractor shall submit a detailed Demolition Plan of the work procedures and safety precautions to be used prior to the beginning of work.

1.3 DEMOLITION PLAN

Contractor shall prepare and submit a detailed Demolition Plan of the work procedures and safety precautions to be used in the identification, demolition, handling, removal, transportation, and reclamation or disposal of removed materials. Contractor shall meet with the Contracting Officer,

prior to beginning work, to discuss in detail the demolition plan.

1.4 EXISTING CONDITIONS

Existing Conditions shall be recorded in the presence of the Contracting Officer showing the condition of structures and other facilities adjacent to areas of alteration or removal. Such record shall contain the elevation of the top of foundation walls, the location and extent of cracks and other damage and description of surface conditions that exist prior to the start of work. Copies of the record shall be submitted and the stated conditions before starting work shall be verified.

1.5 INTERRUPTION OF SERVICE

Written approval by the Contracting Officer for interruption of service Utility Outages and Traffic Interruptions shall be submitted at least 2 weeks prior to work.

PART 2 PRODUCTS

2.1 FILL MATERIAL

Fill material shall conform to the definition of satisfactory soil material as defined in AASHTO M 145, Soil Classification Groups A-1, A-2-4, A-2-5 and A-3. In addition, fill material shall be free from roots and other organic matter, trash, debris, frozen materials, and stones larger than 50 millimeter in any dimension.

Proposed fill material shall be sampled and tested by an approved soil testing laboratory, as follows:

Soil classification	AASHTO M 145
Moisture-density relations	AASHTO T 180, Method B or D

PART 3 EXECUTION

3.1 DISCONNECTING EXISTING UTILITIES

Prior to the start of work, utilities serving each area of alteration or removal will be shut off by the Government and shall be disconnected and sealed by the Contractor.

3.2 TEMPORARY UTILITY SERVICES

Install temporary utility services before disconnecting existing utilities. Contractor shall provide a minimum of 2 aviation red or high intensity white obstruction lights on temporary structures (including cranes) over 30 meter above ground level. Light construction and installation shall comply with FAA AC 70/7460-1. Lights shall be operational during periods of reduced visibility, darkness, and as directed by the Contracting Officer. Maintain the temporary services during the period of construction and remove only after permanent services have been installed and tested and are in operation.

3.3 PRECAUTION AGAINST MOVEMENT

Contractor shall provide shoring and bracing or other supports to prevent movement, settlement, or collapse of facilities that are to remain which

are adjacent to areas of alteration and removal.

3.4 DEMOLITION AND REMOVAL WORK

3.4.1 Demolition

3.4.1.1 Concurrent Earth-Moving Operations

Excavation, filling, and other earth-moving operations that are sequential to demolition work shall not be started in areas occupied by structures to be demolished until all demolition in the area has been completed and debris has been removed.

3.4.1.2 Buildings

Buildings shall be demolished or may be removed, subject to the approval of the Government and of the highway authorities having jurisdiction.

Demolition shall proceed in a systematic manner from the top of the structure to the ground. Demolition works above each tier or floor shall be completed before the supporting members on the lower levels are disturbed. Concrete and masonry walls shall be demolished in small sections. Structural framing members shall be removed and lowered by means of derricks, platform hoists, or other approved method.

Buildings, or the remaining portions thereof, not exceeding 25 meter in height may be demolished by the mechanical method of demolition.

Concrete slabs shall be broken up and removed.

3.4.1.3 Below-Grade Construction

Foundation walls shall be demolished to a depth of not less than 305 millimeter below the existing ground surface. In addition, below-grade wood and metal construction and floor construction, except basement concrete slabs on ground, shall be demolished and removed.

3.4.1.4 Filling Basements and Voids

Basements and voids resulting from the demolition of structures shall be completely filled with specified fill material and graded.

Prior to filling, basements and voids shall be free of standing water, frost, frozen material, trash, and debris.

Fill material shall be placed in horizontal layers not to exceed 200 millimeters in loose depth. Each layer shall be compacted to a minimum of 95 percent of the maximum density as determined by AASHTO T 180, Method D, at optimum moisture content.

After fill has been placed, the surface of the fill shall be graded to meet adjacent contours and to provide surface water drainage.

3.4.2 Protective Measures

Existing construction shall not be disturbed beyond the extent indicated or necessary for installation of new work. Temporary shoring and bracing shall be provided for support of building components to prevent settlement or other movement.

Protective measures shall be provided to control accumulation and migration of dust and dirt in all areas of work. Dust, dirt, and debris shall be removed from the areas of work daily.

3.4.3 Salvageable Materials and Equipment

Government will designate materials and equipment to be salvaged.

Salvageable materials and equipment shall be removed in a manner that will cause the least possible damage thereto. Contractor personnel shall handle, store, and protect removed items that are to be reused in the work or are to be retained by the Government.

Identification tags shall be provided on items boxed or placed in containers, indicating the type, size, and quantity of materials.

3.4.4 Scrap Metal

Scrap metal shall become the Contractor's property and shall be removed from the site as it accumulates.

3.4.5 Site Work

Chain link fencing, gates, and other salvaged items shall be removed and stored. Gates shall be removed as whole units. Chain link fabric shall be cut to lengths of 7 meters and stored in rolls off the ground.

3.4.6 Buildings and Structures

Specified removal operations shall be performed in existing buildings as required to complete the work.

Concrete:

Existing concrete shall be demolished, removed, and disposed of. Square, straight edges shall be provided where existing concrete adjoins new work and other locations. Existing steel reinforcement shall be protected where indicated or shall be cut off flush with face of concrete.

Masonry:

All masonry construction shall be demolished and removed.

Masonry units for reuse shall be removed, cleaned, and stacked off the ground on wood pallets. Salvaged masonry units not reused in the work shall remain the property of the Government. Damaged units unsuitable for reuse shall be considered as debris and shall be disposed. Salvaged masonry units shall be transported for storage to a location as directed by the Contracting Officer.

Miscellaneous metals:

Shop-fabricated items such as access doors and frames, steel gratings, metal ladders, wire mesh partitions, metal railings, and similar items shall be salvaged as whole units.

Light-gage metal items, such as metal gutters, roofing and siding,

and similar items, shall be salvaged unless designated as scrap metal by the Contracting Officer.

Carpentry:

Lumber, millwork items, and finished boards, except those that are unfit for reuse, shall be salvaged.

Windows, doors and frames, and similar items shall be removed as units, complete with trim and accessories. Hardware shall be left intact and attached to units, except that door closers shall be removed. Open end of door frames shall be braced to prevent damage thereto.

Gypsum board, fiberboard, and other composition sheathing boards shall be classified as debris to be removed and disposed of.

Demountable partitions, built-in furniture, toilet partitions, lockers, and other prefabricated units shall be removed in sections and salvaged.

Bolts, nuts, washers, timber connectors, and other rough hardware shall be classified as debris and disposed of.

Salvaged items shall be transported to designated storage area and stored as directed by the Contracting Officer.

Miscellaneous items:

Chalkboards, tackboards, toilet-room accessories, and similar surface-mounted items shall be removed and salvaged as whole units, complete with all accessories.

Venetian blinds, complete with hardware items which shall be packaged and attached thereto, shall be removed and salvaged.

Salvaged items shall be transported to designated storage area and stored as directed by the Contracting Officer.

3.4.7 Mechanical Equipment and Fixtures

Mechanical hardware shall be disconnected at the nearest convenient connection to existing services that are to remain.

Contractor shall remove all equipment NASA bar code or identification tags during demolition and forward the tags to the COTR.

Each item of equipment and fixtures shall be salvaged as a unit; listed, indexed, tagged, and stored. Each unit shall be salvaged with its normal operating auxiliary equipment.

Equipment shall not be removed until approved.

Disconnection from utilities:

Mechanical equipment and fixtures shall be disconnected at fittings. Service valves shall be removed and attached to the unit.

Preparation for storage:

Water, dirt, dust, and foreign matter shall be removed from units; tanks, piping and fixtures shall be drained; and interiors, if previously used to store flammable, explosive, or other dangerous liquids, shall be steam cleaned. Openings shall be sealed with caps, plates, or plugs.

Motors attached by flexible connections shall be secured to the unit.

Lubricating systems shall be charged with the proper oil or grease.

Piping:

Piping shall be disconnected at unions, flanges and valves, and fittings as required to reduce the pipe into straight lengths for practical storage. Salvaged piping shall be stored according to size and type. If the piping that remains can become pressurized due to upstream valve failure, end caps, blind flanges, or other types of plugs or fittings with a pressure gage and bleed valve shall be attached to the open end of the pipe to ensure positive leak control.

Piping that previously contained gas, gasoline, oil, or other dangerous fluids shall be carefully dismantled, with precautions taken to prevent injury to persons and property. Such piping shall be stored outdoors until all fumes and residues are removed.

Prefabricated supports, hangers, plates, valves, and specialty items shall be boxed according to size and type. Sprinkler heads shall be individually wrapped in plastic bags before boxing.

Piping not designated for salvage, or not reusable, shall be considered as scrap metal.

Ducts:

Removed duct work shall be classified as scrap metal.

Fixtures:

Fixtures associated with plumbing, heating, air conditioning, refrigeration, and other mechanical system installations shall be removed and salvaged. Fixture units shall be tagged for identification, storage, and protection from damage.

Broken, damaged, or otherwise unserviceable units shall be classified as debris and disposed of by the Contractor.

Motor and machines:

Motors and machinery items associated with the plumbing, heating, air conditioning, refrigeration, and other mechanical system installations shall be removed and salvaged. Auxiliary units and accessories shall be salvaged and boxed and stored with the main unit.

Such items shall be tagged for identification, stored, and

protected from damage.

Salvaged items shall be transported to designated storage area and stored as directed by the Contracting Officer.

3.4.8 Electrical Equipment and Fixtures

Motors, motor controllers, and operating and control equipment shall be salvaged and attached to the driven equipment.

Contractor shall remove all equipment NASA bar code or identification tags during demolition and forward the tags to the COTR.

Wiring systems and components shall be salvaged. Loose items shall be boxed and tagged for identification.

Primary, secondary, control, communication, and signal circuits shall be disconnected at the point of attachment to their distribution system.

Fixtures:

Electrical fixtures shall be removed and salvaged. Unprotected glassware shall be removed from the fixture and salvaged separately.

Incandescent lamps, mercury-vapor lamps, and fluorescent lamps shall be salvaged, boxed and tagged for identification, and protected from breakage.

Electrical devices:

Switches, receptacles, switchgear, transformers, regulators, meters, instruments, plates, circuit breakers, panelboards, outlet boxes, and similar items shall be removed and salvaged. These items shall be boxed and tagged for identification according to type and size.

Conductors:

Conductors, including insulated wire and nonmetallic sheathed and flexible armored cable, shall be removed and salvaged.

Conduit:

Conduit, except where embedded in concrete or masonry, shall be salvaged. Corroded, bent, or damaged conduit shall be considered as scrap metal. Straight, undamaged lengths shall be sorted and stockpiled according to size and type.

Wiring ducts or troughs:

Wiring ducts or troughs shall be removed and salvaged. Plug-in ducts and wiring troughs shall be disassembled into unit lengths. Plug-in or disconnecting devices shall be removed from the busway and stored separately.

Miscellaneous items:

Supports, knobs, tubes, cleats, and straps shall be classified as

debris to be removed and disposed.

3.4.9 Elevators and Hoists

Elevators, hoists, and similar conveying equipment shall be removed and salvaged as whole units, to the most practical extent. Items shall be removed and prepared for salvage without damage to any of the various parts.

Rails for structural steel shall be salvaged and stored with the equipment as an integral part of the unit.

3.5 DISPOSAL OF REMOVED MATERIALS

3.5.1 General

Debris, rubbish, scrap, and other nonsalvageable materials resulting from removal operations shall be disposed of in accordance with all applicable federal, state and local regulations as contractually specified off the center. Removed materials shall not be stored on the project site.

3.5.2 Burning on Government Property

Burning of materials removed from demolished structures will not be permitted on Government property.

Federal, state, and local laws regulating the building and maintaining of brush and trash fires shall be complied with.

3.5.3 Removal to Spoil Areas on Government Property

Noncombustible materials removed from demolished structures shall be transported to designated spoil areas on Government property.

3.5.4 Removal from Government Property

Waste materials removed from demolished structures, except waste soil, shall be transported from Government property and legally disposed of. Waste soil shall be disposed of as directed.

-- End of Section --

SECTION 02 61 00.98 00

REMOVAL AND DISPOSAL OF CONTAMINATED SOILS

PART 1 GENERAL

1.1 REFERENCES

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

CODE OF FEDERAL REGULATIONS (CFR)

29 CFR 1910	(1996) Occupational Safety and Health Standards
40 CFR 261	(1993) Identification and Listing of Hazardous Waste
40 CFR 262	(1993) Standards Applicable to Generators of Hazardous Waste
49 CFR 171	(1993) General Information, Regulations and Definitions
49 CFR 172	(1993) Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements
49 CFR 178	(1993) Shipping Containers Specifications

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-07 Certificates

Statements shall be submitted for the following items in accordance with paragraphs entitled, "Site Specific Health and Safety Plan" and "Site Specific Work Plan," of this section.

Site Specific Health and Safety Plan G
Site Specific Work Plan G

1.2.1 Site Specific Health and Safety Plan

For companies performing contaminated waste soil operations, a Detailed Description of the work to be performed shall be submitted. The plan shall include but not be limited to objectives, methods, resources and personnel required to complete the task and shall evaluate the potential hazards of the chemical contaminants and explain how workers shall be protected from

those hazards. Personnel performing solid and hazardous waste activities shall be trained pursuant to 29 CFR 1910, Hazardous Waste Operations and Emergency Response (HAZWOPER) and 49 CFR 172, Transportation of Hazardous Materials. For all workers and supervisors performing solid and hazardous waste activities, include 40-hour HAZWOPER training certificates. Employees handling hazardous materials shall be trained in compliance with 49 CFR 172, and the Work Plan shall include evidence of such training. For companies performing hazardous waste operations, a copy of the Contractor's Hazard Communication Program shall be attached to the Site Specific Health and Safety Plan as an Appendix. The Program shall address the evaluation of the potential hazards of chemicals in the work place, communicating information concerning these hazards to employees and descriptions of appropriate measures. One (1) copy of the Site Specific Health and Safety Plan (including the Hazard Communication Program if required) shall be submitted at least four (4) weeks prior to beginning excavation activities.

1.2.2 Site Specific Work Plan

For contaminated waste soil operations, a Detailed Description of the work to be performed shall be submitted. The work plan shall include but not be limited to objectives, methods, resources and personnel required to complete the task including plans for the decontamination of equipment and personnel. The following shall be included:

1. Licenses/Permits - Provide the name and licenses for the waste hauler and the disposal facility.

2. Container Sizes and Suppliers - Provide sizes and suppliers of drums, roll-offs, dump trailers, dump trucks, tanker trucks and frac tank.

3. Profiles - Provide completed Waste Profile Sheets, Waste Product Questionnaires, or Waste Characterization Reports describing the type of solid or hazardous waste generated, volume, frequency, generator name and address, broker and certification statement. Land Disposal Restriction Notification forms shall be included if applicable. Analytical data, to be provided by NASA, shall accompany the Waste Profile. The COTR will obtain the required NASA signatures on the Waste Profiles.

4. Draft Manifests - Provide completed DRAFT Hazardous Waste and Solid Waste Manifests describing the waste being disposed of in accordance with 40 CFR 261.

5. A description of how stormwater and surface runoff will be prevented from entering the excavation shall also be included.

6. If Hazardous Waste soils are to be excavated, a description of the Hazardous Waste Zones Implementation shall be included (see paragraph 3.3 of this specification section).

One (1) copy of the Site Specific Work Plan shall be submitted at least four (4) weeks prior to beginning excavation activities.

1.3 NOTIFICATIONS

1.3.1 Landfill Approval Letter

Letters, forms, or other written documents supplied to the Contractor from the facility designated for the disposal of hazardous or solid waste

acknowledging the wastes are acceptable for disposal. All approvals shall be on company letterhead and bear the signature of an authorized representative of the disposal facility. Provide approval letters at least three weeks (3) prior to beginning excavation activities. No excavation activities shall be permitted prior to NASA's receipt and acknowledgement of the landfill approval letter.

1.3.2 Disposal Records

Provide Disposal Tickets, Weigh Tickets or other records supplied by the disposal facility documenting the weight of waste material disposed of at the disposal facility.

Provide disposal records to NASA within one (1) week of receipt by the Contractor.

1.3.3 Final Manifests

Provide Final, Signed Hazardous Waste and Solid Waste Manifests completed by the Contractor and the disposal facility in accordance with 40 CFR 261. The NASA Waste Management Team (WMT) (address: Glenn Research Center, Mail Stop 6-1, 21000 Brookpark Road, Cleveland, Ohio 44135) shall receive the final signed Manifest directly from the disposal facility. In the event that the Contractor receives the Final signed manifests, it shall be immediately forwarded to the NASA WMT.

1.4 QUALITY ASSURANCE

No contaminated soil shall be removed from the site without written authorization from the Government in the form of completed and signed Waste Manifests and Property Passes.

The COTR will obtain the required NASA signature on all waste profiles, (Land Disposal Restriction Forms, if applicable), property passes and manifests for contaminated waste soil shipments.

The COTR may perform inspections of containers intended for the storage or transportation of soils at any time, and will perform weekly inspections of all containers storing contaminated waste soils.

PART 2 PRODUCTS

2.1 DRUMS

Metal and fiberglass drums shall comply with 49 CFR 178.

Drums shall be marked with the manufacturer's certification, specification, approval, or exemption mark.

Reconditioned drums shall be free of old labels and markings.

Containers shall be of a suitable size and constructed of material which is compatible with the waste being placed in them. Containers shall be leak proof, sift proof and lined with 10 mil (minimum) plastic liner to prevent materials from coming into contact with the inner surface of the container.

Drums shall be identified with number provided by the COTR.

2.2 ROLL-OFFS

Containers shall be leak proof, sift proof and lined with 10 mil (minimum) plastic liner to prevent materials from coming into contact with the inner surface of the container.

Containers shall be constructed of materials which are compatible with the waste being placed in them.

Containers shall be covered with leak proof tarpaulin and secured at all times except when being loaded so that no foreign materials, debris, or rainwater enters the container.

Rolloff boxes shall be identified with number provided by the COTR.

2.3 DUMP TRAILERS AND SUMP TRUCKS

Containers shall be leak proof, sift proof and lined with 10 mil (minimum) plastic liner to prevent materials form coming into contact with the inner liner surface of the container.

Containers shall be covered with a tarpaulin and secured at all times except when loaded so that no foreign materials, debris, or rainwater enters the container.

2.4 TANKER TRUCKS

Inner and outer valves shall be in working condition with visible means of secure closure to prevent leakage.

2.5 FRAC TANKS

Inner and outer valves shall be in working condition with visible means of secure closure to prevent leakage.

Holding tanks used for the temporary storage shall be made of material which are compatible with the liquid waste.

2.6 CONTAINERS

All containers used for storage and transportation of hazardous waste soils shall meet the requirements of 49 CFR 178. Containers and liners shall also meet the requirements of the disposal facility. Containers used for the transportation of hazardous waste soils shall be labeled in accordance with 49 CFR 171 and 49 CFR 172.

PART 3 EXECUTION

3.1 STORAGE AND TRANSPORTATION

The Contractor shall obtain approval from the COTR for the location of any temporary stored soils and containers.

Excavated solid waste soil shall be placed directly into containers or trucks to prohibit infusion of rainwater or foreign debris. Excavated solid waste soils shall not be permitted to be stockpiled.

Excavated hazardous waste soil shall be placed directly into a container or truck and covered to prohibit infusion of rainwater or foreign debris.

Excavated hazardous waste soils shall not be permitted to be stockpiled.

All containers shall be properly labeled and marked prior to filling. If the soil is non-hazardous solid waste, the standard green non-hazardous waste label shall be used. If the soil is hazardous waste, the standard red and white Environmental Protection Agency (EPA)/ Department of Transportation (DOT) label shall be used until shipped. At the time of shipping, the yellow and red hazardous waste label shall be placed over the red and white label and completely filled out. Labels shall include, at a minimum, the date of generation, the project title, the Contractor's name and phone number, and the COTR's name and phone number.

Storage of any hazardous waste soil shall not exceed 90 days from the date of generation in accordance with 40 CFR 262.

Vehicles transporting waste soils for disposal shall be weighed on NASA scales located at Building 119. Vehicles shall be weighed by the Government prior to and after loading of excavated materials. The resulting weight of the waste shall be recorded on the Waste Manifests.

Vehicles transporting waste soils for disposal shall not leave NASA without a completed and signed Property Pass, and completed, numbered and signed Waste Manifest. This paperwork is required for each load leaving GRC. NASA employees are the only ones legally authorized to sign a manifest on the Government's behalf. The Contractor shall not sign any Waste Manifests. The COTR shall also obtain manifest numbers for each document. The top white copy of the Property Pass with the actual signature shall be surrendered to the Security Guards at the Main Gate when exiting the Glenn Research Center.

3.2 DISPOSAL

All soil designated as a solid waste shall be disposed of at an OEPA licensed solid waste facility. The Contractor shall comply with the requirements of the disposal facility. Soil classified as a solid waste will likely be due to the presence of low levels of chlorinated solvents, lead and mercury with levels below the TCLP threshold of hazardous waste.

All soil designated as a hazardous waste shall be disposed of at a state permitted hazardous waste facility. The Contractor shall comply with the requirements of the disposal facility. Soil classified as a hazardous waste would likely be due to the presence of chlorinated solvents such as 1, 1 dichlorobenzene, trichloroethylene, 1, 1 dichloroethylene with waste codes or D027, D040 and D029 or RCRA metals such as lead and mercury with waste codes of D008 and D009.

3.3 HAZARDOUS WASTE OPERATIONS

To reduce the spread of hazardous waste soil form contaminated areas, the Contractor shall delineate zones on the site where different types of operations will occur. The flow of personnel among these zones shall be controlled. This information shall be provided in the Work Plan.

The site shall be divided into at least 3 zones.

1. Exclusion Zone - This is the area where most of the work is accomplished and contamination is present. The outer boundary shall be identified as the Hotline. The Hotline shall be marked by hazard tape, signs, barricades and fences. Flow of personnel and equipment shall be

controlled.

2. Containment Reduction Zone - This is the transition area between the contamination area and the clean area. Decontamination of personnel and equipment shall take place in this area. The outer boundary shall be identified as Contamination Control Line.

3. Support Zone - This is the outermost area. No contamination of any kind shall exist in this area. Administrative and support functions shall be performed in this area.

3.4 STORM AND SURFACE WATER

The Contractor shall prevent Storm Water runoff from entering any open Solid Waste or Hazardous Waste excavation. The Contractor shall notify the COTR of the presence of Storm Water in excavations. Any Storm Water that accumulates in such an excavation shall be considered as a solid waste or a hazardous waste liquid and shall be containerized by the Contractor for analysis. The Contractor shall obtain sampling and analysis of the liquid in accordance with the Northeast Ohio Regional Sewer District (NEORSD) Pre-Treatment Standards. The Contractor shall coordinate the sampling and analytical through the COTR. Once the data is available, NASA will coordinate with the COTR, and shall be in accordance with this Section. If NEORSD determines that the liquid meets the Pre-Treatment Standards, NASA will direct the Contractor on the appropriate method of discharge to the Sanitary Sewer System. With either determination, the Contractor shall be responsible for all costs associated with the sampling, analysis, containerizing, transportation and disposal of the Storm Water Runoff.

3.5 GROUNDWATER

The Contractor shall notify the COTR of the presence of groundwater in excavations. Any groundwater that accumulates in such an excavation shall be considered as a solid waste or a hazardous waste liquid and shall be containerized for analysis. NASA shall obtain sampling and analysis of the liquid in accordance with the Northeast Ohio Regional Sewer District (NEORSD) Pre-Treatment Standards and shall coordinate the sampling and analytical. Once the data is available, NASA will coordinate with the NEOSRD and determine the disposition of the water. If NEORSD determines that a liquid does not meet the Pre-Treatment Standards, all subsequent transportation and disposal shall be coordinated with the COTR, and shall be in accordance with this Section. If NEORSD determines that the liquid meets the Pre-Treatment Standards, NASA will direct the Contractor on the appropriate method of discharge to the Sanitary Sewer System. With either determination, NASA shall be responsible for all costs associated with the sampling, analysis, containerizing, transportation and disposal of the groundwater.

3.6 DIFFERING SITE CONDITIONS

There is the possibility that the Contractor, in the execution of the Work, may encounter a pre-existing soil or groundwater contamination, of which NASA is unaware. If a condition occurs where contamination appears that is different than the contamination expected, the Contractor shall stop work within the immediate area of the impact and notify the COTR. The Contractor shall isolate the impacted area of the differing site condition to the smallest possible footprint, and may continue work in areas outside of the impacted area.

-- End of Section --

SECTION 23 11 23.00 98

FACILITY NATURAL-GAS PIPING

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA C104/A21.4	(2003) Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water

AMERICAN WELDING SOCIETY (AWS)

AWS WHB-2.9	(2004) Welding Handbook; Volume Two - Welding Processes

ASME INTERNATIONAL (ASME)

ASME B16.1	(2005) Standard for Gray Iron Threaded Fittings; Classes 125 and 250
ASME B16.11	(2005) Forged Fittings, Socket-Welding and Threaded
ASME B16.3	(2006) Malleable Iron Threaded Fittings, Classes 150 and 300
ASME B16.40	(2002) Manually Operated Thermoplastic Gas Shutoffs and Valves in Gas Distribution Systems
ASME B16.5	(2003) Standard for Pipe Flanges and Flanged Fittings: NPS 1/2 Through NPS 24
ASME B16.9	(2003) Standard for Factory-Made Wrought Steel Buttwelding Fittings
ASME B31.1	(2007) Power Piping
ASME B31.8	(2007) Gas Transmission and Distribution Piping Systems

ASTM INTERNATIONAL (ASTM)

ASTM A 105/A 105M	(2005) Standard Specification for Carbon Steel Forgings for Piping Applications
ASTM A 181/A 181M	(2006) Standard Specification for Carbon Steel Forgings, for General-Purpose Piping
ASTM A 197/A 197M	(2000; R 2006) Standard Specification for

	Cupola Malleable Iron
ASTM A 234/A 234M	(2007) Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service
ASTM A 269	(2007a) Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service
ASTM A 53/A 53M	(2007) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A 694/A 694M	(2003) Standard Specification for Carbon and Alloy Steel Forgings for Pipe Flanges, Fittings, Valves, and Parts for High-Pressure Transmission Service
ASTM D 1248	(2005) Standard Specification for Polyethylene Plastics Extrusion Materials for Wire and Cable
ASTM D 2513	(2008) Standard Specifications for Thermoplastic Gas Pressure Pipe, Tubing, and Fittings

HYDRAULIC INSTITUTE (HI)

ISO 7005-2	(1988) Metallic Flanges Part 2: Cast Iron Flanges

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

MSS SP-69	(2003; R 2004) Standard for Pipe Hangers and Supports - Selection and Application
MSS SP-83	(2006) Standard for Class 3000 Steel Pipe Unions Socket Welding and Threaded
MSS SP-86	(2002) Guidelines for Metric Data in Standards for Valves, Flanges, Fittings and Actuators

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 54	(2006) National Fuel Gas Code
NFPA 70	(2007) National Electrical Code - 2008 Edition

U.S. DEPARTMENT OF DEFENSE (DOD)

MIL-L-25567	(Rev E; Notice 1) Leak Detection Compound, Oxygen Systems (Metric)
MIL-V-12003	(Rev F; Am 1; CANC Notice 1) Valves,

	Plug, Cast-Iron or Steel, Manually Operated

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

FS L-C-530	(Rev C) Coating, Pipe, Thermoplastic Resin

UNDERWRITERS LABORATORIES (UL)

UL 860	(2001) Standard for Pipe Unions for Flammable and Combustible Fluids and Fire-Protection Service

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Fabrication Drawings shall be submitted for in accordance with paragraph entitled, "General Requirements," of this section.

Installation drawings shall be submitted for natural gas systems in accordance with the paragraphs entitled, "Underground Piping Systems Installation" and "Aboveground Piping Systems Installation," of this section.

SD-03 Product Data

Manufacturer's catalog data shall be submitted for the following items:

Piping Materials
Valves
Piping Specialties
Valve Boxes
Test Boxes and Markers
Riser
Transition Fitting

SD-06 Test Reports

Test reports shall be submitted for the following tests in accordance with paragraph entitled, "Testing," of this section.

Pneumatic
Leakage
Pressure

SD-07 Certificates

Certificates shall be submitted for the following items showing conformance with the referenced standards contained in this section.

Piping Materials

Valves
Piping Specialties

All welding certifications such as WPS, PQRd WQ shall be submitted to NASA's COTR at least two weeks prior to starting any work. These documents will be reviewed by NASA's designated welding inspector.

The Contractor's personnel who perform heat-fusion joining shall be qualified by the pipe manufacturer's qualifying representative prior to starting work.

PART 2 PRODUCTS

2.1 UNDERGROUND PIPING MATERIALS

2.1.1 Piping Types

Ells and tees shall be of the same type and class of material as the pipe.

Type BCS-PS: Black carbon steel piping with polyethylene sheath shall conform to ASTM A 53/A 53M, Type S seamless. In sizes through DN250 iron pipe size (ips), pipe shall have Schedule 40 wall. In size DN300 and larger, pipe wall shall be 10 millimeter thick.

Thermoplastic sheath shall conform to FS L-C-530. Sheath joints shall be made with thermally fitted shrinking sleeves applied with factory-approved shrinking devices. Taped fitting protection and repairs shall be made in accordance with manufacturer's instructions. Electrical flaw detection testing at the factory shall require 10,000 volts to be impressed across the sheath. Sheath breakdown voltage shall be not less than 13,000 volts.

Fittings shall be long-radius butt weld carbon steel conforming to ISO 7005-2, MSS SP-86, ASTM A 234/A 234M and ASME B16.1 to match pipe wall thickness. Bending of pipe is not permitted. Aboveground terminal fittings shall be 1050 kilopascal working steam pressure (wsp) forged steel, weld neck flanges to match wall thickness, conforming to ASTM A 694/A 694M, ASME B16.5, and ASTM A 181/A 181M, Class 60.

When using polyethylene pipe and fittings for underground gas distribution piping shall conform to all applicable provisions and requirements of the latest revisions of the U.S. Department of Transportation Pipeline Safety Regulations 49 CFR Part 192, Federal Minimum Safety Standards.

Polyethylene pipe shall conform to ASTM D 2513, ASTM D 1248, pipe designation PE 3408, DR 11 (100 psig MAWP) and colored yellow for natural gas.

Polyethylene fittings shall use compounds complying with all appropriate requirements of Part 192 of the Federal minimum safety standards. Heat fusion fittings shall be allowed only when joining new sections of pipe together that are the same material type and size and approved by NASA's System Manager. All other connections shall be electrofusion couplings.

A single conductor 14 AWG wire with type TW insulation with a minimum thickness of 30 millimeters shall be installed with HDPE pipe to facilitate pipe location.

2.1.2 Natural Gas Shutoff Valve Assemblies

Lubricated plug valves for carbon steel pipe

Valves shall be Type 1, Style A, taper plug type rated for not less than 1200 kilopascal water, oil, or gas (wog) service and shall conform to MSS SP-86 and MIL-V-12003.

Valves shall be cylindrical plug type, constructed to service pressure and materials requirements specified for taper plug valves. In addition, clearance between plug and body sealing surfaces shall be 0.0508 millimeter, maximum, for valves to DN50 ips and 0.075 to 0.127 millimeter for larger valves. Plug stem seal and bottom support shall be reinforced tetrafluoroethylene, and plug shall be bottom spring loaded.

Plug shall be restricted port type unless full ports or proportioning ports are specified.

Valves shall be provided with screwed end connections for all sizes DN25 ips and smaller and with flanged connections for all larger valves.

Valves shall have an effective sealing and lubrication system which, when actuated, forces movement of plug within seating surfaces.

Extended lubricant lines with check valves shall be provided for grease gun access at grade. Lubricant shall be identified and sufficient quantity provided to lubricate each valve at least once.

T-handle extension operators adapted to valve stem shall be provided for sizes DN150 ips and smaller.

T-handle extensions and worm and gear operator shall be provided for valves DN200 ips and larger. Operator shall not require input of more than 70 newton-meter of torque, shall be totally enclosed, grease packed, and sealed for 6000 millimeter head submerged service in brackish water. Worm and shaft shall be steel, gear shall be bronze. Worm shaft shall be mounted in bronze sleeve bearings. Operator shall have open and close stops and plug position indication.

All external surfaces shall be coated with bituminous sealer conforming to AWWA C104/A21.4.

High density polyethlene valves for underground installation only, shall conform to ASME B16.40. Polyethlene ball valve in shall be full port HDPE, PE 3408 DR 11 with dual purges and high head extension. All valves and larger shall have gear operator and shall turn clockwise to close. Valves with exposed metal parts requiring cathodic protection or which require maintenance or lubrication will not be allowed.

2.1.3 Valve Boxes

Valve boxes shall be of not less than 5 millimeter thick cast-iron construction with locking cover with an appropriate identification legend. Cover shall require a special wrench for access. Boxes shall be adjustable extension type with screw- or slide-type adjustment. Valves DN75 and under shall be fitted with 108 millimeter diameter shaft. Valves DN100 and larger shall be fitted with 133 millimeter diameter shaft. Bases shall be fitted to the valve. Box full-extended length shall be greater than required by depth of cover by not less than 100 millimeter. One

valve-operating wrench shall be supplied for each size of valve wrench nut. Guide rings shall be provided where operating rods are longer than 1800 millimeter. Internal and external surfaces shall be coated with bituminous sealer conforming to AWWA C104/A21.4.

Valve Boxes shall be case iron shaft screw type, with lid marked "GAS", length to suit burial depth.

2.2 ABOVEGROUND PIPING MATERIALS

Type BCS-NG: Black carbon steel

Pipe (DN6 through DN250 and where indicated): Schedule 40 seamless black carbon steel, conforming to ASTM A 53/A 53M, Grade B, Type S

Pipe (DN300 and over): 10 millimeter (4 inches and over): standard weight wall electric resistance welded black carbon steel, conforming to ASTM A 53/A 53M, Grade B, Type E

Fittings (DN25 and under): Class 300 banded black malleable iron screwed, conforming to ASTM A 197/A 197M, ASME B16.3 and ASTM A 234/A 234M

Unions (DN25 and under): Class 300 female, screwed, black malleable iron with brass to iron seat and ground joint, conforming to MSS SP-83 and UL 860

Fittings (DN32 and over): Steel butt weld, conforming to ASTM A 234/A 234M and ASME B16.9 to match pipe wall thickness, or steel socket weld, conforming to ASTM A 105/A 105M and ASME B16.11.

Flanges (DN32 and over): Class 150 forged steel socket or welding neck to match pipe wall thickness, and conforming to ASME B16.5 and ASTM A 694/A 694M

All carbon steel piping will be painted with 1 coat primer and 2 finish coats of safety yellow.

Tubing (all sizes with DN8 outside diameter minimum): Seamless 304 stainless steel ASTM A 269 or equivalent.

2.3 PIPING SPECIALTIES

2.3.1 Appliance Connectors

Connectors shall be corrugated bronze metal with brazed inverted flare-type brass fittings complete with transition for ips connection. Maximum length shall be 1800 millimeter. Connectors shall be AGA-approved type.

2.3.2 Natural Gas Pressure-Reducing Station

2.3.2.1 Pressure-Reducing Station - See Project Drawings

2.4 VALVES

2.4.1 Eccentric Plug Valves (EPV-UL)

Eccentric plug valve maximum size shall be limited to DN80 ips.

Eccentric plug valves shall be constructed with semisteel body, bronze plug with Buna-N resilient elastomer seals. Body sealing face shall be plastic coated. Body end connection shall be screwed for sizes DN25 ips and smaller and flanged in sizes through DN80 ips. Plug shall be top and bottom guided by oil-impregnated bronze bushings and shall be corrosion-resistant steel spring-loaded. Valves shall be rated at 1200 kilopascal wog and shall be UL listed for natural gas service. Valves shall be fitted with pinned lever operators.

Valves shall be provided with locking device where noted.

2.4.2 Gasket Material

Gasket material and type shall be in accordance with NFPA 54.

PART 3 EXECUTION

3.1 UNDERGROUND PIPING SYSTEMS INSTALLATION

3.1.1 Installation

Installation of natural gas systems shall be performed in accordance with ASME B31.8 in the presence of the Contracting Officer who shall be notified by the Contractor 48 hours in advance of start of installation.

All excavations shall be dry and clear of extraneous materials when pipe is being laid.

Piping shall be laid beginning at the low point of a system; when in final position it shall be true to the grades and alignment indicated, with unbroken continuity of invert.

Connection to existing main gas line shall be as noted.

Connections between new work and existing gas line shall be made to the satisfaction of the Contracting Officer, using proper specials and fittings to suit the actual conditions. When connections are made by tapping into a gas main, the connecting fitting shall be the same size as the pipe to be connected.

Gas mains shall be graded for the complete drainage of condensate to drips placed at low points; service lines shall be graded to drain to the main line wherever practical.

Crossings of gas mains under traffic lanes shall be made as shown.

Drips shall be installed where shown and at all low points whether indicated or not. Drips shall conform to the details indicated or shall be of commercial manufacture approved as to type and capacity. A DN32 or larger blowoff pipe shall be connected to each drip at its lowest point and shall extend to or near the ground surface at a convenient location outside of traffic. Discharge terminal shall be provided with a reducing fitting, plug valve, and DN15 nipple turned down. Discharge terminal shall be inside a length of 300 millimeter or larger vitrified clay pipe or concrete sewer pipe, set vertically on a bed of coarse gravel 300 millimeter thick and about 1 meter square, and closed at the ground surface with a suitable replacement cover. When details are not shown, drips shall be made of DN150 pipe 3700 millimeter long, laid parallel and completely below the gas main

and shall be provided with DN32 or larger blowoff as specified above.

When installed underground beneath buildings, gas piping shall be encased in a conduit that shall extend into a normally usable and accessible portion of the building. At the point where the conduit terminates in the building, the space between the conduit and the gas piping shall be sealed to prevent the entrance of gas into the building. Conduit shall extend at least 100 millimeter outside the building, shall be vented above grade, and shall be installed in a manner that will prevent the entrance of water. Conduit shall be of the same materials as used for the line being enclosed. Vent shall be fitted with a metal identification plate indicating its function.

Conduit passing through walls below grade and ground floor slab shall pass through pipe sleeves larger than conduit and shall be made watertight.

In fill areas, conduit passing under or through building grade beams shall have a minimum clearance of 100 millimeter in all directions to prevent damage.

On excavations occurring near and below building footing, the backfilling material shall consist of Class 2000A concrete poured or pressure grouted up to the level of the footing.

Where pipe penetrates earth or concrete grade, not less than 300 millimeter of polyethylene-coated Type BCS-PS pipe shall be exposed to view.

Type BCS-PS materials shall be installed for underground and aboveground piping and in accordance with the manufacturer's instructions. Pipe shall be palletized in padded pallets at the factory and shall be handled from pallet to final position with padded gear. Surfaces shall be protected from the sun with black polyethylene sheeting. Prior to being lowered into a trench, sheeting shall be checked for continuity with 10,000 volts applied by a continuity detector with an audible alarm. In the trench, after joints and fittings have been made, previously untested surfaces shall be checked for continuity. When discontinuities in thermoplastic sheeting are found, not less than 300 millimeter of material upstream and downstream of the fault shall be removed and replaced.

After valves, valve operators, and valve boxes have been inspected, and not less than 48 hours prior to being lowered into a trench, external surfaces shall be coated with a compatible bituminous coating for protection against brackish ground water.

Application shall be in accordance with the manufacturer's instructions and shall result in a dry-film thickness of not less than 0.30 millimeter.

After pressure testing and approval, valves and valve operators shall be thoroughly cleaned, coated with bitumen, wrapped with tape, and recoated with bitumen to form an impervious membrane. Tape shall be glass-fiber reinforced with parallel strands of continuous filament within the fiber structure, bonded with an insoluble, inert, resinous binder that is compatible with bituminous material used.

Prior to backfilling, coated and wrapped pipe and valves shall be tested with an electric holiday detector operating at from 10,000 to 15,000 volts. Defects shall be repaired by clipping back the coatings to the bare metal and recoating with the materials as specified for the original work and to the satisfaction of the Contracting Officer.

Defective materials found shall be distinctly marked and promptly removed from the site.

3.1.2 Valve Boxes

Valves and valve boxes shall be installed where indicated and shall be set plumb. Valve boxes shall be centered on the valves. Where feasible, valves shall be located outside traffic areas. Soil shall be carefully tamped around each valve box to a distance of 1200 millimeter on all sides of the box or to the undisturbed trench face if less than 1200 millimeter. Valve boxes located in roads or sidewalks shall be protected by a concrete slab as indicated.

3.2 ABOVEGROUND PIPING SYSTEMS INSTALLATION

3.2.1 Aboveground Piping

Aboveground piping with operating pressures in excess of 3.5 kilopascal, designated "high pressure," shall be fabricated and installed in accordance with ASME B31.8, AWS WHB-2.9 and MSS SP-69.

Work shall be performed in the presence of the Contracting Officer who shall be notified 48 hours in advance of start of work.

Pipe shall be fabricated to measurements established on the job and shall be carefully worked into place without springing or forcing. Adequate provision shall be made for absorbing all expansion and contraction without stress in any part of the system.

Pipe, tubing, fittings, valves, equipment, and accessories shall be visibly clean and free of foreign material before being installed into the respective systems. Pipe shall be cleaned by hammering, shaking, or swabbing, or by a combination of methods. Lines shall be purged with dry, oil-free compressed air after erection, but purging out shall not be relied upon for removing all foreign matter. Purge velocity shall be equal to 1-1/2 times maximum normal flow velocity. During the progress of construction, open ends of pipe, fittings, and valves shall be properly protected at all times to prevent the admission of foreign matter. Plugs or caps shall be placed in the ends of installed work at all times when connecting work is not actually under way. Plugs shall be commercially manufactured products approved by the Contracting Officer. Outlets, including valve outlets, shall be securely closed gastight with a threaded plug or cap immediately after installation and shall be left closed until the gas equipment is connected thereto.

Piping shall be installed straight and true with approved offsets around obstructions and with expansion bends or fitting offsets essential to a satisfactory installation, and as may be necessary to increase headroom or to avoid interference with the building construction, electric conduit, or facilities equipment.

Natural gas piping smaller than DN15 ips shall not be concealed.

When installing piping that is to be concealed, the following and similar connections shall not be concealed: unions, tubing fittings, running threads, right and left couplings, and swing joints made by combinations of fittings.

Standard long sweep pipe fittings shall be used for changes in direction; no mitered joints or unapproved pipe bends will be permitted.

Pipe bends in seamless pipe of not less than 5 pipe diameters radius may be made with hydraulic benders in the field for pipe sizes to DN100 ips upon approval of the Contracting Officer.

Tee connections shall be made with screwed tee fittings or butt, or, where pipe is being welded, branch connections may be made with either butt or socket welding tees or forged branch outlet fittings, either being acceptable without size limitation. Branch outlet fittings, where used, shall be forged, flared for improved flow where attached to the run, reinforced against external strains, and designed to withstand full pipe-bursting strength requirements.

Short-radius elbows may be used only where specifically authorized by the Contracting Officer.

Horizontal piping shall have a grade of 25 millimeter per 31 meter.

Reducers shall be concentric or eccentric. Eccentric reducers shall be used where required to permit proper drainage of pipe lines. Bushings as reducers are not permitted. Drain valves shall be provided in all piping systems at low points.

Installation of piping shall be such as to prevent stresses and strains from being placed on connected equipment.

Dielectric connection shall be provided at inlet side to building pressure regulator.

Expansion bends in steel pipe shall be made from pipe sections and long radius welding elbows in sizes DN25 and larger. Expansion U-bends shall be cold sprung and welded into the line, which shall be anchored before removing the spreader from the expansion U-bend. Amount of cold spring shall be as indicated.

3.2.2 Joints

Joints larger than DN25 ips shall be welded.

Pipe ends shall be reamed before joint connections are made.

Screwed joints shall be made up with joint compound.

Joint compounds shall be applied to the male thread only, and care shall be exercised to prevent compound from reaching the interior of the pipe.

Screwed unions, welded unions, or bolted flanges shall be provided wherever required to permit convenient removal of equipment, valves, and piping accessories from the piping system.

Flanged joints shall be assembled with appropriate flanges, gaskets, and bolting. Clearance between flange faces shall be such that the connections can be gasketed and bolted tight without imposing undue strain on the piping system. Flange faces shall be parallel and the bores concentric. Gaskets shall be centered on the flange faces without projecting into the bore. Bolting shall be lubricated with oil and graphite before assembly to ensure uniform bolt stressing. Flange bolts shall be drawn up and

tightened in staggered sequence in order to prevent unequal gasket compression and deformation of the flanges. Wherever a flange with a raised face is joined to a companion flange with a flat face, the raised face shall be machined down to a smooth matching surface and a full face gasket shall be used. After the piping system has been tested and is in service at its maximum temperature, bolting shall be retightened to achieve minimum gasket seating stress recommended by the gasket manufacturer. Only hex-head nuts and bolts shall be used.

Gasket material shall be fresh stock.

Uncoated metallic gaskets shall be assembled with specified compound.

Field-welded joints shall conform to the requirements of the AWS WHB-2.9 and ASME B31.1.

Copper tubing for solder joints shall be cut square, and burrs shall be removed with approved cutting and reaming tools. Inside surfaces of fittings and outside surfaces of tubes in joint area shall be cleaned with steel wool before assembly of joint. Joint flux, solder, and heat source shall be applied in accordance with the manufacturer's instructions to provide proper capillary action to fill the socket space and to achieve 100 percent shear-line strength. Valves in copper piping shall have screwed ends with end adapters to suit mechanical connections, unless solder jointing is specified or indicated for a given application. Copper joints that fail pressure tests shall be remade with new materials, including pipe or tubing fittings and filler metal.

Copper tubing for mechanical joints shall be cut square, and burrs shall be removed with approved cutting and reaming tools. Care shall be exercised not to work-harden copper surfaces during flaring and, in case of doubt, tube ends shall be cut off and annealed by heating and air cooling in accordance with the manufacturer's instructions.

3.2.3 Control and Instrument Piping

Tubing shall be mechanically attached to supporting surfaces. Supports using adhesives shall not be acceptable.

Stainless steel tubing horizontal supports for less than three tubes shall be rigid 25 by 10 millimeter metal channel and proprietary metal tube race for three or more tubes.

3.2.4 General Service Valve Locations

Valves shall be located to permit isolation of branch piping and each equipment item from the balance of the system and to allow safe and convenient access without moving equipment and with a minimum of piping and equipment disassembly.

Valves shall be provided in piping mains and branches and at equipment where indicated and where specified.

Three-valve bypasses shall be provided around pressure regulating valves and where indicated.

No valve shall be placed in an inaccessible space.

3.3 NATURAL GAS SYSTEMS TESTING

3.3.1 Tests

Prior to acceptance of the work, the Contractor shall test completed systems in the presence of the Contracting Officer.

Tests shall be Pneumatic and shall utilize dry, oil-free nitrogen. Testing shall be done in two stages, preliminary and acceptance.

Personnel not directly involved in pneumatic testing of ferrous piping in excess of 35 kilopascal shall be evacuated from the area.

Testing of any system for any purpose shall include preliminary testing by the process of swabbing of all joints under test with standard high-film-strength soap solution conforming to MIL-L-25567, and the subsequent observation for bubbles at internal pressures not in excess of 35 kilopascal.

When testing reveals that Leakage exceeds specified limits, the leaks shall be isolated and repaired, defective materials shall be replaced where necessary, and the system shall be retested until specified requirements are met. Leaking gasket joints shall be remade with new gaskets and new flange bolting. Removed bolting and gaskets shall not be used again. Leaking tubing joints shall be remade with new fittings and new tube ends.

Only standard piping flanges, plugs, caps, and valves shall be used for sealing off piping for test purposes.

Components that could sustain damage due to test pressure shall be removed from piping systems during testing. Piping system components such as valves shall be checked for proper operation under system test pressure.

No test media shall be added to a system during a test for a period specified or determined by the Contracting Officer.

Duration of a test will be determined by the Contracting Officer and shall be for a minimum of 15 minutes with a maximum of 24 hours. Tests may be terminated by the Contracting Officer at any point during this period after it has been determined that the permissible leakage rate has not been exceeded.

Test material shall be retained in piping system after successful testing until purged by natural gas. No ambient air shall be permitted to enter piping system.

Records of piping systems tests shall be prepared and maintained. Records shall show Governmental and Contractor test personnel responsibilities, dates, test gage identification numbers, ambient temperatures, pressure ranges, rates of pressure drop, and leakage rates. Each acceptance test shall require the signature of the Contracting Officer.

3.3.2 Test Gages

Contractor's test gages shall have dial size 125 millimeter or larger with accuracy of plus or minus one-half of 1 percent of full-scale range. Dial graduations and pointer width shall be compatible with readability to one-half the accuracy extremes. Maximum permissible scale range for a given test shall be such that the pointer during a test shall have a

starting point at midpoint of the dial or within the middle third of the scale range. Certification of accuracy and correction table shall bear a date within 90 calendar days prior to the test, and shall show test gage number and the project number.

3.3.3 Acceptance Pressure Testing

Testing shall take place during steady ambient temperature conditions.

Any reduction of test pressures shall be deemed to indicate the presence of leaks which shall be corrected unless the pressure loss can otherwise be accounted for. A correction of plus or minus 2 kilopascal will be allowed for each degree change between initial and final system temperature, plus for an increase in temperature and minus for a decrease.

Test duration shall be long enough to determine if there are any leaks but not less than 1 hour for each 14 cubic meter of pipe volume or fraction thereof, except that when testing a system having a volume of less than 0.3 cubic meter, the test duration may be reduced to 15 minutes. For piping systems having a volume of more than 680 cubic meter, the duration of the test shall be 24 hours.

Control and instrumentation tubing systems shall be tested at 200 kilopascal and the test pressure shall be maintained for a period of not less than 24 hours with no pressure drop.

3.3.4 Purging of Piping

During construction, where necessary, purge valves shall be provided and located to ensure complete system purging with discharge exterior to the building.

3.3.5 Lighting of Pilot Lights

Equipment using natural gas under this Contract shall be lighted in the presence of the Contracting Officer.

3.4 ELECTRICAL WORK

3.4.1 Electrical Service

120/240 volts, single-phase, 60-hertz. Contractor equipment with voltage requirements other than that specified shall have transformer equipment.

3.4.2 Electrical Bonding and Grounding

Each aboveground portion of gas piping system upstream of the equipment shutoff valve shall be electrically continuous and bonded to any grounding electrode, in accordance with NFPA 70.

3.4.3 Electrical Circuits

Electrical circuits shall not utilize gas piping or components, except that low voltage (50 volts or less) control circuits, ignition circuits, and electronic flame detection device circuits may use piping or components for a part of an electrical circuit.

An electrically operated normally open safety control shall be provided to shut off the flow of gas if the power fails.

-- End of Section --

SECTION 23 31 13.20 40

WELDING METAL DUCTWORK

PART 1 GENERAL

1.1 REFERENCES

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

ASME INTERNATIONAL (ASME)

ASME B31.1	(2007) Power Piping
ASME B31.5	(2006) Refrigeration Piping and Heat Transfer Components
ASME B31.8	(2007) Gas Transmission and Distribution Piping Systems
ASME BPVC SEC IX	(2007) Boiler and Pressure Vessel Code; Section IX, Welding and Brazing Qualifications
ASME BPVC SEC V	(2007) Boiler and Pressure Vessel Code; Section V, Nondestructive Examination
ASME BPVC SEC VIII D1	(2007) Boiler and Pressure Vessel Code; Section VIII, Pressure Vessels Division 1 - Basic Coverage

INTERNATIONAL CODE COUNCIL (ICC)

ICC IPC	(2006; Supplement 2007) International Plumbing Code

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Manufacturer's catalog data shall be submitted for Welding Equipment and Welding Rods and Accessories in accordance with paragraph entitled, "Welding Equipment," of this section.

SD-04 Samples

Welder's Pre-Qualification Samples shall be submitted prior to start.

SD-06 Test Reports

Test reports shall be submitted for Radiographs.

SD-07 Certificates

Certificates for the following shall be submitted in accordance with paragraph entitled, "Quality Assurance," of this section.

Certified Welding Procedure Specifications (WPS)
Certified Procedure Qualification Records (PQR)
Certified Welder Performance Qualifications (WPQ)

1.3 QUALITY ASSURANCE

Within fifteen (15) calendar days after receipt of Notice to Proceed, the Contractor shall submit for approval to the Contracting Officer Certified Welding Procedure Specifications (WPS) and Certified Procedure Qualification Records. (PQR)

Fifteen (15) calendar days prior to any employee welding on project material, the Contractor shall submit for approval to the Contracting Officer two (2) copies of each Certified Welder Performance Qualifications (WPQ).

1.3.1 Personnel Qualifications

This specification contains the minimum requirements for qualifying welding procedures, welders, and welding operators for making and inspecting welds in mechanical fabrications of carbon steel, low alloy steel, extra-high-strength quenched and tempered low alloy steels, and austenitic stainless steel materials.

Welder's Pre-Qualification Samples shall be submitted by qualified welding operators performing work on contract prior to start. Only after acceptance of samples, will qualified welding operator be permitted to begin work.

The Welder's Performance Qualification (WPQ) shall be affected when the following occurs (QW322):

Welder has not used the process within a six (6) month period, prior to expiration of qualifications.

Welder can extend qualifications for an additional six (6) months with proof of process by means of Welder's Log.

1.3.2 Pressure Vessels Qualification

Qualification documents WPS, PQR and WPQ shall be in accordance with ASME BPVC SEC IX.

1.3.3 Piping Qualifications

1.3.3.1 Low Pressure Piping

Refrigeration Piping: Qualification documents for below 860 kilopascal (125 psig), WPS, PQR and WPQ for "Refrigeration Piping" shall be in accordance with ASME B31.5.

Plumbing: Plumbing work shall be performed by a state licensed plumber registered in the state where the work is being performed.

1.4 WELDING EQUIPMENT

Manufacturer's catalog data shall be provided for welding equipment and welding rods and accessories. Equipment shall meet referenced standards contained in this section.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.1 CONSTRUCTION

3.1.1 Piping

3.1.1.1 Low Pressure (Below 860 kilopascal)

Refrigeration Piping: Piping systems shall be fabricated, assembled and welded/brazed/soldered in accordance with the ASME B31.5.

Plumbing: Plumbing systems shall be fabricated, assembled and welded/brazed/soldered in accordance with ICC IPC.

Other Low Pressure Piping: Other low pressure piping systems shall be fabricated, assembled and welded/brazed/soldered in accordance with the ASME B31.1.

3.2 HEAT INPUT REQUIREMENTS

3.2.1 Preheat

Welding shall not be done at ambient temperature below 0 degrees C, or when the surfaces are wet or exposed to rain, snow, or high wind. Temperature of the metals in the area where the welding is to be done shall be not less than 10 degrees C. When the ambient conditions are such that the normal temperature of the base metal is below 10 degrees C, the area surrounding the joint shall be preheated to provide a base metal temperature of 38 degrees C for a distance of at least 75 millimeter in all directions from the joint to be welded. Preheat shall be in accordance with ASME BPVC SEC VIII D1 and ASME BPVC SEC V.

3.2.2 Interpass

In a multipass weld, the interpass temperature is the temperature of the weld metal before the next pass is started. Interpass requirements shall be in accordance with ASME BPVC SEC VIII D1.

3.2.3 Postweld

Weldments shall not be given a postweld heat treatment unless noted in the applicable code qualified/certified welding documentation, WPS, PQR and WPQ.

3.3 INSPECTION/NONDESTRUCTIVE TESTING (NDT)

3.3.1 General

Fabrication/Erection inspection shall be performed prior to assembly, during assembly, during welding and after welding to ensure that materials and workmanship meet the requirements of the contract documents.

Each specified radiograph shall, as a minimum, have the following additional information permanently included in the image:

Agency Weld No. (including repair cycle no.)

Agency drawing No.

Agency View No.

Agency Contract No.

Final interpretation and acceptance of all Radiographs of welded joints, with the exception of code stamped pressure vessel welds, will be by the Contracting Officer.

Final acceptance of all welded joints shall be by the Contracting Officer.

Prior to the Contracting Officer's inspection, all slag and scale shall be removed from all welds. Procedure employed shall not produce notches in either the weld metal or adjacent base metal.

Unacceptable welds shall be immediately repaired and made ready for Government reinspection at no additional cost to the Government.

After weld joints have been satisfactorily completed by the Contractor and accepted by the Contracting Officer, the joint area shall be cleaned to a bright, unpitted, and unscarred surface and then protected in accordance with the contract documents.

3.3.2 Pressure Vessels

3.3.2.1 Test Method

All nondestructive testing shall be performed in accordance with the requirements of ASME BPVC SEC V.

3.3.2.2 Acceptance Requirements

Acceptance requirements shall be in accordance with ASME BPVC SEC V.

3.3.3 Piping

3.3.3.1 Test Method

NDT (Nondestructive Testing) of all piping systems, except plumbing systems, shall be performed in accordance with the requirements of ASME BPVC SEC V.

3.3.3.2 Acceptance Requirements

Low Pressure (Below 860 kilopascal):

a. Other low pressure piping systems shall meet the requirements of ASME B31.8.

3.4 PROTECTION OF ADJACENT MATERIALS

Contractor shall sufficiently protect machinery, materials, floor, furnishings, finishes and other items adjacent to the welding/brazing operations to prevent any damage from these operations.

-- End of Section --

SECTION 26 00 00.00 98

GENERAL ELECTRICAL PROVISIONS

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Z535.1	(2002) Standard for Safety Color Code

ASTM INTERNATIONAL (ASTM)

ASTM A 123/A 123M	(2008) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE C2	(2007) National Electrical Safety Code

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2008) National Electrical Code

U.S. DEPARTMENT OF DEFENSE (DOD)

MS MIL-T-704	(Rev K) Treatment and Painting of Material

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

FS A-A-59214	(2004) Junction Box: Extension, Junction Box; Cover, Junction Box (Steel, Coated With Corrosion-Resistant Finish)

UNDERWRITERS LABORATORIES (UL)

UL Elec Const Dir	(2005) Electrical Construction Equipment Directory

1.2 SUBMITTALS

Not Used

1.3 INTERPRETATION OF DRAWINGS AND SPECIFICATIONS

It is the intent of these specifications and the contract drawings to provide a complete and workable facility.

Design drawings are diagrammatic and do not show all offsets, bends, elbows, or other specific elements that may be required for proper installation of the work. Such work shall be verified at the site.

Additional bends and offsets, and conduit as required by vertical and horizontal equipment locations or other job conditions, shall be provided to complete the work at no additional cost to the Government.

Except where shown in dimensional detail, the locations of switches, receptacles, lights, motors, outlets, and other equipment shown on plans are approximate. Such items shall be placed to eliminate interference with ducts, piping, and equipment. Exact locations shall be determined in the field. Door swings shall be verified to ensure that light switches are properly located.

Equipment sizes indicated are minimum. Before installing any wire or conduit, the Contractor shall obtain the exact equipment requirements and shall install wire, conduit, disconnect switches, motor starters, heaters, circuit breakers, and other items of the correct size for the equipment actually installed. Wire and conduit sizes shown on the drawings shall be taken as a minimum and shall not be reduced without written approval.

1.4 CODES AND STANDARDS

Equipment design, fabrication, testing, performance, and installation shall, unless shown or specified otherwise, comply with the applicable requirements of NFPA 70 and IEEE C2 to the extent indicated by the references.

1.5 COORDINATION

Installation of the electrical work shall be coordinated with the work of other trades.

1.6 APPROVAL REQUIREMENTS

Where materials and equipment are specified to conform to the standards of the Underwriters Laboratories (UL), the label of, or listing with re-examination, in UL Elec Const Dir will be acceptable as sufficient evidence that the items conform to the requirements.

Where materials or equipment are specified to be constructed or tested in accordance with the standards of NEMA, ANSI, ASTM, or other recognized standards, a manufacturer's certificate of compliance indicating complete compliance of each item with the applicable NEMA, ANSI, ASTM, or other commercial standards specified will be acceptable as proof of compliance.

1.7 PREVENTION OF CORROSION

Metallic materials shall be protected against corrosion. Equipment enclosures shall be given a rust-inhibiting treatment and the standard finish by the manufacturer when used for most indoor installations. For harsh indoor environments (any area subjected to chemical and/or abrasive action), and all outdoor installations, refer to Section 09 96 00.00 40 HIGH- PERFORMANCE COATINGS. Aluminum shall not be used in contact with earth or concrete. Dissimilar metals in intimate contact shall be protected by approved fittings, barrier material, and treatment. Ferrous metals such as anchors, bolts, braces, boxes, bodies, clamps, fittings, guards, nuts, pins, rods, shims, thimbles, washers, and miscellaneous parts not of corrosion-resistant steel or nonferrous materials shall be hot-dip galvanized in accordance with ASTM A 123/A 123M for exterior locations and cadmium-plated in conformance with FS A-A-59214 for interior locations.

1.8 HAZARDOUS AREA

Electrical work within any hazardous location shall meet the applicable requirements of NFPA 70, Chapter 5, Articles 500 through 517. The following definitions apply:

Explosionproof: A receptacle, fixture, device, or equipment enclosure that is designed to withstand explosion of a specified liquid, gas, vapor, or dust within the enclosure and to prevent the ignition of a specified gas, vapor, or dust surrounding the enclosure by sparks, flashes, or explosions of the specified liquid, gas, vapor, or dust that may occur within the enclosure. Enclosure shall be capable of operating at an external temperature that will not ignite a surrounding flammable atmosphere.

Hazardous location: An area where ignitable vapors or dust may cause a fire or explosion created by energy emitted from lighting or other electrical equipment or by electrostatic generation.

NFPA 70, Article 500-2 lists chemical atmospheres by groups A, B, C, and D. In addition, although not defined as a hazardous material by the NEC, oxygen concentrations (liquid and gaseous) are considered to provide a hazard because of the increased flammability of materials exposed to oxygen. Therefore, oxygen concentrations shall be classified under Group D.

PART 2 PRODUCTS

2.1 IDENTIFICATION PLATES

Identification plates shall be 2-layer black-white, engraved to show black letters on a white background. Letters shall be uppercase. Identification plates 40 millimeter 40 millimeter high and smaller shall be 2 millimeter thick with engraved lettering 3 millimeter high. Identification plates larger than 40 millimeter high shall be 3 millimeter thick with engraved lettering not less than 5 millimeter high. Identification plates having edges of 40 millimeter high and larger shall be beveled.

2.2 WARNING SIGNS

Each item of electrical equipment operating at 480 volts and above shall be provided with conspicuously located warning signs conforming to the requirements of Occupational Safety and Health Agency (OSHA) standards.

Any equipment with externally powered wiring shall be marked with a laminated plastic nameplate having 5 millimeter high white letters on a red background as follows:

DANGER - EXTERNAL VOLTAGE SOURCE

Safety color coding for identification of warning signs shall conform to ANSI Z535.1.

2.3 ANCHOR BOLTS

Anchor bolts shall be provided for equipment placed on concrete equipment pads or slabs.

2.4 SEISMIC ANCHORAGE

Electrical equipment, except communications, emergency, and standby equipment, shall be anchored to withstand a lateral force of 0.3 times the weight of the equipment.

Communications, emergency, and standby equipment shall be anchored to withstand a lateral force of 0.6 times the weight of the equipment.

2.5 PAINTING

Enclosures of the following listed items shall be cleaned, primed, and factory-painted inside and outside in accordance with MS MIL-T-704 and the equipment sections of this specification.

ITEM	FINISH COLOR
Circuit Breakers	ANSI No. 61 gray
Transformers	ANSI No. 61 gray
Safety Switches	Manufacturer's standard
Electric Heaters	Manufacturer's standard
Motors	Manufacturer's standard
Limit Switches	Manufacturer's standard
Control Components	Manufacturer's standard

PART 3 EXECUTION

3.1 INSTALLATION

Installation shall be accomplished by workers skilled in this type of work. Installation shall be made so that there is no degradation of the designed fire ratings of walls, partitions, ceilings, and floors. Except as otherwise indicated, emergency switches and alarms shall be installed in conspicuous locations.

3.2 PAINTING APPLICATION

Exposed conduit, supports, fittings, cabinets, pull boxes, and racks, if not factory painted, shall be thoroughly cleaned and painted as specified in the equipment sections in this specification unless otherwise noted. Work shall be left in a neat and clean condition at final completion of the contract.

Emergency equipment, such as fire-alarm boxes, shall be cleaned, primed, and painted red.

3.3 IDENTIFICATION PLATE INSTALLATION

Identification plates shall be fastened by means of corrosion-resistant steel or nonferrous metal screws. Hand lettering, marking, or embossed self-adhesive tapes are not acceptable.

3.4 EQUIPMENT PADS

Equipment pads shall be constructed with a minimum 100 millimeter margin around the equipment and supports.

3.5 CUTTING AND PATCHING

Contractor shall install his work in such a manner and at such time as will require a minimum of cutting and patching on the building structure.

Holes in or through existing masonry walls and floors in exposed locations shall be drilled and smoothed by sanding. Use of a jackhammer will be permitted only where specifically approved.

3.6 DAMAGE TO WORK

Required repairs and replacement of damaged work shall be done as directed by and subject to the approval of the Contracting Officer, and at no additional cost to the Government.

3.7 CLEANING

Exposed surfaces of wireways, conduit systems, and equipment that have become covered with dirt, plaster, or other material during handling and construction shall be thoroughly cleaned before such surfaces are prepared for final finish or painting or are enclosed within the building structure.

Before final acceptance, electrical equipment, including lighting fixtures and glass, shall be clean and free from dirt, grease, and fingermarks.

3.8 FIELD TESTING AND TEST EQUIPMENT

All Field testing specified in Divisions 16 electrical specification shall be made with test equipment specially designed and calibrated for the purpose. Test equipment used shall be calibrated and certified by an approved testing laboratory. Date of last calibration and certification shall not be more than 90 calendar days old at the time of field testing.

-- End of Section --

SECTION 26 05 00.00 98

BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Z535.1	(2006) Standard for Safety Color Code

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

ANSI/NEMA FB 1	(2007) Standard for Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable
ANSI/NEMA OS 1	(2003) Standard for Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports
NEMA KS 1	(2001) Miscellaneous Distribution Equipment Switches (600 Volts Maximum)
NEMA RN 1	(2005) Standard for Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit
NEMA TC 13	(2005) Standard for Electrical Nonmetallic Tubing (ENT)

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2008) National Electrical Code

UNDERWRITERS LABORATORIES (UL)

UL 1	(2005) Standard for Flexible Metal Conduit
UL 1242	(2006) Standard for Electrical Intermediate Metal Conduit - Steel
UL 6	(2007) Standard for Electrical Rigid Metal Conduit-Steel
UL 797	(2007) Standard for Electrical Metallic Tubing
UL 870	(2008) Standard for Wireways, Auxiliary Gutters, and Associated Fittings

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Material, Equipment, and Fixture Lists shall be submitted for the following:

Conduits, Raceway sand Fittings
Wire and Cable
Splices and Connectors
Outlets, Outlet Boxes, and Pull Boxes

SD-03 Product Data

Manufacturer's catalog data shall be submitted for the following items:

Conduits, Raceway sand Fittings
Wire and Cable
Splices and Connectors
Outlets, Outlet Boxes, and Pull Boxes

SD-06 Test Reports - **"G"**

Continuity and Insulation Resistance Test
Phase-Rotation Tests
Insulation Resistance Test

SD-08 Manufacturer's Instructions

Manufacturer's Instructions shall be submitted.

1.3 PREVENTION OF CORROSION

Metallic materials shall be protected against corrosion. Equipment enclosures shall have the standard finish by the manufacturer when used for most indoor installations. For harsh indoor environments (any area subjected to chemical and/or abrasive action), and all outdoor installations, refer to Section 09 96 00.00 40 HIGH-PERFORMANCE COATINGS. Aluminum shall not be used in contact with earth or concrete and, where connected to dissimilar metal, shall be protected by approved fittings and treatment. Ferrous metals such as, but not limited to, anchors, bolts, braces, boxes, bodies, clamps, fittings, guards, nuts, pins, rods, shims, thimbles, washers, and miscellaneous spare parts not of corrosion-resistant steel shall be hot-dip galvanized except where other equivalent protective treatment is specifically approved in writing.

1.4 GENERAL REQUIREMENTS

Material, Equipment, and Fixture Lists shall be submitted for the following items showing manufacturer's style or catalog numbers, specification and drawing reference numbers, warranty information, and fabrication site.

Manufacturer's Instructions shall be submitted including special provisions required to install equipment components and system packages. Special

notices shall detail impedances, hazards and safety precautions.

PART 2 PRODUCTS

2.1 MATERIALS

Materials and equipment to be provided shall be the standard cataloged products of manufacturers regularly engaged in the manufacture of the products.

2.1.1 Rigid Steel Conduit

Rigid steel conduit shall be in accordance with UL 6 and shall be galvanized by the hot-dip process. Where underground and in corrosive areas, rigid steel conduit shall be polyvinylchloride (PVC) coated in accordance with NEMA RN 1 or shall be painted with bitumastic.

Fittings for rigid steel conduit shall be threaded.

Gaskets shall be solid. Conduit fittings with blank covers shall have gaskets, except in clean, dry areas or at the lowest point of a conduit run where drainage is required.

Covers shall have captive screws and shall be accessible after the work has been completed.

2.1.2 Electrical Metallic Tubing (EMT)

EMT shall be in accordance with UL 797 and shall be zinc coated steel. Couplings and connectors shall be zinc-coated, raintight, gland compression with insulation throat. Crimp, spring, or setscrew type fittings shall not be acceptable.

2.1.3 Flexible Metallic Conduit

Flexible metallic conduit shall be in accordance with UL 1 and shall be galvanized steel.

Fittings for flexible metallic conduit shall be specifically designed for such conduit.

Liquidtight flexible metallic conduit shall be provided with a protective jacket of PVC extruded over a flexible interlocked galvanized steel core to protect wiring against moisture, oil, chemicals, and corrosive fumes.

Fittings for liquidtight flexible metallic conduit shall be specifically designed for such conduit.

2.1.4 Intermediate Metal Conduit

Intermediate metal conduit shall be in accordance with UL 1242 and shall be galvanized.

2.1.5 Rigid Nonmetallic Conduit

Rigid nonmetallic conduit shall be in accordance with NEMA TC 13 and shall be PVC with wall thickness not less than Schedule 40.

2.1.6 Wireways and Auxiliary Gutters

Wireway and auxiliary gutters shall be a minimum 100 by 100 millimeter trade size conforming to UL 870.

2.2 WIRE AND CABLE

Conductors installed in conduit shall be copper 600-volt type THWN. All conductors 3.15 millimeter diameter (AWG No. 8) and larger, shall be stranded. All conductors smaller than 3.15 millimeter diameter (AWG No. 8) shall be solid.

Flexible cable shall be Type SO and shall contain a grounding conductor with green insulation.

Conductors installed in plenums shall be marked plenum rated.

2.3 SPLICES AND CONNECTORS

Splices in 3.15 millimeter diameter (AWG No. 8) and smaller shall be made with approved indentor crimp-type connectors and compression tools.

Splices in 4.1 millimeter diameter (AWG No. 6) and larger shall be made with indentor crimp-type connectors and compression tools or bolted clamp-type connectors. Joints shall be wrapped with an insulating tape that has an insulation and temperature rating equivalent to that of the conductor.

2.4 SWITCHES

2.4.1 Safety Switches

Safety switches shall be in accordance with NEMA KS 1, and shall be the heavy-duty type with enclosure, voltage, current rating, number of poles, and fusing as indicated. Switch construction shall be such that, with the switch handle in the "ON" position, the cover or door cannot be opened. Cover release device shall be coinproof and shall be so constructed that an external tool must be used to open the cover. Provisions shall be made to lock the handle in the "OFF" position, but the switch shall not be capable of being locked in the "ON" position.

Switches shall be of the quick-make, quick-break type. Terminal lugs shall be approved for use with copper conductors.

Safety color coding for identification of safety switches shall conform to ANSI Z535.1.

2.5 RECEPTACLES

2.6 OUTLETS, OUTLET BOXES, AND PULL BOXES

Outlet boxes for use with conduit systems shall be in accordance with ANSI/NEMA FB 1 and ANSI/NEMA OS 1 and shall be not less than 40 millimeter deep. Pull and junction boxes shall be furnished with screw-fastened covers.

PART 3 EXECUTION

3.1 CONDUITS, RACEWAYS AND FITTINGS

Conduit runs between outlet and outlet, between fitting and fitting, or between outlet and fitting shall contain not more than the equivalent of three 90-degree bends, including those bends located immediately at the outlet or fitting.

Crushed or deformed conduit shall not be installed. Trapped conduit runs shall be avoided where possible. Care shall be taken to prevent the lodgment of foreign material in the conduit, boxes, fittings, and equipment during the course of construction. Clogged conduit shall be cleared of obstructions or shall be replaced.

Conduit and raceway runs concealed in or behind walls, above ceilings, or exposed on walls and ceilings 1470 millimeter or more above finished floors and not subject to mechanical damage may be electrical metallic tubing (EMT).

3.1.1 Rigid Steel Conduit

Field-made bends and offsets shall be made with approved hickey or conduit bending machine. Conduit elbows larger than 65 millimeter shall be long radius.

Conduit stubbed-up through concrete floors for connections to free-standing equipment with the exception of motor-control centers, cubicles, and other such items of equipment, shall be provided with a flush coupling when the floor slab is of sufficient thickness. Otherwise, a floor box shall be provided and set flush with the finished floor. Conduits installed for future use shall be terminated with a coupling and plug set flush with the floor.

3.1.2 Electrical Metallic Tubing (EMT)

EMT shall be grounded in accordance with NFPA 70, using pressure grounding connectors especially designed for EMT.

3.1.3 Flexible Metallic Conduit

Flexible metallic conduit shall be used to connect recessed fixtures from outlet boxes in ceilings, transformers, and other approved assemblies.

Bonding wires shall be used in flexible conduit as specified in NFPA 70, for all circuits. Flexible conduit shall not be considered a ground conductor.

Electrical connections to vibration-isolated equipment shall be made with flexible metallic conduit.

Liquidtight flexible metallic conduit shall be used in wet and oily locations and to complete the connection to motor-driven equipment.

3.1.4 Intermediate Conduit

Field-made bends and offsets shall be made with approved hickey or conduit bending machine. Intermediate metal conduit shall be used only for indoor installations.

3.1.5 Rigid Nonmetallic Conduit

Rigid PVC conduit shall be direct buried.

A green insulated copper grounding conductor shall be in conduit with conductors and shall be solidly connected to ground at each end. Grounding wires shall be sized in accordance with NFPA 70.

3.2 WIRING

Feeder and branch circuit conductors shall be color coded as follows:

CONDUCTOR	COLOR AC
Phase A	Black
Phase B	Red
Phase C	Blue
Neutral	White
Equipment Grounds	Green

Conductors up to and including 6.5 millimeter diameter (AWG No. 2) shall be manufactured with colored insulating materials. Conductors larger than 6.5 millimeter diameter (AWG No. 2) shall have ends identified with color plastic tape in outlet, pull, or junction boxes.

Splices shall be in accordance with the NFPA 70. Conductor identification shall be provided within each enclosure where a tap, splice, or termination is made and at the equipment terminal of each conductor. Terminal and conductor identification shall match as indicated.

Where several feeders pass through a common pullbox, the feeders shall be tagged to clearly indicate the electrical characteristics, circuit number, and panel designation.

3.3 WIRING DEVICES

3.4 BOXES AND FITTINGS

Pullboxes shall be furnished and installed where necessary in the conduit system to facilitate conductor installation. Conduit runs longer than 30 meter or with more than three right-angle bends shall have a pullbox installed at a convenient intermediate location.

Boxes and enclosures shall be securely mounted to the building structure with supporting facilities independent of the conduit entering or leaving the boxes.

3.5 IDENTIFICATION PLATES AND WARNINGS

Identification plates shall be furnished for all line voltage enclosed circuit breakers, identifying the equipment served, voltage, phase(s) and power source. Circuits 480 volts and above shall have conspicuously located warning signs in accordance with OSHA requirements.

3.6 PAINTING

Exposed conduit, supports, fittings, cabinets, pull boxes, and racks shall be thoroughly cleaned and painted.

3.7 FIELD TESTING

After the installation is complete wire and cable shall be given a continuity and insulation resistance test. Insulation resistance test shall be with a 500 - volt insulation test set. Readings shall be recorded after a minimum of 3 minutes and until the reading is constant for 1 minute. Resistance between phase conductors and ground shall be no less than 25 megohms.

Phase-rotation tests shall be conducted on three-phase circuits using a phase-rotation indicating instrument. Phase rotation of electrical connections to connected equipment shall be A, B, C left to right, or top to bottom facing the equipment.

Final acceptance will depend upon the satisfactory performance of the equipment under test. No conductor or circuit shall be energized until the installation has been approved by the Contracting Officer. Final test data shall be provided to the Contracting Officer. Data shall have a cover letter/sheet clearly marked with the System name, Date, and the words "Final Test Data - Forward to the Systems Engineer/Condition Monitoring Office/Predictive Testing Group for inclusion in the Maintenance Database."

-- End of Section --

SECTION 26 42 00.98

CATHODIC PROTECTION

PART 1 GENERAL

1.1 REFERENCES

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

ASME INTERNATIONAL (ASME)

ASME B16.39	(1998) Malleable Iron Threaded Pipe Unions Classes 150, 250, and 300

NACE INTERNATIONAL (NACE)

NACE RP0169	(2002) Control of External Corrosion on Underground or Submerged Metallic Piping Systems

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA TC 2	(2003) Electrical Plastic Tubing (EPT) and Conduit (EPC-40 and EPC-80)

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2008) National Electrical Code

UNDERWRITERS LABORATORIES (UL)

UL 510	(2005) Insulating Tape
UL 514A	(2004) UL Standard for Safety - Metallic Outlet Boxes
UL 6	(2007) UL Standard for Safety for Electrical Rigid Metal Conduit-Steel

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Evidence of qualifications of Qualified Corrosion Engineer shall be submitted in accordance with the paragraph entitled, "Services of Corrosion Engineer," of this section.

SD-02 Shop Drawings - **"G"**

Installation Drawings shall be submitted in accordance with the

paragraph entitled, "Shop Drawings," of this section.

SD-03 Product Data - **"G"**

Manufacturer's catalog data shall be submitted for the following items:

Anodes
Electrical Wire
Electrical Connections
Conduit
Test Boxes and Junction Boxes
Coatings
Preformed Sheaths
Epoxy Potting Compound
Pavement Inserts
Electrically Insulating Pipe Joints

SD-06 Test Reports - **"G"**

Test reports shall be submitted in booklet form tabulating the following field tests and measurements performed in accordance with the paragraph entitled, "Tests and Measurements," of this section.

Static Potential-to-Soil
Insulation Tests
Output Measurements
Electrode Potential Measurements

1.3 GENERAL REQUIREMENTS

Section 26 00 00 00, "GENERAL ELECTRICAL PROVISIONS," applies to work specified in this section.

1.3.1 Services of Corrosion Engineer

Contractor shall obtain the services of a corrosion engineer to supervise and inspect the installation of the cathodic protection system. Qualified Corrosion Engineer refers to a person, who, by reason of his 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 on buried or submerged metallic piping systems and metallic tanks. Such person may be a licensed professional engineer or may be a person certified by the National Association of Corrosion Engineers if such licensing or certification includes suitable experience in corrosion control on buried or submerged metallic piping systems and metallic tanks. Corrosion engineer's name and qualifications shall be certified in writing to the Contracting Officer for approval prior to the start of construction.

Corrosion engineer shall ensure that the cathodic protection system is installed, tested, and placed into service in accordance with the requirements specified.

1.3.2 Rules

Installation shall conform to the requirements of NFPA 70.

1.4 DELIVERY, STORAGE, AND HANDLING

Storage area for anodes will be designated by the Contracting Officer. If anodes are not stored in a building, tarps or similar protection shall be used to protect anodes from inclement weather. Package anodes, damaged as a result of improper handling or exposure to rain, shall be resacked by the Contractor and the required backfill added.

PART 2 PRODUCTS

2.1 ANODES

2.1.1 Magnesium Anodes

Magnesium anodes shall be Type III Grade AAA corresponding to the applicable chemical composition listed in the following table:

PERCENT BY WEIGHT

ELEMENT	TYPE III
Aluminum	5.3 - 6.7
Zinc	2.5 - 3.5
Manganese	0.15 Min.
Copper	0.02 Max.
Silicon	0.10 Max.
Iron	0.003 Max.
Nickel	0.002 Max.
Others	0.30 Max.
Magnesium	Balance

2.1.2 Anode Wire

Anode lead wire shall be 3.25 millimeter diameter (AWG No. 8)stranded copper wire, not less than 3000 millimeter long, unspliced, complying with NFPA 70, Type TW, RHW, USE, or polyethylene black insulation. Lead wires for magnesium anodes shall be factory installed with the place of emergence from the anode in a cavity sealed flush with a dielectric sealing compound.

2.1.3 Artificial Backfill

Anodes shall be factory packaged with an artificial backfill in a water-permeable fabric sack or cardboard container. Anodes shall be packaged on a vibrating platform to attain dense packing. Centering shall be assured by means of spacers.

Artificial backfill shall have the following composition:

Material	Approximate Percent by Weight
Gypsum	75
Bentonite	20
Sodium Sulfate	5
Total	100

2.2 PIPE LEAD WIRE

Pipe lead wire shall be AWG No. 8 stranded copper wire with Type TW, RHW, USE, or polyethylene red insulation conforming to NFPA 70.

2.3 ELECTRICAL CONNECTIONS

Connecting wire splicing shall be performed only by the use of exothermic welds.

2.4 CONDUIT

Rigid galvanized steel conduit and accessories shall conform to UL 6. Non-metallic conduit shall conform to NEMA TC 2.

2.5 TEST BOXES AND JUNCTION BOXES

Boxes shall be outdoor type conforming to UL 514A.

2.6 JOINT, PATCH, SEAL, AND REPAIR COATINGS

Sealing and dielectric compound shall be a black, rubber-based compound that is soft, permanently pliable, tacky, moldable, and unbacked. Compound shall be applied as recommended by the manufacturer, but not less than 15 millimeter thick.

Coating compound shall be cold-applied coal-tar base mastic.

Pressure-sensitive vinyl plastic electrical tape shall conform to UL 510.

2.7 PREFORMED SHEATHS

Sheaths for encapsulating electrical wire splices to be buried underground shall fit the insulated wires entering the spliced joint.

2.8 EPOXY POTTING COMPOUND

Compound for encapsulating electrical wire splices to be buried underground shall be a two-package system made for the purpose.

2.9 TEST STATIONS

Stations shall be flush mounted type and shall be made of high impact molded glass filled polycarbonate with watertight conduit connections and shall have lockable cover, brass name tag, and scribed arrow showing pipeline direction.

Stations shall be watertight so that electrical terminals are maintained in a dry environment when cabinet is submerged under water.

Stations shall be furnished with a five lead terminal board with terminals accessible from both sides. Terminal board shall be designed for easy removal from the housing to permit above the "surface of the ground" access for taking test readings.

Stations shall have color-coded covers for identification of the following underground piping systems.

PIPING SYSTEM	COLOR CODED COVER
Natural Gas	Yellow

Stations shall be maintenance free and all hardware such as machine screws,

washers, and hex nuts shall be nickel plated brass.

Stations shall be designed and constructed for dimensional and electrical stability from minus 51 degrees C to plus 121 degrees C.

2.10 PAVEMENT INSERTS

Pavement inserts shall be used to permit access to soil under paved areas for taking pipe-to-soil potential readings over existing underground piping systems.

Pavement inserts shall be of the same construction and design as the test stations and shall be designed to be embedded in streets or sidewalks in urban and high vehicular traffic areas.

Pavement inserts shall be designed for flush mounting in paved areas.

Pavement inserts shall have color-coded covers to match color coding for test stations for identification of the underground piping systems.

Pavement inserts shall be maintenance free and hardware shall be nickel plated brass.

2.11 ELECTRICALLY INSULATING PIPE JOINTS

Electrically insulating pipe joints for above or below ground use shall be flexible, mechanical pipe couplings of an electrically insulating type consisting of bolted or compression design provided with electrically insulating joint harness if required to provide pull-out strength.

Threaded type electrically insulating pipe joints shall have molded plastic screw threads and shall only be used above ground. Machined plastic screw threads shall not be used.

Electrically insulating pipe joints shall be of a type that is in regular factory production.

2.11.1 Dielectric Unions

Dielectric unions shall conform to the requirements of ASME B16.39. Class designation for dimensional, strength and pressure requirements shall conform to the specified requirements for the piping system in which the union is to be installed. Insulating barrier shall limit galvanic current to one percent of the short circuit current in a corresponding metallic joint.

2.11.2 Flange Insulating Kits

Class designation for dimensional, strength, and pressure requirements shall conform to the specified requirements for the piping system in which the flange insulation set is to be installed.

Flanges in pipelines shall be electrically insulated by inserting an insulating gasket between the two flange faces. Insulating gaskets may have the same outside diameter as the flange, may fit within the bolt circle of the flange faces, or may fit into the ring groove of ring type joint flanges. Flange coupling securing bolts shall be insulated from the flange face bolt holes by installing insulating sleeves over the shanks of the bolts and insulating washers and steel washers under the bolt heads and

nuts. Insulating bolt sleeves shall be of sufficient length to extend half way inside the steel washer. Insulating sleeves and washers may be combined as a one piece unit.

2.11.2.1 Gasket Materials

Gaskets shall be manufactured from material having low water absorption and high compressive strength. Preference shall be given to materials with low "m" and "y" factors. The "y" factor is a measure of the compressive load required to establish an initial seal, while the "m" factor is an indication of the additional load required to hold fluid pressure needed to keep the seal in operation. The smaller these factors are, the less bolt loading is required.

2.11.2.2 Insulating Bolt Sleeve and Washer Materials

Insulating bolt sleeves and washers shall be manufactured from material having low water absorption, high dielectric strength, and low cold flow characteristics. They should be suitable for the service conditions of the particular application.

PART 3 EXECUTION

3.1 INSTALLATION

All equipment shall be installed in accordance with the manufacturer's recommendations.

3.1.1 Anodes

Anodes of the size indicated shall be installed at the locations shown. Locations may be changed to clear obstructions if approved. Anodes shall be installed as indicated in a dry condition after any plastic or waterproof protective covering has been completely removed from the water permeable, permanent container housing the anode metal. Anode connecting wire shall not be used for lowering the anode into the hole. Annular space around the anode shall be backfilled with fine earth in 150 millimeter layers and each layer shall be hand tamped. Care must be exercised not to strike the anode or connecting wire with the tamper. Approximately 20 liter of water shall be applied to each filled hole after anode backfilling and tamping has been completed to a point about 150 millimeter above the anode. After the water has been absorbed by the earth, backfilling shall be completed to the ground surface level.

In the event a rock strata is encountered prior to achieving specified augured hole depth, the Contractor shall notify the Contracting Officer. With the Contracting Officer's approval, the Contractor may then install the anodes horizontally to a depth at least as deep as the bottom of the pipe to be protected.

Anodes shall be installed a minimum of 900 millimeter and a maximum of 3000 millimeter from the line to be protected.

Single anodes spaced as shown shall be connected through a test station to the pipeline, allowing adequate slack in the connecting wire to compensate for movement during backfill operation.

Connections to ferrous pipe shall be made by exothermic weld methods manufactured for the type of pipe.

Electric arc welded connections and other types of welded connections to ferrous pipe and structures shall be approved before use.

3.1.2 Anode Lead Connections

If the anode lead wire is not of sufficient length to connect the anode to the pipe or test station, an additional length of 3.25 millimeter diameter (AWG No. 8) stranded copper wire shall be added and spliced to the anode lead wire using a homogeneous exothermic welding process. Splice shall be insulated with two half-lapped layers of 20 millimeter wide rubber tape and two half-lapped layers of 20 millimeter wide polyethylene tape.

Connections of anode lead wire to pipe shall be made by an approved exothermic welding process following the instructions of the manufacturer. Installation shall be in strict accordance to manufacturer's recommendations.

Before the anode lead connection is made, the pipe shall be inspected to verify that the condition of the pipe is sound for making an exothermic weld. If the condition of the pipe is proven to be sound, the pipe connection area shall be cleaned to bare metal by means of scraping, filing or other approved methods. Cleaning of the pipe shall be by manual methods and no power-driven wheels or wire brushes shall be used.

Before the anode lead connection is made to a natural gas pipeline, an approved gas leak detector shall be used to determine if there is any gas leakage near the pipe area to be welded. Should a gas leak be discovered, it shall be brought to the immediate attention of the Contracting Officer. Connection shall not be made until the leak is properly repaired and an alternative safe location for the connection is approved by the Contracting Officer and the Contractor's corrosion specialist.

After the anode lead or test lead to pipe connections have been made, they shall be covered with mastic sealant and plastic shield.

Anode lead connection to test station terminals shall be made with insulated compression ring terminals.

3.1.3 Test Stations

Test stations shall be of the type shown and installed at the location shown and shall be flush mounted in concrete. Buried electrically insulating joints shall be provided with test wire connections brought to a test station.

Test stations shall be installed with color-coded covers to identify the piping system on which it is installed as specified in this specification. Each new test station shall be identified by number as depicted on the drawings. Contractor shall furnish and install a screw mounted 50 millimeter round brass identifying tag with 15 millimeter stamped characters onto each test station cover.

Location of the pipeline in relation to the test station shall be indicated by an arrow inscribed in the concrete base of the test station.

3.1.4 Pavement Inserts

Pavement inserts shall be flush mounted and installed in paved areas as

shown on the drawings. Inserts shall be installed with color-coded covers to identify the piping system on which it is installed as specified in this specification.

Pavement inserts shall be installed as closely as possible over the center line of underground pipeline to permit accurate evaluation of future pipe-to-soil potential surveys. Contractor shall use and furnish all necessary labor and pipe location equipment to locate and mark center lines of underground piping systems. Use of reference dimensions on contract drawings shall not be used for determining the center lines of underground piping systems.

3.2 CRITERIA OF PROTECTION

Criteria for determining the adequacy of protection on a buried pipe shall be in accordance with NACE RP0169 and shall be selected by the corrosion engineer as applicable.

3.2.1 Iron and Steel

The following method shall apply:

3.2.1.1 850 mV Negative Voltage

A negative voltage of at least minus 0.85 volt as measured between the pipe and a saturated copper-copper sulfate reference electrode contacting the earth directly over the pipe. Determination of this voltage shall be made with the cathodic system in operation.

3.3 TESTS AND MEASUREMENTS

3.3.1 Baseline Potentials

After backfill of the pipe and anodes is completed, but before the anodes are connected to the pipe, the Static Potential-to-Soil of the pipe shall be measured. Locations of these measurements shall be identical to the locations specified for pipe- to-reference Electrode Potential Measurements. Initial measurements shall be recorded.

3.3.2 Insulation Testing

Before the anode system is connected to the pipe, Insulation Tests shall be made at each insulating joint or fitting. This test shall demonstrate that no metallic contact, or short circuit exists between the two insulated sections of the pipe. Any insulating fittings installed and found to be defective shall be reported to the Contracting Officer.

3.3.3 Anode Output

As the anodes or groups of anodes are connected to the pipe, current Output Measurements shall be taken with an approved low resistance ammeter. Values obtained and the date, time, and location shall be recorded.

3.3.4 Pipe- To-Reference Electrode Potential Measurements

Upon completion of the installation and operation of the entire cathodic protection system electrode potential measurements shall be made using a copper-copper sulfate reference electrode and a potentiometer-voltmeter, or a direct current voltmeter having an internal resistance (sensitivity) of

not less than 100,000 ohms per volt and a full scale of 1 or 2 volts. Locations of these measurements shall be identical to the locations used for the baseline potentials. Values obtained and the dates, times, and locations of measurements shall be recorded.

3.3.5 Location of Measurements

3.3.5.1 Piping

For coated piping, measurements shall be taken from the reference electrode in contact with the earth, directly over the pipe. Connection to the pipe shall be made at service risers, valves, test leads, or by other means suitable for test purposes. Measurements shall be made at intervals not exceeding 120 meter. In no case shall less than three measurements be made over any length of line. Additional measurements shall be made at each distribution service riser, with the reference electrode placed directly over the service line.

3.3.6 Recording Measurements

All pipe- to-soil potential measurements including initial potentials, where required, shall be recorded. Contractor shall locate, correct and report to Contracting Officer any short circuits to foreign pipes encountered during checkout of the installed cathodic protection system. Pipe- to-soil potential measurements are required on as many pipes as necessary to determine the extent of protection or to locate short-circuits.

3.4 PIPE JOINTS

3.4.1 Electrical Continuity

Underground pipe shall be electrically continuous except at places where electrically insulating joints are specified. Pipe joined by means other than welding shall meet electrical continuity requirements.

Mechanical joints that are not factory designed to provide electrical continuity shall be bonded by installing a metallic bond across the joint. Bonding connections shall be made by the exothermic welding process.

Mechanical joints designed to provide electrical continuity shall meet manufacturer's published standards.

3.4.2 Coating

Mechanical joints and fittings of either the electrically conductive or insulating type shall be coated with an underground type dielectric coating system. Where external electrical continuity bonds are installed across mechanical joints, all bare or exposed metal, welds, bare wire and exposed coupling parts shall be coated with a coating system.

Couplings and fittings which have a low profile exterior designed to permit tape coating shall be primed and wrapped with an underground type pipe tape following recommendations of the coupling or fitting manufacturer.

Couplings and fittings that cannot be properly taped shall be enclosed in a spaced mold manufactured for the purpose and filled with a cold applied dielectric compound.

3.5 ELECTRICAL ISOLATION OF STRUCTURES

3.5.1 Insulating Fittings

Insulating flanges and couplings shall be installed above ground, or within manholes, wherever possible. An insulating device that electrically separates a pipeline shall not be installed in a confined area where a combustible atmosphere may collect, unless precautions are taken to prevent arcing, such as by means of externally located lightning arresters, grounding cells, or other means. Insulating flanges and couplings in lines entering buildings shall be located at least 300 millimeter above grade or floor level. Pipelines entering buildings either below or above ground shall be electrically isolated from the structure wall with an electrically isolating wall sleeve.

3.5.2 Gas Distribution Piping

Electrical isolation shall be provided at each building riser pipe to the pressure regulator, at all points where a short circuit to another structure or to a foreign structure may occur, and at other locations as indicated.

Electrical isolation shall be provided at each building entrance, and at other locations as indicated.

3.6 DISSIMILAR METALS

3.6.1 Underground Dissimilar Piping

Buried piping of dissimilar metals including new and old steel piping, excepting valves, shall be electrically separated by means of electrically insulating joints at every place of connection. Insulating joint, including the pipe, shall be coated with an underground type dielectric coating for a minimum distance of 10 diameters on each side of the joint.

3.6.2 Underground Dissimilar Valves

Dissimilar ferrous valves in a buried ferrous pipeline, including the pipe, shall be coated with an underground type dielectric coating for a minimum distance of 10 diameters on each side of the valve.

Brass or bronze valves shall not be used in a buried ferrous pipeline.

3.6.3 Above ground Dissimilar Pipe and Valves

If the dissimilar metal pipe junction, including valves, is not buried and exposed only to atmosphere, the connection or valve, including the pipe, shall be coated with an underground type dielectric coating for a minimum distance of three diameters on each side of the junction.

3.7 CASING

Where a pipeline is installed in a casing under a roadway or railway, the pipeline shall be electrically insulated from the casing and annular space sealed against incursion of water.

3.8 SHOP DRAWINGS

Installation Drawings shall be submitted for cathodic protection systems

consisting of a complete list of equipment and materials including manufacturer's descriptive and technical literature, catalog cuts, and installation instructions. Drawings shall also contain complete wiring and schematic diagrams and any other details required to demonstrate that the system has been coordinated and will function properly as a unit.

-- End of Section --

SECTION 31 23 02.98

EXCAVATION, BACKFILLING, AND COMPACTING FOR UTILITIES

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)

AASHTO M 145	(1991; R 2003) Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes
AASHTO T 180	(2001) Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop
AASHTO T 2	(2000) Sampling of Aggregates
AASHTO T 87	(1986; R 2000) the Dry Preparation of Disturbed Soil and Soil Aggregate Samples for Test

AMERICAN WOOD-PRESERVERS' ASSOCIATION (AWPA)

AWPA C1	(2003) All Timber Products - Preservative Treatment by Pressure Processes
AWPA C3	(1988) Piles - Preservative Treatment by Pressure Processes

ASTM INTERNATIONAL (ASTM)

ASTM C 136	(2001) Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
ASTM D 1556	(2000) Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D 2922	(2001) Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
ASTM D 3740	(2001) Standard Practice for Evaluation of Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used In Engineering Design and Construction
ASTM D 422	(2002) Standard Test Method for Particle-Size Analysis of Soils

ASTM D 4318	(2000) Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Record of Existing Conditions shall be submitted in accordance with the paragraph entitled, "Records of Existing Conditions," of this section.

The records shall include the following:

Location of Underground Utilities
Location of Approved Utilities
Location of Test
Location of Inspection

SD-02 Shop Drawings

As-Built Drawings shall be submitted in accordance with paragraph entitled, "Drawings," of this section.

SD-06 Test Reports

Test reports shall be submitted in writing by the Contractor for Soil Test results within 5 calendar days. Reports shall be according to the paragraph entitled, "Field Quality Control," of this section.

SD-07 Certificates

Certificates for the following shall be submitted by the Contracting Officer in accordance with the paragraph entitled, "Plans," of this section.

Demolition Plan
Work Plan
Protection Plan

Certificates for Proposed Soil Materials shall be submitted by the Contracting Officer in accordance with paragraph entitled, "Proposed Soil Materials," of this section.

Certificates for Compost shall be submitted indicating grade and compliance to state and local regulations.

1.3 QUALITY ASSURANCE

Soil survey for satisfactory soil materials and samples of soil materials shall be furnished by the Contractor. A certified soil-testing service approved by the Contracting Officer shall be provided by the Contractor. Testing shall include soil survey for satisfactory soil materials, sampling

and testing soil materials proposed for use in the work, subbase materials at the mixing plant, and field-testing facilities for quality control during construction period.

Testing agencies shall conform to the requirements of ASTM D 3740.

1.4 PLANS

The Demolition Plan shall be approved by the Contracting Officer at least 48 hours in advance of the work. The plan shall include all special environmental consideration and safety precautions along with the coordination procedures for the protection plan and work plan of this phase of work.

A Work Plan shall be submitted including proposed methods of excavation, earth support, utility construction, and backfilling at least 48 hours in advance of the work, for approval by the Contracting Officer. The plan shall be coordinated with the demolition and protection plans of this section.

The Contractor shall provide a Protection Plan of existing utilities place, and coordinate the plan with the demolition plan.

1.5 DRAWINGS

As-Built Drawings shall be submitted in accordance with Section 01 78 00.98, "CLOSEOUT SUBMITTALS."

1.6 RECORDS OF EXISTING CONDITIONS

The Contractor shall verify the existing conditions are correct as shown on the plans and mentioned in the specification. Any discrepancies found shall be noted immediately, and notification given to the Contracting Officer.

The records shall include Location of Underground Utilities, Location of Approved Utilities, Location of Test and Location of Inspection.

PART 2 PRODUCTS

2.1 STRUCTURAL MATERIALS

Materials used for shoring and bracing, such as sheet piling, uprights, stringers, and crossbraces, shall be in good serviceable condition. Any timber used shall be sound and free from large or loose knots.

Pressure-treated timber shall be used where wood sheeting or piling is specified or indicated to be cut and left in place. Timber and treatment shall conform to AWPA C1. Pressure treatment for piles shall conform to AWPA C3. Chromate Copper Arsenate (CCA) retention shall be not less than 13 kilogram per cubic meter.

2.2 BACKFILL MATERIAL

Backfill material shall consist of sandy clay, sand, gravel, soft shale, or other satisfactory soil materials.

2.2.1 Proposed Soil Materials

Soil materials proposed for use in the work shall be tested. The materials shall be approved by the Contracting Officer prior to start of work, as follows:

MATERIAL	REQUIREMENT	TEST METHOD	NUMBER OF TESTS
Satisfactory soil materials	Sampling	AASHTO T 2	One for each source of material to determine conformance to definition of satisfactory soil materials; additional tests whenever there is any apparent change
	Preparation of samples	AASHTO T 87	
	Sieve analysis of fine and coarse aggregate	ASTM C 136	
	Mechanical analysis of soils	ASTM D 422	
	Liquid limit of soils	ASTM D 4318	
	Plastic limit and plasticity index of soils	ASTM D 4318	
	Moisture-density relations of soil	AASHTO T 180, Method B or D	

2.2.2 Satisfactory Materials

Satisfactory soil materials - AASHTO M 145 Soil Classification Groups A-1, A-2-4, A-2-5, and A-3.

2.2.3 Unsatisfactory Materials

Unsatisfactory soil materials - AASHTO M 145 Soil Classification Groups A-2-6, A-2-7, A-4, A-5, A-6, and A-7, highly organic soils, and soil materials of any classification that have a moisture content at the time of compaction beyond the range of 1 percentage point below and 3 percentage points above the optimum moisture content of the soil material as determined by moisture-density relations test.

2.3 TOPSOIL

Topsoil shall be any soil removed from the project site which consists of clay or sandy loam. The topsoil shall be reasonably free from subsoil, clay lumps, brush, objectionable weeds, and other litter, and shall be free from stones, stumps, roots, and other objectionable materials larger than 50 millimeter in any dimension.

2.4 TOPSOIL BLEND

Where insufficient topsoil is removed from the project site the topsoil removed shall be stockpiled and blended with compost at the site to achieve the required volume.

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

Before starting earthwork, the location of underground utilities shall be carefully verified by hand methods. Utilities to be left in place shall be protected from damage.

Prior to starting any excavation work, Contractor shall submit NASA form C-927 "Excavation Permit" to the COTR.

Excavation, filling, backfilling, and grading shall be to subgrade elevations specified.

Excavated materials suitable for backfill shall be piled in an orderly manner sufficiently distant from excavations to prevent overloading, slides, and cave-ins.

Excavations shall be done in ways that will prevent surface water and subsurface water from flowing into excavations and will also prevent flooding of the site and surrounding area.

3.2 PROTECTION OF PERSONS AND PROPERTY

Excavations shall be barricaded and posted with warning signs for the safety of persons. Warning lights shall be provided during hours of darkness.

Structures, utilities, sidewalks, pavements, and other facilities immediately adjacent to excavations shall be protected against damage including settlement, lateral movement, undermining, and washout.

Topsoil removal operations shall be conducted to ensure safety of persons and to prevent damage to existing structures and utilities, construction in progress, trees and vegetation to remain standing, and other property.

3.3 SHORING, BRACING, AND SHEETING

Shoring and bracing in excavations shall be maintained for the entire length of time excavations will be open. Shoring and bracing shall be carried down with the excavation.

Sheeting used to prevent lateral movement of soil shall be removed in accordance with the requirements.

Untreated sheeting shall not be left in place beneath structures or pavements.

3.4 TRENCH EXCAVATION

Trenches shall be of adequate width and depth for the specified purpose. Side slopes of the trenches shall be as nearly vertical as practicable. Care shall be taken not to overexcavate. Bottoms of the trenches shall be accurately graded to provide uniform bearing and support for each section of pipe on undisturbed soil at every point along its entire length except where it is necessary to excavate for bell holes and for proper sealing of pipe joints. Bell holes and depressions for joints shall be dug after the trench bottom has been graded to ensure that the pipe rests on the prepared

bottom for as much of its full length as practicable. Bell holes and depressions shall be only of such length, depth, and width as required to make the joint. Stones shall be removed, as necessary, to avoid point bearing. Where rock excavation is required in trenches for pipe, the rock shall be excavated to a minimum overdepth of 150 millimeter below the trench depth specified. Except as specified for wet or otherwise unstable material, overdepths shall be backfilled with materials specified for backfilling the lower portion of trenches. Whenever wet or otherwise unstable material that is incapable of properly supporting the pipe, as determined by the Contracting Officer, is encountered in the bottom of the trench, it shall be removed and the trench shall be backfilled to the proper grade with coarse sand, fine gravel, or other suitable, approved material.

Trench excavations in surfaced areas shall be by open cut, unless otherwise shown. The pavement shall be cut by concrete saw or other approved method. Cuts shall be in straight lines parallel to the utility line location and shall be to a depth of at least one quarter of the pavement thickness. The remainder of the pavement shall be broken out. Pavement shall be removed a minimum of 300 millimeter on each side of the trench and 150 millimeter beyond where the base course is to be removed.

3.5 WATER REMOVAL

Water shall not be permitted to accumulate in excavations. Dewatering systems shall be provided by the Contractor to convey water away from excavations so that softening of foundation bottoms, footing undercutting, and soil changes detrimental to subgrade stability and foundation will not occur. Dewatering systems and methods of disposal shall be approved by the Contracting Officer.

Dewatering shall be continued until construction subject to water pressure has obtained full specified strength and backfill is completed.

Water removal from excavations shall be conveyed to approved collecting or runoff areas. Temporary drainage ditches and other diversions as necessary shall be provided and maintained outside of excavation limits.

Trench excavations for utilities shall not be used for temporary drainage ditches.

3.6 EXCAVATION FOR SANITARY SEWERS AND STORM SEWERS

The width of the trench at and below the top of the pipe shall be such that the clear space between the barrel of the pipe and the trench wall shall not exceed 200 millimeter or be less than 125 millimeter on either side of the pipe. The width of the trench above that level shall be as wide as necessary for sheeting and bracing and for the proper performance of the work.

For pipe indicated resting on the trench bottom, the bottom of the trench shall be rounded so that the pipe shall nest firmly on undisturbed soil for as nearly the full length of the barrel (as proper jointing operations will permit). This part of the excavation shall be done manually only a few meter in advance of the pipe being laid.

Depth of excavation for gravity sewer lines shall permit the installation of the pipe at the flow line elevations shown on the plans.

3.7 EXCAVATION FOR WATER DISTRIBUTION SYSTEM

Trenches shall be graded to avoid high points that necessitate placing vacuum and relief valves in the waterlines. If a profile of the pipes is not provided, trenches shall be of a depth to provide a minimum cover over the top of the pipe of 762 millimeter from the existing ground surface or the indicated finished grade (whichever is lower) and at additional depth if necessary to avoid interference of the waterlines with other utilities.

3.8 EXCAVATION FOR GAS DISTRIBUTION SYSTEM

Trenches for gas distribution lines shall be excavated to a depth that will provide not less than 600 millimeter of cover over the top of the pipe from the existing ground surface or from the indicated finished grade (whichever is lower).

3.9 EXCAVATION FOR ELECTRICAL UTILITIES

Excavation of trenches for electrical cables and duct lines shall provide vertical walls, unless otherwise approved by the Contracting Officer, and the trench shall be only as wide as necessary for workers to install the cables or ducts. Abrupt changes in grade of the trench bottom shall be avoided. Trenches shall be of a depth to provide a minimum cover over the top of the cables or ducts of 600 millimeter below finished grade, and at additional depth if necessary to avoid interference of the electrical cables or ducts with other utilities.

3.10 EXCAVATION FOR APPURTENANCES

Excavation for manholes and similar structures shall be sufficient to leave at least 300 millimeter in the clear between the outer surfaces and the embankment or timber used to hold and protect the walls. Any overdepth excavation below such appurtenances that has not been directed will be considered unauthorized and shall be refilled with select bedding material or concrete, as directed by the Contracting Officer, at no additional cost to the Government.

3.11 BORING AND JACKING

Where utilities beneath concrete and asphaltic pavement shall be installed by boring and jacking, The boring and jacking installation shall be performed by workers experienced in such operations, with equipment designed and regularly used for this work. The bored opening shall be kept to the minimum size practical for the installation of the utility. When a void greater than 25 millimeter exists between the bored opening and outside edge of the utility installation, the void shall be filled with grout under pressure, as approved by the Contracting Officer.

3.12 BACKFILLING AND COMPACTION

Where trench sheeting is pulled, withdrawal shall be in increments of not more than 300 millimeter and backfilling and compaction operations shall be carried on simultaneously with trench sheeting pulling.

Trenches shall not be backfilled until required tests are performed and until the utilities systems, as installed, conform to the requirements for the installation of the various utilities. Trenches improperly backfilled shall be reopened to the depth required for proper compaction, then refilled and compacted as specified, or the condition shall be otherwise

corrected as directed.

3.12.1 Bedding

Where the trench is excavated in rocks, a minimum of 150 millimeter of specified bedding material shall be placed on the rock surface before laying conduit or electrical cable.

3.12.2 Backfill Around Pipe

Backfill around pipe shall be applied to 150 millimeter above pipe with the specified bedding material.

3.12.3 Lower Portion of Trench

Backfill material shall be deposited in 200 millimeter uncompacted layers and compacted to the density of the adjacent soil until there is a cover of not less than 300 millimeter. The backfill material in this portion of the trench shall consist of sandy clay, sand, gravel, soft shale, or other approved materials, free from hard clods and stones larger than 25 millimeter in any dimension.

3.12.4 Remainder of Trench

The remainder of the trench shall be backfilled with material that is free of stones larger than 75 millimeter in any dimension. Backfill material shall be deposited in layers not exceeding the thickness specified, and each layer shall be compacted to the minimum density specified.

Under concrete slabs and paved parking areas:

150 millimeter layers, 95 percent of maximum density prescribed in AASHTO T 180, Method B or D

Under other areas:

200 millimeter layers, 90 percent of maximum density prescribed in AASHTO T 180, Method B or D

3.13 FIELD QUALITY CONTROL

The Contractor shall arrange his Soil Test work so that sampling and testing may be performed without interruption. Moisture-density relations shall be determined in accordance with AASHTO T 180, Method B or D. Field density tests shall be performed by methods in sufficient number to ensure that the specified density is obtained.

Soil materials shall be tested during construction as follows:

MATERIAL	REQUIREMENT	TEST METHOD	MATERIAL TESTED AND NUMBER OF TESTS
Soil material-in-place after compaction	Density of soil-in-place	ASTM D 1556, Sand Cone Method or ASTM D 2922, Nuclear Method	At least three daily for each subgrade soil material, and for each layer of soil mate-

MATERIAL	REQUIREMENT	TEST METHOD (when approved by Contracting Officer)	MATERIAL TESTED AND NUMBER OF TESTS
			rial; additional test whenever there is in moisture

3.14 RESTORATION OF SURFACES

Areas within the limits of earthwork under this section, including adjacent transition areas, shall be uniformly graded. The finished surface shall be smooth within the specified tolerances, compacted, and with uniform levels or slopes between points where elevations are indicated or between such points and existing grades.

Grassed areas:

The finished surface of areas to receive topsoil blend shall be not more than 30 millimeter above or below the specified finish elevations.

Walks:

The surface of areas under walks shall be shaped to line, grade, and cross section, and the finished surface shall be not more then 0.0 millimeter above or 30 millimeter below the specified finish elevations.

Pavements:

The surface of areas under pavements shall be shaped to line, grade, and cross section, and the finished surface shall be not more than 13 millimeter above or below the specified finish elevations.

3.15 DISPOSAL OF EXCESS AND WASTE MATERIALS

Waste materials, including excavated material classified as unsatisfactory soil material, trash, and debris, shall be removed from Government property and legally disposed of, by the Contractor.

-- End of Section --

SECTION 31 23 23.33 98

FLOWABLE FILL

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 150	(2004) Standard Specification for Portland Cement
ASTM D 4832	(2002) Standard Test Method for Preparation and Testing of Controlled Low Strength Material (CLSM) Test Cylinders

STATE OF OHIO DEPARTMENT OF TRANSPORTATION (ODOT)

ODOT 613	(2005) Concrete General; and Subparts as Specified
ODOT 701	(2005) Cementitious Materials; and Subparts as Specified

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-07 Certificates

Certificates of Compliance shall be submitted demonstrating compliance with the mix design specified herein. Certificates must contain project name and Contract number, date, name of Contractor, name of supplier and the mix design data.

PART 2 PRODUCTS

2.1 GENERAL

All materials shall conform to the applicable requirements of ODOT 613, Type 2 Low Strength Mortar Backfill, except that no crushed slag, foundry sand, or fly ash is permitted to be used at GRC.

2.2 MATERIALS

2.2.1 Cement

Cement shall conform to ODOT 701.01 or ODOT 701.04, (ASTM C 150 Type I or Type II).

2.2.2 Fine Aggregate

Fine aggregate shall be natural sand or sand manufactured from stone or gravel. The sand shall be fine enough to stay in suspension on the mixture to ensure proper flow.

The gradation of the sand shall be:

Sieve Size	Percent Passing
No. 4 (4.75mm)	90-100
No. 50 (300µm)	7-40
No. 200 (75µm)	0-10

It is intended that the sand be fine enough to stay in suspension in the mixture during all placement activities, without segregation. The COTR reserves the right to reject the sand gradation if a flowable mixture is not produced at the project site.

2.2.3 Performance Enhancing Admixture

A performance enhancing admixture shall be incorporated in the mix that shall have the effect of lowering the wet density to a maximum of 1600 kg per cubic meter, a 28-day unconfined compressive strength between 345 and 689 kPA (50 and 100 pounds per square inch); increasing air content to 30% minimum; and shall eliminate bleed water and segregation This admixture product shall be specifically manufactured for this purpose and shall be used at the recommended design rate. An approved accelerating agent shall be added to the first lift; and may be added to the following lifts if a faster setting time is desired.

2.3 MORTAR DESIGN MIX

The initial mix may be proportioned as follows:

Quantities of Dry Materials per Cubic Meter (Cubic Yard)

Cement	59 kg	(100 lb)
Sand (SSD)*	1,436 kg	(2,420 lb)
Water (Target)	125-178 kg	(210-300 lb)

*saturated surface dry

These quantities of materials are expected to yield approximately one cubic meter (1.308 cubic yard) of material of a flowable consistency. Small adjustments in the amounts of the materials in a mix may be required to achieve the final product. No additional compensation for a change in the material blends shall be allowed. Contractor shall have delivered one or more 1 cubic meter trial batches at different water contents to ensure a flowable material. The mixture is too dry if cracks develop in the mixture as it flows into place. A delay in bleeding indicates there are too many fines in the mixture. Contractor shall adjust the proportions to maintain the total absolute volume. Four test cylinders of the trial mix shall be taken and tested for unconfined compressive strength according to ASTM D 4832.

2.4 ALTERNATE MIXES

Other mixes may be submitted to the COTR for approval. The Contractor shall submit the mix design and test data from an independent test lab 30 days prior to the intended usage for approval.

This requirement is for all mixes that:

1. Vary more than 178 kg (300 pounds) in sand, 59 kg (100 pounds) in water or 12 kg (20 pounds) in cement from the above mixes. These are considered large adjustments.

2. Have less than 59 kg (100 pounds) of cement in the Type 2 mixes.

3. Utilizes alternate materials.

4. Foundry sand, slag, or fly ash shall not be used for any mix.

All alternate mixes shall have an unconfined compressive strength between 345 and 689 kPa (50 and 100 pounds per square inch) at 28 days when tested in accordance with ASTM D 4832. The long term (12 month) unconfined compressive strength shall be less than 689 kPa (100 pounds per square inch).

The final mix shall have the required strength, fill voids of the intended usage and set up within 12 hours. The proportioning, yield, consistency, workability, compressive strength and all other requirements are the sole reasonability of the Contractor.

2.5 MIXING EQUIPMENT

Sufficient mixing capacity and delivery equipment shall be provided for the material to be placed without interruption as much as practical. The Type 2 mix or Type 2 alternate mixes shall be delivered and placed from ready mixed concrete trucks or delivered from a batch plant.

2.6 MIXING THE MATERIALS

The mixture shall be discharged within 2.5 hours after the water is added.

2.7 READY-MIX MORTAR

Low strength mortar backfill shall be supplied by a ready-mix supplier approved by the COTR and delivered to the project site in standard concrete delivery trucks.

PART 3 EXECUTION

3.1 PLACING MORTAR

The flowable material shall be discharged from the mixer by any reasonable means into the space of the plan intended usage. The fill material shall be brought up uniformly to the fill line shown on the plans or as directed by the COTR. Placing of the other fill material over low strength mortar backfill material may commence as soon as the surface water is gone or as directed by the COTR. The COTR reserves the right to reject the mix if a flowable mixture is not produced.

Before placing the low strength mortar backfill for the utilities, the

Contractor shall secure the utility to prevent it from floating during placement of the flowable material.

3.2 METHOD OF MEASUREMENT

Low strength mortar backfill will be measured by the number of cubic meters (cubic yards) computed from the plan lines, and placed. No additional compensation shall be allowed for over excavated areas.

3.3 TEST CYLINDERS

Test cylinders shall be taken at the rate of four (4) cylinders per day for compressive strength tests by a lab at 7, and 28 days. Test may be discontinued at the discretion of the COTR if tests consistently fall within the specified range of strength.

At the discretion of the quality assurance technician, the Government shall take samples of the LSM and submit the samples to a certified laboratory to perform spectrographic analysis. Test shall be performed to determine that materials used in the LSM mix adhere to this specification.

-- End of Section --

SECTION 32 12 17

HOT MIX BITUMINOUS PAVEMENT

PART 1 GENERAL

1.1 SUMMARY

The work under this section shall include all labor, services, equipment, materials and tools necessary to install bituminous asphalt concrete pavement according to the Contract drawings and as specified herein. The work includes preparing the subgrade surface, installing an aggregate base course, a bituminous aggregate base course, a bituminous aggregate intermediate course, an asphalt concrete wearing course, and joints abutting other construction.

The bituminous asphalt pavement shall be installed in the full depth replacement areas and in the new pavement areas as shown on the Contract drawings and pavement markings shall be restored.

1.2 REFERENCES

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

ASTM INTERNATIONAL (ASTM)

ASTM C 127	(2004) Density, Relative Density (Specific Gravity), and Absorption of Coarse Aggregate
ASTM C 128	(2004a) Density, Relative Density (Specific Gravity), and Absorption of Fine Aggregate
ASTM C 131	(2003) Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C 188	(1995; R 2003) Density of Hydraulic Cement
ASTM C 88	(2005) Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
ASTM D 1188	(1996; R 2002) Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Paraffin-Coated Specimens
ASTM D 1559	(1989) Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus
ASTM D 2041	(2003a) Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures
ASTM D 2726	(2004) Bulk Specific Gravity and Density

	of Non-Absorptive Compacted Bituminous Mixtures
ASTM D 4867/D 4867M	(2004) Effect of Moisture on Asphalt Concrete Paving Mixtures
ASTM D 70	(2003) Specific Gravity and Density of Semi-Solid Bituminous Materials (Pycnometer Method)
ASTM D 854	(2002) Specific Gravity of Soil Solids by Water Pycnometer

STATE OF OHIO DEPARTMENT OF TRANSPORTATION (ODOT)

ODOT 301	(2002) Bituminous Aggregate Base; and Subparts as Specified
ODOT 304	(2002) Aggregate Base; and Subparts as Specified
ODOT 401	(2002) Asphalt Concrete Pavements-General; and Subparts as Specified
ODOT 448	(2002) Asphalt Concrete; and Subparts as Specified
ODOT 407	(2002) Tack Coat; and Subparts as Specified
ODOT 408	(2002) Prime Coat; and Subparts as Specified
ODOT 705	(2002) Concrete Pavement Incidentals; and Subparts as Specified

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Construction Equipment List for all major pieces of equipment to be used to execute this specification shall be submitted by the Contractor.

SD-05 Design Data

Mix Designs for each bituminous concrete mixture shall be submitted for approval for each type of bitmunous material specified. Compliance with ODOT material specifications is mandatory.

SD-06 Test Reports

Specific gravity test of asphalt

Coarse aggregate tests

Percent of crushed pieces in gravel

Fine aggregate tests

Bituminous mixture tests

Aggregates tests

Bituminous mix tests

Pavement courses

SD-07 Certificates

Certificates of Compliance for the following items shall be submitted in accordance with the applicable reference standards and specifications contained within this section:

Coarse Aggregate Mineralogy and Gradation
Fine Aggregate Mineralogy and Gradation
Asphalt Cement

1.4 ENVIRONMENTAL CONDITIONS

Place bituminous mixture only during dry weather and on dry surfaces. Place courses only when the surface temperature of the underlying course is greater than 7 degrees C for course thicknesses 25 mm or greater and 13 degrees C for course thicknesses 25 mm.

1.5 CONSTRUCTION EQUIPMENT

Calibrated equipment, such as scales, batching equipment, spreaders and similar equipment, shall have been recalibrated by a calibration laboratory approved by the Contracting Officer within 6 months of commencing work.

1.5.1 Paving Equipment

1.5.1.1 Spreading Equipment

Self-propelled electronically controlled type, unless other equipment is authorized by the Contracting Officer. Equip spreading equipment of the self-propelled electronically controlled type with hoppers, tamping or vibrating devices, distributing screws, electronically adjustable screeds, and equalizing devices. Capable of spreading hot bituminous mixtures without tearing, shoving, or gouging and to produce a finished surface of specified grade and smoothness. Operate spreaders, when laying mixture, at variable speeds between 25 and 230 mm per second. Design spreader with a quick and efficient steering device; a forward and reverse traveling speed; and automatic devices to adjust to grade and confine the edges of the mixture to true lines. The use of a spreader that leaves indented areas or other objectionable irregularities in the fresh laid mix during operations is prohibited.

1.5.1.2 Rolling Equipment

Self-propelled pneumatic-tired rollers supplemented by three-wheel and tandem type steel wheel rollers. The number, type and weight of rollers

shall be sufficient to compact the mixture to the required density without detrimentally affecting the compacted material. Rollers shall be suitable for rolling hot-mix bituminous pavements and capable of reversing without backlash. Pneumatic-tired rollers shall be capable of being operated both forward and backward without turning on the mat, and without loosening the surface being rolled. Equip rollers with suitable devices and apparatus to keep the rolling surfaces wet and prevent adherence of bituminous mixture. Vibratory rollers especially designed for bituminous concrete compaction may be used provided rollers do not impair stability of pavement structure and underlying layers. Repair depressions in pavement surfaces resulting from use of vibratory rollers. Rollers shall be self-propelled, single or dual vibrating drums, and steel drive wheels, as applicable; equipped with variable amplitude and separate controls for energy and propulsion.

1.5.1.3 Mechanical Hand Tampers

Commercial type, operated by pneumatic pressure or by internal combustion.

PART 2 PRODUCTS

2.1 AGGREGATE BASE

The aggregate base shall consist of ODOT 304 aggregate base except that aggregate shall only consist of limestone or dolomite. Slag shall not be permitted for any purpose. All other requirements apply. Thickness shall be as shown on the Contract drawings.

2.1.1 BITUMINOUS AGGREGATE BASE

The bituminous aggregate base course shall consist of ODOT 301 bituminous aggregate base. All requirements found in ODOT 408 apply except that the aggregate shall consist only of limestone or dolomite. Slag shall not be permitted for any purpose. Thickness shall be as shown on the Contract drawings.

2.1.2 INTERMEDIATE COURSE

The intermediate course shall consist of ODOT 448 asphalt concrete. All requirements found in ODOT 401 apply except that the aggregate shall consist only of limestone or dolomite. Slag shall not be permitted for any purpose. Thickness shall be as shown on the Contract drawings.

2.1.3 WEARING COURSE

The wearing course shall consist of ODOT 448 asphalt concrete. All requirements found in ODOT 401 apply except that the aggregate shall consist only of limestone or dolomite. Slag shall not be permitted for any purpose. Thickness shall be as shown on the Contract drawings.

2.1.4 TACK COAT

The bituminous tack coat shall be rapid curing cut-back asphalt conforming to designation RC-70, as specified in ODOT 407.

2.1.5 JOINT SEALANT

The bituminous joint sealant shall be ODOT 705.04 hot-applied crack and joint sealer.

2.7 PRIME COAT

The bituminous prime coat shall comply with the requirements of ODOT 408, except that cover aggregate, where specified on the contract drawings, shall not be slag.

2.8 SOURCE QUALITY CONTROL

Employ a commercial laboratory approved by the Contracting Officer to perform testing. The laboratory used to develop the JMF and the laboratory used to perform all sampling and testing shall meet the requirements of ASTM D 3666. A certification signed by the manager of the laboratory stating that it meets these requirements or clearly listing all deficiencies shall be submitted to the Contracting Officer prior to the start of construction. The certification shall contain as a minimum:

a. Qualifications of personnel; laboratory manager, supervising technician, and testing technicians.

b. A listing of equipment to be used in developing the job mix.

c. A copy of the laboratory's quality control system.

d. Evidence of participation in the AASHTO Materials Reference Laboratory (AMRL) program.

2.2 Tests

Perform testing in accordance with the following:

a. Specific Gravity Test of Asphalt: ASTM D 70

b. Coarse Aggregate Tests:

(1) Bulk Specific Gravity: ASTM C 127

(2) Abrasion Loss: ASTM C 131

(3) Soundness Loss: ASTM C 88

d. Percent of Crushed Pieces in Gravel: Count by observation and weight

e. Fine Aggregate Tests:

(1) Bulk Specific Gravity: ASTM C 128

(2) Soundness Loss: ASTM C 88

f. Specific Gravity of Mineral Filler: ASTM C 188 or ASTM D 854

g. Bituminous Mixture Tests:

(1) Bulk Specific Gravity: ASTM D 1188 or ASTM D 2726

(2) Theoretical Maximum Specific Gravity: ASTM D 2041

(3) Tensile Strength Ratio: ASTM D 4867/D 4867M

PART 3 EXECUTION

3.1 PREPARATION

3.1.1 Preparation of Asphalt Binder Material

The asphalt cement material shall be heated avoiding local overheating and providing a continuous supply of the asphalt material to the mixer at a uniform temperature. The temperature of unmodified asphalts shall be no more than 160 degrees C 325 degrees F when added to the aggregates. Modified asphalts shall be no more than 174 degrees C 350 degrees F when added to the aggregate.

3.1.3 Spraying of Contact Surfaces

Spray contact surfaces of previously constructed pavement with a thin coat of bituminous materials to act as an anti-stripping agent, Paint contact surfaces of structures with a thin coat of emulsion or other approved bituminous material prior to placing the bituminous mixture. Tack coat the previously placed primed coats on base courses when surface has become excessively dirty and cannot be cleaned or when primed surface has cured to the extent that it has lost all bonding effect.

3.2 PLACEMENT

3.2.1 Machine Spreading

The range of temperatures of the mixtures at the time of spreading shall be between 121 degrees C and 149 degrees C. Bituminous concrete having temperatures less than minimum spreading temperature when dumped into the spreader will be rejected. Adjust spreader and regulate speed so that the surface of the course is smooth and continuous without tears and pulling, and of such depth that, when compacted, the surface conforms with the cross section, grade, and contour indicated.Construct longitudinal joints and edges to true line markings. Establish lines parallel to the centerline of the area to be paved, and place string lines coinciding with the established lines for the spreading machine to follow.

3.2.2 Shoveling, Raking, and Tamping After Machine-Spreading

Shovelers and rakers shall follow the spreading machine. Add or remove hot mixture and rake the mixture as required to obtain a course that when completed will conform to requirements specified herein. Broadcasting or fanning of mixture over areas being compacted is prohibited. When segregation occurs in the mixture during placing, suspend spreading operation until the cause is determined and corrected. Correct irregularities in alinement left by the spreader by trimming directly behind the machine. Immediately after trimming, compact edges of the course by tamping laterally with a metal lute or by other approved methods. Distortion of the course during tamping is prohibited.

3.2.3 Hand-Spreading in Lieu of Machine-Spreading

In areas where the use of machine spreading is impractical, spread mixture by hand. The range of temperatures of the mixtures when dumped onto the area to be paved shall be between 121 and 149 degrees C. Mixtures having temperatures less than minimum spreading temperature when dumped onto the area to be paved will be rejected. Spread hot mixture with rakes in a uniformly loose layer of a thickness that, when compacted, will conform to

the required grade, thickness, and smoothness. During hand spreading, place each shovelful of mixture by turning the shovel over in a manner that will prevent segregation. Do not place mixture by throwing or broadcasting from a shovel. Do not dump loads any faster than can be properly handled by the shovelers and rakers.

3.3 COMPACTION OF MIXTURE

Compact mixture by rolling. Begin rolling as soon as placement of mixture will bear rollers. Delays in rolling freshly spread mixture shall not be permitted. Start rolling longitudinally at the extreme sides of the lanes and proceed toward center of pavement, or toward high side of pavement with a one-way slope. Operate rollers so that each trip overlaps the previous adjacent strip by at least 300 mm. Alternate trips of the roller shall be of slightly different lengths. Conduct tests for conformity with the specified crown, grade and smoothness immediately after initial rolling. Before continuing rolling, correct variations by removing or adding materials as necessary. If required, subject course to diagonal rolling with the steel wheeled roller crossing the lines of the previous rolling while mixture is hot and in a compactible condition. Speed of the rollers shall be slow enough to avoid displacement of hot mixture. Correct displacement of mixture immediately by use of rakes and fresh mixture, or remove and replace mixture as directed. Continue rolling until roller marks are eliminated and course has a density of at least 97 percent but not more than 100 percent of that attained in a laboratory specimen of the same mixture prepared in accordance with ASTM D 1559. During rolling, moisten wheels of the rollers enough to prevent adhesion of mixture to wheels, but excessive water is prohibited. Operation of rollers shall be by competent and experienced operators. Provide sufficient rollers for each spreading machine in operation on the job and to handle plant output. In places not accessible to the rollers, compact mixture thoroughly with hot hand tampers. Skin patching of an area after compaction is prohibited. Remove mixture that becomes mixed with foreign materials or is defective and replace with fresh mixture compacted to the density specified herein. Roller shall pass over unprotected edge of the course only when laying of course is to be discontinued for such length of time as to permit mixture to become cold.

3.4 JOINTS

Joints shall present the same texture and smoothness as other portions of the course, except permissible density at the joint may be up to 2 percent less than the specified course density. Carefully make joints between old and new pavement or within new pavements in a manner to ensure a thorough and continuous bond between old and new sections of the course. Vertical contact surfaces of previously constructed sections that are coated with dust, sand, or other objectionable material shall be painted with a thin uniform coat of emulsion or other approved bituminous material just before placing fresh mixture.

3.4.1 Transverse

Roller shall pass over unprotected end of freshly laid mixture only when laying of course is to be discontinued. Except when an approved bulkhead is used, cut back the edge of previously laid course to expose an even, vertical surface for the full thickness of the course. When required, rake fresh mixture against joints, thoroughly tamp with hot tampers, smooth with hot smoothers, and roll. Transverse joints in adjacent lanes shall be offset a minimum of 600 mm.

3.4.2 Longitudinal Joints

Space 150 mm apart. Do not allow joints to coincide with joints of existing pavement or previously placed courses. Spreader screed shall overlap previously placed lanes 50 to 75 mm and be of such height to permit compaction to produce a smooth dense joint. With a lute, push back mixture placed on the surface of previous lanes to the joint edge. Do not scatter mix. Remove and waste excess material. When edges of longitudinal joints are irregular, honeycombed, or poorly compacted, cut back unsatisfactory sections of joint and expose an even vertical surface for the full thickness of the course. When required, rake fresh mixture against joint, thoroughly tamp with hot tampers, smooth with hot smoothers, and roll while hot.

3.5 FIELD QUALITY CONTROL

c. Smoothness: Straightedge test the compacted surface of leveling, binder, and wearing courses as work progresses. Apply straightedge parallel with and at right angles to the closest adjacent curb after final rolling. Unevenness of leveling and binder courses shall not vary more than 6 mm in 3 m; variations in the wearing course shall not vary more than 3 mm in 3 m. Correct each portion of the pavement showing irregularities greater than that specified.

d. Finished Grades: Finish grades of each course placed shall not vary from the finish elevations, profiles, and cross sections indicated by more than 13 mm. Finished surface of the final wearing course will be tested by running lines of levels at intervals of 8 m longitudinally and transversely to determine elevations of completed pavement. Within 45 days after completion of final placement, perform a level survey at the specified grid spacing and plot the results on a plan drawn to the same scale as the drawings. Elevations not in conformance with the specified tolerance shall be noted on the plan in an approved manner. The survey shall be performed by a registered land surveyor. The Contracting Officer will inform the Contractor in writing of paved areas that fail to meet the final grades indicated within the specified tolerances. Correct deficient paved areas by removing existing work and replacing with new materials that meet the specifications. Skin patching for correcting low areas is prohibited.

e. Finish Surface Texture of Wearing Course: Visually check final surface texture for uniformity and reasonable compactness and tightness. Final wearing course with a surface texture having undesirable irregularities such as segregation, cavities, pulls or tears, checking, excessive exposure of coarse aggregates, sand streaks, indentations, ripples, or lack of uniformity shall be removed and replaced with new materials.

3.5 PROTECTION

Do not permit vehicular traffic, including heavy equipment, on pavement until surface temperature has cooled to at least 50 degrees C. Measure surface temperature by approved surface thermometers or other satisfactory methods.

-- End of Section --

SECTION 32 16 13

EXTERIOR CONCRETE SLABS, WALKS, AND CURBS

PART 1 GENERAL

1.1 REFERENCES

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

ACI INTERNATIONAL (ACI)

ACI 223	(1983) Standard Practice for the Use of Shrinkage-Compensating Concrete
ACI 305R	(1999) Hot Weather Concreting
ACI 306R	(1988; R 2002) Cold Weather Concreting
ACI 316R	(1982) Construction of Concrete Pavements and Concrete Bases, Recommendations for
ACI 318	(2005) Building Code Requirements for Structural Concrete and Commentary

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)

AASHTO T 260	(1997; R 2001) Sampling and Testing for Chloride Ion in Concrete and Concrete Raw Materials

ASTM INTERNATIONAL (ASTM)

ASTM C 172	(2004) Sampling Freshly Mixed Concrete
ASTM C 173/C 173M	(2001e1) Air Content of Freshly Mixed Concrete by the Volumetric Method
ASTM C 231	(2004) Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C 309	(2003) Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C 31/C 31M	(2003a) Making and Curing Concrete Test Specimens in the Field
ASTM C 920	(2005) Elastomeric Joint Sealants
ASTM D 1751	(2004) Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)

ASTM D 1752	(2004a) Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction
ASTM D 5893	(2004) Cold Applied, Single Component, Chemically Curing Silicone Joint Sealant for Portland Cement Concrete Pavements

STATE OF OHIO DEPARTMENT OF TRANSPORTATION

ODOT 499	(2005) Concrete General; and Subparts as Specified
ODOT 509	(2005) Reinforcing Steel; and Subparts as Specified
ODOT 511	(2005) Concrete for Structures; and Subparts as Specified
ODOT 701	(2005) Hydraulic Cement; and Subparts as Specified
ODOT 705	(2005) Concrete Pavement Incidentals; and Subparts as Specified
ODOT 709	(2005) Reinforcing Steel; and Subparts as Specified

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Fabrication Drawings for the following items shall be submitted showing size and spacing:

Reinforcing Steel
Bar Lists

Erection/Installation Drawings shall be submitted including the size and spacing for the following items:

Reinforcing Steel
Bar Lists
Expansion and Construction Joint Details

SD-03 Product Data

Concrete

Copies of certified delivery tickets for all concrete used in the construction.

SD-05 Design Data

Mix Designs shall be submitted for approval for each concrete class. The design for concrete properties shall equal or exceed the specified design properties.

SD-06 Test Reports

Test Reports for the following items shall be submitted in accordance with the paragraph entitled, "Concrete Testing During Construction:"

Slump
Air Content
Cylinder Test Specimens

SD-07 Certificates

Certificates of Compliance shall be submitted for the following items demonstrating conformance with the referenced specifications contained in this section. Certificates must contain project name and Contract number, date, name of Contractor, name of concrete testing service, source and mineralogy of aggregates, complete catalog information for all manufactured products proposed and test results.

Reinforcing steel
Form materials
Curing and sealing materials
Joint materials
Concrete materials
Concrete mix design

SD-08 Manufacturer's Instructions

Manufacturer's Instructions for all products used shall be submitted, including any special instructions for equipment installation, for approval prior to use.

1.3 LABORATORY AND FIELD SAMPLING AND TESTING SERVICE

Sampling and testing services shall be provided by the Contractor at the direction of the Contracting Officers Technical Representative (COTR). The testing service agency shall be approved prior to commencing construction. The field testing shall be done to determine conformance with reference Textifications and for quality control.

1.4 Laboratory Testing

Laboratory testing shall consist of running compressive strength tests on concrete cylinders prepared in the field according to ASTM C 39.

1.5 Field Testing and Quality Control During Construction

Concrete shall be sampled and tested at the direction of the COTR and as follows:

REQUIREMENT	TEST METHOD	NUMBER OF TESTS
Sampling	ASTM C 172	As required for each test.

Slump	ASTM C 143	One for each concrete load; one each time water or an admixture is added to the mix.
Air Content	ASTM C 231	One at the point of delivery for each load and one for each set of compressive strength tests.
Compression test each	ASTM C 31	One set of four (4) standard specimens cylinders for compressive strength test.

1.6 WEATHER LIMITATIONS

1.6.1 Placing During Cold Weather

Concrete placement shall not take place when the air temperature reaches 5 degrees C and is falling, or is already below that point. Placement may begin when the air temperature reaches 2 degrees C and is rising, or is already above 5 degrees C. 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 and protection 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.

1.6.2 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 at any time.

1.7 PLANT, EQUIPMENT, MACHINES, AND TOOLS

1.7.1 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.

1.7.2 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 READY MIX CONCRETE

Concrete shall be ready-mix and shall conform to ASTM C 94.

The provisions contained in ODOT 499 apply to this specification as modified herein:

Minimum 28 day compressive strength of 281.2 kilograms per square centimeter (4000 psi).

Maximum chloride ion content of 0.30% by weight of cement in mix per cubic meter according to AASHTO T 260.

Air entrainment of 5% to 7% at point of placement.

Maximum delivered slump shall be 100 mm (4 inches).

Maximum water-cement ratio shall be 0.40.

Course aggregate shall be limestone or dolomite only.

Mix water shall be potable.

2.2 Admixtures

The COTR shall approve all proposed admixture products prior to their use. The COTR, at his discretion, may direct the Contractor as to which admixtures to use. The application of all admixtures shall be done in strict accordance with the manufacturers instructions.

The Contractor is encouraged to use some or all of the following admixtures to ease constructability while complying with this specification and to produce a more durable product:

Slump may be increased to a maximum of 200 mm (8 inches) by adding an approved superplastisizer at the job site to ease casting.

<u>Note: water shall not be added at the job site for the purpose of increasing slump and easing casting.</u>

Accelerator shall be non-corrosive and shall not contribute more than 0.005% chloride ion content by weight of cement and will comply with ASTM C 494, Type C.

A corrosion inhibiting admixture shall be included where concrete will be exposed to deicing salts or any other corrosive environment at the maximum rate allowed by the manufacturer.

Set-retarding admixture shall comply with ASTM C 494, Type D.

Water-reducing admixture shall comply with ASTM C 494, Type A.

Air-entraining admixture shall comply with ASTM C 260.

2.3 Shrinkage Compensating Concrete

The above specifications apply to this section and shall include the following:

Shrinkage compensating concrete shall be Type K constructed according to ACI 223 and ODOT 701.08.

Minimum cement content per cubic meter is 305.5 kilograms (515 pounds).

Maximum water-cement ratio can be increased to 0.50.

Maximum delivered slump is 100 mm (4 inches).

2.2 REINFORCING MATERIALS

2.2.1 Epoxy-Coated Reinforcing Steel

Epoxy-coated reinforcing bars shall meet the requirements of ODOT 709.

2.2.1.2 Deformed and Plain Billet Steel Bars for Concrete Reinforcement

Reinforcing bars shall meet the material requirements of ODOT 709.01.

2.4 CURING AND SEALING COMPOUND

Curing and sealing compound shall conform to ODOT 705.07 Type A and ASTM C 309.

2.5 JOINT FILLER STRIPS

2.5.1 Contraction Joint Filler for Curb and Gutter

Contraction joint filler for curb and gutter shall consist of hard-pressed fiberboard.

2.5.2 Expansion Joint Filler, Premolded

Expansion joint filler, premolded, shall conform to ASTM D 1751 or ASTM D 1752, 13 mm thick, unless otherwise indicated.

2.6 JOINT SEALANTS

Joint sealant, cold-applied shall conform to ASTM C 920 or ASTM D 5893.

2.7 FORM MATERIALS

Forms shall be of wood, steel or other material approved by the COTR, and shall conform to ACI 318.

2.7.1 Sidewalk Forms

Sidewalk forms shall be of a height equal to the full depth of the finished sidewalk.

2.7.2 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 benders, for the full height of the curb, cleated together. In lieu of inside forms for curbs, a curb "mule" may be used for forming and finishing this surface, provided the results are approved.

PART 3 EXECUTION

3.1 GENERAL

Concrete shall be constructed in accordance with ACI 318 Building Code, ACI 305R, ACI 306R, ACI 316R, and ODOT 511.

3.2 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 31 23 16.17.98.

3.2.1 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.

3.2.2 Curb and Gutter Subgrade

The subgrade shall be tested for grade and cross section by means of a template extending the full width of the curb and gutter. The subgrade shall be of materials equal in bearing quality to the subgrade under the adjacent pavement.

3.2.3 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.

3.3.1 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 m straightedge. Forms shall have a transverse slope of 20 mm per meter with the low side adjacent to the roadway. Side forms shall not be removed for 12 hours after finishing has been completed.

3.3 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.

3.4 SIDEWALK CONCRETE PLACEMENT AND FINISHING

3.4.1 Formed Sidewalks

Concrete shall be placed in the forms in one layer. When consolidated and finished, the sidewalks shall be of the thickness indicated. After concrete has been placed in the forms, a strike-off guided by side forms shall be used to bring the surface to proper section to be compacted. The concrete shall be consolidated with an approved vibrator, and the surface shall be finished to grade with a strike off.

3.4.2 Concrete Finishing

After straightedging, when most of the water sheen has disappeared, and just before the concrete hardens, the surface shall be finished with a wood float or darby to a smooth and uniformly fine granular or sandy texture free of waves, irregularities, or tool marks. A scored surface shall be produced by brooming with a fiber-bristle brush in a direction transverse to that of the traffic, followed by edging.

3.4.3 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.

3.4.4 Surface and Thickness Tolerances

Finished surfaces shall not vary more than 8 mm from the testing edge of a 3 m straightedge. Permissible deficiency in section thickness will be up to 6 mm.

3.5 CURB AND GUTTER CONCRETE PLACEMENT AND FINISHING

3.5.1 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".

3.5.2 Curb and Gutter Finishing

Approved slipformed curb and gutter machines may be used in lieu of hand placement.

3.5.3 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.

3.5.4 Joint Finishing

Curb edges at formed joints shall be finished as indicated.

3.5.5 Surface and Thickness Tolerances

Finished surfaces shall not vary more than 6 mm from the testing edge of a 3 m straightedge. Permissible deficiency in section thickness will be up to 6 mm.

3.6 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. Expansion joints are not required between sidewalks and curb that abut the sidewalk longitudinally.

3.6.1 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 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.

3.6.2 Sidewalk Expansion Joints

Expansion joints shall be formed with 13 mm joint filler strips. Joint filler in expansion joints surrounding structures and features within the sidewalk may consist of preformed filler material conforming to ASTM D 1752 or building paper. Joint filler 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. At the end of the curing period, expansion joints shall be cleaned and filled with cold-applied joint sealant. Joint sealant shall be gray or stone in color. The joint opening shall be thoroughly cleaned before the sealing material is placed.

Sealing material shall not be spilled on exposed surfaces of the concrete. Concrete at the joint shall be surface dry and atmospheric and concrete temperatures shall be above 10 degrees C at the time of application of joint sealing material. Excess material on exposed surfaces of the concrete shall be removed immediately and concrete surfaces cleaned.

3.6.3 Reinforcement Steel Placement

The requirements of ODOT 509 shall be strictly adhered to.

Reinforcing bar shall be free of loose, flaky rust and scale as well as any other deleterious materials such as oil, grease or paint that would reduce the bond with the concrete. WWF shall be delivered and installed as flat sheets only.

Epoxy coated bar shall be installed as shown on the Contract drawings and according to ODOT 509.10.

Reinforcement shall be secured in the formwork or on the subgrade surface by ties and chairs of sufficient number and strength to prevent movement during placement and casting operations.

Reinforcement steel shall be accurately and securely fastened in place with suitable supports and ties before the concrete is placed.

3.7 CURB AND GUTTER JOINTS

Curb and gutter joints shall be constructed at right angles to the line of curb and gutter.

3.7.1 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.

a. Contraction joints (except for slip forming) 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.

b. When slip forming is used, the contraction joints shall be cut in the top portion of the gutter/curb hardened concrete in a continuous cut across the curb and gutter, using a power-driven saw. The depth of cut shall be at least one-fourth of the gutter/curb depth and 3 mm in width.

3.7.2 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 13 mm in width shall be provided at intervals not less than 10 meters nor greater than 36 meters. Expansion joints shall be provided in

nonreinforced concrete gutter at locations indicated. Expansion joints shall be sealed immediately following curing of the concrete or as soon thereafter as weather conditions permit. Expansion joints and the top 25 mm depth of curb and gutter contraction-joints shall be sealed with joint sealant. The joint opening shall be thoroughly cleaned before the sealing material is placed. Sealing material shall not be spilled on exposed surfaces of the concrete. Concrete at the joint shall be surface dry and atmospheric and concrete temperatures shall be above 10 degrees C at the time of application of joint sealing material. Excess material on exposed surfaces of the concrete shall be removed immediately and concrete surfaces cleaned.

3.8 CURING AND PROTECTION

3.8.1 General Requirements

Fresh concrete shall be cured in accordance with ODOT 511 Method (b) using an approved liquid membrane curing compound. Traffic on new concrete will be restricted for a minimum of 14 days to allow proper curing to occur.

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.

3.8.2 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.

3.8.3 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.

3.9 FIELD QUALITY CONTROL

3.9.1 General Requirements

Quality control and field testing during construction is the responsibility of the Contractor.

Specimens shall be tested for compressive strength at 7 days and at 28 days.

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.

3.9.2 Concrete Testing

3.9.2.1 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.

3.9.2.2 Air Content

Air content shall be determined in accordance with ASTM C 173/C 173M 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.

3.9.2.3 Slump Test

A slump test shall be made on every batch of concrete 190 cubic meters placed. 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.

3.9.3 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.

3.10 SURFACE DEFICIENCIES AND CORRECTIONS

3.10.1 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.

3.10.2 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.

3.10.3 Appearance

Exposed surfaces of the finished work will be inspected by the Government and any deficiencies in appearance will be identified. Areas which exhibit excessive cracking, discoloration, form marks, or tool marks or which are otherwise inconsistent with the overall appearances of the work shall be removed and replaced.

-- End of Section --

SECTION 32 92 00.98

TURF AND GRASSES

PART 1 GENERAL

1.1 REFERENCES

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

STATE OF OHIO DEPARTMENT OF TRANSPORTATION (ODOT)

ODOT 659	(2005) Seeding and Mulching; and Subparts as Specified

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Laboratory Analysis of Grass Seed for percent pure, percent germination, and percent weed seed, along with laboratory analysis of Proposed Top Soil shall be submitted.

1.3 SAMPLING AND TESTING

Sampling and testing of grass seed and topsoil shall be by an approved testing service and show compliance with all specified requirements.

1.4 DELIVERY AND STORAGE

1.4.1 Seed and Fertilizer

Grass seed and fertilizer shall be delivered in sealed containers or bags, each labeled in accordance with the applicable federal and state regulations and bearing the name, trade name or trademark, and certification of the producer.

Packaged materials shall be stored off the ground, under watertight cover, and away from damp surfaces.

1.5 WEATHER LIMITATIONS

Topsoil shall not be placed when the subgrade is frozen, excessively wet, extremely dry or in a condition detrimental to grass seed planting or finish grading.

Seeding shall be done between August 15 and October 1, or between April 1 and May 30 unless otherwise permitted by the COTR.

PART 2 PRODUCTS

2.1 TOPSOIL

Topsoil previously removed and stockpiled shall be used in the work. Topsoil shall be free from subsoil, litter, and other objectionable material.

Topsoil shall be fertile, friable, natural surface soil obtained from well-drained areas and possessing characteristics of representative soils in the project vicinity that produce heavy growths of crops, grass, or other vegetation. Topsoil shall be free of material that might be harmful to plant growth or hindrances to planting or maintenance operations.

Chemical and physical properties of topsoil proposed for use in the work shall be as follows:

Organic matter shall be at least 6 percent, but not more than 20 percent, as determined by loss on ignition of moisture-free samples of topsoil.

The pH range shall be from 5.0 to 7.0.

The physical analysis of the topsoil shall be within the following limits:

SIEVE SIZE	PERCENT PASSING
6.35 mm	97 to 100
No. 100	40 to 60
No. 200	20 to 40

2.2 GRASS SEED

Grass seed for lawn areas shall be as follows:

KIND OF GRASS SEED	GRASS SEED IN MIXTURE BY WEIGHT PERCENTAGE	GRASS SEED PURITY MINIMUM PERCENTAGE	GRASS SEED GERMINATION MINIMUM PERCENTAGE
Kentucky Bluegrass	40	98	90
Creeping Red Fescue	20	98	90
Annual Ryegrass	40	98	90

Grass seed which has become wet, moldy, or otherwise damaged in transit or storage will not be acceptable.

2.3 LIME

Lime shall conform to ODOT 659.03.

2.4 FERTILIZER

Fertilizer shall conform to ODOT 659.04

2.5 MULCH

Mulch shall be fresh, shredded straw of wheat, rye, oats, or barley and shall be clean and free of seeds.

Mulch that is fresh and excessively brittle or that is in such an advanced stage of decomposition as to smother or retard the growth of grass will not be acceptable.

PART 3 EXECUTION

3.1 TOPSOIL PREPARATION

3.1.1 Subgrade

Before topsoil is placed, the subgrade surface shall be cleared of all materials that might hinder the performance of the work or subsequent maintenance operations.

3.1.2 Grading

Grades on areas that have been previously established shall be maintained in a true and even condition.

Where grades have not been established and where improperly graded, areas shall be uniformly graded. Finished surfaces shall be smooth within a tolerance of 30.5 mm above or below the indicated subgrade elevations, with uniform levels or slopes between the points where elevations are indicated or between such points and existing grades and free from irregular surface changes to prevent the formation of depressions where water will accumulate.

3.1.3 Tillage

Immediately prior to placing the topsoil, the subgrade, wherever excessively compacted by traffic or other cause, shall be loosened to a depth of at least 76.2 mm by plowing, discing, harrowing, or other approved means.

3.1.4 Placing Topsoil

Suitable topsoil shall be placed in the top 75 mm of all grassed areas stripped under this project. All areas to receive topsoil, including cut and fill areas, shall be shaped to provide a minimum of 75 mm topsoil. Prior to placement of the topsoil, the subgrade shall be scarified to a depth of 76.2 mm. The topsoil shall be uniformly distributed and evenly spread to an average thickness of 75 mm. The spreading shall be performed in such a manner that planting can proceed with little additional soil preparation or tillage, and the area shall be left smooth and suitable for lawns. Irregularities in the surface from topsoiling or other operations shall be corrected so as to prevent the formation of depressions where water will stand. Topsoil shall not be hauled and placed when wet or when the subgrade is frozen, excessively wet, extremely dry or in a condition otherwise detrimental to the proposed planting or to proper grading. Topsoil shall be spread uniformly but shall not be compacted. Where any portion of the surface becomes gullied or otherwise damaged, the affected

area shall be repaired to establish the condition and grade prior to topsoiling, and then shall be re-topsoiled.

3.1.5 Application of Lime

The application of lime shall conform to ODOT 659.03.

Lime shall be uniformly distributed over the topsoil surface at a rate of 45 kg per 100 square meter and incorporated into the topsoil to a depth of at least 76.2 mm by discing, harrowing, or other approved means.

3.1.6 Application of Fertilizer

The application of fertilizer shall conform to ODOT 659.04.

Fertilizer shall be uniformly distributed over the topsoil surface at a rate of 10 kg per 100 square meter, and incorporated into the topsoil to a depth of at least 76.2 mm by discing, harrowing, or other approved means.

Fertilizer may be applied mixed with seed and water as specified in paragraph entitled, "Seeding."

3.1.7 Smooth Grading

Undulations or irregularities in the topsoil surface resulting from operations shall be leveled.

The topsoil surface shall be made smooth and uniform.

3.1.8 Cleanup

After smooth grading, the topsoil surface shall be cleared of stones or other objects that might be a hindrance to planting or maintenance operations.

Topsoil or other material that has been brought upon the surfacing of paved areas by operations shall be removed daily.

3.2 HYDROSEEDING

3.2.1 Preparation of Seedbed

Preparation of seedbed shall conform to ODOT 659.10 for residential and commercial properties.

Seedbed shall be loose and porous at the time of seeding. The seedbed shall be loosened to a depth of at least 75 millimeter by harrowing or other suitable means and the surface smooth-graded and cleared of objectionable material as specified.

3.2.2 Mixture Preparation

Mix specified seed, fertilizer, and fiber mulch in water, using equipment specifically designed for hydroseed application. Continue mixing until uniformly blended into momogenous slurry suitable for hydraulic application.

Mix slurry with nonasphaltic tackifier.

Type A fertilizer (5:10:10) shall be mixed in the slurry to be

broadcast at the rate of 20 kilograms per 100 square meter.

3.2.3 Planting

Apply slurry uniformly to all areas to be seeded in a one-step process. apply mulch at the minimum rate of 16.5 kilograms per 100 square meter (1,500 pounds per acre) dry weight, but not less than the rate required to obtain 17.1 kilograms per 100 square meter seed-sowing rate.

Apply slurry uniformly to all areas to be seeded in a two-step process. Apply first slurry application at the minimum rate of 5.5 kilograms per 100 square meter (500 pounds per acre) dry weight, but not less than the rate required to obtain specified seed-sowing rate. Apply slurry cover coat of fiber mulch at a rate of 11 kilograms per 100 square meter (1,000 pounds per acre).

All structures, buildings, walks, roads, and plant materials shall be brushed or swept to remove any mulch impinged thereon.

3.3 MULCHING

3.3.1 Placing Mulch

Placement, repair and maintenance of mulch shall conform to ODOT 659.13 through 659.20.

Hydro-mulch shall be applied at recommended rates, when hydraulic methods are employed for grass seed application.

Where grass seed is applied, areas shall be covered immediately with a uniform blanket of straw mulch not exceeding a loose depth of 38 millimeter.

Straw mulch shall be applied by hand or approved equipment.

3.3.2 Anchoring of Mulch

Where straw mulch is employed, straw mulch shall be anchored with tacking agents noted in ODOT 659.14, or approved fiber mesh netting.

3.4 GRASS ESTABLISHMENT

3.4.1 General

The period of grass establishment shall begin immediately after the completion of mulching in an area and shall continue for a period of 2-months after the completion of seeding on the entire project unless the desired grass cover is established in a shorter period of time and shortening of the grass-establishment period is authorized.

3.4.2 Watering

Immediately after the completion of mulching in an area, the area shall be moistened to a depth of 75 millimeter or more.

After the initial watering, the seeded areas shall be watered as required to maintain the soil in a moist condition for the entire grass-establishment period.

Watering shall conform to ODOT 659.17.

The Contractor shall provide and maintain temporary piping and lawn-watering equipment required to convey water from the water source to uniformly water the seeded areas. Water shall be free from substances detrimental to the growth of vegetation. Water sources located on Government property will be subject to approval prior to use. Temporary watering equipment shall be removed after grass area acceptance.

Watering schedules shall be arranged and lawn-watering equipment laid out in a manner to avoid the necessity of walking over muddy and newly seeded areas.

Watering shall be done in a manner to prevent the displacement of seed and mulch and to prevent puddling and water erosion.

3.4.3 Weeding

Weeds or other undesirable vegetation that threaten to smother the grass shall be uprooted and removed from the area.

3.4.4 Reseeding

After the first mowing, bare areas shall be reseeded.

Reseeding shall be with the grass seed specified for each seeded area and shall be sown at the rate specified and in a manner that will cause a minimum of disturbance to the existing stand of grass and mulch.

3.4.5 Remulching

In areas where mulch has been disturbed sufficiently to nullify its purpose, new mulch shall be added and anchored as specified.

3.4.6 Refertilizing

After the first mowing and during a period when the grass is dry, fertilizer shall be uniformly distributed over the seeded area at a rate of 1.0 kilogram of actual nitrogen per 93 square meter. Fertilizer shall be as specified.

3.5 ACCEPTANCE PROVISIONS

3.5.1 Acceptance Requirements

Completed grass areas shall have been recently mowed and be covered with a uniform stand of the specified grass, be free of rank growths of weeds or other undesirable vegetation, and be free of irregular surface changes and other depressions where water will accumulate.

Scattered bare spots not larger than 152.4 mm in any dimension will be allowed, up to a maximum of 3 percent of any grass area.

The condition of grass areas at the time of inspection will be noted and a determination, made whether the grass-establishment period shall be extended for any area.

3.5.2 Repairs

If, before completion and acceptance of the entire work, portions of the

surface become gullied or otherwise damaged following seeding or the grass seedings have been destroyed, the affected area shall be repaired to re-establish the condition and grade of the soil prior to seeding and then re-seeded, remulched, and the grass established as specified.

3.6 PROTECTION

Seeded areas shall be protected against traffic or other use by erecting barricades around each area immediately after seeding is completed and by placing warning signs of an approved type on each seeded area.

-- End of Section --

SECTION 33 05 23.98

TRENCHLESS UTILITY INSTALLATION

PART 1 GENERAL

1.1 SUBMITTALS

The following shall be submitted in accordance with Section 01 33 00, "Submittals," in sufficient detail to show full compliance with the specification:

SD-08 Statements

Contractor Qualifications: The Contractor shall submit the specific experience of the Contractor or Sub-Contractor performing directional drilling for installation of the force main.

SD-06 Instructions

The Contractor shall use Directional Drilling methods to perform non-open cut construction. A minimum of thirty days prior to starting the directional drilling, the Contractor shall submit a detailed explanation of the proposed construction methods for approval by the COTR. The plan shall include, but not be limited to, the following:

Identification of trenchless construction specialty installer and evidence of required experience;

Explicit description of proposed construction method with any proposed alternative for the trenchless construction installation;

A description of proposed equipment to be used and schedule for work in this Section;

Drawings of each crossing showing temporary staging areas, limits of work and proposed crossing; and

A description of materials, including all certifications showing compliance with material requirements.

1.2 SCOPE OF SERVICE

This Section covers the furnishing and installing of pipe, at the locations indicated, by the directional drilling method.

1.3 CONTRACTOR QUALIFICATIONS

The work described in this Section shall only be performed by a firm experienced in trenchless installation of utilities, specializing in the installation of water mains and sanitary sewer force mains through the use of directional drilling method.

The specialty installer shall have a minimum of one year experience in directional drilling.

The installer shall have installed at least 1,500 linear meters of either water, natural gas, or force main through the directional drilling method.

1.4 JOB CONDITIONS

1.4.1 Site Information

Test borings have been made on the roadway, and boring logs are included on the contract drawings. The data on indicated subsurface conditions are not intended as representations or warranties of the continuity of such conditions between soil borings. It is expressly understood that the Government will not be responsible for interpretations or conclusions drawn there from by the Contractor. The data are made available only for the convenience of the Contractor. Additional test borings and other exploratory operations may be made by the Contractor at no additional expense to the Government.

PART 2 PRODUCTS

2.1 HIGH DENSITY POLYETHYLENE PIPE

High density polyethylene pipe (HDPE) shall conform to ASTM D 3350 for PE3408 material. Pipe shall have a cell classification of 335434. Pipe shall meet or exceed the requirements of AWWA C906 with a dimensional ratio of 11.0. All pipe shall be delivered shall be marked with the designation " AWWA C906-90."

2.2 FITTINGS

Polyethylene fittings shall be produced from materials meeting the same specification requirements as the pipe. Fittings shall be a product of the pipe manufacturer and shall be molded or mechanical fittings suitable for the particular installation and as recommended by the manufacturer. Suitable mechanical fittings and/or adaptors shall be used at connections to ductile iron or other pipe of differing materials.

2.3 TRACE WIRE

Contractor shall provide one (1) #14 THNN Trace wire attached to HDPE Pipe.

2.4 BENTONITE

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

2.5 QUALITY CONTROL

Quality Control: The pipe and fitting manufacturer shall have an established quality control program responsible for inspecting incoming and outgoing materials. Incoming polyethylene materials shall be inspected for density, melt flow rate and contamination. The cell classification properties of the material shall be certified by the supplier. Incoming materials shall be approved by quality control before processing into finished goods. Outgoing products shall be tested as required in AWWA C906. The manufacturer shall maintain quality control and quality assurance records. Certification or copy of these records shall be made available to

the COTR upon request.

PART 3 EXECUTION

3.1 PREPARATION

3.1.1 Existing Utilities

Contractor shall expose all existing underground utilities in vicinity of the proposed directional drilling activity by "pot-hole" excavation. Contractor shall verify exact horizontal and vertical location of existing utilities to ensure that during drilling operations existing utilities will not be disturbed or damaged. This information shall be utilized by the Contractor to ensure that the final vertical and horizontal route of the pipe will not impact or disturb existing utilities.
The Contractor shall be completely responsible for determining the locations of the existing underground utilities. The location as shown on the drawings is solely for general reference.
The Contractor shall be completely liable and financially responsible for any damage or disturbance to existing utilities as a part of this work.
In the event an existing utility is disturbed, damaged or otherwise altered, the Contractor shall repair the existing utility without cost to the Government. Such work shall completed immediately and to the COTR's satisfaction.

a. The Contractor shall properly support all excavations and prevent movement of the soil, pavement, utilities or structures outside of the excavation. The Contractor shall furnish, place and maintain sheeting, bracing, and lining required to support the sides and floor of all excavations and to provide adequate protection of the work, personnel, and the general public.

b. The Contractor shall furnish, install, and maintain equipment to keep the excavations free of excess water. The Contractor shall also provide surface protection during the period of construction to ensure that surface runoff does not enter excavations. Groundwater dewatering shall comply with Section 31 23 02.98 Excavation Backfilling and Compacting for Utilities, Paragraph 3.7. "Groundwater and Storm Water Control and Removal" and shall not affect surrounding soils or structures beyond the tolerances stated in paragraph entitled "Settlement, Alignment and Tolerances."

c. Provide security fence around all access shaft areas and provide shaft cover(s) when the shaft area is not in use.

3.2 INSTALLATION

3.2.1 Installation of Tracer Wire

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

3.2.2 Core Hole

Horizontal directional drilling (HDD) shall be performed by the directional drilling method utilizing controlled fluid jetting. The core hole shall be created by low flow, high-pressure jets of water or liquefied clay

(Bentonite) in advance of the boring tool, which shall be remotely controlled, vertically and horizontally. An electronic detection system shall be employed which shall monitor alignment within three inches of the designated course. The detection system shall be a walkover system utilizing a transmitter on the tool head and a surface locator unit or an electromagnetic system consisting of electric cables positioned and secured over the path of the proposed pipeline.

3.2.3 Pipe Installation

Upon approval of the core hole location by the COTR, the hole enlarging or back reaming phase of the installation shall begin. The borehole diameter shall be increased to accommodate the pullback operation of the required size of HDPE pipe. The type of back reamer to be utilized in this phase shall be determined by the types of sub-surface soil conditions that have been encountered during the pilot hole drilling operation. The reamer type shall be at the Contractor's discretion with the final hole diameter being larger than the outside diameter of the product pipe being installed in the bore hole. The open bore hole may be stabilized by means of Bentonite drilling slurry or polymer gel being pumped through the inside diameter of the drill pipe and through openings in the reamer. The slurry will also serve as an agent to carry the loose cuttings to the surface through the annulus of the borehole. These cuttings and slurry are to be contained at the exit hole or entry side of the directional bore in pits or holding tanks. The slurry may be recycled at this time for the reuse in the hole opening operation or it shall be hauled by the Contractor to a disposal location off Government property, approved by the COTR.

3.2.4 Drilling Materials

A complete list of all drilling fluid additives and mixtures to be used in the directional operation shall be submitted to the COTR along with their respective Material Safety Data Sheets as part of the Health and Safety Plan. All drilling fluids and loose cuttings shall be contained; no fluids shall be allowed to enter any unapproved areas or natural waterways. Upon completion of the directional drill project, all excess drilling fluid shall be removed by the Contractor.

3.2.5 Pipe Joints

The polyethylene pipe shall be butt-fused in accordance with the manufacturer's written instructions. No fittings shall be installed in the borehole. Pulling of the pipe through the borehole shall be performed in such a manner that will prevent the intrusion of earth, slurry or other objectionable materials. Contractor shall de-bead all exterior surfaces of the pipe joints.

3.2.6 Excavation, Backfill and Compaction

Excavation Backfill and Compaction: Upon completion and approval of the installed pipeline by the Contracting Officer, remove all equipment, debris, and unacceptable materials from the pits and commence backfilling operation. Backfilling, compaction and pavement repairs shall be completed in accordance with Section 02225, "Excavation, Backfilling and Compacting for Utilities" and 02514, "Asphalt Concrete Pavement."

3.3 TESTING

3.3.1 General

A pressure test shall be made of the polyethylene pipe prior to installing in the borehole. Heat fusion joints must be completely cooled before pressure testing. The pressure test shall be as specified in AWWA C600. The pressure shall be maintained at 50% above the normal operating pressure and this pressure maintained for at least two hours. The test pump and water supply shall be arranged to allow accurate measurement of the water required to maintain the test pressure. Any water added will be considered leakage. Any material showing seepage or the slightest leakage shall be replaced as directed by the COTR at no additional cost to the Government. Air testing will not be permitted. The manufacturer's recommendations and tolerances concerning pipe stretch allowance and pressure test duration shall be observed.

3.3.2 Testing

The Contractor shall plug the ends of line being tested. Fill the line with water for at least 24 hours prior to testing. Allow all air to escape. Test pressure shall be held for one (1) hour. Provide pressure gauge at highest point on the force main. The test pressure shall be held at 10.6 kilograms per square centimeter (150 psi) as measured at the test gauge. Allowable leakage for HDPE to be computed from this requirement: less than 1.11 liters per day per kilometer of pipe per millimeter diameter (12 gallons per day per mile of pipe per inch diameter) of nominal size.

-- End of Section --

Implementation Plan

For

FY09 Repair of Natural Gas System, GRC, Phase 5

January 20, 2009

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Working Hours:

NASA Glenn Research Center (GRC) standard working hours shall be defined as Monday through Friday 7:30 am to 5:00 pm. Second shift hours at GRC shall be defined as 4:00 pm to midnight. Weekend hours shall be defined as 4:00 P.M. Friday through 6:00 am Monday.

Notices to Proceed:

The construction contract shall be structured with two Notices to Proceed (NTP). These shall be issued as follows:

a) Initial Notice to Proceed

This NTP shall commence all required submittals (equipment, schedules, health & safety plans, etc.). The Contractor shall also submit a preliminary schedule to the COTR for review. After this submittal, and before the Contractor submits a detailed construction schedule, a meeting shall be held between the Contractor, COTR, project manager, system managers, facility manager and building managers. This meeting will be used to discuss the coordination and implementation of construction and the coordination of contractor personnel and NASA personnel. The Contractor shall then incorporate this information into the detailed construction schedule and submit the detailed schedule to the COTR for approval.

b) Second Notice to Proceed

This NTP shall commence actual site construction (fieldwork). The timing between the Initial and Second NTP shall be approximately two (2) months. The Contractor must have approved submittals on major equipment and evidence that material and equipment have been procured (invoices, manufacturing dates, etc.). Contractor must have also received all equipment and materials required to complete the planned work per contractor's detailed construction schedule.

Construction Schedule:

The Contractor shall submit a Construction Schedule showing the approximate dates suggested for construction activities. The schedule shall be detailed indicating sequence of work. Work shall be sequenced to take advantage of favorable seasonal conditions and include factors such as material deliveries, holidays and other known conditions. The actual schedule to be used for construction activities is dependent upon the date of the Construction Notice to Proceed, the Contract Period, and the Construction Progress Schedule submitted by the Contractor and approved by the COTR.

The period of performance for completion of all work is 200 days from the initial N.T.P. date.

Work Scheduling

Duty hours for work shall be as described below. Requests for additional work shall require written approval from the Contracting officer 3 days in advance of the proposed work period.

The Contractor shall telephone the Contracting Officer's Technical Representative/Inspector each workday and report the following:

Themselves
Company name and contact
Work Area
Number of personnel on the job

The Contractor shall require each subcontractor to comply with the above requirements in the Contractor's absence.

General:

See Section **01 31 19.98** of the specifications for additional information regarding project meetings.

The Natural Gas Distribution Piping project shall be performed in a manner that will minimize the disturbance of adjacent building operations, their occupants and traffic flow. The Contractor shall coordinate all activities with the Construction Manager

Utility outages and connections required during the execution of work that affect existing systems shall be arranged for at the convenience of the Government and shall be scheduled in advanced.

The Contractor shall be responsible for submitting requests for excavation permits prior to excavating, providing safety barricades around excavations and providing cleanup of dust and debris at the conclusion of each working day as approved by the NASA Contracting Officer's Technical Representative (COTR).

During the course of construction, existing Buildings 15 and 21 natural gas emergency generators shall be maintained to be ready for use when needed for backup in case of an emergency.

Contacts:

The Contractor shall be furnished with instructions on who and how to make contact for site access, safety response, shutdown coordination, etc. This information will be made available at the construction kick-off meeting.

Sequence of Work:

The project is comprised of three areas of work:

1. North Section of Taylor Road
2. South Section of Taylor Road
3. Building 35 Complex Area

The contractor shall provide a schedule detailing the sequence of work for each work area and identify the duration during which buildings will be without natural gas service.

The contractor shall provide two natural gas storage containers and connect the units as backup for the existing generators in buildings 15 and 21. Each storage unit shall be 10,000 cubic ft. at supply pressure of 11-13 inch H2O.

- Building 15 1500 cubic ft./hr
- Building21 260 cubic ft./hr

The contractor shall provide a plan showing where and how the above storage units will be located, how they will be supported, protected and piped, and documentation on their testing certification.

Work Issues:

General:

Due to research activities being performed in the buildings all required utility shutdowns are critical , shutdown times shall be scheduled and minimized. In order to ensure this, the Contractor shall coordinate all work that will cause the area to be shutdown. The Contractor shall schedule this shutdown with the COTR at least thirty (30) days in advance.

Mechanical:

Natural Gas isolation and shutdown shall be coordinated with the Construction Manager and Building Manager. A five (5) day notice is required for scheduling isolation by NASA support Contractor, CHI.

All piping shall be pressure tested prior to NASA acceptance as per requirements of Contract specifications and drawings.

Buildings 15 and 21 require NG generators during emergency for backup.

Electrical:

No known special conditions

Civil

All excavations will require an approved excavation permit.
All excavations will require Safety Barricades
Restoration of all lawns, grasses, trees, plants, roadway surfaces and covers.

Structural:

No known special conditions.

Architectural:

No known special conditions.

Environmental:

General:

See Environmental Notes on Sheet No. G-001.

Asbestos Abatement:

Pipe gaskets and valve packings were not dismantled and inspected or sampled for asbestos, and therefore are presumed ACM. If flanges or valves are to be dismantled the dismantling shall be performed by a licensed asbestos abatement contractor as per specification section 02 82 00.98 and properly disposing of all gaskets, and valve packings.

Lead Abatement:

The Contractor shall provide for the removal of lead-based paint (LBP) as required and as identified in the plans and specifications.

Handling of Excavated Soil:

Provide General, Storage, Transportation, Disposal, Required Documentation, Permits as identified in the plans and specifications.