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|--|---------------------------------------|----------------------------------|---------------------------------------|
| 2. AMENDMENT/MODIFICATION NO. 0002 | 3. EFFECTIVE DATE 11 JUN 99 | 4. REQUISITION/PURCHASE REQ. NO. | 5. PROJECT NO. <i>(If applicable)</i> |
|--|---------------------------------------|----------------------------------|---------------------------------------|

| | |
|--|--|
| 6. ISSUED BY Department of the Army Corps of Engineers Fort Worth District | 7. ADMINISTERED BY <i>(If other than Item 6)</i> |
|--|--|

| | | |
|--|-----|--|
| 8. NAME AND ADDRESS OF CONTRACTOR <i>(No., street, county, State and ZIP Code)</i> | (✓) | 9A. AMENDMENT OF SOLICITATION NO. DACA63-99-B-0019 |
| | (X) | 9B. DATED <i>(SEE ITEM 11)</i> 24 MAY 1999 |
| | | 10A. MODIFICATION OF CONTRACTS/ORDER NO. |
| | | 10B. DATED <i>(SEE ITEM 13)</i> |

11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers tended. is extended, is not ex-

Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods:
 (a) By completing Items 8 and 15, and returning 1 copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. ACCOUNTING AND APPROPRIATION DATA *(If required)*

13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS, IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.

| | |
|-----|--|
| (✓) | A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: <i>(Specify authority)</i> THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A. |
| | B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES <i>(such as changes in paying office, appropriation date, etc.)</i> SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b). |
| | C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF: |
| | D. OTHER <i>(Specify type of modification and authority)</i> |

E. IMPORTANT: Contractor is not, is required to sign this document and return _____ copies to the issuing office.

14. DESCRIPTION OF AMENDMENT/MODIFICATION *(Organized by UCF section headings, including solicitation/contract subject matter where feasible.)*

The Solicitation for ARMY FAMILY HOUSING REVITALIZATION, WHITE SANDS MISSILE RANGE, NEW MEXICO, is amended as follows:

See Continuation Sheets.

NOTE: Bid Opening date remains "23 June 1999, at 2 p.m. local time," as previously announced.

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

| | |
|--|---|
| 15A. NAME AND TITLE OF SIGNER <i>(Type or print)</i> | 16A. NAME AND TITLE OF CONTRACTING OFFICER <i>(Type or print)</i> |
| 15B. CONTRACTOR/OFFEROR _____ <i>(Signature of person authorized to sign)</i> | 15C. DATE SIGNED |
| 16B. UNITED STATES OF AMERICA BY _____ <i>(Signature of Contracting Officer)</i> | 16C. DATE SIGNED |

Item 14. Continued.

a. Bidding Schedule.- The Bidding Schedule shall be voided and the accompanying new Bidding Schedule, bearing the notation "ACCOMPANYING AMENDMENT NO. 0002 TO SOLICITATION NO. DACA63-99-B-0019", shall be substituted therefor.

b. Wage Rates. Void pages 00710-1 through 00710-21, and substitute therefor the attached pages 00710-1 through 00710-5, each page bearing the notation "ACCOMPANYING AMENDMENT NO. 0002 TO SOLICITATION NO. DACA63-99-B-0019".

c. Specifications.

(1) The following listed sections shall be voided and the accompanying new sections of the same title and number, each bearing the notation "ACCOMPANYING AMENDMENT NO. 0002 TO SOLICITATION NO. DACA63-99-B-0019," shall be substituted therefor:

| <u>Section No.</u> | <u>Title</u> |
|--------------------|---|
| 01000 | CONSTRUCTION SCHEDULE |
| 01010 | OPTIONS |
| 02090 | LEAD-BASED PAINT (LBP) ABATEMENT AND DISPOSAL |
| 02222 | EXCAVATION, TRENCHING AND BACKFILLING FOR UTILITIES SYSTEMS |
| 02225 | EARTHWORK FOR ROADWAYS |
| 02241 | AGGREGATE BASE COURSE |
| 02551 | BITUMINOUS PAVING FOR ROADS, STREETS AND OPEN STORAGE AREAS |
| 02811 | UNDERGROUND SPRINKLER SYSTEMS |
| 02930 | EXTERIOR PLANTING |
| 06410 | CUSTOM CASEWORK |
| 13280 | ASBESTOS ABATEMENT |
| 16375 | ELECTRICAL DISTRIBUTION SYSTEM, UNDERGROUND |
| 16415 | ELECTRICAL WORK, INTERIOR |

(2) The following listed accompanying new section, bearing the notation "ACCOMPANYING AMENDMENT NO. 0002 TO SOLICITATION NO. DACA63-99-B-0019," shall be added to the specifications and add to the Table of Contents:

| <u>Section No.</u> | <u>Title</u> |
|--------------------|--------------|
| 02921 | SEEDING |

d. Drawings.

(1) Changes to Drawings - Sheet C1 - Sequence No. 3 - Change the working, Sanitary Landfill, to read:

"Approximate location of demolition landfill 2 miles east of Hughes Street on Watertown Avenue."

(2) The drawings listed below shall be voided and the attached new drawings of the same number, each bearing the notation "AM #0002," shall be substituted therefor:

| <u>Sequence No.</u> | <u>Sheet No.</u> | <u>Title</u> |
|---------------------|------------------|---|
| Seq 4 | C-2 | IMPROVEMENTS SITE PLAN |
| Seq 20 | A-10 | MISCELLANEOUS DETAILS |
| Seq 21 | A-11 | SECTIONS AND DETAILS |
| Seq 23 | S-1 | FOUNDATION/ROOF FRAMING PLANS & DETAILS |
| Seq 24 | S-2 | FOUNDATION/ROOF FRAMING PLANS & DETAILS |
| Seq 39 | E-1 | ELECTRICAL SITE PLAN DEMOLITION & NEW WORK |
| Seq 40 | E-2 | ELECTRICAL DEMOLITION & NEW WORK PLAN - JL-3 BR. |
| Seq 41 | E-3 | ELECTRICAL DEMOLITION & NEW WORK PLAN - JL-3 BR. H.C. |
| Seq 42 | E-4 | ELECTRICAL DEMOLITION & NEW WORK PLAN - JL-4 BR. |
| Seq 43 | E-5 | ELECTRICAL DEMOLITION & NEW WORK PLAN - JL-4 BR. H.C. |
| Seq 44 | E-6 | ELECTRICAL DEMOLITION & NEW WORK PLAN - JR-3 BR. |
| Seq 45 | E-7 | ELECTRICAL DEMOLITION & NEW WORK PLAN - I-3 BR. |
| Seq 46 | E-8 | ELECTRICAL DEMOLITION & NEW WORK PLAN - M-3 BR. |
| Seq 48 | L-1 | LANDSCAPE PLAN |
| Seq 49 | L-2 | LANDSCAPE PLAN |
| Seq 50 | L-3 | IRRIGATION PLAN |

END OF AMENDMENT

Army Family Housing Revitalization (Title)
White Sands Missile Range, New Mexico (Location)

Solicitation Number DACA63-99-B-0019

BIDDING SCHEDULE
 (To be attached to SF1442)

| Item No. | Description | Estimated Quantity | Unit | Unit Cost | Estimated Amount |
|---|---|--------------------|-----------|-----------|------------------|
| BASE BID: All work required by the plans and specifications for the construction of the Family Housing Units, excluding all work listed as Options. | | | | | |
| 0001 | Type JL 3 Bedroom; complete Including all utilities to the 5-foot line of the building excluding all work listed separately | 14 | Ea | \$ _____ | \$ _____ |
| 0002 | Type JL 3 Bedroom HC; complete Including all utilities to the 5-foot line of the building excluding all work listed separately | 1 | Ea | \$ _____ | \$ _____ |
| 0003 | Type JL 4 Bedroom; complete Including all utilities to the 5-foot line of the building excluding all work listed separately | 11 | Ea | \$ _____ | \$ _____ |
| 0004 | Type JL 4 Bedroom HC; complete Including all utilities to the 5-foot line of the building excluding all work listed separately | 1 | Ea | \$ _____ | \$ _____ |
| 0005 | Type JR 3 Bedroom; complete Including all utilities to the 5-foot line of the building excluding all work listed separately | 2 | Ea | \$ _____ | \$ _____ |
| 0006 | NOT USED | | | | |
| <u>AM#0002</u> | | | | | |
| 0007 | Type M Bedroom; complete Including all utilities to the 5-foot line of the building excluding all work listed separately | <u>1</u> | Ea | \$ _____ | \$ _____ |

BIDDING SCHEDULE (cont)

| Item No. | Description | Estimated Quantity | Unit | Unit Cost | Estimated Amount |
|----------------|---|--------------------|------|-----------|------------------|
| 0008 | Asbestos Abatement | | | | |
| | Gypsum Board | 5,608 | SF | \$ _____ | \$ _____ |
| | Floor Tile Mastic | 10,519 | SF | \$ _____ | \$ _____ |
| | Mercury Thermostats | 29 | Ea | \$ _____ | \$ _____ |
| 0009 | Lead Paint Abatement | 4,681 | SF | \$ _____ | \$ _____ |
| 0010 | All Exterior Work outside the Building's 1524mm line (Including of all Demolition, Asphalt Paving, Sidewalks, Driveways, Curbs and Gutter, Utilities and all other work not listed separately | Job | Sum | *** | \$ _____ |
| TOTAL BASE BID | | | | \$ | _____ |
| 0011 | OPTION NO. 1: All work required by the plans and specifications to construct the Rockwalls. | Job | Sum | *** | \$ _____ |
| 0012 | OPTION NO. 2: All work required by the plans and specifications to construct the concrete driveways identified as Option 2. | Job | Sum | *** | \$ _____ |
| 0013 | OPTION NO. 3: All work required by the plans and specifications to construct the bedroom Screen Walls, doors and patio in lieu of the mowstrips required by the Base Bid. | Job | Sum | *** | \$ _____ |
| 0014 | OPTION NO. 4: All work required by the plans and specifications to construct the concrete patios and sidewalks identified as Option 4. | Job | Sum | *** | \$ _____ |

BIDDING SCHEDULE (cont)

| | | | | | |
|---------------------------------------|--|-----|-----|----------|----------|
| 0015 | OPTION NO. 5: All work required by the plans and specifications to install the drip irrigation system and landscaping. | | | | |
| | | Job | Sum | *** | \$ _____ |
| 0016 | OPTION NO. 6: House No. 219, Type I 3 Bedroom; complete, Including all utilities to the 5-foot line of the building excluding all work listed separately | 1 | Ea | \$ _____ | \$ _____ |
| 0017 | OPTION NO. 7: House No. 220, Type I 3 Bedroom; complete Including all utilities to the 5-foot line of the building excluding all work listed separately | 1 | Ea | \$ _____ | \$ _____ |
| 0018 | OPTION NO. 8: House No. 221, Type I 3 Bedroom; complete Including all utilities to the 5-foot line of the building excluding all work listed separately | 1 | Ea | \$ _____ | \$ _____ |
| 0019 | OPTION NO. 9: House No. 222, Type I 3 Bedroom; complete Including all utilities to the 5-foot line of the building excluding all work listed separately | 1 | Ea | \$ _____ | \$ _____ |
| 0020 | OPTION NO. 10: House No. 223, Type I 3 Bedroom; complete Including all utilities to the 5-foot line of the building excluding all work listed separately | 1 | Ea | \$ _____ | \$ _____ |
| 0021 | OPTION NO. 11: House No. 224, Type I 3 Bedroom; complete Including all utilities to the 5-foot line of the building excluding all work listed separately | 1 | Ea | \$ _____ | \$ _____ |
| TOTAL BASE BID PLUS OPTIONS 1 THRU 11 | | | | | \$ _____ |

BIDDING SCHEDULE (cont)

NOTES:

1. ARITHMETIC DISCREPANCIES: (1989 JUL)

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

(1) Obviously misplaced decimal points will be corrected;

(2) In case of discrepancy between unit price and extended price, the unit price will govern;

(3) Apparent errors in extension of unit prices will be corrected; and

(4) Apparent errors in addition of lump-sum and extended prices will be corrected.

(b) For the purposes of bid evaluation, the Government will proceed on the assumption that the bidder intends his bid to be evaluated on the basis of the unit prices, extensions, and totals arrived at by resolution of arithmetic discrepancies as provided above and the bid will be so reflected on the abstract of bids. (EFARS 14.406-2)

(c) These Correction procedures shall not be used to resolve any ambiguity concerning which bid is low.

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

3. Bidders must bid on all items.

4. Cost attributable to Division 01 - General Requirements are assumed to be prorated among bid items listed.

5. Responders are advised that this requirement may be delayed, cancelled or revised at any time during the solicitation, selection, evaluation, negotiation and/or final award process based on decisions related to DOD changes in force structure and disposition of the Armed Forces.

6. For the purpose of this solicitation, the word "item" shall be considered to mean "schedule" as used in Provision 52.214-0019, CONTRACT AWARD--SEALED BIDDING--CONSTRUCTION, in Section 00100 INSTRUCTIONS, CONDITIONS, AND NOTICES TO BIDDERS, excluding additives, deductives, or optional items.

BIDDING SCHEDULE (cont)

7. EVALUATION OF OPTIONS (JUL 1990) (FAR 52.217-5)

Except when it is determined in accordance with FAR 17.206(b) not to be in the Government's best interests, the Government will evaluate offers for award purposes by adding the total price for all options to the total price for the basic requirement. Evaluation of options will not obligate the Government to exercise the option(s).

8. OPTION FOR INCREASED QUANTITY - SEPARATELY PRICED LINE ITEM (MAR 1989)
(FAR 52.217-7)

The Government may require the completion of the numbered line item, identified in the Bidding Schedule as an option item, in the quantity and at the price stated in the Bidding Schedule. The Contracting Officer may exercise the option by written notice to the Contractor within the period specified in the Bidding Schedule. Completion of added items shall continue at the same schedule as the Base Bid unless otherwise noted in the SPECIAL CONTRACT REQUIREMENTS, paragraph 1 entitled COMMENCEMENT, PROSECUTION AND COMPLETION OF WORK.

9. The Government reserves the right to exercise the option(s) either singularly or in any combination for up to 180 calendar days after award of the Base Bid without an increase in the Offeror's Bid Price.

ACCOMPANYING AMENDMENT NO. 0002 TO SOLICITATION NO. DACA63-99-B-0019

GROUP 2: Air & Power Tool Operator (Not a Carpenter's tool); Asbestos Remover, Asphalt Heater, Asphalt Jointman, Asphalt Raker, Batching Plant Scaleman, Chain Sawman, Concrete Touch-up, Concrete Sawman, Coring Machine, Curbing Machine, Asphalt or Cement; Cutting Torchman; Metal Form Setter-Road; Grade Setter, Gunite Reboundmen; Concrete Power Buggy Operator; Sandblaster, Potmen; Nozzleman, Vibratorman (Hand Type); Vibratory Compactor (Hand Type); Window Washers, Fog Machine Operator; Nurseryman-Gardner; Multi-plate Setter; Concrete Burner; Hod-Carriers; Mortar Mixers, Plaster Spreader Operator; Gunite Nozzlemen; Pipelayer; Pumpcrete Nozzlemen; .

GROUP 3: Landscaper

PAINTERS:

| | | |
|--------------------------|------|------|
| Brush/Roller | 9.00 | |
| Drywall Finishers/Tapers | 8.00 | |
| Spray | 8.39 | 1.45 |

PLASTERERS 6.00

PLUMBERS & PIPEFITTERS 12.00

POWER EQUIPMENT OPERATORS:

| | |
|---------|------|
| GROUP 1 | 6.48 |
| GROUP 2 | 7.52 |
| GROUP 3 | 7.60 |
| GROUP 4 | 7.66 |
| GROUP 5 | 7.72 |
| GROUP 6 | 7.82 |
| GROUP 7 | 7.92 |
| GROUP 8 | 9.00 |

POWER EQUIPMENT OPERATOR CLASSIFICATIONS

GROUP 1: Oiler, Screedman, Rubber-tired Farm-type Tractors, Tractors under 50 hp w/o attachments.

GROUP 2: Rollers, Sheepfoot or Pneumatic Self Propelled w/o Dozer, Concrete Conveyor, Service Truck Operator., (Head Oiler), Air Compressor (300 CFM and over), Pump (6" and over), Screening Plants, Concrete Mixers (under 1 cy), Concrete Saw or Grinder-Span Type, Hoists, 1 drum, Air Tugger, Elevating Belt Type Loaders, Forklift Lumber Stacker, Tractor-Farm Type (under 50 h.p. w/attach.), Motorman & Industrial Locomotive Operator, Winch Trucks, Front End Loader (under 2 CY), Power Plants which generate over 15 kw, Welding Machines.

GROUP 3: Bituminous Distributors, Boilers, Retort & Hot Oil Heaters, Concrete Mixers (1 cy & over), Concrete Paver-Single Drum, Drilling Equipment, Motor Graders (rough), Slusher, Jumbo Form, Trenching Machines (all types), Pumpcrete & Gunite Machines, Slipform Paver, Concrete Slab Spreading Machines, Concrete Slab Finishing Machines, Asphalt Plants, Bituminous Finish Machine, Crushing Plants.

ACCOMPANYING AMENDMENT NO. 0002 TO SOLICITATION NO. DACA63-99-B-0019

GROUP IV: Front End Loader (2 thru 10 cy), Rollers Steel Wheeled - all types, Bulldozers, Scrapers (Motor or Towed), Elevating Graders, Concrete Batching Plants, Self-Propelled Rollers equipped w/dozer Twin-Bowl Scrapers & Quad 8 or 9 Pushers Three Bowl Scrapers, Tractor (Farm Type) w/hydraulic Backhoes.

GROUP V: Hydraulic Cranes-with less than 50' of boom (20 tons & under), Concrete Paver--Double Drum, Cat Cranes, Hysters, Side & Swingboom, CATA, Hoist -2 drum, Auto Fine Grader.

GROUP VI: Mucking Machine, all types, Motor Grader Finish, Mechanic Welder.

GROUP VII: Steam Engineers, Loader (Front End & Over 10 cy), Concrete Pump (Snorkel Type)

GROUP VIII: All shovel type equipment, Cranes, Draglines, Backhoes, Derricks, Guy & Stiff Leg, Pipemobile (#2 Operator) Piledriver, Hydraulic Cranes (20 tons & over), Mine Hoist (Belt Loader "CMI" type), Cranes, Draglines-w/booms & JIB over 150' shovel (wheel type).

| | | |
|--|-------|-----|
| ROOFERS | 9.87 | |
| SHEETMETAL WORKERS | 9.87 | |
| SOFT FLOOR LAYERS (Carpet, Asph Tile, Linoleum) | 10.00 | |
| TILE SETTERS | 8.50 | .66 |
| TRUCK DRIVERS: | | |
| GROUP 1 | 6.88 | |
| GROUP 2 | 7.00 | |
| GROUP 3 | 7.08 | |
| GROUP 4 | 7.20 | |
| GROUP 5 | 7.25 | |
| GROUP 6 | 7.35 | |
| GROUP 7 | 7.45 | |
| GROUP 8 | 7.59 | |
| GROUP 9 | 7.74 | |

TRUCK DRIVER CLASSIFICATIONS

GROUP 1: Pickup 3/8 ton & under service station; Lubrication; Light tire repair or washer.

GROUP 2: Dump or Batch Truck, Under 8 CY WLC; Flatbed (Bobtail), 2 ton & under; Forklift Under 5 ton MRC

GROUP 3: Dump Trucks (including all hwy & off hwy) 8 up to 16 CY WLC; Water, Fuel or Oil Trucks Less than 3,000 Gal; Flatbed (bobtail) over 2 tons.

GROUP 4: Distributor Driver; Lumber Carrier Driver; Young Buggy or Similar Equipment; Transit Mix or Agitor 2 or 3 axle Bobtail Equipment, Scissor Truck; Bulk Cement Bobtail 2 or 3 axles; Semi-

Trailer Driver (Flatbed or Van Single Axle) Forklift 5 ton & over
MRC.

GROUP 5: Dumpster & Dumpcrete Driver; Water, Fuel or Oil Truck
3,000 to 6,000 gal capacity, Low-Boy, Light Equipment Driver;
Euclid type Tank Wagon under 6,000 gal.

GROUP 6: Vacuum Truck, Dump Trucks 16 up to 22 cy WLC.

GROUP 7: Transit Mix or Agitator Semi or 4 axle Equipment
Driver; Flaherty Truck Type Spreader Box Driver; Slurry Truck
Driver; Bulk Cement Driver; Semi-Doubles 4 axle bobtail; Winch
Truck & "A" frame; Dump Trucks 22 cy up to 35 cy WLC.

GROUP 8: Euclid Diesel Powered Turnarocker; Terra Cobra, DW 10,
DW 20, Letourneau Pulls & Similar Diesel Powered Equipment when
used to haul materials & assigned to a teamster; Low-Boy Heavy
Equipment Driver, Water, Fuel or Oil Trucks 6,000 gal & over
incl. Tank Wagon Drivers; Semi-trailer Driver (Flatbed or Van
Tandems); Light Equipment Mechanic; Dump Trucks (incl all hwy &
off-hwy) 35 cy WLC & over; Truck & Trailer or Semi-Trailer
(flatbed).

GROUP 9: Lowboy (Heavy Equipment, Double Gooseneck); Heavy
Equipment Mechanic; Welder.

WELDERS - Receive rate prescribed for craft performing operation
to which welding is incidental.

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Unlisted classifications needed for work not included within the
scope of the classifications listed may be added after award only
as provided in the labor standards contract clauses
(29 CFR 5.5(a)(1)(v)).

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can
be:

- * an existing published wage determination
- * a survey underlying a wage determination
- * a Wage and Hour Division letter setting forth a
position on a wage determination matter
- * a conformance (additional classification and rate)
ruling

On survey related matters, initial contact, including requests
for summaries of surveys, should be with the Wage and Hour
Regional Office for the area in which the survey was conducted
because those Regional Offices have responsibility for the
Davis-Bacon survey program. If the response from this initial
contact is not satisfactory, then the process described in 2.)
and 3.) should be followed.

With regard to any other matter not yet ripe for the formal

process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U. S. Department of Labor
200 Constitution Avenue, N. W.
Washington, D. C. 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N. W.
Washington, D. C. 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U. S. Department of Labor
200 Constitution Avenue, N. W.
Washington, D. C. 20210

4.) All decisions by the Administrative Review Board are final.

END OF GENERAL DECISION

SECTION 01000

CONSTRUCTION SCHEDULE
 05/1998
 AMENDMENT NO. 0002

PART 1 GENERAL

1.1 SCHEDULE

Commence, prosecute, and complete the work under this contract in accordance with the following schedule and Section 00800 SPECIAL CONTRACT REQUIREMENT clauses COMMENCEMENT, PROSECUTION AND COMPLETION OF WORK and LIQUIDATED DAMAGES:

| Item of Work | Commencement of Work (calendar days) | Completion of Work (calendar days) | Liquidated Damages per calendar day |
|---|--|------------------------------------|-------------------------------------|
| (1) All work [AM#2]for Phase I ¹ | Within 10 days after receipt of Notice to Proceed | [AM#2]168 | \$545 .00 |
| (2) [AM#2] All work for Phase II ¹ | 30 calendar days after completion of Phase I and receipt of a letter to start Phase II | 168 | \$ 560.00 |
| (3) Exterior Planting | * | * | --- |
| (4) [AM#2] Cleanup and Closeout of Contract | After completion of Phase II, including completion inspection | 30 | --- |

¹[AM#2] See Section 01015 PHASING and Drawing, Sequence 4, for Phasing description.

*Exterior Planting

Planting and maintenance for Exterior Planting shall be in accordance with SECTION 02930 EXTERIOR PLANTING. No payment will be made for exterior planting until all requirements of the section are adequately performed and accepted, as determined by the Contracting Officer.

1.1.1 Testing of Heating and Air-Conditioning Systems

The times stated for completion do not include testing of heating and air-conditioning systems. Final testing of heating and air-conditioning systems will be accomplished during the appropriate heating/cooling season as determined by the Contracting Officer.

1.2 WORK RESTRICTIONS

1.2.1 Working Hours

The normal duty working shift is Monday through Thursday, 7:30 a.m. - 4:30 p.m.

1.3 UTILITIES

1.3.1 Payment for Utility Services

See Section 00800 SPECIAL CONTRACT REQUIREMENTS.

1.3.2 Outages

The Contractor shall coordinate all requests for utility outages with the Contracting Officer in writing 14 days prior to date of requested outage:

- a. Water, gas, steam, and sewer outages shall be held to a maximum duration of 4 hours unless otherwise approved in writing.
- b. Electrical outages shall have a maximum duration of 4 hours.

1.4 STREET CLOSINGS

The Contractor shall coordinate all requests for street closings with the Contracting Officer in writing 14 days prior to date of requested outage:

- a. One lane traffic shall be maintained at all times (except that a total closing may be allowed for specific 8-hour periods).
- b. The final street repair shall be completed within 14 days after the start of any street crossing. Any part of the street returned to service prior to final repair shall be maintained smooth with hot-mix cold-lay surface course.
- c. Open cuts across paved roads and streets for utility crossings will not be allowed. Utility crossings will be accomplished by boring or jacking procedures only.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

-- End of Section --

SECTION 01010

OPTIONS

1 GENERAL

1.1 SUMMARY

This section specifies administrative and procedural requirements for Options.

1.2 DEFINITION

1.2.1 Option

An option is an amount proposed by Bidders and stated on the Bidding Schedule that will be added to or deducted from Base Bid amount if the Government decides to accept a change in either scope of work or in products, materials, equipment, systems, or installation methods described in Contract Documents.

1.3 PROCEDURES

1.3.1 Coordination

Coordinate related Work and modify or adjust adjacent Work as required to ensure that Work affected by each accepted option is complete and fully integrated into the Project.

1.3.2 Notification

Immediately following award of Contract, prepare and distribute to each party involved, notification of the status of each option. Indicate whether options have been accepted, rejected or deferred for consideration at a later date. Include a complete description of negotiated modifications to options, if any.

1.3.3 Schedule

A "Schedule of Options" is included at the end of this section. Specification sections referenced in the Schedule contain requirements for materials and methods necessary to achieve the Work described under each option.

Include as part of each option, miscellaneous devices, appurtenances and similar items incidental to or required for a complete installation whether or not mentioned as part of the option.

2 PRODUCTS

3 EXECUTION

3.1 OPTION NUMBER ONE

Construct a typical gridded layout of rock walls 5'-0" high on 'property lines" with a 12' wide iron gate at each housing unit. See Civil Drawings for details and distance of rock wall fences. Also included is a wrought iron fence with a 3'-0" gate between housing units. See Civil Drawings for location and details. During Phase I, construct the continuous rock wall with the housing unit separation. During Phase II, construct the rock wall housing unit separation and complete construction of the rock walls.

3.2 OPTION NUMBER TWO

Construct a 9'-0" wide x 23'-0" long x 4" thick concrete driveway, reinforced with 6 x 6 - W1.4 x W1.4 W.W.M. adjacent to each housing unit garage with a 3'-6" wide x 4" thick sidewalk reinforced with 6 x 6 - W1.4 x W1.4 W.W.M. extending towards the side of the existing trash can area. See floor plans on Architectural Drawings.

3.3 OPTION NUMBER THREE

Construct an enclosed patio addition to the master bedroom. A 4'-0" high, 16" thick, rock wall approximately 10'-0" out from the unit by 18'-0" long with a 3'-0" wide iron gate. 4" thick concrete patio 12'-0" x 9'-0" reinforced with 6 x 6 - W1.4 x W1.4 W.W.M. Remove existing master bedroom (front elevation) windows/frames and cmu wall below window to install clad wood swing door with sidelites. (19 housing units.)

AM#0002

3.4 OPTION NUMBER FOUR

Construct a rear patio. 4" thick concrete slab reinforced with 6 x 6 - W1.4 W1.4 W.W.M. Size of rear patio varies with each housing unit type. Provide a 3'-0" wide x 4" thick sidewalk reinforced with 6x6 - w1.4 x w1.4 w.w.m. extending from patio towards the side of the existing trash can area. At Housing Unit Type "M", also provide a 2'-0" high rock wall planter. Stop all rock walls 4" away from housing unit. Configuration as shown on drawings.

3.5 OPTION NUMBER FIVE

Provide all landscaping and a drip irrigation system for each housing unit as per the drawings and Section 02811 UNDERGROUND SPRINKLER SYSTEMS and Section 02930 EXTERIOR PLANTING.

3.6 OPTION NUMBER SIX

House No. 219, Type I 3 Bedroom; complete, Including all utilities to the 5-foot line of the building.

3.7 OPTION NUMBER SEVEN

House No. 220, Type I 3 Bedroom; complete, Including all utilities to the 5-foot line of the building.

3.8 OPTION NUMBER EIGHT

House No. 221, Type I 3 Bedroom; complete, Including all utilities to the 5-foot line of the building.

3.9 OPTION NUMBER NINE

House No. 222, Type I 3 Bedroom; complete, Including all utilities to the 5-foot line of the building.

3.10 OPTION NUMBER TEN

House No. 223, Type I 3 Bedroom; complete, Including all utilities to the 5-foot line of the building.

3.11 OPTION NUMBER ELEVEN

House No. 224, Type I 3 Bedroom; complete, Including all utilities to the 5-foot line of the building.

- End of Section -

SECTION 02090

LEAD-BASED PAINT (LBP) ABATEMENT AND DISPOSAL

1 GENERAL

1.1 REFERENCES

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

CODE OF FEDERAL REGULATIONS (CFR)

| | |
|-------------|--|
| 29 CFR 1910 | Occupational Safety and Health Standards |
| 29 CFR 1926 | Safety and Health Regulations for Construction |
| 40 CFR 148 | Hazardous Waste Injection Restrictions |
| 40 CFR 260 | Hazardous Waste Management System: General |
| 40 CFR 261 | Identification and Listing of Hazardous Waste |
| 40 CFR 262 | Standards Applicable to Generators of Hazardous Waste |
| 40 CFR 263 | Standards Applicable to Transporters of Hazardous Waste |
| 40 CFR 264 | Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities |
| 40 CFR 265 | Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities |
| 40 CFR 268 | Land Disposal Restrictions |
| 40 CFR 745 | Lead; Requirements for Lead Based Paint Activities in Target Housing and Child-Occupied Facilities; Final Rule |
| 49 CFR 172 | Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements |
| 49 CFR 178 | Specifications for Packagings |

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT (HUD)

| | |
|--------|---|
| HUD-01 | (1996) Lead-Based Paint: Guidelines for the Availability and Control of Lead-Based Paint Hazards in Housing |
|--------|---|

ENGINEERING MANUALS (EM)

EM 385-1-1 (1992) U.S. Army Corps of Engineers Safety and Health Requirements Manual

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 701 (1996) Methods of Fire Test for Flame-Resistant Textiles and Films

NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH (NIOSH)

NIOSH OSHA Booklet 3142 Lead in Construction

UNDERWRITERS LABORATORIES (UL)

UL 586 (1996) High-Efficiency, Particulate, Air Filter Units

1.2 SUBMITTALS

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

SD-01 Data

Equipment List; GA.

A list of equipment items to be used in the work, including brand names, model, capacity, performance characteristics, quantities and other pertinent information.

SD-08 Statements

Lead-Based Paint (LBP) Inventory; GA.

A space-by-space inspection shall be conducted with the Contracting Officer. A written inventory shall be prepared that identifies the LBP containing surfaces. The Government's LBP Management Plan will be the basis of the inventory. Areas and materials identified as containing LBP shall be treated unless the contractor provides analytical evidence stating that the materials are not contaminated with LBP. If the inventory identifies additional LBP contamination, the Contractor shall make an amendment to the inventory. Costs of sampling and analysis to verify or add to the Contractor's LBP Inventory shall be approved by the Contracting Officer in advance.

Lead-Based Paint (LBP) Management Plan; GA.

The Contractor shall review the specified abatement work tasks and abatement methods and shall prepare a detailed LBP Management Plan that identifies the work procedures, health, and safety measures to be used in LBP abatement in accordance with 29 CFR 1910, 29 CFR 1926, 40 CFR 745, and 49 CFR 172. The plan shall address the various sources of lead and the methods to be undertaken to abate the lead hazards to include the following key elements:

- a. Location of LBP containing components keyed to project drawings.
- b. Abatement methods for each LBP containing component.
- c. Means for notifying occupants of proposed work schedules.
- d. Training requirements as required by Federal, state, and local regulations.
- e. Unique problems associated with the LBP abatement project.
- f. Sketch of LBP control areas and decontamination areas.
- g. Eating, drinking, smoking, and rest room procedures.
- h. Sequencing of LBP related work.
- i. Personnel protective equipment; respiratory protection program and controls.
- j. Engineering controls, containment structures and safety measures.
- k. Worker exposure assessment procedures.
- l. Work Practice controls.
- m. Housekeeping.
- n. Hygiene facilities and practice.
- o. Medical surveillance, including medical removal protection.
- p. Sampling, testing and analytical methods to include personal air sampling requirements of 29 CFR 1926 Section .62 and when specified or where required, environmental air sampling, dust wipe sampling (preabatement, during abatement, post abatement), soil sampling (preabatement, post abatement, final clearance), toxicity characteristic leaching procedure (TCLP) of the waste material in accordance with 40 CFR 261. Procedures must include frequency, locations, and sampling and analytical methods to be used.

Emergency Contingency Plan; GA

An emergency contingency plan shall be prepared in accordance with 40 CFR 261. Procedure must address the following LBP abatement hazards as appropriate to the project:

- a. Negative air pressure system failure.
- b. Major breach of containment barriers.

- c. Detection of unexpected lead levels on adjacent grounds.
- d. Spilling of lead debris bags or containers.
- e. Phone numbers for project manager, local fire, police and medical personnel.

Hazardous Waste Management Plan; GA.

A Hazardous Waste Management Plan shall be prepared that complies with applicable requirements of Federal, state, and local hazardous waste regulations and addresses:

- a. Identification or documentation of potential hazardous wastes associated with the work.
- b. Estimated quantities of wastes to be generated and disposed of.
- c. Names and qualifications of each Contractor that will be transporting, storing, treating, and disposing of the wastes; the facility location, phone number, and name of a 24-hour point of contact shall be included. Two copies of EPA, state, and local hazardous waste permit applications, permits, and EPA identification numbers.
- d. Names and qualifications (experience and training) of personnel who will be working onsite with hazardous waste.
- e. List of waste handling equipment to be used in performing the work to include cleaning, volume reduction, and transport equipment.
- f. Spill prevention, containment, and clean-up contingency measures to be implemented.
- g. Work plan and schedule for waste containment, removal, and disposal. Waste shall be cleaned up and containerized daily.
- h. Cost for hazardous waste disposal according to this plan.

Waste Handling and Site Storage Plan; GA.

A Handling and Site Storage Plan shall be prepared that addresses the handling and storage of LBP debris in accordance with the requirement of 40 CFR 262 and 40 CFR 265. The Contractor shall confirm that an EPA identification number has been obtained so that proper manifesting of the waste will be addressed, and that site storage limitations, including the time of storage, container requirements, contingency plan, and personnel training have been complied with.

Waste Disposal Plan; GA.

A Waste Disposal Plan shall be prepared that will include but not be limited to the following:

- a. A written confirmation that the debris will be treated and disposed of in accordance with the requirements of 40 CFR 260, 40 CFR 261, 40 CFR 262, 40 CFR 264 and 40 CFR 268.

- b. A written confirmation that transportation of the debris will be in accordance with 40 CFR 263.
- c. Waste subcontractor's name, address, telephone number, and landfill location, including copies of licenses and signed agreements.
- d. Landfill name, address, and telephone number. A copy of the landfill's state and locally issued license, and a signed agreement that the landfill will accept the LBP wastes.
- e. Detailed delivery tickets prepared, signed, and dated by an agent of the landfill, certifying the amount of LBP containing materials delivered to the landfill, within 3 days after delivery.

SD-09 Reports

Sampling Result; GA.

A daily log of the personal and environmental air sampling test results shall be reviewed by the Industrial Hygienist (IH) and submitted, in written form, no more than 48 hours after completion of the sampling cycle. The log shall list each sample result, sampling time and date, sample type, identification of personnel monitored, flow rate and duration, air volume sampled, yield of lead, cassette size, analytical method used, analyst's name and company, and interpretation of results. Results shall be reported in micrograms of lead per cubic meter of air. In addition, the daily log shall include the results of dust wipe samples, soil samples and TCLP sampling including each phase of preabatement, during abatement and final clearance. Documentation of results that exceed specified limits (personal air samples that exceed 30 micrograms per cubic meter) or as required by Federal, state or local requirements shall be highlighted in the log in such a manner to make them easily distinguishable from monitoring results that do not exceed specified or regulatory limits.

SD-13 Certificates

Quality Assurance; GA.

Certificates shall meet the requirements of paragraph QUALITY ASSURANCE. The statements shall be signed and dated by a certifying officer after the award of this contract and contain the following:

- a. Contractor's name and address.
- b. Project name and location.
- c. The specified requirements that are being certified.

1.3 QUALITY ASSURANCE

1.3.1 Qualifications

- a. Contractor: Certification that the Contractor has prior experience on LBP abatement projects similar in nature and extent to ensure the capability to perform the abatement in a satisfactory manner.
- b. Competent Person: Certification that the Contractor's full-time onsite Competent Person meets the competent person requirements of 29 CFR 1926 Section .62 and is experienced in administration and supervision of LBP abatement projects, including work practices,

protective measures for building and personnel, disposal procedures, etc. This person shall have completed a Contractor Supervisor LBP abatement course by an EPA Training Center or an equivalent certification course, and have had a minimum of 2 years on-the-job experience.

- c. Certified Industrial Hygienist (CIH): Certification that the CIH has 2 years prior experience on similar LBP abatement projects and is certified by the American Board of Industrial Hygiene (ABIH). The certification shall include a copy of the ABIH certificate showing certification number, and date of certification or recertification.
- d. Industrial Hygienist: Certification that the Industrial Hygienist meets the Office of Personnel Management Standard for the Industrial Hygiene Series GS-690, and has a minimum of two years experience in LBP abatement.
- e. Testing Laboratory: The name, address, and telephone number of the independent testing laboratory selected to perform [sampling] [and] [analysis] for [personal] [and] [environmental] air samples [lead dust wipes,] [bulk sample analyses,] [and] [TCLP analysis.] Documentation that the laboratory performing the analysis is an EPA National Lead Laboratory Accreditation Program (NLLAP) accredited laboratory and that it is rated proficient in the NIOSH/EPA Environmental Lead Proficiency Analytical Testing Program (ELPAT). Certification shall include accreditation for heavy metal analysis, list of experience relevant to analysis of lead in air, and a Quality Assurance and Quality Control Program. Currently, the American Association for Laboratory Accreditation (ASLA) and the American Industrial Hygiene Association (AIHA) are the EPA recognized laboratory accreditors. Documentation shall include the date of accreditation or reaccreditation.
- f. Blood Lead Testing Laboratory. The name, address and telephone number of the blood lead testing laboratory; the laboratory's listing by OSHA and the U.S. Public Health Service Center for Disease Control (CDC); and documentation that the laboratory certified in the state where the work site is located.

1.3.2 Respiratory Protection Devices

Manufacturer's certification of NIOSH or the Mine Safety and Health Administration (MSHA) approval for respiratory protection devices utilized on the site.

1.3.3 Cartridges, Filters, and Vacuum Systems

Manufacturer's certification of NIOSH approval of respirator cartridges (organic vapor, acid gas, mist, dust, high efficiency particulate); High Efficiency Particulate Air (HEPA) filtration capabilities for all cartridges, filters, and HEPA vacuum systems.

1.3.4 Medical Records

Certification that employees who are involved in LBP abatement work have received medical examinations and will receive continued medical surveillance, including biological monitoring, as required by 29 CFR 1926 Section .62 and by the state and local regulations pertaining to such work.

Records shall be retained, at Contractor expense, in accordance with 29 CFR 1910 Section .20.

1.3.5 Training

Training certification shall be provided prior to the start of work involving LBP abatement, for all of the Contractors' workers, supervisors and Competent Person. Training shall meet the requirements of 29 CFR 1926 Section .62, 29 CFR 1926 Section .59 and 49 CFR 172, and that required by EPA or the state LBP course for the work to be performed. Training shall be provided prior to the time of job assignment and, at least, annually. Training may cover all abatement methods or focus only on those methods specified in the LBP Management Plan. The project specific training shall, as a minimum, include the following:

- a. Specific nature of the operation which could result in exposure to lead.
- b. Purpose, proper selection, fitting, use, and limitations of respirators.
- c. Purpose and description of the medical surveillance program and the medical removal protection program, including information concerning the adverse health effects associated with excessive exposure to lead (with particular attention to the adverse reproductive effects on both males and females and hazards to the fetus and additional precautions for employees who are pregnant).
- d. Relevant engineering controls and good work practices.
- e. The contents of any compliance plan in effect.
- f. Instructions to employees that chelating agents should not routinely be used to remove lead from their bodies and should not be used at all except under the direction of a licensed physician.
- g. The employee's right of access to records under 29 CFR 1910Section .20.

1.3.6 Licenses and Permits

Copies of licenses and permits as required by applicable Federal, state, and local regulations shall be obtained at least 20 working days before the start of the LBP abatement project.

1.4 DESCRIPTION OF WORK

LBP is to be removed or encapsulated according to the Government LBP Management Plan, appended herein. Work includes: Removal and disposal of LBP on the tan wood siding, soffits, and fascia on the exterior of the buildings. In addition, the work includes the removal and disposal of the wood screen doors between the kitchen/pantry and garage.

1.5 SITE VISIT

Contractor shall visit and investigate the site, review the drawings and specifications, assess the amount of LBP, and become familiar with conditions which will affect the work.

1.6 LIABILITY INSURANCE FOR LBP

LBP abatement liability insurance shall be obtained without additional expense to the Government. The Contractor shall assume full responsibility and liability for the compliance with Federal, state, and local regulations pertaining to training, work practices, hauling, disposal, and protection of workers, visitors to the site, and persons occupying areas adjacent to the site.

1.7 PROTECTION OF EXISTING WORK TO REMAIN

Abatement, storage, transportation, and disposal work shall be performed without damaging or contaminating adjacent work and areas. Where such work or areas are damaged or contaminated, the Contractor shall restore work and areas to the original condition.

1.8 COORDINATION WITH OTHER WORK

Abatement and disposal work shall be coordinated with existing work and/or concurrent work being performed in adjacent areas.

1.9 SAFETY AND HEALTH REGULATORY REQUIREMENTS

Work shall be performed in accordance with requirements of EM 385-1-land applicable regulations including, but not limited to 29 CFR 1910, 29 CFR 1926, especially Section .62. Matters of interpretation of the standards shall be submitted to the appropriate agency for resolution before starting work. Where these requirements vary, the most stringent shall apply.

1.10 PRECONSTRUCTION SAFETY MEETING

The Contractor, Competent person, Designated IH, and the Contracting Officer shall attend a preconstruction safety meeting prior to starting any work involving LBP abatement. Items required to be submitted will be reviewed for completeness, and where specified, for acceptance.

1.11 ACCIDENT PREVENTION PLAN

1.11.1 Preparation and Implementation

The Accident Prevention Plan (APP) shall be prepared in accordance with EM 385-1-1, Table 1-1. Where topic in table 1-1 is not applicable, the APP shall justify its omission or reduced level of detail, and establish that adequate consideration was given to the topic. The APP shall cover onsite work by the Contractor or subcontractors. The Competent Person shall be responsible for development, implementation, and quality control of the content and actions required in the APP. For each anticipated work task, the APP shall establish hazards and control measures. The APP shall be easily readable and understandable by the Contractor's work force.

1.11.2 Acceptance and Modifications

The APP shall be prepared, signed and dated by the Contractors Competent Person and submitted 10 days prior to the preconstruction safety conference. Deficiencies in the APP shall be discussed at the Preconstruction Safety Conference and the APP shall be revised to correct the deficiencies, and resubmitted for acceptance. Onsite work shall not begin until the APP has been accepted unless otherwise authorized by the Contracting Officer. One copy of the APP shall be maintained in the Contractor's jobsite file, and a second copy shall be posted where it will be accessible to personnel on the

site. As work proceeds, the APP shall be adapted to new situations and conditions. Changes to the APP shall be made with concurrence of the Competent Person and Site Superintendent, and acceptance of the Contracting Officer. Should an unforeseen hazard become evident during performance of the work, the Competent Person shall bring such hazard to the attention of the Superintendent and the Contracting Officer, both verbally and in writing, for resolution as soon as possible. In the interim, the Contractor shall take necessary action to re-establish and maintain safe working conditions; and to safeguard onsite personnel, visitors, the public, and the environment. Disregard for provisions of this specification, or the accepted APP shall be cause for stopping of work until the matter is rectified.

1.11.3 Activity Hazard Analyses

An Activity Hazard Analysis (AHA) shall be prepared prior to beginning each major phase of the work and submitted for review and acceptance. Format shall be in accordance with EM 385-1-1, figure 1-1. A major phase of work is defined as an operation involving hazards not experienced in previous operations, or where a new work crew is to perform. The analysis shall define the activities and the sequence in which they are to be performed, specific hazards anticipated, and control measures to be implemented to eliminate or reduce each hazard to an acceptable level. Work shall not proceed on that phase until the Activity Hazard Analysis has been accepted and a preparatory meeting has been conducted by the Contractor to discuss content of the AHA with everyone engaged in the activity, including the Government's onsite representative. The AHA shall be continuously reviewed and modified when appropriate to address changing conditions or operations. The accepted AHA shall be appended to and become part of the APP.

1.12 RESPIRATORY PROTECTION PROGRAM

A respiratory protection program shall be established as required by 29 CFR 1926 Section .103 and .62 and in accordance with 29 CFR 1910Section .134. An approved respirator shall be furnished to each employee and visitor required to enter a LBP work control area. A fit test shall be conducted in accordance with 29 CFR 1926 Section .62, Appendix D.

1.13 HAZARD COMMUNICATION PROGRAM

A Hazard Communication Program shall be implemented in accordance with 29 CFR 1926 Section .59.

1.14 SAFETY AND HEALTH OVERSIGHT

The Competent Person shall be the onsite person responsible for coordination, safety, security and execution of the work. The Competent Person shall be able to identify existing and predictable lead hazards and shall have the authority to take corrective measures to eliminate them. The IH shall be responsible for dust wipe and personal and environmental sampling.

1.15 PREPARATORY INSPECTION MEETING

The Contractor and Competent person, Designated IH, and the Contracting Officer shall arrange and hold a preparatory inspection meeting immediately prior to beginning any LBP abatement. The APP, Activity Hazard Analyses, and the Contractor's LBP Management Plan, including containment, engineering controls, worker protection, training, and monitoring, will be reviewed for completeness.

1.16 TRAINED AND COMPETENT PERSONNEL

Work shall be performed by Competent Persons, qualified and trained in the abatement, enclosure, encapsulation, monitoring, testing, storage, treatment, hauling, and disposal of contaminated LBP debris material, and in subsequent cleanup of the affected environment. Workers shall comply with the appropriate Federal, state, and local regulations which mandate training requirements and work practices and shall be capable of performing the work under this contract.

1.17 POSTED WARNINGS AND NOTICES

The following regulations, warnings, and notices shall be posted at the work site in accordance with 29 CFR 1926 Section .62.

1.17.1 Regulations

Two copies of applicable Federal, state, and local regulations and NIOSH OSHA Booklet 3142 shall be maintained. One copy shall be posted at the work site and one copy shall be on file in the project office.

1.17.2 Warning Signs and Labels

Warning signs shall be provided at building entrances and approaches to LBP control areas containing airborne LBP debris. Signs shall be located at a distance from the LBP control areas that will allow personnel to read the

sign and take the necessary protective actions required before entering the LBP control area.

1.17.2.1 Warning Signs

Warning signs shall be in English and Spanish and be of sufficient size to be clearly legible and display the following:

WARNING
LEAD WORK AREA
POISON
NO SMOKING OR EATING
AUTHORIZED PERSONNEL ONLY
RESPIRATORS AND PROTECTIVE CLOTHING ARE REQUIRED IN THIS AREA

1.17.2.2 Warning Labels

Warning labels shall be in English and Spanish and be of sufficient size to be clearly legible and display the following:

CAUTION: CLOTHING CONTAMINATED WITH LEAD. DO NOT REMOVE DUST BY BLOWING OR SHAKING. DISPOSE OF LEAD CONTAMINATED WASH WATER IN ACCORDANCE WITH APPLICABLE FEDERAL, STATE OR LOCAL REGULATIONS.

1.17.3 Worker Information

Right-to-know notices shall be placed in clearly visible areas of the work site in compliance with Federal, state, and local regulations.

1.17.4 Air Monitoring Results

Daily air monitoring results shall be prepared so as to be easily understood by the workers, and shall be placed in a clearly visible area of the work site.

1.17.5 Emergency Telephone Numbers

A list of telephone numbers shall be posted at the site. The list shall include numbers of the local hospital, emergency squad, police and fire departments, Government and Contractor representatives who can be reached 24 hours per day, and professional consultants directly involved in the project.

1.18 EQUIPMENT AND MATERIALS

Sufficient quantities of health and safety materials required by 29 CFR 1926 Section .62, and other materials and equipment needed to complete the project, shall be available and kept on the site.

1.18.1 Respirators

Air-purifying respirators shall be approved by NIOSH for use with dust, fumes, and mists having permissible exposure limits less than 0.05 milligrams per cubic meter (i.e., have high-efficiency particulate air (HEPA) filters) and for other hazardous airborne contaminants that may be encountered, as determined by the Competent Person. Respirators shall comply with the requirements of 29 CFR 1926 Section .62 and shall be used in

accordance with 29 CFR 1926 Section .103 and 29 CFR 1910Section .134.

1.18.2 Respirator Cartridges

A sufficient supply of respirator cartridges shall be maintained at the work site to provide new cartridges to employees, authorized visitors, and Government personnel throughout the duration of the project. Cartridges shall be replaced according to the manufacturer's recommendations, when breathing becomes difficult, or if the cartridge becomes wet.

1.18.3 Protective Clothing

The Contractor shall furnish, at no cost to personnel, equipment/clothing for protection from airborne and waterborne LBP debris. An adequate supply of these items shall be available for worker, authorized visitor, and Government personnel use. Workers and visitors shall not take protective clothing and equipment off the work site at any time. Protective clothing includes:

- a. Coveralls (Whole Body Protective Coverings): Full-body coveralls and head covers shall be worn by workers in the work area. Sleeves shall be secured at the wrist and pants legs at the ankle with tape. Permeable clothing shall be provided in heat-stress conditions. Where non-disposable coveralls are provided, these coveralls shall be cleaned after each wearing. Cleaning of coveralls and other non-disposable clothing shall be in accordance with the provisions for cleaning in 29 CFR 1926 Section .62.
- b. Boots: Work boots with nonskid soles or impermeable work boot covers shall be worn by workers. Where required by OSHA, safety boots (steel toe or steel toe and shank) shall be worn. Paint the uppers of boots red with waterproof enamel. Do not allow boots to be removed from the work area for any reason after being contaminated with LBP debris. Dispose of boots as LBP contaminated waste at the end of the work.
- c. Gloves: Inner gloves, appropriate for items and hazards encountered, and disposable outer work gloves shall be provided to each worker and shall be worn while the worker is in the work area. Glove material shall be appropriate for the specific chemical exposure. Gloves shall not be removed from the work area, and shall be disposed of as LBP contaminated waste at the end of the work.
- d. Hard Hats: Head protection (hard hats) shall be provided as required by OSHA and EM 385-1-1 for workers and authorized visitors. Protective plastic strap suspension hats shall be used. Hard hats shall be worn at all times that work is in progress. Hats shall remain in the work area until the project is completed. Hats shall be thoroughly cleaned, decontaminated, and bagged before being removed from the work area at the end of the project.
- e. Eye Protection: Fog-proof goggles for personnel engaged in LBP abatement operations shall be worn when the use of a full face piece respirator is not required.
- f. Work Clothing: Cloth work clothes shall be provided for wearing under the disposable protective coveralls and foot coverings.

1.18.4 Negative Air Pressure System

When a LBP control area requires the use of an airtight containment barrier, a negative air pressure system shall be used, and pressure differential recordings taken. LBP shall not be removed from the LBP control area until the proper engineer controls and HEPA filtration systems are in place.

1.18.4.1 HEPA Filter Requirements

The negative air pressure system shall be equipped with approved HEPA filters per UL 586. Negative air pressure equipment shall be equipped with new HEPA filters, and shall be sufficient to maintain a minimum pressure differential of minus 0.02 inch of water column relative to adjacent, unsealed areas. Negative air pressure system minimum requirements are listed below.

- a. The unit shall be capable of delivering its rated volume of air with a clean first stage filter, an intermediate filter and a primary HEPA filter in place.
- b. The HEPA filter shall be certified as being capable of removing particles as small as 0.3 micrometers at a minimum efficiency of 99.97 percent.
- c. The unit shall be capable of continuing to deliver no less than 70 percent of rated capacity when the HEPA filter is 70 percent full or measures 2.5 inches of water static pressure differential on a magnehelic gage.
- d. The unit shall be equipped with a manometer-type negative pressure differential monitor with minor scale division of 0.02 inch of water and accuracy within plus or minus 1.0 percent. The manometer shall be calibrated daily as recommended by the manufacturer. Record manually manometer readings of the pressure differential between the LBP control area and adjacent unsealed areas at the beginning of each workday and every 2 working hours thereafter.
- e. The unit shall be equipped with a means for the operator to easily interpret the readings in terms of the volumetric flow rate of air per minute moving through the machine at any given moment.
- f. The unit shall be equipped with an electronic mechanism that automatically shuts the machine off in the event of a filter breach or absence of a filter.
- g. The unit shall be equipped with an audible horn that sounds an alarm when the machine has shut itself off.
- h. The unit shall be equipped with an automatic safety mechanism that prevents a worker from improperly inserting the main HEPA filter.
- i. The unit shall be ducted through the containment barrier wall to the outside of the work area. The unit shall not be exhausted into any work area.

1.18.4.2 Number of Units Required

The air within the containment barrier shall be changed at least once every 15 minutes by a continuously operating negative air pressure system, until the LBP control area barrier is removed. Filters shall be replaced as

necessary to maintain the efficiency of the system. A back-up unit shall be maintained onsite.

1.18.4.3 Auxiliary Generator

An auxiliary generator shall be provided with a capacity adequate to power a minimum of 50 percent of the negative air machines at any time during the work. When power fails, the generator controls shall automatically start the generator and switch the negative air pressure system machines to generator power. The generator shall not present a carbon monoxide hazard to workers.

1.18.4.4 Local HVAC Systems

The building heating, ventilating, and air conditioning (HVAC) system shall not be used as the negative air pressure system for the LBP control area.

1.18.4.5 Discontinuing Negative Air Pressure System

The negative air pressure system shall not be shut down during LBP abatement work unless authorized by the Contracting Officer. At the completion of the LBP abatement and disposal project, units shall be run until full cleanup has been completed and wipe clearance samples have been collected, analyzed, and have passed final clearance testing requirements. Dismantling of the negative air pressure systems shall conform to the written decontamination procedures. Prefilters shall be removed and properly disposed of, and the intake to the machines shall be sealed with polyethylene to prevent environmental contamination.

1.18.5 Expendable Supplies

1.18.5.1 Polyethylene Sheet and Bags - General

Polyethylene sheet and bags shall be minimum 6 mils thick. Bags shall have pre-printed labels, and 5 inch (minimum) long plastic ties, pointed and looped to secure the filled bags. Polyethylene sheets shall be in roll sizes to minimize seams.

1.18.5.2 Polyethylene Sheet - Flame Resistant

Where a potential for fire exists, flame-resistant polyethylene sheets shall be provided. Polyethylene film shall be frosted or black and shall conform to the requirements of NFPA 701.

1.18.5.3 Polyethylene Sheet - Reinforced

Reinforced polyethylene sheet shall be provided where high skin strength is required such as where it constitutes the only barrier between the LBP control area and the outdoor environment. The sheet stock shall consist of translucent, nylon-reinforced or woven-polyethylene thread laminated between two layers of polyethylene film. Film shall meet flame resistant standards of NFPA 701.

1.18.5.4 Tape and Adhesive Spray

Tape and adhesive shall be capable of sealing joints between polyethylene sheets and for attachment of polyethylene sheets to adjacent surfaces. After dry application, tape or adhesive shall retain adhesion when exposed to wet conditions, including amended water. Tape shall be minimum 2 inches wide, industrial strength.

1.18.5.5 Containers

Impermeable containers shall be used to receive and retain lead contaminated material until disposal. Containers shall be labeled in accordance with EPA, DOT and OSHA standards.

1.18.5.6 Chemicals

Chemicals, including caustics and paint strippers, shall be properly labeled and stored in leak-tight containers.

1.18.6 Vacuum Systems

HEPA filtered vacuum systems shall be used during abatement operations which generate dust. The systems shall be suitably sized for the project, and filters shall be capable of removing particles as small as 0.3 micrometers at a minimum efficiency of 99.97 percent.

1.18.7 Heat Blower Guns

Heat blower guns shall be flameless, electrical, paint-softener type with controls to limit temperature to 1,100 degrees F. Heat blower shall be DI (non-grounded) 120 Vac, and shall be equipped with cone, fan, glass protector and spoon reflector nozzles.

1.18.8 Chemical Paint Strippers

Chemical paint strippers shall contain no methylene chloride and shall be formulated to prevent stain, discoloration, or raising of the substrate materials.

1.18.9 Chemical Paint Stripper Neutralizer

Neutralizers for paint strippers shall be used on exteriors only and shall be compatible with the substrate and suitable for use with the chemical stripper that has been applied to the surface.

1.19 STORAGE OF MATERIALS

Materials shall be stored in a place and manner which protects them from damage and contamination. During periods of cold weather, plastic materials shall be protected from the cold. No flammable or hazardous materials shall be stored inside any building. Regularly inspect materials to identify damaged or deteriorating items. Damaged or deteriorated items shall not be used and shall be removed from the site as soon as they are discovered. Any materials which become contaminated with LBP waste shall be disposed of consistent with the requirements of 40 CFR 148 and these specifications. Stored materials shall not present a hazard or an inconvenience to workers, visitors, and/or other occupants and employees of the building.

2 PRODUCTS (NOT APPLICABLE)

3 EXECUTION

3.1 PILOT ABATEMENT PROJECT

Prior to beginning full-scale abatement for all units, a pilot abatement project shall demonstrate the specified abatement procedure on a pre-selected housing unit. Preabatement lead dust wipe and soil samples shall be collected from each type of surface in the pilot facility as specified in the appropriate paragraphs of this section. The Contracting Officer shall evaluate the following during the pilot abatement project:

- a. Lead dust wipe and soil samples shall be collected and analyzed during abatement and for final clearance as specified in the appropriate paragraphs of this section. If results of analysis indicate that lead levels are above clearance levels, the Contractor shall evaluate his/her abatement cleanup procedures. If clearance levels are low and continue to be low, less restrictive engineering controls may be proposed by the Contractor.
- b. If personal air sample analyses indicate that action levels or permissible exposure limits specified in 29 CFR 1926 Section .62 have not been exceeded, then respirator protection may become less restrictive. Half-face respirators shall be the minimum respiratory protection employed.
- c. During cleanup a final dust wipe and soil samples shall be collected after a single cleanup iteration. If the samples are below acceptable levels the Contractor may request approval for one cleanup pass instead of two cleanup passes.
- d. Adequate samples of waste generated (water, solid components, caustic paste, filters, paint chips, etc.) shall be collected for Toxicity Characteristic Leaching Procedure (TCLP) testing. The TCLP test shall be performed by an accredited laboratory.
- e. Waste generated throughout the abatement project shall be properly containerized, according to applicable regulations, and disposed of as per the results of the TCLP analysis.

3.2 WORK PROCEDURES

LBP abatement and related work shall be performed in accordance with the accepted Contractor's LBP Management Plan as modified and approved, as a result of the pilot abatement project. Procedures and equipment required to limit occupational and environmental exposures to lead during LBP removal shall be in accordance with 29 CFR 1926 Section .62, and as specified herein. Paint chips and associated waste shall be disposed of in compliance with Federal, state, and local regulations.

3.2.1 Personnel Protection Procedures

Personnel shall wear and use protective clothing and equipment as specified. Eating, smoking, drinking, chewing tobacco and chewing gum, and applying makeup shall not be permitted in the LBP control area. Personnel of trades not engaged in the abatement and disposal of LBP shall not be exposed at any

time to airborne concentrations of lead equal to or in excess of 30 micrograms per cubic meter of air. Electrical service shall be disconnected when wet removal is performed, and temporary electrical service protected by a ground fault circuit interrupter shall be provided.

3.2.2 Safety and Health Procedures

The Competent Person shall be present on the work site throughout the abatement project to supervise, monitor, and document the project's health and safety provisions. A daily log shall be maintained showing the results of sampling tests throughout the project area. LBP abatement work being conducted within a LBP Control area where an airtight barrier is required shall be stopped if dust wipe concentration levels collected outside the containment area during abatement, equal or exceed the preabatement level or 200 micrograms per square foot, whichever is greater.

3.2.3 Safety and Health Responsibilities

The Competent Person shall:

- a. Verify that training meets applicable requirements.
- b. Review and approve LBP Management Plan for conformance to the applicable referenced standards.
- c. Inspect LBP removal work for conformance with the accepted LBP Management Plan.
- d. Ensure that worker exposure air monitoring activities are in accordance with 29 CFR 1926 Section .62.
- e. Ensure work is performed in strict accordance with specifications.
- f. Ensure hazardous exposure to personnel and to the environment are adequately controlled.

The IH shall be responsible for directing personal and environmental air monitoring and lead dust wipe sampling.

3.2.4 Medical Surveillance Procedures

Medical surveillance shall be implemented in accordance with the approved Contractor's LBP Management Plan, and shall comply with the requirements of 29 CFR 1926 Section .62, including the provisions for biological monitoring, medical removal protection and a physician's written opinion, signed by the physician performing the employee examination. The Contractor shall provide a copy of the written opinion for Contractor's employees 2 working days prior to each employee's commencement of work.

3.2.5 Engineering Controls and Containment Structures

3.2.5.1 LBP Control Area

The LBP control area is where LBP abatement work occurs and as such shall be considered contaminated, and shall be isolated to prevent LBP containing dust or debris from passing into adjacent building or open areas. The control area shall be decontaminated at the completion of the LBP abatement

and disposal work. Work anticipated for this project will fall outside of the building envelope. As such, exterior controls and procedures are anticipated. Controls and procedures for work within the building envelope have been included within this section and will be required, as applicable to the work.

3.2.5.2 Boundary Requirements

Physical boundaries shall be provided around exterior LBP control areas by roping off the area indicated in the LBP Management Plan. Interior projects shall be isolated by curtains, portable partitions, or other enclosures to ensure that concentrations of lead dust outside the LBP control area will not equal or exceed the preabatement level or 200 micrograms per square foot, whichever is greater.

3.2.5.3 Control Barriers

The LBP control area shall be separated from other portions of the building and the outside with control barriers. The polyethylene sheeting will have all openings masked and sealed, and shall be erected according to the Contractor's LBP Management Plan. Polyethylene sheeting shall be mechanically supported, independent of duct tape or spray adhesive.

3.2.5.4 Preabatement Lead-Dust Wipe Samples

Preabatement lead-dust wipe samples shall be taken outside the LBP controlled area, in accordance with HUD-01. Samples shall be taken within 10 feet of the abatement structure at 20 percent of the area planned for abatement.

3.2.5.5 Masking and Sealing

- a. Interior LBP control area requirements: Openings shall be sealed where the release of airborne LBP dust is expected. A control area shall be established with the use of curtains, portable partitions, or other systems in order to prevent the escape of dust from the contaminated control area. The control area shall be provided with protective covering of two layers of polyethylene sheeting over floors. Penetrations of the floor, walls, and ceiling shall be sealed with polyethylene sheeting and duct tape. Polyethylene sheeting shall be firmly attached to the structure. Joints shall be sealed with spray adhesive and duct tape. Openings shall be provided for the supply and exhaust of air for the negative air pressure system. Personal monitoring during the work shift shall be in accordance with 29 CFR 1926 Section .62.
- b. Exterior LBP control area requirements: Where the construction of a contained LBP control area is impractical, a roped-off perimeter shall be installed 20 feet from, and around, the area where the LBP handling procedures are performed and other requirements for LBP control areas shall be maintained. Personal monitoring of airborne concentrations shall be conducted in adjacent areas, during the work shift, in accordance with 29 CFR 1926 Section .62. Where wipe sampling is not practical, air monitoring outside of the roped-off perimeter shall be conducted as specified. Airborne concentrations shall not exceed specified levels.

3.2.5.6 Personnel Decontamination Unit Procedures

Decontamination units shall be constructed when required for the abatement procedures. Materials fabricated or delivered to the site before the shop drawings have been returned to the Contractor will be subject to rejection by the Contracting Officer. Specifications and drawings of portable prefab units, such as a trailer unit, if utilized, must be submitted for review and approval before start of construction. Submittal shall include, but not be limited to, a floor plan layout showing dimensions, materials, sizes, thicknesses, plumbing, and electrical outlets. Access between contaminated and uncontaminated rooms or areas shall be through an airlock. Access between any two rooms or room and trailer within the decontamination unit shall be through a plastic sheeting curtained doorway. A separate equipment decontamination unit shall be provided. Each work area shall have an emergency exit. The personnel decontamination unit's clean room shall be the only means of entrance and exit, except for emergencies, from the LBP control area. Materials shall exit the LBP control area through the equipment decontamination area.

3.2.5.7 Clean Room Procedures

The clean room shall have only one exit to non-contaminated areas of the building or site. An airtight seal shall be constructed of polyethylene between the clean room and the rest of the building. Surfaces of the clean room shall be protected with sheet polyethylene. A temporary unit with a separate equipment decontamination locker room and a clean locker room shall be provided for personnel who are required to wear whole body protective clothing. One locker shall be provided in each locker room for each LBP abatement worker, and each Contractor's representative. Lead-free personal clothing and shoes shall be kept in the clean locker. Hand wash station/showers shall be located between the equipment decontamination locker room and the clean locker room, and employees shall wash or shower before changing into personal clothes. An adequate supply of clean disposable towels shall be provided. LBP contaminated work clothing shall be cleaned. Clean rooms shall be physically attached to the LBP control area for areas inside the building but may be directly adjacent to the LBP control area outside of the building. Joint use of this space for other functions, such as offices, equipment storage, etc., is prohibited.

3.2.5.8 Hand Wash Station/Shower Room Procedures

An operational shower and hand washing station shall be provided between the work area and the clean changing room. Workers shall wash and/or shower before entering the clean changing room. Shower room shall be separated from other rooms by air tight walls fabricated from polyethylene sheeting. Water shall be hot and cold or warm. Shower heads and controls, soap dish, continuing supply of soap, and clean towels shall be provided. The shower shall be maintained in a sanitary condition. Waste water shall be pumped to drain and through waste water filters that meet state and/or local requirements. These filters shall be located inside the shower unit and filters shall be changed regularly. Spent filters shall be discarded as LBP contaminated waste.

3.2.5.9 Equipment Decontamination Unit Procedures

The Equipment Decontamination Unit shall be used for removal of equipment and materials from the LBP control area, and shall include a wash room, holding room, and an enclosed walkway. The unit shall be constructed from wood framing material and polyethylene sheeting. Workers shall not enter or exit the LBP control area through the Equipment Decontamination Unit. A

washdown station, consisting of an enclosed shower unit, shall be located in the work area outside the Wash Room. The washdown station shall be used to clean equipment, bags and containers. Bagged or containerized LBP wastes shall be passed from the work area and cleaned in the Wash Room. The Wash Room shall be separated from the work area by a polyethylene sheeting flap. Wastewater shall be filtered and filters shall be changed as required for the shower unit and the Wash Room. Filters shall be disposed of as LBP contaminated wastes. The Holding Room shall be used as a drop location for bagged LBP passed from the Wash Room. This room shall be constructed so that bagged materials cannot be passed from the Wash Room through the Holding Room to the enclosed walkway. The walkway shall be separated from adjacent rooms by double flaps of 1/16 inch thick single ply rubber roofing materials of EPDM or Neoprene. The enclosed walkway shall isolate the Holding Room from the building exterior and shall be constructed of wood framing and polyethylene sheeting. The walkway shall provide access to the Holding Room from the building exterior. The enclosed walkway shall be separated from the exterior by a single flap of polyethylene sheeting.

3.2.5.10 Maintenance of Decontamination Units

Barriers and polyethylene sheeting shall be effectively sealed and taped. Containment barriers shall be visually inspected at the beginning of each work period. Damaged barriers and defects shall be immediately repaired upon discovery. Smoke methods shall be used to test effectiveness of barriers when directed by the Contracting Officer.

3.2.5.11 LBP Control Area Exiting Procedures

Personnel exiting a LBP control area shall perform the following procedures and shall not leave the work place wearing any clothing or equipment worn during the work day:

- a. Vacuum all protective clothing before removing.
- b. Remove protective clothing in the decontamination room, and place this clothing in an approved impermeable disposal bag.
- c. Wash or shower.
- d. Change to clean clothes prior to leaving the physical boundary designated around the lead-contaminated work site.

3.2.6 Furnishings

The Government will remove furniture and equipment from the work area before LBP removal work begins.

3.2.7 Building Ventilating Systems

Any building ventilating system or any other system bringing air into or out of the LBP control work area shall be shut down and isolated by lockable switch; disconnecting wires; removing circuit breakers; isolated by airtight seals, or other positive means that will prevent spread of contamination through the system and accidental premature restarting of the equipment. Airtight seals shall consist of 2 layers of polyethylene. Individual seals shall be applied to ventilation openings (supply and exhaust), lighting fixtures, clocks, windows, doorways, elevator doors, stairs, ramps, speakers, and other openings into the work area. Seals shall be maintained until project decontamination is completed. After decontamination work has been completed and final air sample testing proves that the area is

decontaminated, seals shall be removed and the ventilating systems may be operated again.

3.2.8 Temporary Utilities

Temporary equipment to provide adequate power, light, heat, and water shall be installed to accomplish the abatement operations properly and safely. The Contractor shall maintain the security and maintenance of the utility system in the LBP control areas. In the event of a failure of any utility system, the Government will not be responsible for any loss of time or other expense incurred by the Contractor. Wiring and electrical service shall be as specified in to Section 16415 Electrical Work, Interior or Section 16370 Electrical Distribution System, Aerial. In addition, the Contractor shall provide:

- a. Backflow protection on all water connections. Fittings installed by the Contractor shall be removed after completion of work with no damage or alteration to existing water piping and equipment.
- b. Heavy-duty abrasion-resistant hoses to provide water to each work area and decontamination area.
- c. A hot water heater, if hot water is not supplied through the building's existing water supply to the decontamination showers.
- d. Electrical service to work areas. Electrical service shall comply with NEMA, NECA, and UL standards. Warning signs shall be posted at power outlets which are other than 110-120 volt power. Only grounded extension cords shall be used. Incandescent lamps and light fixtures shall be of adequate wattage to provide good illumination in LBP control areas.
- e. Temporary heating units, when needed, that have been tested and labeled by UL, FM, or another recognized trade association related to the fuel being consumed. Forced air or fan type units shall not be utilized inside a work area. Units shall have tip-over protection.
- f. Sufficient quantity of single-occupant, self-contained chemical toilets, properly vented and fully enclosed, if permanent toilets are not available.

3.3 LBP ABATEMENT METHODS

3.3.1 Encapsulation with Surface Coatings

Peeling and deteriorated surfaces shall be wet scraped prior to application of the approved encapsulant. Encapsulation of LBP shall be performed in accordance with Section 2100. Debris shall be handled in accordance with the Hazardous Waste Management Plan. Surfaces shall be prepared according to the manufacturer's specifications. Surface coatings shall not be applied to friction surfaces such as window tracks or door jams.

3.3.2 Component Removal and/or Replacement

Peeling and deteriorating surfaces shall be wet scraped prior to component removal. All debris shall be handled in accordance with the Hazardous Waste Management Plan.

All LBP components shall be removed from buildings as specified and replaced as required by this work. All debris shall be handled in accordance with the Hazardous Waste Management Plan. Replacement components shall be installed according to local building codes.

The ground and any plants or shrubs in the area in which exterior abatement is occurring shall be covered with a waterproof canvas tarp and weighted at all edges to prevent blowing. Such covering shall cover from the side of the structure to a point eight feet away from the structure. The covering shall be taped or otherwise attached to the structure. The tarp shall be placed in a manner that traps all debris and water. This is best accomplished by elevating the edges. The tarp shall be properly disposed of and not re-used.

3.3.3 Chemical Stripping

If chemical stripping methods are utilized, LBP shall be removed from soffits, wood siding, and facia by using approved chemical strippers. Chemical strippers containing methylene chloride are prohibited. Chemical stripping shall take place onsite. Stripping shall be done according to manufacturer's recommendations. Substrates shall be thoroughly washed and neutralized before applying a primer or sealing coat if the building component is to be re-used. Waste generated by the stripping process shall be handled in accordance with the Hazardous Waste Management Plan. Adjacent walls and floors shall be protected to prevent contamination.

3.3.4 Hand-Scraping with a Heat Gun

If heat gun methods are utilized, LBP shall be removed from soffits, wood siding, and facia by hand-scraping with a heat gun. Paint residue shall be handled in accordance with the Hazardous Waste Management Plan. Heat guns shall be operated below 1,100 degrees F to prevent possible release of toxic fumes or starting a fire.

3.4 MONITORING

During the entire LBP removal and disposal operations, a IH shall be onsite directing the monitoring/sampling and inspecting the work to ensure that the health and safety requirements of this contract are satisfied.

3.4.1 Personal Air Monitoring

Airborne concentrations of lead shall be collected and analyzed in accordance with 29 CFR 1926 Section .62. Results shall be reported in micrograms per cubic meter of air. The Competent Person shall use personal air monitoring results to determine the effectiveness of engineering controls, the adequacy of PPE and to determine if proper work practices are being employed. The Contracting Officer shall be notified if any personal air monitoring result equals or exceeds 30 micrograms per cubic meter of air. The Contractor shall take steps to reduce the concentration of lead in the air.

3.4.2 Wipe Sampling

Wipe sampling for lead dust concentrations shall be conducted:

- a. Preabatement to establish a baseline.
- b. During abatement to monitor activities and ensure containment integrity.

- c. Post abatement to determine if specified clearance criteria has been met.

3.4.2.1 Preabatement

Preabatement wipe samples shall be collected outside the LBP control area in accordance with paragraph Preabatement Lead-Dust Wipe Samples. Samples outside the LBP control work area shall be collected at critical barriers, in the clean room of the decontamination unit in traffic control areas such as personal and equipment entrances, and outside living areas such as a front or back porch.

3.4.2.2 Abatement

The IH shall collect wipe samples during all LBP abatement activities on a daily basis. The samples shall be collected outside the LBP control area in accordance with paragraph Preabatement Lead-Dust Wipe Samples. Samples shall be collected outside the LBP control work area at critical barriers, in the clean room of the decontamination unit and in traffic control areas such as personal and equipment entrances, and outside living areas such as a front or back porch

3.4.2.3 Results

The Contractor shall have the results of the wipe sampling within 48 hours after the completion of the sampling. Results shall be reported in micrograms per square foot.

3.4.2.4 Excessive Levels

LBP abatement work being conducted within a LBP control area shall be stopped if measured dust wipe concentration levels collected outside the containment area, during abatement, equal or exceed the preabatement levels or 200 micrograms per square foot, whichever is greater. The Contractor shall immediately notify the Contracting Officer. At the direction of the Contracting Officer, the Contractor shall clean outside areas which equal or exceed the levels stated above, at no additional cost to the Government. The cleaning shall be in accordance with paragraph CLEANUP AND DISPOSAL, prior to clearance. The Contractor shall collect and have analyzed additional wipe samples at no charge to the Government to ensure the areas are clean. Cleaning and resampling shall continue until levels as stated above are achieved. The Contractor shall correct containment and/or work practices to mitigate the problem. Removal work shall resume when approval is given by the Contracting Officer.

3.4.2.5 Post Abatement

Post abatement samples shall be collected in accordance with paragraph Final Clearance Testing.

3.4.3 Area Air Monitoring

Airborne concentrations of lead shall be collected and analyzed in accordance with 29 CFR 1926 Section .62. Results shall be reported in micrograms per cubic meter of air.

3.4.3.1 Preabatement

Preabatement samples shall be collected in the following locations outside the work area; one upwind of the abatement and two downwind of the abatement activities.

3.4.3.2 Abatement

The IH shall collect area air samples on a daily basis. The samples shall be collected in the same location as the preabatement samples.

3.4.3.3 Results

The Contractor shall have the results of the area air monitoring within 48 hours after completion of the sampling. Results shall be reported in micrograms per cubic meter of air.

3.4.3.4 Excessive Levels

Outdoor LBP abatement shall cease and the Contracting Officer notified if measured airborne lead concentrations, collected during abatement, exceed the preabatement airborne concentration levels. The Contractor may be required to clean and resample the effected area, at no additional cost to the Government, if directed by the Contracting Officer. The Contractor shall correct the work practices and/or engineering controls and shall resume abatement at the direction of the Contracting Officer.

3.4.4 Waste Sampling and Testing

Sampling and testing of all waste shall be in accordance with 40 CFR 261.

3.4.5 Soil Sampling

3.4.5.1 Preabatement

In order to establish baseline lead-in-soil conditions on the site prior to the initiation of exterior lead abatement, composite soil samples shall be collected. Eight to ten small portions of surface soil shall be scooped with a fresh 50 mL plastic centrifuge tube and composited in the tube. This will represent a single sample. If excessive paint chips are present in the soil they shall be included in the sample. The 8 - 10 samples shall be collected such that they represent the area where abatement occurred. One shall be taken at the dripline extending out a distance of 10 feet. Sampling shall be on bare soil. The laboratory shall utilize procedures in EPA SOP Publication No. 600/2-91-231 or other procedures required by the state where work is being performed.

3.4.5.2 Post Abatement

Post abatement soil samples shall be collected in the same locations as the preabatement samples utilizing the same procedures. If post abatement soil samples exceed the preabatement levels, the Contractor may be required to perform soil excavation to a depth of two inches in the area specified by the Contracting Officer at no additional cost to the Government. The soil shall be tested as specified in paragraph CLEANUP AND DISPOSAL. Analysis that exceed TCLP limits shall be treated as LBP contaminated waste and disposed accordingly.

3.5 ADJACENT AREAS

Damage to adjacent areas shall be repaired to the approval of the Contracting Officer.

3.6 CLEANUP AND DISPOSAL

3.6.1 Cleanup

3.6.1.1 Daily

Surfaces in the LBP control area shall be maintained free of accumulations of paint chips and dust. Spread of dust and debris shall be restricted; waste shall not be distributed over the work area. Dry sweep or compressed air shall not be used for cleanup. At the end of each shift, the area shall be cleaned of visible lead paint contamination by vacuuming with a HEPA filtered vacuum cleaner and wet mopping the area. LBP abatement work shall cease during the cleanup.

3.6.1.2 Prior to Clearance

Upon completion of the lead paint abatement and a satisfactory visual inspection by the Contracting Officer in a given work area, a preliminary clean-up shall be performed by the Contractor. This clean-up includes removal of any contaminated material, equipment or debris including polyethylene sheeting from the work area, except for critical barriers. The polyethylene sheeting shall be sprayed or misted with water for dust control, abatement debris removed and then the sheeting removed by folding it in upon itself. Polyethylene sheeting used for critical barriers shall remain in place until final clearance criteria. The following methodology shall be utilized during the cleanup prior to clearance.

- a. Lead-contaminated debris shall be containerized in accordance with paragraph Contaminated Waste. Waste bags shall not be overloaded, shall be securely sealed and stored in the designated area until disposal.
- b. Non-contaminated debris shall be containerized; removed from the work area and stored in the designated area until disposal in accordance with paragraph Non-Contaminated Waste.
- c. Removal of surface polyethylene sheeting shall begin from upper levels such as cabinets and shelves. Removal of floor polyethylene sheeting shall begin at the corners and folded in the middle to contain the dust. Polyethylene shall be disposed of as specified for debris.
- d. Cleaning. Once the polyethylene sheeting, except critical barriers is removed from the work area, cleaning shall begin. It shall be done in the following sequence: HEPA Vacuum; Tri-Sodium Phosphate (TSP) wash (or equivalent cleaner); and HEPA Vacuum.
- e. HEPA Vacuum. Vacuum all surfaces. Begin with ceilings and proceed down the walls, including window, doors, door trim and ending with floors. Begin vacuuming at the furthest corner from the entrance to the work area.
- f. Wet Wash. Wash or mop the surfaces vacuumed in the same sequence. Contractor shall utilize a tri-sodium phosphate (TSP) detergent

solution or other equally effective cleaning agent and allow surface to dry.

- g. Cleaning Equipment. The Contractor shall prepare and use detergents containing five to ten percent TSP or other equally effective cleaning agent which shall be used in accordance with the manufacturers instructions. The waste water from cleaning shall be contained and disposed of according to applicable Federal, state, county and local regulations and guidelines. The waste water shall not be disposed of in storm sewers or sanitary sewers without specific and written Government approval.

3.6.2 Visual Inspection

Upon completion of the final cleaning, the Contractor shall notify the Contracting Officer and request a final visual inspection with the Contracting Officer's representative with the criteria in the final cleaning/visual inspection example format sheet located at the end of this section. If the area does not pass the visual inspection, the Contractor shall reclean the area as required by paragraph CLEANUP AND DISPOSAL, at no additional expense to the Government. Final clearance testing shall not proceed until the Contracting Officer has accepted the final cleaning by the Contractor.

3.6.3 Final Clearance Testing

Final clearance surface dust sampling in accordance with HUD-01 shall be conducted after a thorough cleanup has been completed in accordance with the following:

- a. Onsite paint removal throughout the unit. Three samples shall be taken (one from a window sill, one from a window well, and one from the floor) in each area. An area is defined as a room, closet, pantry, hall, portion of a room, etc.
- b. Onsite paint removal in limited areas. Three samples shall be taken (one from a window sill, one from a window well, and one from the floor) in each area abated and one sample outside the containment area (within ten feet in 20 percent of the abated units). Pre-abatement wipe samples shall be compared to determine if dust from the abatement process has contaminated non-abated areas. The Contractor shall cleanup these areas if contamination from the abatement process occurs.
- c. Replacement and/or encapsulation only throughout the unit. One wipe sample shall be taken in each area divided equally between window wells, window sills, and floors.
- d. Replacement and/or encapsulation only in limited areas. One wipe sample shall be taken in each abated area divided equally between window wells, window sills, and floors, and one wipe sample outside the containment area within ten feet in 20 percent of the abated units.
- e. Exterior abatement. At least one wipe sample shall be taken on a horizontal surface of the living area such as a front or back porch.

Retests. Should laboratory results indicate that the wipe test clearance level is exceeded, the Contractor shall reclean the affected area, at no

additional cost to the Government. The Contractor shall utilize specified cleaning methods. Retesting will then be performed to determine if specified clearance criteria was met. The Contractor shall pay for additional testing and shall provide, at no additional cost, a recleaning of an affected area until the clearance level is achieved.

3.6.4 Certification

The Competent Person shall certify in writing that inside the LBP control area and the area external to the LBP control area met final clearance requirements.

3.6.5 Removal of Control Area

After approval of the final clearance certification, and when authorized by the Contracting Officer, the LBP control area, containment barriers, and control structures roped-off boundary and warning signs shall be removed.

3.6.6 Disposal

3.6.6.1 Toxicity Characteristic Leaching Procedure (TCLP) Results

The results of the [Pilot Abatement Project] [TCLP analysis performed during abatement] shall be used to determine disposal procedures.

3.6.6.2 Contaminated Waste

Lead-contaminated waste, scrap, and debris shall be disposed of as follows:

- a. Lead-contaminated waste, scrap, debris, bags, containers, equipment, and lead-contaminated clothing, which may produce airborne concentrations of lead particles shall be stored in approved drums. Each drum shall be labeled to identify the type of waste as defined in 49 CFR 172 and the date lead-contaminated wastes were first put into the drum. The Uniform Hazardous Waste Manifest forms from Federal and state agencies shall be obtained and completed. Land disposal restriction notifications shall be as required by 40 CFR 268. The Contracting Officer shall be notified at least 14 days prior to delivery to arrange for job site inspection of the drums and manifests. Lot deliveries of hazardous wastes shall be made as needed to ensure that drums do not remain on the work site longer than 90 calendar days from the date affixed to each drum. The Contracting Officer will assign an area for interim storage of waste-containing drums.
- b. Lead-contaminated waste shall be handled, stored, transported, and disposed of in accordance with 40 CFR 260, 40 CFR 261, 40 CFR 262, 40 CFR 263, 40 CFR 264, and 40 CFR 265. Land disposal restriction notification shall be as required by 40 CFR 268.

3.6.6.3 Non-Contaminated Waste

Non-contaminated waste, scrap, and debris shall be disposed of at the on-site dumpster or waste vehicle.

3.6.7 Disposal Documentation

Written evidence shall be provided that the hazardous waste treatment, storage, or disposal facility is approved for lead disposal by the EPA and state or local regulatory agencies. One copy shall be submitted of the

completed manifest; signed, and dated by the initial transporter in accordance with 40 CFR 262.

3.6.8 Title to Materials

Materials resulting from demolition work, except as specified otherwise, shall become the property of the Contractor, and shall be disposed of in accordance with Section 02050 DEMOLITION, except as specified herein.

3.6.9 Payment for Hazardous Waste

Payment for disposal of hazardous waste will not be made until a signed copy of the manifest from the treatment or disposal facility certifying the amount of lead-containing materials delivered is returned and a copy is furnished to the Government.

-- End of Section --

CERTIFICATION OF FINAL CLEANING AND VISUAL INSPECTION

Individual abatement task as identified in paragraph,
Description of Work _____

In accordance with the clearing and decontamination procedures specified in the Contractor's lead hazard abatement plan and this contract, the Contractor hereby certifies that he/she has thoroughly visually inspected the decontaminated regulated work area (all surfaces, including pipes, beams, ledges, walls, ceiling, floor, decontamination unit, etc.) and has found no dust, debris, or lead containing material residue.

BY: (Contractor's signature) _____
Date _____
Print name and
title _____

(Contractor's Onsite Supervisor signature) _____
Date _____
Print name and
title _____

(Contractor's [Competent Person] [CIH] [IH] signature) _____
Date _____
Print name and
title _____

CONTRACTING OFFICER ACCEPTANCE OR REJECTION

The Contracting Officer hereby determines that the Contractor has performed final cleaning and visual inspection of the decontaminated regulated work area (all surfaces including pipes, beams, ledges, walls, ceiling, floor, decontamination unit, etc.) and by quality assurance inspection, finds the Contractor's final cleaning to be:

_____ Acceptable

_____ Unacceptable, Contractor instructed to reclean the LBP control work area

BY: Contracting Officer's Representative

Signature _____
Date _____
Print name and
title _____

ACCOMPANYING AMENDMENT NO. 0002 TO SOLICITATION NO. DACA63-99-B-0019

SECTION 02222 - EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS

PART 1 GENERAL

1.1 This specification covers the requirements for excavation, trenching and backfilling for utilities systems to the points of connection within 5 feet of the buildings.

1.2 REFERENCES

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

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

| | |
|-------------|--|
| ASTM D 422 | (1963; R 1990) Particle-Size Analysis of Soils |
| ASTM D 1556 | (1990) Density and Unit Weight of Soil in Place by the Sand-Cone Method |
| ASTM D 1557 | (1991) Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/cu. ft. (2,700 kN-m/cu. m.)) |
| ASTM D 2487 | (1993) Classification of Soils for Engineering Purposes (Unified Soil Classification System) |
| ASTM D 2922 | (1991) Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth) |
| ASTM D 3017 | (1988; R 1993) Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth) |

1.3 DEFINITIONS

1.3.1 Degree of Compaction

Degree of compaction shall be expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM D 1557.

1.4 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL PROCEDURES:

SD-09 Reports

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

Copies of all laboratory and field test reports within 24 hours of the completion of the test.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Satisfactory Materials

Satisfactory materials shall consist of any material classified by ASTM D 2487 as GW, GP, SW, GC, CM, GC-GM, GP-GM, GP-GC, SP, SC, SM, SC-SM, SP-SM, SP-SC.

2.1.2 Unsatisfactory Materials

Unsatisfactory materials shall be materials that do not comply with the requirements for satisfactory materials. Unsatisfactory materials include but are not limited to those materials containing roots and other organic matter, trash, debris, frozen materials and stones larger than 2 inches, and materials classified in ASTM D 2487, as ML, MH, CL, CH, PT, OH, and OL. Unsatisfactory materials also include man-made fills, refuse, or backfills from previous construction.

2.1.3 Rock

Rock shall consist of boulders measuring 1/2 cubic yard or more and materials that cannot be removed without systematic drilling and blasting such as rock material in ledges, bedded deposits, unstratified masses and conglomerate deposits, and below ground concrete or masonry structures, exceeding 1/2 cubic yard in volume, except that pavements will not be considered as rock.

2.1.5 Unyielding Material

Unyielding material shall consist of rock and gravelly soils with stones greater than 2 inches in any dimension or as defined by the pipe manufacturer, whichever is smaller.

2.1.6 Unstable Material

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

2.1.7 Select Granular Material

Select granular material shall consist of well-graded sand, gravel, crushed gravel, crushed stone or crushed slag composed of hard, tough and durable particles, and shall contain not more than 10 percent by weight of material passing a No. 200 mesh sieve and no less than 95 percent by weight passing the 1 inch sieve. The maximum allowable aggregate size shall be 2 inches, or the maximum size recommended by the pipe manufacturer, whichever is smaller.

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2.1.8 Initial Backfill Material

Initial backfill shall consist of select granular material or satisfactory materials free from rocks 2 inch or larger in any dimension or free from rocks of such size as recommended by the pipe manufacturer, whichever is smaller. When the pipe is coated or wrapped for corrosion protection, the initial backfill material shall be free of stones larger than 2 inch in any dimension or as recommended by the pipe manufacturer, whichever is smaller.

PART 3 EXECUTION

3.1 EXCAVATION

Excavation shall be performed to the lines and grades indicated. Rock excavation shall include removal and disposition of material defined as rock in paragraph MATERIALS. Earth excavation shall include removal and disposal of material not classified as rock excavation. During excavation, material satisfactory for backfilling shall be stockpiled in an orderly manner at a distance from the banks of the trench equal to 1/2 the depth of the excavation, but in no instance closer than 2 feet. Excavated material not required or not satisfactory for backfill shall be removed from the site. Grading shall be done as may be necessary to prevent surface water from flowing into the excavation, and any water accumulating therein shall be removed to maintain the stability of the bottom and sides of the excavation. Unauthorized overexcavation shall be backfilled in accordance with paragraph BACKFILLING AND COMPACTION at no additional cost to the Government.

3.1.1 Trench Excavation

The trench shall be excavated as recommended by the manufacturer of the pipe to be installed. Trench walls below the top of the pipe shall be sloped, or made vertical, and of such width as recommended in the manufacturer's installation manual. Where no manufacturer's installation manual is available, trench walls shall be made vertical. The trench width below the top of pipe shall not exceed 24 inches plus pipe outside diameter (O.D.) for pipes of less than 24 inches inside diameter and shall not exceed 36 inches plus pipe outside diameter for sizes larger than 24 inches inside diameter. Where recommended trench widths are exceeded, redesign, stronger pipe, or special installation procedures shall be utilized by the Contractor. The cost of redesign, stronger pipe, or special installation procedures shall be borne by the Contractor without any additional cost to the Government.

The excavations shall comply with the Occupational Safety and Health Administration (OSHA), Code of Federal Regulations, Chapter XVII, Title 29, Part 1926, Subpart P, "Excavations, Trenching, and Shoring." Keep construction equipment and stockpiled materials well away from the edge of the excavation to prevent possible slope failure caused by these surcharges.

3.1.1.1 Bottom Preparation

The bottoms of trenches shall be accurately graded to provide uniform bearing and support for the bottom quadrant of each section of the pipe. Bell holes shall be excavated to the necessary size at each joint or coupling to

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eliminate point bearing. Stones of 2 inches or greater in any dimension, or as recommended by the pipe manufacturer, whichever is smaller, shall be removed to avoid point bearing.

3.1.1.2 Removal of Unyielding Material

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

3.1.1.3 Removal of Unstable Material

Where unstable material is encountered in the bottom of the trench, such material shall be removed to the depth directed and replaced to the proper grade with select granular material as provided in paragraph BACKFILLING AND COMPACTION. When removal of unstable material is required due to the fault or neglect of the Contractor in his performance of the work, the resulting material shall be excavated and replaced by the Contractor without additional cost to the Government.

3.1.1.4 Excavation for Appurtenances

Excavation for manholes, catch-basins, inlets, or similar structures shall be sufficient to leave at least 12 inches clear between the outer structure surfaces and the face of the excavation or support members. Rock shall be cleaned of loose debris and cut to a firm surface either level, stepped, or serrated, as shown or as directed. Loose disintegrated rock and thin strata shall be removed. Removal of unstable material shall be as specified above. When concrete or masonry is to be placed in an excavated area, special care shall be taken not to disturb the bottom of the excavation. Excavation to the final grade level shall not be made until just before the concrete or masonry is to be placed.

3.1.1.5 Jacking, Boring, and Tunneling

Unless otherwise indicated, excavation shall be by open cut except that sections of a trench may be jacked, bored, or tunneled if, in the opinion of the Contracting Officer, the pipe, cable, or duct can be safely and properly installed and backfill can be properly compacted in such sections.

3.1.1.6 Stockpiles

Stockpiles of satisfactory, unsatisfactory and wasted materials shall be placed and graded as specified. Stockpiles shall be kept in a neat and well drained condition, giving due consideration to drainage at all times. The ground surface at stockpile locations shall be cleared, grubbed, and sealed by rubber-tired equipment, excavated satisfactory and unsatisfactory materials shall be separately stockpiled. Stockpiles of satisfactory materials shall be protected from contamination which may destroy the quality and fitness of the stockpiled material. If the Contractor fails to protect the stockpiles, and any material becomes unsatisfactory, such material shall be removed and replaced with satisfactory material from approved sources at no additional cost to the Government. Locations of stockpiles of materials shall be subject to prior approval of the Contracting Officer.

3.2 BACKFILLING AND COMPACTION

Backfill material shall consist of satisfactory material, select granular material, or initial backfill material as required. Backfill shall be placed in layers not exceeding 6 inches loose thickness for compaction by hand operated machine compactors, and 8 inches loose thickness for other than hand operated machines, unless otherwise specified. Each layer shall be compacted to at least 95 percent maximum density for cohesionless soils and 90 percent maximum density for cohesive soils, unless otherwise specified.

3.2.1 Trench Backfill

Trenches shall be backfilled to the grade shown. The trench shall be backfilled prior to performing the required pressure tests. The joints and couplings shall be left uncovered during the pressure test.

3.2.1.1 Replacement of Unyielding Material

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

3.2.1.2 Replacement of Unstable Material

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

3.2.1.3 Initial Backfill

Initial backfill material shall be placed and compacted with approved tampers to a height of at least one foot above the utility pipe or conduit. The backfill shall be brought up evenly on both sides of the pipe for the full length of the pipe. Care shall be taken to ensure thorough compaction of the fill under the haunches of the pipe.

3.2.1.4 Final Backfill

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

a. Roadways: Backfill shall be placed up to the elevation at which the requirements in Section 02225 EARTHWORK FOR ROADWAYS control. Water flooding or jetting methods of compaction will not be permitted.

b. Sidewalks, Turfed or Seeded Areas and Miscellaneous Areas: Backfill shall be deposited in layers of a maximum of 12 inch loose thickness, and compacted to 85 percent maximum density for cohesive soils and 90 percent maximum density for cohesionless soils. Compaction by water flooding or jetting will not be permitted. This requirement shall also apply to all other areas not specifically designated above.

3.2.2 Backfill for Appurtenances

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

3.3 SPECIAL REQUIREMENTS

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

3.3.1 Water Lines

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

3.3.2 Plastic Marking Tape

Warning tapes shall be installed directly above the pipe, at a depth of 18 inches below finished grade unless otherwise shown.

3.4 TESTING

Testing shall be the responsibility of the Contractor and shall be performed at no additional cost to the Government.

3.4.1 Testing Facilities

Tests shall be performed by an approved commercial testing laboratory. No work requiring testing will be permitted until the laboratory has been approved by the Contracting Officer.

3.4.2 Testing of Backfill Materials

Characteristics of backfill materials shall be determined in accordance with particle size analysis of soils ASTM D 422 and moisture-density relations of soils ASTM D 1557. A minimum of one particle size analysis and one moisture-density relation test shall be performed on each different type of material used for bedding and backfill.

3.4.3 Field Density Tests

Tests shall be performed in sufficient numbers to ensure that the specified density is being obtained. A minimum of one field density test per lift of backfill for every 50 feet of installation shall be performed. One moisture density relationship shall be determined for every 1500 cubic yards of material used. Field in-place density shall be determined in accordance with ASTM D 2922. The calibration checks of both the density and moisture gauges shall be made at the beginning of a job, on each different type of material encountered, at intervals as directed by the Contracting Officer. Copies of

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calibration curves, results of calibration tests, and field and laboratory density tests shall be furnished to the Contracting Officer. Trenches improperly compacted shall be reopened to the depth directed, then refilled and compacted to the density specified at no additional cost to the Government.

3.4.4 Displacement of Sewers

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

-- End of Section --

SECTION 02225 - EARTHWORK FOR ROADWAYS

PART 1 GENERAL

1.1 This specification covers requirements for excavation, embankment, preparation of subgrades and grading for roadways, including excavation, filling and shaping of drainageways.

1.2 REFERENCES

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

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

| | |
|-------------|--|
| ASTM C 136 | (1993) Sieve Analysis of Fine and Coarse Aggregates |
| ASTM D 422 | (1963; R 1990) Particle-Size Analysis of Soils |
| ASTM D 1140 | (1992) Amount of Material in Soils Finer than the No. 200 (75-micrometer) Sieve |
| ASTM D 1556 | (1990) Density and Unit Weight of Soil in Place by the Sand-Cone Method |
| ASTM D 1557 | (1991) Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/cu. ft. (2,700 kN-m/cu. m.)) |
| ASTM D 2487 | (1993) Classification of Soils for Engineering Purposes (Unified Soil Classification System) |
| ASTM D 2922 | (1991) Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth) |
| ASTM D 2937 | (1983; R 1990) Density of Soil in Place by the Drive-Cylinder Method |
| ASTM D 3017 | (1988; R 1993) Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth) |
| ASTM D 4318 | (1993) Liquid Limit, Plastic Limit, and Plasticity Index of Soils |

1.3 DEFINITIONS

1.3.1 Satisfactory Materials

Materials classified in ASTM D 2487 as GC, GM, GC-GM, GP-GM, GP-GC, SP, SC, SM, SC-SM, SP-SM, SP-SC, GW, GP, and SW, and free from roots and other organic matter, trash, debris, and frozen materials and stones larger than 6 inches in any dimension are satisfactory.

1.3.2 Unsatisfactory Materials

Materials which do not comply with the requirements for satisfactory materials

are unsatisfactory. Materials classified in ASTM D 2487 as ML, MH, CL, CH, Pt, OH, and OL are unsatisfactory. Unsatisfactory materials also include man-made fills, refuse, or backfills from previous construction.

1.3.3 Cohesionless and Cohesive Materials

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

1.3.4 Degree of Compaction

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

1.4 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL PROCEDURES:

SD-08 Statements

Earthwork; FIO.

Procedure and location for disposal of unused satisfactory material. Blasting plan when blasting is permitted. Proposed source of borrow material.

SD-09 Reports

Testing; FIO.

Within 24 hours of conclusion of physical tests, 5 copies of test results, including calibration curves and results of calibration tests.

SD-13 Certificates

Testing; FIO.

Qualifications of the commercial testing laboratory.

SD-18 Records

Earthwork; FIO.

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

1.5 SUBSURFACE DATA

Subsurface soil boring logs are appended to the SPECIAL CLAUSES. The subsoil investigation report on subsurface investigations may be examined upon written request submitted to the Contracting Officer. These data represent some

subsurface information available; however, variations may exist in the subsurface between boring locations.

1.6 CLASSIFICATION OF EXCAVATION

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

1.7 UTILIZATION OF EXCAVATED MATERIALS

Unsatisfactory materials removed from excavations shall be disposed of in designated waste disposal or spoil areas. Satisfactory material removed from excavations shall be used, insofar as practicable, in the construction of fills, embankments, subgrades, shoulders, bedding (as backfill), and for similar purposes. No satisfactory excavated material shall be wasted without specific written authorization. Satisfactory material authorized to be wasted shall be disposed of in designated areas approved for surplus material storage or designated waste areas as directed. Newly designated waste areas on Government-controlled land shall be cleared and grubbed before disposal of waste material thereon. Coarse rock from excavations shall be stockpiled and used for constructing slopes or embankments adjacent to streams, or sides and bottoms of channels and for protecting against erosion. No excavated material shall be disposed of to obstruct the flow of any stream, endanger a partly finished structure, impair the efficiency or appearance of any structure, or be detrimental to the completed work in any way.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.1 STRIPPING OF TOPSOIL

Where indicated or directed, topsoil shall be stripped to a depth of 6 inches. Topsoil shall be spread on areas already graded and prepared for topsoil, or transported and deposited in stockpiles convenient to areas that are to receive application of the topsoil later, or at locations indicated or specified. Topsoil shall be kept separate from other excavated materials, brush, litter, objectionable weeds, roots, stones larger than 2 inches in diameter, and other materials that would interfere with planting and maintenance operations. Any surplus of topsoil from excavations and grading shall be stockpiled in locations indicated.

3.2 EXCAVATION

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

embankment in excess of that produced by excavation within the grading limits shall be excavated from the borrow areas indicated or from other approved areas selected by the Contractor as specified.

3.2.1 Ditches, Gutters, and Channel Changes

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

3.2.2 Drainage Structures

Excavations shall be made to the lines, grades, and elevations shown, or as directed. Trenches and foundation pits shall be of sufficient size to permit the placement and removal of forms for the full length and width of structure footings and foundations as shown. Rock or other hard foundation material shall be cleaned of loose debris and cut to a firm, level, stepped, or serrated surface. Loose disintegrated rock and thin strata shall be removed. When concrete or masonry is to be placed in an excavated area, the bottom of the excavation shall not be disturbed. Excavation to the final grade level shall not be made until just before the concrete or masonry is to be placed. Where pile foundations are to be used, the excavation of each pit shall be stopped at an elevation 1 foot above the base of the footing, as specified, before piles are driven. After the pile driving has been completed, loose and displaced material shall be removed and excavation completed, leaving a smooth, solid, undisturbed surface to receive the concrete or masonry.

3.3 SELECTION OF BORROW MATERIAL

Borrow material shall be selected to meet the requirements and conditions of the particular fill or embankment for which it is to be used. Borrow material shall be obtained from the borrow areas shown or from other approved sources, either private or within the limits of the project site, selected by the Contractor. Unless otherwise provided in the contract, the Contractor shall obtain from the owners the right to procure material, pay royalties and other charges involved, and bear the expense of developing the sources, including rights-of-way for hauling. Borrow material from approved sources on Government-controlled land may be obtained without payment of royalties. Unless specifically provided, no borrow shall be obtained within the limits of the project site without prior written approval. Necessary clearing, grubbing, and satisfactory drainage of borrow pits and the disposal of debris thereon shall be considered related operations to the borrow excavation.

3.4 OPENING AND DRAINAGE OF EXCAVATION AND BORROW PITS

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

3.5 BACKFILL

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

Ground surface on which backfill is to be placed shall be prepared as specified in paragraph PREPARATION OF GROUND SURFACE FOR EMBANKMENTS. Compaction requirements for backfill materials shall also conform to the applicable portions of paragraphs PREPARATION OF GROUND SURFACE FOR EMBANKMENTS, EMBANKMENTS, and SUBGRADE PREPARATION, and Section 02720 STORM-DRAINAGE SYSTEM; and Section 02222 EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS. Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment.

3.6 PREPARATION OF GROUND SURFACE FOR EMBANKMENTS

Ground surface on which fill is to be placed shall be stripped of live, dead, or decayed vegetation, rubbish, debris, and other unsatisfactory material; plowed, disked, or otherwise broken up to a depth of 6 inches; pulverized; moistened or aerated as necessary; thoroughly mixed; and compacted to at least 90 percent laboratory maximum density for cohesive materials or 95 percent laboratory maximum density for cohesionless materials. Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment. The prepared ground surface shall be scarified and moistened or aerated as required just prior to placement of embankment materials to assure adequate bond between embankment material and the prepared ground surface.

3.7 SUBGRADE PREPARATION

3.7.1 Construction

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

3.7.2 Compaction

Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment. Except for paved areas and railroads, each layer of the embankment shall be compacted to at least 95 percent of laboratory maximum density.

3.7.2.1 Subgrade for Pavements

Subgrade for pavements shall be compacted to at least 95 percentage laboratory maximum density for the depth below the surface of the pavement shown.

3.8 FINISHING

The surface of excavations, embankments, and subgrades shall be finished to a smooth and compact surface in accordance with the lines, grades, and cross sections or elevations shown. The degree of finish for graded areas shall be within 0.1 foot of the grades and elevations indicated except that the degree of finish for subgrades shall be specified in paragraph SUBGRADE PREPARATION.

Gutters and ditches shall be finished in a manner that will result in effective drainage. The surface of areas to be turfed shall be finished to a smoothness suitable for the application of turfing materials.

3.9 TESTING

Testing shall be performed by an approved commercial testing laboratory. Field in-place density shall be determined in accordance with ASTM D 2922. The calibration curves shall be checked and adjusted using only the sand cone method as described in ASTM D 1556. ASTM D 2992 results in a wet unit weight of soil and when using this method ASTM D 3017 shall be used to determine the moisture content of the soil. The calibration curves furnished with the moisture gauges shall also be checked along with density calibration checks as described in ASTM D 3017; the calibration checks of both the density and moisture gauges shall be made at the beginning of a job on each different type of material encountered and at intervals as directed by the Contracting Officer. When test results indicate, as determined by the Contracting Officer, that compaction is not as specified, the material shall be removed, replaced and recompact to meet specification requirements. Tests on recompact areas shall be performed to determine conformance with specification requirements. Inspections and test results shall be certified by a registered professional civil engineer. These certifications shall state that the tests and observations were performed by or under the direct supervision of the engineer and that the results are representative of the materials or conditions being certified by the tests. The following number of tests, if performed at the appropriate time, will be the minimum acceptable for each type operation.

3.9.1 Fill and Backfill Material Gradation

One test per 500 cubic yard stockpiled or in-place source material. Gradation of fill and backfill material shall be determined in accordance with ASTM C 136.

3.9.2 In-Place Densities

a. One test per 2400 square foot, or fraction thereof, of each lift of fill or backfill areas compacted.

3.9.3 Moisture Contents

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

3.9.4 Optimum Moisture and Laboratory Maximum Density

Tests shall be made for each type material or source of material including

borrow material to determine the optimum moisture and laboratory maximum density values. One representative test per 500 cubic yard of fill and backfill, or when any change in material occurs which may affect the optimum moisture content or laboratory maximum density.

3.9.5 Tolerance Tests for Subgrades

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

3.10 SUBGRADE AND EMBANKMENT PROTECTION

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

-- End of Section --

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SECTION 02241 - AGGREGATE BASE COURSE

PART 1 GENERAL

1.1 This specification covers the requirements for base course for roads and streets designed for light loads, Type B and C traffic areas for medium loads, overruns, and Type D traffic area.

1.2 REFERENCES

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

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

| | |
|-------------|--|
| ASTM C 29 | (1991a) Unit Weight and Voids in Aggregate |
| ASTM C 127 | (1988; R 1993) Specific Gravity and Absorption of Course Aggregate |
| ASTM C 128 | (1993) Specific Gravity and Absorption of Fine Aggregate |
| ASTM C 131 | (1989) Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine |
| ASTM C 136 | (1993) Sieve Analysis of Fine and Coarse Aggregates |
| ASTM D 75 | (1987; R 1992) Sampling Aggregates |
| ASTM D 422 | (1963; R 1990) Particle-Size Analysis of Soils |
| ASTM D 1556 | (1990) Density and Unit Weight of Soil in Place by the Sand-Cone Method |
| ASTM D 1557 | (1991) Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/cu. ft. (2,700 kN-m/cu. m.)) |
| ASTM D 2167 | (1994) Density and Unit Weight of Soil in Place by the Rubber Balloon Method |
| ASTM D 2922 | (1991) Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth) |
| ASTM D 3017 | (1988; R 1993) Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth) |
| ASTM D 4318 | (1993) Liquid Limit, Plastic Limit, and Plasticity Index of Soils |

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ASTM E 11

(1987) Wire-Cloth Sieves for Testing Purposes

New Mexico State Highway and Transportation Department Standard Specifications

1.3 DEFINITIONS

1.3.1 Aggregate Base

Aggregate base as used herein is well graded, durable aggregate uniformly moistened and mechanically stabilized by compaction.

1.3.2 Degree of Compaction

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

1.4 GENERAL

The work specified herein consists of the construction of an aggregate base course. The work shall be performed in accordance with this specification and shall conform to the lines, grades, notes and typical sections shown in the plans. Sources of all materials shall be selected well in advance of the time that materials will be required in the work.

1.5 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL PROCEDURES:

SD-01 Data

Plant, Equipment, Machines, and Tools; FIO.

List of proposed equipment to be used in performance of construction work including descriptive data.

SD-09 Reports

Sampling and Testing; FIO. Field Density; FIO.

Calibration curves and related test results prior to using the device or equipment being calibrated. Copies of field test results within 24 hours after the tests are performed. Certified copies of test results for approval not less than 30 days before material is required for the work.

SD-18 Records

Waybills and Delivery Tickets; FIO. Coarse Aggregate; FIO.

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Copies of waybills and delivery tickets during the progress of the work.
Certified waybills and delivery tickets for all materials actually used. A
notification stating which type of coarse aggregate is to be used.

1.6 WEATHER LIMITATIONS

Base shall not be constructed when the atmospheric temperature is less than 35 degrees F. Base shall not be constructed on subgrades that are frozen or contain frost. If the temperature falls below 35 degrees F completed areas shall be protected against any detrimental effects of freezing.

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 satisfactory working condition at all times. Other compacting equipment may be used in lieu of that specified, where it can be demonstrated that the results are equivalent. The equipment shall be adequate and have the capability of producing the results specified.

1.7.2 Steel-Wheeled Rollers

Steel-wheeled rollers shall be the self-propelled type weighing not less than 10 tons, with a minimum weight of 300 pounds per inch width of rear wheel. Wheels of the rollers shall be equipped with adjustable scrapers. The use of vibratory rollers is optional.

1.7.3 Pneumatic-Tired Rollers

Pneumatic-tired rollers shall have four or more tires, each loaded to a minimum of 30,000 pounds and inflated to a minimum pressure of 150 psi. The loading shall be equally distributed to all wheels, and the tires shall be uniformly inflated. Towing equipment shall also be pneumatic-tired.

1.7.4 Mechanical Spreader

Mechanical spreader shall be self-propelled or attached to a propelling unit capable of moving the spreader and material truck. The device shall be steerable and shall have variable speeds forward and reverse. The spreader and propelling unit shall be carried on tracks, rubber tires, or drum-type steel rollers that will not disturb the underlying material. The spreader shall contain a hopper, an adjustable screed, and outboard bumper rolls and be designed to have a uniform, steady flow of material from the hopper. The spreader shall be capable of laying material without segregation across the full width of the lane to a uniform thickness and to a uniform loose density so that when compacted, the layer or layers shall conform to thickness and grade requirements indicated. The Contracting Officer may require a demonstration of the spreader prior to approving use in performance of the work.

1.7.5 Sprinkling Equipment

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

1.7.6 Tampers

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

1.7.7 Straightedge

The Contractor shall furnish and maintain at the site, in good condition, one 10-foot straightedge for each bituminous paver, for use in the testing of the finished surface. Straightedge shall be made available for Government use. Straightedges shall be constructed of aluminum or other lightweight metal and shall have blades of box or box-girder cross section with flat bottom reinforced to insure rigidity and accuracy. Straightedges shall have handles to facilitate movement on pavement.

1.8 STOCKPILING MATERIALS

Materials, including approved material available from excavation and grading, shall be stockpiled in the manner and at locations designated. Before stockpiling of material, storage sites shall be cleared, and sloped to drain. Materials obtained from different sources shall be stockpiled separately.

1.9 SAMPLING AND TESTING

1.9.1 General Requirements

Sampling and testing shall be the responsibility of the Contractor. Sampling and testing shall be performed by an approved commercial testing laboratory. Tests shall be performed in sufficient numbers and at the locations and times directed to insure that materials and compaction meet specified requirements. Copies of test results shall be furnished to the Contracting Officer within 24 hours of completion of tests.

1.9.2 Test Results

Results shall verify that materials comply with this specification. When a material source is changed, the new material will be tested for compliance. When deficiencies are found, the initial analysis shall be repeated and the material already placed shall be retested to determine the extent of unacceptable material. All in-place unacceptable material shall be replaced or modified as directed by the Contracting Officer.

1.9.3 Sampling

Samples for laboratory tests shall be taken in accordance with ASTM D 75.

1.9.4 Sieve Analysis

Before starting work, at least one sample of material shall be tested in accordance with ASTM C 136 and ASTM D 422 on sieves conforming to ASTM E 11.

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After the initial test, a minimum of one analysis shall be performed for each 1000 tons of material placed, with a minimum of three analyses for each day's run until the course is completed.

1.9.5 Liquid Limit and Plasticity Index

One liquid limit and plasticity index shall be performed for each sieve analysis. Liquid limit and plasticity index shall be in accordance with ASTM D 4318.

1.9.6 Laboratory Density

Tests shall provide a moisture-density relationship for the aggregate. Tests shall be conducted in accordance with ASTM D 1557.

1.9.8 Wear Tests

Wear tests shall be performed in accordance with ASTM C 131. One test shall be run per 136 square yards of completed base course. A minimum of one test per aggregate source shall be run.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Aggregates

Aggregates shall consist of crushed stone, crushed gravel, angular sand, or other approved material. Aggregates shall be durable and sound, free from lumps of clay, organic matter, objectionable coatings, and other foreign material. Material retained on a No. 4 sieve shall be known as coarse aggregate and that passing the No. 4 sieve shall be known as binder material.

2.1.1.1 Coarse Aggregate

Only one type of coarse aggregate shall be used on the project. Coarse aggregates, consisting of angular fragments of uniform density and quality, shall have a percentage of wear not to exceed 50 percent after 500 revolutions when tested in accordance with ASTM C 131. The amount of flat and elongated particles shall not exceed 30 percent. A flat particle is one having a ratio of width to thickness greater than 3, and an elongated particle is one having a ratio of length to width greater than 3.

a. Crushed Gravel: Crushed gravel shall be manufactured from gravel particles 50 percent of which by weight are retained on the maximum size gradation sieve specified.

b. Crushed Stone: Crushed stone retained on each sieve specified shall contain at least 50 percent by weight of crushed pieces having two or more freshly fractured faces with the area of each face being at least equal to 75 percent of the smallest midsectional area of the piece. When two fractures are adjacent, the angle between the planes of the fractures must be at least 30 degrees to count as two fractured faces.

2.1.2 Binder Material

Binder material shall consist of screenings, angular sand, or other finely divided mineral matter processed or naturally combined with the coarse aggregate. Liquid-limit and plasticity-index requirements shall apply to any component that is blended to meet the required gradation and shall also apply to the completed course. The portion of any component or of the completed course passing the No. 40 sieve shall be either nonplastic or have a liquid limit not greater than 25 and a plasticity index not greater than 5.

2.1.3 Gradation

Requirements for gradation specified shall apply to the completed base course. The aggregates shall have a 1-1/2 inch maximum size and shall be continuously graded within the following limits:

| Sieve Designation | Percentage by Weight Passing square-mesh Sieve * |
|----------------------|---|
| | No. 1 |
| 1 inch | 100 |
| 3/4 inch | 80-100 |
| No. 4 | 30-60 |
| No. 10 | 20-45 |
| No. 200 | 3-10 |

* The table is based on aggregates of uniform specific gravity and the percentages passing the various sieves are subject to appropriate corrections in accordance with ASTM C 127 and ASTM C 128 when aggregates of varying specific gravities are used. The gradation above conforms to New Mexico State Highway and Transportation Department Standard Specifications for base course, Sections 304, Class I-B.

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

When the base is constructed in more than one layer, the previously constructed layer shall be cleaned of loose and foreign matter by sweeping with power sweepers or power brooms, except that hand brooms may be used in areas where power cleaning is not practicable. Adequate drainage shall be provided during the entire period of construction to prevent water from collecting or standing on the working area. Line and grade stakes shall be provided as necessary for control. Grade stakes shall be in lines parallel to the centerline of the area under construction and suitably spaced for string lining.

3.2 OPERATION OF AGGREGATE SOURCES

Aggregates shall be obtained from off-site sources.

3.3 PREPARATION OF UNDERLYING COURSE

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3.3.1 General Requirements

Before constructing aggregate base course, the previously constructed underlying course shall be cleaned of foreign substances. Surface of underlying course shall meet the specified compaction and surface tolerances. Subgrade shall conform to Section 02225 EARTHWORK FOR ROADWAYS, RAILROADS, AND AIRFIELDS Section 02210 GRADING. Ruts or soft, yielding spots that may appear in the underlying course, areas having inadequate compaction, and deviations of the surface from requirements specified shall be corrected. For cohesionless underlying materials containing sands, sand gravels, or any other cohesionless material in harmful quantities, the surface shall be mechanically stabilized with aggregate prior to placement of the aggregate course. Stabilization may be accomplished by mixing base course material into the underlying course and compacting by approved methods. Properly compacted material will be considered as part of the underlying course and shall meet all requirements for the underlying course. Finished underlying course shall not be disturbed by traffic or other operations and shall be maintained in a satisfactory condition until base course is placed.

3.3.2 Grade Control

Underlying material shall be excavated to sufficient depth for the required base course thickness so that the finished base course with the subsequent surface course will meet the fixed grade. Finished and completed area shall conform to the lines, grades, cross section, and dimensions indicated.

3.4 INSTALLATION

3.4.1 Mixing and Placing

Materials shall be mixed by the stationary plant, traveling plant, or road mix method and placed in such a manner as to obtain uniformity of the aggregate base course material and at a uniform optimum water content for compaction. The Contractor shall make such adjustments in mixing or placing procedures or in equipment to obtain the true grades, to minimize segregation and degradation, to reduce or accelerate loss or increase of water, and to ensure a satisfactory base course.

3.4.2 Edges of Base Course

Approved material shall be placed along edges of aggregate base course in such quantities as will compact to thickness of the course being constructed, or to the thickness of each layer in a multiple layer course, allowing in each operation at least a 1 foot width of the shoulder to be rolled and compacted simultaneously with rolling and compacting of each layer of base course.

3.4.3 Compaction

Each layer of aggregate base course shall be compacted. Water content shall be maintained at optimum. Density of compacted mixture shall be at least 100 percent of laboratory maximum density. Rolling shall begin at the outside edge of the surface and proceed to the center, overlapping on successive trips at least one-half the width of the roller. Alternate trips of the roller shall be slightly different lengths. Speed of the roller shall be such that

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displacement of the aggregate does not occur. Areas inaccessible to the
rollers shall be compacted with mechanical tampers, and shall be shaped and
finished by hand methods.

3.4.4 Layer Thickness

Compacted thickness of the aggregate course shall be as indicated. No layer
shall be in excess of 8 inches nor less than 3 inches in compacted thickness.

3.4.5 Proof Rolling

Proof rolling of the areas indicated shall be in addition to the compaction
specified and shall consist of the application of 30 coverages with a heavy
pneumatic-tired roller having four or more tires, each loaded to a minimum of
30,000 pounds and inflated to a minimum of 150 psi. In areas designated,
proof rolling shall be applied to the top lift or layer on which base course
is laid and to each layer of base course. Water content of the top lift or
layer on which base course is laid shall be maintained at optimum or at
percentage directed from start of compaction to completion of proof rolling of
that layer. Water content of each layer of the base course shall be
maintained at the optimum percentage directed from start of compaction to
completion of proof rolling. Materials in base course or underlying materials
that produce unsatisfactory results by rolling shall be removed and replaced
with satisfactory materials and recompacted.

3.4.6 Finishing

The surface of the top layer shall be finished to grade and cross section
shown. Finished surface shall be of uniform texture. Light blading during
compaction may be necessary for the finished surface to conform to the lines,
grades, and cross sections. Should the surface for any reason become rough,
corrugated, uneven in texture, or traffic marked prior to completion, such
unsatisfactory portion shall be scarified, reworked, recompacted, or replaced
as directed.

3.4.6.1 Smoothness

Surface of each layer shall show no deviations in excess of 3/8 inch when
tested with the 10-foot straightedge. Deviations exceeding this amount shall
be corrected by removing material and replacing with new material, or by
reworking existing material and compacting, as directed.

3.4.6.2 Thickness Control

Compacted thickness of the base course shall be within 1/2 inch of the
thickness indicated. Where the measured thickness is more than 1/2 inch
deficient, such areas shall be corrected by scarifying, adding new material of
proper gradation, reblading, and recompacting as directed. Where the measured
thickness is more than 1/2 inch thicker than indicated, the course shall be
considered as conforming to the specified thickness requirements. Average job
thickness shall be the average of all thickness measurements taken for the
job, but shall be within 1/4 inch of the thickness indicated.

3.5 FIELD QUALITY CONTROL

3.5.1 Field Density

Field in-place density shall be determined in accordance with ASTM D 1556 ASTM D 2167 ASTM D 2922. When ASTM D 2922 is used, the calibration curves shall be checked, and adjusted if necessary, using the sand cone method as described in paragraph Calibration of the ASTM publication. ASTM D 2922 results in a wet unit weight of soil, and when using this method, ASTM D 3017 shall be used to determine the moisture content of the soil. The calibration curves furnished with the moisture gauges shall be checked along with density calibration checks as described in ASTM D 3017. If ASTM D 2922 is used, in-place densities shall be checked by ASTM D 1556 at least once per lift for each 100 square yard of base material. Calibration curves and calibration test results shall be furnished within 24 hours of the conclusion of the tests. At least one field density test shall be performed for each 250 square yards of each layer of base material.

3.5.2 Smoothness

Measurements for deviation from grade and cross section shown shall be taken in successive positions parallel to the road centerline with a 10 foot straightedge. Measurements shall also be taken perpendicular to the road centerline at 15 foot intervals.

3.5.3 Thickness

Thickness of the base course shall be measured at intervals in such a manner as to ensure one measurement for each 500 square yards of base course. Measurements shall be made in 3 inch diameter test holes penetrating the base course.

3.6 TRAFFIC

Completed portions of the area may be opened to traffic, provided there is no marring or distorting of the surface by the traffic. Heavy equipment shall not be permitted except when necessary to construction, and then the area shall be protected against marring or damage to the completed work.

3.7 MAINTENANCE

The aggregate base course shall be maintained in a satisfactory condition until accepted. Maintenance shall include immediate repairs to any defects and shall be repeated as often as necessary to keep the area intact.

3.8 DISPOSAL OF UNSATISFACTORY MATERIALS

Removed in-place materials that are unsuitable for the base course material that is removed for the required correction of defective areas, and waste material and debris shall be disposed of as directed.

-- End of Section --

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SECTION 02551 - BITUMINOUS PAVING FOR ROADS, STREETS AND OPEN STORAGE AREAS

PART 1 GENERAL

1.1 This specification covers the requirements for bituminous intermediate and wearing courses (central-plant hot-mix).

1.2 REFERENCES

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

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

| | |
|------------|---|
| ASTM C 29 | (1991a) Unit Weight and Voids in Aggregate |
| ASTM C 88 | (1990) Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate |
| ASTM C 117 | (1990) Materials Finer than 75-micrometer (No 200) Sieve in Mineral Aggregates by Washing |
| ASTM C 127 | (1988) Specific Gravity and Absorption of Coarse Aggregate |
| ASTM C 128 | (1988) Specific Gravity and Absorption of Fine Aggregate |
| ASTM C 131 | (1989) Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine |
| ASTM C 136 | (1984a) Sieve Analysis of Fine and Coarse Aggregates |
| ASTM C 183 | (1988) Sampling and the Amount of Testing of Hydraulic Cement |
| ASTM D 5 | (1986) Penetration of Bituminous Materials |
| ASTM D 75 | (1987) Sampling Aggregates |
| ASTM D 140 | (1988) Sampling Bituminous Materials |
| ASTM D 242 | (1985; R 1990) Mineral Filler for Bituminous Paving Mixtures |
| ASTM D 422 | (1963; R 1990) Particle-Size Analysis of Soils |

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| | |
|-------------|---|
| ASTM D 946 | (1982) Penetration-Graded Asphalt Cement for Use in Pavement Construction |
| ASTM D 1075 | (1988) Test Method for Effect of Water on Cohesion of Compacted Bituminous Mixtures |
| ASTM D 1188 | (1989) Test Method for Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Paraffin Coated Specimens |
| ASTM D 1250 | (1980; R 1990) Petroleum Measurement Tables |
| ASTM D 1559 | (1989) Test Methods for Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus |
| ASTM D 1856 | (1979; R 1984) Recovery of Asphalt from Solution by Abson Method |
| ASTM D 2041 | (1991) Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures |
| ASTM D 2172 | (1992) Quantitative Extraction of Bitumen from Bituminous Paving Mixtures |
| ASTM D 2216 | (1990) Laboratory Determination of Water (Moisture) Content of Soil, and Rock |
| ASTM D 2726 | (1990) Test Method for Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Saturated Surface Dry Specimens |
| ASTM D 3381 | (1983) Viscosity-Graded Asphalt Cement for Use in Pavement Construction |
| ASTM D 3515 | (1989) Hot-Mixed, Hot-Laid Bituminous Paving Mixtures |
| ASTM D 4791 | (1989) Flat or Elongated Particles in Coarse Aggregate |

New Mexico State Highway and Transportation Department Standard Specifications

1.3 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300
SUBMITTAL PROCEDURES:

SD-09 Reports

Bituminous Pavement; GA.

Hot Bin Gradation; FIO.

Marshall Specimens; FIO.

Asphalt Extractions; FIO.

Field Density Tests; FIO.

Thickness Measurements; FIO.

Job Mix Formula (JMF); GA.

Three copies of each individual test results.

SD-18 Records

Waybills and Delivery Tickets; GA.

Waybills and delivery tickets, during progress of the work.

Asphalt Material; FIO

Seal number from tank and the number of the TSDHPT Laboratory test report.

1.4 PLANT, EQUIPMENT, MACHINES, AND TOOLS

1.4.1 General

The bituminous plant shall be of such capacity to produce the quantities of bituminous mixtures required. Hauling equipment, paving machines, rollers, miscellaneous equipment, and tools shall be provided in sufficient numbers and capacity and in proper working condition to place the bituminous paving mixtures at a rate equal to the plant output.

1.4.2 Straightedge

The Contractor shall furnish and maintain at the site, in good condition, one 12-foot straightedge for each bituminous paver. Straightedge shall be made available for Government use. Straightedges shall be constructed of aluminum or other lightweight metal and shall have blades of box or box-girder cross section with flat bottom reinforced to insure rigidity and accuracy. Straightedges shall have handles to facilitate movement on pavement.

1.5 WEATHER LIMITATIONS

Unless otherwise directed, bituminous courses shall not be constructed when temperature of the surface of the existing pavement or base course is below 40 degrees F.

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1.6 PROTECTION OF PAVEMENT

After final rolling, no vehicular traffic of any kind shall be permitted on the pavement until the pavement has cooled to 140 degrees F.

1.7 GRADE AND SURFACE-SMOOTHNESS REQUIREMENTS

Finished surface of bituminous courses, when tested as specified below, shall conform to gradeline and elevations shown and to surface-smoothness requirements specified.

1.7.1 Plan Grade

The grade of the completed surface shall not deviate more than 0.05 foot from the plan grade.

1.7.2 Surface Smoothness

When a 12-foot straightedge is laid on the surface parallel with the centerline of the paved area or transverse from crown to pavement edge, the surface shall vary not more than 1/4 inch from the straightedge.

1.8 GRADE CONTROL

Lines and grades shall be established and maintained by means of line and grade stakes placed at site of work in accordance with the SPECIAL CLAUSES. Elevations of bench marks used by the Contractor for controlling pavement operations at the site of work will be determined, established, and maintained by the Government. Finished pavement elevations shall be established and controlled at the site of work by the Contractor in accordance with bench mark elevations furnished by the Contracting Officer.

1.9 SAMPLING AND TESTING

Sampling and testing shall be the responsibility of the Contractor. Sampling and testing shall be performed by an approved commercial testing laboratory or by the Contractor subject to approval. Unless otherwise specified, sampling shall be in accordance with ASTM D 75 for aggregates, ASTM C 183 for mineral filler, and with ASTM D 140 for bituminous material. Copies of the test results shall be furnished to the Contracting Officer. Approval of a source does not relieve the Contractor of responsibility for delivery at the job site of materials meeting the requirements herein.

1.9.1 Tests Required

1.9.1.1 Plant Mix

1.9.1.1.1 Hot Bin Gradations

Hot bin gradations (cold-feed gradation when drum mix plant is used), shall be tested in accordance with ASTM C 136 and ASTM C 117. A minimum of one test will be conducted per every 200 tons of wearing course mix placed or fraction thereof.

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1.9.1.1.2 Marshall Specimens

Marshall specimens shall be taken in accordance with CRD-C 652-95. At least one set of specimens shall be taken per each 200 tons of wearing course mix placed, and one set of specimens shall be taken per each 350 tons of intermediate course mix placed. However, not less than two sets of specimens (three specimens per set) shall be taken in any one day regardless of the quantity of mix placed.

1.9.1.1.3 Asphalt Extractions

Asphalt extractions shall be performed in accordance with ASTM D 2172, Method A or B. At least one asphalt extraction shall be conducted per day.

1.9.1.2 Field Density Tests

Field density tests shall be conducted in accordance with CRD-C 650-95. A minimum of one test will be conducted per every 200 tons of wearing course mix placed or fraction thereof, and a minimum of one test conducted per every 350 tons of intermediate course mix placed or fraction thereof.

1.9.1.3 Thickness Measurements

Thickness measurements shall be taken at a minimum of one measurement per each 835 square meters (1,000 square yards) of mix placed.

1.10 DELIVERY, STORAGE, AND HANDLING OF MATERIALS

1.10.1 Mineral Aggregates

Mineral aggregates shall be delivered to the site of the bituminous mixing plant and stockpiled in such manner as to preclude fracturing of aggregate particles, segregation, contamination, or intermingling of different materials in the stockpiles or cold-feed hoppers. Mineral filler shall be delivered, stored, and introduced into the mixing plant in a manner to preclude exposure to moisture or other detrimental conditions.

1.10.2 Bituminous Materials

Bituminous materials shall be maintained at appropriate temperature during storage but shall not be heated by application of direct flame to walls of storage tanks or transfer lines. Storage tanks, transfer lines, and weigh buckets shall be thoroughly cleaned before a different type or grade of bitumen is introduced into the system. The asphalt cement shall be heated sufficiently to allow satisfactory pumping of the material; however, the storage temperature shall be maintained below 300 degrees F.

1.11 ACCESS TO PLANT AND EQUIPMENT

The Contracting Officer shall have access at all times to all parts of the paving plant for checking adequacy of the equipment in use; inspecting operation of the plant; verifying weights, proportions, and character of

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materials; and checking temperatures maintained in preparation of the mixtures.

1.12 WAYBILLS AND DELIVERY TICKETS

Before the final statement is allowed, the Contractor shall file with the Contracting Officer certified waybills and certified delivery tickets for all aggregates and bituminous materials actually used in construction.

PART 2 PRODUCTS

2.1 HOT-MIX SURFACE COURSE

Bituminous hot-mix surface course shall conform to the requirements of TSDHPT-01 for "Hot-Mix Asphaltic Concrete Pavement," Item 340, except as specified hereinafter.

2.1.1 Asphalt Materials

Asphalt material for the surface course shall be asphalt cement AC-20 conforming to TSDHPT-01 for "Asphalts, Oils and Emulsions," Item 300. Asphalt material shall come from a source approved for use by the TSDHPT. The seal number from the tank and the number of the TSDHPT Laboratory test report shall be furnished to the Contracting Officer.

2.1.2 Paving Mixture

Paving mixture shall be Type "D".

2.1.3 State Specification Modifications

TSDHPT Specification shall be modified as follows:

- a. Material retained on the 2mm size sieve shall not exceed 65 percent.
- b. Density and stability requirements shall not apply.
- c. Construction methods paragraph shall not apply.
- d. The measurement and payment paragraphs shall not apply.

2.2 PROPORTIONING OF MIXTURE

2.2.1 Job Mix Formula (JMF)

The JMF for the bituminous mixture will be furnished to the Contracting Officer for approval. No payments will be made for mixtures produced prior to the approval of the JMF. The formula shall indicate the percentage of each stockpiled and mineral filler, the percentage of each size aggregate, the percentage of bitumen, and the temperature of the completed mixture when discharge from the mixer. The tolerances specified in TSDHPT-01 "Item 340", will be allowed for asphalt content, temperature and aggregate grading for tests conducted on the mix as discharged from the mixing plant. Bituminous mix that deviates more than 4-degrees Celsius from the JMF shall be rejected.

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The JMF may be adjusted during construction to improve paving mixtures, as directed, without adjustments in the contract unit prices.

2.2.2 Test Properties of Bituminous Mixtures

Finished mixture shall meet the requirements described below when tested in accordance with CRD-C 649-5. All samples will be compacted with 50 blows of specified hammer on each side of sample. When bituminous mixture fails to meet the requirements specified below, the paving operation shall be stopped until the cause of noncompliance is determined and corrected.

2.2.2.1 Stability, Flow, and Voids

Requirements for stability, flow, and voids are shown in TABLES I and II for nonabsorptive and absorptive aggregates, respectively.

TABLE I. NONABSORPTIVE-AGGREGATE MIXTURE

| | Intermediate | <u>Wearing Course</u> | <u>Course</u> |
|---------------------------------------|--------------|-----------------------|---------------|
| Stability minimum, Newtons | | 2,200 | 2,200 |
| Flow maximum, 25/100-millimeter units | | 20 | 20 |
| Total mix, percent (1) | | 2-4 | 4-6 |
| Filled with bitumen, percent (2) | | 75-85 | 65-75 |

(1) The Contracting Officer may permit deviations from limits specified when gyratory method of design is used to develop the JMF.

(2) The Contracting Officer may permit deviation from limits specified for voids filled with bitumen in the intermediate course in order to stay within limits for percent voids total mix.

TABLE II. ABSORPTIVE-AGGREGATE MIXTURE

| | Intermediate | <u>Wearing Course</u> | <u>Course</u> |
|---------------------------------------|--------------|-----------------------|---------------|
| Stability minimum, Newtons | | 2,200 | 2,200 |
| Flow maximum, 25/100-millimeter units | | 20 | 20 |
| Total mix, percent (1) | | 2-4 | 3-5 |
| Filled with bitumen, percent (2) | | 80-90 | 70-80 |

(1) The Contracting Officer may permit deviations from limits specified when gyratory method of design is used to develop the JMF.

(2) The Contracting Officer may permit deviation from limits specified for voids filled with bitumen in the intermediate course in order to stay within limits for percent voids total mix.

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a. When the water-absorption value of the entire blend of aggregate does not exceed 2.5 percent as determined in accordance with ASTM C 127 and ASTM C 128, the aggregate is designated as nonabsorptive. The theoretical specific gravity computed from the apparent specific gravity or ASTM D 2041 will be used in computing voids total mix and voids filled with bitumen, and the mixture shall meet requirements in TABLE I.

b. When the water-absorption value of the entire blend of aggregate exceeds 2.5 percent as determined in accordance with ASTM C 127 and ASTM C 128, the aggregate is designated as absorptive. The theoretical specific gravity computed from the bulk-impregnated specific gravity method contained in ASTM D 2041 shall be used in computing percentages of voids total mix and voids filled with bitumen; the mixture shall meet requirements in TABLE II.

2.2.2.2 Stability

The index of retained stability must be greater than 75 percent as determined by CRD-C 652-95 (Marshall Specimens). When the index of retained stability is less than 75, the aggregate stripping tendencies may be countered by the use of hydrated lime or by treating the bitumen with an approved antistripping agent. The hydrated lime is considered as mineral filler and should be considered in the gradation requirements. The amount of hydrated lime or antistripping agent added to bitumen shall be sufficient, as approved, to produce an index of retained stability of not less than 75 percent. No additional payment will be made to the Contractor for addition of antistripping agent required.

PART 3 EXECUTION

3.1 BASE COURSE CONDITIONING

The surface of the base course will be inspected for adequate compaction and surface tolerances specified in SECTION 02241 AGGREGATE BASE COURSE. Unsatisfactory areas shall be corrected.

3.2 PREPARATION OF BITUMINOUS MIXTURES

Rates of feed of aggregates shall be regulated so that the moisture content and temperature of aggregates will be within specified tolerances. Aggregates, mineral filler, and bitumen shall be conveyed into the mixer in proportionate quantities required to meet the JMF. Mixing time shall be as required to obtain a uniform coating of the aggregate with the bituminous material. Temperature of bitumen at time of mixing shall not exceed 300 degrees F. Temperature of aggregate and mineral filler in the mixer shall not exceed 325 degrees F when bitumen is added. Overheated and carbonized mixtures or mixtures that foam shall not be used.

3.4 WATER CONTENT OF AGGREGATES

Drying operations shall reduce the water content of mixture to less than 0.75 percent. The water content test will be conducted in accordance with ASTM D 2216; the weight of the sample shall be at least 500 grams. If the water

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content is determined on hot bin samples, the water content will be a weighted average based on composition of blend.

3.5 STORAGE OF BITUMINOUS PAVING MIXTURE

Storage shall conform to the applicable requirements of ASTM D 3515; however, in no case shall the mixture be stored for more than 4 hours.

3.6 TRANSPORTATION OF BITUMINOUS MIXTURE

Transportation from paving plant to site shall be in trucks having tight, clean, smooth beds lightly coated with an approved releasing agent to prevent adhesion of the mixture to the truck bodies. Excessive releasing agent shall be drained prior to loading. Each load shall be covered with canvas or other approved material of ample size to protect mixture from weather and to prevent loss of heat. Loads that have crusts of cold, unworkable material or that have become wet will be rejected. Hauling over freshly placed material will not be permitted.

3.7 SURFACE PREPARATION OF UNDERLYING COURSE

Prior to placing of the intermediate or wearing course, the underlying course shall be cleaned of all foreign or objectionable matter with power brooms and hand brooms.

3.8 PRIME COATING

Surfaces of previously constructed base course shall be sprayed with a coat of bituminous material conforming to Section 02559 BITUMINOUS PRIME COAT.

3.9 TACK COATING

Contact surfaces of previously constructed pavement, curbs, manholes, and other structures shall be sprayed with a thin coat of bituminous material conforming to Section 02558 BITUMINOUS TACK COAT.

3.10 PLACING

Bituminous courses shall be constructed only when the base course or existing pavement has no free water on the surface. Bituminous mixtures shall not be placed without ample time to complete spreading and rolling during daylight hours, unless approved satisfactory artificial lighting is provided.

3.10.1 Offsetting Joints

The wearing course shall be placed so that longitudinal joints of the wearing course will be offset from joints in the intermediate course by at least 1 foot. Transverse joints in the wearing course shall be offset by at least 2 feet from transverse joints in the intermediate course.

3.10.2 General Requirements for Use of Mechanical Spreader

Range of temperatures of mixtures, when dumped into the mechanical spreader, shall be as determined by the Contracting Officer. Mixtures having

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temperatures less than 225 degrees F when dumped into the mechanical spreader shall not be used. The mechanical spreader shall be adjusted and the speed regulated so that the surface of the course being laid will be smooth and continuous without tears and pulls, and of such depth that, when compacted, the surface will conform to the cross section indicated. Placing with respect to center line areas with crowned sections or high side of areas with one-way slope shall be as directed. Placing of the mixture shall be as nearly continuous as possible, and speed of placing shall be adjusted, as directed, to permit proper rolling. When segregation occurs in the mixture during placing, the spreading operation shall be suspended until the cause is determined and corrected.

3.10.3 Placing Strips Succeeding Initial Strips

In placing each succeeding strip after initial strip has been spread and compacted as specified below, the screed of the mechanical spreader shall overlap the previously placed strip 2 to 3 inches and be sufficiently high so that compaction produces a smooth dense joint. Mixture placed on the edge of a previously placed strip by the mechanical spreader shall be pushed back to the edge of the strip by use of a lute. Excess mixture shall be removed and wasted.

3.10.4 Handspreading in Lieu of Machine Spreading

In areas where the use of machine spreading is impractical, the mixture shall be spread by hand. Spreading shall be in a manner to prevent segregation. The mixture shall be spread uniformly with hot rakes in a loose layer of thickness that, when compacted, will conform to required grade, density, and thickness.

3.11 COMPACTION OF MIXTURE

Rolling shall begin as soon after placing as the mixture will bear a roller without undue displacement. Delays in rolling freshly spread mixture will not be permitted. After initial rolling, preliminary tests of crown, grade, and smoothness shall be made by the Contractor. Deficiencies shall be corrected so that the finished course will conform to requirements for grade and smoothness specified herein. After the Contractor is assured of meeting crown, grade, and smoothness requirements, rolling shall be continued until a mat density of 97.0 to 100.0 percent and a joint density of 95.0 to 100.0 percent of density of laboratory-compacted specimens of the same mixture is obtained. Places inaccessible to rollers shall be thoroughly compacted with hot hand tampers.

3.11.1 Correcting Deficient Areas

Mixtures that become contaminated or are defective shall be removed to the full thickness of the course. Edges of the area to be removed shall be cut so that sides are perpendicular and parallel to the direction of traffic and so that the edges are vertical. Edges shall be sprayed with bituminous materials conforming to Section 02558 BITUMINOUS TACK COAT and Section 02559 BITUMINOUS PRIME COAT. Fresh paving mixture shall be placed in the excavated areas in sufficient quantity so that the finished surface will conform to grade and smoothness requirements. Paving mixture shall be compacted to the

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density specified herein. Skin patching of an area that has been rolled shall not be permitted.

3.12 JOINTS

3.12.1 General

Joints between old and new pavements, between successive work days, or joints that have become cold (less than 175 degrees F) shall be made to insure continuous bond between the old and new sections of the course. All joints shall have the same texture and smoothness as other sections of the course. Contact surfaces of previously constructed pavements coated by dust, sand, or other objectionable material shall be cleaned by brushing or shall be cut back as directed. When directed by the Contracting Officer, the surface against which new material is placed shall be sprayed with a thin, uniform coat of bituminous material conforming to Section 02558 BITUMINOUS TACK COAT. Material shall be applied far enough in advance of placement of a fresh mixture to insure adequate curing. Care shall be taken to prevent damage or contamination of the sprayed surface.

3.12.2 Transverse Joints

The roller shall pass over the unprotected end of a strip of freshly placed material only when placing is discontinued or delivery of the mixture is interrupted to the extent that the material in place may become cold. In all cases, prior to continuing placement, the edge of previously placed pavement shall be cut back to expose an even vertical surface for full thickness of the course. In continuing placement of a strip, the mechanical spreader shall be positioned on the transverse joint so that sufficient hot mixture will be spread to obtain a joint after rolling that conforms to the required density and smoothness specified herein.

3.12.3 Longitudinal Joints

Edges of a previously placed strip shall be prepared such that the pavement in and immediately adjacent to the joint between this strip and the succeeding strip meets the requirements for grade, smoothness, and density.

-- End of Section --

SECTION 02811

UNDERGROUND SPRINKLER SYSTEMS

1 GENERAL

1.1 REFERENCES

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

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

| | |
|-------------|--|
| ASTM A 53 | (1997) Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless |
| ASTM B 32 | (1996) Solder Metal |
| ASTM B 43 | (1996) Seamless Red Brass Pipe, Standard Sizes |
| ASTM B 88 | (1996) Seamless Copper Water Tube |
| ASTM D 1785 | (1996a) Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120 |
| ASTM D 2241 | (1996a) Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series) |
| ASTM D 2287 | (1996) Nonrigid Vinyl Chloride Polymer and Copolymer Molding and Extrusion Compounds |
| ASTM D 2464 | (1996a) Threaded Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80 |
| ASTM D 2466 | (1996a) Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40 |
| ASTM D 2564 | (1996a) Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems |
| ASTM D 2774 | (1994) Underground Installation of Thermoplastic Pressure Piping |
| ASTM D 2855 | (1996) Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings |
| ASTM D 3261 | (1996) Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing |
| ASTM F 441 | (1995) Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40 and 80 |

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME B1.2 (1983; R 1991; Errata May 1992) Gages and Gaging for Unified Inch Screw Threads

ASME B16.3 (1992) Malleable Iron Threaded Fittings

ASME B16.15 (1985; R 1994) Cast Bronze Threaded Fittings Classes 125 and 250

ASME B16.18 (1984; R 1994) Cast Copper Alloy Solder Joint Pressure Fittings

ASME B16.22 (1995) Wrought Copper and Copper Alloy Solder Joint Pressure Fittings

ASME B40.1 (1991) Gauges - Pressure Indicating Dial Type - Elastic Element

AMERICAN SOCIETY OF SANITARY ENGINEERING (ASSE)

ASSE ANSI/ASSE 1012 (1995) Backflow Preventers with Intermediate Atmospheric Vent

ASSE 1013 (1993) Reduced Pressure Principle Backflow Preventers

ASSE 1020 (1974; Rev thru Feb 1989) Pressure Vacuum Breaker Assembly (Recommended for Outdoor Usage)

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA C509 (1994) Resilient-Seated Gate Valves for Water Supply Service

AWWA C901 (1996) Polyethylene (PE) Pressure Pipe and Tubing, 1/2 In. Through 3 In., for Water Service

COMMERCIAL ITEM DESCRIPTIONS (CID)

CID A-A-51145 (Rev C) Flux, Soldering, Non-Electronic, Paste & Liquid

FOUNDATION FOR CROSS-CONNECTION CONTROL AND HYDRAULIC RESEARCH (FCCCHR)

FCCCHR-01 (1993) Manual of Cross-Connection Control

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

MSS SP-80 (1997) Bronze Gate, Globe, Angle and Check Valves

MSS SP-85 (1994) Cast Iron Globe & Angle Valves Flanged and Threaded Ends

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA ICS 2 (1993) Industrial Control and Systems, Controllers, Contactors, and Overload Relays Rated Not More Than 2,000 Volts AC or 750 Volts DC

NEMA ICS 6 (1993) Industrial Control and Systems, Enclosures

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (1996; Errata 96-4) National Electrical Code

PLUMBING AND DRAINAGE INSTITUTE (PDI)

PDI WH 201 (1992) Water Hammer Arresters

1.2 PERFORMANCE REQUIREMENTS

System shall operate with a minimum water pressure of 65 psi at connection to meter and 20 psi at the last emitter in each zone.

1.3 SUBMITTALS

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

SD-01 Data

Framed Instructions; FIO .

Labels, signs, and templates of operating instructions that are required to be mounted or installed on or near the product for normal, safe operation.

Field Training; FIO.

Information describing training to be provided, training aids to be used, samples of training materials to be provided, and schedules and notification of training.

Spare Parts; FIO .

Spare parts data for each different item of material and equipment specified, after approval of the related submittals and not later than the start of the field tests. The data shall include a complete list of parts and supplies, with current unit prices and source of supply.

SD-04 Drawings

Sprinkler System; FIO .

As-built Drawings which provide current factual information showing locations of mains, heads, valves, and controllers including deviations from and amendments to the drawings and changes in the work shall be included.

SD-06 Instructions

Sprinkler System; FIO .

Detailed procedures defining the Contractor's provisions for accident prevention, health protection, and other safety precautions for the work to be done.

SD-09 Reports

Field Tests; FIO .

Performance test reports, in booklet form, showing all field tests performed to adjust each component; and all field tests performed to prove compliance with the specified performance criteria, upon completion and testing of the installed system. Each test report shall indicate the final position of control valves.

SD-13 Certificates

Sprinkler System; FIO .

The material supplier's or equipment manufacturer's statement that the supplied material or equipment meets specified requirements. Each certificate shall be signed by an official authorized to certify in behalf of material supplier or product manufacturer and shall identify quantity and date or dates of shipment or delivery to which the certificates apply.

SD-19 Operation and Maintenance Manuals

Sprinkler System; FIO .

Six (6) copies of operation and six (6) copies of maintenance manuals for the equipment furnished. One complete set prior to field testing and the remainder upon acceptance. Manuals shall be approved prior to the field training course. Operating manuals shall detail the step-by-step procedures required for system startup, operation, and shutdown. Operating manuals shall include the manufacturer's name, model number, parts list, and brief description of all equipment and their basic operating features. Maintenance manuals shall list routine maintenance procedures, possible breakdowns and repairs, and troubleshooting guides. Maintenance manuals shall include piping and equipment layout, simplified wiring and control diagrams of the system as installed, and system programming schedule.

1.4 DELIVERY AND STORAGE

All equipment delivered and placed in storage shall be protected from the weather; excessive humidity and temperature variation; direct sunlight (in the case of plastic or rubber materials); and dirt, dust, or other contaminants.

1.5 FIELD MEASUREMENTS

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

2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT REQUIREMENTS

2.1.1 Standard Products

Materials and equipment shall be the standard products of a manufacturer who has produced similar systems which have performed well for a minimum period of 2 years prior to bid opening. Equipment shall be supported by a service organization that is, in the opinion of the Contracting Officer, reasonably convenient to the site.

2.1.2 Nameplates

Each item of equipment shall have the manufacturer's name, address, type or style, model or serial number, and catalog number on a plate secured to the item of equipment.

2.1.3 Extra Stock

The following extra stock shall be provided: Twenty emitters of each size and type, two valve keys for operating manual valves, and four irrigation controller housing keys.

2.2 PIPING MATERIALS

2.2.1 Copper Tubing and Associated Fittings

Tubing shall conform to requirements of ASTM B 88, Type K. Fittings shall conform to ASME B16.22 and ASME B16.18, solder joint. Solder shall conform to ASTM B 32 95-5 tin-antimony. Flux shall conform to CID A-A-51145, Type I.

2.2.2 Red Brass Pipe and Associated Fittings

Pipe shall conform to requirements of ASTM B 43, regular. Fittings shall be Class 250, cast bronze threaded conforming to the requirements of ASME B16.15.

2.2.3 Galvanized Steel Pipe and Associated Fittings

Pipe shall conform to requirements of ASTM A 53, Schedule 40. Fittings shall be Class 150 conforming to requirements of ASME B16.3.

2.2.4 Polyvinyl Chloride (PVC) Pipe, Fittings and Solvent Cement

2.2.4.1 PVC Pipe

Pipe shall conform to the requirements of ASTM D 1785, PVC 1120 Schedule [40] [80]; or ASTM D 2241, PVC 1120 SDR 21, Class 200.

2.2.4.2 PVC Fittings

Solvent welded socket type fittings shall conform to requirements of ASTM D 2466, Schedule 40. Threaded type fittings shall conform to requirements of ASTM D 2464, Schedule 80.

2.2.4.3 Solvent Cement

Solvent cement shall conform to the requirements of ASTM D 2564.

2.2.5 Polyethylene (PE) Plastic Piping

Pipe shall conform to AWWA C901, outside diameter base with dimension ratio (DR) of 9.3 to provide 150 psi minimum pressure rating. Fittings shall conform to ASTM D 3261, DR of 9.3.

2.2.6 Dielectric Fittings

Dielectric fittings shall conform to ASTM F 441, Schedule 80, CPVC threaded pipe nipples, 4 inch minimum length.

2.2.7 Emitter Hose and Distribution Tubing

Emitter hose and distribution tubing shall conform to ASTM D 2287, maximum inside diameter of 3/4 inch, minimum wall thickness of 90 mils, vinyl plastic extruded from non-rigid chloride, integrally algae-resistant, homogeneous throughout, smooth inside and outside, free from foreign materials, cracks, serrations, blisters and other effects. Slip fittings shall be provided.

2.3 SPRINKLER AND EMITTER HEADS

2.3.1 Emitter Heads

Emitter heads shall be self-cleaning, pressure compensating diaphragm with one or six self-piercing barbed outlets; each capable of emitting from 1/4 to 2 gallons per hour flow. Emitter body shall be ultraviolet stabilized, algae, and heat resistant plastic construction.

2.4 VALVES

2.4.1 Gate Valves, Less than 3 Inches

Gate valves shall conform to the requirements of MSS SP-80, Type 1, Class 150, [threaded] [soldered] ends.

2.4.2 Remote Control Valves, Electrical

Remote control valves shall be solenoid actuated globe valves of 3/4 to 3 inch size, suitable for 24 volts, 60 cycle, and designed to provide for shut-off in event of power failure. Valve shall be cast bronze or brass or plastic housing suitable for service at 150 psi operating pressure with external flow control adjustment for shut-off capability, external plug at diaphragm chamber to enable manual operation, filter in control chamber to prevent valve body clogging with debris, durable diaphragm, and accessibility to internal parts without removing valve from system.

2.4.3 Backflow Preventers

Reduced pressure principle assemblies, double check valve assemblies, atmospheric (nonpressure) type vacuum breakers, and pressure type vacuum breakers shall be tested, approved, and listed in accordance with FCCCHR-01. Backflow preventers with intermediate atmospheric vent shall be in accordance with ASSE ANSI/ASSE 1012. Reduced pressure principle backflow preventers shall be in accordance with ASSE 1013.

2.4.3.1 Reduced Pressure Type Backflow Preventers

Backflow preventers shall be [150] [_____] pound flanged [cast iron], [bronze] [brass] mounted gate valve [and strainer], [304] [_____] stainless steel or bronze, internal parts. Total pressure drop through complete assembly shall be a maximum of 10 psi at rated flow. Piping shall be <TAI OPT=RED BRASS PIPE>[red brass pipe and fittings]</TAI> <TAI OPT=GALVANIZED STEEL PIPE>[galvanized steel pipe and fittings]</TAI>. Strainers shall be bronze or brass construction with gasket caps. Units shall have 200-mesh stainless steel screen elements.

2.5 ACCESSORIES AND APPURTENANCES

2.5.1 Valve Keys for Manually Operated Valves

Valve keys shall be 1/2 inch diameter by 3 feet long, tee handles and keyed to fit valves.

2.5.2 Valve Boxes and Concrete Pads

2.5.2.1 Valve Boxes

Valve boxes shall be cast iron, plastic lockable, or precast concrete for each gate valve, manual control valve and remote control valve. Box sizes shall be adjustable for valve used. Word "IRRIGATION" shall be cast on cover. Shaft diameter of box shall be minimum 5-1/4 inches. Cast iron box shall have bituminous coating.

2.5.2.2 Concrete Pads

Concrete pads shall be precast or cast-in-place reinforced concrete construction for reduced pressure type backflow preventers.

2.5.3 Service Clamps

Service clamps shall be bronze flat, double strap, with neoprene gasket or "O"-ring seal.

2.5.4 Emitter Head Accessories

2.5.4.1 Strainer

Strainer shall be provided at inlet to each drip line. Strainer shall have stainless steel screen having equivalent of 140-mesh filtration capacity and incorporate flush valves within strainer to clean screen without disassembling unit.

2.5.4.2 Pressure Regulator

Pressure regulator shall be provided at each drip system if supply pressure exceeds 50 psi.

2.5.4.3 Riser Adapters

Riser adapters shall be provided with a rigid piping system.

2.5.4.4 Tubing Stakes

Tubing stakes shall be plastic coated steel, or other non-corrosive strong material to secure tubing.

2.5.4.5 Emitter Outlet Check Valve (Bug Cap)

Check valves shall be provided at end of each emitter outlet distribution line. Valves shall permit free flow of water with minimum restriction; prevent back siphoning, entry of insects, and contamination into outlet ports.

2.5.4.6 Access Sleeve

Access sleeve shall be provided at buried emitters placed in covered boxes. Lids of access sleeve shall be secured with removable lugs. Drip hose in both vertical and horizontal axis shall be secured.

2.5.4.7 Closure Caps

Closure caps shall be in accordance with manufacturer's recommendations.

2.6 AUTOMATIC CONTROLLERS, ELECTRICAL

Controller shall conform to the requirements of NEMA ICS 2 with 120-volt single phase service, operating with indicated stations, and grounded chassis. Enclosure shall conform to NEMA ICS 6 Type 3R, with locking hinged cover, wall-mounted. Controller shall be programmed for various schedules by setting switches and dials equipped with the following features: A switch for each day of week for three schedules, allowing each station to be scheduled individually as to days of watering; a minute switch for each station with a positive increment range of 0 to 3 hours, set time within one percent; a switch allowing selected schedules to be repeated after each completion of initial watering schedule and allowing each operation to be scheduled throughout a 24-hour day; a circuit breaker for surge protection; and circuit for a 9-volt rechargeable NiCad battery.

2.7 ELECTRICAL WORK

Wiring and rigid conduit for electrical power shall be in accordance with NFPA 70, and Section 16375 ELECTRICAL DISTRIBUTION SYSTEM, UNDERGROUND.

2.8 CONCRETE MATERIALS

Concrete shall have a compressive strength of 2500 psi at 28 days as specified in Section 03300, CAST-IN-PLACE STRUCTURAL CONCRETE.

2.9 WATER SUPPLY MAIN MATERIALS

Tapping sleeves, service cut off valves, and connections to water supply mains shall be in accordance with Section 02510 WATER DISTRIBUTION SYSTEM.

2.10 INSULATING JOINTS

Insulating joints and dielectric fittings shall be in accordance with Section 02510 WATER DISTRIBUTION SYSTEM.

3 EXECUTION

3.1 INSTALLATION

Sprinkler system shall be installed after site grading has been completed. Excavation, trenching, and backfilling for sprinkler system shall be in accordance with the applicable provisions of Section 02316, EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS, except as modified herein.

3.1.1 Trenching

Trench around roots shall be hand excavated to pipe grade when roots of 2 inches diameter or greater are encountered. Trench width shall be 4 inches minimum or 1-1/2 times diameter of pipe, whichever is wider. Backfill shall be hand tamped over excavation. When rock is encountered, trench shall be excavated 4 inches deeper and backfilled with silty sand (SM) or well-graded sand (SW) to pipe grade. Trenches shall be kept free of obstructions and debris that would damage pipe. Subsoil shall not be mixed with topsoil. Existing concrete walks, drives and other obstacles shall be bored at a depth conforming to bottom of adjacent trenches. Pipe sleeves for bored pipe shall be two pipe diameters larger than sprinkler pipe.

3.1.2 Piping System

3.1.2.1 Cover

Underground piping shall be installed to meet the minimum depth of backfill cover specified.

3.1.2.2 Clearances

Minimum horizontal clearances between lines shall be 4 inches for pipe 2 inches and less; 12 inches for 2-1/2 inches and larger. Minimum vertical clearances between lines shall be 1 inch.

3.1.2.3 Minimum Slope

Minimum slope shall be 6 inches per 100 feet in direction of drain valves.

3.1.3 Piping Installation

3.1.3.1 Polyvinyl Chloride (PVC) Pipe

a. Solvent-cemented joints shall conform to the requirements of ASTM D 2855.

b. Threaded joints shall be full cut with a maximum of three threads remaining exposed on pipe and nipples. Threaded joints shall be made tight without recourse to wicks or fillers, other than polytetrafluoroethylene thread tape.

c. Piping shall be joined to conform with requirements of ASTM D 2774 or ASTM D 2855, and pipe manufacturer's instructions. Pipe shall be installed in a serpentine (snaked) manner to allow for expansion and contraction in trench before backfilling. Pipes shall be installed at temperatures over 40 degrees F.

3.1.3.2 Soldered Copper Tubing

Pipe shall be reamed and burrs removed. Contact surfaces of joint shall be cleaned and polished. Flux shall be applied to male and female ends. End of tube shall be inserted into fittings full depth of socket. After soldering, a solder bead shall show continuously around entire joint circumference. Excess acid flux shall be removed from tubings and fittings.

3.1.3.3 Threaded Brass or Galvanized Steel Pipe

Prior to installation, pipe shall be reamed. Threads shall be cut in conformance with ASME B1.2. Pipe joint compound shall be applied to male end only.

3.1.3.4 Insulating Joints

Insulating and dielectric fittings shall be provided where pipes of dissimilar metal are joined and at connections to water supply mains as shown. Installation shall be in accordance with Section 02510 WATER DISTRIBUTION SYSTEM.

3.1.4 Installation of Valves

3.1.4.1 Manual Valves

Valves shall be installed in a valve box extending from grade to below valve body, with a minimum of 4 inches cover measured from finish grade to top of valve stem.

3.1.4.2 Automatic Valves

Valve shall be set plumb in a valve box extending from grade to below valve body, with minimum of 4 inch cover measured from grade to top of valve. Automatic valves shall be installed beside sprinkler heads with a valve box.

3.1.5 Installation of Drip Irrigation System

3.1.5.1 Emitter Hose

Emitter laterals shall be buried 6 inches deep. Connections shall be solvent welded in accordance with manufacturer's recommendation to standard weight Schedule 40 PVC fittings and bushings. Hose shall be installed in a serpentine manner. When cutting hose, shearing tool such as a pipe cutter, knife, or shears shall be used. Manufacturer's recommended tool and procedures when punching hose for emitters shall be followed.

3.1.5.2 Emitter Heads

Emitters shall be installed in a plastic emitter box. Emitter on a rigid PVC nipple shall be connected to PVC drip lateral with a tee or elbow. Tubing shall be attached to barbed fitting and daylight distribution tubing at root ball secured with stake, with bug cap at end of secured distribution tubing. After installing emitters and before operating system, end of drip lateral shall be opened and flushed clean. The number of emitters on a line shall not exceed manufacturer's recommendations for that hose or distribution tubing size and length.

3.1.5.3 Tubing Stakes

Main irrigation line shall be secured with stakes where line is aboveground. Stakes shall be spaced to ensure that hose does not shift location in presence of foot traffic, operations, gravity on slope installations, or environmental effects. Discharge of the emitter distribution tubing shall be staked to ensure that discharge point of emitter will be maintained at specified position in relation to plant material to be irrigated.

3.1.6 Backflow Preventers

Backflow preventer shall be installed in new connection to existing water distribution system, between connection and control valves. Backflow preventer shall be installed with concrete pads.

3.1.6.1 Reduced Pressure Type

Pipe lines shall be flushed prior to installing reduced pressure device; device shall be protected by a strainer located upstream. Device shall not be installed in pits or where any part of device could become submerged in standing water.

3.1.7 Control Wire and Conduit

3.1.7.1 Wires

Low voltage wires may be buried beside pipe in same trench. Rigid conduit shall be provided where wires run under paving. Wires shall be number tagged at key locations along main to facilitate service. One control circuit shall be provided for each zone and a circuit to control sprinkler system.

3.1.7.2 Loops

A 12 inch loop of wire shall be provided at each valve where controls are connected.

3.1.7.3 Expansion and Contraction

Multiple tubes or wires shall be bundled and taped together at [10] [20] foot intervals with 12 inch loop for expansion and contraction.

3.1.7.4 Splices

Electrical splices shall be waterproof.

3.1.8 Automatic Controller

Exact field location of controllers shall be determined before installation. Coordinate the electrical service to these locations. Install in accordance with manufacturer's recommendations and NFPA 70.

3.1.9 Backfill

3.1.9.1 Minimum Cover

Depth of cover shall be 12 inches for 1-1/4 inch pipe or smaller; 18 inches for 1-1/2 to 2 inch pipe; 24 inches for 2-1/2 inch pipe or larger; 36 inches for pipes under traffic loads, farm operations, and freezing temperatures; and 18 inches for low-voltage wires. Remainder of trench or pipe cover shall be filled to within 3 inches of top with excavated soil, and compact soil with plate hand-held compactors to same density as undisturbed adjacent soil.

3.1.9.2 Restoration

Top 3 inches shall be filled with topsoil and compacted with same density as surrounding soil. Lawns and plants shall be restored in accordance with Sections 02921 SEEDING, 02922 SODDING, 02923 SPRIGGING, and Section 02930 EXTERIOR PLANTING. Pavements shall be restored in accordance with Section [_____].

3.1.10 Adjustment

After grading, seeding, and rolling of planted areas, sprinkler heads shall be adjusted flush with finished grade. Adjustments shall be made by providing new nipples of proper length or by use of heads having an approved device, integral with head, which will permit adjustment in height of head without changing piping.

3.1.11 Disinfection

Sprinkler system fed from a potable water system shall be disinfected upstream of backflow preventer in accordance with Section 02510 WATER DISTRIBUTION SYSTEM.

3.1.12 Cleaning of Piping

Prior to the hydrostatic and operation tests, the interior of the pipe shall be flushed with clean water until pipe is free of all foreign materials. Flushing and cleaning out of system pipe, valves, and components shall not be considered completed until witnessed and accepted by Contracting Officer.

3.2 FIELD TESTS

All instruments, equipment, facilities, and labor required to conduct the tests shall be provided by Contractor.

3.2.1 Hydrostatic Pressure Test

Piping shall be tested hydrostatically before backfilling and proved tight at a hydrostatic pressure of 150 psi without pumping for a period of one hour with an allowable pressure drop of 5 psi. If hydrostatic pressure

cannot be held for a minimum of 4 hours, Contractor shall make adjustments or replacements and the tests repeated until satisfactory results are achieved and accepted by the Contracting Officer.

3.2.2 Leakage Tests

Leakage tests for service main shall be in accordance with Section 02510 WATER DISTRIBUTION SYSTEM.

3.2.3 Operation Test

At conclusion of pressure test, sprinkler heads or emitter heads, quick coupling assemblies, and hose valves shall be installed and entire system tested for operation under normal operating pressure. Operation test consists of the system operating through at least one complete programmed cycle for all areas to be sprinkled.

3.3 FRAMED INSTRUCTIONS

Framed instructions containing wiring and control diagrams under glass or in laminated plastic shall be posted where directed. Condensed operating instructions, prepared in typed form, shall be framed as specified above and posted beside the diagrams. The framed instructions shall be posted before acceptance testing of the system. After as-built drawings are approved by Contracting Officer, controller charts and programming schedule shall be prepared. One chart for each controller shall be supplied. Chart shall be a reduced drawing of actual as-built system that will fit the maximum dimensions inside controller housing. Black line print for chart and a different pastel or transparent color shall indicate each station area of coverage. After chart is completed and approved for final acceptance, chart shall be sealed between two 20 mil pieces of clear plastic.

3.4 FIELD TRAINING

A field training course shall be provided for designated operating and maintenance staff members. Training shall be provided for a total period of two hours of normal working time and shall start after the system is functionally complete but prior to final acceptance tests. Field training shall cover all of the items contained in the operating and maintenance manuals.

3.5 CLEANUP

Upon completion of installation of system, all debris and surplus materials resulting from the work shall be removed.

SECTION 02921

SEEDING

1 GENERAL

1.1 REFERENCES

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

AGRICULTURAL MARKETING SERVICE (AMS)

AMS-01 (Aug 95) Federal Seed Act Regulations Part 201

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 977 (1991) Emulsified Asphalt

ASTM D 2028 (1976; R 1992) Cutback Asphalt (Rapid-Curing Type)

ASTM D 4972 (1995a) pH of Soils

ASTM D 5268 (1992; R 1996) Topsoil Used for Landscaping Purposes

ASTM D 5883 (1996) Standard Guide for Use of Rotary Kiln Produced Expanded Shale, Clay or Slate (ESCS) as a Mineral Amendment in Topsoil Used for Landscaping and Related Purposes

1.2 SUBMITTALS

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

SD-01 Data

Equipment; FIO. Surface Erosion Control Material; FIO. Chemical Treatment Material; FIO.

Manufacturer's literature including physical characteristics, application and installation instructions for equipment, surface erosion control material and chemical treatment material.

SD-07 Schedules

Equipment; FIO.

A listing of equipment to be used for the seeding operation.

SD-08 Statements

Delivery; FIO.

Delivery schedule.

Finished Grade and Topsoil; FIO.

Finished grade status.

Topsoil; FIO.

Availability of topsoil from the stripping and stock piling operation.

SD-09 Reports

Equipment Calibration; FIO.

Certification of calibration tests conducted on the equipment used in the seeding operation.

Soil Test; FIO.

Certified reports of inspections and laboratory tests, prepared by an independent testing agency, including analysis and interpretation of test results. Each report shall be properly identified. Test methods used and compliance with recognized test standards shall be described.

SD-13 Certificates

Seed; FIO. Topsoil; FIO. pH Adjuster; FIO. Fertilizer; FIO. Organic Material; FIO. Soil Conditioner; FIO. Mulch; FIO. Asphalt Adhesive; FIO. Pesticide; FIO.

Prior to the delivery of materials, certificates of compliance attesting that materials meet the specified requirements. Certified copies of the material certificates shall include the following:

- a. Seed. Classification, botanical name, common name, percent pure live seed, minimum percent germination and hard seed, maximum percent weed seed content, and date tested.
- b. Topsoil. Particle size, pH, organic matter content, textural class, soluble salts, chemical and mechanical analyses.
- c. pH Adjuster. Calcium carbonate equivalent and sieve analysis.
- d. Fertilizer. Chemical analysis and composition percent.
- e. Organic Material: Composition and source.
- f. Soil Conditioner: Composition and source.
- g. Mulch: Composition and source.
- h. Asphalt Adhesive: Composition.
- i. Pesticide. EPA registration number and registered uses.

SD-14 Samples

Delivered Topsoil; FIO.

Samples taken from several locations at the source.

Soil Amendments; FIO.

A 10 pound sample.

Mulch; FIO.

A 10 pound sample.

SD-18 Records

Quantity Check; FIO.

Bag count or bulk weight measurements of material used compared with area covered to determine the application rate and quantity installed.

Seed Establishment Period; FIO.

Calendar time period for the seed establishment period. When there is more than one seed establishment period, the boundaries of the seeded area covered for each period shall be described.

Maintenance Record; FIO.

Maintenance work performed, area repaired or reinstalled, diagnosis for unsatisfactory stand of grass plants.

Application of Pesticide; FIO.

Pesticide treatment plan with sequence of treatment work with dates and times. The pesticide trade name, EPA registration number, chemical composition, formulation, concentration of original and diluted material, application rate of active ingredients, method of application, area treated, amount applied; and the name and state license number of the state certified applicator shall be included.

1.3 SOURCE INSPECTION

The source of delivered topsoil shall be subject to inspection.

1.4 DELIVERY, INSPECTION, STORAGE, AND HANDLING

1.4.1 Delivery

A delivery schedule shall be provided at least 10 calendar days prior to the first day of delivery.

1.4.1.1 Delivered Topsoil

Prior to the delivery of any topsoil, its availability shall be verified in paragraph TOPSOIL. A soil test shall be provided for topsoil delivered to the site.

1.4.1.2 Soil Amendments

Soil amendments shall be delivered to the site in the original, unopened containers bearing the manufacturer's chemical analysis. In lieu of containers, soil amendments may be furnished in bulk. A chemical analysis shall be provided for bulk deliveries.

1.4.1.3 Pesticides

Pesticide material shall be delivered to the site in the original, unopened containers bearing legible labels indicating the EPA registration number and the manufacturer's registered uses.

1.4.2 Inspection

Seed shall be inspected upon arrival at the job site for conformity to species and quality. Seed that is wet, moldy, or bears a test date five months or older, shall be rejected. Other materials shall be inspected for compliance with specified requirements. The following shall be rejected: open soil amendment containers or wet soil amendments; topsoil that contains slag, cinders, stones, lumps of soil, sticks, roots, trash or other material over a minimum 1-1/2 inch diameter; and topsoil that contains viable plants and plant parts. Unacceptable materials shall be removed from the job site.

1.4.3 Storage

Materials shall be stored in designated areas. Seed, and fertilizer shall be stored in cool, dry locations away from contaminants. Chemical treatment material shall be stored according to manufacturer's instructions and not with seeding operation materials.

1.4.4 Handling

Except for bulk deliveries, materials shall not be dropped or dumped from vehicles.

1.4.5 Time Limitation

Hydroseeding time limitation for holding seed in the slurry shall be a maximum 24 hours.

2 PRODUCTS

2.1 SEED

2.1.1 Seed Classification

State-approved seed of the latest season's crop shall be provided in original sealed packages bearing the producer's guaranteed analysis for percentages of mixture, purity, germination, hard seed, weed seed content,

and inert material. Labels shall be in conformance with AMS-01 and applicable state seed laws.

2.1.2 Permanent Seed Species and Mixtures

Permanent seed species and mixtures shall be proportioned by weight as follows:

| Botanical Name | Common Name | Mixture Percent by Weight | Percent Pure Live Seed |
|---------------------|---------------------|---------------------------|------------------------|
| LAWN SEED | | | |
| Cynodon Dactylon | Common Bermudagrass | 97% | 85% |
| FIELD SEED | | | |
| Buchloe Dactyloides | Buffalograss | 85% | 70% |

2.1.3 Temporary Seed Species

Temporary seed species for surface erosion control or overseeding shall be as follows:

| Botanical Name | Common Name | Percent Pure Live Seed |
|----------------|--------------------|------------------------|
| Lolium perenne | Perennial Ryegrass | 90% |

2.1.4 Quality

Weed seed shall be a maximum 1 percent by weight of the total mixture.

2.1.5 Seed Mixing

The mixing of seed may be done by the seed supplier prior to delivery, or on site as directed.

2.1.6 Substitutions

Substitutions will not be allowed without written request and approval from the Contracting Officer.

2.2 TOPSOIL

Topsoil shall be as defined in ASTM D 5268. Topsoil shall be delivered and amended as recommended by the soil test for the seed specified. Topsoil shall be free from slag, cinders, stones, lumps of soil, sticks, roots, trash or other material over a minimum 1-1/2 inch diameter. Topsoil shall be free from viable plants and plant parts.

2.3 SOIL AMENDMENTS

Soil amendments shall consist of pH adjuster, fertilizer, organic material and soil conditioners meeting the following requirements. Vermiculite shall not be used.

2.3.1 pH Adjuster

The pH adjuster shall be an agricultural liming material in accordance with ASTM C 602. These materials may be burnt lime, hydrated lime, ground limestone, sulfur, or shells. The pH adjuster shall be used to create a favorable soil pH for the plant material specified.

2.3.2 Fertilizer

Nutrients ratio shall be as recommended by the soil test. Fertilizer shall be controlled release commercial grade, free flowing, uniform in composition, and consist of a nitrogen-phosphorus-potassium ratio. The fertilizer shall be derived from sulphur coated urea, urea formaldehyde, plastic or polymer coated pills, or isobutylenediurea (IBDU). Fertilizer shall be balanced with the inclusion of trace minerals and micro-nutrients.

2.3.3 Nitrogen Carrier Fertilizer

It shall be as recommended by the soil test. Nitrogen carrier fertilizer shall be commercial grade, free flowing, and uniform in composition. The fertilizer may be a liquid nitrogen solution.

2.3.4 Organic Material

Organic material shall consist of either bonemeal, rotted manure, decomposed wood derivatives, recycled compost, or worm castings.

2.3.4.1 Bonemeal

Bonemeal shall be finely ground, steamed bone product containing from 2 to 4 percent nitrogen and 16 to 40 percent phosphoric acid.

2.3.4.2 Rotted Manure

Rotted manure shall be unleached horse, chicken or cattle manure containing a maximum 25 percent by volume of straw, sawdust, or other bedding materials. It shall contain no chemicals or ingredients harmful to plants. The manure shall be heat treated to kill weed seeds and be free of stones, sticks, and soil.

2.3.4.3 Decomposed Wood Derivatives

Decomposed wood derivatives shall be ground bark, sawdust, yard trimmings, or other wood waste material that is free of stones, sticks, soil, and toxic substances harmful to plants, and is fully composted or stabilized with nitrogen.

2.3.4.4 Recycled Compost

Compost shall be a well decomposed, stable, weed free organic matter source. Compost shall be derived from food; agricultural or industrial residuals;

biosolids (treated sewage sludge); yard trimmings; or source-separated or mixed solid waste. The compost shall possess no objectionable odors and shall not resemble the raw material from which it was derived. The material shall not contain substances toxic to plants. Gradation: The compost material shall pass through a 3/8 inch screen, possess a pH of 5.5 to 8.0, and have a moisture content between 35-55 percent by weight. The material shall not contain more than 1 percent by weight of man-made foreign matter. Compost shall be cleaned of plastic materials larger than 2 inches in length.

2.3.4.5 Worm Castings

Worm castings shall be screened from worms and food source, and shall be commercially packaged.

2.3.5 Soil Conditioner

Soil conditioner shall be sand, super absorbent polymers, calcined clay, or gypsum for use singly or in combination to meet the requirements of the soil test.

2.3.5.1 Sand

Sand shall be clean and free of toxic materials. Gradation: A minimum 95 percent by weight shall pass a No. 10 sieve and a minimum 10 percent by weight shall pass a No. 16 sieve. Greensand shall be balanced with the inclusion of trace minerals and nutrients.

2.3.5.2 Super Absorbent Polymers

To improve water retention in soils, super absorbent polymers shall be sized and applied according to the manufacturer's recommendations. Polymers shall be added as a soil amendment and be cross-linked polyacrylamide, with an absorption capacity of 250-400 times its weight. Polymers shall also be added to the seed and be a starch grafted polyacrylonitrile, with graphite added as a tacky sticker. It shall have an absorption capacity of 100 plus times its weight.

2.3.5.3 Calcined Clay

Calcined clay shall be granular particles produced from montmorillonite clay calcined to a minimum temperature of 1200 degrees F. Gradation: A minimum 90 percent shall pass a No. 8 sieve; a minimum 99 percent shall be retained on a No. 60 sieve; and a maximum 2 percent shall pass a No. 100 sieve. Bulk density: A maximum 40 pounds per cubic foot.

2.3.5.4 Gypsum

Gypsum shall be commercially packaged, free flowing, and a minimum 95 percent calcium sulfate by volume.

2.3.5.5 Expanded Shale, Clay, or Slate (ESCS)

Rotary kiln produced ESCS material shall be in conformance with [ASTM D 5883](#).

2.4 MULCH

Mulch shall be free from weeds, mold, and other deleterious materials. Mulch materials shall be native to the region.

2.4.1 Straw

Straw shall be stalks from oats, wheat, rye, barley, or rice, furnished in air-dry condition and with a consistency for placing with commercial mulch-blowing equipment.

2.4.2 Hay

Hay shall be native hay, sudan-grass hay, broomsedge hay, or other herbaceous mowings, furnished in an air-dry condition suitable for placing with commercial mulch-blowing equipment.

2.4.3 Wood Cellulose Fiber

Wood cellulose fiber shall not contain any growth or germination-inhibiting factors and shall be dyed an appropriate color to facilitate placement during application. Composition on air-dry weight basis: 9 to 15 percent moisture, pH range from 4.5 to 6.0.

2.4.4 Paper Fiber

Paper fiber mulch shall be recycled news print that is shredded for the purpose of mulching seed.

2.5 ASPHALT ADHESIVE

Asphalt adhesive shall conform to the following: Emulsified asphalt, conforming to ASTM D 977, Grade SS-1; and cutback asphalt, conforming to ASTM D 2028, Designation RC-70.

2.6 WATER

Water shall be the responsibility of the Contractor, unless otherwise noted. Water shall not contain elements toxic to plant life.

2.7 PESTICIDE

Pesticide shall be insecticide, herbicide, fungicide, nematocide, rodenticide or miticide. For the purpose of this specification, a soil fumigant shall have the same requirements as a pesticide. The pesticide material shall be EPA registered and approved.

2.8 SURFACE EROSION CONTROL MATERIAL

Surface erosion control material shall conform to the following:

2.8.1 Surface Erosion Control Blanket

Blanket shall be machine produced mat of wood excelsior formed from a web of interlocking wood fibers; covered on one side with either knitted straw blanket-like mat construction; covered with biodegradable plastic mesh; or

interwoven biodegradable thread, plastic netting, or twisted kraft paper cord netting.

2.8.2 Surface Erosion Control Fabric

Fabric shall be knitted construction of polypropylene yarn with uniform mesh openings 3/4 to 1 inch square with strips of biodegradable paper. Filler paper strips shall have a minimum life of 6 months.

2.8.3 Surface Erosion Control Net

Net shall be heavy, twisted jute mesh, weighing approximately 1.22 pounds per linear yard and 4 feet wide with mesh openings of approximately 1 inch square.

2.8.4 Surface Erosion Control Chemicals

Chemicals shall be high-polymer synthetic resin or cold-water emulsion of selected petroleum resins.

2.8.5 Hydrophilic Colloids

Hydrophilic colloids shall be physiologically harmless to plant and animal life without phytotoxic agents. Colloids shall be naturally occurring, silicate powder based, and shall form a water insoluble membrane after curing. Colloids shall resist mold growth.

2.8.6 Erosion Control Material Anchors

Erosion control anchors shall be as recommended by the manufacturer.

3 EXECUTION

3.1 INSTALLING SEED TIME AND CONDITIONS

3.1.1 Seeding Time

Seed shall be installed from June 1 to July 15 for summer establishment.

3.1.2 Seeding Conditions

Seeding operations shall be performed only during periods when beneficial results can be obtained. When drought, excessive moisture, or other unsatisfactory conditions prevail, the work shall be stopped when directed. When special conditions warrant a variance to the seeding operations, proposed alternate times shall be submitted for approval.

3.1.3 Equipment Calibration

Immediately prior to the commencement of seeding operations, calibration tests shall be conducted on the equipment to be used. These tests shall confirm that the equipment is operating within the manufacturer's specifications and will meet the specified criteria. The equipment shall be calibrated a minimum of once every day during the operation. The calibration test results shall be provided within 1 week of testing.

3.1.4 Soil Test

Delivered topsoil, existing soil in smooth graded areas, and stockpiled topsoil shall be tested in accordance with ASTM D 5268 and ASTM D 4972 for determining the particle size, pH, organic matter content, textural class, chemical analysis, soluble salts analysis, and mechanical analysis. Sample collection on site shall be random over the entire site. Sample collection for stockpiled topsoil shall be at different levels in the stockpile. The soil shall be free from debris, noxious weeds, toxic substances, or other materials harmful to plant growth. The test shall determine the quantities and type of soil amendments required to meet local growing conditions for the seed species specified.

3.2 SITE PREPARATION

3.2.1 Finished Grade and Topsoil

Prior to the commencement of the seeding operation, the surface of all seeded areas shall be finished to a smooth and compact surface in accordance with the lines, grades, and cross sections or elevations shown. The surface of seeded areas shall be finished to a smoothness suitable for the application of seeding materials. The degree of finish for seeded areas shall be within 0.1 foot of the grades and elevations indicated.

3.2.2 Application of Soil Amendments

3.2.2.1 Applying pH Adjuster

The pH adjuster shall be applied as recommended by the soil test. The pH adjuster shall be incorporated into the soil to a maximum 4 inch depth or may be incorporated as part of the tillage operation.

3.2.2.2 Applying Fertilizer

The fertilizer shall be applied as recommended by the soil test. Fertilizer shall be incorporated into the soil to a maximum 4 inch depth or may be incorporated as part of the tillage or hydroseeding operation.

3.2.2.3 Applying Soil Conditioner

The soil conditioner shall be as recommended by the soil test. The soil conditioner shall be spread uniformly over the soil a minimum 1 inch depth and thoroughly incorporated by tillage into the soil to a maximum 4 inch depth.

3.2.2.4 Applying Super Absorbent Polymers

Polymers shall be spread uniformly over the soil as recommended by the manufacturer and thoroughly incorporated by tillage into the soil to a maximum 4 inch depth.

3.2.3 Tillage

Soil on slopes up to a maximum 3-horizontal-to-1-vertical shall be tilled to a minimum 4 inch depth. On slopes between 3-horizontal-to-1-vertical and 1-horizontal-to-1 vertical, the soil shall be tilled to a minimum 2 inch depth by scarifying with heavy rakes, or other method. Rototillers shall be used

where soil conditions and length of slope permit. On slopes 1-horizontal-to-1 vertical and steeper, no tillage is required. Drainage patterns shall be maintained as indicated on drawings. Areas compacted by construction operations shall be completely pulverized by tillage. Soil used for repair of surface erosion or grade deficiencies shall conform to topsoil requirements. The pH adjuster, fertilizer, and soil conditioner may be applied during this procedure.

3.2.4 Prepared Surface

3.2.4.1 Preparation

The prepared surface shall be a maximum 1 inch below the adjoining grade of any surfaced area. New surfaces shall be blended to existing areas. The prepared surface shall be completed with a light raking to remove debris.

3.2.4.2 Lawn Area Debris

Debris and stones over a minimum 5/8 inch in any dimension shall be removed from the surface.

3.2.4.3 Field Area Debris

Debris and stones over a minimum 3 inch in any dimension shall be removed from the surface.

3.2.4.4 Protection

Areas with the prepared surface shall be protected from compaction or damage by vehicular or pedestrian traffic and surface erosion.

3.3 INSTALLATION

Prior to installing seed, any previously prepared surface compacted or damaged shall be reworked to meet the requirements of paragraph SITE PREPARATION. Seeding operations shall not take place when the wind velocity will prevent uniform seed distribution.

3.3.1 Installing Seed

Seeding method shall be Broadcast Seeding, Drill Seeding or Hydroseeding. Seeding procedure shall ensure even coverage. Gravity feed applicators, which drop seed directly from a hopper onto the prepared soil, shall not be used because of the difficulty in achieving even coverage, unless otherwise approved. Absorbent polymer powder shall be mixed with the dry seed at the rate recommended by the manufacturer.

3.3.1.1 Broadcast Seeding

Seed shall be uniformly broadcast at the rate of 2.5 pounds per 1000 square feet using broadcast seeders. Half the total rate of seed application shall be broadcast in 1 direction, with the remainder of the seed rate broadcast at 90 degrees from the first direction. Seed shall be covered a maximum 1/4 inch depth by disk harrow, steel mat drag, cultipacker, or other approved device.

3.3.1.2 Drill Seeding

Seed shall be uniformly drilled to a maximum 1/2 inch depth and at the rate of 2.5 pounds per 1000 square feet, using equipment having drills a maximum 7 inches distance apart. Row markers shall be used with the drill seeder. Half the total rate of seed application shall be drilled in 1 direction, with the remainder of the seed rate drilled at 90 degrees from the first direction. The drilling equipment shall be maintained with half full seed boxes during the seeding operations.

3.3.1.3 Rolling

The entire area shall be firmed with a roller not exceeding 90 pounds per foot roller width. Slopes over a maximum 3-horizontal-to-1 vertical shall not be rolled. Areas seeded with seed drills equipped with rollers shall not be rolled.

3.3.2 Hydroseeding

Seed shall be mixed to ensure broadcast at the rate of 2.5 pounds per 1000 square feet. Seed and fertilizer shall be added to water and thoroughly mixed to meet the rates specified. The time period for the seed to be held in the slurry shall be a maximum 24 hours. [Wood cellulose fiber mulch and tackifier shall be added at the rates recommended by the manufacturer after the seed, fertilizer, and water have been thoroughly mixed to produce a homogeneous slurry.] Slurry shall be uniformly applied under pressure over the entire area. The hydroseeded area shall not be rolled.

3.3.3 Mulching

3.3.3.1 Hay or Straw Mulch

Hay or straw mulch shall be spread uniformly at the rate of 2 tons per acre. Mulch shall be spread by hand, blower-type mulch spreader, or other approved method. Mulching shall be started on the windward side of relatively flat areas or on the upper part of steep slopes, and continued uniformly until the area is covered. The mulch shall not be bunched or clumped. Sunlight shall not be completely excluded from penetrating to the ground surface. All areas installed with seed shall be mulched on the same day as the seeding. Mulch shall be anchored immediately following spreading.

3.3.3.2 Mechanical Anchor

Mechanical anchor shall be a V-type-wheel land packer; a scalloped-disk land packer designed to force mulch into the soil surface; or other suitable equipment.

3.3.3.3 Asphalt Adhesive Tackifier

Asphalt adhesive tackifier shall be sprayed at a rate between 10 to 13 gallons per 1000 square feet. Sunlight shall not be completely excluded from penetrating to the ground surface.

3.3.3.4 Non-Asphaltic Tackifier

Hydrophilic colloid shall be applied at the rate recommended by the manufacturer, using hydraulic equipment suitable for thoroughly mixing with water. A uniform mixture shall be applied over the area.

3.3.3.5 Asphalt Adhesive Coated Mulch

Hay or straw mulch may be spread simultaneously with asphalt adhesive applied at a rate between 10 to 13 gallons per 1000 square feet, using power mulch equipment which shall be equipped with suitable asphalt pump and nozzle. The adhesive-coated mulch shall be applied evenly over the surface. Sunlight shall not be completely excluded from penetrating to the ground surface.

3.3.3.6 Wood Cellulose Fiber, Paper Fiber, and Recycled Paper

Wood cellulose fiber, paper fiber, or recycled paper shall be applied as part of the hydroseeding operation. The mulch shall be mixed and applied in accordance with the manufacturer's recommendations.

3.3.4 Watering Seed

Watering shall be started immediately after completing the seeding of an area. Water shall be applied to supplement rainfall at a rate sufficient to ensure moist soil conditions to a minimum 1 inch depth. Run-off and puddling shall be prevented. Watering trucks shall not be driven over turf areas, unless otherwise directed. Watering of other adjacent areas or plant material shall be prevented.

3.4 SURFACE EROSION CONTROL

3.4.1 Surface Erosion Control Material

Where indicated or as directed, surface erosion control material shall be installed in accordance with manufacturer's instructions. Placement of the material shall be accomplished without damage to installed material or without deviation to finished grade.

3.4.2 Temporary Seeding

The application rate shall be 40.0 pounds per 1000 square yard. When directed during contract delays affecting the seeding operation or when a quick cover is required to prevent surface erosion, the areas designated shall be seeded in accordance with temporary seed species listed under Paragraph SEED.

3.4.2.1 Soil Amendments

When soil amendments have not been applied to the area, the quantity of 1/2 of the required soil amendments shall be applied and the area tilled in accordance with paragraph SITE PREPARATION. The area shall be watered in accordance with paragraph Watering Seed.

3.4.2.2 Remaining Soil Amendments

The remaining soil amendments shall be applied in accordance with the paragraph Tillage when the surface is prepared for installing seed.

3.5 QUANTITY CHECK

For materials provided in bags, the empty bags shall be retained for recording the amount used. For materials provided in bulk, the weight certificates shall be retained as a record of the amount used. The amount of material used shall be compared with the total area covered to determine the rate of application used. Differences between the quantity applied and the quantity specified shall be adjusted as directed.

3.6 APPLICATION OF PESTICIDE

When application of a pesticide becomes necessary to remove a pest or disease, a pesticide treatment plan shall be submitted and coordinated with the installation pest management program.

3.6.1 Technical Representative

The certified installation pest management coordinator shall be the technical representative, and shall be present at all meetings concerning treatment measures for pest or disease control. They may be present during treatment application.

3.6.2 Application

A state certified applicator shall apply required pesticides in accordance with EPA label restrictions and recommendations. Clothing and personal protective equipment shall be used as specified on the pesticide label. A closed system is recommended as it prevents the pesticide from coming into contact with the applicator or other persons. Water for formulating shall only come from designated locations. Filling hoses shall be fitted with a backflow preventer meeting local plumbing codes or standards. Overflow shall be prevented during the filling operation. Prior to each day of use, the equipment used for applying pesticide shall be inspected for leaks, clogging, wear, or damage. Any repairs are to be performed immediately. A pesticide plan shall be submitted.

3.7 RESTORATION AND CLEAN UP

3.7.1 Restoration

Existing turf areas, pavements, and facilities that have been damaged from the seeding operation shall be restored to original condition at Contractor's expense.

3.7.2 Clean Up

Excess and waste material shall be removed from the seeded areas and shall be disposed offsite. Adjacent paved areas shall be cleaned.

3.8 PROTECTION OF INSTALLED AREAS

Immediately upon completion of the seeding operation in an area, the area shall be protected against traffic or other use by erecting barricades and providing signage as required, or as directed. Signage shall be in accordance with Section 10430 EXTERIOR SIGNAGE.

3.9 SEED ESTABLISHMENT PERIOD

3.9.1 Commencement

The seed establishment period to obtain a healthy stand of grass plants shall begin on the first day of work under this contract and shall end 3 months after the last day of the seeding operation. Written calendar time period shall be furnished for the seed establishment period. When there is more than 1 seed establishment period, the boundaries of the seeded area covered for each period shall be described. The seed establishment period shall be coordinated with 02930 EXTERIOR PLANTING. The seed establishment period shall be modified for inclement weather, shut down periods, or for separate completion dates of areas.

3.9.2 Satisfactory Stand of Grass Plants

Grass plants shall be evaluated for species and health when the grass plants are a minimum 1 inch high.

3.9.2.1 Lawn Area

A satisfactory stand of grass plants from the seeding operation for a lawn area shall be a minimum 20 grass plants per square foot. Bare spots shall be a maximum 6 inches square. The total bare spots shall be a maximum 2 percent of the total seeded area.

3.9.2.2 Field Area

A satisfactory stand of grass plants from the seeding operation for a field area shall be a minimum 10 grass plants per square foot. The total bare spots shall not exceed 2 percent of the total seeded area.

3.9.3 Maintenance During Establishment Period

Maintenance of the seeded areas shall include eradicating weeds, insects and diseases; protecting embankments and ditches from surface erosion; maintaining erosion control materials and mulch; protecting installed areas from traffic; mowing; watering; and post-fertilization.

3.9.3.1 Mowing

- a. Lawn Areas: Lawn areas shall be mowed to a minimum 3 inch height when the turf is a maximum 4 inches high. Clippings shall be removed when the amount cut prevents sunlight from reaching the ground surface.
- b. Field Areas: Field areas shall be mowed once during the season to a minimum 3 inch height. Clippings shall be removed when the amount cut prevents sunlight from reaching the ground surface.

3.9.3.2 Post-Fertilization

The fertilizer shall be applied as recommended by the soil test. A maximum 1/2 pound per 1000 square feet of actual available nitrogen shall be provided to the grass plants. The application shall be timed prior to the advent of winter dormancy and shall be made without burning the installed grass plants.

3.9.3.3 Pesticide Treatment

Treatment for disease or pest shall be in accordance with paragraph APPLICATION OF PESTICIDE.

3.9.3.4 Repair or Reinstall

Unsatisfactory stand of grass plants and mulch shall be repaired or reinstalled, and eroded areas shall be repaired in accordance with paragraph SITE PREPARATION.

3.9.3.5 Maintenance Record

A record of each site visit shall be furnished, describing the maintenance work performed; areas repaired or reinstalled; and diagnosis for unsatisfactory stand of grass plants.

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SECTION 02930

EXTERIOR PLANTING

1 GENERAL

1.1 REFERENCES

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

AMERICAN NURSERY AND LANDSCAPE ASSOCIATION (ANLA)

ANLA ANSI/ANLA Z60.1 (1996) American Standard for Nursery Stock

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI A300 (1995) Tree Care Operations - Trees, Shrubs and other Woody Plant Maintenance

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 602 (1995a) Agricultural Liming Materials

ASTM D 4972 (1995a) pH of Soils

ASTM D 5034 (1995) Breaking Strength and Elongation of Textile Fabrics (Grab Test)

ASTM D 5035 (1995) Breaking Strength and Elongation of Textile Fabrics (Grab Test)

ASTM D 5268 (1992; R1996) Topsoil Used for Landscaping Purposes

ASTM D 5883 (1996) Standard Guide for Use of Rotary Kiln Produced Expanded Shale, Clay or Slate (ESCS) as a Mineral Amendment in Topsoil Used for Landscaping and Related Purposes

1.2 SUBMITTALS

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

SD-01 Data

Geotextile; FIO. Steel Edging; FIO. Chemical Treatment Material; FIO.

Manufacturer's literature including physical characteristics, application and installation instructions for geotextile, steel edging, and chemical treatment material.

SD-07 Schedules

Equipment; FIO.

A listing of equipment to be used for the planting operation.

SD-08 Statements

Delivery; FIO.

Delivery schedule.

Finished Grade, Topsoil and Underground Utilities; FIO.

Finished grade status; location of underground utilities and facilities; and availability of topsoil from the stripping and stock piling operation.

SD-09 Reports

Soil Test; FIO. Percolation Test; FIO.

Certified reports of inspections and laboratory tests, prepared by an independent testing agency, including analysis and interpretation of test results. Each report shall be properly identified. Test methods used and compliance with recognized test standards shall be described.

SD-13 Certificates

Plant Material; FIO. Fertilizer; FIO. Organic Material; FIO. Mycorrhizal Fungi Inoculum; FIO. Pesticide; FIO.

Prior to delivery of materials, certificates of compliance attesting that materials meet the specified requirements. Certified copies of the material certificates shall include the following.

- a. Plant Material: Classification, botanical name, common name, size, quantity by species, and location where grown.
- b. Fertilizer: Chemical analysis and composition percent.
- c. Organic Material: Composition and source.
- d. Mycorrhizal Fungi Inoculum: Plant material treated.
- e. Pesticide. EPA registration number and registered uses.

SD-14 Samples

Delivered Topsoil; N/A.

Samples taken from several locations at the source.

Soil Amendments; FIO.

A 10 pound sample.

Geotextile; FIO.

A 6 inch square sample.

SD-18 Records

Plant Establishment Period; FIO.

Calendar time period for the plant establishment period. When there is more than one establishment period, the boundaries of the planted areas covered for each period shall be described.

Maintenance Record; FIO.

Maintenance work performed, quantity of plant losses, and replacements; and diagnosis of unhealthy plant material.

Application of Pesticide; FIO.

Pesticide treatment plan with sequence of treatment work with dates and times. The pesticide trade name, EPA registration number, chemical composition, formulation, concentration of original and diluted material, application rate of active ingredients, method of application, area treated, amount applied; and the name and state license number of the state certified applicator shall be included.

SD-19 Operation and Maintenance Manuals

Maintenance Instructions; FIO.

Instruction for year-round care of installed plant material.

1.3 SOURCE INSPECTIONS

The nursery or source of plant material and the source of delivered topsoil shall be subject to inspection.

1.4 DELIVERY, INSPECTION, STORAGE, AND HANDLING

1.4.1 Delivery

A delivery schedule shall be provided at least 10 calendar days prior to the first day of delivery.

1.4.1.1 Plant Material Identification

Plant material shall be identified with attached, durable, waterproof labels and weather-resistant ink, stating the correct botanical plant name and size.

1.4.1.2 Protection During Delivery

Plant material shall be protected during delivery to prevent desiccation and damage to the branches, trunk, root system, or earth ball. Branches shall be protected by tying-in. Exposed branches shall be covered during transport.

1.4.1.3 Delivered Topsoil

Prior to the delivery of any topsoil, the availability of topsoil shall be verified in paragraph TOPSOIL. A soil test shall be provided for delivered topsoil.

1.4.1.4 Soil Amendments

Soil amendments shall be delivered to the site in the original, unopened containers bearing the manufacturer's chemical analysis. In lieu of containers, soil amendments may be furnished in bulk. A chemical analysis shall be provided for bulk deliveries.

1.4.1.5 Pesticide Material

Pesticide material shall be delivered to the site in the original, unopened containers bearing legible labels indicating the Environmental Protection Agency (EPA) registration number and the manufacturer's registered uses.

1.4.2 Inspection

Plant material shall be well shaped, vigorous and healthy with a healthy, well branched root system, free from disease, harmful insects and insect eggs, sun-scald injury, disfigurement or abrasion. Plant material shall be checked for unauthorized substitution and to establish nursery grown status. Plant material showing desiccation, abrasion, sun-scald injury, disfigurement, or unauthorized substitution shall be rejected. The plant material shall exhibit typical form of branch to height ratio; and meet the caliper and height measurements specified. Plant material that measures less than specified, or has been poled, topped off or headed back, shall be rejected. Container-grown plant material shall show new fibrous roots and the root mass shall contain its shape when removed from the container. Plant material with broken or cracked balls; or broken containers shall be rejected. Bare-root plant material that is not dormant or is showing roots were pulled from the ground shall be rejected. Other materials shall be inspected for compliance with paragraph PRODUCTS. Open soil amendment containers or wet soil amendments shall be rejected. Topsoil that contains slag, cinders, stones, lumps of soil, sticks, roots, trash or other material larger than 1-1/2 inch diameter shall be rejected. Topsoil that contains viable plant material and plant parts shall be rejected. Unacceptable material shall be removed from the job site.

1.4.3 Storage

1.4.3.1 Plant Material Storage

Plant material not installed on the day of arrival at the site shall be stored and protected in designated areas. Plant material shall not be stored longer than 30 days. Plant material shall be protected from direct exposure to wind and sun. Bare-root plant material shall be heeled-in. All plant material shall be kept in a moist condition by watering with a fine mist spray until installed.

1.4.3.2 Other Material Storage

Storage of other material shall be in designated areas. Soil amendments shall be stored in dry locations and away from contaminants. Chemical

treatment material shall be stored according to manufacturer's instructions and not with planting operation material.

1.4.4 Handling

Plant material shall not be injured in handling. Cracking or breaking the earth ball of balled and burlapped plant material shall be avoided. Plant material shall not be handled by the trunk or stems. Materials shall not be dropped from vehicles.

1.4.5 Time Limitation

Except for container-grown plant material, the time limitation from digging to installing plant material shall be a maximum 90 days. The time limitation between installing the plant material and placing the mulch shall be a maximum 24 hours.

1.5 WARRANTY

Furnished plant material shall have a warranty for plant growth to be in a vigorous growing condition for a minimum 12 month period. A minimum 12 month calendar time period for the warranty of plant growth shall be provided regardless of the contract time period. When plant material is determined to be unhealthy in accordance with paragraph PLANT ESTABLISHMENT PERIOD, it shall be replaced once under this warranty.

2 PRODUCTS

2.1 PLANT MATERIAL

2.1.1 Plant Material Classification

The plant material shall be nursery grown stock conforming to ANLA ANSI/ANLA Z60.1 and shall be the species specified.

2.1.2 Plant Schedule

The plant schedule shall provide botanical names as included in one or more of the publications listed under "Nomenclature" in ANLA ANSI/ANLA Z60.1.

2.1.3 Substitutions

Substitutions will not be permitted without written request and approval from the Contracting Officer.

2.1.4 Quality

Well shaped, well grown, vigorous plant material having healthy and well branched root systems in accordance with ANLA ANSI/ANLA Z60.1 shall be provided. Plant material shall be provided free from disease, harmful insects and insect eggs, sun-scald injury, disfigurement and abrasion. Plant material shall be free of shock or damage to branches, trunk, or root systems, which may occur from the digging and preparation for shipment, method of shipment, or shipment. Plant quality is determined by the growing conditions; method of shipment to maintain health of the root system; and growth of the trunk and crown as follows.

2.1.5 Growing Conditions

Plant material shall be native to or well-suited to the growing conditions of the project site. Plant material shall be grown under climatic conditions similar to those at the project site.

2.1.6 Method of Shipment to Maintain Health of Root System

2.1.6.1 Balled and Potted (Pot) Plant Material

Ball size and ratio shall be in accordance with ANLA ANSI/ANLA Z60.1. The ball shall be of a diameter and depth to encompass enough fibrous and feeding root system necessary for the full recovery of the plant. Removal shall be done by hand digging or mechanical devices. The plant stem or trunk shall be centered in the ball. All roots shall be clean cut at the ball surface. Roots shall not be pulled from the ground. Before shipment the root ball shall be dipped in gels containing mycorrhizal fungi inoculum. Container shall be used to retain the ball unbroken. Container shall be rigid to hold ball shape and protect root mass during shipping.

2.1.6.2 Container-Grown (C) Plant Material

Container size shall be in accordance with ANLA ANSI/ANLA Z60.1. Plant material shall be grown in a container over a duration of time for new fibrous roots to have developed and for the root mass to retain its shape and hold together when removed from the container. Container-grown plant material shall be inoculated with mycorrhizal fungi during germination in the nursery. Before shipment the root system shall be dipped in gels containing mycorrhizal fungi inoculum. The container shall be sufficiently rigid to hold ball shape and protect root mass during shipping.

2.1.7 Growth of Trunk and Crown

2.1.7.1 Deciduous Shrubs

Deciduous shrubs shall have the height and number of primary stems recommended by ANLA ANSI/ANLA Z60.1. Acceptable plant material shall be well shaped, with sufficient well-spaced side branches, and recognized by the trade as typical for the species grown in the region of the project.

2.1.7.2 Coniferous Evergreen Plant Material

Coniferous Evergreen plant material shall have the height-to-spread ratio recommended by ANLA ANSI/ANLA Z60.1. The coniferous evergreen trees shall not be "poled" or the leader removed. Acceptable plant material shall be exceptionally heavy, well shaped and trimmed to form a symmetrical and tightly knit plant. The form of growth desired shall be as indicated.

2.1.7.3 Broadleaf Evergreen Plant Material

Broadleaf evergreen plant material shall have the height-to-spread ratio recommended by ANLA ANSI/ANLA Z60.1. Acceptable plant material shall be well shaped and recognized by the trade as typical for the variety grown in the region of the project.

2.1.7.4 Ground Cover and Vine Plant Material

Ground cover and vine plant material shall have the minimum number of runners and length of runner recommended by ANLA ANSI/ANLA Z60.1. Plant material shall have heavy, well developed and balanced crown with vigorous, well developed root system and shall be furnished in containers.

2.1.8 Plant Material Size

Plant material shall be furnished in sizes indicated. Plant material larger in size than specified may be provided at no additional cost to the Government.

2.1.9 Plant Material Measurement

Plant material measurements shall be in accordance with ANLA ANSI/ANLA Z60.1.

2.2 TOPSOIL

Topsoil shall be as defined in ASTM D 5268. When available, the topsoil shall be the existing surface soil stripped and stockpiled onsite in accordance with Section 02300 EARTHWORK. When additional topsoil is required beyond the available topsoil from the stripping operation, topsoil shall be delivered and amended as recommended by the soil test for the plant material specified. Topsoil shall be free from slag, cinders, stones, lumps of soil, sticks, roots, trash or other material over a minimum 1-1/2 inch diameter. Topsoil shall be free from viable plants and plant parts.

2.3 SOIL AMENDMENTS

Soil amendments shall consist of pH adjuster, fertilizer, organic material and soil conditioners meeting the following requirements. Vermiculite is not recommended.

2.3.1 Fertilizer

It shall be as recommended by the soil test. Fertilizer shall be controlled release commercial grade; free flowing, pellet or tablet form; uniform in composition; and consist of a nitrogen-phosphorus-potassium ratio. The fertilizer shall be derived from sulphur coated urea, urea formaldehyde, plastic or polymer coated pills, or isobutylenediurea (IBDU). Fertilizer shall be balanced with the inclusion of trace minerals and micro-nutrients.

2.3.2 Organic Material

Organic material shall consist of either bonemeal, peat, rotted manure, decomposed wood derivatives, recycled compost, or worm castings.

2.3.2.1 Bonemeal

Bonemeal shall be a finely ground, steamed bone product containing from 2 to 4 percent nitrogen and 16 to 40 percent phosphoric acid.

2.3.2.2 Rotted Manure

Rotted manure shall be unleached horse, chicken, or cattle manure containing a maximum 25 percent by volume of straw, sawdust, or other bedding materials. Manure shall contain no chemicals or ingredients harmful to plants. The manure shall be heat treated to kill weed seeds and shall be free of stones, sticks, and soil.

2.3.2.3 Decomposed Wood Derivatives

Decomposed wood derivatives shall be ground bark, sawdust, or other wood waste material free of stones, sticks, and toxic substances harmful to plants, and stabilized with nitrogen.

2.3.2.4 Recycled Compost

Compost shall be a well decomposed, stable, weed free organic matter source. It shall be derived from food, agricultural, or industrial residuals; biosolids (treated sewage sludge); yard trimmings; or source-separated or mixed solid waste. The compost shall possess no objectionable odors and shall not resemble the raw material from which it was derived. The material shall not contain substances toxic to plants. Gradation: The compost material shall pass through a 3/8 inch screen, possess a pH of 5.5 to 8.0, and have a moisture content between 35-55 percent by weight. The material shall not contain more than 1 percent or less by weight of man-made foreign matter. Compost shall be cleaned of plastic materials larger than 2 inches in length.

2.3.2.5 Worm Castings

Worm castings shall be screened from worms and food source and shall be commercially packaged.

2.4 MULCH

Mulch shall be free from weeds, mold, and other deleterious materials. Mulch materials shall be native to the region. Rotted manure is not recommended to be used as a mulch because it would encourage surface rooting of the plant material and weeds.

2.4.1 Inorganic Mulch

When inorganic mulch is required for decorative purposes, it shall be provided in areas designated, and consist of:

- a. Gray Rounded Stone 3/4" to 1 1/4" inches
- b. Franklin Red Stone 3/4" to 1 1/4" inches

2.5 GEOTEXTILE WEED BARRIER & STEEL EDGING

Geotextile shall be woven or nonwoven; polypropylene, polyester, or fiberglass, mat in accordance with ASTM D 5034 or ASTM D 5035. It shall be made specifically for use as a fabric around plant material. Nominal weight shall be a minimum 4 ounces per square yard. Permeability rate shall be a minimum 0.04 inch per second. Steel edging shall be 3/16" x 4" deep x 16' to 20' long manufactured landscape edging with 8" overlap joints and punched

stake slots at 30" intervals. Nominal weight shall be 2 ¼ pounds per lineal foot. Fasteners shall be 15" long tapered steel stakes.

2.6 MYCORRHIZAL FUNGI INOCULUM

Mycorrhizal fungi inoculum shall be composed of multiple-fungus inoculum as recommended by the manufacturer for the plant material specified.

2.7 WATER

Unless otherwise directed, water shall be the responsibility of the Contractor. Water shall not contain elements toxic to plant life.

2.8 PESTICIDE

Pesticide shall be insecticide, herbicide, fungicide, nematocide, rodenticide or miticide. For the purpose of this specification a soil fumigant shall have the same requirements as a pesticide. The pesticide material shall be EPA registered and approved.

3 EXECUTION

3.1 INSTALLING PLANT MATERIAL TIME AND CONDITIONS

3.1.1 Deciduous Plant Material Time

Deciduous plant material shall be installed from Jan to Dec.

3.1.2 Evergreen Plant Material Time

Evergreen plant material shall be installed from Jan to Dec.

3.1.3 Plant Material Conditions

Planting operations shall be performed only during periods when beneficial results can be obtained. When drought, excessive moisture, frozen ground or other unsatisfactory conditions prevail, the work shall be stopped when directed. When special conditions warrant a variance to the planting operations, proposed planting times shall be submitted for approval.

3.1.4 Tests

3.1.4.1 Percolation Test

Test for percolation shall be done to determine positive drainage of plant pits and beds. A positive percolation shall consist of a minimum 1 inch per 3 hours; when a negative percolation test occurs, a shop drawing shall be submitted indicating the corrective measures.

3.1.4.2 Soil Test

Delivered topsoil, excavated plant pit soil, and stockpiled topsoil shall be tested in accordance with ASTM D 5268 and ASTM D 4972 for determining the particle size, pH, organic matter content, textural class, chemical analysis, soluble salts analysis, and mechanical analysis. Sample

collection onsite shall be random over the entire site. Sample collection for stockpiled topsoil shall be at different levels in the stockpile. The soil shall be free from debris, noxious weeds, toxic substances, or other materials harmful to plant growth. The test shall determine the quantities and type of soil amendments required to meet local growing conditions for the plant material specified.

3.2 SITE PREPARATION

3.2.1 Finished Grade, Topsoil and Underground Utilities

The Contractor shall verify that finished grades are as indicated on drawings, and that the placing of topsoil, the smooth grading, and the compaction requirements have been completed in accordance with Section 02300 EARTHWORK, prior to the commencement of the planting operation. The location of underground utilities and facilities in the area of the planting operation shall be verified. Damage to underground utilities and facilities shall be repaired at the Contractor's expense.

3.2.2 Layout

Plant material locations and bed outlines shall be staked on the project site before any excavation is made. Plant material locations may be adjusted to meet field conditions.

3.2.3 Protecting Existing Vegetation

When there are established lawns in the planting area, the turf shall be covered and/or protected during planting operations. Existing trees, shrubs, and plant beds that are to be preserved shall be barricaded along the dripline to protect them during planting operations.

3.3 EXCAVATION

3.3.1 Obstructions Below Ground

When obstructions below ground affect the work, shop drawings showing proposed adjustments to plant material location, type of plant and planting method shall be submitted for approval.

3.3.2 Turf Removal

Where the planting operation occurs in an existing lawn area, the turf shall be removed from the excavation area to a depth of 4".

3.3.3 Plant Pits

Plant pits for ball and burlapped or container plant material shall be dug to a depth equal to the height of the root ball as measured from the base of the ball to the base of the plant trunk. Plant pits for bare-root plant material shall be dug to a depth equal to the height of the root system. Plant pits shall be dug a minimum 50 percent wider than the ball or root system to allow for root expansion. The pit shall be constructed with sides sloping towards the base as a cone, to encourage well aerated soil to be available to the root system for favorable root growth. Cylindrical pits with vertical sides shall not be used.

3.4 INSTALLATION

3.4.1 Setting Plant Material

Plant material shall be set plumb and held in position until sufficient soil has been firmly placed around root system or ball. In relation to the surrounding grade, the plant material shall be set even with the grade at which it was grown.

3.4.2 Backfill Soil Mixture

The backfill soil mixture may be a mix of topsoil and soil amendments suitable for the plant material specified. When practical, the excavated soil from the plant pit that is not amended provides the best backfill and shall be used.

3.4.3 Adding Mycorrhizal Fungi Inoculum

Mycorrhizal fungi inoculum shall be added as recommended by the manufacturer for the plant material specified.

3.4.4 Backfill Procedure

Prior to backfilling, all metal, wood, synthetic products, or treated burlap devices shall be removed from the ball or root system avoiding damage to the root system. The backfill procedure shall remove air pockets from around the root system. Additional requirements are as follows.

3.4.4.1 Container-Grown and Balled and Potted Plant Material

The plant material shall be carefully removed from containers that are not biodegradable. Prior to setting the plant in the pit, a maximum 1/4 depth of the root mass, measured from the bottom, shall be spread apart to promote new root growth. For plant material in biodegradable containers the container shall be split prior to setting the plant with container. Backfill mixture shall be added to the plant pit in 6 inch layers with each layer tamped.

3.4.4.2 Earth Berm

An earth berm, consisting of backfill soil mixture, shall be formed with a minimum 4 inch height around the edge of the plant pit to aid in water retention and to provide soil for settling adjustments.

3.4.5 Plant Bed

Plant material shall be set in plant beds according to the drawings. Backfill soil mixture shall be placed on previously scarified subsoil to completely surround the root balls, and shall be brought to a smooth and even surface, blending to existing areas. Earth berms shall be provided. Polymers shall be spread uniformly over the plant bed and in the planting pit as recommended by the manufacturer and thoroughly incorporated into the soil to a maximum 4 inch depth.

3.4.6 Watering

Plant pits and plant beds shall be watered immediately after backfilling, until completely saturated.

3.5 FINISHING

3.5.1 Plant Material

Prior to placing mulch, the installed area shall be uniformly edged to provide a clear division line between the planted area and the adjacent turf area, shaped as indicated. The installed area shall be raked and smoothed while maintaining the earth berms.

3.5.2 Placing Geotextile Weed Barrier and Steel Edging

Prior to placing mulch, geotextile shall be placed as indicated in accordance with the manufacturer's recommendations. Steel edging shall be placed to the lines and curves as shown on the drawings. The lines and curves shall be smooth even and consistent, free of kinks and any irregular alignments. The top of the steel edging shall meet flush with all curbs and sidewalks. Splice and stake as indicated in accordance with the manufacturer's recommendations.

3.5.3 Placing Mulch

The placement of mulch shall occur a maximum 48 hours after planting. Mulch, used to reduce soil water loss, regulate soil temperature and prevent weed growth, shall be spread to cover the installed area with a minimum 4 inch uniform thickness. Mulch shall be kept out of the crowns of shrubs, ground cover, and vines and shall be kept off buildings, sidewalks and other facilities.

3.5.4 Pruning

Pruning shall be accomplished by trained and experienced personnel. The pruning of trees and palms shall be in accordance with ANSI A300. Only dead or broken material shall be pruned from installed plants. The typical growth habit of individual plant material shall be retained. Clean cuts shall be made flush with the parent trunk. Improper cuts, stubs, dead and broken branches shall be removed. "Headback" cuts at right angles to the line of growth will not be permitted. Trees shall not be poled or the leader removed, nor shall the leader be pruned or "topped off".

3.6 MAINTENANCE DURING PLANTING OPERATION

Installed plant material shall be maintained in a healthy growing condition. Maintenance operations shall begin immediately after each plant is installed to prevent desiccation and shall continue until the plant establishment period commences. Installed areas shall be kept free of weeds, grass, and other undesired vegetation. The maintenance includes maintaining the mulch, watering, and adjusting settling.

3.7 APPLICATION OF PESTICIDE

When application of a pesticide becomes necessary to remove a pest or disease, a pesticide treatment plan shall be submitted and coordinated with the installation pest management program.

3.7.1 Technical Representative

The certified installation pest management coordinator shall be the technical representative, and shall be present at all meetings concerning treatment measures for pest or disease control. They may be present during treatment application.

3.7.2 Application

A state certified applicator shall apply required pesticides in accordance with EPA label restrictions and recommendations. Clothing and personal protective equipment shall be used as specified on the pesticide label. A closed system is recommended as it prevents the pesticide from coming into contact with the applicator or other persons. Water for formulating shall only come from designated locations. Filling hoses shall be fitted with a backflow preventer meeting local plumbing codes or standards. Overflow shall be prevented during the filling operation. Prior to each day of use, the equipment used for applying pesticide shall be inspected for leaks, clogging, wear, or damage. Any repairs are to be performed immediately.

3.8 RESTORATION AND CLEAN UP

3.8.1 Restoration

Turf areas, pavements and facilities that have been damaged from the planting operation shall be restored to original condition at the Contractor's expense.

3.8.2 Clean Up

Excess and waste material shall be removed from the installed area and shall be disposed offsite. Adjacent paved areas shall be cleared.

3.9 PLANT ESTABLISHMENT PERIOD

3.9.1 Commencement

Upon completion of the last day of the planting operation, the plant establishment period for maintaining installed plant material in a healthy growing condition shall commence and shall be in effect for the remaining contract time period, not to exceed 12 months. Written calendar time period shall be furnished for the plant establishment period. When there is more than one plant establishment period, the boundaries of the planted area covered for each period shall be described. The plant establishment period shall be coordinated with Sections 02921 SEEDING; 02922 SODDING; and 02923 SPRIGGING. The plant establishment period shall be modified for inclement weather shut down periods, or for separate completion dates for areas.

3.9.2 Maintenance During Establishment Period

Maintenance of plant material shall include straightening plant material, straightening stakes; tightening guying material; correcting girdling; supplementing mulch; pruning dead or broken branch tips; maintaining plant

material labels; watering; eradicating weeds, insects and disease; post-fertilization; and removing and replacing unhealthy plants.

3.9.2.1 Watering Plant Material

The plant material shall be watered as necessary to prevent desiccation and to maintain an adequate supply of moisture within the root zone. An adequate supply of moisture is estimated to be the equivalent of 1 inch absorbed water per week, delivered in the form of rain or augmented by watering. Run-off, puddling and wilting shall be prevented. Unless otherwise directed, watering trucks shall not be driven over turf areas. Watering of other adjacent areas or existing plant material shall be prevented.

3.9.2.2 Weeding

Grass and weeds in the installed areas shall not be allowed to reach a maximum 3 inches height before being completely removed, including the root system.

3.9.2.3 Pesticide Treatment

Treatment for disease or pest shall be in accordance with paragraph APPLICATION OF PESTICIDE.

3.9.2.4 Post-Fertilization

The plant material shall be topdressed at least once during the period of establishment with controlled release fertilizer, reference paragraph SOIL AMENDMENTS. Apply at the rate of 2 pounds per 100 square feet of plant pit or bed area. Dry fertilizer adhering to plants shall be flushed off. The application shall be timed prior to the advent of winter dormancy.

3.9.2.5 Plant Pit Settling

When settling occurs to the backfill soil mixture, additional backfill soil shall be added to the plant pit or plant bed until the backfill level is equal to the surrounding grade. Serious settling that affects the setting of the plant in relation to the maximum depth at which it was grown requires replanting in accordance with paragraph INSTALLATION. The earth berm shall be maintained.

3.9.2.6 Maintenance Record

A record shall be furnished describing the maintenance work performed, the quantity of plant losses, diagnosis of the plant loss, and the quantity of replacements made on each site visit.

3.9.3 Unhealthy Plant Material

A tree shall be considered unhealthy or dead when the main leader has died back, or up to a maximum 25 percent of the crown has died. A shrub shall be considered unhealthy or dead when up to a maximum 25 percent of the plant has died. This condition shall be determined by scraping on a branch an area 1/16 inch square, maximum, to determine if there is a green cambium layer below the bark. The Contractor shall determine the cause for unhealthy plant material and shall provide recommendations for replacement.

Unhealthy or dead plant material shall be removed immediately and shall be replaced as soon as seasonal conditions permit.

3.9.4 Replacement Plant Material

Unless otherwise directed, plant material shall be provided for replacement in accordance with paragraph PLANT MATERIAL. Replacement plant material shall be installed in accordance with paragraph INSTALLATION, and recommendations in paragraph PLANT ESTABLISHMENT PERIOD. Plant material shall be replaced in accordance with paragraph WARRANTY. An extended plant establishment period shall not be required for replacement plant material.

3.9.5 Maintenance Instructions

Written instructions shall be furnished containing drawings and other necessary information for year-round care of the installed plant material; including, when and where maintenance should occur, and the procedures for plant material replacement,.

SECTION 06410

CUSTOM CASEWORK

1 GENERAL

1.1 REFERENCES

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

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI A208.1 (1989) Wood Particleboard

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 1036 (1991) Flat Glass

ASTM D 1037 (1991) Evaluating the Properties of Wood-Base Fiber and Particle Panel Materials

ARCHITECTURAL WOODWORK INSTITUTE (AWI)

AWI-02 (1988) Architectural Woodwork Quality Standards, Guide Specifications, and Quality Certification Program

BUILDERS HARDWARE MANUFACTURERS ASSOCIATION (BHMA)

BHMA A156.5 (1992) Auxiliary Locks and Associated Products

BHMA A156.9 (1988) Cabinet Hardware

BHMA A156.18 (1987) Materials and Finishes

HARDWOOD PLYWOOD MANUFACTURERS ASSOCIATION (HPMA)

HPMA HP-1 (1992) Interim Voluntary Standard for Hardwood and Decorative Plywood

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA LD 3 (1991) High-Pressure Decorative Laminates

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL DESCRIPTIONS:

SD-01 Data

Custom Casework; FIO.

Manufacturer's catalog data, including standard color charts.

SD-04 Drawings

Custom Casework; GA.

Drawings shall show each type of casework, counters, cabinets, and related items, and shall clearly indicate the complete layout of the cabinets and accessories, and pertinent details of construction, fabrication and attachments.

SD-06 Instructions

Custom Casework; FIO.

Manufacturer's instructions shall include assembling, installation, finishing, and maintenance instructions.

SD-14 Samples

Custom Casework; GA.

Plastic Laminate; GA.

Samples shall be submitted with the drawings. In lieu of individual samples, complete minimum size casework may be furnished as samples. Mock-up units are not acceptable. Samples shall include the following items:

- a. Door and drawer fronts - one of each type, with hardware mounted.
- b. Countertop and backsplash - one section, 4-inches wide, containing both.
- c. Plastic laminate color samples, 3 by 6 inches.

1.3 DELIVERY, HANDLING, AND STORAGE

The Contractor shall protect materials from damage during delivery, when stored, and during construction. Damaged and defective materials shall be removed and replaced with new. Cabinet work shall be constructed, or delivered and brought into the building, only after the building has dried out, following the installation of wet materials, and when there is no danger of damage to materials due to excessive moisture. Mill-fabricated cabinets and casework, scheduled to receive a stain finish, shall be delivered to the project with one coat of an approved stain-sealer of a type compatible with the final finish.

2 PRODUCTS

2.1 GENERAL REQUIREMENTS

Casework, including cabinets and counters, shall be design and shall be custom built, either at a mill or in-place in the building. Casework shall be economy grade, and unless otherwise specified, shall be built to the quality standards specified in AWI-02 for cabinets and casework. Design shall be as indicated on the drawings.

2.1.1.1 Plywood

Hardwood plywood shall meet or exceed the requirements of HPMA HP-1. Plywood shall be of specified thickness with face-veneer on both sides. Veneers shall meet or exceed the requirements of HPMA HP-1, Grade A, and be Type II bonded to the core with water-resistant adhesives. Face veneer for paint finish shall be any species, sound grade. Exposed edges shall receive factory-applied edge banding, same species as the face veneer. Plywood core shall be hardwood or softwood veneer core type. Plywood shall be prefinished, sanded, sealed, and ready for finishing.

2.1.1.2 Particleboard

Wood particleboard shall be a mat-formed particleboard conforming to ANSI A208.1, Type I (interior) medium density, Grade 1-M-2. Board shall be laminated construction, composed of large wood flakes at the core and finer wood flakes at each surface. Flakes shall be coated and bonded with urea-formaldehyde resin under heat and pressure-formed into boards. When tested in accordance with ASTM D 1037 and in addition to complying with the properties listed in ANSI A208.1, water absorption shall not exceed 15 percent in 24 hours, swelling thickness shall not exceed 6 percent in 24 hours, and maximum moisture content shall not exceed 7 percent. Wood particleboard intended for use as exposed or semi-exposed shelving or casework shall be sanded and sealed on both surfaces; exposed edges shall be trimmed with 3/4- by 3/8-inch solid poplar, birch, or oak, with tongue-and-groove joint or butt joint glued to the particleboard with water-resistant glue.

2.1.1.3 Construction

Construction shall be plumb, square, and true; accurately milled and fabricated to details with clean-cut profiles and lines. Accurately size the cabinets, counters, and casework to the indicated dimensions. Surfaces shall be flat, true, free of planer marks or other marks, and smoothly sanded. Select best wood pieces with most uniform grain and color for exposed surfaces. Where possible, conceal fastenings; where not possible, locate fastenings in inconspicuous places. Where nailing is permitted on exterior exposed faces, conceal nailheads. Do not fasten with exposed nails in hardwood. Mortise, tenon, splice, house, joint, block, nail, screw, glue, or bolt together, as approved, in manner to provide rigidity, to avoid swelling or shrinking, and to insure work to remain in place without warping, splitting, and opening of joints. Furnish and securely install cleats, nailers, strips, blocking, hangers, anchors, moldings, and the like, required to neatly and securely install cabinets, counters, and casework.

2.1.3.1 Framing

Cabinets and counters, constructed in place shall have frame fronts and solid ends, or frame construction throughout. Frame member shall be 3/4 by 1-1/2-inch kiln-dried hardwood, mortised and tenoned, dovetailed or doweled, and glued together. Top and bottom corners shall be braced with hardwood blocks that are glued with water-resistant glue and nailed in place. Continuous back panels shall be provided for all mill-fabricated counters, cabinets, shelving, and casework. Back panels shall be 1/4-inch

minimum thick hardwood plywood, sound grade, or 1/8-inch tempered hardboard when painted or concealed. Exposed or semi-exposed backs shall be hardwood plywood of the same veneer as the face of the cabinet. Bottoms of cabinets shall be minimum 3/8-inch plywood good grade and shall be braced with wood members glued in place. Cabinet ends shall be hardwood plywood. Shelves shall be minimum 1/2-inch thick plywood.

2.1.3.2 Counter and Cabinet Bases

Bases shall be constructed of 2-inch thick wood framing, members cut to fit, with toe space of the indicated height and depth. Cross rails shall be provided at cabinet ends, points of concentrated loads, and intervals not to exceed 24 inches.

2.1.3.3 Doors and Drawer Fronts

Door design shall be to match existing. Flush doors shall be hardwood plywood with matching solid hardwood edges. Lipped doors shall be hardwood plywood with lumber core. Drawer fronts shall be at least 3/4-inch thick solid wood or edge-banded hardwood plywood with veneer species to match cabinet. Finish is to match existing.

2.1.3.4 Countertops and Backsplashes

Countertops and backsplashes shall be constructed of plywood, Grade B-D or better, and covered with shop-applied plastic laminate. Countertops shall be at least 3/4-inch thick. Backsplash shall be plywood, Grade B-D or better, 3/4-inch thick. Unless otherwise indicated, backsplashes shall be not less than 3-1/2 inches high.

2.1.4 Fasteners and Adhesives

2.1.4.1 Nails

Nails shall be steel casing nails with flat countersunk cupped head and diamond point.

2.1.4.2 Adhesives

Adhesives shall be moisture-resistant. Adhesive shall also be contact type for adhering plastic laminate sheets.

2.1.4.3 Wood Screws

Wood screws shall be carbon steel or brass. Wood screws exposed to view shall be brass with an oval head with cross recess drive.

2.2 CABINET HARDWARE

Cabinet finish hardware shall conform to the types and styles of BHMA A156.9. Screws and attachments shall be finished to match the hardware item. Finishes shall be 639 for hardware items having a base metal of steel.

2.2.1 Shelf Supports

2.2.1.1 Surface-Applied Supports

Surface-applied, adjustable shelf supports shall be B24061, wrought brass, nickel plated, with 1/2-inch increment adjustment slots and with provision

for screw fastening 6 inches on vertical center.

2.2.1.2 Shelf Rests

Shelf rests shall be Type B24081, wrought brass, nickel plated. Rests shall have a minimum projection of 3/4-inch and a minimum width of 9/16-inch. Shelf rests for use in drilled holes shall be B84013, wrought steel, nickel plated with 1/4-inch diameter pin, 3/8-inch long, overall length 1-1/4 inches.

2.2.2 Cabinet Hinges

Cabinet hinges shall be wrought steel or brass, designated size and finish and shall conform to BHMA A156.9, as follows:

Concealed hinges for flush doors shall be B81501.

Semi-concealed hinges for lipped doors shall be B21381 0.050-inch wrought steel, with 2-inch high barrel, fast button tip pins, mortise jamb leaf.

2.2.3 Cabinet Catches

Cabinet catches shall be B43142, magnetic catches, aluminum case, minimum 4-pound pull.

2.2.4 Pulls

Door and drawer pulls shall be B12011, contemporary-design, cast bronze, 3-inch centers, screw attached from inside of door or drawer at handicap units only and B22131 or B42131 knob-type pulls, 1-1/2-inch diameter, brass or anodized aluminum knob and shank at all other units.

2.2.5 Drawer Slides

Drawer slides shall be B85051, ball bearing full extension drawer slides for attachment to each side of drawer. Rubber stops shall be provided at striking points.

2.3 PLASTIC LAMINATES

2.3.1 Countertops, Edges, and Backsplashes

Countertop surface, edge, and backsplash shall be covered with high-pressure plastic laminate, general-purpose type, conforming to NEMA LD 3, Type GP50.

Color, pattern, and finish shall be as indicated on the ROOM FINISH AND COLOR SCHEDULE.

2.3.2 Adhesive

Adhesives for plastic-laminate sheets shall be phenol-resorcinol and melamine conforming to FS MMM-A-181 or contact adhesive conforming to FS MMM-A-130, Type I.

2.4 SINK RIMS

Sink rims shall be corrosion resistant steel, clamping type, sized to the sink, and a standard product of a manufacturer regularly producing this type of equipment.

3 EXECUTION

3.1 GENERAL

Casework shall be installed only when temperature and humidity conditions approximate the interior conditions that will exist when the building is occupied. The relative humidity in the building at the time of installation of materials shall be within the limits recommended by the manufacturer. Casework shall be installed level, plumb, and true to line, and shall be attached to the walls or floors with concealed toggle bolts. Countertops, accessories, and hardware shall be installed as indicated. Closure and filler strips and finish moldings shall be provided as required. Make neat, close-fitting cut-outs for indicated sinks, plumbing, and other items projecting through tops. Carefully locate cut-outs for pipes so that edges of holes will be covered by escutcheons. The inner edge of sink cut-outs shall be painted with a coat of semigloss enamel paint; sink flanges shall be set in a bed of sealants. Prior to final acceptance, the Contractor shall align all doors, adjust all hardware, and leave cabinets in a clean and neat condition.

3.1.1 Counters

Conceal fastenings where practicable, fit the counter neatly, install in a rigid and substantial manner, and scribe to adjoining surfaces. Provide counter sections in the longest lengths practicable; keep joints in tops to a minimum; and where joints are necessary, provide tight hairline joints drawn up with concealed-type heavy pull-up bolts. Glue joints with water-resistant glue and, in addition, make rigid and substantial with screws, bolts, or other approved fastenings.

3.1.2 Nailing

Exposed nailing shall be countersunk finishing nails; the countersunk holes shall be filled with a matching wood filler or putty. Staples shall not be permitted in exposed cabinet or casework.

3.1.3 Finishing

Exposed wood surfaces shall be machine sanded at the mill to the specified standard and then shall receive a final sanding at the site to a smooth clean finish, free of machine or tool marks, abrasions, raised grain, or similar imperfections.

3.2 APPLICATION OF PLASTIC LAMINATE

Plastic laminate shall be a continuous sheet of the longest length practicable. Joints in the surface sheeting shall be tight and flush, and held to a practical minimum number. Adhesive for application of the plastic laminate shall be the approved product recommended by the manufacturer of the laminate. Exposed edges shall be rounded to 1/32-inch radius.

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SECTION 13280

ASBESTOS ABATEMENT

1 GENERAL

1.1 REFERENCES

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

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

- | | |
|------------|---|
| ANSI Z9.2 | (1979; R 1991) Fundamentals Governing the Design and Operation of Local Exhaust Systems |
| ANSI Z87.1 | (1989; Errata; Z87.1a) Occupational and Educational Eye and Face Protection |
| ANSI Z88.2 | (1992) Respiratory Protection |

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- | | |
|-------------|--|
| ASTM C 732 | (1995) Aging Effects of Artificial Weathering on Latex Sealants |
| ASTM D 522 | (1993a) Mandrel Bend Test of Attached Organic Coatings |
| ASTM D 1331 | (1989; R 1995) Surface and Interfacial Tension of Solutions of Surface-Active Agents |
| ASTM D 2794 | (1993) Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact) |
| ASTM D 4397 | (1996) Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications |
| ASTM E 84 | (1996a) Surface Burning Characteristics of Building Materials |
| ASTM E 96 | (1995) Water Vapor Transmission of Materials |
| ASTM E 119 | (1995a) Fire Tests of Building Construction and Materials |
| ASTM E 736 | (1992) Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members |
| ASTM E 1368 | (1997) Visual Inspection of Asbestos Abatement Projects |

CODE OF FEDERAL REGULATIONS (CFR)

- | | |
|-------------|--|
| 29 CFR 1910 | Occupational Safety and Health Standards |
|-------------|--|

| | |
|-------------|--|
| 29 CFR 1926 | Safety and Health Regulations for Construction |
| 40 CFR 61 | National Emissions Standards for Hazardous Air Pollutants |
| 40 CFR 763 | Asbestos |
| 42 CFR 84 | Approval of Respiratory Protective Devices |
| 49 CFR 107 | Hazardous Materials Program Procedures |
| 49 CFR 171 | General Information, Regulations and Definitions |
| 49 CFR 172 | Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements |
| 49 CFR 173 | Shippers - General Requirements for Shipments and Packagings |

COMPRESSED GAS ASSOCIATION (CGA)

| | |
|-----------|---|
| CGA G-7 | (1990) Compressed Air for Human Respiration |
| CGA G-7.1 | (1989) Commodity Specification for Air |

ENGINEERING MANUALS (EM)

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

ENVIRONMENTAL PROTECTION AGENCY (EPA)

| | |
|------------------|--|
| EPA 340/1-90-018 | (1990) Asbestos/NESHAP Regulated Asbestos Containing Materials Guidance |
| EPA 340/1-90-019 | (1990) Asbestos/NESHAP Adequately Wet Guidance |
| EPA 560/5-85-024 | (1985) Guidance for Controlling Asbestos-Containing Materials in Buildings |

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

| | |
|----------|--|
| NFPA 701 | (1996) Methods of Fire Test for Flame-Resistant Textiles and Films |
|----------|--|

NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH (NIOSH)

| | |
|----------------------|---|
| NIOSH Pub No. 84-100 | (1984; Supple 1985, 1987, 1988 & 1990) NIOSH Manual of Analytical Methods |
|----------------------|---|

UNDERWRITERS LABORATORIES (UL)

| | |
|--------|---|
| UL 586 | (1996) High-Efficiency, Particulate, Air Filter Units |
|--------|---|

1.2 DEFINITIONS

- a. Adequately Wet: A term defined in 40 CFR 61, Subpart M, and EPA 340/1-90-019 meaning to sufficiently mix or penetrate with liquid to prevent the release of particulate. If visible emissions are observed coming from asbestos-containing material (ACM), then that material has not been adequately wetted. However, the absence of visible emissions is not sufficient evidence of being adequately wetted.
- b. Aggressive Method: Removal or disturbance of building material by sanding, abrading, grinding, or other method that breaks, crumbles, or disintegrates intact asbestos-containing material (ACM).
- c. Amended Water: Water containing a wetting agent or surfactant with a surface tension of at least 29 dynes per square centimeter when tested in accordance with ASTM D 1331.
- d. Asbestos: Asbestos includes chrysotile, amosite, crocidolite, tremolite asbestos, anthophyllite asbestos, actinolite asbestos, and any of these minerals that have been chemically treated and/or altered.
- e. Asbestos-Containing Material (ACM): Any materials containing more than one percent asbestos.
- f. Asbestos Fiber: A particulate form of asbestos, 5 micrometers or longer, with a length-to-width ratio of at least 3 to 1.
- g. Authorized Person: Any person authorized by the Contractor and required by work duties to be present in the regulated areas.
- h. Building Inspector: Individual who inspects buildings for asbestos and has EPA Model Accreditation Plan (MAP) "Building Inspector" training; accreditation required by 40 CFR 763, Subpart E, Appendix C.
- i. Certified Industrial Hygienist (CIH): An Industrial Hygienist certified in the practice of industrial hygiene by the American Board of Industrial Hygiene.
- j. Class I Asbestos Work: Activities defined by OSHA involving the removal of thermal system insulation (TSI) and surfacing ACM.
- k. Class II Asbestos Work: Activities defined by OSHA involving the removal of ACM which is not thermal system insulation or surfacing material. This includes, but is not limited to, the removal of asbestos-containing wallboard, floor tile and sheeting, roofing and siding shingles, and construction mastic. Certain "incidental" roofing materials such as mastic, flashing and cements when they are still intact are excluded from Class II asbestos work. Removal of small amounts of these Class materials which would fit into a glovebag may be classified as a Class III job.
- l. Class III Asbestos Work: Activities defined by OSHA that involve repair and maintenance operations, where ACM, including TSI and surfacing ACM, is likely to be disturbed. Operations may include drilling, abrading, cutting a hole, cable pulling, crawling through tunnels or attics and spaces above the ceiling, where asbestos is

actively disturbed or asbestos-containing debris is actively disturbed.

- m. Class IV Asbestos Work: Maintenance and custodial construction activities during which employees contact but do not disturb ACM and activities to clean-up dust, waste and debris resulting from Class I, II, and III activities. This may include dusting surfaces where ACM waste and debris and accompanying dust exists and cleaning up loose ACM debris from TSI or surfacing ACM following construction.
- n. Clean room: An uncontaminated room having facilities for the storage of employees' street clothing and uncontaminated materials and equipment.
- o. Competent Person: In addition to the definition in 29 CFR 1926, Section .32(f), a person who is capable of identifying existing asbestos hazards as defined in 29 CFR 1926, Section .1101, selecting the appropriate control strategy, has the authority to take prompt corrective measures to eliminate them and has EPA Model Accreditation Plan (MAP) "Contractor/Supervisor" training; accreditation required by 40 CFR 763, Subpart E, Appendix C.
- p. Contractor/Supervisor: Individual who supervises asbestos abatement work and has EPA Model Accreditation Plan "Contractor/Supervisor" training; accreditation required by 40 CFR 763, Subpart E, Appendix C.
- q. Critical Barrier: One or more layers of plastic sealed over all openings into a regulated area or any other similarly placed physical barrier sufficient to prevent airborne asbestos in a regulated area from migrating to an adjacent area.
- r. Decontamination Area: An enclosed area adjacent and connected to the regulated area and consisting of an equipment room, shower area, and clean room, which is used for the decontamination of workers, materials, and equipment that are contaminated with asbestos.
- s. Demolition: The wrecking or taking out of any load-supporting structural member and any related razing, removing, or stripping of asbestos products.
- t. Disposal Bag: A 6 mil thick, leak-tight plastic bag, pre-labeled in accordance with 29 CFR 1926, Section .1101, used for transporting asbestos waste from containment to disposal site.
- u. Disturbance: Activities that disrupt the matrix of ACM, crumble or pulverize ACM, or generate visible debris from ACM. Disturbance includes cutting away small amounts of ACM, no greater than the amount which can be contained in 1 standard sized glovebag or waste bag, not larger than 60 inches in length and width in order to access a building component.
- v. Equipment Room or Area: An area adjacent to the regulated area used for the decontamination of employees and their equipment.
- w. Employee Exposure: That exposure to airborne asbestos that would occur if the employee were not using respiratory protective equipment.

- x. Fiber: A fibrous particulate, 5 micrometers or longer, with a length to width ratio of at least 3 to 1.
- y. Friable ACM: A term defined in 40 CFR 61, Subpart M and EPA 340/1-90-018 meaning any material which contains more than 1 percent asbestos, as determined using the method specified in 40 CFR 763, Subpart E, Appendix A, Section 1, Polarized Light Microscopy (PLM), that when dry, can be crumbled, pulverized, or reduced to powder by hand pressure. If the asbestos content is less than 10 percent, as determined by a method other than point counting by PLM, the asbestos content is verified by point counting using PLM.
- z. Glovebag: Not more than a 60 by 60 inch impervious plastic bag-like enclosure affixed around an asbestos-containing material, with glove-like appendages through which material and tools may be handled.
- aa. High-Efficiency Particulate Air (HEPA) Filter: A filter capable of trapping and retaining at least 99.97 percent of all mono-dispersed particles of 0.3 micrometers in diameter.
- bb. Homogeneous Area: An area of surfacing material or thermal system insulation that is uniform in color and texture.
- cc. Industrial Hygienist: A professional qualified by education, training, and experience to anticipate, recognize, evaluate, and develop controls for occupational health hazards.
- dd. Intact: ACM which has not crumbled, been pulverized, or otherwise deteriorated so that the asbestos is no longer likely to be bound with its matrix. Removal of "intact" asphaltic, resinous, cementitious products does not render the ACM non-intact simply by being separated into smaller pieces.
- ee. Model Accreditation Plan (MAP): USEPA training accreditation requirements for persons who work with asbestos as specified in 40 CFR 763, Subpart E, Appendix C.
- ff. Modification: A changed or altered procedure, material or component of a control system, which replaces a procedure, material or component of a required system.
- gg. Negative Exposure Assessment: A demonstration by the Contractor to show that employee exposure during an operation is expected to be consistently below the OSHA Permissible Exposure Limits (PELs).
- hh. NESHAP: National Emission Standards for Hazardous Air Pollutants. The USEPA NESHAP regulation for asbestos is at 40 CFR 61, Subpart M.
- ii. Nonfriable ACM: A NESHAP term defined in 40 CFR 61, Subpart M and EPA 340/1-90-018 meaning any material containing more than 1 percent asbestos, as determined using the method specified in 40 CFR 763, Subpart E, Appendix A, Section 1, Polarized Light Microscopy, that, when dry, cannot be crumbled, pulverized or reduced to powder by hand pressure.
- jj. Nonfriable ACM (Category I): A NESHAP term defined in 40 CFR 61, Subpart E and EPA 340/1-90-018 meaning asbestos-containing

packings, gaskets, resilient floor covering, and asphalt roofing products containing more than 1 percent asbestos as determined using the method specified in 40 CFR 763, Subpart F, Appendix A, Section 1, Polarized Light Microscopy.

- kk. Nonfriable ACM (Category II): A NESHAP term defined in 40 CFR 61, Subpart E and EPA 340/1-90-018 meaning any material, excluding Category I nonfriable ACM, containing more than 1 percent asbestos, as determined using the methods specified in 40 CFR 763, Subpart F, Appendix A, Section 1, Polarized Light Microscopy, that when dry, cannot be crumbled, pulverized, or reduced to powder by hand pressure.
- ll. Permissible Exposure Limits (PELs):
 - (1) PEL-Time weighted average(TWA): Concentration of asbestos not in excess of 0.1 fibers per cubic centimeter of air (f/cc) as an 8 hour time weighted average (TWA), as determined by the method prescribed in 29 CFR 1926, Section .1101, Appendix A, or the current version of NIOSH Pub No. 84-100 analytical method 7400.
 - (2) PEL-Excursion Limit: An airborne concentration of asbestos not in excess of 1.0 f/cc of air as averaged over a sampling period of 30 minutes as determined by the method prescribed in 29 CFR 1926, Section .1101, Appendix A, or the current version of NIOSH Pub No. 84-100 analytical method 7400.
- mm. Regulated Area: An OSHA term defined in 29 CFR 1926, Section .1101 meaning an area established by the Contractor to demarcate areas where Class I, II, and III asbestos work is conducted; also any adjoining area where debris and waste from such asbestos work accumulate; and an area within which airborne concentrations of asbestos exceed, or there is a reasonable possibility they may exceed, the permissible exposure limit.
- nn. Removal: All operations where ACM is taken out or stripped from structures or substrates, and includes demolition operations.
- oo. Repair: Overhauling, rebuilding, reconstructing, or reconditioning of structures or substrates, including encapsulation or other repair of ACM attached to structures or substrates. If the amount of asbestos so "disturbed" cannot be contained in 1 standard glovebag or waste bag, Class I precautions are required.
- pp. Spills/Emergency Cleanups: Cleanup of sizable amounts of asbestos waste and debris which has occurred, for example, when water damage occurs in a building, and sizable amounts of ACM are dislodged. A Competent Person evaluates the site and ACM to be handled, and based on the type, condition and extent of the dislodged material, classifies the cleanup as Class I, II, or III. Only if the material was intact and the cleanup involves mere contact of ACM, rather than disturbance, could there be a Class IV classification.
- qq. Surfacing ACM: Asbestos-containing material which contains more than 1% asbestos and is sprayed-on, troweled-on, or otherwise applied to surfaces, such as acoustical plaster on ceilings and fireproofing materials on structural members, or other materials on surfaces for acoustical, fireproofing, or other purposes.

- rr. Thermal system insulation (TSI) ACM: ACM which contains more than 1% asbestos and is applied to pipes, fittings, boilers, breeching, tanks, ducts, or other interior structural components to prevent heat loss or gain or water condensation.
- ss. Transite: A generic name for asbestos cement wallboard and pipe.
- tt. Worker: Individual (not designated as the Competent Person or a supervisor) who performs asbestos work and has completed asbestos worker training required by 29 CFR 1926, Section .1101, to include EPA Model Accreditation Plan (MAP) "Worker" training; accreditation required by 40 CFR 763, Subpart E, Appendix C, if required by the OSHA Class of work to be performed or by the state where the work is to be performed.

1.3 DESCRIPTION OF WORK

The work covered by this section includes the removal encapsulation encasement enclosure repair of asbestos-containing materials (ACM) which are encountered during demolition alteration maintenance renovation spill/emergency cleanup housekeeping activities associated with this project and describes procedures and equipment required to protect workers and occupants of the regulated area from contact with airborne asbestos fibers and ACM dust and debris. Activities include OSHA Class I through Class III work operations involving ACM. The work also includes containment, storage, transportation and disposal of the generated ACM wastes. More specific operational procedures shall be detailed in the required Accident Prevention Plan and its subcomponents, the Asbestos Hazard Abatement Plan and Activity Hazard Analyses required in paragraph SAFETY AND HEALTH PROGRAM AND PLANS.

1.3.1 Abatement Work Tasks

The specific ACM to be abated is identified on the detailed plans and project drawings. A summary of work task data elements for each individual ACM abatement work task to include the appropriate RESPONSE ACTION DETAIL SHEET (item to be abated and methods to be used) and SET-UP DETAIL SHEETS (containment techniques to include safety precautions and methods) is included in Table 1, "Individual Work Task Data Elements" at the end of this section.

1.3.2 Unexpected Discovery of Asbestos

For any previously untested building components suspected to contain asbestos and located in areas impacted by the work, the Contractor shall notify the Contracting Officer (CO) who will have the option of ordering up to [_____] bulk samples to be obtained at the Contractor's expense and delivered to a laboratory accredited under the National Institute of Standards and Technology (NIST) "National Voluntary Laboratory Accreditation Program (NVLAP)" and analyzed by PLM at no additional cost to the Government. Any additional components identified as ACM that have been approved by the Contracting Officer for removal shall be removed by the Contractor and will be paid for by an equitable adjustment to the contract price under the CONTRACT CLAUSE titled "changes". Sampling activities undertaken to determine the presence of additional ACM shall be conducted by personnel who have successfully completed the EPA Model Accreditation Plan (MAP) "Building Inspector" training course required by 40 CFR 763, Subpart E, Appendix C.

1.4 SUBMITTALS

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

SD-01 Data

Materials and Equipment; FIO.

Manufacturer's catalog data for all materials and equipment to be used in the work, including brand name, model, capacity, performance characteristics and any other pertinent information. Test results and certificates from the manufacturer of encapsulants substantiating compliance with performance requirements of this specification. Material Safety Data Sheets for all chemicals to be used onsite in the same format as implemented in the Contractor's HAZARD COMMUNICATION PROGRAM. Data shall include, but shall not be limited to, the following items:

- a. High Efficiency Filtered Air (HEPA) local exhaust equipment
- b. Vacuum cleaning equipment
- c. Pressure differential monitor for HEPA local exhaust equipment
- d. Air monitoring equipment
- e. Respirators
- f. Personal protective clothing and equipment
 - (1) Coveralls
 - (2) Underclothing
 - (3) Other work clothing
 - (4) Foot coverings
 - (5) Hard hats
 - (6) Eye protection
 - (7) Other items required and approved by Contractors Designated IH and Competent Person
- g. Glovebag
- h. Duct Tape
- i. Disposal Containers
 - (1) Disposal bags
 - (2) Fiberboard drums
 - (3) Paperboard boxes
- j. Sheet Plastic
 - (1) Polyethylene Sheet - General
 - (2) Polyethylene Sheet - Flame Resistant
 - (3) Polyethylene Sheet - Reinforced
- k. Wetting Agent
 - (1) Amended Water
 - (2) Removal encapsulant

- l. Strippable Coating
- m. Prefabricated Decontamination Unit
- n. Other items
- o. Chemical encapsulant
- p. Chemical encasement materials
- q. Material Safety Data Sheets (for all chemicals proposed)

SD-04 Drawings

Site Layout; GA.

Descriptions, detail project drawings, and site layout to include worksite containment area techniques as prescribed on applicable SET-UP DETAIL SHEETS, local exhaust ventilation system locations, decontamination and load-out units, other temporary waste storage facility, access tunnels, location of temporary utilities (electrical, water, sewer) and boundaries of each regulated area.

SD-08 Statements

Qualifications; GA.

A written report providing evidence of qualifications for personnel, facilities and equipment assigned to the work.

Training Program; FIO.

A copy of the written project site-specific training material as indicated in 29 CFR 1926, Section .1101 that will be used to train onsite employees. The training document shall be signed by the Contractor's Designated IH and Competent Person.

Medical Requirements; FIO.

Physician's written opinion.

Encapsulants; GA.

Certificates stating that encapsulants meet the applicable specified performance requirements.

SD-09 Reports

Exposure Assessment and Air Monitoring; GA.

Initial exposure assessments, negative exposure assessments, air-monitoring results and documentation.

Local Exhaust Ventilation; FIO.

Pressure differential recordings.

Licenses, Permits and Notifications; GA.

Licenses, permits, and notifications.

SD-13 Certificates

Vacuum, Filtration and Ventilation Equipment; FIO.

Manufacturer's certifications showing compliance with ANSI Z9.2 for:

- a. Vacuums.
- b. Water filtration equipment.
- c. Ventilation equipment.
- d. Other equipment required to contain airborne asbestos fibers.

SD-18 Records

Respiratory Protection Program; GA.

Records of the respirator program.

Cleanup and Disposal; GA.

Waste shipment records. Weigh bills and delivery tickets shall be furnished for information only.

1.5 QUALIFICATIONS

1.5.1 Written Qualifications and Organization Report

The Contractor shall furnish a written qualifications and organization report providing evidence of qualifications of the Contractor, Contractor's Project Supervisor, Designated Competent Person, supervisors and workers; Designated IH (person assigned to project and firm name); independent testing laboratory (including name of firm, principal, and analysts who will perform analyses); all subcontractors to be used including disposal transportation and disposal facility firms, subcontractor supervisors, subcontractor workers; and any others assigned to perform asbestos abatement and support activities. The report shall include an organization chart showing the Contractor's staff organization for this project by name and title, chain of command and reporting relationship with all subcontractors. The report shall be signed by the Contractor, the Contractor's onsite project manager, Designated Competent Person, Designated IH, designated testing laboratory and the principals of all subcontractors to be used. The Contractor shall include the following statement in the report: "By signing this report I certify that the personnel I am responsible for during the course of this project fully understand the contents of 29 CFR 1926, Section .1101, 40 CFR 61, Subpart M, and the federal, state and local requirements specified in paragraph SAFETY AND HEALTH PROGRAM AND PLANS for those asbestos abatement activities that they will be involved in."

1.5.2 Specific Requirements

The Contractor shall designate in writing, personnel meeting the following qualifications:

- a. Designated Competent Person: The name, address, telephone number, and resume of the Contractor's Designated Competent Person shall be provided. Evidence that the full-time Designated Competent Person is qualified in accordance with 29 CFR 1926, Sections .32 and

.1101, has EPA Model Accreditation Plan (MAP) "Contractor/Supervisor" training accreditation required by 40 CFR 763, Subpart E, Appendix C, and is experienced in the administration and supervision of asbestos abatement projects, including exposure assessment and monitoring, work practices, abatement methods, protective measures for personnel, setting up and inspecting asbestos abatement work areas, evaluating the integrity of containment barriers, placement and operation of local exhaust systems, ACM generated waste containment and disposal procedures, decontamination units installation and maintenance requirements, site safety and health requirements, notification of other employees onsite, etc. The duties of the Competent Person shall include the following: controlling entry to and exit from the regulated area; supervising any employee exposure monitoring required by 29 CFR 1926, Section .1101; ensuring that all employees working within a regulated area wear the appropriate personal protective equipment (PPE), are trained in the use of appropriate methods of exposure control, and use the hygiene facilities and decontamination procedures specified; and ensuring that engineering controls in use are in proper operating conditions and are functioning properly. The Designated Competent Person shall be responsible for compliance with applicable federal, state and local requirements, the Contractor's Accident Prevention Plan and Asbestos Hazard Abatement Plan. The Designated Competent Person shall provide, and the Contractor shall submit, the "Contractor/Supervisor" course completion certificate and the most recent certificate for required refresher training with the employee "Certificate of Worker Acknowledgment" required by this paragraph. The Contractor shall submit evidence that this person has a minimum of [2 years] [_____] of on-the-job asbestos abatement experience relevant to OSHA competent person requirements. The Designated Competent Person shall be onsite at all times during the conduct of this project.

- b. Project and Other Supervisors: The Contractor shall provide the name, address, telephone number, and resume of the Project Supervisor and other supervisors who have responsibility to implement the Accident Prevention Plan, including the Asbestos Hazard Abatement Plan and Activity Hazard Analyses, the authority to direct work performed under this contract and verify compliance, and have EPA Model Accreditation Plan (MAP) "Contractor/Supervisor" training accreditation required by 40 CFR 763, Subpart E, Appendix C. The Project Supervisor and other supervisors shall provide, and the Contractor shall submit, the "Contractor/Supervisor" course completion certificate and the most recent certificate for required refresher training with the employee "Certificate of Worker Acknowledgment" required by this paragraph. The Contractor shall submit evidence that the Project Supervisor has a minimum of [2 years] [_____] of on-the-job asbestos abatement experience relevant to project supervisor responsibilities and the other supervisors have a minimum of [1 year] [_____] on-the-job asbestos abatement experience commensurate with the responsibilities they will have on this project.
- c. Designated Industrial Hygienist: The Contractor shall provide the name, address, telephone number, resume and other information specified below for the Industrial Hygienist (IH) selected to prepare the Contractor's Asbestos Hazard Abatement Plan, prepare and perform training, direct air monitoring and assist the Contractor's Competent Person in implementing and ensuring that

safety and health requirements are complied with during the performance of all required work. The Designated IH shall be a person who is [board certified in the practice of industrial hygiene] [or] [board eligible (meets all education and experience requirements)] as determined and documented by the American Board of Industrial Hygiene (ABIH), has EPA Model Accreditation Plan (MAP) "Contractor/Supervisor" training accreditation required by 40 CFR 763, Subpart E, Appendix C, and has a minimum of [2 years] [_____] of comprehensive experience in planning and overseeing asbestos abatement activities. The Designated IH shall provide, and the Contractor shall submit, the "Contractor/Supervisor" course completion certificate and the most recent certificate for required refresher training with the employee "Certificate of Worker Acknowledgment" required by this paragraph. The Designated IH shall be completely independent from the Contractor according to federal, state, or local regulations; that is, shall not be a Contractor's employee or be an employee or principal of a firm in a business relationship with the Contractor negating such independent status. A copy of the Designated IH's current valid ABIH [certification] [confirmation of eligibility in writing from the ABIH] shall be included. The Designated IH shall [be onsite at all times] [visit the site at least [_____] per [month] [week]] for the duration of asbestos activities and shall be available for emergencies. In addition, the Designated IH shall prepare, and the Contractor shall submit, the name, address, telephone numbers and resumes of additional IH's and industrial hygiene technicians (IHT) who will be assisting the Designated IH in performing onsite tasks. IHs and IHTs supporting the Designated IH shall have a minimum of [2 years] [_____] of practical onsite asbestos abatement experience. The formal reporting relationship between the Designated IH and the support IHs and IHTs, the Designated Competent Person, and the Contractor shall be indicated.

- d. Asbestos Abatement Workers: Asbestos abatement workers shall meet the requirements contained in 29 CFR 1926, Section .1101, 40 CFR 61, Subpart M, and other applicable federal, state and local requirements. Worker training documentation shall be provided as required on the "Certificate of Workers Acknowledgment" in this paragraph.
- e. Worker Training and Certification of Worker Acknowledgment: Training documentation will be required for each employee who will perform OSHA Class I, Class II, Class III, or Class IV asbestos abatement operations. Such documentation shall be submitted on a Contractor generated form titled "Certificate of Workers Acknowledgment", to be completed for each employee in the same format and containing the same information as the example certificate at the end of this section. Training course completion certificates (initial and most recent update refresher) required by the information checked on the form shall be attached.
- f. Physician: The Contractor shall provide the name, medical qualifications, address, telephone number and resume of the physician who will or has performed the medical examinations and evaluations of the persons who will conduct the asbestos abatement work tasks. The physician shall be currently licensed by the state where the workers will be or have been examined, have expertise in pneumoconiosis and shall be responsible for the determination of medical surveillance protocols and for review of examination/test results performed in compliance with 29 CFR 1926, Section .1101 and

paragraph MEDICAL REQUIREMENTS. The physician shall be familiar with the site's hazards and the scope of this project.

- g. First Aid and CPR Trained Persons: The names of at least 2 persons who are currently trained in first aid and CPR by the American Red Cross or other approved agency shall be designated and shall be onsite at all times during site operations. They shall be trained in universal precautions and the use of PPE as described in the Bloodborne Pathogens Standard of 29 CFR 1910, Section .1030 and shall be included in the Contractor's Bloodborne Pathogen Program. These persons may perform other duties but shall be immediately available to render first aid when needed. A copy of each designated person's current valid First Aid and CPR certificate shall be provided.
- h. Independent Testing Laboratory: The Contractor shall provide the name, address and telephone number of the independent testing laboratory selected to perform the sample analyses and report the results. The testing laboratory shall be completely independent from the Contractor as recognized by federal, state or local regulations. Written verification of the following criteria, signed by the testing laboratory principal and the Contractor, shall be submitted:

(1) Phase contrast microscopy (PCM): The laboratory is fully equipped and proficient in conducting PCM of airborne samples using the methods specified by 29 CFR 1926, Section .1101, OSHA method ID-160, the most current version of NIOSH Pub No. 84-100 Method 7400, and NIOSH Pub No. 84-100 Method 7402, transmission electron microscopy (TEM); the laboratory is currently judged proficient (classified as acceptable) in counting airborne asbestos samples by PCM by successful participation in each of the last 4 rounds in the American Industrial Hygiene Association (AIHA) Proficiency Analytical Testing (PAT) Program; the names of the selected microscopists who will analyze airborne samples by PCM with verified documentation of their proficiency to conduct PCM analyses by being judged proficient in counting samples as current participating analysts in the AIHA PAT Program, and having successfully completed the Asbestos Sampling and Analysis course (NIOSH 582 or equivalent) with a copy of course completion certificate provided; when the PCM analysis is to be conducted onsite, documentation shall be provided certifying that the onsite analyst meets the same requirements.

(2) Polarized light microscopy (PLM): The laboratory is fully equipped and proficient in conducting PLM analyses of suspect ACM bulk samples in accordance with 40 CFR 763, Subpart E, Appendix E; the laboratory is currently accredited by NIST under the NVLAP for bulk asbestos analysis and will use analysts (names shall be provided) with demonstrated proficiency to conduct PLM to include its application to the identification and quantification of asbestos content.

(3) Transmission electron microscopy (TEM): The laboratory is [fully equipped and proficient in conducting TEM analysis of airborne samples using the mandatory method specified by 40 CFR 763, Subpart E, Appendix E; the laboratory is currently accredited by NIST under the NVLAP for airborne sample analysis of asbestos by TEM; the laboratory will use analysts (names shall be provided) that are currently evaluated as competent with demonstrated

proficiency under the NIST NVLAP for airborne sample analysis of asbestos by TEM.] [proficient in conducting analysis for low asbestos concentration, enhanced analysis of floor tiles and bulk materials where multiple layers are present, using an improved EPA test method titled, "Method for the Determination of Asbestos in Bulk Building Materials".]

(4) PCM/TEM: The laboratory is fully equipped and each analyst (name shall be provided) possesses demonstrated proficiency in conducting PCM and TEM analysis of airborne samples using NIOSH Pub No. 84-100 Method 7400 PCM and NIOSH Pub No. 84-100 Method 7402 (TEM confirmation of asbestos content of PCM results) from the same filter.

- i. Disposal Facility, Transporter: The Contractor shall provide written evidence that the landfill to be used is approved for asbestos disposal by the [USEPA] [and] [state] [and] [local] regulatory agencies. Copies of signed agreements between the Contractor (including subcontractors and transporters) and the asbestos waste disposal facility to accept and dispose of all asbestos containing waste generated during the performance of this contract shall be provided. Qualifications shall be provided for each subcontractor or transporter to be used, indicating previous experience in transport and disposal of asbestos waste to include all required state and local waste hauler requirements for asbestos. The Contractor and transporters shall meet the DOT requirements of 49 CFR 171, 49 CFR 172, and 49 CFR 173 as well as registration requirements of 49 CFR 107 and other applicable state or local requirements. The disposal facility shall meet the requirements of 40 CFR 61, Sections .154 or .155, as required in 40 CFR 61, Section .150(b), and other applicable state or local requirements.

1.5.3 Federal, State or Local Citations on Previous Projects

The Contractor and all subcontractors shall submit a statement, signed by an officer of the company, containing a record of any citations issued by Federal, State or local regulatory agencies relating to asbestos activities (including projects, dates, and resolutions); a list of penalties incurred through non-compliance with asbestos project specifications, including liquidated damages, overruns in scheduled time limitations and resolutions; and situations in which an asbestos-related contract has been terminated (including projects, dates, and reasons for terminations). If there are none, a negative declaration signed by an officer of the company shall be provided.

1.6 REGULATORY REQUIREMENTS

In addition to detailed requirements of this specification, work performed under this contract shall comply with EM 385-1-1, applicable federal, state, and local laws, ordinances, criteria, rules and regulations regarding handling, storing, transporting, and disposing of asbestos waste materials. This includes, but is not limited to, OSHA standards, 29 CFR 1926, especially Section .1101, 40 CFR 61, Subpart M and 40 CFR 763. Matters of interpretation of standards shall be submitted to the appropriate administrative agency for resolution before starting work. Where the requirements of this specification, applicable laws, criteria, ordinances, regulations, and referenced documents vary, the most stringent requirements shall apply. The following state and local laws, rules and regulations regarding demolition, removal, encapsulation, construction alteration,

repair, maintenance, renovation, spill/emergency cleanup, housekeeping, handling, storing, transporting and disposing of asbestos material apply: [_____].

1.7 SAFETY AND HEALTH PROGRAM AND PLANS

The Contractor shall develop and submit a written comprehensive site-specific Accident Prevention Plan at least [30] [_____] days prior to the preconstruction conference. The Accident Prevention Plan shall address requirements of EM 385-1-1, Appendix A, covering onsite work to be performed by the Contractor and subcontractors. The Accident Prevention Plan shall incorporate an Asbestos Hazard Abatement Plan, and Activity Hazard Analyses as separate appendices into 1 site specific Accident Prevention Plan document. Any portions of the Contractor's overall Safety and Health Program that are referenced in the Accident Prevention Plan, e.g., respirator program, hazard communication program, confined space entry program, etc., shall be included as appendices to the Accident Prevention Plan. The plan shall take into consideration all the individual asbestos abatement work tasks identified in Table 1. The plan shall be prepared, signed (and sealed, including certification number if required), and dated by the Contractor's Designated IH, Competent Person, and Project Supervisor.

1.7.1 Asbestos Hazard Abatement Plan Appendix

The Asbestos Hazard Abatement Plan appendix to the Accident Prevention Plan shall include, but not be limited to, the following:

- a. The personal protective equipment to be used;
- b. The location and description of regulated areas including clean and dirty areas, access tunnels, and decontamination unit (clean room, shower room, equipment room, storage areas such as load-out unit);
- c. Initial exposure assessment in accordance with 29 CFR 1926, Section .1101;
- d. Level of supervision;
- e. Method of notification of other employers at the worksite;
- f. Abatement method to include containment and control procedures;
- g. Interface of trades involved in the construction;
- h. Sequencing of asbestos related work;
- i. Storage and disposal procedures and plan;
- j. Type of wetting agent and asbestos encapsulant to be used;
- k. Location of local exhaust equipment;
- l. Air monitoring methods (personal, environmental and clearance);
- m. Bulk sampling and analytical methods (if required);
- n. A detailed description of the method to be employed in order to control the spread of ACM wastes and airborne fiber concentrations;
- o. Fire and medical emergency response procedures;

p. The security procedures to be used for all regulated areas.

1.7.2 Activity Hazard Analyses Appendix

Activity Hazard Analyses, for each major phase of work, shall be submitted and updated during the project. The Activity Hazard Analyses format shall be in accordance with EM 385-1-1 (Figure 1-1). The analysis shall define the activities to be performed for a major phase of work, identify the sequence of work, the specific hazards anticipated, and the control measures to be implemented to eliminate or reduce each hazard to an acceptable level. Work shall not proceed on that phase until the Activity Hazard Analyses has been accepted and a preparatory meeting has been conducted by the Contractor to discuss its contents with everyone engaged in the activities, including the onsite Government representatives. The Activity Hazard Analyses shall be continuously reviewed and, when appropriate, modified to address changing site conditions or operations.

1.8 PRECONSTRUCTION CONFERENCE AND ONSITE SAFETY

The Contractor and the Contractor's Designated Competent Person, Project Supervisor, and Designated IH shall meet with the Contracting Officer prior to beginning work at a safety preconstruction conference to discuss the details of the Contractor's submitted Accident Prevention Plan to include the Asbestos Hazard Abatement Plan and Activity Hazard Analyses appendices. Deficiencies in the Accident Prevention Plan will be discussed and the Accident Prevention Plan shall be revised to correct the deficiencies and resubmitted for acceptance. Any changes required in the specification as a result of the Accident Prevention Plan shall be identified specifically in the plan to allow for free discussion and acceptance by the Contracting Officer, prior to the start of work. Onsite work shall not begin until the Accident Prevention Plan has been accepted. A copy of the written Accident Prevention Plan shall be maintained onsite. Changes and modifications to the accepted Accident Prevention Plan shall be made with the knowledge and concurrence of the Designated IH, the Project Supervisor, Designated Competent Person, and the Contracting Officer. Should any unforeseen hazard become evident during the performance of the work, the Designated IH shall bring such hazard to the attention of the Project Supervisor, Designated Competent Person, and the Contracting Officer, both verbally and in writing, for resolution as soon as possible. In the interim, all necessary action shall be taken by the Contractor to restore and maintain safe working conditions in order to safeguard onsite personnel, visitors, the public, and the environment. Once accepted by the Contracting Officer, the Accident Prevention Plan, including the Asbestos Hazard Abatement Plan and Activity Hazard Analyses will be enforced as if an addition to the contract. Disregarding the provisions of this contract or the accepted Accident Prevention Plan will be cause for stopping of work, at the discretion of the Contracting Officer, until the matter has been rectified. [_____].

1.9 SECURITY

[Twenty-four hour security guard] [Fenced and locked security area] [_____] shall be provided for each regulated area. A log book shall be kept documenting entry into and out of the regulated area. Entry into regulated areas shall only be by personnel authorized by the Contractor and the Contracting Officer. Personnel authorized to enter regulated areas shall be trained, be medically evaluated, and wear the required personal protective equipment, for the specific regulated area to be entered.

1.10 MEDICAL REQUIREMENTS

Medical requirements shall conform to 29 CFR 1926, Section .1101.

1.10.1 Medical Examinations

Before being exposed to airborne asbestos fibers, workers shall be provided with a medical examination as required by 29 CFR 1926, Section .1101 and other pertinent state or local requirements. This requirement shall have been satisfied within the last 12 months. The same medical examination shall be given on an annual basis to employees engaged in an occupation involving asbestos and within 30 calendar days before or after the termination of employment in such occupation. X-ray films of asbestos workers shall be identified to the consulting radiologist and medical record jackets shall be marked with the word "asbestos."

1.10.1.1 Information Provided to the Physician

The Contractor shall provide the following information in writing to the examining physician:

- a. A copy of 29 CFR 1926, Section .1101 and Appendices D, E, G, and I;
- b. A description of the affected employee's duties as they relate to the employee's exposure;
- c. The employee's representative exposure level or anticipated exposure level;
- d. A description of any personal protective and respiratory equipment used or to be used;
- e. Information from previous medical examinations of the affected employee that is not otherwise available to the examining physician.

1.10.1.2 Written Medical Opinion

For each worker, a written medical opinion prepared and signed by a licensed physician indicating the following:

- a. Summary of the results of the examination.
- b. The potential for an existing physiological condition that would place the employee at an increased risk of health impairment from exposure to asbestos.
- c. The ability of the individual to wear personal protective equipment, including respirators, while performing strenuous work tasks under cold and/or heat stress conditions.
- d. A statement that the employee has been informed of the results of the examination, provided with a copy of the results, informed of the increased risk of lung cancer attributable to the combined effect of smoking and asbestos exposure, and informed of any medical condition that may result from asbestos exposure.

1.10.2 Medical and Exposure Records

Complete and accurate records shall be maintained of each employee's medical examinations, medical records, and exposure data, as required by 29 CFR 1910, Section .1910.20 and 29 CFR 1926, Section .1101 for a period of [50] [_____] years after termination of employment. Records of the required medical examinations and exposure data shall be made available, for inspection and copying, to the Assistant Secretary of Labor for Occupational Safety and Health (OSHA) or authorized representatives of the employee and an employee's physician upon request of the employee or former employee. A copy of the required medical certification for each employee shall be maintained on file at the worksite for review, as requested by the Contracting Officer or the representatives.

1.11 TRAINING PROGRAM

1.11.1 General Training Requirements

The Contractor shall establish a training program as specified by EPA Model Accreditation Plan (MAP), training requirements at 40 CFR 763, Subpart E, Appendix C, the State of [_____] regulation no. [_____] , OSHA requirements at 29 CFR 1926, Section .1101(k)(9), and this specification. Contractor employees shall complete the required training for the type of work they are to perform and such training shall be documented and provided to the Contracting Officer as specified in paragraph QUALIFICATIONS.

1.11.2 Project Specific Training

Prior to commencement of work, each worker shall be instructed by the Contractor's Designated IH and Competent Person in the following project specific training:

- a. The hazards and health effects of the specific types of ACM to be abated;
- b. The content and requirements of the Contractor's Accident Prevention Plan to include the Asbestos Hazard Abatement Plan and Activity Hazard Analyses and site-specific safety and health precautions;
- c. Hazard Communication Program;
- d. Hands-on training for each asbestos abatement technique to be employed;
- e. Heat and/or cold stress monitoring specific to this project;
- f. Air monitoring program and procedures;
- g. Medical surveillance to include medical and exposure record-keeping procedures;
- h. The association of cigarette smoke and asbestos-related disease;
- i. Security procedures;
- j. Specific work practice controls and engineering controls required for each Class of work in accordance with 29 CFR 1926, Section .1101.

1.12 RESPIRATORY PROTECTION PROGRAM

The Contractor's Designated IH shall establish in writing, and implement a respiratory protection program in accordance with 29 CFR 1926, Section .1101, 29 CFR 1910, Section .134, ANSI Z88.2, CGA G-7, CGA G-7.1 and DETAIL SHEET 12. The Contractor's Designated IH shall establish minimum respiratory protection requirements based on measured or anticipated levels of airborne asbestos fiber concentrations encountered during the performance of the asbestos abatement work. The Contractor's respiratory protection program shall include, but not be limited to, the following elements:

- a. The company policy, used for the assignment of individual responsibility, accountability, and implementation of the respiratory protection program.
- b. The standard operating procedures covering the selection and use of respirators. Respiratory selection shall be determined by the hazard to which the worker is exposed.
- c. Medical evaluation of each user to verify that the worker may be assigned to an activity where respiratory protection is required.
- d. Training in the proper use and limitations of respirators.
- e. Respirator fit-testing, i.e., quantitative, qualitative and individual functional fit checks.
- f. Regular cleaning and disinfection of respirators.
- g. Routine inspection of respirators during cleaning and after each use when designated for emergency use.
- h. Storage of respirators in convenient, clean, and sanitary locations.
- i. Surveillance of regulated area conditions and degree of employee exposure (e.g., through air monitoring).
- j. Regular evaluation of the continued effectiveness of the respiratory protection program.
- k. Recognition and procedures for the resolution of special problems as they affect respirator use (e.g., no facial hair that comes between the respirator face piece and face or interferes with valve function; prescription eye wear usage; contact lenses usage; etc.).
- l. Proper training in putting on and removing respirators.

1.12.1 Respiratory Fit Testing

A qualitative or quantitative fit test conforming to 29 CFR 1926, Section 1101, Appendix C shall be conducted by the Contractor's Designated IH for each Contractor worker required to wear a respirator, and for the Contracting Officer and authorized visitors who enter a regulated area where respirators are required to be worn. A respirator fit test shall be performed for each worker wearing a negative-pressure respirator prior to initially wearing a respirator on this project and every 6 months thereafter. The qualitative fit tests may be used only for testing the fit of half-mask respirators where they are permitted to be worn, or of full-facepiece air purifying respirators where they are worn at levels at which

half-facepiece air purifying respirators are permitted. If physical changes develop that will affect the fit, a new fit test for the worker shall be performed. Functional fit checks shall be performed by employees each time a respirator is put on and in accordance with the manufacturer's recommendation.

1.12.2 Respirator Selection and Use Requirements

The Contractor shall provide respirators, and ensure that they are used as required by 29 CFR 1926, Section .1101 and in accordance with the manufacturer's recommendations. Respirators shall be jointly approved by the Mine Safety and Health Administration and the National Institute for Occupational Safety and Health (MSHA/NIOSH), or by NIOSH, under the provisions of 42 CFR 84, for use in environments containing airborne asbestos fibers. Personnel who handle ACM, enter regulated areas that require the wearing of a respirator, or who are otherwise carrying out abatement activities that require the wearing of a respirator, shall be provided with approved respirators that are fully protective of the worker at the measured or anticipated airborne asbestos concentration level to be encountered. For air-purifying respirators, the particulate filter portion of the cartridges or canister approved for use in airborne asbestos environments shall be high-efficiency particulate air (HEPA). The initial respirator selection and the decisions regarding the upgrading or downgrading of respirator type shall be made by the Contractor's Designated IH based on the measured or anticipated airborne asbestos fiber concentrations to be encountered. Recommendations made by the Contractor's Designated IH to downgrade respirator type shall be submitted in writing to the Contracting Officer. The Contractor's Designated Competent Person in consultation with the Designated IH, shall have the authority to take immediate action to upgrade or downgrade respiratory type when there is an immediate danger to the health and safety of the wearer. Respirators shall be used in the following circumstances:

- a. During all Class I asbestos jobs.
- b. During all Class II work where the ACM is not removed in a substantially intact state.
- c. During all Class II and III work which is not performed using wet methods. Respirators need not be worn during removal of ACM from sloped roofs when a negative exposure assessment has been made and ACM is removed in an intact state.
- d. During all Class II and III asbestos jobs where the Contractor does not produce a negative exposure assessment.
- e. During all Class III jobs where TSI or surfacing ACM is being disturbed.
- f. During all Class IV work performed within regulated areas where employees performing other work are required to wear respirators.
- g. During all work where employees are exposed above the PEL-TWA or PEL-Excursion Limit.
- h. In emergencies

1.12.3 Class I Work

The Contractor shall provide: (1) a tight-fitting, powered air purifying respirator equipped with high efficiency filters, or (2) a full-facepiece supplied air respirator operated in the pressure demand mode, equipped with HEPA egress cartridges, or (3) an auxiliary positive pressure self-contained breathing apparatus, for all employees within the regulated area where Class I work is being performed; provided that a negative exposure assessment has not been produced, and that the exposure level will not exceed 1 f/cc as an 8-hour time weighted average. A full-facepiece supplied air respirator, operated in the pressure demand mode, equipped with an auxiliary positive pressure self-contained breathing apparatus shall be provided under such conditions, if the exposure assessment indicates exposure levels above 1 f/cc as an 8-hour time weighted average.

1.12.4 Class II and III Work

The Contractor shall provide an air purifying respirator, other than a disposable respirator, equipped with high-efficiency filters whenever the employee performs Class II and III asbestos jobs where the Contractor does not produce a negative exposure assessment; and Class III jobs where TSI or surfacing ACM is being disturbed.

1.12.5 Sanitation

Employees who wear respirators shall be permitted to leave work areas to wash their faces and respirator facepieces whenever necessary to prevent skin irritation associated with respirator use.

1.13 HAZARD COMMUNICATION PROGRAM

A hazard communication program shall be established and implemented in accordance with 29 CFR 1926, Section .59. Material safety data sheets (MSDSs) shall be provided for all hazardous materials brought onto the worksite. One copy shall be provided to the Contracting Officer and 1 copy shall be included in the Contractor's Hazard Communication Program.

1.14 LICENSES, PERMITS AND NOTIFICATIONS

1.14.1 General Legal Requirements

Necessary licenses, permits and notifications shall be obtained in conjunction with the project's asbestos abatement, transportation and disposal actions and timely notification furnished of such actions as required by federal, state, regional, and local authorities. The [Contractor shall] [Government will] notify the [Regional Office of the USEPA] [state's environmental protection agency responsible for asbestos air emissions] [local air pollution control district/agency] [state OSHA program] [and the Contracting Officer] in writing, at least [10] [_____] days prior to the commencement of work, in accordance with 40 CFR 61, Subpart M, and state and local requirements to include the mandatory "Notification of Demolition and Renovation Record" form and other required notification documents. Notification shall be by Certified Mail, Return Receipt Requested. The Contractor shall furnish copies of the receipts to the Contracting Officer, in writing, prior to the commencement of work. Local fire department shall be notified 3 days before fire-proofing material is removed from a building and the notice shall specify whether or not the material contains asbestos. A copy of the rental company's written acknowledgment and agreement shall be provided as required by paragraph RENTAL EQUIPMENT. For licenses, permits, and notifications that the

Contractor is responsible for obtaining, the Contractor shall pay any associated fees or other costs incurred.

1.14.2 Litigation and Notification

The Contractor shall notify the Contracting Officer if any of the following occur:

- a. The Contractor or any of the subcontractors are served with notice of violation of any law, regulation, permit or license which relates to this contract;
- b. Proceedings are commenced which could lead to revocation of related permits or licenses; permits, licenses or other Government authorizations relating to this contract are revoked;
- c. Litigation is commenced which would affect this contract;
- d. The Contractor or any of the subcontractors become aware that their equipment or facilities are not in compliance or may fail to comply in the future with applicable laws or regulations.

1.15 PERSONAL PROTECTIVE EQUIPMENT

[Three] [_____] complete sets of personal protective equipment shall be made available to the Contracting Officer and authorized visitors for entry to the regulated area. Contracting Officer and authorized visitors shall be provided with training equivalent to that provided to Contractor employees in the selection, fitting, and use of the required personal protective equipment and the site safety and health requirements. Contractor workers shall be provided with personal protective clothing and equipment and the Contractor shall ensure that it is worn properly. The Contractor's Designated IH and Designated Competent Person shall select and approve all the required personal protective clothing and equipment to be used.

1.15.1 Respirators

Respirators shall be in accordance with paragraph RESPIRATORY PROTECTION PROGRAM.

1.15.2 Whole Body Protection

Personnel exposed to airborne concentrations of asbestos that exceed the PELs, or for all OSHA Classes of work for which a required negative exposure assessment is not produced, shall be provided with whole body protection and such protection shall be worn properly. The Contractor's Designated IH and Competent Person shall select and approve the whole body protection to be used. The Competent Person shall examine work suits worn by employees at least once per work shift for rips or tears that may occur during performance of work. When rips or tears are detected while an employee is working, rips and tears shall be immediately mended, or the work suit shall be immediately replaced. Disposable whole body protection shall be disposed of as asbestos contaminated waste upon exiting from the regulated area. Reusable whole body protection worn shall be either disposed of as asbestos contaminated waste upon exiting from the regulated area or be properly laundered in accordance with 29 CFR 1926, Section .1101. Whole body protection used for asbestos abatement shall not be removed from the worksite by a worker to be cleaned. Recommendations made by the Contractor's Designated IH to downgrade whole body protection shall be submitted in writing to the Contracting Officer. The Contractor's

Designated Competent Person, in consultation with the Designated IH, has the authority to take immediate action to upgrade or downgrade whole body protection when there is an immediate danger to the health and safety of the wearer.

1.15.2.1 Coveralls

[Disposable-impermeable] [Disposable-breathable] [Reusable] coveralls with a zipper front shall be provided. Sleeves shall be secured at the wrists, and foot coverings secured at the ankles. See DETAIL SHEET 13.

1.15.2.2 Underwear

Disposable underwear shall be provided. If reusable underwear are used, they shall be disposed of as asbestos contaminated waste or laundered in accordance with 29 CFR 1926, Section .1101. Asbestos abatement workers shall not remove contaminated reusable underwear worn during abatement of ACM from the site to be laundered.

1.15.2.3 Work Clothing

An additional coverall shall be provided when the abatement and control method employed does not provide for the exit from the regulated area directly into an attached decontamination unit. Cloth work clothes for wear under the protective coverall, and foot coverings, shall be provided when work is being conducted in low temperature conditions. Cloth work clothes shall be either disposed of as asbestos contaminated waste or properly laundered in accordance with 29 CFR 1926, Section .1101.

1.15.2.4 Gloves

Gloves shall be provided to protect the hands. Where there is the potential for hand injuries (i.e., scrapes, punctures, cuts, etc.) a suitable glove shall be provided and used.

1.15.2.5 Foot Coverings

Cloth socks shall be provided and worn next to the skin. Footwear, as required by OSHA and EM 385-1-1, that is appropriate for safety and health hazards in the area shall be worn. Rubber boots shall be used in moist or wet areas. Reusable footwear removed from the regulated area shall be thoroughly decontaminated or disposed of as ACM waste. Disposable protective foot covering shall be disposed of as ACM waste. If rubber boots are not used, disposable foot covering shall be provided.

1.15.2.6 Head Covering

Hood type [disposable] [reusable] head covering shall be provided. In addition, protective head gear (hard hats) shall be provided as required. Hard hats shall only be removed from the regulated area after being thoroughly decontaminated.

1.15.2.7 Protective Eye Wear

Eye protection provided shall be in accordance with ANSI Z87.1.

1.16 HYGIENE FACILITIES AND PRACTICES

The Contractor shall establish a decontamination area for the decontamination of employees, material and equipment. The Contractor shall

ensure that employees enter and exit the regulated area through the decontamination area.

1.16.1 Shower Facilities

Shower facilities, when provided, shall comply with 29 CFR 1910, Section .141(d)(3).

1.16.2 -Stage Decontamination Area

[A temporary negative pressure decontamination unit that is adjacent and attached in a leak-tight manner to the regulated area shall be provided as described in SET-UP DETAIL SHEET Numbers 22 and 23.] [Utilization of prefabricated units shall have prior approval of the Contracting Officer.] The decontamination unit shall have an equipment room and a clean room separated by a shower that complies with 29 CFR 1910, Section .141 (unless the Contractor can demonstrate that such facilities are not feasible). Equipment and surfaces of containers filled with ACM shall be cleaned prior to removing them from the equipment room or area. Surfaces of the equipment room shall be wet wiped 2 times after each shift. Materials used for wet wiping shall be disposed of as asbestos contaminated waste. Two separate lockers shall be provided for each asbestos worker, one in the equipment room and one in the clean room. [Hot water service may be secured from the building hot water system provided backflow protection is installed by the Contractor at the point of connection.] [Should sufficient hot water be unavailable, the Contractor shall provide a minimum 40 gal. electric water heater with minimum recovery rate of 20 gal. per hour and a temperature controller for each showerhead.] The Contractor shall provide a minimum of [2] [_____] showers. Instantaneous type in-line water heater may be incorporated at each shower head in lieu of hot water heater, upon approval by the Contracting Officer. Flow and temperature controls shall be located within the shower and shall be adjustable by the user. The wastewater pump shall be sized for 1.25 times the showerhead flow-rate at a pressure head sufficient to satisfy the filter head loss and discharge line losses. The pump shall supply a minimum 25 gpm flow with 35 ft. of pressure head. Used shower water shall be collected and filtered to remove asbestos contamination. Filters and residue shall be disposed of as asbestos contaminated material, per DETAIL SHEETS 9 and 14. Filtered water shall be discharged to the sanitary system. Wastewater filters shall be installed in series with the first stage pore size of 20 microns and the second stage pore size of 5 microns. The floor of the decontamination unit's clean room shall be kept dry and clean at all times. Water from the shower shall not be allowed to wet the floor in the clean room. Surfaces of the clean room and shower shall be wet-wiped 2 times after each shift change with a disinfectant solution. Proper housekeeping and hygiene requirements shall be maintained. Soap and towels shall be provided for showering, washing and drying. Any cloth towels provided shall be disposed of as ACM waste or shall be laundered in accordance with 29 CFR 1926, Section .1101.

1.16.3 Load-Out Unit

A temporary load-out unit that is adjacent and connected to [the regulated area] [and] [access tunnel] shall be provided as described in DETAIL SHEET Number [20] [and] [25]. Utilization of prefabricated units shall have prior approval of the Contracting Officer. The load-out unit shall be attached in a leak-tight manner to each regulated area. Surfaces of the load-out unit and access tunnel shall be adequately wet-wiped 2 times after each shift change. Materials used for wet wiping shall be disposed of as asbestos contaminated waste.

1.16.4 Single Stage Decontamination Area

A decontamination area (equipment room/area) shall be provided for Class I work involving less than 25 feet or 10 square feet of TSI or surfacing ACM, and for Class II and Class III asbestos work operations where exposures exceed the PELs or where there is no negative exposure assessment produced before the operation. The equipment room or area shall be adjacent to the regulated area for the decontamination of employees, material, and their equipment which is contaminated with asbestos. The equipment room or area shall consist of an area covered by an impermeable drop cloth on the floor or horizontal working surface. The area must be of sufficient size to accommodate cleaning of equipment and removing personal protective equipment without spreading contamination beyond the area. Surfaces of the equipment room shall be wet wiped 2 times after each shift. Materials used for wet wiping shall be disposed of as asbestos contaminated waste.

1.16.5 Decontamination Requirements for Class IV Work

The Contractor shall ensure that employees performing Class IV work within a regulated area comply with the hygiene practice required of employees performing work which has a higher classification within that regulated area, or the Contractor shall provide alternate decontamination area facilities for employees cleaning up debris and material which is TSI or surfacing ACM.

1.16.6 Decontamination Area Entry Procedures

The Contractor shall ensure that employees entering the decontamination area through the clean room or clean area:

- a. Remove street clothing in the clean room or clean area and deposit it in lockers.
- b. Put on protective clothing and respiratory protection before leaving the clean room or clean area.
- c. Pass through the equipment room to enter the regulated area.

1.16.7 Decontamination Area Exit Procedures

The Contractor shall ensure that the following procedures are followed:

- a. Before leaving the regulated area, respirators shall be worn while employees remove all gross contamination and debris from their work clothing using a HEPA vacuum.
- b. Employees shall remove their protective clothing in the equipment room and deposit the clothing in labeled impermeable bags or containers (see Detail Sheets 9 and 14) for disposal and/or laundering.
- c. Employees shall not remove their respirators in the equipment room.
- d. Employees shall shower prior to entering the clean room. If a shower has not been located between the equipment room and the clean room or the work is performed outdoors, the Contractor shall ensure that employees engaged in Class I asbestos jobs: a) Remove asbestos contamination from their work suits in the equipment room or decontamination area using a HEPA vacuum before proceeding to a shower that is not adjacent to the work area; or b) Remove their

contaminated work suits in the equipment room, without cleaning worksuits, and proceed to a shower that is not adjacent to the work area.

- e. After showering, employees shall enter the clean room before changing into street clothes.

1.16.8 Lunch Areas

The Contractor shall provide lunch areas in which the airborne concentrations of asbestos are below 0.01 f/cc.

1.16.9 Smoking

Smoking, if allowed by the Contractor, shall only be permitted in designated areas approved by the Contracting Officer.

1.17 REGULATED AREAS

All Class I, II, and III asbestos work shall be conducted within regulated areas. The regulated area shall be demarcated to minimize the number of persons within the area and to protect persons outside the area from exposure to airborne asbestos. Where critical barriers or negative pressure enclosures are used, they shall demarcate the regulated area. Access to regulated areas shall be limited to authorized persons. The Contractor shall control access to regulated areas, ensure that only authorized personnel enter, and verify that Contractor required medical surveillance, training and respiratory protection program requirements are met prior to allowing entrance.

1.18 WARNING SIGNS AND TAPE

Warning signs and tape printed [bilingually] [in English] [and] [_____] [in pictographs and graphics] shall be provided at the regulated boundaries and entrances to regulated areas. The Contractor shall ensure that all personnel working in areas contiguous to regulated areas comprehend the warning signs. Signs shall be located to allow personnel to read the signs and take the necessary protective steps required before entering the area. Warning signs, as shown and described in DETAIL SHEET 11, shall be in vertical format conforming to 29 CFR 1910 and 29 CFR 1926, Section .1101, a minimum of 20 by 14 inches, and displaying the following legend in the lower panel:

DANGER
ASBESTOS
CANCER AND LUNG DISEASE HAZARD
AUTHORIZED PERSONNEL ONLY

Spacing between lines shall be at least equal to the height of the upper of any two lines. Warning tape shall be provided as shown and described on DETAIL SHEET 11. Decontamination unit signage shall be as shown and described on DETAIL SHEET 15.

1.19 WARNING LABELS

Warning labels shall be affixed to all asbestos disposal containers used to contain asbestos materials, scrap, waste debris, and other products contaminated with asbestos. Containers with preprinted warning labels conforming to requirements are acceptable. Warning labels shall be as described in DETAIL SHEET 14, shall conform to 29 CFR 1926, Section .1101

and shall be of sufficient size to be clearly legible displaying the following legend:

DANGER
CONTAINS ASBESTOS FIBERS
AVOID CREATING DUST
CANCER AND LUNG DISEASE HAZARD

1.20 LOCAL EXHAUST VENTILATION

Local exhaust ventilation units shall conform to ANSI Z9.2 and 29 CFR 1926, Section .1101. Filters on local exhaust system equipment shall conform to ANSI Z9.2 and UL 586. Filter shall be UL labeled.

1.21 TOOLS

Vacuums shall be leak proof to the filter, equipped with HEPA filters, of sufficient capacity and necessary capture velocity at the nozzle or nozzle attachment to efficiently collect, transport and retain the ACM waste material. Power tools shall not be used to remove ACM unless the tool is equipped with effective, integral HEPA filtered exhaust ventilation capture and collection system, or has otherwise been approved for use by the Contracting Officer. Residual asbestos shall be removed from reusable tools prior to storage and reuse. Reusable tools shall be thoroughly decontaminated prior to being removed from regulated areas.

1.22 RENTAL EQUIPMENT

If rental equipment is to be used, written notification shall be provided to the rental agency, concerning the intended use of the equipment, the possibility of asbestos contamination of the equipment and the steps that will be taken to decontaminate such equipment. A written acceptance of the terms of the Contractor's notification shall be obtained from the rental agency.

1.23 AIR MONITORING EQUIPMENT

The Contractor's Designated IH shall approve air monitoring equipment to be used to collect samples. The equipment shall include, but shall not be limited to:

- a. High-volume sampling pumps that can be calibrated and operated at a constant airflow up to 16 liters per minute when equipped with a sampling train of tubing and filter cassette.
- b. Low-volume, battery powered, body-attachable, portable personal pumps that can be calibrated to a constant airflow up to approximately 3.5 liters per minute when equipped with a sampling train of tubing and filter cassette, and a self-contained rechargeable power pack capable of sustaining the calibrated flow rate for a minimum of 10 hours. The pumps shall also be equipped with an automatic flow control unit which shall maintain a constant flow, even as filter resistance increases due to accumulation of fiber and debris on the filter surface.
- c. Single use standard 25 mm diameter cassette, open face, 0.8 micron pore size, mixed cellulose ester membrane filters and cassettes with 50 mm electrically conductive extension cowl, and shrink bands, to be used with low flow pumps in accordance with 29 CFR 1926, Section .1101 for personal air sampling.

- d. Single use standard 25 mm diameter cassette, open face, 0.45 micron pore size, mixed cellulose ester membrane filters and cassettes with 50 mm electrically conductive cowl, and shrink bands, to be used with high flow pumps when conducting environmental area sampling using NIOSH Pub No. 84-100 Methods 7400 and 7402, (and the transmission electric microscopy method specified at 40 CFR 763 if required).
- e. Appropriate plastic tubing to connect the air sampling pump to the selected filter cassette.
- f. A flow calibrator capable of calibration to within plus or minus 2 percent of reading over a temperature range of minus 4 to plus 140 degrees F and traceable to a NIST primary standard.

1.24 EXPENDABLE SUPPLIES

1.24.1 Glovebag

Glovebags shall be provided as described in 29 CFR 1926, Section .1101 and SET-UP DETAIL SHEET 10. The glovebag assembly shall be 6 mil thick plastic, prefabricated and seamless at the bottom with preprinted OSHA warning label.

1.24.2 Duct Tape

Industrial grade duct tape of appropriate widths suitable for bonding sheet plastic and disposal container shall be provided.

1.24.3 Disposal Containers

Leak-tight (defined as solids, liquids, or dust that cannot escape or spill out) disposal containers shall be provided for ACM wastes as required by 29 CFR 1926 Section .1101 and DETAIL SHEETS 9A, 9B, 9C and 14.

1.24.4 Disposal Bags

Leak-tight bags, 6 mil thick, shall be provided for placement of asbestos generated waste as described in DETAIL SHEET 9A.

1.24.5 Fiberboard Drums

Fiberboard drums shall be [_____].

1.24.6 Cardboard Boxes

Heavy-duty corrugated cardboard boxes, coated with plastic or wax to retard deterioration from moisture, shall be provided as described in DETAIL SHEET 9C, if required by state and local requirements. Boxes shall fit into selected ACM disposal bags. Filled boxes shall be sealed leak-tight with duct tape.

1.24.7 Sheet Plastic

Sheet plastic shall be polyethylene of 6 mil minimum thickness and shall be provided in the largest sheet size necessary to minimize seams, as indicated on the project drawings. Film shall be [clear] [frosted] [or] [black] and conform to ASTM D 4397, except as specified below:

1.24.7.1 Flame Resistant

Where a potential for fire exists, flame-resistant sheets shall be provided. Film shall be [frosted] [or] [black] and shall conform to the requirements of NFPA 701.

1.24.7.2 Reinforced

Reinforced sheets shall be provided where high skin strength is required, such as where it constitutes the only barrier between the regulated area and the outdoor environment. The sheet stock shall consist of translucent, nylon-reinforced or woven-polyethylene thread laminated between 2 layers of polyethylene film. Film shall meet flame resistant standards of NFPA 701.

1.24.8 Amended Water

Amended water shall meet the requirements of ASTM D 1331.

1.24.9 Mastic Removing Solvent

Mastic removing solvent shall be nonflammable and shall not contain methylene chloride, glycol ether, or halogenated hydrocarbons. Solvents used onsite shall have a flash point greater than 140 degrees F.

1.24.10 Leak-tight Wrapping

Two layers of 6 mil minimum thick polyethylene sheet stock shall be used for the containment of removed asbestos-containing components or materials such as reactor vessels, large tanks, boilers, insulated pipe segments and other materials too large to be placed in disposal bags as described in DETAIL SHEET 9B. Upon placement of the ACM component or material, each layer shall be individually leak-tight sealed with duct tape.

1.24.11 Viewing Inspection Window

Where feasible, a minimum of 1 clear, 1/8 inch thick, acrylic sheet, 18 by 24 inches, shall be installed as a viewing inspection window at eye level on a wall in each containment enclosure. The windows shall be sealed leak-tight with industrial grade duct tape.

1.24.12 Wetting Agents

Removal encapsulant (a penetrating encapsulant) shall be provided when conducting removal abatement activities that require a longer removal time or are subject to rapid evaporation of amended water. The removal encapsulant shall be capable of wetting the ACM and retarding fiber release during disturbance of the ACM greater than or equal to that provided by amended water. Performance requirements for penetrating encapsulants are specified in paragraph ENCAPSULANTS.

1.24.13 Strippable Coating

Strippable coating in aerosol cans shall be used to adhere to surfaces and to be removed cleanly by stripping, at the completion of work. This work shall only be done in well ventilated areas.

1.25 MISCELLANEOUS ITEMS

A sufficient quantity of other items, such as, but not limited to: scrapers, brushes, brooms, staple guns, tarpaulins, shovels, rubber

squeegees, dust pans, other tools, scaffolding, staging, enclosed chutes, wooden ladders, lumber necessary for the construction of containments, UL approved temporary electrical equipment, material and cords, ground fault circuit interrupters, water hoses of sufficient length, fire extinguishers, first aid kits, portable toilets, logbooks, log forms, markers with indelible ink, spray paint in bright color to mark areas, project boundary fencing, etc., shall be provided.

2 PRODUCTS

2.1 ENCAPSULANTS

Encapsulants shall conform to USEPA requirements, shall contain no toxic or hazardous substances and no solvent and shall meet the following requirements:

ALL ENCAPSULANTS

| Requirement | Test Standard |
|---|------------------------------|
| Flame Spread - 25, Smoke Emission - 50 | ASTM E 84 |
| Combustion Toxicity Zero Mortality | Univ. of Pittsburgh Protocol |
| Life Expectancy, 20 yrs Accelerated Aging Test | ASTM C 732 |
| Permeability, Minimum 0.4 perms | ASTM E 96 |

Additional Requirements for Bridging Encapsulant

| Requirement | Test Standard |
|---|---------------|
| Cohesion/Adhesion Test, 50 pounds of force/foot | ASTM E 736 |
| Fire Resistance, Negligible affect on fire resistance rating over 3 hour test (Classified by UL for use over fibrous and cementitious sprayed fireproofing) | ASTM E 119 |
| Impact Resistance, Minimum 43 in-lb (Gardner Impact Test) | ASTM D 2794 |
| Flexibility, no rupture or cracking (Mandrel Bend Test) | ASTM D 522 |

Additional Requirements for Penetrating Encapsulant

| Requirement | Test Standard |
|---|---------------|
| Cohesion/Adhesion Test, 50 pounds of force/foot | ASTM E 736 |
| Fire Resistance, Negligible affect on fire resistance rating over 3 hour test (Classified by UL for use over fibrous and cementitious sprayed fireproofing) | ASTM E 119 |
| Impact Resistance, Minimum 43 in-lb (Gardner Impact Test) | ASTM D 2794 |
| Flexibility, no rupture or cracking (Mandrel Bend Test) | ASTM D 522 |

Additional Requirements for Lockdown Encapsulant

| Requirement | Test Standard |
|--|---------------|
| Fire Resistance, Negligible affect on fire resistance rating over 3 hour test (Tested with fireproofing over encapsulant applied directly to steel member) | ASTM E 119 |
| Bond Strength, 100 pounds of force/foot (Tests compatibility with cementitious and fibrous fireproofing) | ASTM E 736 |

2.2 ENCASEMENT PRODUCTS

Encasement shall consist of primary cellular polymer coat, polymer finish coat, and any other finish coat as approved by the Contracting Officer.

3 EXECUTION

3.1 GENERAL REQUIREMENTS

Asbestos abatement work tasks shall be performed as shown on the detailed plans and drawings, as summarized in paragraph DESCRIPTION OF WORK and including Table 1 and the Contractor's Accident Prevention Plan, Asbestos Hazard Abatement Plan, and the Activity Hazard Analyses. The Contractor shall use the engineering controls and work practices required in 29 CFR 1926, Section .1101(g) in all operations regardless of the levels of exposure. Personnel shall wear and utilize protective clothing and equipment as specified. The Contractor shall not permit eating, smoking, drinking, chewing or applying cosmetics in the regulated area. All hot work (burning, cutting, welding, etc.) shall be conducted under controlled conditions in conformance with 29 CFR 1926, Section .352, Fire Prevention. Personnel of other trades, not engaged in asbestos abatement activities, shall not be exposed at any time to airborne concentrations of asbestos unless all the administrative and personal protective provisions of the Contractor's Accident Prevention Plan are complied with. Power to the regulated area shall be locked-out and tagged in accordance with 29 CFR 1910, and temporary electrical service with ground fault circuit interrupters shall be provided as needed. Temporary electrical service shall be disconnected when necessary for wet removal. The Contractor shall stop abatement work in the regulated area immediately when the airborne total fiber concentration: (1) equals or exceeds 0.01 f/cc, or the pre-abatement concentration, whichever is greater, outside the regulated area; or (2) equals or exceeds 1.0 f/cc inside the regulated area. The Contractor shall correct the condition to the satisfaction of the Contracting Officer, including visual inspection and air sampling. Work shall resume only upon notification by the Contracting Officer. Corrective actions shall be documented.

3.2 PROTECTION OF ADJACENT WORK OR AREAS TO REMAIN

Asbestos abatement shall be performed without damage to or contamination of adjacent work or area. Where such work or area is damaged or contaminated, as verified by the Contracting Officer using visual inspection or sample analysis, it shall be restored to its original condition or decontaminated by the Contractor at no expense to the Government, as deemed appropriate by the Contracting Officer. This includes inadvertent spill of dirt, dust or

debris in which it is reasonable to conclude that asbestos may exist. When these spills occur, work shall stop in all effected areas immediately and the spill shall be cleaned. When satisfactory visual inspection and air sampling analysis results are obtained and have been evaluated by the Contractor's Designated IH and the Contracting Officer, work shall proceed.

3.3 OBJECTS

3.3.1 Removal of Mobile Objects

[Mobile objects, furniture, [_____] and equipment will be removed from the area of work by the Government before asbestos abatement work begins.] [DETAIL SHEET 27, contains a summary of Contractor's required handling, cleaning and storage and reinstallation of mobile objects, furniture and equipment located in each abatement area. Mobile objects and furnishings identified in DETAIL SHEET 27 [are] [are not] considered contaminated with asbestos fibers. Mobile objects and furnishings shall be precleaned using HEPA filtered vacuum followed by [wet wiping] [and] [or] [steam cleaning]. These objects shall be removed to an area or site designated on DETAIL SHEET 27 and as identified by the Contracting Officer, and stored; or other appropriate action taken as identified on DETAIL SHEET 27. Carpets, draperies, and other items which may not be suitable for onsite wet cleaning methods shall be [properly laundered in accordance with 29 CFR 1926, Section .1101] [disposed of as asbestos contaminated material].]

3.3.2 Stationary Objects

Stationary objects, furniture, [_____] and equipment as shown on DETAIL SHEET 27, shall remain in place [and shall be precleaned using HEPA vacuum followed by adequate wet wiping.] Stationary objects and furnishings shall be covered with 2 layers of polyethylene and edges sealed with duct tape.

3.3.3 Reinstallation of Mobile Objects

At the conclusion of the asbestos abatement work in each regulated area, and after meeting the final clearance requirements for each regulated area, objects previously removed shall be transferred back to the cleaned area from which they came in accordance with the storage code designation for that material as shown on DETAIL SHEET 27, and reinstalled.

3.4 BUILDING VENTILATION SYSTEM AND CRITICAL BARRIERS

Building ventilating systems supplying air into or returning air out of a regulated area shall be [shut down and isolated by lockable switch or other positive means in accordance with 29 CFR 1910, Section .147.] [isolated by airtight seals to prevent the spread of contamination throughout the system.] Air-tight critical barriers shall be installed on building ventilating openings located inside the regulated area that supply or return air from the building ventilation system or serve to exhaust air from the building. The critical barriers shall consist of [air-tight rigid covers for building ventilation supply and exhaust grills where the ventilation system is required to remain in service during abatement] [2 layers of polyethylene]. Edges to wall, ceiling and floor surfaces shall be sealed with industrial grade duct tape. Critical barriers shall be installed as shown on drawings and appended SET-UP DETAIL SHEETS.

3.5 PRECLEANING

[Surfaces shall be [cleaned by HEPA vacuum] [and] [adequately wet wiped] prior to establishment of containment.] [The following surfaces [_____] shall be [_____].]

3.6 METHODS OF COMPLIANCE

3.6.1 Mandated Practices

The Contractor shall employ proper handling procedures in accordance with 29 CFR 1926 and 40 CFR 61, Subpart M, and the specified requirements. The specific abatement techniques and items identified shall be detailed in the Contractor's Asbestos Hazard Abatement Plan including, but not limited to, details of construction materials, equipment, and handling procedures. The Contractor shall use the following engineering controls and work practices in all operations, regardless of the levels of exposure:

- a. Vacuum cleaners equipped with HEPA filters to collect debris and dust containing ACM.
- b. Wet methods or wetting agents to control employee exposures during asbestos handling, mixing, removal, cutting, application, and cleanup; except where it can be demonstrated that the use of wet methods is unfeasible due to, for example, the creation of electrical hazards, equipment malfunction, and in roofing.
- c. Prompt clean-up and disposal in leak-tight containers of wastes and debris contaminated with asbestos.
- d. Inspection and repair of polyethylene in work and high traffic areas.
- e. Cleaning of equipment and surfaces of containers filled with ACM prior to removing them from the equipment room or area.

3.6.2 Control Methods

The Contractor shall use the following control methods to comply with the PELs:

- a. Local exhaust ventilation equipped with HEPA filter dust collection systems;
- b. Enclosure or isolation of processes producing asbestos dust;
- c. Ventilation of the regulated area to move contaminated air away from the breathing zone of employees and toward a filtration or collection device equipped with a HEPA filter;
- d. Use of other work practices and engineering controls;
- e. Where the feasible engineering and work practice controls described above are not sufficient to reduce employee exposure to or below the PELs, the Contractor shall use them to reduce employee exposure to the lowest levels attainable by these controls and shall supplement them by the use of respiratory protection that complies with paragraph, RESPIRATORY PROTECTION PROGRAM.

3.6.3 Unacceptable Practices

The following work practices and engineering controls shall not be used for work related to asbestos or for work which disturbs ACM, regardless of measured levels of asbestos exposure or the results of initial exposure assessments:

- a. High-speed abrasive disc saws that are not equipped with point of cut ventilator or enclosures with HEPA filtered exhaust air.
- b. Compressed air used to remove asbestos, or materials containing asbestos, unless the compressed air is used in conjunction with an enclosed ventilation system designed to capture the dust cloud created by the compressed air.
- c. Dry sweeping, shoveling, or other dry clean-up of dust and debris containing ACM.
- d. Employee rotation as a means of reducing employee exposure to asbestos.

3.6.4 Class I Work Procedures

In addition to requirements of paragraphs Mandated Practices and Control Methods, the following engineering controls and work practices shall be used:

- a. A Competent Person shall supervise the installation and operation of the control system.
- b. For jobs involving the removal of more than 25 feet or 10 square feet of TSI or surfacing material, the Contractor shall place critical barriers over all openings to the regulated area.
- c. HVAC systems shall be isolated in the regulated area by sealing with a double layer of plastic or air-tight rigid covers.
- d. Impermeable dropcloths (6 mil or greater thickness) shall be placed on surfaces beneath all removal activity.
- e. Objects within the regulated area shall be handled as specified in paragraph OBJECTS.
- f. Where a negative exposure assessment has not been provided or where exposure monitoring shows the PEL was exceeded, the regulated area shall be ventilated to move contaminated air away from the employee's breathing zone toward a HEPA unit or collection device.

3.6.5 Specific Control Methods for Class I Work

In addition to requirements of paragraph Class I Work Procedures, Class I asbestos work shall be performed using the control methods identified in the subparagraphs below.

3.6.5.1 Negative Pressure Enclosure (NPE) System

The NPE system shall be as shown in SETUP DETAIL SHEET [2] [3] [4] [8]. The system shall provide at least 4 air changes per hour inside the containment. The local exhaust unit equipment shall be operated 24 hours per day until the containment is removed, and shall be leak-proof to the filter and

equipped with HEPA filters. Air movement shall be directed away from the employees and toward a HEPA filtration device. The NPE shall be smoke tested for leaks at the beginning of each shift. Local exhaust equipment shall be sufficient to maintain a minimum pressure differential of minus 0.02 inch of water column relative to adjacent, unsealed areas. Pressure differential shall be monitored continuously, 24 hours per day, with an automatic manometric recording instrument. Pressure differential recordings shall be provided daily on the same day collected. Readings shall be reviewed by the Contractor's Designated Competent Person and IH prior to submittal. The Contracting Officer shall be notified immediately if the pressure differential falls below the prescribed minimum. The building ventilation system shall not be used as the local exhaust system for the regulated area. The local exhaust system shall terminate outdoors unless an alternate arrangement is allowed by the Contract Officer. All filters used shall be new at the beginning of the project and shall be periodically changed as necessary and disposed of as ACM waste.

3.6.5.2 Glovebag Systems

Glovebag systems shall be as shown in SETUP DETAIL SHEET 10. The glovebag system shall be used to remove ACM from straight runs of piping and elbows and other connections. Glovebags shall be used without modification and shall be smoke-tested for leaks and any leaks sealed prior to use. Glovebags shall be installed to completely cover the circumference of pipe or other structures where the work is to be done. Glovebags shall be used only once and shall not be moved. Glovebags shall not be used on surfaces that have temperatures exceeding 150 degrees F. Prior to disposal, glovebags shall be collapsed by removing air within them using a HEPA vacuum. Before beginning the operation, loose and friable material adjacent to the glovebag operation shall be wrapped and sealed in 2 layers of plastic or otherwise rendered intact. At least 2 persons shall perform Class I glovebag removal. Asbestos regulated work areas shall be established as specified and shown on detailed drawings and plans for glovebag abatement. Designated boundary limits for the asbestos work shall be established with rope or other continuous barriers and all other requirements for asbestos control areas shall be maintained, including area signage and boundary warning tape as specified in SET-UP DETAIL SHEET 11.

- a. In addition to requirements for negative pressure glovebag systems above, the Contractor shall attach HEPA vacuum systems or other devices to the bag to prevent collapse during removal of ACM from straight runs of piping and elbows and other connections.
- b. The negative pressure glove boxes used to remove ACM from pipe runs shall be fitted with gloved apertures and a bagging outlet and constructed with rigid sides from metal or other material which can withstand the weight of the ACM and water used during removal. A negative pressure shall be created in the system using a HEPA filtration system. The box shall be smoke tested for leaks prior to each use.

3.6.5.3 Mini-Enclosures

[Single bulkhead containment] [Double bulkhead containment] [or] [Mini-containment (small walk-in enclosure)] as shown in SETUP DETAIL SHEET [5] [6] [7] to accommodate no more than 2 persons, may be used if the disturbance or removal can be completely contained by the enclosure with the following specifications and work practices. The mini-enclosure shall be inspected for leaks and smoke tested before each use. Air movement shall be directed away from the employee's breathing zone within the mini-enclosure.

3.6.5.4 Wrap and Cut Operation

Wrap and cut operations shall be as shown in SETUP DETAIL SHEET [9B] [10]. Prior to cutting pipe, the asbestos-containing insulation shall be wrapped with polyethylene and securely sealed with duct tape to prevent asbestos becoming airborne as a result of the cutting process. The following steps shall be taken: install glovebag, strip back sections to be cut 6 inches from point of cut, and cut pipe into manageable sections.

3.6.6 Class II Work

In addition to the requirements of paragraphs Mandated Practices and Control Methods, the following engineering controls and work practices shall be used:

- a. A Competent Person shall supervise the work.
- b. For indoor work, critical barriers shall be placed over all openings to the regulated area.
- c. Impermeable dropcloths shall be placed on surfaces beneath all removal activity.

3.6.7 Specific Control Methods for Class II Work

In addition to requirements of paragraph Class II Work, Class II work shall be performed using the following methods:

3.6.7.1 Vinyl and Asphalt Flooring Materials

When removing vinyl and asphalt flooring materials [which contain ACM] [from a building in which ACM has not been verified], the Contractor shall use the following practices as shown in RESPONSE ACTION DETAIL SHEET [56] [57] [58] [59] [60] [61] [62] [63] [64]. Resilient sheeting shall be removed by adequately wet methods. Tiles shall be removed intact (if possible); wetting is not required when tiles are heated and removed intact. Flooring or its backing shall not be sanded. Scraping of residual adhesive and/or backing shall be performed using wet methods. Mechanical chipping is prohibited unless performed in a negative pressure enclosure. Dry sweeping is prohibited. The Contractor shall use vacuums equipped with HEPA filter, disposable dust bag, and metal floor tool (no brush) to clean floors.

3.6.7.2 Roofing Material

When removing roofing materials which contain ACM as described in 29 CFR 1926, Section .1101(g)(8)(ii), the Contractor shall use the following practices as shown in RESPONSE ACTION DETAIL SHEET [74] [75]. Roofing material shall be removed in an intact state. Wet methods shall be used to remove roofing materials that are not intact, or that will be rendered not intact during removal, unless such wet methods are not feasible or will create safety hazards. When removing built-up roofs, with asbestos-containing roofing felts and an aggregate surface, using a power roof cutter, all dust resulting from the cutting operations shall be collected by a HEPA dust collector, or shall be HEPA vacuumed by vacuuming along the cut line. Asbestos-containing roofing material shall not be dropped or thrown to the ground, but shall be lowered to the ground via covered, dust-tight chute, crane, hoist or other method approved by the Contracting Officer. Any ACM that is not intact shall be lowered to the ground as soon as practicable, but not later than the end of the work shift. While the

material remains on the roof it shall be kept wet or placed in an impermeable waste bag or wrapped in plastic sheeting. Intact ACM shall be lowered to the ground as soon as practicable, but not later than the end of the work shift. Unwrapped material shall be transferred to a closed receptacle precluding the dispersion of dust. Critical barriers shall be placed over roof level heating and ventilation air intakes.

3.6.7.3 Cementitious Siding and Shingles or Transite Panels

When removing cementitious asbestos-containing siding, shingles or transite panels the Contractor shall use the following practices as shown in RESPONSE ACTION DETAIL SHEET [81] [82] [83]. Intentionally cutting, abrading or breaking siding, shingles, or transite panels is prohibited. Each panel or shingle shall be sprayed with amended water prior to removal. Nails shall be cut with flat, sharp instruments. Unwrapped or unbagged panels or shingles shall be immediately lowered to the ground via covered dust-tight chute, crane or hoist, or placed in an impervious waste bag or wrapped in plastic sheeting and lowered to the ground no later than the end of the work shift.

3.6.7.4 Gaskets

Gaskets shall be thoroughly wetted with amended water prior to removal and immediately placed in a disposal container. If a gasket is visibly deteriorated and unlikely to be removed intact, removal shall be undertaken within a glovebag. Any scraping to remove residue shall be performed wet.

3.6.7.5 Other Class II Jobs

The Contractor shall use the following work practices when performing Class II removal of [_____] ACM: The material shall be thoroughly wetted with amended water prior and during its removal. The material shall be removed in an intact state. Cutting, abrading or breaking the material is prohibited. The ACM removed shall be immediately bagged or wrapped.

3.6.8 Specific Control Methods for Class III Work

Class III asbestos work shall be conducted using engineering and work practice controls which minimize the exposure to employees performing the asbestos work and to bystander employees. The work shall be performed using wet methods and, to the extent feasible, using local exhaust ventilation. The Contractor shall use impermeable dropcloths and shall isolate the operation, using mini-enclosures or glovebag systems, where the disturbance involves drilling, cutting, abrading, sanding, chipping, breaking, or sawing of TSI or surfacing material.

3.6.9 Specific Control Methods for Class IV Work

Class IV jobs shall be conducted using wet methods, HEPA vacuums, and prompt clean-up of debris containing ACM. Employees cleaning up debris and waste in a regulated area where respirators are required shall wear the selected respirators.

3.6.10 Alternative Methods for Roofing Materials and Asphaltic Wrap

The Contractor shall use the following engineering controls and work practices when removing, repairing, or maintaining intact pipeline asphaltic wrap, or roof cements, mastics, coatings, or flashings which contain asbestos fibers encapsulated or coated by bituminous or resinous compounds. If during the course of the job the material does not remain intact, the

Contractor shall use the procedures described in paragraph Roofing Material. Before work begins, and as needed during the job, the Designated Competent Person shall conduct an inspection and determine that the roofing material is intact and will likely remain intact. The material shall not be sanded, abraded, or ground. Manual methods which would render the material non-intact shall not be used. Roofing material shall not be dropped or thrown to the ground but shall be lowered via covered, dust-tight chute, crane, hoist or other method approved by the Contracting Officer. All such material shall be removed from the roof as soon as practicable, but not later than the end of the work shift. Removal or disturbance of pipeline asphaltic wrap shall be performed using wet methods.

3.6.11 Cleaning After Asbestos Removal

After completion of all asbestos removal work, surfaces from which ACM has been removed shall be wet wiped or sponged clean, or cleaned by some equivalent method to remove all visible residue. Run-off water shall be collected and filtered through a dual filtration system. A first filter shall be provided to remove fibers 20 micrometers and larger, and a final filter provided that removes fibers 5 micrometers and larger. After the gross amounts of asbestos have been removed from every surface, remaining visible accumulations of asbestos on floors shall be collected using plastic shovels, rubber squeegees, rubber dustpans, and HEPA vacuum cleaners as appropriate to maintain the integrity of the regulated area. When TSI and surfacing material has been removed, workmen shall use HEPA vacuum cleaners to vacuum every surface. Surfaces or locations which could harbor accumulations or residual asbestos dust shall be checked after vacuuming to verify that no asbestos-containing material remains; and shall be re-vacuumed as necessary to remove the ACM.

3.6.12 Class I Asbestos Work Response Action Detail Sheets

The following Class I Asbestos Work Response Action Detail Sheet is specified on Table 1 for each individual work task to be performed:

- a. Troweled Wall Plaster on Masonry: See Sheet 32
- b. Troweled Wall Plaster on Stud Wall: See Sheet 33
- c. Troweled Ceiling Plaster on Structural Substrate: See Sheet 35
- d. Troweled Ceiling Plaster on Hung Ceiling: See Sheet 36
- e. Acoustical Wall Plaster on Masonry: See Sheet 42
- f. Acoustical Ceiling Plaster (Non-Asbestos Substrate): See Sheet 44
- g. Asbestos Decorative Paint on Plaster: See Sheet 46
- h. Asbestos-contaminated Masonry for Masonry Chimney: See Sheet 50
- i. Asbestos-contaminated Masonry Wall or Thermal Insulation: See Sheet 51
- j. Fireproofing or Thermal Surface Insulation: See Sheet 68
- k. Acoustical Ceiling Insulation: See Sheet 70
- l. Exterior Asbestos Stucco: See Sheet 79

- m. Duct Insulation: Duct work insulation removal shall not begin without the written authorization of the Contracting Officer stating that the HVAC system to be worked on is either isolated or inoperative and locked out of service. Forced air circulation is not permitted in ductwork while abatement work is in progress. See Sheet 101
- n. Pipe Insulation (Using a Glovebag): See Sheet 87
- o. Horizontal Pipe Insulation (Using a Containment Area): See Sheet 88
- p. Pipe Insulation (Using a Mini-Containment Area): See Sheet 89
- q. Storage Tank and Boiler Breeching Insulation: See Sheet 93. Written approval shall be obtained from the Contracting Officer before start of work on tanks and boiler breeching. The Contracting Officer will ensure that tanks and boilers have been valved off or shut down and allowed a sufficient amount of time to cool down. Insulation shall be sprayed with a mist of amended water or removal encapsulant. Amended water or removal encapsulant shall be allowed to saturate material to substrate. Bands or wires holding breeching or insulation to equipment shall be cut. Cover jackets shall be slit at seams, and sections removed and hand-placed in a polyethylene disposable bag. Exposed surfaces shall be continuously sprayed with amended water to minimize airborne dust. Insulation on tanks and boiler breeching shall not be allowed to drop to the floor. Residue shall be removed from tank and boiler surfaces. A water stream shall be used to dislodge insulation in joints or irregular spaces that cannot be reached with tools. Lagging on piping and insulation on fittings shall be removed. A penetrating encapsulant shall be sprayed on all exposed tank, boiler and boiler breeching surfaces.
- r. Troweled Wall Plaster on Studs: See Sheet 30
- s. Troweled Ceiling or Wall Plaster on Masonry: See Sheet 31
- t. Acoustical Ceiling on Wall Plaster: See Sheet 41
- u. Interior Stucco: See Sheet 78
- v. Exterior Stucco: See Sheet 80
- w. Pipe and Fitting Insulation (using Glovebag): See Sheet 86
- x. Storage Tank and Boiler Breeching: See Sheet 92
- y. Duct Insulation: See Sheet 100.

3.6.13 Class II Asbestos Work Response Action Detail Sheets

The following Class II Asbestos Work Response Action Detail Sheet is specified on Table 1 for each individual work task to be performed:

- a. Light Curtain: See Sheet 47
- b. Interior Asbestos Cement, Fiberboard and Drywall Panels: See Sheet 48

- c. Suspended Asbestos Cement Ceiling Tile: See Sheet 52
- d. Asbestos Cement Architectural Products: See Sheet 53
- e. Glued-on Acoustical Ceiling and Wall Tile: See Sheet 55
- f. Suspended Acoustical Ceiling Tile: See Sheet 54
- g. Vinyl or Vinyl Asbestos Tile Adhered to Concrete Floor System by Asbestos-Containing Adhesive: See Sheet 56
- h. Vinyl or Vinyl Asbestos Tile Adhered to Wood Floor System by Asbestos Containing Adhesive: See Sheet 60
- i. Vinyl Asbestos Tile Adhered to Concrete Floor System by Asbestos Containing Adhesive: See Sheet 57
- j. Vinyl Asbestos Tile Adhered to Concrete Floor System by Asbestos Free Adhesive: See Sheet 58
- k. Vinyl Asbestos Tile and Chemical Dissolution of Asbestos-Containing Adhesives on Concrete Floor System: See Sheet 59
- l. Vinyl Asbestos Tile Adhered to Wood Floor System by Asbestos-Containing Adhesive: See Sheet 61
- m. Vinyl Asbestos Tile Adhered to Wood Floor System by Asbestos Free Adhesive: See Sheet 62
- n. Sheet Flooring Adhered Wood Floor System: See Sheet 63
- o. Asbestos-Containing Sheet Flooring Adhered to Concrete Floor System by Asbestos-Containing Adhesive: See Sheet 64
- p. Carpeting (Asbestos-Containing or Contaminated): See Sheet 65
- q. Miscellaneous Asbestos-Containing Materials: See Sheet 45
- r. Built-Up Roofing and Flashing: See Sheet 74
- s. Roof, Shingles and Underlayment: See Sheet 75
- t. Asbestos Cement Siding: See Sheet 81
- u. Asbestos Cement Roofing: See Sheet 82
- v. Asbestos-Containing Walkway Cover: See Sheet 83
- w. Asbestos-Contaminated Metal Siding: See Sheet 84
- x. Asbestos Cement Sunscreen Louvers: See Sheet 85
- y. Electrical Wiring and Fixtures: See Sheet 95
- z. Asbestos Insulated Electrical Fixture: See Sheet 96
- aa. Boiler Firebox Insulation: The asbestos-containing boiler firebox lining shall be removed from out-of-service boilers before the boiler is dismantled: See Sheet 97.

3.6.14 Abatement of Asbestos Contaminated Soil

[Asbestos contaminated soil shall be removed from areas to a minimum depth of [2] [_____] inches. Soil shall be thoroughly dampened with amended water and then removed by manual shoveling into labeled containers. The workers shall be closely monitored for heat exhaustion. The minimum ventilation shall be 8 air changes per hour through a local exhaust HEPA system. See DETAIL SHEET 73.] [The Contractor has the option to propose encapsulation of soil instead of removal. Since soil encapsulation is highly dependent on soil chemistry, available skills for application and proprietary products, the Contractor shall first test the proposed soil encapsulant on a minimum 100 square feet of soil area onsite. The test shall be witnessed by the Contracting Officer's and the manufacturer's representative. A written application for encapsulation shall be submitted to the Contracting Officer with test results, encapsulant manufacturer's positive recommendation for use, a guarantee for satisfactory performance for 10 years, and limitation of application. The Contracting Officer reserves the right to accept or reject the application with no effect to the contract. If the application is accepted, the soil encapsulation shall proceed in compliance with all provisions and instructions of the encapsulant manufacturer and under the supervision of a person certified by the manufacturer who is trained and experienced in the proper application of the soil encapsulant. See DETAIL SHEET 72.] [A concrete slab of minimum [2] [_____] inch thickness shall be poured over the entire soil surface. Soil surface shall be thoroughly dampened before pouring concrete. Soil encapsulators and supervisors shall be primarily concrete workers trained to work in asbestos contaminated environments. See DETAIL SHEET 71.]

3.6.15 Enclosure of ACM

Isolation of ACM by construction of a permanent enclosure shall be conducted as specified in Section [_____] . Enclosures shall be as follows:

- a. Enclosure of Acoustical Wall Plaster on Masonry Wall: See Detail Sheet 37
- b. Enclosure of Asbestos Contaminated Soil: See Detail Sheet 71
- c. Enclosure of Acoustical Ceiling Plaster, Spray-on Fireproofing and Thermal Insulation Plaster: See Detail Sheet 43.

3.6.16 Encapsulation of ACM

Prior to applying any encapsulant, the entire surface area shall be inspected for loose, or damaged asbestos material:

- a. Penetrating Encapsulation: Before penetrating encapsulation is applied, asbestos removal work in the area shall be complete and the surfaces to be encapsulated shall be free of loose or damaged material. Substrate shall be evaluated before application to ensure that the encapsulant will not cause the substrate to fail in any way. Acoustical wall and ceiling plaster surfaces shall be encapsulated in accordance with manufacturer's recommendations. Plug samples shall be taken to determine if full penetration has been achieved. If full penetration has not been achieved, surfaces shall be recoated while the matrix is still wet, until full penetration is achieved: See Detail Sheet 39.
- b. Bridging Encapsulation: Prior to applying the bridging encapsulant, the pre-encapsulation inspection shall be performed.

The surface shall be encapsulated in sections of 1000 square feet or less as recommended by the encapsulant manufacturer. Upon completion of each section, the dry thickness of the bridging encapsulation shall be measured. Additional bridging encapsulant shall be applied to obtain the desired encapsulant thickness. Additional coats shall blend with the original bridging encapsulant. Bridging encapsulation shall include:

- (1) Troweled Wall Plaster: See Detail Sheet 29
- (2) Troweled Ceiling Plaster: See Detail Sheet 34
- (3) Acoustical Wall Plaster: See Detail Sheet 38
- (4) Acoustical Ceiling Plaster: See Detail Sheet 34
- (5) Asbestos Cement Wall, Fiberboard and Drywall Panels: See Detail Sheet 49
- (6) Exterior Asbestos Stucco: See Detail Sheet 76
- (7) Interior Asbestos Stucco: See Detail Sheet 77
- (8) Storage Tank and Boiler Breeching: See Detail Sheet 91
- (9) Boiler and Piping Gasket: See Detail Sheet 98.

3.6.17 Combination Encapsulation of Acoustical Wall and Ceiling Plaster

The combination penetrating/bridging encapsulation system shall be installed by first applying the penetrating encapsulant and then the bridging encapsulant: See Detail Sheet 40.

3.6.18 Response Action Detail Sheets for Repair of Class I Materials

- a. Troweled Wall Plaster on Studs: See Detail Sheet 30
- b. Troweled Ceiling or Wall Plaster on Masonry: See Detail Sheet 31
- c. Acoustical Ceiling on Wall Plaster: See Detail Sheet 41
- d. Interior Stucco: See Detail Sheet 78
- e. Exterior Stucco: See Detail Sheet 80
- f. Pipe and Fitting Insulation (using Glovebag): See Detail Sheet 86
- g. Storage Tank and Boiler Breeching: See Detail Sheet 92
- h. Duct Insulation: See Detail Sheet 100
- i. Exposed Pipe Insulation Edges: Asbestos insulation to remain shall have exposed edges contained; the following steps shall be performed: Wet and cut the rough ends true and square with sharp tools and then encapsulate the edges with a 1/4 inch thick layer of non-asbestos-containing insulating cement troweled to a smooth hard finish; when cement is dry, lag the end with a layer of non-asbestos lagging cloth, overlapping the existing ends by 4 inches.

3.6.19 Response Action Detail Sheets for Repair of Class II Materials

- a. Vinyl or Vinyl Asbestos Tile Adhered to Concrete Floor System by Asbestos-Containing Adhesive: See Detail Sheet 56
- b. Vinyl or Vinyl Asbestos Tile Adhered to Wood Floor System by Asbestos Containing Adhesive: See Detail Sheet 60.

3.6.20 Encasement of ACM

Prior to applying the first layer of the polymer system, the structural stability of the ACM shall be verified. Encasement materials shall not be applied until all removal work within the regulated area has been completed. Mechanical fasteners shall be installed to wall, mesh or deck as needed. A low density cellular or polymer shall be applied to a depth of approximately 1 inch. The asbestos substrate shall be completely encased. A polymer finish containing fiberglass shall be applied over the low density cellular foam to a thickness of 1 inch. All system components shall be applied according to the system manufacturer's instructions and data. Encased material shall be decontaminated. Encasement shall be applied to:

- a. Beams and Decking: See Detail Sheet 66
- b. Columns: See Detail Sheet 67
- c. Acoustical Ceiling Insulation: See Detail Sheet 69
- d. Storage Tank and Boiler Breeching: See Detail Sheet 90.

3.6.21 Sealing Contaminated Items Designated for Disposal

Contaminated architectural, mechanical, and electrical appurtenances such as Venetian blinds, full height partitions, carpeting, duct work, pipes and fittings, radiators, light fixtures, conduit panels, and other contaminated items designated for removal shall be coated with an asbestos lockdown encapsulant at the demolition site before being removed from the asbestos control area. These items [shall] [shall not] be vacuumed prior to application of the lockdown encapsulant. The asbestos lockdown encapsulant shall be tinted a contrasting color and shall be spray applied by airless method. Thoroughness of sealing operation shall be visually gauged by the extent of colored coating on exposed surfaces.

3.7 FINAL CLEANING AND VISUAL INSPECTION

Upon completion of abatement, the regulated area shall be cleaned by collecting, packing, and storing all gross contamination; see SET-UP DETAIL SHEETS 9, 14 and 20. A final cleaning shall be performed using HEPA vacuum and wet cleaning of all exposed surfaces and objects in the regulated area. Upon completion of the cleaning, the Contractor shall conduct a visual pre-inspection of the cleaned area in preparation for a final inspection before final air clearance monitoring and recleaning, as necessary. Upon completion of the final cleaning, the Contractor and the Contracting Officer shall conduct a final visual inspection of the cleaned regulated area in accordance with ASTM E 1368 and document the results on the Final Cleaning and Visual Inspection as specified on the SET-UP DETAIL SHEET 19. If the Contracting Officer rejects the clean regulated area as not meeting final cleaning requirements, the Contractor shall reclean as necessary and have a follow-on inspection conducted with the Contracting Officer. Recleaning and follow-up reinspection shall be at the Contractor's expense.

3.8 LOCKDOWN

Prior to removal of plastic barriers and after clean-up of gross contamination and final visual inspection, a post removal (lockdown) encapsulant shall be spray applied to ceiling, walls, floors, and other surfaces in the regulated area.

3.9 EXPOSURE ASSESSMENT AND AIR MONITORING

3.9.1 General Requirements For Exposure

Exposure assessment, air monitoring and analysis of airborne concentration of asbestos fibers shall be performed in accordance with 29 CFR 1926, Section .1101, the Contractor's air monitoring plan, and as specified. Personal exposure air monitoring (collected at the breathing zone) that is representative of the exposure of each employee who is assigned to work within a regulated area shall be performed by the Contractor's Designated IH. Breathing zone samples shall be taken for at least 25 percent of the workers in each shift, or a minimum of 2, whichever is greater. Air monitoring results at the 95 percent confidence level shall be calculated as shown in Table 2 at the end of this section. [[The Contractor shall] [The Contracting Officer will] provide an onsite independent testing laboratory with qualified analysts and appropriate equipment to conduct sample analyses of air samples using the methods prescribed in 29 CFR 1926, Section .1101, to include NIOSH Pub No. 84-100 Method 7400.] Preabatement and abatement environmental air monitoring shall be performed by the [Contractor's Designated IH] [and] [Contracting Officer's IH]. Final clearance environmental air monitoring, shall be performed by the [Contractor's Designated IH] [Contracting Officer's IH]. Environmental and final clearance air monitoring shall be performed using [NIOSH Pub No. 84-100 Method 7400 (PCM) with optional confirmation of results by NIOSH Pub No. 84-100 Method 7402 (TEM)] [the EPA TEM Method specified in 40 CFR 763]. For environmental and final clearance, air monitoring shall be conducted at a sufficient velocity and duration to establish the limit of detection of the method used at 0.005 f/cc. Confirmation of asbestos fiber concentrations (asbestos f/cc) from environmental and final clearance samples collected and analyzed by NIOSH Pub No. 84-100 Method 7400 (total f/cc) may be conducted using TEM in accordance with NIOSH Pub No. 84-100 Method 7402. When such confirmation is conducted, it shall be from the same sample filter used for the NIOSH Pub No. 84-100 Method 7400 PCM analysis. For all Contractor required environmental or final clearance air monitoring, confirmation of asbestos fiber concentrations, using NIOSH Pub No. 84-100 Method 7402, shall be at the Contractor's expense. Monitoring may be duplicated by the Government at the discretion of the Contracting Officer. Results of breathing zone samples shall be posted at the job site and made available to the Contracting Officer. The Contractor shall maintain a fiber concentration inside a regulated area less than or equal to 0.1 f/cc expressed as an 8 hour, time-weighted average (TWA) during the conduct of the asbestos abatement. If fiber concentration rises above 0.1 f/cc, work procedures shall be investigated with the Contracting Officer to determine the cause. At the discretion of the Contracting Officer, fiber concentration may exceed 0.1 f/cc but shall not exceed 1.0 f/cc expressed as an 8-hour TWA. The Contractor's workers shall not be exposed to an airborne fiber concentration in excess of 1.0 f/cc, as averaged over a sampling period of 30 minutes. Should either an environmental concentration of 1.0 f/cc expressed as an 8-hour TWA or a personal excursion concentration of 1.0 f/cc expressed as a 30-minute sample occur inside a regulated work area, the Contractor shall stop work immediately, notify the Contracting Officer, and implement additional engineering controls and work practice controls to reduce airborne fiber levels below prescribed limits in the work area. Work shall not restart until authorized by the Contracting Officer.

3.9.2 Initial Exposure Assessment

The Contractor's Designated IH shall conduct an exposure assessment immediately before or at the initiation of an asbestos abatement operation to ascertain expected exposures during that operation. The assessment shall

be completed in time to comply with the requirements which are triggered by exposure data or the lack of a negative exposure assessment, and to provide information necessary to assure that all control systems planned are appropriate for that operation. The assessment shall take into consideration both the monitoring results and all observations, information or calculations which indicate employee exposure to asbestos, including any previous monitoring conducted in the workplace, or of the operations of the Contractor which indicate the levels of airborne asbestos likely to be encountered on the job. [For Class I asbestos work, until the employer conducts exposure monitoring and documents that employees on that job will not be exposed in excess of PELs, or otherwise makes a negative exposure assessment, the Contractor shall presume that employees are exposed in excess of the PEL-TWA and PEL-Excursion Limit.]

3.9.3 Negative Exposure Assessment

The Contractor shall provide a negative exposure assessment for the specific asbestos job which will be performed. The negative exposure assessment shall be provided within [_____] days of the initiation of the project and conform to the following criteria:

- a. Objective Data: Objective data demonstrating that the product or material containing asbestos minerals or the activity involving such product or material cannot release airborne fibers in concentrations exceeding the PEL-TWA and PEL-Excursion Limit under those work conditions having the greatest potential for releasing asbestos.
- b. Prior Asbestos Jobs: Where the Contractor has monitored prior asbestos jobs for the PEL and the PEL-Excursion Limit within 12 months of the current job, the monitoring and analysis were performed in compliance with asbestos standard in effect; the data were obtained during work operations conducted under workplace conditions closely resembling the processes, type of material, control methods, work practices, and environmental conditions used and prevailing in the Contractor's current operations; the operations were conducted by employees whose training and experience are no more extensive than that of employees performing the current job; and these data show that under the conditions prevailing and which will prevail in the current workplace, there is a high degree of certainty that the monitoring covered exposure from employee exposures will not exceed the PEL-TWA and PEL-Excursion Limit.
- c. Initial Exposure Monitoring: The results of initial exposure monitoring of the current job, made from breathing zone air samples that are representative of the 8-hour PEL-TWA and 30-minute short-term exposures of each employee. The monitoring covered exposure from operations which are most likely during the performance of the entire asbestos job to result in exposures over the PELs.

3.9.4 Preabatement Environmental Air Monitoring

Preabatement environmental air monitoring shall be established [1 day] [_____] prior to the masking and sealing operations for each regulated area to determine background concentrations before abatement work begins. As a minimum, preabatement air samples shall be collected using NIOSH Pub No. 84-100 Method 7400, PCM at these locations: outside the building; inside the building, but outside the regulated area perimeter; and inside each regulated work area. One sample shall be collected for every 2000 square

feet of floor space. At least 2 samples shall be collected outside the building: at the exhaust of the HEPA unit; and downwind from the abatement site. The PCM samples shall be analyzed within 24 hours; and if any result in fiber concentration greater than 0.01 f/cc, asbestos fiber concentration shall be confirmed using NIOSH Pub No. 84-100 Method 7402 (TEM).

3.9.5 Environmental Air Monitoring During Abatement

Until an exposure assessment is provided to the Contracting Officer, environmental air monitoring shall be conducted at locations and frequencies that will accurately characterize any evolving airborne asbestos fiber concentrations. The assessment shall demonstrate that the product or material containing asbestos minerals, or the abatement involving such product or material, cannot release airborne asbestos fibers in concentrations exceeding 0.01 f/cc as a TWA under those work conditions having the greatest potential for releasing asbestos. The monitoring shall be at least once per shift at locations including, but not limited to, close to the work inside a regulated area; preabatement sampling locations; outside entrances to a regulated area; close to glovebag operations; representative locations outside of the perimeter of a regulated area; inside clean room; and at the exhaust discharge point of local exhaust system ducted to the outside of a containment (if used). If the sampling outside regulated area shows airborne fiber levels have exceeded background or 0.01 f/cc, whichever is greater, work shall be stopped immediately, and the Contracting Officer notified. The condition causing the increase shall be corrected. Work shall not restart until authorized by the Contracting Officer.

3.9.6 Final Clearance Air Monitoring

Prior to conducting final clearance air monitoring, the Contractor and the Contracting Officer shall conduct a final visual inspection of the regulated area where asbestos abatement has been completed. The final visual inspection shall be as specified in SET-UP DETAIL SHEET 19. Final clearance air monitoring shall not begin until acceptance of the Contractor's final cleaning by the Contracting Officer. [The Contractor's Designated IH shall] [The Contracting Officer's IH will] conduct final clearance air monitoring using aggressive air sampling techniques as defined in EPA 560/5-85-024 or as otherwise required by federal or state requirements. The sampling and analytical method used will be [NIOSH Pub No. 84-100 Method 7400 (PCM) and Table 3 with confirmation of results by NIOSH Pub No. 84-100 Method 7402 (TEM).] [the EPA TEM Method specified at 40 CFR 763 and Table 4.]

3.9.6.1 Final Clearance Requirements, NIOSH PCM Method

For PCM sampling and analysis using NIOSH Pub No. 84-100 Method 7400, the fiber concentration inside the abated regulated area, for each airborne sample, shall be less than 0.01 f/cc. The abatement inside the regulated area is considered complete when every PCM final clearance sample is below the clearance limit. If any sample result is greater than 0.01 total f/cc, the asbestos fiber concentration (asbestos f/cc) shall be confirmed from that same filter using NIOSH Pub No. 84-100 Method 7402 (TEM) at Contractor's expense. If any confirmation sample result is greater than 0.01 asbestos f/cc, abatement is incomplete and cleaning shall be repeated. Upon completion of any required recleaning, resampling with results to meet the above clearance criteria shall be done.

3.9.6.2 Final Clearance Requirements, EPA TEM Method

For EPA TEM sampling and analysis, using the EPA Method specified in 40 CFR 763, abatement inside the regulated area is considered complete when the arithmetic mean asbestos concentration of the 5 inside samples is less than or equal to 70 structures per square millimeter (70 S/mm). When the arithmetic mean is greater than 70 S/mm, the 3 blank samples shall be analyzed. If the 3 blank samples are greater than 70 S/mm, resampling shall be done. If less than 70 S/mm, the 5 outside samples shall be analyzed and a Z-test analysis performed. When the Z-test results are less than 1.65, the decontamination shall be considered complete. If the Z-test results are more than 1.65, the abatement is incomplete and cleaning shall be repeated. Upon completion of any required recleaning, resampling with results to meet the above clearance criteria shall be done.

3.9.6.3 Air Clearance Failure

If clearance sampling results fail to meet the final clearance requirements, the Contractor shall pay all costs associated with the required recleaning, resampling, and analysis, until final clearance requirements are met.

3.9.7 Air-Monitoring Results and Documentation

Air sample fiber counting shall be completed and results provided within 24 hours (breathing zone samples), and [_____] hours (environmental/clearance monitoring) after completion of a sampling period. The Contracting Officer shall be notified immediately of any airborne levels of asbestos fibers in excess of established requirements. Written sampling results shall be provided within 5 working days of the date of collection. The written results shall be signed by testing laboratory analyst, testing laboratory principal and the [Contractor's Designated IH] [Contracting Officer's IH]. The air sampling results shall be documented on a Contractor's daily air monitoring log. The daily air monitoring log shall contain the following information for each sample:

- a. Sampling and analytical method used;
- b. Date sample collected;
- c. Sample number;
- d. Sample type: BZ = Breathing Zone (Personal), P = Preabatement, E = Environmental, C = Abatement Clearance;
- e. Location/activity/name where sample collected;
- f. Sampling pump manufacturer, model and serial number, beginning flow rate, end flow rate, average flow rate (L/min);
- g. Calibration date, time, method, location, name of calibrator, signature;
- h. Sample period (start time, stop time, elapsed time (minutes));
- i. Total air volume sampled (liters);
- j. Sample results (f/cc and S/mm square) if EPA methods are required for final clearance;

- k. Laboratory name, location, analytical method, analyst, confidence level. In addition, the printed name and a signature and date block for the Industrial Hygienist who conducted the sampling and for the Industrial Hygienist who reviewed the daily air monitoring log verifying the accuracy of the information.

3.10 CLEARANCE CERTIFICATION

When asbestos abatement is complete, ACM waste is removed from the regulated areas, and final clean-up is completed, the Contracting Officer will certify the areas as safe before allowing the warning signs and boundary warning tape to be removed. After final clean-up and acceptable airborne concentrations are attained, but before the HEPA unit is turned off and the containment removed, the [Contractor shall] [Government will] remove all pre-filters on the building HVAC system and provide new pre-filters. The Contractor shall dispose of such filters as asbestos contaminated materials. HVAC, mechanical, and electrical systems shall be re-established in proper working order. The Contractor and the Contracting Officer shall visually inspect all surfaces within the containment for residual material or accumulated debris. The Contractor shall reclean all areas showing dust or residual materials. The Contracting Officer will certify in writing that the area is safe before unrestricted entry is permitted. The Government will have the option to perform monitoring to certify the areas are safe before entry is permitted.

3.11 CLEANUP AND DISPOSAL

3.11.1 Title to ACM Materials

ACM material resulting from abatement work, except as specified otherwise, shall become the property of the Contractor and shall be disposed of as specified and in accordance with applicable federal, state and local regulations.

3.11.2 Collection and Disposal of Asbestos

All ACM waste including contaminated wastewater filters, scrap, debris, bags, containers, equipment, and asbestos contaminated clothing, shall be collected and placed in leak-tight containers such as double plastic bags (see DETAIL SHEET 9A); sealed double wrapped polyethylene sheet (see DETAIL 9B); sealed fiberboard boxes (see DETAIL SHEET 9C); or other approved containers. Waste within the containers shall be wetted in case the container is breached. Asbestos-containing waste shall be disposed of [at an EPA, state and local approved asbestos landfill] [off Government property]. For temporary storage, sealed impermeable containers shall be stored in an asbestos waste load-out unit or in a storage/transportation conveyance (i.e., dumpster, roll-off waste boxes, etc.) in a manner acceptable to and in an area assigned by the Contracting Officer. Procedure for hauling and disposal shall comply with 40 CFR 61, Subpart M, state, regional, and local standards.

3.11.3 Scale Weight Measurement

Scales used for measurement shall be public scales. Weighing shall be at a point nearest the work at which a public scale is available. Scales shall be standard truck scales of the beam type; scales shall be equipped with the type registering beam and an "over and under" indicator; and shall be capable of accommodating the entire vehicle. Scales shall be tested, approved and sealed by an inspector of the State of [_____]. Scales shall be calibrated and resealed as often as necessary and at least once every

three months to ensure continuous accuracy. Vehicles used for hauling ACM shall be weighed empty daily at such time as directed and each vehicle shall bear a plainly legible identification mark.

3.11.4 Weigh Bill and Delivery Tickets

Copies of weigh bills and delivery tickets shall be submitted to the Contracting Officer during the progress of the work. The Contractor shall furnish the Contracting Officer scale tickets for each load of ACM weighed and certified. These tickets shall include tare weight; identification mark for each vehicle weighed; and date, time and location of loading and unloading. Tickets shall be furnished at the point and time individual trucks arrive at the worksite. A master log of all vehicle loading shall be furnished for each day of loading operations. Before the final statement is allowed, the Contractor shall file with the Contracting Officer certified weigh bills and/or certified tickets and manifests of all ACM actually disposed by the Contractor for this contract.

3.11.5 Asbestos Waste Shipment Record

The Contractor shall complete and provide the Contracting Officer final completed copies of the Waste Shipment Record for all shipments of waste material as specified in 40 CFR 61, Subpart M and other required state waste manifest shipment records, within 3 days of delivery to the landfill. Each Waste Shipment Record shall be signed and dated by the [Contractor] [Contracting Officer], the waste transporter and disposal facility operator.

-- End of Section --

TABLE 1

INDIVIDUAL WORK TASK DATA ELEMENTS

Sheet _____ of _____

There is a separate data sheet for each individual work task.

1. WORK TASK DESIGNATION NUMBER _____
2. LOCATION OF WORK TASK _____

3. BRIEF DESCRIPTION OF MATERIAL TO BE ABATED: _____

 - a. Type of Asbestos _____
 - b. Percent asbestos content _____ %
4. ABATEMENT TECHNIQUE TO BE USED _____
5. OSHA ASBESTOS CLASS DESIGNATION FOR WORK TASK _____
6. EPA NESHAP FRIABILITY DESIGNATION FOR WORK TASK
Friable _____ Non-friable Category I _____
Non-friable Category II _____
7. FORM _____ and CONDITION OF ACM: GOOD _____ FAIR _____ POOR _____
8. QUANTITY: METERS _____, SQUARE METERS _____
- 8a. QUANTITY: LINEAR FT. _____, SQUARE FT. _____
9. RESPONSE ACTION DETAIL SHEET NUMBER FOR WORK TASK _____
10. SET-UP DETAIL SHEET NUMBERS
FOR WORK TASK _____, _____, _____, _____,
_____, _____, _____, _____.

NOTES:

- (1) Numeric sequence of individual work tasks (1,2,3,4, etc.) for each regulated area. Each category of EPA friability/OSHA class has a separate task.
- (2) Specific location of work (building, floor, area, e.g., Building 1421, 2nd Floor, Rm 201)
- (3) A description of material to be abated (example: horizontal pipe, cement wall panels, tile, stucco, etc.) type of asbestos (chrysotile, amosite, crocidolite, etc.); and % asbestos content.
- (4) Technique to be used: Removal = REM; Encapsulation = ENCAP; Encasement = ENCAS; Enclosure = ENCL; Repair = REP.
- (5) Class designation: Class I, II, III, or IV (OSHA designation).
- (6) Friability of materials: Check the applicable EPA NESHAP friability designation.
- (7) Form: Interior or Exterior Architectural = IA or EA; Mechanical/Electrical = ME.
Condition: Good = G; Fair = F; Poor = P.
- (8) Quantity of ACM for each work task in meters or square meters.
- (8a) Quantity of ACM for each work task in linear feet or square feet.
- (9) Response Action Detail Sheet specifies the material to be abated and the methods to be used. There is only one Response Action Detail Sheet for each abatement task.
- (10) Set-up Detail Sheets indicate containment and control methods used in support of the response action (referenced in the selected Response Action Detail Sheet).

TABLE 2

FORMULA FOR CALCULATION OF THE 95 PERCENT CONFIDENCE LEVEL
(Reference: NIOSH 7400)

$$\text{Fibers/cc(01.95 percent CL)} = X + [(X) * (1.645) * (CV)]$$

Where: $X = ((E)(AC))/((V)(1000))$

$$E = ((F/Nf) - (B/Nb))/Af$$

CV = The precision value; 0.45 shall be used unless the analytical laboratory provides the Contracting Officer with documentation (Round Robin Program participation and results) that the laboratory's precision is better.

AC = Effective collection area of the filter in square millimeters

V = Air volume sampled in liters

E = Fiber density on the filter in fibers per square millimeter

F/Nf = Total fiber count per graticule field

B/Nb = Mean field blank count per graticule field

Af = Graticule field area in square millimeters

$$\text{TWA} = C1/T1 + C2/T2 = Cn/Tn$$

Where: C = Concentration of contaminant

T = Time sampled.

TABLE 3

NIOSH METHOD 7400

PCM ENVIRONMENTAL AIR SAMPLING PROTOCOL (NON-PERSONAL)

| Sample Location | Minimum No. of Samples | Filter Pore Size (Note 1) | Min. Vol. (Note 2) (Liters) | Sampling Rate (liters/min.) |
|---|-------------------------------------|---------------------------|-----------------------------|-----------------------------|
| Inside Abatement Area | 0.5/140 Square Meters (Notes 3 & 4) | 0.45 microns | 1500 | 2-10 |
| Each Room in 1 Abatement Area Less than 140 Square meters | | 0.45 microns | 1500 | 2-10 |
| Field Blank | 2 | 0.45 microns | 0 | 0 |
| Laboratory Blank | 1 | 0.45 microns | 0 | 0 |

Notes:

1. Type of filter is Mixed Cellulose Ester.
2. Ensure detection limit for PCM analysis is established at 0.005 fibers/cc.
3. One sample shall be added for each additional 140 square meters. (The corresponding I-P units are 5/1500 square feet).
4. A minimum of 5 samples are to be taken per abatement area, plus 2 field blanks.

TABLE 4

EPA AHERA METHOD: TEM AIR SAMPLING PROTOCOL

| Location Sampled | Minimum No. of Samples | Filter Pore Size | Min. Vol. (Liters) | Sampling Rate (liters/min.) |
|------------------------|------------------------|------------------|--------------------|-----------------------------|
| Inside Abatement Area | 5 | 0.45 microns | 1199 | 2-10 |
| Outside Abatement Area | 5 | 0.45 microns | 1199 | 2-10 |
| Field Blank | 2 | 0.45 microns | 0 | 0 |
| Laboratory Blank | 1 | 0.45 microns | 0 | 0 |

Notes:

1. Type of filter is Mixed Cellulose Ester.
2. The detection limit for TEM analysis is 70 structures/square mm.

CERTIFICATE OF WORKER'S ACKNOWLEDGMENT

PROJECT NAME _____ CONTRACT NO. _____
PROJECT ADDRESS _____
CONTRACTOR FIRM NAME _____
EMPLOYEE'S NAME _____,
(Print) (Last) (First) (MI)

Social Security Number: _____ - _____ - _____,

WORKING WITH ASBESTOS CAN BE DANGEROUS. INHALING ASBESTOS FIBERS HAS BEEN LINKED WITH TYPES OF LUNG DISEASE AND CANCER. IF YOU SMOKE AND INHALE ASBESTOS FIBERS, THE CHANCE THAT YOU WILL DEVELOP LUNG CANCER IS GREATER THAN THAT OF THE NONSMOKING PUBLIC.

Your employer's contract for the above project requires that you be provided and you complete formal asbestos training specific to the type of work you will perform and project specific training; that you be supplied with proper personal protective equipment including a respirator, that you be trained in its use; and that you receive a medical examination to evaluate your physical capacity to perform your assigned work tasks, under the environmental conditions expected, while wearing the required personal protective equipment. These things are to be done at no cost to you. By signing this certification, you are acknowledging that your employer has met these obligations to you. The Contractor's Designated Industrial Hygienist will check the block(s) for the type of formal training you have completed. Review the checked blocks prior to signing this certification.

FORMAL TRAINING:

_____ a. For Competent Persons and Supervisors: I have completed EPA's Model Accreditation Program (MAP) training course, "Contractor/Supervisor", that meets this State's requirements.

b. For Workers:

_____ (1) For OSHA Class I work: I have completed EPA's MAP training course, "Worker", that meets this State's requirements.

_____ (2) For OSHA Class II work (where there will be abatement of more than one type of Class II materials, i.e., roofing, siding, floor tile, etc.): I have completed EPA's MAP training course, "Worker", that meets this State's requirements.

_____ (3) For OSHA Class II work (there will only be abatement of one type of Class II material):
_____ (a) I have completed an 8-hour training class on the elements of 29 CFR 1926, Section .1101(k)(9)(viii), in addition to the specific work practices and engineering controls of 29 CFR 1926, Section .1101(g) and hands-on training.

_____ (b) I have completed EPA's MAP training course, "Worker", that meets this State's requirements.

_____ (4) For OSHA Class III work: I have completed at least a 16-hour course consistent with EPA requirements for training of local education agency maintenance and custodial staff at 40 CFR 763, Section .92(a)(2) and the elements of 29 CFR 1926, Section .1101(k)(9)(viii), in addition to the specific work practices and engineering controls at 29 CFR 1926, Section .1101, and hands-on training.

_____ (5) For OSHA Class IV work: I have completed at least a 2-hr course consistent with EPA requirements for training of local education agency maintenance and custodial staff at 40 CFR 763, (a)(1), and the elements of 29 CFR 1926, Section .1101(k)(9)(viii), in addition to the specific work practices and engineering controls at 29 CFR 1926, Section .1101(g) and hands-on training.

_____ c. Workers, Supervisors and the Designated Competent Person: I have completed annual refresher training as required by EPA's MAP that meets this State's requirements.

PROJECT SPECIFIC TRAINING:

_____ I have been provided and have completed the project specific training required by this Contract. My employer's Designated Industrial Hygienist and Designated Competent Person conducted the training.

RESPIRATORY PROTECTION:

_____ I have been trained in accordance with the criteria in the Contractor's Respiratory Protection program. I have been trained in the dangers of handling and breathing asbestos dust and in the proper work procedures and use and limitations of the respirator(s) I will wear. I have been trained in and will abide by the facial hair and contact lens use policy of my employer.

RESPIRATOR FIT-TEST TRAINING:

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

MEDICAL EXAMINATION:

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

_____ were no limitations to performing the required work tasks.

_____ were identified physical limitations to performing the required work tasks.

Date of the medical examination _____

Employee Signature _____ date _____

Contractor's Industrial

Hygienist Signature _____ date _____

SECTION 16375

ELECTRICAL DISTRIBUTION SYSTEM, UNDERGROUND

1 GENERAL

1.1 REFERENCES

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

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

- ANSI C37.16 (1988; C37.16a) Low-Voltage Power Circuit Breakers and AC Power Circuit Protectors - Preferred Ratings, Related Requirements, and Application Recommendations
- ANSI C37.46 (1981; R 1992) Power Fuses and Fuse Disconnecting Switches
- ANSI C80.1 (1990) Rigid Steel Conduit - Zinc Coated
- ANSI C135.30 (1988) Zinc-Coated Ferrous Ground Rods for Overhead or Underground Line Construction

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- ASTM A 123 (1989a) Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
- ASTM A 153 (1996) Zinc Coating (Hot-Dip) on Iron and Steel Hardware

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

- IEEE C2 (1997) National Electrical Safety Code
- IEEE Std 81 (1983) Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System (Part 1)
- IEEE Std 100 (1992) IEEE Standard Dictionary of Electrical and Electronics Terms
- IEEE Std 590 (1977; R 1991) IEEE Cable Plowing Guide

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

- NEMA AB 1 (1993) Molded Case Circuit Breakers and Molded Case Switches
- NEMA FB 1 (1993) Fittings, Cast Metal Boxes and Conduit Bodies for Conduit and Cable Assemblies

NEMA FU 1 (1986) Low Voltage Cartridge Fuses
NEMA PB 1 (1990) Panelboards
NEMA TC 6 (1990) PVC and ABS Plastic Utilities Duct for
Underground Installation

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (1996) National Electrical Code

UNDERWRITERS LABORATORIES (UL)

UL 6 (1993; Rev March 96) Rigid Metal Conduit
UL 198C (1986; Rev thru Jun 1993) High-Interrupting-
Capacity Fuses, Current-Limiting Types
UL 198D (1995) Class K Fuses
UL 198E (1988; Rev Jul 1988) Class R Fuses
UL 198H (1988; Rev thru Nov 1993) Class T Fuses
UL 467 (1993; Rev thru Aug 1996) Grounding and
Bonding Equipment
UL 486A (1991; Rev Oct 1991) Wire Connectors and
Soldering Lugs for Use with Copper Conductors
UL 486B (1991; Rev thru Oct 1996) Wire Connectors for
Use with Aluminum Conductors
UL 489 (1996) Molded-Case Circuit Breakers and
Circuit-Breaker Enclosures
UL 510 (1994) Insulating Tape
UL 514A (1996) Metallic Outlet Boxes
UL 651 (1995) Schedule 40 and 80 Rigid PVC Conduit
UL 854 (1996; Rev May 1996) Service-Entrance Cables
UL 857 (1994; Rev Oct 1994) Busways and Associated
Fittings

1.2 GENERAL REQUIREMENTS

1.2.1 Terminology

Terminology used in this specification is as defined in IEEE Std 100.

1.3 SUBMITTALS

GOVERNMENTAL APPROVAL IS REQUIRED FOR SUBMITTALS WITH A "GA" DESIGNATION; SUBMITTALS HAVING AN "FIO" DESIGNATION ARE FOR INFORMATION ONLY. THE FOLLOWING SHALL BE SUBMITTED IN ACCORDANCE WITH SECTION 01330 SUBMITTAL PROCEDURES:

SD-01 Data

Material, Equipment, and Fixture Lists; GA.

A complete itemized listing of equipment and materials proposed for incorporation into the work. Each entry shall include an item number, the quantity of items proposed, and the name of the manufacturer of each such item.

Test Reports; GA.

Six copies of the information described below in 8-1/2 by 11 inch binders having a minimum of three rings, including a separate section for each test. Sections shall be separated by heavy plastic dividers with tabs.

- a. The test results, signed and dated.

Materials and Equipment; FIO.

Where materials or equipment are specified to conform to the standards of the Underwriters Laboratories (UL) or to be constructed or tested, or both, in accordance with the standards of the American National Standards Institute (ANSI), the Institute of Electrical and Electronics Engineers (IEEE), or the National Electrical Manufacturers Association (NEMA), the Contractor shall submit proof that the items provided conform to such requirements. The label of, or listing by, UL will be acceptable as evidence that the items conform. Either a certification or a published catalog specification data statement, to the effect that the item is in accordance with the referenced ANSI or IEEE standard, will be acceptable as evidence that the item conforms. A similar certification or published catalog specification data statement to the effect that the item is in accordance with the referenced NEMA standard, by a company listed as a member company of NEMA, will be acceptable as evidence that the item conforms. In lieu of such certification or published data, the Contractor may submit a certificate from a recognized testing agency equipped and competent to perform such services, stating that the items have been tested and that they conform to the requirements listed, including methods of testing of the specified agencies. Compliance with above-named requirements does not relieve the Contractor from compliance with any other requirements of the specifications.

1.4 DELIVERY, STORAGE, AND HANDLING

Devices and equipment shall be visually inspected by the Contractor when received and prior to acceptance from conveyance. Stored items shall be protected from the environment in accordance with the manufacturer's published instructions. Damaged items shall be replaced.

1.5 EXTRA MATERIALS

One additional spare fuse or fuse element for each furnished fuse or fuse element shall be delivered to the contracting officer when the electrical system is accepted.

2 PRODUCTS

2.1 STANDARD PRODUCT

Material and equipment shall be the standard product of a manufacturer regularly engaged in the manufacture of the product and shall essentially duplicate items that have been in satisfactory use for at least 2 years prior to bid opening. Items of the same classification shall be identical including equipment, assemblies, parts, and components.

2.2 NAMEPLATES

2.2.1 General

Each major component of this specification shall have the manufacturer's name, address, type or style, model or serial number, and catalog number on a nameplate securely attached to the equipment. Nameplates shall be made of noncorrosive metal. As a minimum, nameplates shall be provided for switches, and switchgear.

2.3 CORROSION PROTECTION

2.3.1 Aluminum Materials

Aluminum shall not be used.

2.3.2 Ferrous Metal Materials

2.3.2.1 Hardware

Ferrous metal hardware shall be hot-dip galvanized in accordance with [ASTM A 153](#) and [ASTM A 123](#).

2.4 CABLES

Cables shall be single conductor type unless otherwise indicated.

2.4.1 Conductor Material

Underground cables shall be of soft drawn copper.

2.4.2 Low-Voltage Cables

Cables shall be rated 600 volts and shall conform to the requirements of [NFPA 70](#). Cables shall be of the insulation types noted on drawings.

2.4.2.1 Direct Buried

Service entrance cables shall conform to [UL 854](#) for Type USE service entrance cable.

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2.4.2.2 In Duct DELETED

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2.5 CONDUIT

Shall be single, round-bore type, with wall thickness and fittings suitable for the application.

2.5.1 Metallic Conduit

Rigid galvanized steel conduit shall comply with **UL 6** and **ANSI C80.1**.
Metallic conduit fittings and outlets shall comply with **UL 514A** and **NEMA FB 1**.

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2.5.2 Nonmetallic

2.5.2.1 Direct Burial

UL 651 PVC Schedule 80 as indicated.

2.6 GROUNDING AND BONDING

2.6.1 Driven Ground Rods

Ground rods shall be copper-clad steel conforming to **UL 467**, not less than 3/4 inch in diameter by 10 feet in length.

2.6.2 Grounding Conductors

Grounding conductors shall be bare, except where installed in conduit with associated phase conductors. Insulated conductors shall be of the same material as phase conductors and green color-coded, except that conductors shall be rated no more than 600 volts. Bare conductors shall be **ASTM B 8** soft-drawn unless otherwise indicated. Aluminum is not acceptable.

3 EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

Equipment and devices shall be installed and energized in accordance with the manufacturer's published instructions. Steel conduits installed underground shall be installed and protected from corrosion in conformance with the requirements of Section **16415** ELECTRICAL WORK, INTERIOR. Except as covered herein, excavation, trenching, and backfilling shall conform to the requirements of Section **02222** EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS.

3.1.1 Conformance to Codes

The installation shall comply with the requirements and recommendations of **NFPA 70** and **IEEE C2** as applicable.

3.1.2 Verification of Dimensions

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

3.1.3 Cable Installation Plan and Procedure

Cable shall be installed strictly in accordance with the cable manufacturer's recommendations.

3.1.3.1 Trenching

Trenches for direct-burial cables shall be excavated to depths required to provide the minimum necessary cable cover. Bottoms of trenches shall be smooth and free of stones and sharp objects. Where bottoms of trenches comprise materials other than sand, a 3 inch layer of sand shall be laid first and compacted to approximate densities of surrounding firm soil.

3.2 CONNECTIONS TO BUILDINGS

Cables shall be extended into the various buildings as indicated, and shall be connected to the first applicable termination point in each building. Interfacing with building interior conduit systems shall be at conduit stubouts terminating 5 feet outside of a building and 2 feet below finished grade as specified and provided under Section 16415 ELECTRICAL WORK, INTERIOR. After installation of cables, conduits shall be sealed with caulking compound to prevent entrance of moisture or gases into buildings.

3.2.1 Grounding Electrodes

Grounding electrodes shall be installed as shown on the drawings and as follows:

- a. Driven rod electrodes - Unless otherwise indicated, ground rods shall be driven into the earth until the tops of the rods are approximately 1 foot below finished grade.

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3.2.2 Grounding and Bonding Connections

Connections above grade shall be made by the fusion-welding process or with bolted solderless connectors, in compliance with UL 467, and those below grade shall be made by a fusion-welding process.

3.2.3 Grounding and Bonding Conductors

Grounding and bonding conductors include conductors used to bond transformer enclosures and equipment frames to the grounding electrode system. Grounding and bonding conductors shall be sized as shown, and located to provide maximum physical protection. Bends greater than 45 degrees in ground conductors are not permitted. Routing of ground conductors through concrete shall be avoided. When concrete penetration is necessary, nonmetallic conduit shall be cast flush with the points of concrete entrance and exit so as to provide an opening for the ground conductor, and the opening shall be sealed with a suitable compound after installation.

3.3 FIELD TESTING

3.3.1 General

Field testing shall be performed in the presence of the Contracting Officer if requested. The Contractor shall notify the Contracting Officer 15 days prior to conducting tests. The Contractor shall furnish all materials, labor, and equipment necessary to conduct field tests. The Contractor shall perform all tests and inspections recommended by the manufacturer unless specifically waived by the Contracting Officer. The Contractor shall maintain a written record of all tests which includes date, test performed, personnel involved, devices tested, serial number and name of test equipment, and test results. Field test reports shall be signed and dated by the Contractor.

3.3.2 Safety

The Contractor shall provide and use safety devices such as rubber gloves, protective barriers, and danger signs to protect and warn personnel in the test vicinity. The Contractor shall replace any devices or equipment which are damaged due to improper test procedures or handling.

3.3.3 Low-Voltage Cable Test

Low-voltage cable, complete with splices, shall be tested for insulation resistance after the cables are installed, in their final configuration, ready for connection to the equipment, and prior to energization. The test voltage shall be 500 volts dc, applied for one minute between each conductor and ground and between all possible combinations conductors in the same trench, duct, or cable, with all other conductors in the same trench, duct, or conduit. The minimum value of insulation shall be:

R in megohms = (rated voltage in kV + 1) x 1000/(length of cable in feet)

Each cable failing this test shall be repaired or replaced. The repaired cable shall be retested until failures have been eliminated.

3.4 ACCEPTANCE

Final acceptance of the facility will not be given until the Contractor has successfully completed all tests and after all defects in installation, material or operation have been corrected.

END OF SECTION

SECTION 16415

ELECTRICAL WORK, INTERIOR

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

- ANSI C82.1 (1985; C82.1a; C82.1b; C82.1c; C82.1d; C82.1e; R 1992) Specifications for Fluorescent Lamp Ballasts
- ANSI C82.4 (1992) Ballasts for High-Intensity-Discharge and Low-Pressure Sodium Lamps (Multiple-Supply Type)

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- ASTM D 709 (1992; R 1997) Laminated Thermosetting Materials
- ASTM B 1 (1995) Hard-Drawn Copper Wire
- ASTM B 8 (1995) Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

- IEEE C2 (1997) National Electrical Safety Code
- IEEE ANSI/IEEE C37.13 (1990; R 1995) Low-Voltage AC Power Circuit Breakers Used in Enclosures
- IEEE C62.41 (1991; R 1995) Surge Voltages in Low-Voltage AC Power Circuits

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

- NEMA 250 (1991) Enclosures for Electrical Equipment (1000 Volts Maximum)
- NEMA AB 1 (1993) Molded Case Circuit Breakers and Molded Case Switches
- NEMA OS 1 (1989) Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports
- NEMA PB 1 (1990) Panelboards

| | |
|---|---|
| NEMA RN 1 | (1989) Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit |
| NEMA TC 2 | (1990) Electrical Polyvinyl Chloride (PVC) Tubing (EPT) and Conduit (EPC-40 and EPC-80) |
| NEMA TC 13 | (1993) Electrical Nonmetallic Tubing (ENT) |
| NEMA WD 1 | (1983; R 1989) General Requirements for Wiring Devices |
| NEMA WD 6 | (1988) Wiring Devices - Dimensional Requirements |
| NATIONAL FIRE PROTECTION ASSOCIATION (NFPA) | |
| NFPA 70 | (1996; Errata 96-4) National Electrical Code |
| NFPA 101 | (1997; Errata 97-1) Life Safety Code |
| UNDERWRITERS LABORATORIES (UL) | |
| UL 1 | (1993; Rev thru Jan 1995) Flexible Metal Conduit |
| UL 6 | (1997) Rigid Metal Conduit |
| UL 20 | (1995; Rev thru Jan 1998) General-Use Snap Switches |
| UL 44 | (1997; Rev Aug 1997) Thermoset-Insulated Wires and Cables |
| UL 50 | (1995; Rev thru Oct 1997) Enclosures for Electrical Equipment |
| UL 67 | (1993; Rev thru Nov 1995) Panelboards |
| UL 83 | (1996; Rev Sep 1997) Thermoplastic-Insulated Wires and Cables |
| UL 98 | (1994; R thru Oct 1995) Enclosed and Dead-Front Switches |
| UL 198G | (1988; Rev May 1988) Fuses for Supplementary Overcurrent Protection |
| UL 360 | (1996; Rev thru Oct 1997) Liquid-Tight Flexible Steel Conduit |
| UL 467 | (1993; Rev thru Aug 1996) Grounding and Bonding Equipment |
| UL 486A | (1997) Wire Connectors and Soldering Lugs for Use with Copper Conductors |

UL 486C (1997) Splicing Wire Connectors

UL 486E (1994; Rev thru Feb 1997) Equipment Wiring Terminals for Use with Aluminum and/or Copper Conductors

UL 489 (1996; Rev thru Nov 1997) Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures

UL 498 (1996; Rev thru Nov 1997) Attachment Plugs and Receptacles

UL 510 (1994; Rev thru Nov 1997) Insulating Tape

UL 512 (1993; R Dec 1995) Fuseholders

UL 514A (1996) Metallic Outlet Boxes

UL 514B (1997) Fittings for Conduit and Outlet Boxes

UL 542 (1994; Rev May 1997) Lampholders, Starters, and Starter Holders for Fluorescent Lamps

UL 651 (1995; Rev thru Apr 1997) Schedule 40 and 80 Rigid PVC Conduit

UL 651A (1995; Rev Sep 1996) Type EB and A Rigid PVC Conduit and HDPE Conduit

UL 797 (1993; Rev thru Mar 1997) Electrical Metallic Tubing

UL 854 (1996)</CHG> Service-Entrance Cables

UL 869A (1993; Rev thru Apr 1996) Reference Standard for Service Equipment

UL 935 (1995; Rev thru Apr 1997)Fluorescent-Lamp Ballasts

UL 943 (1993; Rev thru Mar 1997)Ground-Fault Circuit-Interrupters

UL 1010 (1995; Rev thru Dec 1996)Receptacle-Plug Combinations for Use in Hazardous (Classified) Locations

UL 1029 (1994; Rev thru Sep 1995) High-Intensity-Discharge Lamp Ballasts

UL 1242 (1996; Rev Apr 1997) Intermediate Metal Conduit

UL 1570 (1995; Rev thru Jun 1997) Fluorescent Lighting Fixtures

UL 1571 (1995; Rev thru Jun 97) Incandescent Lighting Fixtures

UL 1572 (1995; Rev thru Jun 97) High Intensity Discharge Lighting Fixtures

1.2 GENERAL

1.2.1 Rules

The installation shall conform to the requirements of NFPA 70 and NFPA 101, unless more stringent requirements are indicated or shown.

1.2.2 Coordination

The drawings indicate the extent and the general location and arrangement of equipment, conduit, and wiring. The Contractor shall become familiar with all details of the work and verify all dimensions in the field so that the outlets and equipment shall be properly located and readily accessible. Lighting fixtures, outlets, and other equipment and materials shall be located to avoid interference with mechanical or structural features; otherwise, lighting fixtures shall be symmetrically located according to the room arrangement when uniform illumination is required, or asymmetrically located to suit conditions fixed by design and shown. Raceways, junction and outlet boxes, and lighting fixtures shall not be supported from sheet metal roof decks. If any conflicts occur necessitating departures from the drawings, details of and reasons for departures shall be submitted and approved prior to implementing any change. The Contractor shall coordinate electrical work with the HVAC and electrical drawings and specifications and provide power related wiring.

1.2.3 Special Environments

1.2.3.1 Weatherproof Locations

Wiring, Fixtures, and equipment in designated locations shall conform to NFPA 70 requirements for installation in damp or wet locations.

1.2.3.2 Ducts, Plenums and Other Air-Handling Spaces

Wiring and equipment in ducts, plenums and other air-handling spaces shall be installed using materials and methods in conformance with NFPA 70 unless more stringent requirements are indicated in this specification or on the contract drawings.

1.2.4 Standard Products

Material and equipment shall be a standard product of a manufacturer regularly engaged in the manufacture of the product and shall essentially duplicate items that have been in satisfactory use for at least 2 years prior to bid opening.

1.2.5 NAMEPLATES

1.2.5.1 Identification Nameplates

Major items of electrical equipment and major components shall be permanently marked with an identification name to identify the equipment by type or function and specific unit number as indicated. Unless otherwise specified, identification nameplates shall be made of laminated plastic in accordance with ASTM D 709 with black outer layers and a white core. Edges shall be chamfered. Plates shall be fastened with black-finished round-head drive screws, except motors, or approved nonadhesive metal fasteners. When the nameplate is to be installed on an irregular-shaped object, the Contractor shall devise an approved support suitable for the application and ensure the proper installation of the supports and nameplates. In all instances, the nameplate shall be installed in a conspicuous location. At the option of the Contractor, the equipment manufacturer's standard embossed nameplate material with black paint-filled letters may be furnished in lieu of laminated plastic. The front of each panelboard shall have a nameplate to indicate the phase letter, corresponding color and arrangement of the phase conductors. The following equipment, as a minimum, shall be provided with identification nameplates:

Minimum 1/4 inch

High Letters

Minimum 1/8 inch

High Letters

Panelboards
Safety Switches
Transformers
Equipment Enclosures
Motors

1.2.6 As-Built Drawings

Following the project completion or turnover, within 30 days the Contractor shall furnish 2 sets of as-built drawings to the Contracting Officer.

1.3 SUBMITTALS

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

SD-01 Data

Manufacturer's Catalog.

Data composed of catalog cuts, brochures, circulars, specifications, product data, and printed information in sufficient detail and scope to verify compliance with the requirements of the contract documents.

Material, Equipment, and Fixture Lists.

A complete itemized listing of equipment and materials proposed for incorporation into the work. Each entry shall include an item number, the quantity of items proposed, and the name of the manufacturer of each item.

Interior Electrical Equipment.

Detail drawings consisting of equipment drawings, illustrations, schedules, instructions, diagrams, and other information necessary to define the installation. Detail drawings shall show the rating of items and systems and how the components of an item and system are assembled, function together, and how they will be installed on the project. Data and drawings for component parts of an item or system shall be coordinated and submitted as a unit. Data and drawings shall be coordinated and included in a single submission. Multiple submissions for the same equipment or system are not acceptable except where prior approval has been obtained from the Contracting Officer. In such cases, a list of data to be submitted later shall be included with the first submission. Detail drawings shall show physical arrangement, construction details, connections, finishes, materials used in fabrication, provisions for conduit entrance, access requirements for installation and maintenance, physical size, electrical characteristics, foundation and support details, and equipment weight. Drawings shall be drawn to scale and/or dimensioned.

Structural drawings showing the structural or physical features of major equipment items, components, assemblies, and structures, including foundations or other types of supports for equipment and conductors. These drawings shall include accurately scaled or dimensioned outline and arrangement or layout drawings to show the physical size of equipment and components and the relative arrangement and physical connection of related components. Weights of equipment, components and assemblies shall be provided when required to verify the adequacy of design and proposed construction of foundations or other types of supports. Dynamic forces shall be stated for switching devices when such forces must be considered in the design of support structures. The appropriate detail drawings shall show the provisions for leveling, anchoring, and connecting all items during installation, and shall include any recommendations made by the manufacturer.

Electrical drawings including single-line and three-line diagrams, and schematics or elementary diagrams of each electrical system; internal wiring and field connection diagrams of each electrical device when published by the manufacturer; wiring diagrams of cabinets, panels, units, or separate mountings; interconnection diagrams that show the wiring between separate components of assemblies; field connection diagrams that show the termination of wiring routed between separate items of equipment; internal wiring diagrams of equipment showing wiring as actually provided for this project. Field wiring connections shall be clearly identified.

If departures from the contract drawings are deemed necessary by the Contractor, complete details of such departures, including changes in related portions of the project and the reasons why, shall be submitted with the detail drawings. Approved departures shall be made at no additional cost to the Government.

As-Built Drawings.

The as-built drawings shall be a record of the construction as installed. The drawings shall include all the information shown on the contract drawings, deviations, modifications, and changes from the contract drawings, however minor. The as-built drawings shall be kept at the job site and updated daily. The as-built drawings shall be a full-sized set of prints

marked to reflect all deviations, changes, and modifications. The as-built drawings shall be complete and show the location, size, dimensions, part identification, and other information. Additional sheets may be added. Upon completion of the work, the Contractor shall submit three full sized sets of the marked prints to the Contracting Officer for approval. If upon review, the as-built drawings are found to contain errors and/or omissions, they will be returned to the Contractor for correction. The Contractor shall correct and return the as-built drawings to the Contracting Officer for approval within ten calendar days from the time the drawings are returned to the Contractor.

SD-08 Statements

Onsite Test.

A detailed description of the Contractor's proposed procedures for on-site tests.

SD-09 Reports

Materials and Equipment;

The label or listing of the Underwriters Laboratories, Inc., will be accepted as evidence that the materials or equipment conform to the applicable standards of that agency. In lieu of this label or listing, a statement from a nationally recognized, adequately equipped testing agency indicating that the items have been tested in accordance with required procedures and that the materials and equipment comply with all contract requirements will be accepted. Items which are required to be listed and labeled in accordance with Underwriters Laboratories must be affixed with a UL label that states that it is UL listed. No exceptions or waivers will be granted to this requirement. Materials and equipment will be approved based on the manufacturer's published data.

For other than equipment and materials specified to conform to UL publications, a manufacturer's statement indicating complete compliance with the applicable standard of the American Society for Testing and Materials, National Electrical Manufacturers Association, or other commercial standard, is acceptable.

1.4 WORKMANSHIP

Materials and equipment shall be installed in accordance with [NFPA 70](#), recommendations of the manufacturer, and as shown.

PART 2 PRODUCTS

Products shall conform to the respective publications and other requirements specified below. Materials and equipment not listed below shall be as specified elsewhere in this section. Items of the same classification shall be identical including equipment, assemblies, parts, and components.

2.1 CABLES AND WIRES

Conductors No. 8 AWG and larger diameter shall be stranded. Conductors No. 10 AWG and smaller diameter shall be solid, except that conductors for remote control, alarm, and signal circuits, classes 1, 2, and 3, shall be

stranded unless specifically indicated otherwise. Conductor sizes and ampacities shown are based on copper, unless indicated otherwise. All conductors shall be copper.

2.1.1 Equipment Manufacturer Requirements

When manufacturer's equipment requires copper conductors at the terminations or requires copper conductors to be provided between components of equipment, provide copper conductors or splices, splice boxes, and other work required to meet manufacturer's requirements.

2.1.2 Insulation

Unless indicated otherwise, or required by **NFPA 70**, power and lighting wires shall be 600-volt, Type THWN or THHN. Where lighting fixtures require 90-degree Centigrade (C) conductors, provide only conductors with 90-degree C insulation or better.

2.1.3 Bonding Conductors

ASTM B 1, solid bare copper wire for sizes No. 8 AWG and smaller diameter; **ASTM B 8**, Class B, stranded bare copper wire for sizes No. 6 AWG and larger diameter.

2.1.4 Service Entrance Cables

Service entrance (SE) and underground service entrance (USE) cables, **UL 854**.

2.2 CIRCUIT BREAKERS

2.2.1 MOLDED-CASE CIRCUIT BREAKERS

Circuit breakers may be installed in panelboards.

2.2.1.1 Construction

Circuit breakers shall be suitable for mounting and operating in any position. Lug shall be listed for copper conductors only in accordance with **UL 486E**. Single-pole circuit breakers shall be full module size with not more than one pole per module. Multi-pole circuit breakers shall be of the common-trip type having a single operating handle such that an overload or short circuit on any one pole will result in all poles opening simultaneously. Sizes of 100 amperes or less may consist of single-pole breakers permanently factory assembled into a multi-pole unit having an internal, mechanical, nontamperable common-trip mechanism and external handle ties. All circuit breakers shall have a quick-make, quick-break overcenter toggle-type mechanism, and the handle mechanism shall be trip-free to prevent holding the contacts closed against a short-circuit or sustained overload. All circuit breaker handles shall assume a position between "ON" and "OFF" when tripped automatically. All ratings shall be clearly visible.

2.2.1.2 Ratings

Voltage ratings shall be not less than the applicable circuit voltage. The interrupting rating of the circuit breakers shall be at least equal to the available short-circuit current at the line terminals of the circuit breaker

and correspond to the UL listed integrated short-circuit current rating specified for the panelboards and switchboards. Molded-case circuit breakers shall have nominal voltage ratings, maximum continuous-current ratings, and maximum short-circuit interrupting ratings in accordance with NEMA AB 1.

2.2.1.3 Thermal-Magnetic Trip Elements

Thermal magnetic circuit breakers shall be provided as shown. Automatic operation shall be obtained by means of thermal-magnetic tripping devices located in each pole providing inverse time delay and instantaneous circuit protection.

2.2.2 HACR Circuit Breakers

Circuit breakers 60 amperes or below, 240 volts, 1-pole or 2-pole, intended to protect multi-motor and combination-load installations involved in heating, air conditioning, and refrigerating equipment shall be marked "Listed HACR Type."

2.3 CONDUIT AND TUBING

2.3.1 Electrical, Zinc-Coated Steel Metallic Tubing (EMT)

UL 797

2.3.2 Flexible Conduit, Steel and Plastic

General-purpose type, UL 1; liquid tight, UL 360.

2.3.3 Intermediate Metal Conduit

UL 1242.

2.3.4 PVC Coated Rigid Steel Conduit

NEMA RN 1.

2.3.5 Rigid Metal Conduit

UL 6.

2.4 CONDUIT AND DEVICE BOXES AND FITTINGS

2.4.1 Boxes, Metallic Outlet

NEMA OS 1 and UL 514C.

2.4.2 Boxes, Nonmetallic, Outlet and Flush-Device Boxes and Covers

NEMA OS 2.

2.4.3 Boxes, Switch (Enclosed), Surface-Mounted

UL 98.

2.4.5 Fittings for Conduit and Outlet Boxes

UL 514B.

2.4.6 Fittings, PVC, for Use with Rigid PVC Conduit and Tubing

UL 514B.

2.5 CONDUIT COATINGS PLASTIC RESIN SYSTEM

NEMA RN 1, Type A-40.

2.6 CONNECTORS, WIRE PRESSURE

2.6.1 For Use With Copper Conductors

UL 486A.

2.7 ELECTRICAL GROUNDING AND BONDING EQUIPMENT

UL 467.

2.7.2 Cabinets and Boxes

Cabinets and boxes with volume greater than 100 cubic inches shall be in accordance with UL 50, hot-dip, zinc-coated, if sheet steel.

2.7.2 Circuit Breaker Enclosures

UL 489.

2.8 FIXTURES, LIGHTING AND FIXTURE ACCESSORIES/COMPONENTS

Fixtures, accessories and components, including ballasts, lampholders, lamps, starters and starter holders, shall conform to industry standards specified below.

2.8.1 Incandescent Fixture

UL 1571.

2.8.2 Compact Fluorescent

Furnish as specified on drawings.

2.8.3 High-Intensity-Discharge

- a. Fixture: Per UL 1572 and as specified in fixture schedule.
- b. Ballasts: ANSI C82.4 for multiple supply types and UL 1029.

2.9 LOW-VOLTAGE FUSES AND FUSEHOLDERS

2.9.1 Fuses for Supplementary Overcurrent Protection

UL 198G.

2.9.2 Fuseholders

UL 512.

2.10 PANELBOARDS

Dead-front construction, NEMA PB 1 and UL 67.

2.11 RECEPTACLES

2.11.1 Standard Grade

UL 498.

2.11.2 Ground Fault Interrupters

UL 943, Class A or B.

2.11.3 NEMA Standard Receptacle Configurations

NEMA WD 6.

- a. Duplex, 20-Ampere, 125 Volt, non-locking, NEMA type 5-20R.
- b. 30-Ampere, 250 Volt

Two-pole, 3-wire grounding, non-locking: NEMA type 6-30R.

2.12 SERVICE ENTRANCE EQUIPMENT

UL 869A.

2.13 SPLICE, CONDUCTOR

UL 486C.

2.14 Circuit Breakers

Circuit breakers shall be molded-case circuit breakers.

2.15 SNAP SWITCHES

UL 20.

2.16 WIRING DEVICES

NEMA WD 1 for wiring devices, and NEMA WD 6 for dimensional requirements of wiring devices.

PART 3 EXECUTION

3.1 GROUNDING

Grounding shall be in conformance with NFPA 70, the contract drawings, and the following specifications.

3.1.1 Ground Bus

Noncurrent-carrying metal parts of transformer neutrals and other electrical equipment shall be effectively grounded by bonding to the ground bus. The ground bus shall be bonded to both the entrance ground, and to a ground rod or rods as specified above having the upper ends terminating approximately 4 inches above the floor. Connections and splices shall be of the brazed, welded, bolted, or pressure-connector type, except that pressure connectors or bolted connections shall be used for connections to removable equipment.

3.1.2 Grounding Conductors

Equipment grounding bars shall be provided in all panelboards. The equipment grounding conductor shall be carried back to the service entrance grounding connection or separately derived grounding connection. All equipment grounding conductors, including metallic raceway systems used as such, shall be bonded or joined together in each wiring box or equipment enclosure. Metallic raceways and grounding conductors shall be checked to assure that they are wired or bonded into a common junction. Metallic boxes and enclosures, if used, shall also be bonded to these grounding conductors by an approved means per NFPA 70. When boxes for receptacles, switches, or other utilization devices are installed, any designated grounding terminal on these devices shall also be bonded to the equipment grounding conductor junction with a short jumper.

3.2 WIRING METHODS

Wiring shall conform to NFPA 70, the contract drawings, and the following specifications. Unless otherwise indicated, wiring shall consist of insulated conductors installed in rigid zinc-coated steel conduit. Wire fill in conduits shall be based on NFPA 70 for the type of conduit and wire insulations specified.

3.2.1 Conduit and Tubing Systems

Conduit and tubing systems shall be installed as indicated. Conduit sizes shown are based on use of copper conductors with insulation types as described in paragraph WIRING METHODS. Minimum size of raceways shall be 1/2 inch. Only metal conduits will be permitted when conduits are required for shielding or other special purposes indicated, or when required by conformance to NFPA 70. Electrical metallic tubing (EMT) may be installed only within buildings. EMT may be installed in concrete and grout in dry locations. EMT installed in concrete or grout shall be provided with concrete tight fittings. EMT shall not be installed in damp or wet locations, or the air space of exterior masonry cavity walls. Bushings, manufactured fittings or boxes providing equivalent means of protection shall be installed on the ends of all conduits and shall be of the insulating type, where required by NFPA 70. Only UL listed adapters shall be used to connect EMT to rigid metal conduit, cast boxes, and conduit bodies. Except as otherwise specified, IMC may be used as an option for rigid steel conduit in areas as permitted by NFPA 70. Raceways shall not be installed under the firepits of boilers and furnaces and shall be kept 6 inches away from parallel runs of flues, steam pipes and hot-water pipes. Raceways shall be concealed within finished walls, ceilings, and floors unless otherwise shown. All bends in conduit used for fiber optic cabling shall have a minimum 12" bending radius.

3.2.1.1 Pull Wires

A pull wire shall be inserted in each empty raceway in which wiring is to be installed if the raceway is more than 50 feet in length and contains more than the equivalent of two 90-degree bends, or where the raceway is more than 150 feet in length. The pull wire shall be of No. 14 AWG zinc-coated steel, or of plastic having not less than 200 pounds per square inch tensile strength. Not less than 10 inches of slack shall be left at each end of the pull wire.

3.2.1.2 Conduit Stub-Ups

Where conduits are to be stubbed up through concrete floors, a short elbow shall be installed below grade to transition from the horizontal run of conduit to a vertical run. A conduit coupling fitting, threaded on the inside shall be installed, to allow terminating the conduit flush with the finished floor. Wiring shall be extended in rigid threaded conduit to equipment, except that where required, flexible conduit may be used 150 mm 6 inches above the floor. Empty or spare conduit stub-ups shall be plugged flush with the finished floor with a threaded, recessed plug.

3.2.1.3 Changes in Direction of Runs

Changes in direction of runs shall be made with symmetrical bends or cast-metal fittings. Field-made bends and offsets shall be made with an approved hickey or conduit-bending machine. Crushed or deformed raceways shall not be installed. Trapped raceways in damp and wet locations shall be avoided where possible. Lodgment of plaster, dirt, or trash in raceways, boxes, fittings and equipment shall be prevented during the course of construction. Clogged raceways shall be cleared of obstructions or shall be replaced.

3.2.1.4 Supports

Metallic conduits and tubing, and the support system to which they are attached, shall be securely and rigidly fastened in place to prevent vertical and horizontal movement at intervals of not more than 3 meters (10 feet) and within 900 mm (3 feet) of boxes, cabinets, and fittings, with approved pipe straps, wall brackets, conduit clamps, conduit hangers, threaded C-clamps, beam clamps, or ceiling trapeze. Loads and supports shall be coordinated with supporting structure to prevent damage or deformation to the structure. Loads shall not be applied to joist bridging. Attachment shall be by wood screws or screw-type nails to wood; by toggle bolts on hollow masonry units; by expansion bolts on concrete or brick. Holes drilled for support anchors, but not used, shall be filled. Raceways shall not be supported using wire or nylon ties. Raceways shall be independently supported from the structure. Upper raceways shall not be used as a means of support for lower raceways. Supporting means shall not be shared between electrical raceways and mechanical piping or ducts. Conduits shall be fastened to sheet-metal boxes and cabinets with two locknuts where required by NFPA 70, where insulating bushings are used, and where bushings cannot be brought into firm contact with the box; otherwise, a single locknut and bushing may be used. Threadless fittings for electrical metallic tubing shall be of a type approved for the conditions encountered. Additional support for horizontal runs is not required when EMT rests on steel stud cutouts.

3.2.1.5 Exposed Raceways

Exposed raceways shall be installed parallel or perpendicular to walls, structural members, or intersections of vertical planes and ceilings.

3.2.2 Cables and Conductors

Installation shall conform to the requirements of **NFPA 70**.

3.2.2.1 Sizing

Unless otherwise noted, all sizes are based on copper conductors and the insulation types indicated. Sizes shall be not less than indicated. Branch-circuit conductors shall be not smaller than No. 12 AWG. Conductors for branch circuits of 120 volts more than 100 feet long from panel to load center, shall be no smaller than No. 10 AWG.

3.2.2.2 Use of Aluminum Conductors in Lieu of Copper

Aluminum conductors shall not be used.

3.2.2.3 Cable Splicing

Splices shall be made in an accessible location. Crimping tools and dies shall be approved by the connector manufacturer for use with the type of connector and conductor.

- a. Copper Conductors, 600 Volt and Under: Splices in conductors No. 10 AWG and smaller diameter shall be made with an insulated, pressure-type connector. Splices in conductors No. 8 AWG and larger diameter shall be made with a solderless connector and insulated with tape or heat-shrink type insulating material equivalent to the conductor insulation.

3.2.2.4 Conductor Identification and Tagging

Power, control, and signal circuit conductor identification shall be provided within each enclosure where a tap, splice, or termination is made. Where several feeders pass through a common pull box, the feeders shall be tagged to indicate clearly the electrical characteristics, circuit number, and panel designation. Phase conductors of low voltage power circuits shall be identified by color coding. Phase identification by a particular color shall be maintained continuously for the length of a circuit, including junctions.

- a. Color coding shall be provided for service, feeder, branch, and ground conductors. Color shall be green for grounding conductors and white for neutrals; except where neutrals of more than one system are installed in the same raceway or box, other neutral shall be white with colored (not green) stripe. The color coding for single-phase low voltage systems shall be as follows:

120/240-volt, 1-phase: Black and red.

- b. Conductor phase and voltage identification shall be made by color-coded insulation for all conductors smaller than No. 6 AWG. For conductors No. 6 AWG and larger, identification shall be made by

color-coded insulation, or conductors with black insulation may be furnished and identified by the use of half-lapped bands of colored electrical tape wrapped around the insulation for a minimum of **75 mm 3 inches** of length near the end, or other method as submitted by the Contractor and approved by the Contracting Officer.

- c. Control and signal circuit conductor identification shall be made by color-coded insulated conductors, plastic-coated self-sticking printed markers, permanently attached stamped metal foil markers, or equivalent means as approved. Control circuit terminals of equipment shall be properly identified. Terminal and conductor identification shall match that shown on approved detail drawings. Hand lettering or marking is not acceptable.

3.3 BOXES AND SUPPORTS

Boxes shall be provided in the wiring or raceway systems where required by **NFPA 70** for pulling of wires, making connections, and mounting of devices or fixtures. Pull boxes shall be furnished with screw-fastened covers. Indicated elevations are approximate, except where minimum mounting heights are required by **NFPA 70**. Unless otherwise indicated, boxes for wall switches shall be mounted **48 inches** above finished floors.

3.3.1 Box Applications

Each box shall have not less than the volume required by **NFPA 70** for number of conductors enclosed in box. Boxes for metallic raceways, **4 by 4 inch** nominal size and smaller, shall be of the cast-metal hub type when located in normally wet locations, when flush and surface mounted on outside of exterior surfaces. Cast-metal boxes installed in wet locations and boxes installed flush with the outside of exterior surfaces shall be gasketed. Boxes for mounting lighting fixtures shall be not less than **4 inches** square, or octagonal, except smaller boxes may be installed as required by fixture configuration, as approved. Cast-metal boxes with **3/32 inch** wall thickness are acceptable. Large size boxes shall be NEMA 1, 3R or as shown. Boxes in other locations shall be sheet steel. Boxes for use in masonry-block or tile walls shall be square-cornered, tile-type, or standard boxes having square-cornered, tile-type covers.

3.3.2 Brackets and Fasteners

Boxes and supports shall be fastened to wood with wood screws or screw-type nails of equal holding strength, with bolts and metal expansion shields on concrete or brick, with toggle bolts on hollow masonry units, and with machine screw or welded studs on steel work. Threaded studs driven in by powder charge and provided with lockwashers and nuts, or nail-type nylon anchors may be used in lieu of expansion shields, or machine screws. Penetration of more than **1-1/2 inches** into reinforced-concrete beams or more than **3/4 inch** into reinforced-concrete joists shall avoid cutting any main reinforcing steel. The use of brackets which depend on gypsum wallboard or plasterboard for primary support will not be permitted. In partitions of light steel construction, bar hangers with **1 inch** long studs, mounted between metal wall studs or metal box mounting brackets shall be used to secure boxes to the building structure. When metal box mounting brackets are used, additional box support shall be provided on the side of the box opposite the brackets. This additional box support shall consist of a minimum **12 inch** long section of wall stud, bracketed to the opposite side of

the box and secured by two screws through the wallboard on each side of the stud. Metal screws may be used in lieu of the metal box mounting brackets.

3.3.3 Mounting in Walls, Ceilings, or Recessed Locations

In walls or ceilings of concrete, tile, or other non-combustible material, boxes shall be installed so that the edge of the box is not recessed more than 1/4 inch from the finished surface. Boxes mounted in combustible walls or ceiling material shall be mounted flush with the finished surface. The use of gypsum or plasterboard as a means of supporting boxes will not be permitted. Boxes installed for concealed wiring shall be provided with suitable extension rings or plaster covers, as required. The bottom of boxes installed in masonry-block walls for concealed wiring shall be mounted flush with the top of a block to minimize cutting of the blocks, and boxes shall be located horizontally to avoid cutting webs of block. Separate boxes shall be provided for flush or recessed fixtures when required by the fixture terminal operating temperature, and fixtures shall be readily removable for access to the boxes unless ceiling access panels are provided.

3.3.4 Installation in Overhead Spaces

In open overhead spaces, cast-metal boxes threaded to raceways need not be separately supported except where used for fixture support; cast-metal boxes having threadless connectors and sheet metal boxes shall be supported directly from the building structure or by bar hangers. Hangers shall not be fastened to or supported from joist bridging. Where bar hangers are used, the bar shall be attached to raceways on opposite sides of the box and the raceway shall be supported with an approved type fastener not more than 24 inches from the box.

3.4 DEVICE PLATES

One-piece type device plates shall be provided for all outlets and fittings. Plates on unfinished walls and on fittings shall be of zinc-coated sheet steel, cast-metal, or impact resistant plastic having rounded or beveled edges. Plates on finished walls shall be of with baked enamel finish or impact-resistant plastic and shall be of the color type to match existing. Screws shall be of metal with countersunk heads, in a color to match the finish of the plate. Plates shall be installed with all four edges in continuous contact with finished wall surfaces without the use of mats or similar devices. Plaster fillings will not be permitted. Plates shall be installed with an alignment tolerance of 1/16 inch. The use of sectional-type device plates will not be permitted. Plates installed in wet locations shall be gasketed and provided with a hinged, gasketed cover, unless otherwise specified.

3.5 RECEPTACLES

3.5.1 Duplex, 20-ampere, 125 volt

Duplex receptacles shall be rated 20 amperes, 125 volts, two-pole, three-wire, grounding type with polarized parallel slots. Bodies shall be of type and color to match color of switch handles in the same room or to harmonize with the color of the respective wall, and supported by mounting strap having plaster ears. Contact arrangement shall be such that contact is made on two sides of an inserted blade. Receptacle shall be side- or back-wired with two screws per terminal. The third grounding pole shall be connected

to the metal mounting yoke. Switched receptacles shall be the same as other receptacles specified except that the ungrounded pole of each suitable receptacle shall be provided with a separate terminal. Only the top receptacle of a duplex receptacle shall be wired for switching application. Receptacles with ground fault circuit interrupters shall have the current rating as indicated, and shall be UL Class A type unless otherwise shown. Ground fault circuit protection shall be provided as required by NFPA 70 and as indicated on the drawings.

3.5.2 Weatherproof Applications

Weatherproof receptacles shall be suitable for the environment, damp or wet as applicable, and the housings shall be labeled to identify the allowable use. Receptacles shall be marked in accordance with UL 514A for the type of use indicated; "Damp locations", "Wet Locations", "Wet Location Only When Cover Closed". Assemblies shall be installed in accordance with the manufacturer's recommendations.

3.5.2.1 Damp Locations

Receptacles in damp locations shall be mounted in an outlet box with a gasketed, weatherproof, cast-metal device plate and a gasketed cap hood, receptacle cover. The cap shall be either a screw-on type permanently attached to the cover plate by a short length of bead chain or shall be a flap type attached to the cover with a spring loaded hinge.

3.5.2.2 Wet Locations

Receptacles in wet locations shall be installed in an assembly rated for such use whether the plug is inserted or withdrawn, unless otherwise indicated. In a duplex installation, the receptacle cover shall be configured to shield the connections whether one or both receptacles are in use.

3.5.3 Receptacles, 30-Ampere, 125/250-Volt

Receptacles, single, 30-ampere, 125/250-volt, shall be molded-plastic, three-pole, four-wire, grounding type, complete with appropriate mating cord-grip type attachment plug. Each dryer receptacle shall be furnished with a non-detachable power supply cord for connection to the electric clothes dryer. The cord shall be an angle-type 900 mm 36 inch length of Type SRD range and dryer cable with three No. 10 AWG conductors.

3.5.4 Receptacles, 30-Ampere, 250-Volt

Receptacles, single, 30-ampere, 250-volt, shall be molded-plastic, three-pole, three-wire type, complete with appropriate mating cord-grip plug.

3.6 WALL SWITCHES

Wall switches shall be of the totally enclosed tumbler type. The wall switch handle and switch plate color shall be of the color to match existing within the same room. Wiring terminals shall be of the screw type or of the solderless pressure type having suitable conductor-release arrangement. Not more than two switches shall be installed in a single-gang position. Switches shall be rated 20-ampere 120-volt for use on alternating current only.

3.7 SERVICE EQUIPMENT

Service-disconnecting means shall be of the enclosed molded-case circuit breaker type. When service disconnecting means is a part of an assembly, the assembly shall be listed as suitable for service entrance equipment. Enclosures shall be sheet metal with hinged cover for surface mounting unless otherwise indicated.

3.8 PANELBOARDS AND LOADCENTERS

Circuit breakers and switches used as a motor disconnecting means shall be capable of being locked in the open position. Door locks shall be keyed alike. Nameplates shall be as approved. Directories shall be typed to indicate loads served by each circuit and mounted in a holder behind a clear protective covering. Busses shall be copper.

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3.9 FUSES DELETED

3.9.1 Continuous Current Ratings (600 Amperes and Smaller) DELETED

3.10 UNDERGROUND SERVICE

Unless otherwise indicated, interior conduit systems shall be stubbed out 5 feet beyond the building wall and 2 feet below finished grade, for interface with the exterior service lateral conduits. Outside conduit ends shall be bushed when used for direct burial service lateral conductors. Outside conduit ends shall be capped or plugged until connected to exterior conduit systems. Underground service lateral conductors will be extended to building service entrance and terminated in accordance with the requirements of Section 16375 ELECTRICAL DISTRIBUTION SYSTEM, UNDERGROUND and NFPA 70.

3.11 AERIAL SERVICE

Services shall conform to the requirements of IEEE C2, and NFPA 70. The service drop conductors shall be continuous from the point of connection on the last pole to the service mast or structural support, connected to the service entrance conductors, and shall be routed to a weatherhead, or weatherproof conduit fitting, before entry into an enclosing conduit. A drip loop shall be formed in each service conductor below the entrance to the weatherhead or the weatherproof conduit fitting. The weatherhead or weatherproof service entrance conduit fitting shall be securely fastened to a rigid galvanized steel (RGS) conduit that shall be terminated in the service entrance equipment which penetrates the exterior wall as noted on the drawings. Penetration of the conduit through an exterior wall shall be sealed to prevent the entrance of moisture and the escape of conditioned air. Service entrance conductors shall be routed in in the exterior wall, or in the interior of the building or facility that contains service entrance equipment.

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3.12 MOTORS DELETED

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3.15 MOTOR-DISCONNECT MEANS DELETED

3.15 LAMPS AND LIGHTING FIXTURES

Ballasted fixtures shall have ballasts which are compatible with the specific type and rating of lamps indicated and shall comply with the applicable provisions of the publications referenced.

3.15.1 Lamps

Lamps of the type, wattage, and voltage rating indicated shall be delivered to the project in the original cartons and installed in the fixtures just prior to the completion of the project.

3.15.1.1 Incandescent

Incandescent lamps shall be for 125-volt operation unless otherwise indicated.

3.15.1.2 Fluorescent

Compact fluorescent lamps for electronic ballasts shall be as indicated.

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3.15.1.3 High-Intensity-Discharge DELETED

3.15.2.1 Accessories

Accessories such as straps, mounting plates, nipples, or brackets shall be provided for proper installation. Open type fluorescent fixtures with exposed lamps shall have a wire-basket type guard.

3.16 EQUIPMENT CONNECTIONS

Wiring not furnished and installed under other sections of the specifications for the connection of electrical equipment as indicated on the drawings shall be furnished and installed under this section of the specifications. Connections shall comply with the applicable requirements of paragraph WIRING METHODS. Flexible conduits 6 feet or less in length shall be provided to all electrical equipment subject to periodic removal, vibration, or movement and for all motors. All motors shall be provided with separate grounding conductors. Liquid-tight conduits shall be used in damp or wet locations.

3.16.1 Motors and Motor Control

Motors shall be installed in accordance with NFPA 70, the manufacturer's recommendations, and as indicated. Wiring shall be extended to motors and terminated.

3.17 CIRCUIT PROTECTIVE DEVICES

The Contractor shall calibrate, adjust, set and test each new adjustable circuit protective device to ensure that they will function properly prior to the initial energization of the new power system under actual operating conditions.

3.18 REPAIR OF EXISTING WORK

The work shall be carefully laid out in advance, and where cutting, channeling, chasing, or drilling of floors, walls, partitions, ceiling, or other surfaces is necessary for the proper installation, support, or anchorage of the conduit, raceways, or other electrical work, this work shall be carefully done, and any damage to building, piping, or equipment shall be repaired by skilled mechanics of the trades involved at no additional cost to the Government.

3.19 Safety

The Contractor shall provide and use safety devices such as rubber gloves, protective barriers, and danger signs to protect and warn personnel in the test vicinity. The Contractor shall replace any devices or equipment which are damaged due to improper test procedures or handling.

3.21.1 Circuit Breaker Tests

The following field tests shall be performed on circuit breakers.

3.21.2 Circuit Breakers, Molded Case

- a. Manual operation of the breaker.

3.22 ACCEPTANCE

Final acceptance of the facility will not be given until the Contractor has successfully completed all tests and after all defects in installation, material or operation have been corrected.

END OF SECTION