SPECIFICATION
FOR
ENVIRONMENTAL PROTECTION SHELTER
HERA Support Program
Pt. Wingate, Gallup, New Mexico

REVISION NO. 2, April 1996

1.0 SCOPE: This Specification sets forth the requirements for the construction of the Environmental Protection Shelter for the HERA Support Program, White Sands Missile Range, New Mexico.

2.0 APPLICABLE DOCUMENTS:

2.1 American Institute of Steel Construction (AISC):

2.2 American Iron and Steel Institute (AISI):
"Specification for the Design of Cold Formed Steel Structural Members"; latest edition.

2.3 American Welding Society (AWS):

2.4 American Concrete Institute (ACI):
ACI 318-89 "Building Code Requirements for Reinforced Concrete".

2.5 American Society of Civil Engineers (ASCE):

2.6 American National Standards Institute (ANSI):
ANSI C80.1 Rigid Steel Conduit, Zinc Coated.

ANSI C80.3 Electrical Metallic Tubing, Zinc Coated.
2.7 Federal Specification (FS):

FS W-C-375  Circuit Breakers, Molded Case, Branch Circuit and Service.

FS W-P-115  Power Distribution Panel.

FS W-S-865  Switch, Box, (Enclosed), Surface-mounted.

2.8 National Electrical Manufacturer's Association (NEMA):

NEMA AB 1  Molded Case Circuit Breakers.

NEMA FB 1  Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.

NEMA ICS 2  Industrial Control Devices, Controllers, and Assemblies.

NEMA ICS 4  Terminal Blocks for Industrial Control Equipment and Systems.

NEMA KS 1  Enclosed Switches.

NEMA ICS 6  Enclosures for Industrial Control Equipment and Systems.

NEMA OS 1  Sheet-Steel Outlet Boxes, Device Boxes, Covers and Box Supports.

NEMA PB 1  Panelboards.

NEMA PB 1.1  Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.

NEMA ST 20  Dry type transformers for general applications.

NEMA WC 5  Thermoplastic-insulated wire and cable for the transmission and distribution of electrical energy.

NEMA WD 1  General-purpose Wiring Devices.

NEMA WD 6  Wiring Device Configurations.

NEMA 250  Enclosures for Electrical Equipment (1000 Volts Maximum).

2.9 National Fire Protection Association (NFPA):
NFPA 70  National Electrical Code.
NFPA 780  Lightning Protection Code.

2.10  Underwriters Laboratories, Inc. (UL):
UL 96  Lightning Protection Components.
UL 96A  Installation Requirements for Lightning Protection Systems


2.12  Hoist Manufacturers Institute Standards.


2.14  Drawings: The following drawings are attached to and form a part of this Specification:

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3.0  REQUIREMENTS: Essential physical and performance requirements are, but are not limited to, the following:

3.1  GENERAL:

3.1.1  The project consists of constructing a new mobile shelter approximately 80'-0" long by 79'-0" wide by 50'-0" tall. The shelter will be move on rails and shall provide a conditioned environment within a building envelope approximately 80'-0" long by 29'-0" wide by 50'-0" tall. The shelter shall have two unobstructed openings. One opening
shall be 22'-0" wide by 49'-4" high at one end of the shelter and the other shall be 16'-0" wide by 15'-0" high at the opposite end of the shelter. Both openings shall be enclosed by hydraulically operated bifold doors. A single personnel door shall be provided in each bifold door set.

3.1.2 The shelter shall be designed for erection and subsequent disassembly at remote sites. Components shall be sized for transportation to and handling at remote sites. Shelter shall have the capability to be disassembled and reassembled at various locations.

3.1.3 The exterior design environment for the shelter is as follows:

Wind: Basic 70 mile per hour wind at standard height 30'-0" and Exposure C per ASCE 7-88.

Temperature: -10 Degrees Fahrenheit, Minimum.
100 Degrees Fahrenheit, Maximum.

Rain: ½" inch per hour.

Snow: 30 pounds per square foot on roof.

All components of the shelter shall be capable of operating in these conditions.

3.1.4 The shelter shall maintain the following interior temperatures: 60 degrees Fahrenheit at the maximum exterior temperature and 80 degrees Fahrenheit at the minimum exterior temperature.

3.1.5 The shelter shall be capable of being propelled at 55 feet per minute. The design shall include a winch and cable system with an appropriate control system to allow start, stop and reverse of the travel direction. The control system shall provide a controlled, slow startup and slow down at start, reverse direction and stop.

3.1.6 The majority of the items and materials specified are qualified with an "or preapproved equal". Should the Subcontractor propose to substitute items and/or materials, his bid response shall be accompanied by applicable product literature, to include (when appropriate) illustrations, size specifications and performance characteristics.

3.1.7 Submittals:

3.1.7.1 The subcontractor shall submit complete shop drawings for the following:

3.1.7.1.1 Structural Steel showing all framing, member sizes, connection details and erection sequence.

3.1.7.1.2 Light Gauge, Cold Formed Steel showing all framing, member sizes, connection details and erection sequence.
3.1.7.1.3 Precast Concrete Ballast Members showing reinforcing, member sizes, lifting details and member weight. The submittal shall also include the design calculations sealed by a professional engineer licensed to practice in the State of New Mexico.

3.1.7.1.4 Crane End Trucks and Bridge Beam showing connection of the bridge beam to the end trucks, dimensions of the end trucks, certification that the crane trucks and bridge beam are capable of handling the maximum load shown on the drawings, rated load data and operation and maintenance data.

3.1.7.1.5 Hydraulically Operated, Bifold Doors showing design data complete construction details, clearance requirements, metal gauges, electrical requirements, installation details and sequence, and operational and maintenance data.

3.1.7.1.6 Cable, Winch and Control System to self propel the shelter showing winch load capacity and horsepower, wire rope cable size and load capacity and control system components and features.

3.1.7.1.7 Mechanical HVAC System showing complete unit details, sizes and weight, electrical requirements, duct layout and certification that the units meet the design requirements shown on the drawings.

3.2 STRUCTURAL AND ARCHITECTURAL:

3.2.1 Structural Steel:

3.2.1.1 All structural steel wide flange, channel and angle shapes shall conform to ASTM A36. All tube steel (TS) shapes shall conform to ASTM A500.

3.2.1.2 All structural steel design, detail, fabrication and erection shall conform to AISC Manual of Steel Design, 9th Edition.

3.2.2 Light Gauge, Cold Formed Steel:

3.2.2.1 All light gauge, cold rolled roof purlins and wall girts shall conform to ASTM A607, Grade 50.

3.2.2.2 All light gauge, cold formed roof and wall panels or any members fabricated from galvanized sheet steel shall conform to ASTM A446 with G90 coating and "class" to suit shelter use requirements.

3.2.2.2.1 Roof and wall panels and related trim and accessories shall have a shop applied fluoropolymer finish. Color to be selected by owner from manufacturer's standard colors.

3.2.2.3 All light gauge, cold formed steel design, detail, fabrication and erection shall conform to AISI Specifications for the Design of Cold Formed Steel Structural Members, latest edition.
3.2.2.4 All light gauge, cold formed steel components and their assembly shall form a
weathertight building which shall conform to the standard practices of the Metal
Building Manufacturers Association (MBMA). Standard metal building industry
accessories such as flexible closure strips, sealing tape and joint sealants shall be used
to provide a weathertight structure.

3.2.3 Precast Concrete:

3.2.3.1 All precast concrete ballast pieces shall conform to the requirements of ACI 318-89.
Precast members shall weigh within plus or minus 2 pounds per square foot of the
required ballast weight shown on the drawings.

3.2.4 Crane End Trucks and Bridge Beam:

3.2.4.1 The manufacturer of the end trucks and beam shall be regularly engaged in the
manufacture of such equipment and shall be represented by a local, manufacturer-
certified installer. Design basis is Wright Crane Series 531, end truck product No.
4300670 as manufactured by ACCO Babcock, Inc., York, PA.

3.2.4.2 The end trucks and beam shall meet the requirements of OSHA Standard 1910.179,
Overhead and Gantry Cranes.

3.2.4.3 The work includes all parts and accessories necessary for a complete operative system.

3.2.4.4 The crane end trucks and bridge beam shall be finish painted in standard machinery
yellow color with the paint system required for its operational environment.

3.2.5 Hydraulically Operated, Bifold Doors:

3.2.5.1 Provide each hydraulically operated, bifold door as a complete unit produced by one
manufacturer, including all accessories necessary for a complete operative system.
Furnish hydraulically operated, bifold doors by one manufacturer for the entire project.
The manufacturer shall be regularly engaged in the manufacture of such equipment.
Design basis is Model 46 Four Fold Doors and Hydraulic Operating System with Jamb
Mounted Actuators as manufactured by Electric Power Door, Hibbing, MN.

3.2.5.2 The hydraulic operating system shall be furnished complete and shall consist of an
integral pump and tank assembly attached to the motor, mounting brackets, control panel,
adjustable limits, jamb mounted hydraulic cylinders (minimum five per side for the 22'-
0" by 49'-4" door), push buttons and all necessary brackets and fittings to provide a
smooth and satisfactory operation.

3.2.5.3 Provide an emergency override system so door can be operated in case of power failure.
Door panels shall be free to operate manually after emergency override system is
activated. The system shall automatically reset itself after returning to normal operation
without readjusting any limit switches.
3.2.5.4 All steel surfaces shall receive one shop painted coat of the manufacturer's standard primer. Doors shall be field painted to match the final colors selected by the owner. Doors shall be insulated with a fibrous glass batt type insulation providing a U value of 0.12 or less. The insulating material shall be fitted to cover the entire surface of the door panel.

3.2.5.5 The installation of the doors shall be by an authorized representative of the door manufacturer. Upon completion of the installation, the doors shall be free from warp, twist or distortion and shall be lubricated and properly adjusted to operate freely and smoothly. Door installer shall provide the final adjustments for the limit switches. In the closed position, the door shall fit weathertight for the entire perimeter as well as at the panel joints.

3.2.6 Building Insulation:


3.2.6.2 Material shall be inorganic (nonasbestos) fibers formed with binders into resilient flexible blankets or semi rigid batts; FS HH-I-521. Thickness as required to achieve R rating indicated on drawings. Use manufacturer's standard lengths and widths as required to coordinate with the spaces to be insulated.

3.2.6.3 Comply with manufacturer's instructions for particular conditions of installation. If printed instructions are not available or do not apply to project conditions, consult manufacturer's technical representative for specific recommendations before proceeding with work.

3.2.6.4 Apply a single layer of insulation of the required thickness. Cut and fit tightly around obstructions and fill voids. Use combination of stick clips, wire and friction method in conjunction with anchors to retain shape and installation of batts. Use spindle type anchors to prevent sagging and distortion, center anchors on each corner near top of each batt and then space successive wire anchors 2'-0" on center.

3.2.7 Painting:

3.2.7.1 Field painting of all exposed, primed structural members, the primed surfaces of the bifold doors and any other parts of the shelter that require painting shall be by the owner.

3.2.8 Cable, Winch and Control System:

3.2.8.1 Pullift Corporation normal duty all enclosed gearing single speed industrial rated horizontal base mounted positive control dual direction electric motor driven puller system consisting of two (2) 5,000# capacity model EW7CP-55-50 or approved equal.

3.2.8.2 The operating concept for the winch and cable system is to attach the ends of the cables
the winch drums and to deadman anchors with only four complete wraps of the cables around the winch drums. As the winch drums rotate, the shelter will be pulled by the cables.

3.2.8.2.1 With the shelter positioned over the mid point of the rail length, the cables must be installed tight to the drums. Turnbuckle connections shall be used between the cables and the anchors to provide adjustment of the cables to the proper tightness for smooth operation of the system.

3.2.8.3 The manufacturer of the winches shall be regularly engaged in the manufacture of such equipment and shall be represented by a local, manufacture-certified installer. Design basis is the Pullift Model No. EW7CP-55-50, 2 ton capacity, 10 horsepower, as manufactured by Pullift Corp, Solon, Ohio.

3.2.8.4 The wire rope cable shall be preformed 6x37, XIPS and shall be supplied by the winch manufacturer.

3.2.8.5 The wire rope cable shall be attached to the deadman anchors using galvanized rope thimbles and galvanized U-bolt clips on the rope with jaw-and-jaw end fitted turnbuckles between the cables and the anchors. The turnbuckle diameter shall be 1 inch with a 7/8 inch pin through the jaw.

3.2.8.6 The components of the control system, the adjustment of the control system and the positioning of the limit switches is described in the electrical section of these specifications (Section 3.4).

3.2.8.6.1 The system shall provide a smooth startup to the maximum travel speed of 55 feet per minute with a smooth slow down and stop. The system shall be capable of slowing, stopping and reversing direction at any point along the length of the crane rails. These requirements are similar to those imposed on large capacity overhead traveling cranes. For this reason, the winch supplier's representative shall have demonstrated experience in the installation and adjustment of such overhead cranes.

3.3 MECHANICAL:

3.3.1 General:

3.3.1.1 The Mechanical HVAC System shall be wall mounted HVAC Units with direct expansion cooling and electric heating. The system shall be capable of maintaining the inside ambient temperature between 60 degrees Fahrenheit and 80 degree Fahrenheit with outside winter design conditions at -10 degrees Fahrenheit and outside summer design conditions at 100 degrees Fahrenheit.

3.3.1.2 Wall mounted HVAC units are specified on the drawings.

3.4 ELECTRICAL:
3.4.1 General:

3.4.1.1 Products: Means new material, machinery, components, equipment, fixtures, and systems forming the Work. Does not include machinery and equipment used for preparation, fabrication, conveying and erection of the Work.

3.4.1.1.1 Provide interchangeable components of the same manufacturer, for similar products. Use same manufacturer for products of same category unless Contract Documents specifically indicate otherwise.

3.4.1.2 Equipment and outlet locations: Drawing locations are approximate only. Determine exact locations by examining architectural, structural, civil and mechanical Drawings, taking physical measurements and coordinating Work in same and adjacent locations.

3.4.1.3 Tests: Test electrical systems. Operate switches, circuit breakers and controls under load. Energize light fixtures, motors, heaters and Owner equipment. Test receptacles.

3.4.1.4 Cleaning:

3.4.1.4.1 Remove debris adhering to electrical equipment. Vacuum clean interiors of troughs, wireways, boxes, hinged cover enclosures, disconnect switches, panelboards and motor control equipment.

3.4.1.4.2 Remove paint and plaster splatters, dirt, dust, stains, films and other foreign substances from electrical equipment, wall plates, covers, devices, boxes, enclosures and fixtures.

3.4.1.4.3 Remove temporary protection and labels not required to remain.

3.4.1.4.4 Touch up scratched or marred surfaces to match original finishes. Use manufacturer's paint or treatment intended for the purpose. Apply in accordance with manufacturer's instructions.

3.4.1.4.5 Polish painted surfaces to a clear shine.

3.4.1.5 Regulatory requirements:

3.4.1.5.1 Conform to NFPA 70, and Contract Documents. Provide Work conforming to the more exacting requirements.

3.4.1.5.2 Obtain permits, and request inspections from authority having jurisdiction.

3.4.2 Rigid Conduit and Fittings:
3.4.2.1 Conduit: ANSI C80.1 - Rigid Steel Conduit, Zinc Coated.

3.4.2.2 Fittings and conduit bodies: ANSI/NEMA FB 1; steel, or malleable iron, threaded types, zinc plated. Threadless, set screw, and die cast types prohibited.

3.4.2.3 Couplings: Threaded galvanized steel.

3.4.2.4 Hubs: Threaded malleable iron, zinc plated. Raintight with insulated throat and bonding screw.

3.4.2.5 Elbow, Reducing Bushing, Nipple, and Offset Nipple Fittings: Threaded malleable iron, zinc plated, with insulated throats.

3.4.2.6 Standard Locknuts: Steel in sizes 3/4 through 2 inch; malleable iron in 2-1/2 inch and larger sizes. Zinc plated.

3.4.2.7 Sealing Locknuts: Steel, zinc plated, with integrally fused raintight and oil tight gasket.

3.4.2.8 Bushings: Threaded insulated type. Malleable iron body, thermoplastic insulator. UL 150 degrees C temperature rating.

3.4.2.9 Split Couplings, 45 Degree Elbows, Corner Pulling Ells and Pull-In Elbows: Use prohibited.

3.4.3 Liquidtight Flexible Conduit and Fittings:

3.4.3.1 Conduit: Interlocked steel construction with PVC jacket.

3.4.3.2 Fittings and conduit bodies: ANSI/NEMA FB 1; steel or malleable iron, strain relief type.

3.4.4 Electrical Metallic Tubing (EMT) and Fittings:

3.4.4.1 EMT: ANSI C80.3 galvanized tubing.

3.4.4.2 Fittings and conduit bodies: ANSI/NEMA FB1; steel, or malleable iron, rain tight and concrete tight. Set screw, indenter and die cast types prohibited.

3.4.4.3 Connectors: Steel with insulated throats, and steel locknuts.

3.4.4.4 Couplings: Compression type, steel body and malleable iron nut.

3.4.4.5 Offset Connectors: Malleable iron compression type, with insulated throats.
3.4.4.6 Angle Connectors: 90 degrees compression type, malleable iron, with insulated throats.

3.4.4.7 Handy and Inspection Ells, Capped Corner Couplings, 45 Degree Angle Elbows: Use prohibited.

3.4.5 Conduit Supports:

3.4.5.1 Dry Location Supports: One hole snap type, double ribbed, zinc plated steel straps; or "Caddy" spring steel fasteners; or Unistrut pipe clamps.

3.4.5.2 Damp and Wet Location Straps: One hole malleable iron, hot dip galvanized, with conduit spacers (clamp-backs).

3.4.5.3 Beam Clamps: Zinc plated or galvanized malleable iron, with hardened steel bolt.

3.4.5.4 U-Bolts: Zinc plated steel bolt and nuts, with malleable iron conduit clamp.

3.4.5.5 Nail Straps: Use prohibited.

3.4.6 Conduit Requirements:

3.4.6.1 Verify routing and termination locations of conduit prior to rough in.

3.4.6.2 Route conduit as required to complete wiring system and to avoid conflict with other services, equipment, structural elements.

3.4.6.3 Size conduit for wires and cables to be installed, or as specifically noted on Drawings. Base sizing on wire and cable fill of not more than 33 1/3 percent of interior cross sectional area of conduit.

3.4.6.4 Minimum Size for Project: 3/4 inch trade size.

3.4.6.5 Use electrical metallic tubing in trade sizes 3/4 inch to 2 inch only.

3.4.6.6 Interior Dry Locations: Use electrical metallic tubing, or rigid steel or intermediate metal conduit.

3.4.6.7 Exposed Exterior Locations: Use rigid steel or intermediate metal conduit.

3.4.6.8 Aluminum Conduit: Use prohibited.

3.4.7 Conduit Arrangement, and Support:

3.4.7.1 Arrange conduit to maintain headroom and present a neat appearance.
3.4.7.2 Route conduits parallel and perpendicular to walls, structural members, intersections of vertical planes, and adjacent piping.

3.4.7.3 Do not run conduit within concrete slab on grade.

3.4.7.4 Conduit systems may be run exposed.

3.4.7.5 Maintain minimum 6 inch clearance between conduit and piping. Maintain 12 inch clearance between conduit and heat sources such as flues, and heating appliances.

3.4.7.6 Arrange conduit supports to prevent distortion of alignment by wire pulling operations.

3.4.7.7 Provide and arrange supports to rigidly fix conduit in place.

3.4.7.8 Do not support conduit on ductwork, or on equipment unless solely serving that equipment.

3.4.7.9 Do not support conduit on wires, straps, stays and other non-rigid supports.

3.4.7.10 Do not support conduit on supports for light fixtures and equipment, unless otherwise indicated or approved in writing by Engineer.

3.4.7.11 Do not support conduits from other raceways.

3.4.7.12 Support horizontal runs of conduit within 24 inches of elbow, bend, change of direction, coupling, fitting, box, enclosure and termination, and at intermediate points not exceeding 8 feet spacing.

3.4.7.13 Support vertical runs of conduit within 24 inches of elbow, bend, coupling, fitting, change of direction and box on connecting horizontal run, and at intermediate points not exceeding 8 feet spacing.

3.4.7.14 Locate electrical conduits above other service pipes wherever possible. Do not locate electrical conduits on supports or racks with other service pipes.

3.4.7.15 Do not fasten conduit with wire, perforated pipe straps, plastic tie wraps, rope or string. Remove all means used for temporary conduit support during construction, before conductors are pulled.

3.4.7.16 Cut conduit square using a saw; do not use pipe cutter. De-burr cut ends.

3.4.7.17 Bring conduit to the shoulder of fittings and couplings and fasten securely. Make joints mechanically tight and electrically continuous.

3.4.7.18 Use conduit hubs for fastening conduit to cast boxes, and for fastening conduit to sheet
metal boxes in damp or wet locations. Use sealing locknuts and insulating bushings on inside of enclosure.

3.4.7.19 Use locknuts and insulating bushings for fastening rigid steel and intermediate conduit to sheet metal boxes in dry locations. Provide two locknuts, one inside and one outside the box.

3.4.7.20 Use connector fittings for fastening EMT to boxes.

3.4.7.21 Install bends and offsets not exceeding 270 degrees between terminations at panelboards, enclosures, boxes, wiring troughs, and wireways, and do not exceed 100 feet in total length of run. Do not exceed 150 feet in straight conduit run. Provide pull boxes, if necessary to meet these requirements.

3.4.7.22 Use conduit bodies to make sharp changes in direction, as around beams.

3.4.7.23 Do not use conduit bodies as a substitute for pull boxes.

3.4.7.24 Use hydraulic one-shot conduit bender or factory elbows for bends in conduit larger than 2 inch size.

3.4.7.25 Avoid moisture traps where possible; where unavoidable, provide junction box with drain fitting at conduit low point.

3.4.8 Liquidtight Flexible Conduit Installation:

3.4.8.1 Use for connections to motors, dry type transformers, and other equipment subject to movement, vibration, misalignment, cramped quarters, or where noise transmission is to be eliminated or reduced.

3.4.8.2 Restrict maximum length to 36 inches.

3.4.8.3 Use only listed liquidtight conduit fittings.

3.4.9 Wires: Copper conductors only.

3.4.9.1 Building Wire:

3.4.9.1.1 Single conductor thermoplastic-insulated wire; NEMA WC5; 600 volts rating, Types THHN/THWN, and XHHW.

3.4.9.1.2 Size: 12 AWG, minimum, unless otherwise noted.

3.4.9.2 Signal and Control Wire:
3.4.9.2.1 Thermoplastic-insulated, NEMA WC 5, 600V, Class B stranded THHN/THWN.

3.4.9.2.2 Size: 14 AWG, minimum, unless otherwise noted.

3.4.9.3 Shielded Cables: Tinned copper stranded, polyethylene insulated twisted pairs, individually shielded, PVC jacket.

3.4.9.3.1 Shielding: Polyester with aluminum laminated to both sides and stranded tinned copper drain wire.

3.4.9.3.2 Sizes and Pairs: As required for acceptable system performance.

3.4.9.3.3 Size: 22 AWG, minimum.

3.4.9.4 Armored and Metal Clad Cables Types AC and MC, Nonmetallic-Sheathed and Shielded Nonmetallic-Sheathed Cables Types NM, NMC and SNM, Service-Entrance Cables Types SE and USE, Underground Feeder and Branch-Circuit Cables Type UF, and Electrical Non-Metallic Tubing Type ENT: Use prohibited.

3.4.9.5 Thermostat Cables: Copper stranded, PVC insulated, twisted pairs. 18 AWG, minimum.

3.4.9.5.1 Number of Conductors: As required for acceptable system performance.

3.4.9.6 Bare Wires: Copper. Solid in sizes through 6 AWG; Class B stranded in larger sizes.

3.4.9.7 Power Cable Reel:

3.4.9.7.1 Weathertight electric cable reel, spring loaded horizontal retractable type.

3.4.9.7.2 Slip Rings: Suitable for 480Y/277 volts, 3 phase 4 wire, 200 amperes rating.

3.4.9.7.3 Cable: Mining type dragging cable Type W, installed on reel by manufacturer, for 123 feet of active travel, copper conductors, 600 volts AC, 200 amperes, four A-3/0 AWG conductors (three phase and one neutral) plus equipment ground conductor.

3.4.9.7.4 Manufacturer: Gleason Reel Model SHO1002-420-18MF60-AE-5, or acceptable substitution.

3.4.9.8 Thermocouple Extension Wire: Solicit No 20 AWG, Teflon insulated, Type T thermocouple extension wire.

3.4.9.9 Wire Connectors:

3.4.9.9.1 Control and signal wire terminations: Ring and spade type insulated compression
3.4.9.9.2 Control and signal wire splices: Butt splice insulated compression connectors.

3.4.9.9.3 Building Wire Sizes through 8 AWG: Insulated twist-on spring grip with steel inner shell.

3.4.9.9.4 Building Wire Sizes 6 AWG and Larger: Parallel, Tee-Tap, and Multi-Tap connectors with 90 degrees C, 600 volt rated insulated plastic snap-on covers.

3.4.9.9.5 Tap Feed Connectors: Insulation piercing type. Main conductor No. 8 to 750 MCM; Tap conductor No. 14 to 500 MCM. Integral insulated cover.

3.4.9.9.6 Split bolt connectors and taped connections: Use prohibited.

3.4.9.10 Color Coding Tapes: Vinyl plastic tape, 8.5 mils minimum thickness, flame retardant, abrasion, ultra-violet, moisture, alkali, acid, and corrosion resistant.

3.4.9.11 Circuitry: Install circuits according to Drawings. Request permission in writing for variation. State reason for request.

3.4.9.12 General Wiring Methods:

3.4.9.12.1 Run wire and cables in raceways, unless otherwise indicated.

3.4.9.12.2 Provide homerun conductors of continuous length without joint or splice from overcurrent device to first outlet, or equipment served.

3.4.9.12.3 Place an equal number of conductors for each phase of a circuit in same raceway or cable.

3.4.9.12.4 Splice only in accessible junction and outlet boxes. Do not splice in panelboards, cabinets, control panels and enclosures, unless otherwise indicated on the Drawings.

3.4.9.12.5 Neatly train wiring in loose formations inside panelboards cabinets, control panels, enclosures and boxes.

3.4.9.12.6 Do not lace and tie wires in bundles inside panelboards, cabinets, control panels and enclosures and boxes.

3.4.9.12.7 Do not bend connectors with inside radius less than six times outside diameter.

3.4.9.12.8 Do not exceed manufacturer's maximum pulling tension and straight and angled pulling length.
3.4.9.13  Wiring Installation in Raceways:

3.4.9.13.1  Pull all conductors into a raceway at the same time.

3.4.9.13.2  Install wire in raceway after all mechanical work likely to injure conductors has been completed.

3.4.9.13.3  Completely and thoroughly swab raceway system before installing conductors.

3.4.9.13.4  Remove and discard conductors cut too short or installed in wrong raceway. Do not install conductors which have been removed from a raceway.

3.4.9.14  Branch Circuit Wiring:

3.4.9.14.1  Wire circuits with one phase conductor for each pole position of circuit breaker.

3.4.9.14.2  Include neutral conductors for 120 volt and 277 volt circuits.

3.4.9.14.3  Two or three branch circuits on different phases of the same system may share a common neutral, if routed in same raceway.

3.4.9.14.4  A number of circuits in one raceway may share a common equipment grounding conductor.

3.4.9.14.5  Run neutral and equipment grounding conductors in same raceway with related circuit phase conductor or conductors.

3.4.9.14.6  Do not terminate looped multi-wire circuit neutral and equipment grounding conductors on device or equipment terminals. Splice in outlet or junction box and tap feed device and equipment.

3.4.9.14.7  Do not install conductors of different voltage systems in same raceway.

3.4.9.15  Wiring Connections and Terminations:

3.4.9.15.1  Use only approved wire connectors.

3.4.9.15.2  Make splices, taps and terminations to carry full capacity of conductors without perceptible temperature rise.

3.4.9.15.3  Install wire connectors in accordance with manufacturer's instructions. Use tools and accessories recommended.

3.4.9.15.4  Ground shields of shielded cables at one end of run only.
3.4.9.15.5 Do not cut or splice main conductors in making tap feeds. Use only acceptable insulation piercing tap feed connectors to tap smaller conductors from main conductors.

3.4.9.16 Field Tests: Perform continuity test on all branch circuit conductors. Verify proper phasing connections.

3.4.9.16.1 Inspect wire and cable for physical damage and proper connection.

3.4.9.16.2 Torque test conductor connections and terminations to manufacturer's recommended values.

3.4.10 Boxes:

3.4.10.1 Sheet Metal Outlet Boxes: ANSI/NEMA OS 1; galvanized steel, with grounding terminal and 1 inch male fixture studs where required.

3.4.10.1.1 Minimum Size: 4-inch square by 1-1/2 inches deep.

3.4.10.1.2 Covers: Provide with flat covers.

3.4.10.2 Cast boxes: Die cast aluminum; shallow type, with threaded hubs and grounding terminal, and gasketed cover.

3.4.10.3 Pull and Junction Boxes: Sheet metal boxes: ANSI/NEMA OS1; galvanized steel, with grounding terminal. Minimum Size: 4-inch square by 1-1/2 inches deep.

3.4.10.4 NEMA 4X Boxes: Stainless Steel.

3.4.10.5 Coordination of Box Locations:

3.4.10.5.1 Provide electrical boxes as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections, and compliance with NEC and Contract Documents.

3.4.10.5.2 Electrical box locations shown on Drawings are approximate unless dimensioned.

3.4.10.5.3 Locate and install boxes to allow access.

3.4.10.5.4 Locate and install to maintain headroom and to present a neat appearance.

3.4.10.6 Box Installation:

3.4.10.6.1 Provide box grounding terminal or pigtail and screw in boxes containing conductors for systems operating at above 50 volts to ground.
3.4.10.6.2 Provide knockout closures for unused openings. Provide blank plates for all junction boxes.

3.4.10.6.3 Securely fasten boxes in at least two places to the building structure, independent of the conduit, except for boxes that are connected to two rigid metal conduits, both supported within 12 inches of box.

3.4.10.6.4 Do not fasten boxes to mechanical ductwork and pipes.

3.4.10.6.5 Paint exposed box surfaces to match surface on which it is mounted.

3.4.11 Wiring Devices:

3.4.11.1 Wall Switches: NEMA WD 1. Heavy duty specification grade. AC general use snap switch with toggle handle for lighting circuits and motor loads one horsepower and less. Ivory plastic handle. Self-grounding or with grounding terminal on switch body.

3.4.11.1.1 Rating: 20 amperes at 120 or 277 volts AC; 1 HP at 120 volts AC.

3.4.11.2 Receptacles: NEMA WD 1; heavy duty specification grade. Self-grounding and with grounding terminal on receptacle body.

3.4.11.2.1 Configuration: NEMA WD 6; type as specified and indicated. Convenience Receptacle Configuration: NEMA Type 5-20R, ivory plastic face.

3.4.11.2.2 GFI Receptacles: Duplex NEMA Type 5-20R receptacle with integral ground fault current interrupter. Arrange with lettering on face upright with ground pole upright or on left side.

3.4.11.3 Specific-Use Receptacles: As indicated on Drawings.

3.4.11.4 Wall Plates:

3.4.11.4.1 Indoor Type: Stainless steel Type 302, with matching screws.

3.4.11.4.2 Weatherproof cover plate: Gasketed cast metal with self-closing hinged gasketed device covers. Hinges to be vertically above devices. Side mounted hinges prohibited.

3.4.11.5 Installation: Install wiring devices in outlet boxes. Secure with at least 2 screws. Do not use cover plate as sole means of device support.

3.4.11.6 Install wall switches with OFF position down.

3.4.11.7 Install receptacles with grounding pole on top, unless otherwise noted.
3.4.11.8 Install GFI receptacles with grounding pole on left side or on top.

3.4.11.9 Install devices and wall plates plumb and level. Align devices evenly and firmly seated in wall plate opening.

3.4.11.10 Connect wiring devices by wrapping conductor around screw terminal. Do not use push-in pressure terminals for connecting wires.

3.4.11.11 Connect wiring device grounding terminal to branch circuit equipment grounding conductor at box grounding terminal.

3.4.12 Hinged Cover Enclosures:

3.4.12.1 Construction: NEMA 250, Type 12, steel. ANSI 61 gray polyester powder coating outside, white enamel inside, over phosphatized surface.

3.4.12.2 Covers: Continuous hinge, captive screw cover clamps, hasp and staple for padlocking, gasketed.

3.4.12.3 Sizes: As indicated on Drawings or as required to accommodate interior equipment and wiring, whichever is the larger.

3.4.12.4 Steel Panel: Manufacturer's standard steel panel, for mounting on interior collar studs. Finish: Baked white enamel.

3.4.12.5 Terminal Blocks: ANSI/NEMA ICS 4; UL listed; assemble on metal mounting channel with screw-held end clamps, voltage barriers, guide blocks and marking strip. 600 volts rated, modular type, solderless box lug connectors.

3.4.12.6 Shop assemble enclosures housing terminal blocks and electrical components in accordance with ANSI/NEMA ICS 6.

3.4.12.7 Provide protective pocket inside front cover with schematic diagram, connection diagram, and layout drawing of control wiring and components within enclosure.

3.4.12.8 Wire panel components to terminal block for field wiring connections.

3.4.12.9 Provide and label terminal block for each system voltage present.

3.4.12.10 Wire panel interior power and control circuits with Type MTW stranded copper conductors.

3.4.12.11 Bundle, lace and loom wiring neatly.

3.4.12.12 Provide terminals for landing neutrals and equipment grounding conductors associated
with phase conductors of circuits controlled or utilized within panel.

3.4.12.13 Install enclosure plumb; anchor securely to wall and structural supports at each corner, minimum.

3.4.12.14 Provide electrical identification for enclosures and their interior components.

3.4.13 Grounding and Bonding Materials:

3.4.13.1 Grounding and bonding bushings: Malleable iron, insulated, 150 degrees C. Thomas and Betts Series 3800 and 3900, or acceptable substitution.

3.4.13.2 Bonding locknuts: Steel or malleable iron. Thomas and Betts Series 100, or acceptable substitution.

3.4.13.3 Conduit grounding hubs: Screw-joint type conduit connection with pressure type conductor connection; heavy duty saddle clamp with pressure type conductor connection. Thomas and Betts Series 3900, or acceptable substitution.

3.4.13.4 Ground Rods: As described on the Drawings.

3.4.13.5 Ground Rod Connections: Exothermic weld process. Cadweld Series "GRC", or acceptable substitution.

3.4.13.6 Provide a separate insulated equipment grounding conductor in all raceway systems with conductors operating at above 50 volts to ground. Terminate conductor on grounding terminal, lug, bus, bushing or pigtails of boxes, panels, cable trays, enclosures and equipment to or through which it is run, unless otherwise noted. Size in accordance with NEC Article 250.

3.4.13.7 Install ground rods vertically as recommended by manufacturer.

3.4.13.8 Bond grounding conductors to metallic conduits in which they are run. Use grounding bushings at box, panel, disconnect and conduit grounding hub fitting at end of conduit stub.

3.4.14 Electrical Identifications:


3.4.14.2 Voltage identifications: Black on orange adhesive labels.
3.4.14.3 Equipment nameplates: White core laminated plastic. White lettering on black background, same style throughout. Screw or rivet attach to surface. Main title: 3/8 inch high condensed block letters; other lettering: 3/16 condensed block.

3.4.14.4 Legends: Description as indicated on drawings, e.g., "PANEL A", "XFRM-A", "OVERHEAD DOOR", "WINCH CONTROL PANEL". Source: Description of source; e.g., "FED FROM PANEL A, CCT. No. 33".

3.4.14.5 Install nameplates, signs and labels, and engraved wall plates parallel to equipment lines.

3.4.14.6 Embossed tape: Use prohibited.

3.4.14.7 Voltage identification: Apply to conduits, enclosures, panelboards, dry-type transformers, disconnect switches, contactors, control panels, wireways, pull and junction boxes, and associated electrical equipment.

3.4.14.8 Equipment nameplates: Identify wall switches, receptacles, enclosures, panelboards, dry-type transformers, disconnect switches, control panels, and other electrical equipment with nameplates showing descriptions or designations on Drawings and source of power feeding the equipment.

3.4.14.9 Panelboard circuit breaker identification and directory:

3.4.14.9.1 Circuit breaker identification: Numbered identifications for each panelboard circuit breaker pole position, to be provided by manufacturer adjacent to pole position on metal dead front cover.

3.4.14.9.2 Circuit breaker directory: Typewritten or process printed. Hand lettering unacceptable, but indicate "Spares" and "Future" circuits in erasable pencilled Hand lettering. Provide panelboard designation and system voltage on each directory card.

3.4.15 Switches:

3.4.15.1 Fusible Switch Assemblies: NEMA KS 1; Type HD; FS W-S-865; Heavy duty; quick-make, quick-break, load interrupter enclosed switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position. Fuse Clips: Designed to accommodate Class R fuses.

3.4.15.2 Non-fusible Switch Assemblies: NEMA KS 1; Type HD; FS W-S-865; Heavy duty; quick-make, quick-break, load interrupter enclosed switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position.

3.4.15.3 Enclosures: NEMA 1 indoor; NEMA 3R outdoor.
3.4.15.4 Mounting Height: 5'- 0" above finished floor to centerline of disconnect handle in the "ON" position, or local to equipment served by switch.

3.4.16 Dry Type Two Winding Transformers:

3.4.16.1 ANSI/NEMA ST 20; factory-assembled, shielded isolation dry type transformers

3.4.16.2 Primary and Secondary Voltages: As noted on Drawings.

3.4.16.3 KVA Ratings: As noted on Drawings.

3.4.16.4 Temperature Ratings: 150 degrees C rise; 220 degrees Class C.

3.4.16.5 Taps: Six - Two 2.5 percent taps above and four 2.5 percent taps below normal full capacity.

3.4.16.6 Connectors: Solderless lug terminal blocks.

3.4.16.7 Mounting: Wall mount as indicated on Drawings.

3.4.16.8 Mount transformers on wall, plumb and level. Use all support points provided by manufacturer.

3.4.16.9 Maintain working space of transformer width by 3 feet deep in front of transformer.

3.4.16.10 Make conduit connections to sides or bottom of case. Use liquidtight flexible metallic conduit, 12 to 36 inches long.

3.4.16.11 Check for damage and tight connections prior to energizing transformer.

3.4.16.12 Measure primary voltages. Connect taps to provide secondary voltages as close as possible to nominal secondary voltages.

3.4.17 Circuit Breaker Panelboards:

3.4.17.1 Lighting and appliance branch circuit panelboards: NEMA PB1; circuit breaker type. FS W-P-115a, Type I, Class 1.

3.4.17.2 Enclosures: NEMA PB 1. Surface mount. NEMA Type 1.

3.4.17.3 Cabinet size: 6 inches deep; 20 inches wide, minimum.

3.4.17.4 Deadfront: Provide screw attached deadfront cover over branch circuit breakers, main lugs, main breaker, and neutral lug and bus.
3.4.17.5 Covers: Flat steel cover with integral concealed hinged circuit breaker door. Secure cover with concealed trim clamps to deadfront, or with concealed screws to mounting brackets fixed to interior of enclosure or mounting pan. Exposed fixings on panel cover prohibited.

3.4.17.6 Install panelboards plumb in conformance with NEMA PB 1.1.

3.4.17.7 Locate panelboards to provide minimum working clearances and installation conditions required under NEC Articles 110 and 384.

3.4.17.8 Mounting Heights: 6'-6" above finished floor to top of panelboard.

3.4.17.9 Tighten lugs and terminals with torque wrench in accordance with values give in manufacturer's published data.

3.4.17.10 Do not connect more than one conductor to panelboard terminal unless manufacturer's data lists terminal for multiple connections.

3.4.17.11 Provide filler plates for unused spaces in panelboards.

3.4.17.12 Do not use panelboard wiring gutters as pull or junction boxes. Install only wiring in unbroken lengths originating at load side of panelboard circuit breakers and line side of main breakers and main lugs.

3.4.17.13 Measure steady state load currents at each panelboard feeder. Should the difference at any panelboard between phases exceed 20 percent, rearrange circuits in the panelboard to balance the phase loads within 20 percent. Take care to maintain proper phasing for multi-wire branch circuits. Provide revised typed circuit directory.

3.4.17.14 Visual and Mechanical Inspection: Inspect for physical damage, proper alignment, anchorage, and grounding. Check proper installation and tightness of accessible connections for bus, and circuit breakers.

3.4.18 Motor Control Equipment:

3.4.18.1 Movement of Shelter by Winch System: Adjust settings on soft stop/start motor torque control, time delay relay, and location and operation of limit switches on Shelter, as directed by winch supplier. Provide a fully functional system to the satisfaction of the Owner.

3.4.18.2 Magnetic motor reversing contactor: NEMA ICS 2; AC general-purpose Class A magnetic controller for induction motors rated in horsepower with electrically interlocked forward and reverse contactors. Provide 120 volts AC coils and the number of auxiliary contacts shown on the Drawings.
3.4.18.3 Overload Relays: Provide bimetallic ambient compensated heater elements in each phase leg of motor, and auxiliary normally closed control circuit contact. Size according to manufacturer's tables.

3.4.18.4 Soft Stop/Start Motor Torque Control: Solid state variable voltage control for three-phase induction motors. Aluminum enclosure with integral heat sink. Manufacturer: Motortronics LC94 Series or acceptable substitution to accommodate the winches provided under paragraph 3.2.8.3 or acceptable substitution. The motor control shall include capability for soft start and soft stops.

3.4.19 Lighting Contactors: NEMA ICS 2, 20 ampere magnetic lighting contactor. Mechanically held, 3 wire control.

3.4.19.1 Coil Voltage: 120 volts, 60 Hertz.

3.4.19.2 Poles: As required or specified on Drawings.

3.4.20 Lighting: Install luminaires at locations and heights as indicated on Drawings, in accordance with laminar manufacturer's written instructions, applicable requirements of NEC, NEMA standards, and with recognized industry practices to ensure that luminaries fulfill requirements.

3.4.20.1 Fasten surface mount luminaires rigidly and securely to ceiling and wall structural supports; and mount luminaires plumb and level.

3.4.20.2 Align luminaires and clean lenses and diffusers at completion of Work. Clean paint splatters, dirt, and debris from installed luminaries.

3.4.20.3 Install new lamps in all luminaires.

3.4.21 Emergency Inverter System:

3.4.21.1 Type: As described on Drawings.

3.4.21.2 Tests: Perform functional tests, full 90 minute discharge test, and 24 hour recharge test.

3.4.22 Lightning Protection:

3.4.22.1 Components: In accordance with ANSI/UL 96, as indicated on the Drawings.

3.4.22.2 Tee Clamp Fitting: Heavy duty tee splicer with 8 inches of main conductor contact and 4 inches of branch conductor contact.
3.4.22.3 Parallel Clamp Fitting: Bronze fixed position type with two pressure clamps for conductors.

3.4.22.4 Bonding Lug Fitting: Heavy duty bronze fitting with two pressure clamps for conductor attachment. 3/8 inch diameter hole for bonding bolt.

3.4.22.5 Bonding Plate Fitting: Heavy duty 4 inches square bronze fitting with two pressure conductor clamps for 4 inches of conductor contact.

3.4.22.6 Pipe Clamp Fitting: Adjustable tinned copper bonding strap, 2 inches wide, with pressure clamp conductor terminal.

3.4.22.7 Cable Holders: inch wide copper duplex loop.

3.4.22.8 Fasteners: Stainless steel or brass.

3.4.22.9 Do not use adhesives or nails as means of support for components of system.

3.4.23 Relays and Control Equipment: As described on the Drawings.

End of Specifications
Contracting Division

P C & M Construction Company, Inc.
317 Bortot
Gallup, New Mexico 87301

Gentlemen:

Your bid dated September 25, 1995, in the amount of $2,470,484.00 under Solicitation DACA63-95-B-0150, Theater Missile Defense (TMD) Target Launch Facilities, Fort Wingate Depot Activity, New Mexico is accepted. Contract DACA63-95-C-0122, Defense Priorities and Allocations System letter, and bond documents are enclosed.

Please execute two copies of the bonds and return them to this office within 10 days after receipt thereof.

You are required to procure and maintain, during the entire period of the contract, the minimum insurance stated in Section 00800, Special Clauses, Required Insurance. Also you are encouraged to develop, prepare, and submit value engineering change proposals. (See Section 00700, Construction Contract Clauses, Value Engineering - Construction.)

This letter does not constitute a Notice to Proceed.

Sincerely,

John H. Rodgers
Contracting Officer

Enclosures
## NOTICE TO PROCEED

<table>
<thead>
<tr>
<th>Contracting Officer Fort Worth District, Corp of Engineers</th>
<th>Date 16 November 1995</th>
</tr>
</thead>
<tbody>
<tr>
<td>P.O. Box 17300, Fort Worth, Texas 76102-0300</td>
<td>Contract No. DACA63-95-C-0122</td>
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<tr>
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<td>Invitation For Bid No. DACA63-95-B-0150</td>
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<table>
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<th>To</th>
<th>Project and Location</th>
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<tr>
<td>P C &amp; M Construction Company, Inc.</td>
<td>Theater Missile Defense (TMD) Target Launch Facilities, Fort Wingate Depot Activity, New Mexico</td>
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<tr>
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<tr>
<td>Gallup New Mexico 87301</td>
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In accordance with the terms of the above contract, you are hereby notified to proceed with the work. Your attention is invited to the contract provision which prescribes the time for starting and completing the work and/or delivery.

Your attention is further invited to the Return Receipt Card which was signed by you or your representative on the date this notice was delivered by the U.S. Postal Service. The date of acknowledgement which you indicate below should agree with the card. If they differ, the date shown on the Return Receipt Card will govern in figuring contract completion time.

Acknowledge receipt of the NOTICE TO PROCEED in the space provided below, and return to this office.

☐ The Original
☐ The Original and one copy.

One copy of this NOTICE TO PROCEED is for your record.

THE UNITED STATES OF AMERICA

[Signature]
John H. Rodgers
Contracting Officer

### ACKNOWLEDGEMENT

This NOTICE TO PROCEED AND enclosures were received 11-28-95

(Date)

By

[Title] President

SWP Form 205 (R)
Rev 8 Feb 77
Contracting Division

P C & M Construction Company, Inc.
317 Bortot
Gallup, New Mexico 87301

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Sincerely,

John H. Rodgers
Contracting Officer

Enclosures

Copies furnished:
CESWF-RM-F
CESWF-CD
CESWE-PM-J
CESWF-AO-SW

COBERN CESWF-ED-C
PROCTOR CESWF-OC
RODGERS CESWF-CT-M

RETURN TO CESWF-CT-M
(VALERIE)
PURCHASE REQUEST AND COMMITMENT

For use of this form, see AR 37-1: the proponent agency is Hq Dept. Army

PURCHASE INSTRUMENT NO. 6453XMA527233577
REQUISITION NO. 6453XMA527233577
DATE 29-SEP-95
PAGE 0001

TO: Purchasing and Contracting Officer
THRU: SECTION A
FROM: MILITARY BRANCH

It is requested that the supplies and services enumerated below or on attached list be:

Purchased for Military Branch: DELIVERED TO SEE LINE ITEM BELOW

The supplies and services listed below cannot be secured through normal channels or other Army supply sources in the immediate vicinity, and their procurement will not violate existing regulations pertaining to local purchases for stock, therefore, local procurement is necessary for the following reason: (Check appropriate box and complete item)

LOCAL PURCHASES AUTHORIZED AS THE NORMAL MEANS OF SUPPLY FOR THE FOREGOING BY

REQUISITIONING DISCLOSES NONAVAILABILITY OF ITEMS AND LOCAL PURCHASE IS AUTHORIZED BY

FUND CERTIFICATION

The supplies and services listed on this request are properly chargeable to the following allotments, the available balances of which are sufficient to cover the cost thereof, and funds have been committed.

ACCOUNTING CLASSIFICATION AND AMOUNT

SEE LINE ITEM BELOW

$2,470,484.00

TYPED NAME AND TITLE OF CERTIFYING OFFICER
LINDA PRUITT
ACCOUNTING TECHNICIAN
/S/LINDA R PRUITT
29-SEP-95

DISCOUNT TERMS

PURCHASE ORDER NUMBER

DELIVERY REQUIREMENTS

ARE MORE THAN 7 DAYS REQUIRED TO INSPECT AND ACCEPT THE REQUESTED GOODS OR SERVICES YES NO
IF YES, NUMBER OF DAYS REQUIRED

TYPED NAME AND GRADE OF INITIATING OFFICER
DAVID NEWCOMER

SIGNATURE
/S/DAVID NEWCOMER

DATE 29-SEP-95

TYPED NAME AND GRADE OF APPROVING OFFICER OR DESIGNEE

SIGNATURE

DAVID NEWCOMER
PROGRAM ANALYST

SIGNATURE
/S/DAVID NEWCOMER

DATE 29-SEP-95

DA FORM 3953, MAR 91

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<th>ITEM</th>
<th>DESCRIPTION OF SUPPLY OR SERVICES</th>
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<th>UNIT</th>
<th>UNIT PRICE</th>
<th>TOTAL COST</th>
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SOLICITATION, OFFER, AND AWARD
(Construction, Alteration, or Repair)

1. SOLICITATION NO.
   DACA63-95-B-0150

2. TYPE OF SOLICITATION
   □ SEALED BID (IFB)
   □ NEGOTIATED (RFP)

3. DATE ISSUED
   08/17/95

4. CONTRACT NO.
   DACA63-95-C-0122

5. REQUISITION/PURCHASE REQUEST NO.
   W4520A-5206-2402

6. PROJECT NO.

7. ISSUED BY CODE
   US ARMY ENGINEER DISTRICT, FTW
   P O BOX 17300
   819 TAYLOR ST
   FT. WORTH TX 76102-0300

8. ADDRESS OFFER TO
   SF1442
   US ARMY ENGINEER DISTRICT, FTW
   ATTN: CESWF-CT
   819 TAYLOR STREET/PO BOX 17300
   FORT WORTH TX 76102-0300

9. FOR INFORMATION CALL:
   A. NAME
   VALERIE J SANDS
   C44
   (817) 334-2721

SOLICITATION

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

10. THE GOVERNMENT REQUIRES PERFORMANCE OF THE WORK DESCRIBED IN THESE DOCUMENTS (Title, identifying no., date):

   Theater Missile Defense (TMD) Target Launch Facilities, Fort Wingate Depot
   Activity, New Mexico

11. The Contractor shall begin performance within 1 calendar days and complete it within 240 calendar days after receiving award, notice to proceed. This performance period is □ mandatory, □ negotiable. (See ___________)

12A. THE CONTRACTOR MUST FURNISH ANY REQUIRED PERFORMANCE AND PAYMENT BONDS?
   (If "YES," indicate within how many calendar days after award in item 12B.)
   YES □ NO

12B. CALENDAR DAYS
   010

13. ADDITIONAL SOLICITATION REQUIREMENTS:

   A. Sealed offers in original and 0 copies to perform the work required are due at the place specified in Item 8 by 1400 hour local time 09/14/95 (date). If this is a sealed bid solicitation, offers must be publicly opened at that time. Sealed envelopes containing offers shall be marked to show the offeror's name and address, the solicitation number, and the date and time offers are due.

   B. An offer guarantee □ is, □ is not required.

   C. All offers are subject to the (1) work requirements, and (2) other provisions and clauses incorporated in the solicitation in full text or by reference.

   Offers providing less than 60 calendar days for Government acceptance after the date offers are due will not be considered and will be rejected.

NSN 7540-01-155-3212

1442-101

00010-1

STANDARD FORM 1442 (REV. 4-65)
Prepared by GSA
FAR (48 CFR) 52.226-1(e)
14. NAME AND ADDRESS OF OFFEROR (Include ZIP Code)

P C & M Construction Company, INC.
317 Bortot
Gallup, New Mexico 87301
Cage Code: OTE-76
Contractor Establishment Code: 02-123-8670

15. TELEPHONE NO. (Include area code)
(505) 722-6427
FAX (505) 722-0891

18. REMITTANCE ADDRESS (Include only if different than item 14)

17. The offeror agrees to perform the work required at the prices specified below in strict accordance with the terms of this solicitation, if this offer is accepted by the Government in writing within 60 calendar days after the date offers are due. (Insert any number equal to or greater than the minimum requirement stated in Item 130. Failure to insert any number means the offeror accepts the minimum in item 130.)

AMOUNTS

Set forth in attached Bid Schedule.

18. The offeror agrees to furnish any required performance and payment bonds.

19. ACKNOWLEDGMENT OF AMENDMENTS
(The offeror acknowledges receipt of amendments to this solicitation - give number and date of each)

<table>
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<tr>
<th>AMENDMENT NO.</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
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<td>9-6-95</td>
<td>9-7-95</td>
<td>9-8-95</td>
<td>9-8-95</td>
<td>9-13-95</td>
<td>9-14-95</td>
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</table>

20A. NAME AND TITLE OF PERSON AUTHORIZED TO SIGN OFFER
Pat Chee Miller, President

20B. SIGNATURE
Pat Chee Miller
9-25-95

AWARD (To be completed by Government)

BASE BID
(Items 0001 - 0007 to include Amendments 1-7)

<table>
<thead>
<tr>
<th>AMOUNT</th>
<th>$2,470,484.00</th>
</tr>
</thead>
</table>

24. SUBMIT INVOICES TO ADDRESS SHOWN IN
4 copies unless otherwise specified

25A. ACCOUNTING AND APPROPRIATION DATA
W45XMA-5272-3357

28. ADMINISTERED BY
US Army Engineer District, Fort Worth
ATIN: CESWF-AO-SW
DRAWER J
WHITE SANDS MISSILE RANGE, NM 88002-5507

27. PAYMENT WILL BE MADE BY
Special Disbursing Agent, US Army Engineer District, Fort Worth, Corps of Engineers
Fort Worth, Texas 76102-0300

CONTRACTING OFFICER WILL COMPLETE ITEM 28 OR 29 AS APPLICABLE

28. NEGOTIATED AGREEMENT (Contractor is required to sign this document and return 2 copies to issuing office.) Contractor agrees to furnish and deliver all items or perform all work, requirements identified on this form and any other sheets for the consideration stated in this contract. The rights and obligations of the parties to this contract shall be governed by (a) this contract award, (b) the solicitation, and (c) the clauses, representations, certifications, and specifications incorporated by reference in or attached to this contract.

29. AWARD (Contractor is not required to sign this document.) Your offer on this solicitation is hereby accepted as to the items listed. This award constitutes the contract, which consists of (a) the Government solicitation and your offer, and (b) the contract award. No further contractual document is necessary.

30A. NAME AND TITLE OF CONTRACTOR OR PERSON AUTHORIZED TO SIGN (Type or print)
JOHN H. ROGERS

31A. NAME OF CONTRACTING OFFICER (Type or print)

30C. DATE

31B. UNITED STATES OF AMERICA

31C. AWARD DATE
9/30/95

STANDARD FORM 442 BACK (REV. 4-85)
BIDDING SCHEDULE
(To be attached to SF 1442)

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Description</th>
<th>Estimated Quantity</th>
<th>Unit</th>
<th>Unit Price</th>
<th>Estimated Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>0001.00</td>
<td>Launch Pad, complete:</td>
<td>**Sum ***</td>
<td></td>
<td>**Sum ***</td>
<td>$475,149.00</td>
</tr>
<tr>
<td>0002.00</td>
<td>Missile Assembly Building, including all utilities to the five-foot line of the building.</td>
<td><strong>Job</strong>*</td>
<td></td>
<td>**Sum ***</td>
<td>$686,081.00</td>
</tr>
<tr>
<td>0003.00</td>
<td>Launch Operations Trailer Shelter, including all utilities to the five-foot line of the building.</td>
<td><strong>Job</strong>*</td>
<td></td>
<td>**Sum ***</td>
<td>$160,763.00</td>
</tr>
<tr>
<td>0004.00</td>
<td>Launch Equipment Building, including all utilities to the five-foot line of the building.</td>
<td><strong>Job</strong>*</td>
<td></td>
<td>**Sum ***</td>
<td>$95,983.00</td>
</tr>
<tr>
<td>0005.00</td>
<td>Site Work/Supporting Facilities; complete, including all utilities outside the buildings' five-foot lines, and all other work not separately listed:</td>
<td><strong>Job</strong>*</td>
<td></td>
<td>**Sum ***</td>
<td>$604,502.00</td>
</tr>
<tr>
<td>0006.00</td>
<td>Operations and Maintenance Manuals</td>
<td><strong>Job</strong>*</td>
<td></td>
<td>**Sum ***</td>
<td>$3,000.00</td>
</tr>
<tr>
<td>0007.00</td>
<td>Final As-Built Drawings</td>
<td><strong>Job</strong>*</td>
<td></td>
<td>**Sum ***</td>
<td>$5,000.00</td>
</tr>
</tbody>
</table>

TOTAL (BID ITEM NOS. 0001 through 0007) $2,470,484.00
AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

2. AMENDMENT NO. 0007

3. EFFECTIVE DATE 95 SEP 14

4. REQUISITION/ PURCHASE REQ. NO.

5. PROJECT NO. (If applicable) 17 AUGUST 1995

6. ISSUED BY

7. ADMINISTERED BY (If other than Item 6)

Department of the Army
Corps of Engineers
Fort Worth District

8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, State and ZIP Code)

DACA63-95-B-0150

9A. AMENDMENT OF SOLICITATION NO.

9B. DATED (SEE ITEM 11)

10A. MODIFICATION OF CONTRACT/ORDER NO.

10B. DATED (SEE ITEM 13)

FACILITY CODE

11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

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

Bid opening date is 25 September 1995, as previously announced.

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: (Specify authority) 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 (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(d).

C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:

D. OTHER (Specify type of modification and authority)

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 Wage Rates for Theater Missile Defense (TMD) Target Launch Facilities, Fort Wingate Depot Activity, Fort Wingate, New Mexico, are hereby modified as follows:

Void pages 00710-1 through 00710-23, and substitute therefor the attached pages 00710-1 through 00710-23, each page bearing the notation "ACCOMPANYING AMENDMENT NO. 0007 TO SOLICITATION NO. DACA63-95-B-0150."

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 (Type or print)

15B. CONTRACTOR/OFFERER

15C. DATE SIGNED

16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print)

16B. UNITED STATES OF AMERICA

16C. DATE SIGNED

(Signature of person authorized to sign)  (Signature of Contracting Officer)

NSN 7540-01-152-0070

30-105-02

STANDARD FORM 30 (REV. 10-83)

PREVIOUS EDITION UNUSABLE

Prescribed by GSA

FAR (48 CFR) 53.243
INSTRUCTIONS

Instructions for items other than those that are self-explanatory, are as follows:

1) Item 1 (Contract ID Code). Insert the contract type identification code that appears in the title block of the contract being modified.

2) Item 2 (Effective date).

(1) For a solicitation amendment, change order, or administrative change, the effective date shall be the issue date of the amendment, change order, or administrative change.

(2) For a supplemental agreement, the effective date shall be the date agreed to by the contracting parties.

(3) For a modification issued as an initial or confirming notice of termination for the convenience of the Government, the effective date and the modification number of the confirming notice shall be the same as the effective date and modification number of the initial notice.

(4) For a modification converting a termination for default to a termination for the convenience of the Government, the effective date shall be the same as the effective date of the termination for default.

5) For a modification confirming the contracting officer's determination of the amount due in settlement of a contract termination, the effective date shall be the same as the effective date of the initial decision.

6) Item 6 (Issued By). Insert the name and address of the issuing office. If applicable, insert the appropriate issuing office code in the code block.

7) Item 8 (Name and Address of Contractor). For modifications to a contract or order, enter the contractor's name, address, and code as shown in the original contract or order, unless changed by this or a previous modification.

8) Items 9, (Amendment of Solicitation No.—Dated), and 10, (Modification of Contract/Order No.—Dated). Check the appropriate box and in the corresponding blanks insert the number and date of the original solicitation, contract, or order.

9) Item 12 (Accounting and Appropriation Data). When appropriate, indicate the impact of the modification on each affected accounting classification by inserting one of the following entries:

Accounting classification
Net increase $ ____________________

(2) Accounting classification
Net decrease $ ____________________

NOTE: If there are changes to multiple accounting classifications that cannot be placed in block 12, insert an asterisk and the words "See continuation sheet".

10) Item 13. Check the appropriate box to indicate the type of modification. Insert in the corresponding blank the authority under which the modification is issued. Check whether or not contractor must sign this document. (See FAR 43.103.)

11) Item 14 (Description of Amendment/Modification). (1) Organize amendments or modifications under the appropriate Uniform Contract Format (UCF) section headings from the applicable solicitation or contract. The UCF table of contents, however, shall not be set forth in this document.

(2) Indicate the impact of the modification on the overall total contract price by inserting one of the following entries:

(i) Total contract price increased by $ __________

(ii) Total contract price decreased by $ __________

(iii) Total contract price unchanged.

3) State reason for modification.

4) When removing, reinstating, or adding funds, identify the contract items and accounting classifications.

5) When the SF 30 is used to reflect a determination by the contracting officer of the amount due in settlement of a contract terminated for the convenience of the Government, the entry in Item 14 of the modification may be limited to —

(i) A reference to the letter determination; and

(ii) A statement of the net amount determined to be due in settlement of the contract.

6) Include subject matter or short title of solicitation/contract where feasible.

12) Item 16B. The contracting officer's signature is not required on solicitation amendments. The contracting officer's signature is normally affixed last on supplemental agreements.
**NM950001**

**General Decision Number NM950001**

Superseded General Decision No. NM940001

**State:** New Mexico

**Construction Type:**
BUILDING
HEAVY

**County(ies):**
STATEWIDE

**STATEWIDE - EXCLUDING EDDY AND LEA COUNTIES FOR BUILDING CONSTR.**

GENERAL BUILDING AND HEAVY ENGINEERING CONSTRUCTION shall include the construction, alteration, repair and demolition of buildings including office buildings, warehouses, industrial and commercial buildings, institutional and public buildings, and all air conditioning, conduit, heating and other mechanical and electrical works and site preparation for building or heavy engineering projects under this classification, stadia; and shall include electrical, gas, water, sewer lines, and other such utility construction which are part of projects under this classification and included within the property line or less than five (5) feet from the building or heavy engineering structure, whichever is closer, provided, however, regard to electrical utilities such construction shall include construction from the first attachment of incoming power source without regard to the property line or proximity to the building or the heavy engineering structure; and include construction, alteration, repair and demolition of heavy engineering work such as power generating plants, pump stations, natural gas compressor stations; covered reservoirs and covered sewage and water treatment facilities; concrete linings for canals, ditches and channels; concrete dams; earth dams of one million (1,000,000) cubic yards or over; radio towers, ovens, furnaces, kilns, silos shafts and tunnels (other than highway shafts and tunnels), hydro-electric projects; and well drilling, telephone and electrical transmission lines which are part of GENERAL BUILDING AND HEAVY ENGINEERING PROJECTS: mining appurtenances such as tipples, washeries and loading and discharging chutes, and specialized structures for testing, launching and recovering space and other rocket-type missiles.
<table>
<thead>
<tr>
<th>Modification Number</th>
<th>Publication Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>02/10/1995</td>
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<tr>
<td>1</td>
<td>02/17/1995</td>
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<tr>
<td>2</td>
<td>03/31/1995</td>
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<tr>
<td>3</td>
<td>04/07/1995</td>
</tr>
<tr>
<td>4</td>
<td>04/14/1995</td>
</tr>
<tr>
<td>5</td>
<td>05/19/1995</td>
</tr>
<tr>
<td>6</td>
<td>07/28/1995</td>
</tr>
<tr>
<td>7</td>
<td>08/04/1995</td>
</tr>
<tr>
<td>8</td>
<td>09/01/1995</td>
</tr>
</tbody>
</table>
COUNTY(ies): STATEWIDE

ASBE0066D 04/19/1994 Rates Fringes
CURRY, HARDING, LEA, QUAY, ROOSEVELT, UNION COUNTIES
ASBESTOS WORKERS/INSULATORS
(Includes application of all insulating materials, protective coverings, coatings and finishes to all types of mechanical systems and asbestos removal)
14.73 4.17

ASBE0076B 01/01/1994
REMAINS COUNTIES
ASBESTOS WORKERS/INSULATORS
(Includes application of all insulating materials, protective coverings, coatings and finishes to all types of mechanical systems and asbestos removal)
14.00 4.75

BOIL0627A 04/01/1995
BOILERMakers
17.15 8.10

BRNM0001A 04/01/1994
BRICKLAYERS & STONEMASON:
DONA ANA AND COMMUNITIES OF SILVER CITY, BAYARD, CENTRAL, HURLEY AND TOWN SITE OF TYRONE & COMMUNITY OF ALAMOGORDO (Area Residents) 14.01 2.79
GRANT, LUNA, OTERO AND SIERRA COS. 15.76 2.79
HIDALGO COUNTY 16.26 2.79

BRNM0002A 06/01/1995
BRICKLAYERS-STONEMASON:
BERNALILLO COUNTY AND TOWNSHIPS OF

00710-3
BELEN, BERNALILLO, RIO RANCHO
EDGECWOOD, LOS LUNAS, MORAINTY
AND SANTA FE COUNTY  

16.86  3.12

CATRON, COLFAX, CIBOLA, HARDING
LOS ALAMOS, MCKINLEY, MORA, RIO
ARRIBA, SANDOVAL, SAN JUAN, SAN
MIGUEL, SOCORRO, TAOS, TORRENCE,
UNION & VALENCIA COUNTIES  

16.86  3.12

----------------------------------------

BRNM00003A  06/01/1995

BRICKLAYERS AND STONEMasons:

CURRY AND ROOSEVELT COS.  

16.86  3.12

DEBACA, GUADALUPE AND QUAY
COUNTIES; AND MINE AND
REFINERY SITES LOCATED
OUTSIDE OF MUNICIPAL LIMITS  

16.86  3.12

----------------------------------------

BRNM00004A  10/01/1994

BRICKLAYERS-STONEMasons:

CHAVES COUNTY  

16.36  2.92

LINCOLN COUNTY, AND MINE AND
REFINERY SITES OUTSIDE OF
MUNICIPAL LIMITS  

16.36  2.92

----------------------------------------

* CARP0092A  10/01/1994

Carpenters, Lathers, 
& Piledrivers  

15.70  2.92

Light commercial construction**  

10.65  2.22

**SEE DEFINITION AT THE END OF TRUCK DRIVERS

----------------------------------------

MILLWrights:

ZONE I  

16.85  2.90

ZONE II  

19.10  2.90

Light commercial construction**  

10.65  2.22

Basing points for Millwrights only from Albuquerque City Hall

ZONE I  0 TO 15 ROAD MILES
ZONE II  15 TO 35 ROAD MILES

00710-4
ELECO583B 01/01/1995

<table>
<thead>
<tr>
<th>ELECTRICIANS</th>
<th>Rates</th>
<th>Fringes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zone I</td>
<td>15.15</td>
<td>2.50+3.5%</td>
</tr>
<tr>
<td>Zone II</td>
<td>17.10</td>
<td>2.50+3.5%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CABLE SPLICERS:</th>
<th>Rates</th>
<th>Fringes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zone I</td>
<td>15.40</td>
<td>2.50+3.5%</td>
</tr>
<tr>
<td>Zone II</td>
<td>17.35</td>
<td>2.50+3.5%</td>
</tr>
</tbody>
</table>

Zone 1: The area within a 25 mile radius from the downtown Post Office in El Paso, TX. Ft Bliss and Biggs Field proper to be included in this free zone. The area within a 15 mile radius from the Post Office in Las Cruces, NM and within a 5 mile radius from the Post Office in Alamogordo, Deming and Lordsburg. The area 10 miles East and 10 miles West of Interstate 10 between El Paso, Texas and Las Cruces, NM.

Zone 2: Dona Ana, Otero, Luna and Hidalgo Counties (except that area in Zone 1).

* ELECO611B 07/01/1995

<table>
<thead>
<tr>
<th>COMMERCIAL LINE WORK:</th>
<th>Rates</th>
<th>Fringes</th>
</tr>
</thead>
</table>

Bernalillo, Catron, Chaves, Colfax, Curry, DeBaca, Grant, Guadalupe, Harding, Lincoln, Los Alamos, McKinley, Mora, Quay, Rio Arriba, Roosevelt, Sandoval, San Juan, San Miguel, Santa Fe, Sierra, Socorro, Taos, Torrance, Union, Valencia & White Sands Missile Range and that portion of Fort Bliss in New Mexico.

<table>
<thead>
<tr>
<th>Lineman - Technicians:</th>
<th>Rates</th>
<th>Fringes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zone I</td>
<td>18.60</td>
<td>4.15+3.75%</td>
</tr>
<tr>
<td>Zone II</td>
<td>20.27</td>
<td>4.15+3.75%</td>
</tr>
<tr>
<td>Zone III</td>
<td>21.39</td>
<td>4.15+3.75%</td>
</tr>
<tr>
<td>Zone IV</td>
<td>23.44</td>
<td>4.15+3.75%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cable Splicers:</th>
<th>Rates</th>
<th>Fringes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zone I</td>
<td>20.46</td>
<td>4.15+3.75%</td>
</tr>
<tr>
<td>Zone II</td>
<td>22.13</td>
<td>4.15+3.75%</td>
</tr>
<tr>
<td>Zone III</td>
<td>23.25</td>
<td>4.15+3.75%</td>
</tr>
<tr>
<td>Zone IV</td>
<td>25.30</td>
<td>4.15+3.75%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Equipment Op. (includes helicopter op.):</th>
<th>Rates</th>
<th>Fringes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zone I</td>
<td>17.67</td>
<td>4.15+3.75%</td>
</tr>
<tr>
<td>Zone II</td>
<td>19.34</td>
<td>4.15+3.75%</td>
</tr>
<tr>
<td>Zone III</td>
<td>20.46</td>
<td>4.15+3.75%</td>
</tr>
<tr>
<td>Zone IV</td>
<td>22.51</td>
<td>4.15+3.75%</td>
</tr>
</tbody>
</table>
Equipment Mechanic (includes helicopter mechanic):
Zone I  17.67  4.15+3.75%
Zone II  19.34  4.15+3.75%
Zone III  20.46  4.15+3.75%
Zone IV  22.51  4.15+3.75%
Powderman:
Zone I  16.18  4.15+3.75%
Zone II  17.85  4.15+3.75%
Zone III  18.97  4.15+3.75%
Zone IV  21.05  4.15+3.75%
Groundman - Jackhammer Op.:
Zone I  13.21  3.90+3.75%
Zone II  14.88  3.90+3.75%
Zone III  16.00  3.90+3.75%
Zone IV  18.05  3.90+3.75%

<table>
<thead>
<tr>
<th>City</th>
<th>Basic Wage Rates</th>
<th>Miles From Main Post Office</th>
</tr>
</thead>
<tbody>
<tr>
<td>*Albuquerque</td>
<td></td>
<td>25 miles</td>
</tr>
<tr>
<td>Santa Fe</td>
<td></td>
<td>10 miles</td>
</tr>
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<td>Las Vegas</td>
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<td>8 miles</td>
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<td>Farmington</td>
<td></td>
<td>6 miles</td>
</tr>
<tr>
<td>Raton</td>
<td></td>
<td>6 miles</td>
</tr>
<tr>
<td>Tucumcari</td>
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<td>6 miles</td>
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<tr>
<td>Gallup</td>
<td></td>
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<td>Roswell</td>
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<td>12 miles</td>
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<td>Ruidoso</td>
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<td>Portales</td>
<td></td>
<td>12 miles</td>
</tr>
<tr>
<td>Carrizozo</td>
<td></td>
<td>12 miles</td>
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<tr>
<td>Clovis</td>
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<td>12 miles</td>
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<tr>
<td>Belen</td>
<td></td>
<td>12 miles</td>
</tr>
<tr>
<td>Los Lunas</td>
<td></td>
<td>12 miles</td>
</tr>
<tr>
<td>Espanola</td>
<td></td>
<td>14 miles</td>
</tr>
</tbody>
</table>

*The eastern edge of the Albuquerque Zone extends no further than the western boundary of the Village of Tijeras.

Zone 2 extending up to twenty (20) miles beyond Zone 1, EXCEPT ALBUQUERQUE, rates per hour shall be increased by nine percent (9%) of the journeyman rate for Zone 1.

Zone 3 extending up to thirty (30) miles beyond Zone 1, EXCEPT ALBUQUERQUE, rates per hour shall be increased by fifteen percent (15%) of the journeyman rate for Zone 1.

Zone 4 anything beyond thirty (30) miles from Zone 1, EXCEPT ALBUQUERQUE, rates per hour shall be increased by twenty-six percent (26%) of the journeyman rate for Zone 1.
Switching stations and sub-stations adjacent to power plants in Zones I and II in Luna, Dona Ana, Otero & Hidalgo Cos., exclusive of White Sands Missile Range & that portion of Fort Bliss in New Mexico.

Linemen - Technicians
  Zone I          15.15          2.90+3.75%
  Zone II         17.10          2.90+3.75%
Cable Splicers
  Zone I          15.45          2.90+3.75%
  Zone II         17.44          2.90+3.75%
Equipment Op. (includes Helicopter Op.):
  Zone I          13.18          2.90+3.75%
  Zone II         14.88          2.90+3.75%
Equipment Mechanic (includes Helicopter Mech.):
  Zone I          13.18          2.90+3.75%
  Zone II         14.88          2.90+3.75%
Powderman:
  Zone I          12.73          2.90+3.75%
  Zone II         14.36          2.90+3.75%
Groundman - Jackhammer Op.:
  Zone I          10.76          2.90+3.75%
  Zone II         12.14          2.90+3.75%

ZONE I:

a. The area within a 25 mile radius from the Downtown Post Office in El Paso, Texas. Fort Bliss and Biggs Field Property to be included in this Free Zone. Fort Bliss and Biggs Field to be defined by official U.S. Government Map

b. The area within a five mile radius of any city, town, or municipality within which an employer establishes or maintains his permanent place of business.

c. The area within a fifteen mile radius from the Post Office in Las Cruces, New Mexico, and within a five mile radius from the Post Office in Alamogordo, Deming, and Lordsburg, New Mexico.

d. The area ten miles East and ten miles West of Interstate 10, between El Paso, Texas and Las Cruces, New Mexico.

ZONE II: All other areas of the jurisdiction except those specified in Zone I.
Switching stations adjacent to power plants in Eddy and Lea Cos.; the following zones listed shall be designated from post office of Artesia, Carlsbad, Hobbs & Lovington:

Zone I - 0 to 12 miles  Zone III - 22 to 40 miles
Zone II - 12 to 22 miles  Zone IV - 40 miles

**Lineman - Technicians:**

<table>
<thead>
<tr>
<th>Zone</th>
<th>Rate</th>
<th>Fringes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zone I</td>
<td>17.05</td>
<td>4.15+3.75%</td>
</tr>
<tr>
<td>Zone II</td>
<td>17.50</td>
<td>4.15+3.75%</td>
</tr>
<tr>
<td>Zone III</td>
<td>17.65</td>
<td>4.15+3.75%</td>
</tr>
<tr>
<td>Zone IV</td>
<td>17.90</td>
<td>4.15+3.75%</td>
</tr>
</tbody>
</table>

**Cable Splicers:**

<table>
<thead>
<tr>
<th>Zone</th>
<th>Rate</th>
<th>Fringes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zone I</td>
<td>17.40</td>
<td>4.15+3.75%</td>
</tr>
<tr>
<td>Zone II</td>
<td>17.85</td>
<td>4.15+3.75%</td>
</tr>
<tr>
<td>Zone III</td>
<td>18.00</td>
<td>4.15+3.75%</td>
</tr>
<tr>
<td>Zone IV</td>
<td>18.25</td>
<td>4.15+3.75%</td>
</tr>
</tbody>
</table>


<table>
<thead>
<tr>
<th>Zone</th>
<th>Rate</th>
<th>Fringes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zone I</td>
<td>16.20</td>
<td>4.15+3.75%</td>
</tr>
<tr>
<td>Zone II</td>
<td>16.65</td>
<td>4.15+3.75%</td>
</tr>
<tr>
<td>Zone III</td>
<td>16.80</td>
<td>4.15+3.75%</td>
</tr>
<tr>
<td>Zone IV</td>
<td>17.05</td>
<td>4.15+3.75%</td>
</tr>
</tbody>
</table>

**Powderman:**

<table>
<thead>
<tr>
<th>Zone</th>
<th>Rate</th>
<th>Fringes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zone I</td>
<td>14.83</td>
<td>4.15+3.75%</td>
</tr>
<tr>
<td>Zone II</td>
<td>15.28</td>
<td>4.15+3.75%</td>
</tr>
<tr>
<td>Zone III</td>
<td>15.43</td>
<td>4.15+3.75%</td>
</tr>
<tr>
<td>Zone IV</td>
<td>15.68</td>
<td>4.15+3.75%</td>
</tr>
</tbody>
</table>

**Groundman - Jackhammer Op.:**

<table>
<thead>
<tr>
<th>Zone</th>
<th>Rate</th>
<th>Fringes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zone I</td>
<td>12.11</td>
<td>4.15+3.75%</td>
</tr>
<tr>
<td>Zone II</td>
<td>12.56</td>
<td>4.15+3.75%</td>
</tr>
<tr>
<td>Zone III</td>
<td>12.71</td>
<td>4.15+3.75%</td>
</tr>
<tr>
<td>Zone IV</td>
<td>12.96</td>
<td>4.15+3.75%</td>
</tr>
</tbody>
</table>

---

**Rates Fringes**

**ELECTRICIANS:**
Bernalillo, Santa Fe, Torrance, DeBaca, Guadalupe, Quay, San Miguel, Mora, Harding, Union, Colfax, Taos, Rio Arriba, Grant, Sandoval, Valencia, Socorro, Catron, McKinley, Sierra, San Juan, Chaves, Curry, Lincoln, Cibola & Roosevelt Counties

**Zone 1**
- Electricians: 18.60  4.15+4%
- Cable Splicers: 20.46  4.15+4%

**Zone 2**
- Electricians: 20.27  4.15+4%
- Cable Splicers: 22.13  4.15+4%
Zones 3 and 4

<table>
<thead>
<tr>
<th>Zone</th>
<th>Electricians</th>
<th>Cable Splicers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zone 3</td>
<td>21.39</td>
<td>4.15+4%</td>
</tr>
<tr>
<td></td>
<td>23.25</td>
<td>4.15+4%</td>
</tr>
<tr>
<td>Zone 4</td>
<td>23.44</td>
<td>4.15+4%</td>
</tr>
<tr>
<td></td>
<td>25.30</td>
<td>4.15+4%</td>
</tr>
</tbody>
</table>

### Basic Wage Rates

<table>
<thead>
<tr>
<th>City</th>
<th>Miles From Main Post Office</th>
</tr>
</thead>
<tbody>
<tr>
<td>*Albuquerque</td>
<td>25 miles</td>
</tr>
<tr>
<td>Santa Fe</td>
<td>10 miles</td>
</tr>
<tr>
<td>Las Vegas</td>
<td>8 miles</td>
</tr>
<tr>
<td>Farmington</td>
<td>6 miles</td>
</tr>
<tr>
<td>Raton</td>
<td>6 miles</td>
</tr>
<tr>
<td>Belen</td>
<td>12 miles</td>
</tr>
<tr>
<td>Espanola</td>
<td>14 miles</td>
</tr>
<tr>
<td>Los Lunas</td>
<td>12 miles</td>
</tr>
<tr>
<td>Tucumcari</td>
<td>6 miles</td>
</tr>
<tr>
<td>Roswell</td>
<td>12 miles</td>
</tr>
<tr>
<td>Ruidoso</td>
<td>12 miles</td>
</tr>
<tr>
<td>Portales</td>
<td>12 miles</td>
</tr>
<tr>
<td>Carrizozo</td>
<td>12 miles</td>
</tr>
<tr>
<td>Clovis</td>
<td>12 miles</td>
</tr>
<tr>
<td>Gallup</td>
<td>10 miles</td>
</tr>
</tbody>
</table>

*The eastern edge of the Albuquerque Zone extends no further than the western boundary of the Village of Tijeras.*

Zone 2 extending up to twenty (20) miles beyond Zone 1, EXCEPT ALBUQUERQUE, rates per hour shall be increased by nine percent (9%) of the journeyman rate for Zone 1.

Zone 3 extending up to thirty (30) miles beyond Zone 1, EXCEPT ALBUQUERQUE, rates per hour shall be increased by fifteen percent (15%) of the journeyman rate for Zone 1.

Zone 4 anything beyond thirty (30) miles from Zone 1, EXCEPT ALBUQUERQUE, rates per hour shall be increased by twenty-six percent (26%) of the journeyman rate for Zone 1.

**FOR ESTABLISHING THE OUTLYING ZONES FROM THE ALBUQUERQUE FREE ZONE ONLY, ZONE 2 SHALL EXTEND UP TO TEN (10) MILES BEYOND ZONE 1, ZONE 3 SHALL EXTEND UP TO TWENTY (20) MILES BEYOND ZONE 1, AND ZONE 4 ANYTHING BEYOND TWENTY (20) MILES FROM ZONE 1.**
### ELEC0611D  07/01/1995

<table>
<thead>
<tr>
<th>Rates</th>
<th>Fringes</th>
</tr>
</thead>
<tbody>
<tr>
<td>21.39</td>
<td>4.15+4%</td>
</tr>
<tr>
<td>23.25</td>
<td>4.15+4%</td>
</tr>
</tbody>
</table>

### ELEC0611E  07/01/1995

#### ZONE I

<table>
<thead>
<tr>
<th>Rates</th>
<th>Fringes</th>
</tr>
</thead>
<tbody>
<tr>
<td>17.05</td>
<td>4.15+4%</td>
</tr>
<tr>
<td>17.40</td>
<td>4.15+4%</td>
</tr>
</tbody>
</table>

#### ZONE II

<table>
<thead>
<tr>
<th>Rates</th>
<th>Fringes</th>
</tr>
</thead>
<tbody>
<tr>
<td>17.50</td>
<td>4.15+4%</td>
</tr>
<tr>
<td>17.85</td>
<td>4.15+4%</td>
</tr>
</tbody>
</table>

#### ZONE III

<table>
<thead>
<tr>
<th>Rates</th>
<th>Fringes</th>
</tr>
</thead>
<tbody>
<tr>
<td>17.65</td>
<td>4.15+4%</td>
</tr>
<tr>
<td>18.00</td>
<td>4.15+4%</td>
</tr>
</tbody>
</table>

#### ZONE IV

<table>
<thead>
<tr>
<th>Rates</th>
<th>Fringes</th>
</tr>
</thead>
<tbody>
<tr>
<td>17.90</td>
<td>4.15+4%</td>
</tr>
<tr>
<td>18.25</td>
<td>4.15+4%</td>
</tr>
</tbody>
</table>

#### ZONE I

<table>
<thead>
<tr>
<th>Rates</th>
<th>Fringes</th>
</tr>
</thead>
<tbody>
<tr>
<td>16.45</td>
<td>3.45+4%</td>
</tr>
<tr>
<td>13.16</td>
<td>3.45+4%</td>
</tr>
<tr>
<td>10.69</td>
<td>3.45+4%</td>
</tr>
</tbody>
</table>

#### ZONE II

<table>
<thead>
<tr>
<th>Rates</th>
<th>Fringes</th>
</tr>
</thead>
<tbody>
<tr>
<td>16.90</td>
<td>3.45+4%</td>
</tr>
<tr>
<td>13.51</td>
<td>3.45+4%</td>
</tr>
<tr>
<td>11.14</td>
<td>3.45+4%</td>
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</tbody>
</table>

#### ZONE III

<table>
<thead>
<tr>
<th>Rates</th>
<th>Fringes</th>
</tr>
</thead>
<tbody>
<tr>
<td>17.05</td>
<td>3.45+4%</td>
</tr>
<tr>
<td>13.76</td>
<td>3.45+4%</td>
</tr>
<tr>
<td>11.29</td>
<td>3.45+4%</td>
</tr>
</tbody>
</table>

#### ZONE IV

<table>
<thead>
<tr>
<th>Rates</th>
<th>Fringes</th>
</tr>
</thead>
<tbody>
<tr>
<td>17.30</td>
<td>3.45+4%</td>
</tr>
</tbody>
</table>
FROM THE MAIN POST OFFICE OF ARTESIA,
CARLSBAD, HOBBS & LOVINGTON, NEW MEXICO

<table>
<thead>
<tr>
<th>ZONE</th>
<th>Description</th>
<th>Rate</th>
<th>Fringe</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>0 to 12 miles</td>
<td>14.01</td>
<td>4.45+4%</td>
</tr>
<tr>
<td>II</td>
<td>12 miles to 22 miles</td>
<td>11.54</td>
<td>4.45+4%</td>
</tr>
<tr>
<td>III</td>
<td>22 miles to 40 miles</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IV</td>
<td>40 miles and beyond</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**ELEV0128B** 11/01/1993

<table>
<thead>
<tr>
<th>CHAVES, HIDALGO, DONA ANA, GRANT, LUNA, OTERO &amp; SIERRA COUNTIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELEVATOR CONSTRUCTORS:</td>
</tr>
<tr>
<td>MECHANIC</td>
</tr>
<tr>
<td>Rates</td>
</tr>
<tr>
<td>Fringes</td>
</tr>
<tr>
<td>14.98</td>
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</tbody>
</table>

**ELEV0131A** 02/01/1995

<table>
<thead>
<tr>
<th>REMAINDER OF COUNTIES:</th>
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</thead>
<tbody>
<tr>
<td>ELEVATOR CONSTRUCTORS:</td>
</tr>
<tr>
<td>MECHANIC</td>
</tr>
<tr>
<td>Rates</td>
</tr>
<tr>
<td>Fringes</td>
</tr>
<tr>
<td>17.24</td>
</tr>
</tbody>
</table>

**FOOTNOTE:** a. Under 5 years service $6\%$; over 5 years service $8\%$.

**ENGI0953C** 11/01/1993

<table>
<thead>
<tr>
<th>POWER EQUIPMENT OPERATORS:</th>
</tr>
</thead>
<tbody>
<tr>
<td>BUILDING CONSTRUCTION:</td>
</tr>
<tr>
<td>GROUP I</td>
</tr>
<tr>
<td>Rates</td>
</tr>
<tr>
<td>Fringes</td>
</tr>
<tr>
<td>11.63</td>
</tr>
<tr>
<td>GROUP II</td>
</tr>
<tr>
<td>12.82</td>
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<td>GROUP III</td>
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<tr>
<td>12.90</td>
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<td>GROUP IV</td>
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<tr>
<td>13.11</td>
</tr>
<tr>
<td>GROUP V</td>
</tr>
<tr>
<td>13.17</td>
</tr>
<tr>
<td>GROUP VI</td>
</tr>
<tr>
<td>13.29</td>
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<tr>
<td>GROUP VII</td>
</tr>
<tr>
<td>13.39</td>
</tr>
<tr>
<td>GROUP VIII</td>
</tr>
<tr>
<td>14.62</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>HEAVY CONSTRUCTION:</th>
</tr>
</thead>
<tbody>
<tr>
<td>GROUP I</td>
</tr>
<tr>
<td>Rates</td>
</tr>
<tr>
<td>Fringes</td>
</tr>
<tr>
<td>12.00</td>
</tr>
<tr>
<td>GROUP II</td>
</tr>
<tr>
<td>13.23</td>
</tr>
<tr>
<td>GROUP III</td>
</tr>
<tr>
<td>13.32</td>
</tr>
</tbody>
</table>
HAZARDOUS PAY - The following pay shall be applicable for every hour an operating engineer is required by governmental regulations and does wear special equipment for hazardous work at the designated levels. This is applicable in all three zones.

LEVEL C - 10% above regular hourly wage
LEVEL B - 10% above regular hourly wage
LEVEL A - 15% above regular hourly wage

ZONE PAY

ZONE I - Albuquerque - 0 to 50 mile radius of Bernalillo County Court House shall be a Free Zone

- Farmington - 0 to 15 mile radius of Farmington City Hall shall be a Free Zone

- Santa Fe - 0 to 25 mile radius of the State capitol Building shall be a free zone

Zone II - Shall be $1.50 per hour above base pay. Will apply outside of above parameters up to 35 miles

Zone III - Shall be $.75 cents per hour above Zone II for a total of $2.25 per hour and will apply after 35 miles of Zone I's parameters.

POWER EQUIPMENT OPERATOR CLASSIFICATIONS

GROUP I
Fireman, Oiler, Screedman, Scale op. such as Bin-a-Batch, Rubber Tired Farm Type Tractor, Tractors under 50 hp w/o Attachments, Breakman, Concrete Paving Curing Machine (Bridge Type).

GROUP II
Rollers, Sheepsfoot or Pneumatic Self-Propelled w/o Dozer, Concrete Conveyors, Service Truck op. (Head Oiler), Air Compressor (300 CFM & Over), Pumps (6" & Over), Screening Plants, Concrete Mixers (Under 1 CY), Concrete Saw or Grinder-Span Type, 1 Drum Hoist, Air Tugger, Elevating Belt Type Loaders, Forklift, Lumber Stacker, Tractor Farm Type (under 50 HP w/Attachments), Motorman and Industrial
NM950001

Locomotive op., Winch Truck, Front End Loaders (under 2 CY), Power Plants which Generate over 15 KW., Welding Machines.

GROUP III
Bituminous Distributors, Boilers, Retort & Hot Oil Heaters
Concrete Mixers, (1 CY & Over), Conc. Paver-Single Drum,
Drilling Equip. (Refrigeration, Slusher, Jumbo forms),
Trenching Machines (all Types), Pumpcrete & Gunite Machines
Slipfrom Paver, Mechanical Bullfloats, Concrete Slab Spreading
Machine, Conc. Slab Finishing Machine, Asphalt Plants,
Bituminous Finishing Machines, Crushing Plants.

GROUP IV
Front End Loaders (2 thru 10 CY), Rollers Steel Wheeled-All
Types, Bulldozer, Scrapers (Motor or Towed), Elevating Graders
Concrete Batching Plants, Self-Propelled Rollers - Equipped
W/Dozer, Twin-Bowl Scrapers and Quad 8 or 9 Pushers (35: Over
Basic Rate).

GROUP V
Hydraulic Cranes-With less than 50 feet of Boom (20 Tons and
Under), Concrete Paver-Double Drum, Cat Cranes, Hysters, Side
and Swingboom Cats, 2 Drum Hoist, Auto Fine Grader.

GROUP VI
Mucking Machines-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, Hydraulic & Stiff Leg, Pipemobile (No 2 Operator)
Piledriver, Hydraulic Cranes (20 Tons & Over), Mine Hoist,
Belt Loader ("C.M.I." Type), Boom and Jibs 150 ft. Through
199 ft.-$. 25 per hour above base pay 200 ft and over - 50:
per hour above base pay. Shovel (Wheel Type), Boring Machine
(Tunnel or Shaft Mole), Pipe Mobile.

IRON0495A 07/01/1995
Rates Fringes
BERNALILLO, CATRON, CIBOLA, COLFAX, DEBACA, GUADALUPE, LINCOLN,
LOS ALAMOS, TAOS, MCKINLEY, MORA, RIO ARRIBA, SAN JUAN, SAN
MIGUEL, SANDOVAL, SANTA FE, SOCORRO, TORRANCE, VALENCIA COUNTIES

IRONWORKERS
14.90 5.31
IRON0840C  08/01/1994

REMAINING COUNTIES

IRONWORKERS

<table>
<thead>
<tr>
<th></th>
<th>Rates</th>
<th>Fringes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>15.00</td>
<td>3.55</td>
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</tbody>
</table>

LABO0016A  10/01/1993

LABORERS:

<table>
<thead>
<tr>
<th>GROUP</th>
<th>Rates</th>
<th>Fringes</th>
</tr>
</thead>
<tbody>
<tr>
<td>GROUP I</td>
<td>9.94</td>
<td>2.21</td>
</tr>
<tr>
<td>GROUP II</td>
<td>10.51</td>
<td>2.21</td>
</tr>
<tr>
<td>GROUP III</td>
<td>11.60</td>
<td>2.21</td>
</tr>
</tbody>
</table>

LABORER CLASSIFICATIONS

GROUP I: Chairmen -- Stakedrivers -- Demolition -- Hand Flagmen -- Heater Tender -- Pick and Shovel Work -- Window Cleaning and Clean-up, (Chairman and Stakedrivers working

GROUP II: Sandblaster (potman); Cement Mason Tender; hod Carrier; Mortar Mixers; Plaster Tenders and Brick Masons Tenders; Powermen and Blasters; Sandblaster; Gunnite Workers; Terrazzo Grinders; Air power Tool Operators; Power Buggy Operator; Cutting Torch Operator; Wagon Drill Operators; Pipelayers; Pumpcrete Nozzlmen; Water Pump Operator; Kettle And Pot Men; All Pipe Cleaning and Wrapping; Mortar and Plaster Mixing Machine, Grout Machines; Pumpcrete machine.

GROUP III: Asbestos Abatement Laborer; Toxic and Hazardous Waste Removal Laborer; Lead Base Paint Removal Laborer.

MAR80002C  06/01/1995

MARBLE MASON, TILE LAYERS & TERRAZZO WORKERS

Bernalillo County and the Townships of Belen, Bernalillo, Edgewood, Los Lunas, Moriarty, Rio Rancho and Santa Fe

<table>
<thead>
<tr>
<th></th>
<th>Rates</th>
<th>Fringes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>15.47</td>
<td>2.97</td>
</tr>
</tbody>
</table>

Catron, Colfax, Cibola, Harding, Los Alamos, McKinley, Mora, Rio Arriba, Sandoval, San Juan, San Miguel, Socorro, Taos, Torrence, Union and Valencia Counties

<table>
<thead>
<tr>
<th></th>
<th>Rates</th>
<th>Fringes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>17.97</td>
<td>2.97</td>
</tr>
<tr>
<td></td>
<td>Rates</td>
<td>Fringes</td>
</tr>
<tr>
<td>----------------</td>
<td>-------</td>
<td>---------</td>
</tr>
<tr>
<td><strong>Grant, Luna, Otero and Sierra</strong></td>
<td>15.76</td>
<td>2.79</td>
</tr>
<tr>
<td><strong>Hidalgo</strong></td>
<td>16.26</td>
<td>2.79</td>
</tr>
</tbody>
</table>

**PAIN0063B 04/01/1994**

**PAINTERS:**
- Mines, Mills, Power Plants, energy plants, refineries, coal gasification plants, nuclear related facilities & all steel work incidental thereto including stacks of all description:
  - Brush, roller, pot tender, sandblaster grinder operator:
    - **New work:**
      - Zone I: 15.00 2.38
      - Zone II: 16.00 2.38
      - Zone III: 17.50 2.38
    - **Repaint/remodel:**
      - Zone I: 12.75 2.38
      - Zone II: 13.75 2.38
      - Zone III: 15.25 2.38

**Spray Preparation for and application of Epoxy & Special Coatings:**
- **New Work**
  - Zone I: 15.50 2.38
  - Zone II: 16.50 2.38
  - Zone III: 18.00 2.38
- **Repaint/remodel**
  - Zone I: 13.18 2.38
  - Zone II: 14.18 2.38
  - Zone III: 15.68 2.38

**Drywall Finisher & Ames Tool Op.:**
- **New Work**
  - Zone I: 15.50 2.38
  - Zone II: 16.50 2.38
  - Zone III: 18.00 2.38
- **Repaint/remodel**
  - Zone I: 13.18 2.38
  - Zone II: 14.18 2.38
  - Zone III: 15.68 2.38

**Handfinisher, machine textures:**
- **New Work**
  - Zone I: 15.30 2.38
  - Zone II: 16.30 2.38
  - Zone III: 17.80 2.38
|                          | Zone I  | Zone II | Zone III | Repaint/remodel Zone I | Repaint/remodel Zone II | Repaint/remodel Zone III | Spray, Special Coating Application Zone I  | Spray, Special Coating Application Zone II | Spray, Special Coating Application Zone III | Sign Painter Zone I  | Sign Painter Zone II | Sign Painter Zone III | Paper Hanger Zone I  | Paper Hanger Zone II | Paper Hanger Zone III | Ames Tool Operator Zone I  | Ames Tool Operator Zone II | Ames Tool Operator Zone III |
|--------------------------|---------|---------|----------|-------------------------|--------------------------|--------------------------|---------------------------------------------|---------------------------------------------|---------------------------------------------|----------------------------|----------------------|-----------------------|-----------------------|----------------------|------------------------|------------------------|------------------------|------------------------|------------------------|
| **Paperhangers:**       |         |         |          |                          |                          |                          |                                                              |                                                              |                                                              | **Machine Operator** |                      |                       | **Ames Tool Operator** |                      |                       | **Ames Tool Operator** |                      |                       | **Ames Tool Operator** |
| **New work**            |         |         |          |                          |                          |                          |                                                              |                                                              |                                                              | **New work**            |                      |                       | **New work**            |                      |                       | **New work**            |                      |                       | **New work**            |
| Zone I                   | 16.00   |         |          |                          |                          |                          |                                                              |                                                              |                                                              | 14.20                   |                      |                       | 14.70                 |                      |                       | 15.20                 |                      |                       | 16.70                 |
| Zone II                  | 17.00   |         |          |                          |                          |                          |                                                              |                                                              |                                                              | 15.55                   |                      |                       | 15.70                 |                      |                       | 17.05                 |                      |                       | 17.20                 |
| Zone III                 | 18.50   |         |          |                          |                          |                          |                                                              |                                                              |                                                              |                          |                      |                       |                      |                      |                       |                      |                      |                       |                      |
| Repaint/remodel Zone I   | 13.60   |         |          |                          |                          |                          |                                                              |                                                              |                                                              |                          |                      |                       |                      |                      |                       |                      |                      |                       |                      |
| Zone II                  | 14.60   |         |          |                          |                          |                          |                                                              |                                                              |                                                              |                          |                      |                       |                      |                      |                       |                      |                      |                       |                      |
| Zone III                 | 16.10   |         |          |                          |                          |                          |                                                              |                                                              |                                                              |                          |                      |                       |                      |                      |                       |                      |                      |                       |                      |
| **All Other Work; Commercial:** |         |         |          |                          |                          |                          |                                                              |                                                              |                                                              |                          |                      |                       |                      |                      |                       |                      |                      |                       |                      |
| **Brush & Roller, Hand Texture:** |         |         |          |                          |                          |                          |                                                              |                                                              |                                                              |                          |                      |                       |                      |                      |                       |                      |                      |                       |                      |
| **New work**            |         |         |          |                          |                          |                          |                                                              |                                                              |                                                              |                          |                      |                       |                      |                      |                       |                      |                      |                       |                      |
| Zone I                   | 13.70   |         |          |                          |                          |                          |                                                              |                                                              |                                                              |                          |                      |                       |                      |                      |                       |                      |                      |                       |                      |
| Zone II                  | 14.70   |         |          |                          |                          |                          |                                                              |                                                              |                                                              |                          |                      |                       |                      |                      |                       |                      |                      |                       |                      |
| Zone III                 | 16.20   |         |          |                          |                          |                          |                                                              |                                                              |                                                              |                          |                      |                       |                      |                      |                       |                      |                      |                       |                      |
| Repaint/remodel Zone I   | 11.95   |         |          |                          |                          |                          |                                                              |                                                              |                                                              |                          |                      |                       |                      |                      |                       |                      |                      |                       |                      |
| Zone II                  | 12.95   |         |          |                          |                          |                          |                                                              |                                                              |                                                              |                          |                      |                       |                      |                      |                       |                      |                      |                       |                      |
| Zone III                 | 14.45   |         |          |                          |                          |                          |                                                              |                                                              |                                                              |                          |                      |                       |                      |                      |                       |                      |                      |                       |                      |
| **Spray, Special Coating Application** |         |         |          |                          |                          |                          |                                                              |                                                              |                                                              |                          |                      |                       |                      |                      |                       |                      |                      |                       |                      |
| **Sandblaster, Steel Painter, Striping** |         |         |          |                          |                          |                          |                                                              |                                                              |                                                              |                          |                      |                       |                      |                      |                       |                      |                      |                       |                      |
| **Machine Operator**     |         |         |          |                          |                          |                          |                                                              |                                                              |                                                              |                          |                      |                       |                      |                      |                       |                      |                      |                       |                      |
| **New work**            |         |         |          |                          |                          |                          |                                                              |                                                              |                                                              |                          |                      |                       |                      |                      |                       |                      |                      |                       |                      |
| Zone I                   | 14.20   |         |          |                          |                          |                          |                                                              |                                                              |                                                              |                          |                      |                       |                      |                      |                       |                      |                      |                       |                      |
| Zone II                  | 15.20   |         |          |                          |                          |                          |                                                              |                                                              |                                                              |                          |                      |                       |                      |                      |                       |                      |                      |                       |                      |
| Zone III                 | 16.70   |         |          |                          |                          |                          |                                                              |                                                              |                                                              |                          |                      |                       |                      |                      |                       |                      |                      |                       |                      |
| Repaint/remodel Zone I   | 12.45   |         |          |                          |                          |                          |                                                              |                                                              |                                                              |                          |                      |                       |                      |                      |                       |                      |                      |                       |                      |
| Zone II                  | 13.45   |         |          |                          |                          |                          |                                                              |                                                              |                                                              |                          |                      |                       |                      |                      |                       |                      |                      |                       |                      |
| Zone III                 | 14.95   |         |          |                          |                          |                          |                                                              |                                                              |                                                              |                          |                      |                       |                      |                      |                       |                      |                      |                       |                      |
| **Sign Painter**         |         |         |          |                          |                          |                          |                                                              |                                                              |                                                              |                          |                      |                       |                      |                      |                       |                      |                      |                       |                      |
| **New work**            |         |         |          |                          |                          |                          |                                                              |                                                              |                                                              |                          |                      |                       |                      |                      |                       |                      |                      |                       |                      |
| Zone I                   | 14.55   |         |          |                          |                          |                          |                                                              |                                                              |                                                              |                          |                      |                       |                      |                      |                       |                      |                      |                       |                      |
| Zone II                  | 15.55   |         |          |                          |                          |                          |                                                              |                                                              |                                                              |                          |                      |                       |                      |                      |                       |                      |                      |                       |                      |
| Zone III                 | 17.05   |         |          |                          |                          |                          |                                                              |                                                              |                                                              |                          |                      |                       |                      |                      |                       |                      |                      |                       |                      |
| **Paper Hanger**         |         |         |          |                          |                          |                          |                                                              |                                                              |                                                              |                          |                      |                       |                      |                      |                       |                      |                      |                       |                      |
| **New work**            |         |         |          |                          |                          |                          |                                                              |                                                              |                                                              |                          |                      |                       |                      |                      |                       |                      |                      |                       |                      |
| Zone I                   | 14.70   |         |          |                          |                          |                          |                                                              |                                                              |                                                              |                          |                      |                       |                      |                      |                       |                      |                      |                       |                      |
| Zone II                  | 15.70   |         |          |                          |                          |                          |                                                              |                                                              |                                                              |                          |                      |                       |                      |                      |                       |                      |                      |                       |                      |
| Zone III                 | 17.20   |         |          |                          |                          |                          |                                                              |                                                              |                                                              |                          |                      |                       |                      |                      |                       |                      |                      |                       |                      |
| Repaint/Remodel Zone I   | 12.95   |         |          |                          |                          |                          |                                                              |                                                              |                                                              |                          |                      |                       |                      |                      |                       |                      |                      |                       |                      |
| Zone II                  | 13.95   |         |          |                          |                          |                          |                                                              |                                                              |                                                              |                          |                      |                       |                      |                      |                       |                      |                      |                       |                      |
| Zone III                 | 15.45   |         |          |                          |                          |                          |                                                              |                                                              |                                                              |                          |                      |                       |                      |                      |                       |                      |                      |                       |                      |
| **Ames Tool Operator**   |         |         |          |                          |                          |                          |                                                              |                                                              |                                                              |                          |                      |                       |                      |                      |                       |                      |                      |                       |                      |
| **New work**            |         |         |          |                          |                          |                          |                                                              |                                                              |                                                              |                          |                      |                       |                      |                      |                       |                      |                      |                       |                      |
| Zone I                   | 14.25   |         |          |                          |                          |                          |                                                              |                                                              |                                                              |                          |                      |                       |                      |                      |                       |                      |                      |                       |                      |
| Zone II                  | 15.25   |         |          |                          |                          |                          |                                                              |                                                              |                                                              |                          |                      |                       |                      |                      |                       |                      |                      |                       |                      |
| Zone III                 | 16.75   |         |          |                          |                          |                          |                                                              |                                                              |                                                              |                          |                      |                       |                      |                      |                       |                      |                      |                       |                      |
Repaint/Remodel
Zone I 12.55 2.38
Zone II 13.55 2.38
Zone III 15.05 2.38
Hand finisher, machine texture
New work
Zone I 14.05 2.38
Zone II 15.05 2.38
Zone III 16.55 2.38
Repaint/remodel
Zone I 12.30 2.38
Zone II 13.30 2.38
Zone III 14.80 2.38

DONA ANA, OTERO, LUNA COUNTIES
Commercial:
Brush, Roller, Drywall, Paperhanger 9.40 2.02
Spray, Sandblast, Swing Stage, Steam Cleaning 11.00 2.02
Heavy:
Brush, Roller 10.25 2.02
Spray, Sandblast, Swing Stage,
Steam Cleaning 11.50 2.02
Water Tanks, Towers, Smoke Stacks 12.50 2.02

PAINTERS ZONE DEFINITIONS
ALBUQUERQUE, SANTA FE, AND BELEN SHALL BE CONSIDERED
IN ZONE I
Zone I - BASE PAY UP TO 30 MILES

Zone II - Extending 30 miles to 75 miles beyond Zone I.

Zone III - Extending 75 miles and beyond Zone II.

PAIN1665A 04/01/1994

Rates Fringes

SOFT FLOOR LAYERS

ZONE I 13.70 2.38
ZONE II 14.70 2.38
ZONE III 16.20 2.38

SOFT FLOOR LAYERS ZONE DEFINITIONS

Zone I -- Cities and Towns Basing Points - Miles from
Main Post Office
Albuquerque, Santa Fe, and Belen shall be considered Zone I.
Albuquerque - 30 mile radius
## ACCOMPANYING AMENDMENT NO. 0007 TO SOLICITATION NO. DACA63-95-B-0150

### NM950001

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**HEAVY CONSTRUCTION:**

| Zone I:    |        |      |
| I          | 10.08  | 1.79 |
| II         | 10.35  | 1.79 |
| III        | 10.43  | 1.79 |
| IV         | 10.55  | 1.79 |
| V          | 10.60  | 1.79 |
| VI         | 10.70  | 1.79 |
| VII        | 10.80  | 1.79 |
| VIII       | 10.94  | 1.79 |
| IX         | 11.09  | 1.79 |

| Zone II:   |        |      |
| I          | 11.58  | 1.79 |
| II         | 11.85  | 1.79 |
| III        | 11.93  | 1.79 |
| IV         | 12.05  | 1.79 |
| V          | 12.10  | 1.79 |
| VI         | 12.20  | 1.79 |
| VII        | 12.30  | 1.79 |
| VIII       | 12.44  | 1.79 |
| IX         | 12.59  | 1.79 |

| Zone III:  |        |      |
| I          | 11.83  | 1.79 |
| II         | 12.10  | 1.79 |
| III        | 12.18  | 1.79 |
| IV         | 12.30  | 1.79 |
TRUCK DRIVER (BUILDING & HEAVY CONSTRUCTION) CLASSIFICATIONS

GROUP I:
Pickup 3/4 Ton and Under, Lubrication, Light Tire Repair and Washer, Swamper, 2 or 4 and up.

GROUP II:
Dump or Batch Truck Under 8 C.Y.W.L.: Flat Bed (bobtail) 2 Ton and Under, Warehouseman including Material Check, Fork Lift Under 5 Ton MRC.

GROUP III:
Dump Trucks (Including All Highway and Off Highway) 8 up to 16 C.Y.W.L.C.; Water, Fuel or Oil Trucks Less Than 3,000 gal. Flat Bed (bobtail) Over 2 Tons.

GROUP IV:
Distributor Driver, Heavy Tire Repair, Lumber Carrier Driver, Young Buggy or Similar Equipment, Transit Mix or Agitator 2 or 3 Axle Bobtail Equipment, Scissor Truck, Bulk Cement Bobtail 2 or 3 Axle, Semi-Trailer Flat Bed or Van Single Axle Forklift 5 Ton and over M.R.C.

GROUP V:
Dumpsters and Dumpcrete Driver; Water, Fuel or Oil Trucks 3,000 to 6,000 Gallons; Lowboys and Light Equipment Driver; Euclid Type Tank Wagon Under 6,000 Gallons.

GROUP VI:
Vacuum Truck; Dump Trucks (including all highway and off-highway 16 up to 22 C.Y.W.L.C.

GROUP VII:
Transit Mix or Agitator Semi or 4 Axle Equipment Driver; Flaherty Truck Type Spreader Box Driver; Slurry Truck Driver Bulk Cement Driver; Semi-Doubles; $ Axle Bobtail; Winch Truck and "A" Frame; Dump Truck (including all Highway and Off-Highway) 22 CY up to 35 C.Y.W.L.C.

GROUP VIII:
Euclid Diesel Power Turnarocker; Terra Coba-DW20-Tourneau Pulls and Similar Diesel Powered Equipment when used to haul Materials and Assigned to a Teamster-Lowboy Heavy Equipment Driver; Water, Fuel and Oil Trucks 6,000 Gallons and Over
Including Tank Wagon Drivers, Semi-Trailer Driver (Flat-Bed or Van Tandems); Light Equipment Mechanic; Dump Trucks (Including All Highway and Off-Highway) 35 C.Y.W.L.C. and Over; Truck and Trailer or Semi-Trailer (Flated); eject all.

GROUP IX:
Lowboy (Heavy Equipment Double Gooseneck); Heavy Equipment Mechanic; Welder (Body and Fender Men).

TRUCK DRIVERS ZONE PAY BASING POINTS AND DEFINITIONS LISTED BELOW FOR BUILDING AND HEAVY CONSTRUCTION - BASING POINTS ARE AS FOLLOWS:

ALAMOGORDO, ALBUQUERQUE, ARTESIA, BAYARD, BELEN, CARLSBAD, CLOVIS, DEMING, ESPANOLA, EUNICE, FARMINGTON, GALLUP, GRANTS, HOBBS, LAS CRUCES, LAS VEGS, LORDSBURG, LOVINGTON, PORTALES, RATON, ROSWELL, RUIDOSO, SANTA FE, SANTA ROSE, SILVER CITY, SOCORRO, TAOS, TUCUMCARI

ZONE I
Projects within 15 miles from the starting points above

ZONE II
Projects 15 or more road miles but less than 35 miles from above, includes all of Los Alamos County

ZONE III
Projects more than 35 road miles, or more from above.

--------------------------------------------------------------------------------

FOOTNOTE:

**LIGHT COMMERCIAL DEFINITION

Construction, erection, alteration, repair, modification, addition to or improvement in whole or in part of structures for which the major support system is wood frame construction and will also include all apartments over 4 stories, all convenience stores, fast food restaurants, automobile service stations & motels up to 2 stories high.

--------------------------------------------------------------------------------

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

--------------------------------------------------------------------------------

Requests for additional classifications and wage rates may be submitted to the contracting officer after award, and may be approved only if: (1) the work to be performed by the classification requested is not performed by a classification in the wage determination; (2) the classification is utilized in the
area by the construction industry; and (3) the proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination (for the given area and type of construction). (See 29 CFR 5.5(a)(v)).

In the listing above, the "SU" designation means that rates listed under that identifier do not reflect collectively bargained wage and fringe benefit rates. Other designations indicate unions whose rates have been determined to be prevailing.

END OF GENERAL DECISION
AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

2. AMENDMENT NO. 0006
3. EFFECTIVE DATE 95 SEP 13

4. REQUISITION/PURCHASE REQ. NO. 5. PROJECT NO. (If applicable)

6. ISSUED BY
   Department of the Army
   Corps of Engineers
   Fort Worth District

7. ADMINISTERED BY (If other than Item 6)

8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, State and ZIP Code)

9A. AMENDMENT OF SOLICITATION NO.
   DACA63-95-B-0150

9B. DATED (SEE ITEM 11)
   17 AUGUST 1995

10A. MODIFICATION OF CONTRACT/ORDER NO.

10B. DATED (SEE ITEM 13)

11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

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

   Bid opening date is 25 September 1995, as previously announced.

   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.

VI. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) 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 (such as changes in paying office, appropriation date, etc.) 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 (Specify type of modification and authority)

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 UCP section headings, including solicitation/contract subject matter where feasible.)

Bidders’ Questions and Answers, Specifications and Drawings for Theater Missile Defense (TMD) Target Launch Facilities, Fort Wingate Depot Activity, Fort Wingate, New Mexico, are hereby modified as follows:

See Continuation Sheet.

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 (Type or print)

15B. CONTRACTOR/OFFEREE

15C. DATE SIGNED

16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print)

16B. UNITED STATES OF AMERICA

16C. DATE SIGNED

(Signature of person authorized to sign) 

(By (Signature of Contracting Officer) )

NSN 7540-01-152-8070
PREVIOUS EDITION UNUSABLE

STANDARD FORM 30 (REV. 10-83) 
Prescribed by GSA
FAR (48 CFR) 53.243
30-105
INSTRUCTIONS

Instructions for items other than those that are self-explanatory, are as follows:

(a) Item 1 (Contract ID Code). Insert the contract type identification code that appears in the title block of the contract being modified.

(b) Item 3 (Effective date).

(1) For a solicitation amendment, change order, or administrative change, the effective date shall be the issue date of the amendment, change order, or administrative change.

(2) For a supplemental agreement, the effective date shall be the date agreed to by the contracting parties.

(3) For a modification issued as an initial or confirming notice of termination for the convenience of the Government, the effective date and the modification number of the confirming notice shall be the same as the effective date and modification number of the initial notice.

(4) For a modification converting a termination for default to a termination for the convenience of the Government, the effective date shall be the same as the effective date of the termination for default.

(5) For a modification confirming the contracting officer's determination of the amount due in settlement of a contract termination, the effective date shall be the same as the effective date of the initial decision.

(c) Item 6 (Issued By). Insert the name and address of the issuing office. If applicable, insert the appropriate issuing office code in the code block.

(d) Item 8 (Name and Address of Contractor). For modifications to a contract or order, enter the contractor's name, address, and code as shown in the original contract or order, unless changed by this or a previous modification.

(e) Items 9, (Amendment of Solicitation No.—Dated), and 10, (Modification of Contract/Order No.—Dated). Check the appropriate box and in the corresponding blanks insert the number and date of the original solicitation, contract, or order.

(f) Item 12 (Accounting and Appropriation Data). When appropriate, indicate the impact of the modification on each affected accounting classification by inserting one of the following entries:

(1) Accounting classification Net increase $ ........................................

(2) Accounting classification Net decrease $ ........................................

NOTE: If there are changes to multiple accounting classifications that cannot be placed in block 12, insert an asterisk and the words "See continuation sheet".

(g) Item 13. Check the appropriate box to indicate the type of modification. Insert in the corresponding blank the authority under which the modification is issued. Check whether or not contractor must sign this document. (See FAR 43.103.)

(h) Item 14 (Description of Amendment/Modification).

(1) Organize amendments or modifications under the appropriate Uniform Contract Format (UCF) section headings from the applicable solicitation or contract. The UCF table of contents, however, shall not be set forth in this document.

(2) Indicate the impact of the modification on the overall total contract price by inserting one of the following entries:

(i) Total contract price increased by $ ............

(ii) Total contract price decreased by $ ............

(iii) Total contract price unchanged.

(3) State reason for modification.

(4) When removing, reinstating, or adding funds, identify the contract items and accounting classifications.

(5) When the SF 30 is used to reflect a determination by the contracting officer of the amount due in settlement of a contract terminated for the convenience of the Government, the entry in Item 14 of the modification may be limited to —

(i) A reference to the letter determination; and

(ii) A statement of the net amount determined to be due in settlement of the contract.

(6) Include subject matter or short title of solicitation/contract where feasible.

(i) Item 16B. The contracting officer's signature is not required on solicitation amendments. The contracting officer's signature is normally affixed last on supplemental agreements.

a. **Bidders' Questions and Answers** - Responses to bidders' questions asked at the Site Visit and Conference on 30 August 1995 accompany this amendment. These questions and answers are for bidders' information only and do not become a part of the bidding documents unless changes to the specifications or drawings are officially issued by amendment.

b. **Specifications**

(1) **SECTION 02221, PAGES 3 and 4** - These pages shall be deleted and the attached new pages SECTION 02221 PAGE 3 and SECTION 02221 PAGE 4, each bearing the notation "ACOMPANYING AMENDMENT NO. 0006 TO SOLICITATION NO. DACA63-95-B-0150," shall be substituted therefor.

(2) **SECTION 02546, PAGES 3 and 4** - These pages shall be deleted and the attached new pages SECTION 02546 PAGE 4 and SECTION 02546 PAGE 4, each bearing the notation "ACOMPANYING AMENDMENT NO. 0006 TO SOLICITATION NO. DACA63-95-B-0150," shall be substituted therefor.

(3) **Section 16370** - Insert attached Section 16370, ELECTRICAL DISTRIBUTION SYSTEM, AERIAL, bearing the notation "ACOMPANYING AMENDMENT NO. 0006 TO SOLICITATION NO. DACA63-95-B-0150" after Section 15895.

(4) **SECTION 16375, PAGES 17 and 18** - These pages shall be deleted and the attached new pages SECTION 16375 PAGE 17 and SECTION 16375 PAGE 18, each bearing the notation "ACOMPANYING AMENDMENT NO. 0006 TO SOLICITATION NO. DACA63-95-B-0150," shall be substituted therefor.

(5) **SECTION 16375, PAGE 33 through PAGE 36** - These pages shall be deleted and the attached new pages SECTION 16375 PAGE 33, SECTION 16375 PAGE 34, SECTION 16375 PAGE 35, and SECTION 16375 PAGE 36, each bearing the notation "ACOMPANYING AMENDMENT NO. 0006 TO SOLICITATION NO. DACA63-95-B-0150," shall be substituted therefor.

(6) **SECTION 16375, PAGE 39 through PAGE 48** - These pages shall be deleted and the attached new pages SECTION 16375 PAGE 39 through SECTION 16375 PAGE 48, each bearing the notation "ACOMPANYING AMENDMENT NO. 0006 TO SOLICITATION NO. DACA63-95-B-0150," shall be substituted therefor.

c. **Drawings** - Replace the drawings listed below with the attached new drawings of the same number, bearing the notation "AM #0006, 13 SEP 95":

<table>
<thead>
<tr>
<th>Sequence No.</th>
<th>Sequence No.</th>
<th>Sequence No.</th>
<th>Sequence No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>G-4</td>
<td>A-CE-4</td>
<td>B-C-1</td>
<td>D-C-2</td>
</tr>
<tr>
<td>A-C-2</td>
<td>A-CE-5</td>
<td>B-C-2</td>
<td>D-CE-1</td>
</tr>
<tr>
<td>A-C-8</td>
<td>A-CE-6</td>
<td>B-E-1</td>
<td>D-E-1</td>
</tr>
<tr>
<td>A-C-9</td>
<td>A-CE-7</td>
<td>B-S-1</td>
<td>D-E-2</td>
</tr>
<tr>
<td>A-CE-1</td>
<td>A-CE-8</td>
<td>C-M-1</td>
<td>E-C-1</td>
</tr>
<tr>
<td>A-CE-2</td>
<td>A-CE-9</td>
<td>C-E-1</td>
<td>E-C-2</td>
</tr>
<tr>
<td>A-CE-3</td>
<td>A-CE-10</td>
<td>D-C-1</td>
<td>E-M-2</td>
</tr>
</tbody>
</table>

Page 2 of 2 AM #0006
2.2 CAPILLARY WATER BARRIER

Capillary Water Barrier shall consist of clean, crushed, nonporous rock, crushed gravel, or uncrushed gravel. The maximum particle size shall be 1-1/2 inches and no more than 2 percent by weight shall pass the No. 4 size sieve.

2.3 RIPRAP

Riprap shall consist of sound and durable stone, cobbles, or spalls. The material shall have a maximum size of 12 inches and be reasonably well-graded between the maximum size stone permitted and 3 inch stone, with not more than 5 percent by weight smaller than the 3 inch size. The least dimension of a stone shall be considered its size.

2.5 MEDIUM GRADATION SAND

Medium sand shall pass the #28 sieve, and be retained on the #65 sieve.

PART 3  EXECUTION

3.1 PROTECTION OF HISTORICAL AND ARCHAEOLOGICAL RESOURCES

All items having any apparent historical or archaeological interest which are discovered in the course of any construction activities shall be carefully preserved. The Contractor shall leave archaeological finds undisturbed, flag an area of 50 feet radius around finds, and immediately report finds to the Contracting Officer.

3.2 CLEARING AND GRUBBING

The areas within lines 5 feet outside of each building and structure line shall be cleared and grubbed of trees, stumps, roots, brush and other vegetation, debris, existing foundations, pavements, utility lines, structures, fences, and other items that would interfere with construction operations. Stumps, logs, roots, and other organic matter shall be completely removed and the resulting depressions shall be filled with satisfactory material, placed and compacted in accordance with paragraph FILLING AND BACKFILLING. Materials removed shall be disposed of in the designated waste disposal areas or outside the limits of Government-controlled property at the Contractor's responsibility.

3.3 EXCAVATION

Excavation shall conform to the dimensions and elevations indicated for each building, structure, and footing except as specified hereinafter, and shall include trenching for utility and foundation drainage systems to a point 5 feet beyond the building line of each building and structure, excavation for outside grease interceptors, underground fuel tanks, and all work incidental thereto. Excavation shall extend a sufficient distance from walls and footings to allow for placing and removal of forms. Excavations below indicated depths will not be permitted except to remove unsatisfactory material. Unsatisfactory material encountered below the grades shown shall be removed as directed and replaced with satisfactory material. Satisfactory material removed below the depths indicated without specific direction of the Contracting Officer shall be replaced at no additional cost to the Government to the indicated excavation grade with satisfactory materials, except that concrete footings shall be increased in thickness to the bottom of the overdepth excavations and over-break in rock
excavation. Satisfactory material shall be placed and compacted as specified in paragraph FILLING AND BACKFILLING. Determination of elevations and measurements of approved overdepth excavation of unsatisfactory material below grades indicated shall be done under the direction of the Contracting Officer.

3.4 DRAINAGE AND DEWATERING

3.4.1 Drainage

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

3.5 SHORING

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

3.6 CLASSIFICATION OF EXCAVATION

Rock excavation shall consist of the removal and disposal of boulders 1 cubic yard or more in volume; solid rock; materials that cannot be removed without systematic drilling and blasting such as rock material in ledges or aggregate conglomerate deposits that are so firmly cemented as to possess the characteristics of solid rock; and concrete or masonry structures exceeding 1 cubic yard in volume, except sidewalks and paving. Hard and compact materials such as cemented gravel, glacial till, and relatively soft or disintegrated rock that can be removed without continuous and systematic drilling and blasting will not be considered as rock excavation. Rock excavation will not be considered as such because of intermittent drilling and blasting that is performed merely to increase production. Excavation of the material claimed as rock shall not be performed until the material has been cross sectioned by the Contractor and approved by the Contracting Officer. Common excavation shall consist of all excavation not classified as rock excavation.

3.7 BLASTING

Blasting will not be permitted.

3.8 UTILITY AND DRAIN TRENCHES

Trenches for underground utilities systems and drain lines shall be excavated to the required alignments and depths. The bottoms of trenches shall be graded to secure the required slope and shall be tamped if necessary to provide a firm pipe bed. Recesses shall be excavated to accommodate bells and joints so that pipe will be uniformly supported for
1.5.2.1 Gradation

Aggregate gradation shall be made in conformance with ASTM C 117, ASTM C 136, and ASTM D 422. Sieves shall conform to ASTM E 11.

1.5.2.2 Liquid Limit and Plasticity Index

Liquid limit and plasticity index shall be determined in accordance with ASTM D 4318.

1.5.3 Approval of Materials

The source of the material to be used for producing aggregates shall be selected 30 days prior to the time the material will be required in the work. Approval of sources not already approved by the Corps of Engineers will be based on an inspection by the Contracting Officer. Tentative approval of materials will be based on appropriate test results on the aggregate source. Final approval of the materials will be based on tests for gradation, liquid limit, and plasticity index performed on samples taken from the completed and compacted surface course.

1.6 WEATHER LIMITATIONS

Aggregate courses shall not be constructed when the ambient temperatures is below 35 degrees F and on subgrades that are frozen or contain frost. It shall be the responsibility of the Contractor to protect, by approved method or methods, all areas of surfacing that have not been accepted by the Contracting Officer. Surfaces damaged by freeze, rainfall, or other weather conditions shall be brought to a satisfactory condition by the Contractor.

PART 2 PRODUCTS

2.1 AGGREGATES

Aggregates shall consist of clean, sound, durable particles of natural gravel, crushed gravel, crushed stone, sand, slag, soil, or other approved materials processed and blended or naturally combined. Aggregates shall be free from lumps and balls of clay, organic matter, objectionable coatings, and other foreign materials. The Contractor shall be responsible for obtaining materials that meet the specification and can be used to meet the grade and smoothness requirements specified herein after all compaction operations have been completed.

2.1.1 Coarse Aggregates

The material retained on the No. 4 sieve shall be known as coarse aggregate. Coarse aggregates shall be reasonably uniform in density and quality. The coarse aggregate shall have a percentage of wear not to exceed 50 percent after 500 revolutions as determined by ASTM C 131. The amount of flat and/or elongated particles shall not exceed 20 percent. A flat particle is one having a ratio of width to thickness greater than three; an elongated particle is one having a ratio of length to width greater than three. When the coarse aggregate is supplied from more than one source, aggregate from each source shall meet the requirements set.
forth herein.

2.1.2 Fine Aggregates

The material passing the No. 4 sieve shall be known as fine aggregate. Fine aggregate shall consist of screenings, sand, soil, or other finely divided mineral matter that is processed or naturally combined with the coarse aggregate.

2.1.3 Gradation Requirements

Gradation requirements specified in TABLE I shall apply to the completed aggregate base and surface course. It shall be the responsibility of the Contractor to obtain materials that will meet the gradation requirements after mixing, placing, compacting, and other operations. Capillary water barrier and base course shall consist of coarse aggregate only. Sieves shall conform to ASTM E 11.

TABLE I. GRADATION FOR AGGREGATE SURFACE COURSES

<table>
<thead>
<tr>
<th>Sieve Designation</th>
<th>Surface</th>
<th>Base</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 in.</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>3/4 in.</td>
<td>---</td>
<td>90-100</td>
</tr>
<tr>
<td>1/2 in.</td>
<td>---</td>
<td>20-55</td>
</tr>
<tr>
<td>3/8 in.</td>
<td>50-85</td>
<td>0-15</td>
</tr>
<tr>
<td>No. 4</td>
<td>35-65</td>
<td>0-5</td>
</tr>
<tr>
<td>No. 10</td>
<td>25-50</td>
<td>---</td>
</tr>
<tr>
<td>No. 40</td>
<td>15-30</td>
<td>---</td>
</tr>
<tr>
<td>No. 200</td>
<td>8-15</td>
<td>---</td>
</tr>
</tbody>
</table>

NOTE: For the surface course the percent by weight finer than 0.02mm shall not exceed 3 percent.

2.1.4 Liquid Limit and Plasticity Index

The portion of the completed aggregate surface course passing the No. 40 sieve shall have a maximum liquid limit of 35 and a plasticity index of 4 to 9.

PART 3 EXECUTION

3.1 OPERATION OF AGGREGATE SOURCES

Clearing, stripping, and excavating shall be the responsibility of the Contractor. The aggregate sources shall be operated to produce the quantity and quality of materials meeting these specification requirements in the specified time limit. Upon completion of the work, the aggregate sources on Government reservations shall be conditioned to drain readily and be left in a satisfactory condition. Aggregate sources on private lands shall be conditioned in agreement with local laws or authorities.
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)

<table>
<thead>
<tr>
<th>ANSI Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANSI C29.2</td>
<td>(1992) Insulators - Wet-Process Porcelain and Toughened Glass - Suspension Type</td>
</tr>
<tr>
<td>ANSI C29.4</td>
<td>(1989) Wet-Process Porcelain Insulators - Strain Type</td>
</tr>
<tr>
<td>ANSI C29.6</td>
<td>(1984) Wet-Process Porcelain Insulators - High-Voltage Pin Type</td>
</tr>
<tr>
<td>ANSI C29.7</td>
<td>(1983; C29.7a) Wet-Process Porcelain Insulators - High-Voltage Line-Post Type</td>
</tr>
<tr>
<td>ANSI C135.1</td>
<td>(1979) Galvanized Steel Bolts and Nuts for Overhead Line Construction</td>
</tr>
<tr>
<td>ANSI C135.4</td>
<td>(1987) Zinc-Coated Ferrous Eyebolts and Nuts for Overhead Line Construction</td>
</tr>
<tr>
<td>ANSI C135.14</td>
<td>(1979) Staples with Rolled or Slash Points for Overhead Line Construction</td>
</tr>
</tbody>
</table>
ACCOMPANYING AMENDMENT NO. 006 TO SOLICITATION NO. DACA63-95-B-0150
TARGET LAUNCH FACILITIES, PHASE 1, FT WINGATE, NM

ANSI 05.1 (1992) Specifications and Dimensions for Wood Poles

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 123 (1989a) Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A 153 (1982; R 1987) Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A 475 (1989) Zinc-Coated Steel Wire Strand
ASTM A 575 (1989) Steel Bars, Carbon, Merchant Quality, M-Grades
ASTM A 576 (1990b) Steel Bars, Carbon, Hot-Wrought, Special Quality
ASTM B 8 (1993) Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft

AMERICAN WOOD-PRESERVERS' ASSOCIATION (AWPA)

AWPA C4 (1993) Poles - Preservative Treatment by Pressure Processes
AWPA C25 (1992) Sawn Crossarms - Preservative Treatment by Pressure Processes
AWPA P1/P13 (1991) Standard for Coal Tar Creosote for Land and Fresh Water and Marine (Coastal Water) Use
AWPA P5 (1993) Standards for Waterborne Preservatives
AWPA P8 (1993) Standards for Oil-Borne Preservatives

INSTITUTE OF ELECTRICAL AND ELECTRONIC ENGINEERS (IEEE)


SECTION 16370 PAGE 2
Switches, Fuse Disconnecting Switches, and Accessories


IEEE Std 100 (1992) IEEE Standard Dictionary of Electrical and Electronics Terms

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)


NEMA LA 1 (1992) Surge Arresters

NEMA SG 2 (1993) High Voltage Fuses

NEMA WC 5 (1992) Thermoplastic-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)


RURAL ELECTRIFICATION ADMINISTRATION (REA)


UNDERWRITERS LABORATORIES (UL)

UL 467 (1993) Grounding and Bonding Equipment


1.2 GENERAL REQUIREMENTS

1.2.1 Terminology

Terminology used in this specification is as defined in IEEE Std 100.

1.2.2 Service Conditions

Items provided under this section shall be specifically suitable for the following service conditions.

a. Altitude: 4100 feet above mean sea level.

b. Ambient Temperature: from 0 to 110 degrees F.

c. Frequency: 60 Hertz.

d. Seismic Zone: 2.

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 DESCRIPTIONS:

Manufacturer's Catalog; GA.

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.

SD-04 Drawings

Electrical Distribution System; GA.

Detail drawings consisting of equipment drawings, illustrations, schedules, instructions, diagrams and other information necessary to define the installation and enable the Government to check conformity with the requirements of the contract drawings. Detail drawings shall as a minimum include:

a. Poles.

b. Crossarms.

c. Fused Cut-outs.

d. Conductors.

e. Insulators.

f. Surge arresters.

If departures from the contract drawings are deemed necessary by the
Contractor, complete details of such departures shall be submitted with the
detail drawings. Approved departures shall be made at no additional cost
to the Government.

detail drawings shall show how components 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 consist
of the following:

a. Detail drawings showing physical arrangement, construction details,
connections, finishes, materials used in fabrication, provisions for
conduit or busway 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. Optional items shall be clearly identified as included
or excluded.

As-Built Drawings; GA.

The as-built drawings shall be a record of the construction as installed.
The drawings shall include the information shown on the contract
drawings as well as 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 deviations, modifications, and
changes. The as-built drawings shall be complete and show the location,
dimensions, part identification, and other information. Additional
sheets may be added. The as-built drawings shall be jointly inspected for
accuracy and completeness by the Contractor's quality control
representative and by the Contracting Officer prior to the submission of
each monthly pay estimate. 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-09 Reports

Factory Test; FIO.

Certified factory test reports shall be submitted when the manufacturer
performs routine factory tests, including tests required by standards
listed in paragraph REFERENCES. Results of factory tests performed shall
be certified by the manufacturer, or an approved testing laboratory, and
submitted within 7 days following successful completion of the tests
specified in applicable publications or in these specifications.

Field Testing; FIO.
A proposed field test plan 20 days prior to testing the installed system. No field test shall be performed until the test plan is approved. The test plan shall consist of complete field test procedures including tests to be performed, test equipment required, and tolerance limits.

Test Reports; GA.

Six copies of the information described below in 8-1/2 by 11 inch binders having a minimum of 5 rings, and including a separate section for each test. Sections shall be separated by heavy plastic dividers with tabs.

a. A list of equipment used, with calibration certifications.

b. A copy of measurements taken.

c. The dates of testing.

d. The equipment and values to be verified.

e. The condition specified for the test.

f. The test results, signed and dated.

g. A description of adjustments made.

SD-13 Certificates

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 Electronic Engineers (IEEE), or the National Electrical Manufacturers Association (NEMA), the Contractor shall submit proof that the items provided under this section of the specifications conform to such requirements. The label of, or listing by, UL will be acceptable as evidence that the items conform thereto. 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 thereto. 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 thereto. 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.

Three additional copies of the instructions manual within 30 calendar days following the approval of the manuals.
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. Oil filled transformers and switches shall be stored in accordance with the manufacturer's requirements. Wood poles held in storage for more than 2 weeks shall be stored in accordance with ANSI 05.1. Handling of wood poles shall be in accordance with ANSI 05.1, except that pointed tools capable of producing indentations more than inch in depth shall not be used. Metal poles shall be handled and stored in accordance with the manufacturer's instructions.

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. Two complete sets of all special tools required for maintenance shall be provided, complete with a suitable tool box. Special tools are those that only the manufacturer provides, for special purposes (to access compartments, or operate, adjust, or maintain special parts).

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

Products shall conform to the following requirements. Items of the same classification shall be identical including equipment, assemblies, parts, and components.

2.2 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.

2.3 NAMEPLATES

2.3.1 General

Each major component 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 transformers, regulators, circuit breakers, capacitors, meters and switches.

2.4 CORROSION PROTECTION

2.4.1 Aluminum Materials

Aluminum shall not be used in contact with earth or concrete. Where aluminum conductors are connected to dissimilar metal, fittings conforming
to UL 486B shall be used.

2.4.2 Ferrous Metal Materials

2.4.2.1 Hardware

Ferrous metal hardware shall be hot-dip galvanized in accordance with ASTM A 153 and ASTM A 123.

2.4.3 Finishing

Painting required for surfaces not otherwise specified and finish painting of items only primed at the factory shall be as specified in Section 09900 PAINTING, GENERAL.

2.5 CONDUCTORS, CONNECTORS, AND SPLICES

2.5.1 Aluminum-Composition Conductors

Aluminum-conductor-steel-reinforced, ACSR, shall comply with ASTM B 232.

2.5.2 Connectors and Splices

Connectors and splices shall be of copper alloys for copper conductors, aluminum alloys for aluminum-composition conductors, and a type designed to minimize galvanic corrosion for copper to aluminum-composition conductors. Aluminum-composition and aluminum-composition to copper shall comply with UL 486B, and copper-to-copper shall comply with UL 486A.

2.5.3 Copper Conductors

Hard-drawn-copper conductors shall comply with ASTM B 1 and ASTM B 8 as appropriate for the conductor size.

2.5.4 Connectors and Splices

Connectors and splices shall be of copper alloys for copper conductors, aluminum alloys for aluminum-composition conductors, and a type designed to minimize galvanic corrosion for copper to aluminum-composition conductors. Aluminum-composition and aluminum-composition to copper shall comply with UL 486B, and copper-to-copper shall comply with UL 486A.

2.6 MEDIUM-VOLTAGE LINES

2.6.1 Bare Medium-Voltage Lines

Bare medium-voltage line conductors shall be aluminum-conductor-steel-reinforced, ACSR. Conductor types shall not be mixed on any project, unless specifically indicated. Conductors larger than No. 2 AWC shall be stranded.
2.7 LOW-VOLTAGE LINES

Low-voltage line conductors shall be of the neutral-supported secondary and service drop type with thermoplastic insulation in accordance with NEMA WC 5. Neutral-supported secondary and service drop conductors shall be insulated aluminum with bare 1350 alloy aluminum or ACSR neutrals.

2.8 POLES AND HARDWARE

Poles shall be of lengths and classes indicated.

2.8.1 Wood Poles

Wood poles shall comply with ANSI O5.1, and shall be pressure treated in accordance with AWPA C4, with creosote conforming to AWPA P1/P13 or with oil-borne preservatives and petroleum conforming to AWPA P8 and AWPA P9, respectively, and waterborne preservatives conforming to AWPA P5. Waterborne preservatives shall be either chromated or ammoniacal copper arsenate. Any species listed in ANSI O5.1 for which a preservative treatment is not specified in AWPA C4, shall not be used; northern white cedar, if treated as specified for western red cedar, and western fir, if treated as specified for Douglas fir, may be used. Wood poles shall have pole markings located approximately 10 feet from pole butts for poles 50 feet or less in length. Poles shall be machine trimmed by turning smooth full length, and shall be roofed, gained, and bored prior to pressure treatment. Where poles are not provided with factory-cut gains, metal gain plates shall be provided.

2.8.2 Pole Line Hardware

Zinc-coated hardware shall comply with ANSI C135.1, ANSI C135.2, ANSI C135.4, ANSI C135.14, ANSI C135.17, ANSI C135.22, and ANSI C135.33. Steel hardware shall comply with ASTM A 575 and ASTM A 576. Hardware shall be hot-dip galvanized in accordance with ASTM A 153. Pole-line hardware shall be hot-dip galvanized steel, except anchor rods of the copper-molten welded-to-steel type with nonferrous corrosion-resistant fittings shall be used. Washers shall be installed under boltheads and nuts on wood surfaces and elsewhere as required. Washers used on through-bolts and double-arming bolts shall be approximately 2-1/4 inches square and 3/16 inch thick. The diameter of holes in washers shall be the correct standard size for the bolt on which a washer is used. Washers for use under heads of carriage-bolts shall be of the proper size to fit over square shanks of bolts. Eye bolts, bolt eyes, eye nuts, strain-load plates, lag screws, guy clamps, fasteners, hooks, shims, and clevises shall be used wherever required to support and to protect poles, brackets, crossarms, guy wires, and insulators.

2.8.3 Armless Construction

Pole mounting brackets for line-post or pin insulators and eye bolts for suspension insulators shall be as shown. Brackets shall be attached to poles with a minimum of two bolts. Brackets may be either provided integrally as part of an insulator or attached to an insulator with a suitable stud. Bracket mounting surface shall be suitable for the shape of the pole. Brackets for wood poles shall have wood gripping members.
Horizontal offset brackets shall have a 5-degree uplift angle. Pole top brackets shall conform to ANSI C135.22, except for modifications necessary to provide support for a line-post insulator. Brackets shall provide a strength exceeding that of the required insulator strength, but in no case less than a 2800 pound cantilever strength.

2.8.4 Guy Assemblies

Guy assemblies shall be zinc-coated steel in accordance with ASTM A 475. Guy assemblies, including insulators and attachments, shall provide a strength exceeding the required guy strength. Three-eye thimbles shall be provided on anchor rods to permit attachment of individual primary, secondary, and communication down guys. Anchors shall provide adequate strength to support all loads. Guy strand shall be 7 strand. Guy material shall be zinc-coated-steel with a minimum breaking strength as shown except where two or more guys are used to provide the required strength. Guy rods shall be not less than 8 feet in length by 5/8 inch in diameter.

2.9 INSULATORS

Insulators shall comply with NEMA HV 2 for general requirements. Suspension insulators shall be used at corners, angles, dead-ends, other areas where line insulators do not provide adequate strength, and as indicated. Mechanical strength of suspension insulators and hardware shall exceed the rated breaking strength of the attached conductors.

2.9.1 Medium-Voltage Line Insulators

Medium-voltage line insulators shall comply with ANSI C29.2, ANSI C29.5, ANSI C29.6, and ANSI C29.7 as applicable. Ratings shall not be lower than the ANSI classes indicated in TABLE I. Horizontal line-post insulators shall be used for armless construction and shall have the same mechanical and electrical ratings as vertical line-post insulators for the ANSI class indicated, but shall be modified to be suitable for horizontal installation. Where line-post insulators are used for angles greater than 15 degrees, clamp-top fittings shall be provided as well as for other locations shown. Conductor clamps for use with clamp-top, line-post insulators shall be hot-dip galvanized malleable iron for copper conductors and aluminum alloy for aluminum-composition conductors. Either line-post or pin insulators may be used for crossarm construction. Pin insulators for use on voltages in excess of 6 kV phase-to-phase shall be radio-interference-free or else line-post insulators shall be used.

<table>
<thead>
<tr>
<th>Voltage Level</th>
<th>Line-Post</th>
<th>Pin</th>
<th>Suspension</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 5 kV</td>
<td>57-1 or 11</td>
<td>55-3</td>
<td>One 52-1</td>
</tr>
<tr>
<td></td>
<td>57-1 or 11</td>
<td>55-5</td>
<td>Two 52-1</td>
</tr>
<tr>
<td>6 kV to 15 kV</td>
<td>57-1 or 11</td>
<td>55-5</td>
<td>Two 52-2</td>
</tr>
<tr>
<td></td>
<td>57-2 or 12</td>
<td>56-3</td>
<td>Two 52-3 or 4</td>
</tr>
<tr>
<td>16 kV to 25 kV</td>
<td>57-2 or 12</td>
<td>56-3</td>
<td>Two 52-3 or 4</td>
</tr>
</tbody>
</table>

SECTION 16370 PAGE 10
TABLE I - MINIMUM ANSI RATING OF MEDIUM-VOLTAGE INSULATORS BY CLASS

<table>
<thead>
<tr>
<th>Voltage Level</th>
<th>Line-Post</th>
<th>Pin</th>
<th>Suspension</th>
</tr>
</thead>
<tbody>
<tr>
<td>26 kV to 35 kV</td>
<td>57-3 or 13</td>
<td>56-4</td>
<td>Three 52-3 or 4</td>
</tr>
<tr>
<td>57-4 or 14</td>
<td>56-5</td>
<td></td>
<td>Four 52-3 or 4</td>
</tr>
</tbody>
</table>

2.9.2 Strain Insulators for Guy Wires

Strain insulators for use in insulated guy assemblies shall comply with ANSI C29.4 for porcelain or equivalent fiberglass, and shall have a mechanical strength exceeding the rated breaking strength of the attached guy wire. Insulators shall be not smaller than Class 54-1 for lines up to 5 kV.

2.10 CROSSARM ASSEMBLIES

2.10.1 Crossarms

Crossarms shall comply with REA Bulletin 1728H-701 and shall be solid wood, distribution type, except cross-sectional area with pressure treatment conforming to AWPA C25, and a 1/4 inch, 45 degree chamfer on all top edges. Cross-sectional area minimum dimensions shall be 4-1/4 inches in height by 3-1/4 inches in depth in accordance with ANSI C2 for Grade B construction. Crossarms shall be 8 feet in length. Crossarms shall be machined, chamfered, trimmed, and bored for stud and bolt holes before pressure treatment. Factory drilling shall be provided for pole and brace mounting, for four pin or four vertical line-post insulators, and for four suspension insulators, except where otherwise indicated or required. Drilling shall provide required climbing space and wire clearances. Crossarms shall be straight and free of twists to within 1/10 inch per foot of length. Bend or twist shall be in one direction only.

2.10.2 Crossarm Gains

Crossarm gains shall comply with ANSI C135.33.

2.11 FUSES AND SWITCHES, MEDIUM-VOLTAGE

2.11.1 Fused Cutouts

Medium-voltage fuses and cutouts shall comply with NEMA SG 2 and shall be of the loadbreak open type construction rated 15 kV and of the heavy-duty type. Open-link cut-outs are not acceptable. Fuses shall be either indicating or dropout type. Fuse ratings shall be as indicated. Fuse cutouts shall be equipped with mounting brackets suitable for the indicated installations.

2.12 SURGE ARRESTERS

Surge arresters shall comply with NEMA LA 1 and IEEE C62.1, IEEE C62.2, and IEEE C62.11, and shall be provided for protection of
aerial-to-underground transitions, group-operated load-interrupter switches, transformers and other indicated equipment. Arresters shall be distribution class, rated as shown. Arresters for use at elevations in excess of 6000 feet above mean sea level shall be specifically rated for that purpose. Arresters shall be equipped with mounting brackets suitable for the indicated installations. Arresters shall be of the metal-oxide varistor type suitable for outdoor installations.

2.13 GROUNDING AND BONDING

2.13.1 Driven Ground Rods

Ground rods shall be of copper-clad steel conforming to UL 467 not less than 3/4 inch in diameter by 10 feet in length of the sectional type driven full length into the earth.

2.13.2 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 the 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.

2.14 FACTORY TESTS

Factory tests shall be performed, as follows, in accordance with the applicable publications and with other requirements of these specifications. The Contracting Officer shall be notified at least 10 days before the equipment is ready for testing.

a. High-Voltage Fuses: Manufacturer’s standard tests in accordance with IEEE C37.41.

b. Electric Power Insulators: Manufacturer’s standard tests in accordance with ANSI C29.1.

PART 3 EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

Equipment and devices shall be installed and energized in accordance with the manufacturer’s published instructions. Circuits installed in conduits or underground and splices and terminations for medium-voltage cable shall conform to the requirements of Section 16375 ELECTRICAL DISTRIBUTION SYSTEM, UNDERGROUND. Secondary circuits installed in conduit on poles shall conform to the requirements of Section 16415 ELECTRICAL WORK, INTERIOR.

3.1.1 Conformance to Codes

The installation shall comply with the requirements and recommendations of NFPA 70 and ANSI C2 for medium loading districts, Grade B construction. No reduction in clearance shall be made.
3.1.2 Verification of Dimensions

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

3.2 POLE INSTALLATION

Crossarm construction shall be provided for support of equipment except where direct-pole mounting is indicated. Provision for communication services is required on pole-line construction, except where specifically noted otherwise. A vertical pole space of not less than 2 feet shall be reserved at all locations.

3.2.1 Wood Pole Setting

Wood Pole Setting: Wood poles shall be set straight and firm. In normal firm ground, minimum pole-setting depths shall be as listed in Table II. Poles in straight runs shall be in a straight line. Curved poles shall be placed with curvatures in the direction of the pole line. Poles shall be set to maintain as even a grade as practicable. When the average ground run is level, consecutive poles shall not vary more than 5 feet in height. When the ground is uneven, poles differing in length shall be kept to a minimum by locating poles to avoid the highest and lowest ground points. If it becomes necessary to shorten a pole, a piece shall be sawed off the top end and roofed. If any pole is shortened after treatment, the shortened end of the pole shall be given an application of hot preservative. Where poles are set on hilly terrain, along edges of cuts or embankments, or where soil may be washed out, special precautions shall be taken to ensure durable pole foundations, and the setting depth shall be measured from the lower side of the pole. Holes shall be dug large enough to permit proper use of tampers to the full depth of a hole. Earth shall be placed into the hole in 6 inch maximum layers, then thoroughly tamped before the next layer is placed. Surplus earth shall be placed around each pole in a conical shape and packed tightly to drain water away from poles.

<table>
<thead>
<tr>
<th>Length Overall Feet</th>
<th>Straight Lines</th>
<th>Curves, Corners, and Points of Extra Strain</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>5.0</td>
<td>5.0</td>
</tr>
<tr>
<td>25</td>
<td>5.5</td>
<td>5.5</td>
</tr>
<tr>
<td>30</td>
<td>5.5</td>
<td>5.5</td>
</tr>
<tr>
<td>35</td>
<td>6.0</td>
<td>6.0</td>
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<tr>
<td>40</td>
<td>6.5</td>
<td>6.5</td>
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<tr>
<td>45</td>
<td>6.5</td>
<td>7.0</td>
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<tr>
<td>50</td>
<td>7.0</td>
<td>7.5</td>
</tr>
<tr>
<td>55</td>
<td>7.5</td>
<td>8.0</td>
</tr>
</tbody>
</table>

TABLE II - MINIMUM POLE-SETTING DEPTH (FEET)
TABLE II - MINIMUM POLE-SETTING DEPTH (FEET)

<table>
<thead>
<tr>
<th>Length Overall Feet</th>
<th>Straight Lines</th>
<th>Curves, Corners, and Points of Extra Strain</th>
</tr>
</thead>
<tbody>
<tr>
<td>60</td>
<td>8.0</td>
<td>8.5</td>
</tr>
<tr>
<td>65</td>
<td>8.5</td>
<td>9.0</td>
</tr>
<tr>
<td>70</td>
<td>9.0</td>
<td>9.5</td>
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<tr>
<td>75</td>
<td>9.5</td>
<td>10.0</td>
</tr>
<tr>
<td>80</td>
<td>10.0</td>
<td>10.5</td>
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<tr>
<td>85</td>
<td>10.5</td>
<td>11.0</td>
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<tr>
<td>90</td>
<td>11.0</td>
<td>11.5</td>
</tr>
<tr>
<td>95</td>
<td>11.5</td>
<td>12.0</td>
</tr>
<tr>
<td>100</td>
<td>12.5</td>
<td>12.5</td>
</tr>
</tbody>
</table>

3.3 CROSSARM MOUNTING

Crossarms shall be bolted to poles with 5/8 inch through-bolts with square washers at each end. Bolts shall extend not less than 1/8 inch nor more than 2 inches beyond nuts. On single crossarm construction, the bolt head shall be installed on the crossarm side of the pole. Fiberglass crossarm braces shall be provided on crossarms. Flat braces may be provided for 8 foot crossarms and shall be 1/4 by 1-1/4 inches, not less than 28 inches in length. Flat braces shall be bolted to arms with 3/8 inch carriage bolts with round or square washers between boltheads and crossarms, and secured to poles with 1/2 by 4 inch lag screws after crossarms are leveled and aligned. Double crossarms shall be securely held in position by means of 5/8 inch double-arming bolts. Each double-arming bolt shall be equipped with four nuts and four square washers.

3.3.1 Line Arms and Buck Arms

Line arms and buck arms shall be set at right angles to lines for straight runs and for angles 45 degrees and greater; and line arms shall bisect angles of turns of less than 45 degrees. Dead-end assemblies shall be used for turns where shown. Buckarms shall be installed, as shown, at corners and junction poles. Double crossarms shall be provided at ends of joint use or conflict sections, at dead-ends, and at angles and corners to provide adequate vertical and longitudinal strength. Double crossarms shall be provided at each line-crossing structure and where lines not attached to the same pole cross each other.

3.3.2 Equipment Arms

Equipment arms shall be set parallel or at right angles to lines as required to provide climbing space. Equipment arms shall be located below line construction to provide necessary wire and equipment clearances.
3.4 GUY INSTALLATION

Guys shall be provided where shown, with loads and strengths as indicated, and wherever conductor tensions are not balanced, such as at angles, corners, and dead-ends. Where a single guy will not provide the required strength, two or more guys shall be provided. Where guys are wrapped around poles, at least two guy hooks shall be provided and pole shims shall be provided where guy tension exceeds 6000 pounds. Guy clamps 6 inches in length with three 5/8 inch bolts, or offset-type guy clamps, or approved guy grips shall be provided at each guy terminal. Guy-strain insulators shall be provided in each guy for wood poles. Multiple-helix screw anchors shall be provided in marly ground; rock anchors shall be installed in rock at right angles to guys, elsewhere anchors shall be of an expanding type, except that power installed screw anchors of equivalent holding power are acceptable. A half-round yellow polyvinyl, fiberglass, or other suitable plastic guy marker, not less than 8 feet in length, shall be provided at the anchor end of each guy shown, securely clamped to the guy or anchor at the bottom and top of the marker. Holding capacities for down guys shall be based on a lead angle of 45 degrees.

3.5 CONDUCTOR INSTALLATION

3.5.1 Line Conductors

Unless otherwise indicated, conductors shall be installed in accordance with manufacturer's approved tables of sags and tensions. Proper care shall be taken in handling and stringing conductors to avoid abrasions, sharp bends, cuts, kinks, or any possibility of damage to insulation or conductors. Conductors shall be paid out with the free end of conductors fixed and cable reels portable, except where terrain or obstructions make this method unfeasible. Bend radius for any insulated conductor shall not be less than the applicable NEMA specification recommendation. Conductors shall not be drawn over rough or rocky ground, nor around sharp bends. When installed by machine power, conductors shall be drawn from a mounted reel through stringing sheaves in straight lines clear of obstructions. Initial sag and tension shall be checked by the Contractor, in accordance with the manufacturer's approved sag and tension charts, within an elapsed time after installation as recommended by the manufacturer.

3.5.2 Connectors and Splices

Connectors and splices shall be mechanically and electrically secure under tension and shall be of the nonbolted compression type. The tensile strength of any splice shall be not less than the rated breaking strength of the conductor. Splice materials, sleeves, fittings, and connectors shall be noncorrosive and shall not adversely affect conductors. Aluminum-composition conductors shall be wire brushed and an oxide inhibitor applied before making a compression connection. Connectors which are factory-filled with an inhibitor are acceptable. Inhibitors and compression tools shall be of types recommended by the connector manufacturer. Primary line apparatus taps shall be by means of hot line clamps attached to compression type bail clamps (stirrups). Low-voltage connectors for copper conductors shall be of the solderless pressure type. Noninsulated connectors shall be smoothly taped to provide a waterproof
insulation equivalent to the original insulation, when installed on insulated conductors. On overhead connections of aluminum and copper, the aluminum shall be installed above the copper.

3.5.3 Conductor-To-Insulator Attachments

Conductors shall be attached to insulators by means of clamps, shoes or tie wires, in accordance with the type of insulator. For insulators requiring conductor tie-wire attachments, tie-wire sizes shall be as indicated in TABLE II.

<table>
<thead>
<tr>
<th>CONDUCTOR</th>
<th>TIE WIRE</th>
</tr>
</thead>
<tbody>
<tr>
<td>AAC, AAAC, or ACSR (AWG)</td>
<td>AAAC OR AAC (AWG)</td>
</tr>
<tr>
<td>Any size</td>
<td>6 or 4</td>
</tr>
</tbody>
</table>

3.5.4 Armor Rods

Armor rods shall be provided for AAC, AAAC, and ACSR conductors. Armor rods shall be installed at supports, except armor rods will not be required at primary dead-end assemblies if aluminum or aluminum-lined zinc-coated steel clamps are used. Lengths and methods of fastening armor rods shall be in accordance with the manufacturer's recommendations. For span lengths of less than 200 feet, flat aluminum armor rods may be used. Flat armor rods, not less than 0.03 by 0.25 inch shall be used on No. 1 AWG AAC and AAAC and smaller conductors and on No. 5 AWG ACSR and smaller conductors. On larger sizes, flat armor rods shall be not less than 0.05 by 0.30 inches. For span lengths of 200 feet or more, preformed round armor rods shall be used.

3.6 CONNECTIONS TO UTILITY LINES

The Contractor shall coordinate the work with the Contracting Officer and shall provide for final connections to the installation electric lines.

3.7 CONNECTIONS BETWEEN AERIAL AND UNDERGROUND SYSTEMS

Connections between aerial and underground systems shall be made as shown. Underground cables shall be extended up poles in conduit to cable terminations. Conduits shall be secured to poles by two-hole galvanized steel pipe straps spaced not more than 10 feet apart and with one support not more than 12 inches from any bend or termination. Cables shall be supported by devices separate from the conduit or guard, near their point of exit from the riser conduit ac guard. Cables guards shall be secured in accordance with the manufacturers published procedure. Risers shall be equipped with bushings to protect cables. Capnut potheads shall be used to terminate medium-voltage multiple-conductor cable.
3.8 CONNECTIONS TO BUILDINGS

3.8.1 Underground Services

Connections to buildings shall be made at the point indicated and shall be terminated at the service entrance equipment terminals. Cable pulling shall be in accordance with Section 16375, ELECTRICAL DISTRIBUTION SYSTEM, UNDERGROUND. Service entrance conduits with termination fittings and conductors within the building shall conform to the requirements of Section 16415 ELECTRICAL WORK, INTERIOR.

3.9 GROUNDING

Noncurrent-carrying metal parts of equipment and conductor assemblies, such as luminaires, medium-voltage cable terminations and messengers, metal poles, operating mechanisms of pole top switches, panel enclosures, transformers, capacitors, recloser frames (cases) and other noncurrent-carrying metal items shall be grounded. Additional grounding of equipment, neutral, and surge arrester grounding systems shall be installed at poles where indicated.

3.9.1 Grounding Electrodes

Grounding electrodes shall be installed as follows:

a. Driven rod electrodes - Unless otherwise indicated, ground rods shall be located approximately 3 feet out from base of the pole and shall be driven into the earth until the tops of the rods are approximately 1 foot below finished grade. Multiple rods shall be evenly spaced at least 10 feet apart and connected together 2 feet below grade with a minimum No. 6 bare copper conductor.

b. Ground Resistance - The maximum resistance of a driven ground rod shall not exceed 25 ohms under normally dry conditions. Whenever the required ground resistance is not met, provide additional electrodes interconnected with grounding conductors, to achieve the specified ground resistance. The additional electrodes will be up to three, 10 foot rods spaced a minimum of 10 feet apart. In high ground resistance, UL listed chemically charged ground rods may be used. If the resultant resistance exceeds 25 ohms measured not less than 48 hours after rainfall, the Contracting Officer shall be notified immediately. Connections below grade shall be fusion welded. Connections above grade shall be fusion welded or shall use UL 467 approved connectors.

3.9.2 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. Where grounding conductors are connected to aluminum-composition conductors, specially treated or lined copper-to-aluminum connectors suitable for this purpose shall be used.
3.9.3 Grounding Electrode Conductors

On multi-grounded circuits, as defined in ANSI C2, provide a single continuous vertical grounding electrode conductor. Neutrals, surge arresters, and equipment grounding conductors shall be bonded to this conductor. For single grounded or ungrounded systems, provide a grounding conductor for the surge arrester and equipment grounding conductors and a separate grounding conductor for the secondary neutrals. Grounding electrode conductors shall be sized as shown. Secondary system neutral conductors shall be connected directly to the transformer neutral bushings, then connected with a neutral bonding jumper between the transformer neutral bushing and the vertical grounding electrode conductor, as shown. Grounding electrode conductors shall be stapled to wood poles at intervals not exceeding 2 feet. On metal poles, a preformed galvanized steel strap, 5/8 inch wide by 22 gauge minimum by length, secured by a preformed locking method standard with the manufacturer, shall be used to support a grounding electrode conductor installation on the pole and spaced at intervals not exceeding 5 feet with one band not more than 3 inches from each end of the vertical grounding electrode conductor. Bends greater than 45 degrees in grounding electrode conductor are not permitted.

3.10 FIELD TESTING

3.10.1 General

Field testing shall be performed in the presence of the Contracting Officer. The Contractor shall notify the Contracting Officer 20 days prior to conducting tests. The Contractor shall furnish materials, labor, and equipment necessary to conduct field tests. The Contractor shall perform tests and inspections recommended by the manufacturer unless specifically waived by the Contracting Officer. The Contractor shall maintain a written record of tests which includes date, test performed, personnel involved, devices tested, serial number and name of test equipment, and test results. Field reports will be signed and dated by the Contractor.

3.10.2 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.

3.10.3 Ground-Resistance Tests

The resistance of each grounding electrode system shall be measured using the fall-of-potential method defined in IEEE Std 81. Ground resistance measurements shall be made before the electrical distribution system is energized and shall be made in normally dry conditions not less than 48 hours after the last rainfall. Resistance measurements of separate grounding electrode systems shall be made before the systems are bonded together below grade. The combined resistance of separate systems may be used to meet the required resistance, but the specified number of electrodes shall be provided.
3.10.4 Sag and Tension Test

The Contracting Officer shall be given prior notice of the time schedule for stringing conductors or cables serving overhead medium-voltage circuits and reserves the right to witness the procedures used for ascertaining that initial stringing sags and tensions are in compliance with requirements for the applicable loading district and cable weight.

3.10.5 Operating Tests

After the installation is completed, and at such time as the Contracting Officer may direct, the Contractor shall conduct operating tests for approval. The equipment shall be demonstrated to operate in accordance with the specified requirements. An operating test report shall be submitted in accordance with paragraph SUBMITTALS.

3.11 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 --
2.6.1 Deleted

2.6.2 Nonmetallic Ducts

2.6.2.1 Concrete Encased Ducts
UL 651 Schedule 40 or NEMA TC 6 Type EB.

2.6.2.2 Direct Burial
UL 651 as indicated, or NEMA TC 6 Type DB.

2.6.3 Conduit Sealing Compound

Compounds for sealing ducts and conduit shall have a putty-like consistency workable with the hands at temperatures as low as 35 degrees F, shall neither slump at a temperature of 300 degrees F, nor harden materially when exposed to the air. Compounds shall adhere to clean surfaces of fiber or plastic ducts; metallic conduits or conduit coatings; concrete, masonry, or lead; any cable sheaths, jackets, covers, or insulation materials; and the common metals. Compounds shall form a seal without dissolving, noticeably changing characteristics, or removing any of the ingredients. Compounds shall have no injurious effect upon the hands of workmen or upon materials.

2.6.4 Cable Trays

Cable trays shall form a wireway system, and shall be dimensioned as shown and in nominal 3 foot lengths. Cable trays shall be constructed of steel that has been zinc-coated after fabrication. Trays shall include splice plates and miscellaneous hardware. Edges and hardware shall be finished free from burrs and sharp edges.

2.7 HANDHOLES AND PULLBOXES

Handholes and pullboxes shall be as indicated.

In paved areas, frames and covers in vehicular traffic areas shall be rated for wheel loads in accordance with FS RR-F-621. Cast iron shall comply with ASTM A 48, Class 30B, minimum. Concrete pullboxes shall consist of precast reinforced concrete boxes, extensions, bases, and covers.

2.8 TRANSFORMERS, SUBSTATIONS, AND SWITCHGEAR

Transformers, substations, and switchgear shall be of the outdoor type having the ratings and arrangements indicated. Medium-voltage ratings of cable terminations shall be 15 kV between phases for 133 percent insulation level.
2.8.1 Unit Substation

Unit substations shall comply with ANSI C37.121 and shall be of the radial type with an outgoing section mounted integrally on the transformer. Substations shall be subassembled and coordinated by one manufacturer and shall be shipped in complete sections ready for connection at the site. Complete sections shall include incoming, transformer, and outgoing sections and, where practicable, shall be shipped as one unit.

2.8.1.1 Incoming Section

Metal-enclosed interrupter switchgear of the fused load-interrupter air type shall be provided for protection of incoming circuits. Metal-enclosed interrupter switchgear shall comply with IEEE C37.20.3 and IEEE C37.30 for load-interrupter switches, NEMA SG 2 for power fuses, and shall be of the outdoor no-aisle type that meets or exceeds the requirements of applicable publications listed. Switch construction shall be of the manually-operated, "OPEN-CLOSED," air load interrupter type equipped with a stored energy operator for quick-make quick-break to make operating speeds independent of manual switch operations. Where indicated, suitable bus or lug connections shall be provided to mount field-installed, slip-on, medium-voltage cable terminations for cable entering via conduit from below and a bus throat suitable for connection to the associated metal-enclosed bus. Surge protection shall be provided in accordance with paragraph SURGE ARRESTERS. Switches shall be of the 2-position type, open-closed.

a. Ratings. Fuse continuous current ratings shall be as indicated for the transformer for an incoming line unit and for the line tie unit. Unless otherwise indicated, fuses shall be of the current limiting type. Switch ratings at 60 Hz shall be:

Nominal voltage..................................................13.8 kV
Rated maximum voltage...........................................17 kV
Maximum symmetrical interrupting capacity.................12,000
Maximum asymmetrical interrupting capacity.............19,200
Rated continuous current.................................600A
BIL.................................................................110 kV

b. Basic Requirements. The electrical devices listed below shall be rated for the application and voltage and current indicated. Unless otherwise noted, manufacturer's standard devices shall be provided and shall include the following:

(1) A switch-operating handle with provisions for locking in either the open or closed position.

(2) A switch mechanical position indicator.
extend at least four inches below grade.

2.11 PROTECTIVE DEVICES

2.11.1 Fuses, Medium-Voltage, Including Current-Limiting

Medium-voltage fuses, including current-limiting, shall comply with NEMA SG 2.

2.11.2 Fuses, Low-Voltage, Current-Limiting

Low-voltage, current-limiting fuses shall comply with FS W-F-1814/GEN for Class L or UL 198E for Class R.

2.12 SURGE ARRESTERS

Surge arresters shall comply with NEMA LA 1, IEEE C62.1, IEEE C62.2, and IEEE C62.11 and shall be provided where indicated. Arresters shall be intermediate class, rated as shown. Arresters for use at elevations in excess of 6000 feet above mean sea level shall be specifically rated for that purpose. Arresters shall be equipped with mounting brackets suitable for the indicated installations. Arresters shall be of the metal-oxide varistor type.

2.13 GROUNDING AND BONDING

2.13.1 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. Sectional type rods may be used.

2.13.2 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.

2.14 CONCRETE AND REINFORCEMENT

Concrete shall be a minimum of 2500 psi at 28 days. All other requirements shall be as specified in Section 03300 CONCRETE FOR BUILDING CONSTRUCTION. Concrete reinforcing shall be as specified in Section 03200 CONCRETE REINFORCEMENT.

2.15 PADLOCKS

Padlocks shall conform to ASTM F 883, Type EPC, size 2.

2.16 Deleted
2.16.1 Deleted

2.16.2 Deleted

2.16.3 Deleted

2.17 LIQUID DIELECTRICS

Liquid dielectrics for transformers, capacitors, reclosers, and other liquid-filled electrical equipment shall be non-polychlorinated biphenyl (PCB) mineral-oil or less-flammable liquid as specified. Nonflammable fluids shall not be used. Tetrachloroethylene (perchloroethylene) and 1, 2, 4 trichlorobenzene fluids shall not be used. Liquid dielectrics in retrofitted equipment shall be certified by the manufacturer as having less than 50 parts per million (ppm) PCB content. In lieu of the manufacturer's certification, the Contractor may submit a test sample of the dielectric in accordance with ASTM D 923 and have tests performed per ASTM D 4059 at a testing facility approved by the Contracting Officer. Equipment with test results indicating PCB level exceeding 50 ppm shall be replaced.

2.18 FACTORY TESTS

Factory tests shall be performed, as follows, in accordance with the applicable publications and with other requirements of these specifications. The Contracting Officer shall be notified at least 10 days before the equipment is ready for testing. The Contracting Officer reserves the right to witness the tests.

a. Transformers: Manufacturer's standard routine and design tests in accordance with IEEE C57.12.00.

b. Transformers rated 200 kVA and above: Reduced full-wave, chopped-wave, and full-wave impulse test on each line and neutral terminal, in accordance with IEEE C57.98.
c. High-Voltage Air Switches: Manufacturer's standard tests in accordance with IEEE C37.34 and IEEE C37.41.

d. Protective Relays: Seismic tests in accordance with IEEE C37.98. Surge withstand tests in accordance with IEEE C37.90.1.

e. Relaying Current Transformers: Manufacturer's standard tests in accordance with IEEE C57.13.

f. Instrument Current Transformers: Manufacturer's standard tests in accordance with IEEE C57.13.

g. Factory Preformed Terminations: Wet withstand voltage tests in accordance with IEEE Std 48 for the next higher BIL level.

h. Outdoor Switchgear: Manufacturer's standard tests in accordance with IEEE C37.20.1, IEEE C37.20.2, and IEEE C37.20.3.

i. Electrical Power Insulators: Manufacturer's standard tests in accordance with ANSI C29.1.

2.19 AREA LIGHTING

2.19.1 Bracket Arms on Wood Poles

Poles shall be in accordance with ANSI C136.13 provided with galvanized steel pipe bracket arms coordinated for pole attachment. The bracket arm shall be as indicated on the drawings.

2.19.2 Insulated Cable

Cable shall be type USE conforming to UL 854, with copper conductors and type RHW or XHHW insulation conforming to UL 44, and shall include green ground conductor. Cable shall be provided with insulation of a thickness not less than that given in column A of TABLE 15.1 of UL 854. Cable shall be rated 600 volts. Parts of the cable system such as splices and terminations shall be rated not less than 600 volts. The size and number of conductors and the number of cables shall be as indicated. Conductors larger than No. 8 AWG shall be stranded.

2.20 POLES

Poles shall be designed for a wind velocity of 80 mph at the base of the pole, for a wind gust factor of 1.3, and for the height and drag factors recommended by AASHTO LTS-2. The effective projected area of luminaires and other pole-mounted devices shall be taken into account in pole design. Poles shall have grounding provisions. The type of pole shaft material provided shall not be mixed on any project. Grounding connection shall be provided near the bottom of each metal pole and at each concrete pole anchor base. Scratched, stained, chipped, or dented poles shall not be installed.
2.20.1 Wood Poles

Wood poles shall conform to ANSI O5.1. Poles shall be pressure treated in accordance with AWPA C4 with creosote conforming to AWPA P1/P13 and oil-borne preservatives and petroleum conforming to AWPA P8 and AWPA P9. Species listed in ANSI O5.1 for which a preservative treatment is not specified in AWPA C4 shall not be used. Northern white cedar may be used if treated as specified for western red cedar, and western fir may be used if treated as specified for Douglas fir. Pole markings shall be located approximately 10 feet from the butt of the pole or as approved. Poles shall be machine trimmed by turning smooth full length and shall be roofed, gained, and bored before pressure treatment.

2.20.2 Exposed-to-Weather Enclosures

Enclosures to house lighting equipment in an outdoor environment shall meet the requirements of a NEMA 4 enclosure as defined in NEMA 250.

2.21 LAMPS AND BALLASTS, HIGH PRESSURE SODIUM

Lamps shall conform to ANSI C78.1352. Ballasts shall conform to ANSI C82.4, or UL 1029. High-pressure sodium lamps shall be clear.

2.21.1 Photo-Control Devices

Photo-control devices shall conform to ANSI C136.10. Each photo-control element shall be a replaceable, weatherproof, plug-in or twist-lock assembly adjustable operation range of approximately 0.5 to 5.0 foot-candles. Luminaires shall be equipped with weatherproof plug-in or twist-lock receptacle to receive the photo-control element.

2.22 PHOTOMETRIC DISTRIBUTION CLASSIFICATION

Photometrics shall conform to IESNA ARP-8.

2.23 FIXTURES

Standard fixtures shall be as detailed on Standard Detail No. 40-06-04, Sheet No. 52 which accompanies and forms a part of this specification. Special fixtures shall be as indicated on the drawings. Illustrations shown on these sheets or on the drawings are indicative of the general type desired and are not intended to restrict selection to fixtures of any particular manufacturer. Fixtures of similar design, equivalent light distribution and brightness characteristics, equal finish and quality will be acceptable as approved.

2.24 FENCING

Fencing shall conform to the requirements of Section 02831 CHAIN LINK FENCE.

2.25 Primary Cable Terminating/Sectionalizing Enclosures

Cable terminating enclosures shall be hood-stick operable, deadfront construction conforming to the requirements of ANSI/IEEE C37.20.3, Category A. Enclosure shall be a minimum of 12 gage steel and provided with 200 A loadbreak junctions and elbow-type separable loadbreak connectors, cable parking stands, and grounding lugs. The cable terminating equipment shall conform to ANSI/IEEE 386. Ratings at 60 Hz shall be:

- Nominal voltage (kV) ........................................ 12.47
- Rated continuous current (A) ................................ 200
- Three-second short-time current carrying capacity (kA) sym. 3
- BIL (kV) ............................................................ 95
g. Cable sidewall thrust pressure.

h. Cable minimum bend radius and minimum diameter of pulling wheels used.

i. Cable jam ratio.

j. Maximum allowable pulling tension on each different type and size of conductor.

k. Maximum allowable pulling tension on pulling device.

3.2.2 Duct Line

Cables shall be installed in duct lines where indicated. Cable splices in low-voltage cables shall be made in handholes only, except as otherwise noted. Cable joints in medium-voltage cables shall be made in terminating/sectionalizing enclosures or approved pullboxes only. Neutral and grounding conductors shall be installed in the same duct with their associated phase conductors.

3.2.3 Direct-Burial

Low-voltage cables shall be buried directly in the earth as indicated.

3.2.3.1 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.

3.2.3.2 Plowing

Cable plowing is not permitted.

3.2.3.3 Cable Burial

Cables shall be unreeled along the sides of or in trenches and carefully placed on sand or earth bottoms. Pulling cables into direct-burial trenches from a fixed reel position will not be permitted, except as required to pull cables through conduits under paving or railroad tracks. Where cables cross, a separation of at least 3 inches shall be provided, unless each cable circuit is protected by a nonmetallic conduit sleeve at the crossing. Where single-conductor cable is installed, all 3 phases and the neutral shall be installed in the same sleeve. Bend radius of any cable shall be not less than 8 times the diameter of the cable. In no case shall cables be left under longitudinal tension. The first 6 inch layer of backfill shall be of sand. Machine compaction shall not be used within 6 inches of the cable.

3.2.3.4 Other Requirements

Where direct-burial cables cross under roads or other paving exceeding 5 feet in width, such cables shall be installed in concrete-encased ducts.
least 5 feet beyond each edge of any paving

Ducts shall extend at

Cables may be pulled into duct from a fixed

Where usable suitable rollers are provided in the trench. Where direct

burial cable transitions to duct-enclosed cable, direct-burial cables shall

be centered in duct entrances, and a waterproof nonhardening mastic

compound shall be used to facilitate such centering.

Where cuts are made in

any paving, the paving and subbase shall be restored to their original

condition.

3.2.3.5 Medium-Voltage Cable Joints or Low-Voltage Cable Splices

Cable joints or splices in direct-burial cables are not permitted in runs

of 1000 feet or less, nor at intervals of less than 1000 feet in longer

runs, except as required for taps. Locations of cable joints or splices in

shorter intervals, where required to avoid obstructions or damage to

cables, shall be approved. Cable joints or splices in direct burial

installations shall be installed in above-ground junction boxes or in cast

metal splice boxes suitable for direct burial use. Cable joints or splices

in duct banks shall be made only in manholes, handboxes, or pullboxes.

3.2.3.6 Cable Markers

Markers shall be located near the ends of cable runs, at each cable joint

or splice, at approximately every 500 feet along cable runs, and at changes

in direction of cable runs. In addition to markers, a 5 mil, brightly

colored plastic tape not less than 3 inches in width and suitably inscribed

at not more than 10 feet on centers, or other approved dig-in warning

indication, shall be placed approximately 12 inches below finished grade

levels of trenches.

3.2.4 Electric Handholes

Cables shall be routed around the interior walls and securely supported

from walls on cables racks. Cable routing shall minimize cable crossover,

provide access space for maintenance and installation of additional cables,

and maintain cable separation in accordance with ANSI C2.

3.3 CABLE JOINTS

Medium-voltage cable joints shall be made by qualified cable splicers only.

Qualifications of cable splicers shall be submitted in accordance with

paragraph SUBMITTALS. Shields shall be applied as required to continue the

shielding system through each entire cable joint. Shields may be

integrially molded parts of preformed joints. Shields shall be grounded at

each joint or in accordance with manufacturer’s recommended practice.

Cable joints shall provide insulation and jacket equivalent to that of the

associated cable. Armored cable joints shall be enclosed in

compound-filled, cast-iron or alloy, splice boxes equipped with stuffing

boxes and armor clamps of a suitable type and size for the cable being
3.5 DUCT LINES

3.5.1 Requirements

Numbers and sizes of ducts shall be as indicated. Duct lines shall be laid with a minimum slope of 4 inches per 100 feet. Depending on the contour of the finished grade, the high-point may be at a terminal, a handhole, or between termination points. Short-radius manufactured 90-degree duct bends may be used only for pole or equipment risers, unless specifically indicated as acceptable. The minimum manufactured bend radius shall be 18 inches for ducts of less than 3 inch diameter, and 36 inches for ducts 3 inches or greater in diameter. Otherwise, long sweep bends having a minimum radius of 25 feet shall be used for a change of direction of more than 5 degrees, either horizontally or vertically. Both curved and straight sections may be used to form long sweep bends, but the maximum curve used shall be 30 degrees and manufactured bends shall be used. Ducts shall be provided with end bells whenever duct lines terminate.
3.5.2 Treatment

Ducts shall be kept clean of concrete, dirt, or foreign substances during construction. Field cuts requiring tapers shall be made with proper tools and match factory tapers. A coupling recommended by the duct manufacturer shall be used whenever an existing duct is connected to a duct of different material or shape. Ducts shall be stored to avoid warping and deterioration with ends sufficiently plugged to prevent entry of any water or solid substances. Ducts shall be thoroughly cleaned before being laid. Plastic ducts shall be stored on a flat surface and protected from the direct rays of the sun.

3.5.3 Concrete Encasement

Ducts requiring concrete encasements shall comply with NFPA 70, except that electrical duct bank configurations for ducts 6 inches in diameter shall be determined by calculation and as shown on the drawings. The separation between adjacent electric power and communication ducts shall conform to ANSI C2. Duct line encasements shall be monolithic construction. Where a connection is made to a previously poured encasement, the new encasement shall be well bonded or doweled to the existing encasement. The Contractor shall submit proposed bonding method for approval in accordance with the detail drawing portion of paragraph SUBMITTALS. At any point, tops of concrete encasements shall be not less than the cover requirements listed in NFPA 70. Where ducts are jacked under existing pavement, rigid steel conduit will be installed because of its strength. To protect the corrosion-resistant conduit coating, predrilling or installing conduit inside a larger iron pipe sleeve (jack-and-sleeve) is required. Separators or spacing blocks shall be made of steel, concrete, plastic, or a combination of these materials placed not farther apart than 4 feet on centers. Ducts shall be securely anchored to prevent movement during the placement of concrete and joints shall be staggered at least 6 inches vertically.

3.5.4 Nonencased Direct-Burial

Top of duct lines shall be as indicated on the drawings and shall be installed with a minimum of 3 inches of earth around each duct, except that between adjacent electric power and communication ducts, 12 inches of earth is required. Bottoms of trenches shall be graded toward manholes or handholes and shall be smooth and free of stones, soft spots, 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 before installing ducts. Joints in adjacent tiers of duct shall be vertically staggered at least 6 inches. The first 6 inch layer of backfill cover shall be sand compacted as previously specified. The rest of the excavation shall be backfilled and compacted in 3 to 6 inch layers. Duct banks may be held in alignment with earth. However, high-tiered banks shall use a wooden frame or equivalent form to hold ducts in alignment prior to backfilling.
3.5.5 Installation of Couplings

Joints in each type of duct shall be made up in accordance with the manufacturer's recommendations for the particular type of duct and coupling selected and as approved.

3.5.5.1 Plastic Duct

Duct joints shall be made by brushing a plastic solvent cement on insides of plastic coupling fittings and on outsides of duct ends. Each duct and fitting shall then be slipped together with a quick 1/4-turn twist to set the joint tightly.

3.5.6 Duct Line Markers

Duct line markers shall be provided at the ends of long duct line stubouts or for other ducts whose locations are indeterminate because of duct curvature or terminations at completely below-grade structures. In addition to markers, a 5 mil brightly colored plastic tape, not less than 3 inches in width and suitably inscribed at not more than 10 feet on centers with a continuous metallic backing and a corrosion-resistant 1 mil metallic foil core to permit easy location of the duct line, shall be placed approximately 12 inches below finished grade levels of such lines.

3.6 HANDHOLES, AND PULLBOXES

3.6.1 General

Handholes shall be constructed approximately where shown. The exact location of each handhole shall be determined after careful consideration has been given to the location of other utilities, grading, and paving. The location of each handhole shall be approved by the Contracting Officer before construction of the handhole is started.

The Contractor may at his option utilize precast handholes having the required strength and inside dimensions as required by the drawings or specifications. In paved areas, frames and covers for handhole entrances in vehicular traffic areas shall be flush with the finished surface of the paving. In unpaved areas, the top of handhole covers shall be approximately 1/2 inch above the finished grade. Where existing grades that are higher than finished grades are encountered, concrete assemblies designed for the purpose shall be installed to elevate temporarily the manhole cover to existing grade level. Where duct lines enter handholes, the sections of duct may be either cast in concrete or may enter the handhole through a square or rectangular opening of suitable dimensions provided in the handhole walls. Where openings are provided for the entrance of duct lines, the space between ducts and between ducts and handhole walls shall be sealed.
3.6.2 Deleted

3.6.3 Deleted

3.6.2 Ground Rods

A ground rod shall be installed at the handholes and pullboxes. Ground rods shall be driven into the earth before the handhole floor is poured so that approximately 4 inches of the ground rod will extend above the floor. When precast concrete handholes are used, the top of the ground rod may be below the handhole floor and a No. 1/0 AWG ground conductor brought into the handhole through a watertight sleeve in the handhole wall.

3.7 PAD-MOUNTED EQUIPMENT INSTALLATION

Pad-mounted equipment, shall be installed on concrete pads in accordance with the manufacturer's published, standard installation drawings and procedures, except that they shall be modified to meet the requirements of this document. Units shall be installed so that they do not damage equipment or scratch painted or coated surfaces. After installation, surfaces shall be inspected and scratches touched up with a paint or coating provided by the manufacturer especially for this purpose. Three-phase transformers shall be installed with the phase sequence, required by the local utility company.

3.7.1 Concrete Pads

3.7.1.1 Construction

Concrete pads for pad-mounted electrical equipment shall be poured-in-place. Pads shall be constructed as indicated, except that exact pad dimensions and mounting details are equipment specific and are the responsibility of the Contractor. Tops of concrete pads shall be level and shall project 4 inches above finished paving or grade and sloped to drain. Edges of concrete pads shall have 3/4 inch chamfer. Conduits for primary, secondary, and grounding conductors shall be set in place prior to placement of concrete pads. Where grounding electrode conductors are installed through concrete pads, PVC conduit sleeves shall be installed through the concrete to provide physical protection. To facilitate cable installation and termination, the concrete pad shall be provided with a rectangular hole below the primary and secondary compartments, sized in accordance with the manufacturer's recommended dimensions. Upon completion of equipment installation the rectangular hole shall be filled with masonry.
grout. Duct bends and ducts entering equipment pads shall be rigid, galvanized steel.

3.7.1.2 Concrete and Reinforcement

Concrete work shall comply with the requirements of Section 03300 CONCRETE FOR BUILDING CONSTRUCTION. Concrete pad reinforcement shall be in accordance with Section 03200 CONCRETE REINFORCEMENT.

3.7.1.3 Sealing

When the installation is complete, the Contractor shall seal all conduit and other entries into the equipment enclosure with an approved sealing compound. Seals shall be of sufficient strength and durability to protect all energized live parts of the equipment from rodents, insects, or other foreign matter.

3.7.2 Padlocks

Padlocks shall be provided for pad-mounted equipment and for each fence gate. Padlocks shall be keyed as directed by the Contracting Officer.

3.7.3 Fencing

Fencing shall conform to the requirements of and be installed in accordance with Section 02831 CHAIN LINK FENCE. Fences shall provide working clearances for operation and maintenance in accordance with ANSI C2. The entire space between fences and concrete pads shall be excavated to a minimum depth of 4 inches below finished gradelines, shall be graded to reasonably level surfaces, and filled with well-compactcd clean coarse gravel or crushed stone of 1/2 inch to 1-1/2 inches graded size up to finished gradelines. Space between fences and concrete pads shall be excavated to a minimum depth of 4 inches below finished gradelines, shall be graded to reasonably level surfaces, and filled with well-compactcd clean coarse gravel or crushed stone of 1/2 inch to 1-1/2 inches graded size up to finished gradelines.

3.7.4 Surface Treatment

Horizontal spaces between concrete foundations or pads and fences shall be excavated to minimum depth of six inches below finished gradelines, shall be graded to level surfaces, and filled with well-compactcd clean coarse gravel or crushed stone of 1/2 to 1-1/2 inches in size up to finished gradelines.

3.7.5 Transformer Stations

Transformer stations shall be installed in accordance with IEEE C57.12.11 and shall be fence-enclosed type and mounted on concrete pads.
3.7.6 Equipment Finishes

Equipment shall be carefully installed so as not to scratch finishes. After installation, finished surfaces shall be inspected and scratches touched up with a finish provided by the manufacturer especially for this purpose.

3.7.7 Supports

Enclosures and enclosure supports shall be installed in accordance with manufacturer's instructions. Supports shall consist of anchored channels leveled and then embedded in the concrete foundation. Channels, anchors, shims, or other leveling items shall be installed in accordance with the recommendations of the equipment manufacturer.

3.7.8 Switchgear Leveling

After leveling items are correctly installed, switchgear lineups shall be out-of-plumb by not more than 1/4 inch for the entire length and width. Insertion or withdrawal of removable elements shall be easily accomplished, and component devices shall operate properly after the switchgear assembly is completely installed.

3.8 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.

3.9 GROUNDING

A ground mat or ring consisting of the indicated configuration of bare copper conductors and driven ground rods shall be installed under or around pad-mounted equipment as shown. Equipment frames of metal-enclosed equipment, and other noncurrent-carrying metal parts, such as cable shields, cable sheaths and armor, and metallic conduit shall be grounded. At least 2 connections shall be provided from a transformer, a switchgear ground bus, and a unit substation to the ground mat. Metallic frames and covers of handholes and pull boxes shall be grounded by use of a braided, copper ground strap with equivalent ampacity of No. 6 AWG.

3.9.1 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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**VOLUME I - DIVISION 1 THROUGH DIVISION 6**

**SPECIFICATIONS**

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DESIGN AUTHENTICATION

Signatures affixed below indicate the drawings and specifications included in this solicitation were prepared, reviewed, and certified in accordance with ER 1110-345-100, Design Policy for Military Construction.

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This project was designed by the Fort Worth District of the U.S. Army Corps of Engineers. The initials or signatures and registration designations of individuals appear on these project documents within the scope of their employment as required by ER 1110-1-8152.
SOLICITATION NO. DACA63-95-B-0150
DATE: AUGUST 1995

US Army Corps
of Engineers
Fort Worth District

U.S. ARMY ENGINEER DIVISION, HUNTSVILLE
CORPS OF Engineers
HUNTSVILLE, ALABAMA

FORT WINGATE DEPOT ACTIVITY
FORT WINGATE, NEW MEXICO

SPECIFICATIONS
FOR

THEATER MISSILE DEFENSE (TMD) TARGET LAUNCH FACILITIES

VOLUME I
OF TWO VOLUMES

NOTE
THIS IS A 100% SET ASIDE FOR
SMALL DISADVANTAGED BUSINESS CONCERNS
2.1.5.8 Rigid Metal Conduit
   UL 6.

2.1.5.9 Deleted

2.1.5.10 Surface Metal Electrical Raceways and Fittings
   UL 5.

2.1.6 Conduit and Device Boxes and Fittings

2.1.6.1 Boxes, Metallic Outlet
   NEMA OS 1 and UL 514A.

2.1.6.2 Boxes, Nonmetallic, Outlet and Flush-Device Boxes and Covers
   NEMA OS 2 and UL 514C.

2.1.6.3 Boxes, Outlet for Use in Hazardous (Classified) Locations
   UL 886.

2.1.6.4 Boxes, Switch (Enclosed), Surface-Mounted
   UL 98.

2.1.6.5 Fittings for Conduit and Outlet Boxes
   UL 514B.

2.1.6.6 Fittings for Use in Hazardous (Classified) Locations
   UL 886.

2.1.6.7 Fittings, FVC, for Use with Rigid FVC Conduit and Tubing
   UL 514B.

2.1.7 Conduit Coatings Plastic Resin System
   FS L-C-530 or NEMA RN 1, Type A-40.

2.1.8 Connectors, Wire Pressure

2.1.8.1 Copper Conductors
   UL 486A.

SECTION 16415  PAGE 12
2.1.4.1 Molded-Case and Insulated-Case Circuit Breakers

NEMA AB 1 and UL 489 for circuit breakers, and UL 877 for circuit breakers and circuit breaker enclosures in hazardous (classified) locations.

a. Molded-Case Circuit Breakers: Single-pole breakers shall be full module size; two poles shall not be installed in a single module. Multipole breakers shall be of the common-trip type having a single operating handle, but for sizes of 100 amperes or less may consist of single-pole breakers permanently factory assembled into a multipole unit having an internal, mechanical, nontamperable common-trip mechanism and external handle ties. Breakers coordinated with current-limiting fuses shall have a combined interrupting capacity of 100,000 symmetrical amperes. All poles of associated breakers shall open if any fuse blows.

2.1.4.2 Ground Fault Circuit Interrupters

UL 943. Breakers equipped with ground fault interrupters shall have ground fault class, interrupting capacity, and voltage and current ratings as indicated.

2.1.5 Conduit and Tubing

2.1.5.1 Electrical, Zinc-Coated Steel Metallic Tubing (EMT)

UL 797.

2.1.5.2 Deleted

2.1.5.3 Electrical Plastic Tubing and Conduit

NEMA TC 2.

2.1.5.4 Flexible Conduit, Steel and Plastic

General-purpose type, UL 1; liquid tight, UL 360, and UL 1660

2.1.5.5 Intermediate Metal Conduit

UL 1242.

2.1.5.6 PVC Coated Rigid Steel Conduit

NEMA RN 1.

2.1.5.7 Rigid Aluminum Conduit

ANSI C80.5 and UL 6.
2.1.1.2 Grounding Cables

Grounding cables shall be bare or shall have green low-voltage insulation.

2.1.1.3 Cord Sets and Power-Supply Cords

UL 817.

2.1.2 Cable Trays

Cable trays shall form a wireway system, and shall be of nominal 6 inch depth. Cable trays shall be constructed of aluminum.

Trays shall include splice and end plates, dropouts, and miscellaneous hardware. Edges, fittings, and hardware shall be finished free from burrs and sharp edges. Fittings shall have not less than the load-carrying ability of straight tray sections and shall have manufacturer's minimum standard radius unless otherwise indicated. Radius of bends shall be 24 inches.

2.1.2.1 Trough

Trough-type cable trays shall be of a nominal 12 inch width as indicated.

2.1.3 Telephone Backboards

Backboards shall be 3/4 inch plywood having a two-coat insulating varnish finish. Connector blocks shall be type 66 equipped with punch down clips.

2.1.4 Circuit Breakers

Circuit breakers shall have voltage, current and interrupting ratings as indicated. Fully rated circuit breakers shall be provided to obtain the specified interrupting rating.
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. However, materials and equipment installed in hazardous locations must bear the UL label unless the data submitted from other testing agency is specifically approved in writing by the Contracting officer. Materials and equipment shall 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 Federal Specification, or standard of the American Society for Testing and Materials, National Electrical Manufacturers Association, or other commercial standard, is acceptable.

SD-13 Certificates

Telephone Installer: GA.

Qualifications of the telephone installer.

1.4 WORKMANSHIP

Materials and equipment shall be installed in accordance with recommendations of the manufacturer and as shown.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

Materials and equipment 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.

2.1.1 Cables and Wires

Conductors in cables shall be annealed copper, except that AA-8000 series aluminum conductors may be used as an equivalent for copper conductors of No. 6 AWG or larger. Intermixing of copper and aluminum conductors in these sizes is not permitted. Design is based on copper conductors and aluminum conductors shall have an ampacity not less than that of the indicated copper conductors. Cables shall be single-conductor type, unless otherwise indicated. Cables and wires shall conform to UL 44 for rubber-insulated type; UL 83 for the thermoplastic-insulated type; and UL 719 for the nonmetallic-sheathed cables.

2.1.1.1 Service Entrance Cable

Type USE.
3.12.3 Ground-Resistance Tests

The resistance of each grounding electrode system, ground mat, or ground ring shall be measured using the fall-of-potential method defined in IEEE Std 81. Ground resistance measurements shall be made before the electrical distribution system is energized and shall be made in normally dry conditions not less than 48 hours after the last rainfall. Resistance measurements of separate grounding electrode systems shall be made before the systems are bonded together below grade. The combined resistance of separate systems may be used to meet the required resistance, but the specified number of electrodes must still be provided.

a. Ground mat – 3 ohms.
b. Ground ring – 3 ohms.

3.12.4 Ground-Mat Connection Inspection

All below-grade ground-mat connections will be visually inspected by the Contracting Officer before backfilling. The Contractor shall notify the Contracting Officer 48 hours before the site is ready for inspection.

3.12.5 Medium-Voltage Cable Test

After installation and before the operating test or connection to an existing system, the medium-voltage cable system shall be given a high potential test. Direct-current voltage shall be applied on each phase conductor of the system by connecting conductors as one terminal and connecting grounds or metallic shieldings or sheaths of the cable as the other terminal for each test. Prior to making the test, the cables shall be isolated by opening applicable protective devices and disconnecting equipment. The test shall be conducted with all splices, connectors, and terminations in place. The method, voltage, length of time, and other characteristics of the test for initial installation shall be in accordance with NEMA WC 7 or NEMA WC 8 for the particular type of cable installed, except that 28 kV and 35 kV insulation test voltages shall be in accordance with either AEIC CS5 or AEIC CS6 as applicable, and shall not exceed the recommendations of IEEE Std 404 for cable joints and IEEE Std 48 for cable terminations unless the cable and accessory manufacturers indicate higher voltages are acceptable for testing. Should any cable fail due to a weakness of conductor insulation or due to defects or injuries incidental to the installation or because of improper installation of cable, cable joints, terminations, or other connections, the Contractor shall make necessary repairs or replace cables as directed. Repaired or replaced cables shall be retested.

3.12.6 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 of conductors in the same trench, duct, or cable, with all other conductors in the same trench, duct, or cable grounded. The minimum value of insulation shall be:
3.7.1.2 Concrete and Reinforcement

Concrete work shall comply with the requirements of Section 03300 CONCRETE FOR BUILDING CONSTRUCTION. Concrete pad reinforcement shall be in accordance with Section 03200 CONCRETE REINFORCEMENT.

3.7.1.3 Sealing

When the installation is complete, the Contractor shall seal all conduit and other entries into the equipment enclosure with an approved sealing compound. Seals shall be of sufficient strength and durability to protect all energized live parts of the equipment from rodents, insects, or other foreign matter.

3.7.2 Padlocks

Padlocks shall be provided for pad-mounted equipment and for each fence gate. Padlocks shall be keyed as directed by the Contracting Officer.

3.7.3 Fencing

Fencing shall conform to the requirement of and be installed in accordance with Section 02831 CHAIN LINK FENCE. Fences shall provide working clearances for operation and maintenance in accordance with ANSI C2. The entire space between fences and concrete pads shall be excavated to a minimum depth of 4 inches below finished gradelines, shall be graded to reasonably level surfaces, and filled with well-compact ed clean coarse gravel or crushed stone of 1/2 inch to 1-1/2 inches graded size up to finished gradelines. Space between fences and concrete pads shall be excavated to a minimum depth of 4 inches below finished gradelines, shall be graded to reasonably level surfaces, and filled with well-compact ed clean coarse gravel or crushed stone of 1/2 inch to 1-1/2 inches graded size up to finished gradelines.

3.7.4 Surface Treatment

Horizontal spaces between concrete foundations or pads and fences shall be excavated to minimum depth of six inches below finished gradelines, shall be graded to level surfaces, and filled with well-compact ed clean coarse gravel or crushed stone of 1/2 to 1-1/2 inches in size up to finished gradelines.

3.7.5 Transformer Stations

Transformer stations shall be installed in accordance with IEEE C57.12.11 and shall be fence-enclosed type and mounted on concrete pads.
2.9.6 Protective Relays

Electromechanical protective relays shall be provided as shown and shall be of a type specifically designed for use on power switchgear or associated electric power apparatus. Protective relays shall conform to IEEE C37.90. Relays shall be the manufacturer's standard items of equipment with appropriate ranges for time dial, tap, and other settings. Relay device numbers shall correspond to the function names and descriptions of IEEE C37.2.

2.9.6.1 Construction

Relays shall be suitable for operation on the voltage and/or current circuits to which they are shown connected. Relays shall be of the semiflush, rectangular, back-connected, dustproof switchboard type. Cases shall have black finish and window-type removable covers capable of being sealed against tampering. Relays shall be of a type that can be withdrawn, through approved sliding contacts, from fronts of panels or doors without opening current transformer secondary circuits, disturbing external circuits, or requiring disconnection of any relay leads. Necessary test devices shall be incorporated within each relay and shall provide means for testing either from an external source of electric power or from associated instrument transformers. Each relay shall be provided with an operation indicator and an external target reset device. Relays shall have necessary auxiliaries for proper operation. Relays and auxiliaries shall be suitable for operation with the instrument transformer ratios and connections provided.

2.9.6.2 Overcurrent Relays

Overcurrent relays shall be as follows:

a. Phase overcurrent relays for main circuit breakers shall be single-phase, nondirectional, induction type time delay, device 51.

b. Ground overcurrent relays for feeder circuit breakers shall be nondirectional, induction type time delay, device 5iN, residually connected.

c. Phase overcurrent relays for feeder circuit breakers shall be single-phase, nondirectional, induction type time delay, device 50/51.
the loss of the "Normal" source, transfer to the "Backup" source shall be via manual transfer. Retransfer back to the "Normal" source shall also be a manual operation. Insulated wire buses shall be wired to interface terminal blocks for connection between switchgear units and exterior components. Wire bus shall not be less than No. 8 AWG, nor less than required to serve the complete switchgear lineup plus 25 percent spare capacity.

2.9.4 Control Power Transformers

Control power transformers shall comply with IEEE C57.12.01, shall be of the ventilated dry type, and shall provide 240/120-volt, single-phase electric power for station ac control power requirements. The transformer primary voltage rating shall be 4.2 kV and the transformer capacity shall be 10 kVA. The BIL rating shall equal or exceed the BIL rating of the switchgear. Transformer current-limiting primary fuses shall be drawout type and shall be interlocked with a secondary molded case circuit breaker provided as a part of the transformer installation. Molded case circuit breakers shall comply with NEMA AB 1. It shall not be possible to open the primary fuse compartment unless this secondary circuit breaker is in the open position. Construction shall be of the drawout type for either the complete assembly or for primary fuses only, according to the manufacturer's standard. Mechanical interlocks shall prevent removal of primary fuses, unless the associated assembly is in a drawout or disconnected position. Transformer compartments shall have hinged doors.

2.9.5 Instrument Transformers

Instrument transformers shall comply with ANSI C12.11 and IEEE C57.13 and shall be of a type suitable for mounting in switchgear and shall have a BIL not less than that of the associated switchgear. Polarity marks on instrument transformers shall be visually evident and shown on drawings.

2.9.5.1 Current Transformers for Metal-Clad Switchgear

Current transformers shall have indicated ratios. Single-ratio units, used for metering and relaying, shall have a metering accuracy class rating of C20 B.0.1. Single-ratio units, used only for relaying, shall have a relaying accuracy class rating of C20 for either a C or T classification. The continuous thermal-current rating factor shall be not less than 1.0. Other thermal and mechanical ratings of current transformers and their primary leads shall be consistent with the switchgear design and shall not be less than the momentary rating of the associated circuit breaker. Unless otherwise indicated, bar, wound, or window-type transformers are acceptable; and except for window-type units installed over insulated buses, transformers shall be insulated for the rated voltage of the associated switchgear or electric power apparatus. Transformer secondaries shall be connected directly to a short-circuiting type terminal block.

2.9.5.2 Voltage Transformers

Voltage transformers shall have indicated ratios. Units shall have an accuracy class rating of 0.3. Voltage transformers shall be of the drawout type having current-limiting fuses in both primary and secondary circuits.
e. magnetic liquid level indicator with high and low level alarm contacts
f. pressure relief device with alarm contacts
g. ground connection pad
h. provision for jacking, lifting, and towing
i. diagram and rating nameplate

2.8.1.3 Integral Outgoing Section

Integral outgoing section shall be of the metal-enclosed switchgear type. Each circuit breaker and auxiliary compartment shall have a suitable metal or laminated plastic nameplate with white cut letters at least 1/4 inch high on contrasting backgrounds identifying the unit and/or circuit number as shown on the drawings.

a. Metal-Enclosed Switchgear Type:

Metal-enclosed interrupter switchgear shall comply with NEMA SG 5 for switchgear, ANSI C37.32 for load-interrupter switches, NEMA SG 2 for power fuses, and shall be of the outdoor no-aisle type that meets or exceeds the requirements of applicable publications listed. Switch construction shall be of the manually-operated, "OPEN-CLOSED," air load interrupter type equipped with a stored energy operator for quick-make-quick-break to make operating speeds independent of manual switch operations. Where indicated, bus or lug connections to mount field-installed, slip-on, medium-voltage cable terminations for cable entering from below and a flanged throat for direct connection to the associated transformer be three-phase, four-wire.

1) Ratings

Switches shall have an operating life expectancy of at least 20 full-load, close/open operations in accordance with the requirements of IEEE C37.30. Switch ratings at 60 Hz shall be in accordance with IEEE C37.2 and as follows:

Nominal voltage..............................................4.16 kV
Rated maximum voltage..................................4.8 kV
Maximum symmetrical interrupting capacity..............12,000
Maximum asymmetrical interrupting capacity.............19,200
Rated continuous current..................................600A
BIL.............................................................60 kV

2) Basic Requirements

The electrical devices listed below and for specific unit requirements
2.6.1 Deleted

2.6.2 Nonmetallic Ducts

2.6.2.1 Concrete Encased Ducts

UL 651 Schedule 40 or NEMA TC 6 Type EB.

2.6.2.2 Direct Burial

UL 651 as indicated, or NEMA TC 6 Type DB.

2.6.3 Conduit Sealing Compound

Compounds for sealing ducts and conduit shall have a putty-like consistency workable with the hands at temperatures as low as 35 degrees F, shall neither slump at a temperature of 300 degrees F, nor harden materially when exposed to the air. Compounds shall adhere to clean surfaces of fiber or plastic ducts; metallic conduits or conduit coatings; concrete, masonry, or lead; any cable sheaths, jackets, covers, or insulation materials; and the common metals. Compounds shall form a seal without dissolving, noticeably changing characteristics, or removing any of the ingredients. Compounds shall have no injurious effect upon the hands of workmen or upon materials.

2.6.4 Cable Trays

Cable trays shall form a wireway system, and shall be dimensioned as shown and in nominal 3 foot lengths. Cable trays shall be constructed of steel that has been zinc-coated after fabrication. Trays shall include splice plates and miscellaneous hardware. Edges and hardware shall be finished free from burrs and sharp edges.

2.7 MANHOLES, HANDBOLES, AND PULLBOXES

Manholes, handholes and pullboxes shall be as indicated. Precast-concrete manholes shall have the required strength established by ASTM C 476. Frames and covers shall be made of gray cast iron and a machine-finished seat shall be provided to ensure a matching joint between frame and cover. In paved areas, frames and covers in vehicular traffic areas shall be rated for wheel loads in accordance with FS RR-P-621. Cast iron shall comply with ASTM A 48, Class 30B, minimum. Concrete pullboxes shall consist of precast reinforced concrete boxes, extensions, bases, and covers.

2.8 TRANSFORMERS, SUBSTATIONS, AND SWITCHGEAR

Transformers, substations, and switchgear shall be of the outdoor type having the ratings and arrangements indicated. Medium-voltage ratings of cable terminations shall be 15 kV between phases for 133 percent insulation level.
shall be as indicated.

2.7.1.1 Centrifugal Type Power Roof Ventilators (EF-1, EF-2, EF-3).

Fans shall be direct or V-belt driven with backward inclined, non-overloading wheel. Motor compartment housing shall be hinged or removable and weatherproof, constructed of heavy gauge aluminum. Fans shall be provided with birdscreen, disconnect switch, roof curb, and extended base. Motors for EF-1 and EF-3 shall be spark proof for Class 1, Division 2.

2.7.1.2 Ceiling Type Exhaust Fans (EF5 & EF6)

Fans shall be mounted in ceiling with grill on intake and ductwork connection on exhaust. Fans shall be controlled by light switch for room installed in.

2.7.1.3 Panel Type Power Wall Ventilators (EF-4)

Fans shall be propeller type, assembled on a reinforced metal panel with venturi opening spun into panel. Fans with wheels less than 24 inches in diameter shall be direct or V-belt driven and fans with wheels 24 inches in diameter and larger shall be V-belt drive type. Fans shall be furnished with wall mounting collar. Lubricated bearings shall be provided. Fans shall be fitted with wheel and motor side metal or wire guards which have a corrosion-resistant finish. Motor enclosure shall be dripproof type. Gravity backdraft dampers shall be provided where indicated.

2.7.2 Air Filters

Air filters shall be listed according to requirements of UL 900, except high efficiency particulate air filters of 99.97 percent efficiency by the DOE Test method shall be as listed under the Label Service and shall meet the requirements of UL 586.

2.7.2.1 Extended Surface Nonsupported Pocket Filters

Filters shall be 30 inch depth, sectional, replaceable dry media type of the size indicated and shall have an average efficiency of 80 to 85 percent when tested according to ASHRAE 52. Initial resistance at 500 feet per minute shall not exceed 0.45 inches water gauge. Filters shall be UL Class 1. Media shall be fibrous glass, supported in the air stream by a wire or non-woven synthetic backing and secured to a galvanized steel metal header. Pockets shall not sag or flap at anticipated air flows. Each filter shall be installed with an extended surface pleated panel filter as a prefilter in a factory preassembled, side access housing or a factory-made sectional frame as indicated.

2.7.2.2 Extended Surface Pleated Panel Filters

Filters shall be 2 inch depth, sectional, disposable type of the size indicated and shall have an average efficiency of 25 to 30 percent when tested according to ASHRAE 52. Initial resistance at 500 feet per minute shall not exceed 0.36 inches water gauge. Filters shall be UL Class 2. Media shall be nonwoven cotton and synthetic fiber mat. A wire support grid bonded to the media shall be attached to a moisture resistant
finishing machine may be used in accordance with the directions of the machine manufacturer. A final hard steel troweling shall be done by hand.

3.8.2.4 Broom Finish

After floating, exterior slabs shall be lightly trowelled, and then broomed with a fiber-bristle brush in a direction transverse to that of the main traffic.

3.8.2.5 FLOOR HARDENER

Floor hardener shall be applied to interior slabs in the Missile Assembly Building and the Launch Equipment Building. Floor hardener shall be applied after the concrete had been air dried for 14 days. Three coats shall be applied, each the day after the preceding coat was applied. For the first application, one pound of the silico-fluoride shall be dissolved in one gallon of water. For subsequent applications, the solution shall be two pounds of silico-fluoride to each gallon of water. Floor should be mopped with clear water shortly after the preceding application has dried to remove encrusted salts. Proprietary hardeners shall be applied in accordance with the manufacturer's instructions. During application, area should be well ventilated. Precautions shall be taken when applying silico-fluorides due to the toxicity of the salts. Any compound that contacts glass or aluminum should be immediately removed with clear water.

3.9 CURING AND PROTECTION

3.9.1 General

All concrete shall be cured by an approved method for the period of time given below:

<table>
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<th>Concrete Description</th>
<th>Cure Period</th>
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<tr>
<td>Concrete with Type I, II, IF or IS cement</td>
<td>7 days</td>
</tr>
<tr>
<td>Concrete with Type I or Type II cement</td>
<td>7 days</td>
</tr>
<tr>
<td>blended with pozzolan</td>
<td></td>
</tr>
<tr>
<td>Concrete with Type V cement</td>
<td>10 days</td>
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Immediately after placement, concrete shall be protected from premature drying extremes in temperatures, rapid temperature change, mechanical injury and injury from rain and flowing water. Air and forms in contact with concrete shall be maintained at a temperature above 50 degrees F for the first 3 days and at a temperature above 32 degrees F for the remainder of the specified curing period. Exhaust fumes from combustion heating units shall be vented to the outside of the enclosure and heaters and ducts shall be placed and directed so as not to cause areas of overheating and drying of concrete surfaces or to create fire hazards. All materials and equipment needed for adequate curing and protection shall be available and at the site prior to placing concrete. No fire or excessive heat shall be permitted near or in direct contact with the concrete at any time. Curing shall be accomplished by any of the following methods, or combination thereof, as approved.
3.7 CONSTRUCTION JOINTS

Construction joints shall be located as indicated or approved. Where concrete work is interrupted by weather, end of work shift or other similar type of delay, location and type of construction joint shall be subject to approval of the Contracting Officer. Unless otherwise indicated and except for slabs on grade, reinforcing steel shall extend through construction joints. Construction joints in slabs on grade shall be keyed or doweled as shown. Concrete columns, walls, or piers shall be in place at least 2 hours, or until the concrete is no longer plastic, before placing concrete for beams, girders, or slabs thereon. In walls having door window openings, lifts shall terminate at the top and bottom of the opening. Other lifts shall terminate at such levels as to conform to structural requirements or architectural details. Where horizontal construction joints are required, a strip of 1-inch square-edge lumber, bevelled and oiled to facilitate removal, shall be tacked to the inside of the forms at the construction joint. Concrete shall be placed to a point 1 inch above the underside of the strip. The strip shall be removed 1 hour after the concrete has been placed, and any irregularities in the joint line shall be leveled off with a wood float, and all laitance shall be removed. Prior to placing additional concrete, horizontal construction joints shall be prepared as specified in paragraph PREPARATIONS OF SURFACES.

3.8 FINISHING CONCRETE

3.8.1 Formed Surfaces

All above grade formed concrete surfaces shall have a Class B finish. All below grade formed concrete surfaces shall be given a Class D finish and shall receive a waterproofing treatment consisting of two coats of boiled linseed oil.

3.8.1.1 Repair of Surface Defects

Surface defects shall be repaired within 24 hours after the removal of forms. Honeycombed and other defective areas shall be cut back to solid concrete or to a depth of not less than 1 inch, whichever is greater. Edges shall be cut perpendicular to the surface of the concrete. The prepared areas shall be dampened and brush-coated with neat cement grout. The repair shall be made using mortar consisting of not more than 1 part cement to 2-1/2 parts sand. The mixed mortar shall be allowed to stand to stiffen (approximately 45 minutes), during which time the mortar shall be intermittently remixed without the addition of water. After the mortar has attained the stiffest consistency that will permit placing, the patching mix shall be thoroughly tamped into place by means approved by the Contracting Officer and finished slightly higher than the surrounding surface. For Class B finished surfaces the cement used in the patching mortar shall be a blend of job cement and white cement proportioned to produce a finished repair surface matching, after curing, the color of adjacent surfaces. Holes left after the removal of form ties shall be cleaned and filled with patching mortar. Holes left by the removal of tie rods shall be reamed and filled by dry-packing. Repaired surfaces shall be cured as required for adjacent surfaces. The temperature of concrete,
2.2 CEMENTITIOUS MATERIALS

Cementitious materials shall each be of one type and from one source when used in concrete which will have surfaces exposed in the finished structure. Cementitious materials shall conform to one of the following:

2.2.1 Cement

ASTM C 150, Type I, II or V. Type V cement shall be used in all concrete less than 24 inches above finished grade, except for floor slabs within buildings and for buried concrete for electrical systems.

2.2.2 Portland Blast-Furnace-Slag Cement

ASTM C 595, Type IS.

2.2.3 Portland-Pozzolan Cement

ASTM C 595, Type IP.

2.2.4 Pozzolan

ASTM C 618, Class F. Pozzolan may be blended with Type I or II portland cement. When a pozzolan is used in a flexural strength concrete mix design, the solid volume of pozzolan when combined with portland cement shall not exceed 25 percent of the solid volume of portland cement plus pozzolan. Only one class of pozzolan, from a single source, shall be used.

2.2.5 Ground Iron Blast-Furnace Slag

ASTM C 989, Grade 120.

2.3 AGGREGATES

Aggregates shall conform to the following:

2.3.1 Normal Weight Aggregate

ASTM C 33. Grading requirement for coarse aggregate shall conform to size number 467.

2.4 CURING MATERIALS

2.4.1 Burlap

FS CCC-C-467.

2.4.2 Impervious Sheets

ASTM C 171, type optional, except that polyethylene film, if used, shall be white opaque.

2.4.3 Membrane-Forming Compounds

ASTM C 309, Type 1-D, Class A or B.
subjected to check testing by the Government from samples obtained at the 
mill, at transfer points, or at the project site.

1.3 GENERAL REQUIREMENTS

Tolerances for concrete construction and materials shall be in accordance 
with ACI 117.

1.3.1 Strength Requirements

Structural concrete for all work shall have a 28-day compressive strength 
of 4000 pounds per square inch. Concrete slabs on-grade shall have a 28-day 
flexural strength of 650 pounds per square inch. Concrete made with 
high-early strength cement shall have a 7-day strength equal to the 
specified 28-day strength for concrete made with Type I or II portland 
cement.

1.3.2 Air Entrainment

Concrete shall be air entrained to produce concrete with 3 to 5 percent 
total air. Concrete containing Type V cement shall have 4 to 7 percent total 
air.

1.3.3 Special Properties

Concrete may contain other admixtures, such as water reducers, 
superplasticizers, or set retarding agents to provide special properties to 
the concrete, if approved.

1.3.4 Slump

Slump shall be within the following limits:

<table>
<thead>
<tr>
<th>Structural Element</th>
<th>Slump in inches</th>
</tr>
</thead>
<tbody>
<tr>
<td>Walls, columns and beams</td>
<td>Minimum</td>
</tr>
<tr>
<td>Foundation walls, substructure walls, footings, pavement, and slabs</td>
<td>1</td>
</tr>
<tr>
<td>Any structural concrete approved for placement by pumping</td>
<td>None</td>
</tr>
</tbody>
</table>

*Where use of superplasticizers are approved to produce flowing concrete 
these slump requirements do not apply.

1.3.5 Technical Service for Specialized Concrete

The service of a technical representative shall be obtained to oversee 
proportioning, batching, mixing, placing, consolidating and finishing of 
specialized structural concrete, such as lightweight or flowing concrete 
until field controls indicate concrete of specified quality is furnished.
1. Preparation of Perculation Test Holes - Perculation test holes shall be dug and bored with vertical sides and a width of four to twelve inches to a depth of the proposed drainfield trench bottom (2½ inches minimum depth). Carefully scratch the sides of the holes to disturb any unsealed surfaces. In clay and loam soils, two inches of fine gravel should be added to protect the bottom of the percolation test holes from sediment. Be sure loose soil materials are removed from the holes. Two test holes are required 50 feet apart in the proposed drainfield area for individual lots.

2. Saturation and Swelling of Soil - Perculation test holes shall be filled with water and saturated for a minimum of four hours prior to testing. Clayey soils should be saturated overnight, as should soils tested during the dry season.

3. Percolation Rate Measurement - From a fixed reference point, measure the distance from the ground surface to the bottom of the hole and to the water surface. Adjust the water level to approximately six inches above the bottom. In sandy soils, measure the water level every ten minutes for an hour (or till six inches as necessary). Divide ten by the inches of drop in the last ten minutes to find the percolation rate. In tighter soils, measure the drop in water level every 30 minutes for four hours (or till six-inch level as necessary) and divide 30 by the inches of drop during the last 30 minutes to find the percolation rate. Record the times and readings below.

<table>
<thead>
<tr>
<th>Test Hole Number 1</th>
<th>Test Hole Number 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>TIME</td>
<td>WATER DEPTH</td>
</tr>
<tr>
<td>3:37</td>
<td>8½</td>
</tr>
<tr>
<td>3:42</td>
<td>8¼</td>
</tr>
<tr>
<td>3:52</td>
<td>8½</td>
</tr>
<tr>
<td>3:57</td>
<td>8¾</td>
</tr>
<tr>
<td>4:03</td>
<td>8¾</td>
</tr>
<tr>
<td>4:10</td>
<td>8¾</td>
</tr>
<tr>
<td>4:17</td>
<td>8¾</td>
</tr>
<tr>
<td>4:24</td>
<td>8¾</td>
</tr>
<tr>
<td>4:29</td>
<td>8¾</td>
</tr>
</tbody>
</table>

Test completed by: _____________________________________________________________________________

☐ Owner  ☐ Contractor  ☐ Other - specify _____________________________________________________________________________

5. Location of Property:

Owner: _____________________________________________________________________________ Phone: _____________________________________________________________________________

Address: _____________________________________________________________________________

6. Report Reviewed by: _____________________________________________________________________________ Date: _____________________________________________________________________________

EID 058 Revised 5/88
CERTIFICATE OF ANALYSIS
RESULTS BY SAMPLE

SENT WESTERN TECHNOLOGIES INC.
TO: 8305 WASHINGON PL. NE
ALBUQUERQUE, NM 87113

ATTN: MIKE ANDERSON

Lab ID: 9507194-01A
Sample ID: #2 W. J BLOCK

Collected: 07/20/95 15:00
Matrix: SOIL

<table>
<thead>
<tr>
<th>TEST / METHOD</th>
<th>RESULT</th>
<th>UNITS</th>
<th>LIMIT</th>
<th>D_F</th>
<th>DATE</th>
<th>BATCH_ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH/SW846 9045B</td>
<td>8.1</td>
<td>pH Uas</td>
<td>0.10</td>
<td></td>
<td>07/25/95</td>
<td>SPH-161</td>
</tr>
</tbody>
</table>

Lab ID: 9507194-02A
Sample ID: #1 E. J BLOCK

Collected: 07/20/95 15:00:00
Matrix: SOIL

<table>
<thead>
<tr>
<th>TEST / METHOD</th>
<th>RESULT</th>
<th>UNITS</th>
<th>LIMIT</th>
<th>D_F</th>
<th>DATE</th>
<th>BATCH_ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH/SW846 9045B</td>
<td>7.9</td>
<td>pH Uas</td>
<td>0.10</td>
<td></td>
<td>07/25/95</td>
<td>SPH-161</td>
</tr>
</tbody>
</table>

James A. Sealy
Operations Manager
**SOIL AND WATER WEST, INC**  
**NATURAL RESOURCE CONSULTANTS AND TESTING LABORATORIES**

**1700 Southern Blvd.**  
**Rio Rancho, NM 87124**  
**Phone: (505) 891-9472**  
**Fax: (505) 892-6607**

<table>
<thead>
<tr>
<th>NAME:</th>
<th>Assaiar Analytical Laboratories</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADDRESS:</td>
<td>7300 Jefferson, NE</td>
</tr>
<tr>
<td></td>
<td>Albuquerque, NM 87109</td>
</tr>
<tr>
<td>CONTACT:</td>
<td>Dan Moore</td>
</tr>
<tr>
<td>DATE RECEIVED:</td>
<td>7/28/95</td>
</tr>
<tr>
<td>DATE:</td>
<td></td>
</tr>
<tr>
<td>NUMBER OF SAMPLES:</td>
<td>2</td>
</tr>
<tr>
<td>PROJECT / PO#:</td>
<td></td>
</tr>
<tr>
<td>TIME RECEIVED:</td>
<td>3:40 p.m.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>LAB #</th>
<th>SAMPLE ID</th>
<th>Resistivity ohms/cm</th>
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</thead>
<tbody>
<tr>
<td>1960-1</td>
<td>7242-01A</td>
<td>6580</td>
</tr>
<tr>
<td>1960-2</td>
<td>7242-02A</td>
<td>6300</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Method #:</th>
</tr>
</thead>
<tbody>
<tr>
<td>SELM/72-35</td>
</tr>
</tbody>
</table>

**Comments:**

**SIGNED:**

**DATE: 8/1/95**

**SIGNED:**

**DATE: 8/1/95**
DEFINITIONS/DATA QUALIFIERS

The following are definitions, abbreviations, and data qualifiers which may have been utilized in your report:

**ND** = Analyte "not detected" in analysis at the sample specific detection limit.

**DF** = Sample "dilution factor"

**NT** = Analyte "not tested" per client request.

**B** = Analyte was also detected in laboratory method QC blank.

**E** = Analyte concentration (result) is an estimated value or exceeds analysis calibration range.

**LIMIT** = The minimum amount of the analyte that AAL can detect utilizing the specified analysis.

Please Note: Multiply the "Limit" value (AAL's Detection Limit) by Dilution Factor (D_F) to obtain the sample specific Detection Limit.
CERTIFICATE OF ANALYSIS
RESULTS BY SAMPLE

SENT WESTERN TECHNOLOGIES INC.
5305 WASHINGTON PL., NE
ALBUQUERQUE, NM 87113

TO: MIKE ANDERSON

Workorder #: 9507242
Client Code: WES01
Date Received: 07/20/95

Lab ID: 9507242-01A
Sample ID: #2 W. J BLOCK
Collected: 07/20/95 15:00:00
Matrix: SOIL

TEST / METHOD            RESULT            UNITS LIMIT  D_F DATE ANAL BATCH_ID

RESISTIVITY
Resistivity in soil       ATTACHED

Lab ID: 9507242-02A
Sample ID: #1 E. J BLOCK
Collected: 07/20/95 15:00:00
Matrix: SOIL

TEST / METHOD            RESULT            UNITS LIMIT  D_F DATE ANAL BATCH_ID

RESISTIVITY
Resistivity in soil       ATTACHED

James L. Sealy
Operations Manager
DRILLING LOG

TMD TARGET LAUNCH FACILITIES

LOCATION (Coordinates or Street)
FORT WINGATE, NEW MEXICO

DRILLING AGENCY:
ENVIRONMENTAL DRILL

HOLE NO.:
A-13

NAME OF DRILLER:

DIRECTION OF HOLE:
VERTICAL

THICKNESS OF OVERBURDEN:
3.5'

DEPTH DRILLED INTO ROCK:
1.0'

TOTAL DEPTH OF HOLE:
4.5'

MOISTURE CONTENT:

DEPTH:

LEGEND:
CLASSIFICATION OF MATERIALS (Description):

REMARKS:

1. JAR SAMPLES
   A. 0.2' TO 1.5'
   B. 1.5' TO 3.0'

2. NO WATER ENCOUNTERED.
   HOLE BACKFILLED AFTER COMPLETION.

3. HOLE LOCATION AS SHOWN ON REQUEST.

* VISUAL DESCRIPTION ONLY.

AUGER REFUSAL AT 4.5' T.D.
Hole No. 8AC-12

1. **PROJECT**: TIMED TARGET LAUNCH FACILITIES
2. **LOCATION (Coordinates or Street)**: FORT WORTH, NEW MEXICO

### DRILLING LOG

<table>
<thead>
<tr>
<th>DIVISION</th>
<th>SOUTHWEST</th>
<th>INSTALLATION</th>
<th>FORT WORTH DISTRICT</th>
</tr>
</thead>
<tbody>
<tr>
<td>10. SIZE AND TYPE OF BIT</td>
<td>8&quot; H. S. A., 2&quot; NX CORE</td>
<td>11. DATUM FOR ELEVATION SHOWN</td>
<td>(ftm or m)</td>
</tr>
<tr>
<td>12. MANUFACTURER'S DESIGNATION OF DRILL</td>
<td>CME 75</td>
<td>13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN</td>
<td>1</td>
</tr>
<tr>
<td>14. TOTAL NUMBER CORE BOXES</td>
<td>1</td>
<td>15. ELEVATION GROUND WATER</td>
<td></td>
</tr>
<tr>
<td>16. DATE HOLE STARTED</td>
<td>20 JUL 95</td>
<td>17. ELEVATION TOP OF HOLE</td>
<td></td>
</tr>
<tr>
<td>18. TOTAL CORE RECOVERY FOR BORING</td>
<td>100%</td>
<td>19. SIGNATURE OF INSPECTOR</td>
<td>DOUGLAS P. MASSOTH</td>
</tr>
</tbody>
</table>

### SOIL CLASSIFICATION

<table>
<thead>
<tr>
<th>MOISTURE CONTENT</th>
<th>DEPTH</th>
<th>CLASSIFICATION OF MATERIALS (Descriptive)</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.5</td>
<td>0.0' TO 0.2'</td>
<td>ASPHALT</td>
<td>BOX 1</td>
</tr>
<tr>
<td>4.9</td>
<td>0.2' TO 1.5'</td>
<td>GRAVEL - BASE COURSE, CLAYEY, REDDISH - BROWN, DRY, LOOSE TO MEDIUM, SANDY.</td>
<td>CTD. 1</td>
</tr>
<tr>
<td></td>
<td>1.5' TO 16.5'</td>
<td>SANDSTONE</td>
<td></td>
</tr>
<tr>
<td>5.7</td>
<td>2.0' TO 16.5'</td>
<td>UNWEATHERED, LIGHT GRAY, FINE TO MEDIUM GRAINED, CROSSBEDDED, MASSIVE, OCCASIONAL CARBON STAINS, OCCASIONAL WEAK TO MODERATELY CEMENTED ZONES, HARD TO VERY HARD (ROCK CLASSIFICATION), WEAKER CLAYSTONE SEAMS AT 3.4', 3.8', 5.0', 13.4', 13.5', AND 14.2'.</td>
<td>CTD. 2</td>
</tr>
<tr>
<td></td>
<td>T.O. 16.5'</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. DRILLING
   - AUGERED TO 2.0', REFUSAL.
   - USED 2" NX DRY CORE BARREL FROM 2.0' TO 16.5'.

2. JAR SAMPLES
   - 0.2' TO 1.5'

3. CARTON SAMPLES
   - CTD. 1: 2.2' TO 3.0'
   - CTD. 2: 10.6' TO 11.2'

4. CORE BOXES
   - BOX 1: 2.0' TO 13.0'

- NOTE: CORE FROM 13.0' TO 16.5' WAS NOT SAVED; ALL OTHER CORE SENT TO SVO LAB; CARTON SAMPLES PLACED IN ZIPLOC BAGS AND PUT IN CORE BOX.

5. SLIGHT AMOUNT OF WATER ENCOUNTERED BELOW 8.0'. DRY HOLE AT END OF DRILLING.
6. BORING LOCATION AS SHOWN ON REQUEST.

* VISUAL DESCRIPTION ONLY.
<table>
<thead>
<tr>
<th>MOISTURE CONTENT</th>
<th>DEPTH (ft)</th>
<th>CLASSIFICATION OF MATERIALS (Description)</th>
<th>7 CORE RECOVERY</th>
<th>BOX ON SAMPLE NO.</th>
<th>REMARKS (Drilling time, water loss, depth of weathering, etc. if significant)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.1</td>
<td>0.0' TO 0.2'</td>
<td>ASPHALT</td>
<td>A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14.0</td>
<td>0.2' TO 2.0'</td>
<td>SAND - GRAVELY BASE COURSE (FILL), CLAYET, REDDISH - BROWN, DRY, MEDIUM.</td>
<td>B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.6</td>
<td>2.0' TO 3.5'</td>
<td>SAND - CLAYET, LIGHT BROWN, DRY, LOOSE, GRAVELLY.</td>
<td>C</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3.5' TO 7.0'</td>
<td>SANDSTONE - WEATHERED, FRAGMENTAL, LIGHT GRAY, FINE TO MEDIUM GRAINED, VERY SOFT TO SOFT (ROCK CLASSIFICATION). DRY AUGER REFUSAL AT 7.0' T.D.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **Hole No. 8A-11**
- **DRILLING Log DIVISION**: SOUTHWEST
- **INSTALLATION**: FORT WORTH DISTRICT
- **PROJECT**: TMD TARGET LAUNCH FACILITIES
- **LOCATION (Coordinates or Station)**: FORT WINGATE, NEW MEXICO
- **DRILLING AGENCY**: ENVIRONMENTAL DRILL
- **HOLE NO.**: 8A-11
- **NAME OF DRILLER**: JAR SAMPLES
- **PROJECT**: TMD FACILITIES
- **HOLE NO.**: 8A-11

---

*Visual Description Only.*
<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Moisture Content</th>
<th>Classification of Materials (Description)</th>
<th>Core Recovery</th>
</tr>
</thead>
<tbody>
<tr>
<td>15.4</td>
<td></td>
<td>ASPHALT</td>
<td>A</td>
</tr>
<tr>
<td>14.7</td>
<td></td>
<td>CLAY</td>
<td>B</td>
</tr>
<tr>
<td>3.0</td>
<td></td>
<td>BROWN, RED, EARTH</td>
<td>Ctn.1</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td>BASE COURSE</td>
<td></td>
</tr>
<tr>
<td>5.3</td>
<td></td>
<td>SANDSTONE</td>
<td>Ctn.2</td>
</tr>
</tbody>
</table>

1. DRILLING:
- AUGERED TO 40'. REFUSAL. USED 2 NX DRY CORE BARREL FROM 40' TO 160'.
- JAR SAMPLES
  - A: 0.3 TO 2.8'
  - B: 2.8'-5.6'

2. CARTON SAMPLES
   - Ctn.1: 4.8'-5.5'
   - Ctn.2: 11.5'-12.2'

3. CORE BOXES
   - BOX 1: 4.0'-16.0'

NOTE: ALL CORE DELIVERED TO S.I. LAB; CARTON SAMPLES PLACED IN ZIPLOC BAGS AND PLACED IN CORE BOX.

5. SLIGHT AMOUNT OF WATER ENCOUNTERED BELOW 8.0' AT END OF DRILLING. WATER LEVEL AT 15.5' TO 20-HOUR CHECK ON 20 JULY WATER LEVEL AT 12.0'.

6. BORING LOCATION AS SHOWN ON REQUEST.

* VISUAL DESCRIPTION ONLY.
### Drilling Log

**Hole No. BAGC-9**

**Division:** Southwest
**Installation:** Fort Worth District

1. **Project:** TMD Target Launch Facilities
2. **Location (Coordinates or Station):** Fort Wingate, New Mexico
3. **Drilling Agency:** Environmental Drill
4. **Hole No. (As shown on drawing title and file number):** BAGC-9
5. **Name of Driller:** Hammer
6. **Direction of Hole:**
   - Vertical
   - Inclined (1.6°)
7. **Thicker of Overburden:** 1.6’
8. **Depth Drilled into Rock:** 17.0’
9. **Total Depth of Hole:** 17.0’
10. **Date Hole Started:** 19 July 95
11. **Date Hole Completed:** 19 July 95
12. **Elevation Ground Water:**
13. **Total No. of Overburden Samples Taken:** 1
14. **Total Number Core Boxes:** 2
15. **Signature of Inspector:** Douglas P. Massoth

#### Moisture Content

<table>
<thead>
<tr>
<th>Depth</th>
<th>Moisture Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>12.9</td>
<td>0.0’ to 1.6’ CLAY - LIGHT BROWN, MOIST</td>
</tr>
<tr>
<td>4.4</td>
<td>1.6’ to 17.0’ SANDSTONE</td>
</tr>
<tr>
<td>4.7</td>
<td>10.0’</td>
</tr>
</tbody>
</table>

#### Classification of Materials

<table>
<thead>
<tr>
<th>Depth</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>12.9</td>
<td>CLAY - LIGHT BROWN, MOIST</td>
</tr>
<tr>
<td>4.4</td>
<td>MEDIUM PLASTICITY, SCATTERED GRAVEL, SILTY, SLIGHTLY SANDY, MOIST TO WET AT 1.6’</td>
</tr>
<tr>
<td>1.6’ to 17.0’</td>
<td>SANDSTONE</td>
</tr>
<tr>
<td>1.5’ to 17.0’</td>
<td>LIGHT GRAY, FINE TO MEDIUM GRAINED, MASSIVE, SCATTERED BROWN (HORIZONTAL) CLAYSTONE SEAMS (LESS THAN 1/8” THICK), CROSSBEDDED, OCCASIONAL PYRITE FLAKES, HARD TO VERY HARD (ROCK CLASSIFICATION).</td>
</tr>
<tr>
<td>T.0. 17.0’</td>
<td></td>
</tr>
</tbody>
</table>

**Drilling:**
- AUGERED TO 1.9’, REFUSAL. USED 2” NX DRY CORE BARREL FROM 1.9’ TO 17.0’.

**JAR Samples:**
- 0.0’ TO 1.6’
- CARTON SAMPLES: A-1. 2.0’ TO 2.85’
- CTRN: 2. 8.0’ TO 8.8’

**Core Boxes:**
- BOX 1: 2.0’ TO 13.0’
- BOX 2: 13.0’ TO 17.0’

**Note:** All core delivered to SWO Lab; Carton Samples placed in ziploc bags and placed in core box.

**Boring Location Offset Toward Road:** See Revised Drill Request Map.
| MOISTURE CONTENT | DEPTH | LEGEND | CLASSIFICATION OF MATERIALS (Description) | 2 CORE RECOVERY BOX ON SAMPLE NO. | REMARKS
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0' TO 1.0'</td>
<td>10</td>
<td>SAND - CLAYEY, GRAVELLY, LOOSE, LIGHT BROWN, MOIST</td>
<td>1.0' TO 3.0' SANDSTONE - HIGHLY WEATHERED, FRAGMENTAL AND BROKEN, LIGHT GRAY, DRY, VERY SOFT TO SOFT (ROCK CLASSIFICATION). AUGER REFUSAL AT 3.0' T.O.</td>
<td>A 1. JAR SAMPLES A. 0.0' TO 1.0' B. 1.0' TO 3.0'</td>
<td>2. NO WATER ENCOUNTERED, HOLE BACKFILLED AFTER COMPLETION. BORING LOCATION OFFSET DUE TO ARCHAEOLOGICAL SITES SEE REVISED DRILL REQUEST MAP.</td>
</tr>
<tr>
<td>Depth</td>
<td>Description</td>
<td>Core Recovery</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------</td>
<td>-------------</td>
<td>--------------</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| 0.0' - 2.5' | SAND - CLAYEY, TAN TO LIGHT BROWN, GRAVELY MOIST FROM 0.0' TO 1.0', THEN DRY; LOOSE TO MEDIUM. AUGER REFUSAL AT 2.5' T.D. (ENCOUNTERED SANDSTONE) | A | 1. JAR SAMPLES  
A. 0.0' - 2.5'  
2. NO WATER ENCOUNTERED  
3. BORING LOCATION OFFSET DUE TO ARCHAEOLOGICAL SITE; SEE REVISED DRILL REQUEST MAP.  

Remarks: (Drilling time, water loss, depth of weathering, etc., if significant)
| No. |  |  |
|-----|--------------------------------------|
| 1.  | PROJECT: TMD TARGET LAUNCH FACILITIES |
| 2.  | LOCATION: FORT WINGATE, NEW MEXICO |
| 3.  | DRILLING AGENCY: ENVIRONMENTAL DRILL |
| 4.  | HOLE NO. (as shown on drawing title and plan number): BA-6 |
| 5.  | NAME OF DRILLER: HAMMER |
| 6.  | DIRECTION OF HOLE: VERTICAL |
| 7.  | THICKNESS OF OVERBURY: 1.0' |
| 8.  | DEPTH DRILLED INTO ROCK: 1.0' |
| 9.  | TOTAL DEPTH OF HOLE: 2.0' |
| 10. | SIZE AND TYPE OF BIT: 8" HOLLOW STEM AUGER |
| 11. | DATUM FOR ELEVATION SHOWN: TBM |
| 12. | MANUFACTURER'S DESIGNATION OF DRILL:
| 13. | TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: 2 |
| 14. | ELEVATION GROUND WATER: 17.00 |
| 15. | TOTAL NUMBER CORE BOXES: 2 |
| 16. | DATE HOLE STARTED: 20 JUL 95 |
| 17. | COMPLETED: 20 JUL 95 |
| 18. | TOTAL CORE RECOVERY FOR BORING: 100% |
| 19. | SIGNATURE OF INSPECTOR: DOUGLAS P. MASSOTH |

### MOISTURE CONTENT

<table>
<thead>
<tr>
<th>DEPTH</th>
<th>VISUAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0' TO 1.0'</td>
<td></td>
</tr>
<tr>
<td>1.0' TO 2.0'</td>
<td></td>
</tr>
</tbody>
</table>

### CLASSIFICATION OF MATERIALS

<table>
<thead>
<tr>
<th>DEPTH</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0' TO 1.0'</td>
<td></td>
</tr>
<tr>
<td>1.0' TO 2.0'</td>
<td></td>
</tr>
</tbody>
</table>

### REMARKS

- 1. JAR SAMPLES
- 2. NO WATER ENCOUNTERED, HOLE BACKFILLED AFTER COMPLETION.
- 3. BORING LOCATION OFFSET DUE TO ARCHEOLOGICAL SITE: SEE REVISED DRILL REQUEST MAP.
<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Depth</th>
<th>% Moisture Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0' TO 1.6'</td>
<td>0.0' TO 1.6' VISUAL: CLAY - LIGHT BROWN, VERY SANDY, MOIST, LOW PLASTICITY, SOFT TO MEDIUM.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.6' TO 2.5'</td>
<td>1.6' TO 2.5' VISUAL: CLAYSTONE - REDDISH PURPLE, VERY SOFT (ROCK CLASSIFICATION), DRY, HIGHLY WEATHERED.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.5' TO 3.0'</td>
<td>2.5' TO 3.0' VISUAL: SANDSTONE - HIGHLY WEATHERED, FRAGMENTAL AND BROKEN, LIGHT GRAY, FINE TO MEDIUM GRAINED, VERY SOFT TO SOFT (ROCK CLASSIFICATION), DRY. AUGER REFUSAL AT 3.0' T.D.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Remarks:**
1. NO SAMPLES TAKEN.
2. NO WATER ENCOUNTERED, HOLE BACKFILLED AFTER COMPLETION.
3. BORING LOCATION: OFFSET 10 FEET TO THE WEST.
### Drilling Log

**Division:** Southwest  
**Installation:** Fort Worth District  
**Sheet:** 1 of 1

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. <strong>Project</strong></td>
<td>TMD Target Launch Facilities</td>
</tr>
<tr>
<td>2. <strong>Location (Coordinates or Street):</strong></td>
<td>Fort Wingate, New Mexico</td>
</tr>
<tr>
<td>3. <strong>Driller:</strong></td>
<td>Environmental Drill</td>
</tr>
<tr>
<td>4. <strong>Driller:</strong></td>
<td>Douglas P. Massoth</td>
</tr>
<tr>
<td>5. <strong>Direction of Hole:</strong></td>
<td>Vertical</td>
</tr>
<tr>
<td>6. <strong>Depth Drilled into Rock:</strong></td>
<td>4.0'</td>
</tr>
<tr>
<td>7. <strong>Total Depth of Hole:</strong></td>
<td>6.0'</td>
</tr>
<tr>
<td>8. <strong>Moisture Content:</strong></td>
<td>0.0' to 2.0'</td>
</tr>
<tr>
<td>9. <strong>Classification of Materials (Description):</strong></td>
<td>Visual</td>
</tr>
<tr>
<td>10. <strong>Core Size:</strong></td>
<td>DRY</td>
</tr>
<tr>
<td>11. <strong>Remarks:</strong></td>
<td>1. Core samples: A. 2.6' to 6.0'</td>
</tr>
<tr>
<td>13. <strong>Remarks:</strong></td>
<td>3. Hole location as shown on request.</td>
</tr>
</tbody>
</table>

**Additional Notes:**
- Sand - Light brown to brown, very clayey, loose, moist.
- Sandstone - Highly weathered, fragmental and broken, light gray, fine to medium grained, very soft to soft (rock classification), dry.
- Claystone - Reddish purple, soft (rock classification), easy to auger, dry, unweathered.
- T.D. 6.0'
Hole No. 8A-2

1. PROJECT
TMD TARGET LAUNCH FACILITIES
FORT WINGATE, NEW MEXICO

2. LOCATION (Coordinates or Survey)

3. DRILLING AGENCY
ENVIRONMENTAL DRILL

4. HOLE NO. (Iag shown on drawing and this number)
8A-2

5. NAME OF DRILLER
HAGNER

6. DIRECTION OF HOLE
VERTICAL

7. THICKNESS OF OVERBURDEN
15.0'

8. DEPTH DRILLED INTO ROCK
0.0'

9. TOTAL DEPTH OF HOLE
15.0'

10. SIZE AND TYPE OF BIT
8" HOLLOW STEM AUGER

11. DATE FOR ELEVATION SHOWN
MAR 71

12. MANUFACTURER'S DESIGNATION OF DRILL
CME 75

13. TOTAL NO. OF OVER-
BURDEN SAMPLES TAKEN
2

14. TOTAL NUMBER CORE BOXES

15. ELEVATION GROUND WATER

16. DATE HOLE STARTED
120 JUL 95

17. ELEVATION TOP OF HOLE

18. DATE HOLE COMPLETED
20 JUL 95

19. TOTAL CORE RECOVERY FOR BORING

20. SIGNATURE OF INSPECTOR
DOUGLAS P. MASSOTH

MOISTURE CONTENT
0.0' TO 15.0'

CLASSIFICATION OF MATERIALS
CLAY
0.0' TO 5.0' - TAN TO LIGHT
BROWN, SILTY, SANDY, DRY, LOY
PLASTICITY, MEDIUM.

5.0' TO 15.0' - REDDISH -
BROWN, DRY, HIGH PLASTICITY,
MEDIUM.

T.O. 15.0'

EVENT
BAG 1

1. BAG SAMPLES
BAG 1 0.0' TO 5.0'

2. JAR SAMPLES
A. 5.0' TO 10.0'

3. NO WATER ENCOUNTERED.
HOLE BACKFILLED AFTER
COMPLETION.

4. SEE REVISED DRILL REQUEST
MAP FOR BORING LOCATION.
<table>
<thead>
<tr>
<th>X</th>
<th>MOISTURE CONTENT</th>
<th>DEPTH</th>
<th>LEGEND</th>
<th>CLASSIFICATION OF MATERIALS (Description)</th>
<th>% CORE RECOVERY</th>
<th>BOX OR SAMPLE NO.</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>0.0'</td>
<td>16.8</td>
<td>0.0' TO 15.0' Clay</td>
<td></td>
<td></td>
<td>1. BAG SAMPLES</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.0'</td>
<td>10</td>
<td>0.0' TO 6.0' Light brown to tan, dry, high plasticity, soft to medium, sandy, 6.0' TO 15.0' Reddish brown, dry, high plasticity, medium.</td>
<td></td>
<td></td>
<td>BAG 1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.0'</td>
<td>40</td>
<td>T.O. 15.0'</td>
<td></td>
<td></td>
<td>2. JAR SAMPLES</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.0'</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>A 6.0' TO 11.0'</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.0'</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3. NO WATER ENCOUNTERED, HOLE BACKFILLED AFTER COMPLETION.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.0'</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4. SEE REVISED DRILL REQUEST MAP FOR BORING LOCATION.</td>
</tr>
</tbody>
</table>

**DRILLING LOG**

- **DIVISION**: SOUTHWEST
- **INSTALLATION**: FORT WORTH DISTRICT
- **HOLE NO.**: BA-1

**PROJECT**: TMD TARGET LAUNCH FACILITIES
- **LOCATION**: FORT WINGATE, NEW MEXICO
- **MANUFACTURERS DESIGNATION OF DRILL**: HAMMER
- **DATE HOLE STARTED**: 20 JUL 95
- **DATE HOLE COMPLETED**: 20 JUL 95

**ELEVATION GROUND WATER**: 20 FT

**TOTAL NO. OF OVERBURDEN SAMPLES TAKEN**: 2

**TOTAL NUMBER CORE BOXES**: 1

**DATE PAIR WASTES**: 20 JUL 95

**SIGNATURE OF INSPECTOR**: DOUGLAS P. MASSOTH

**DEPHT DRILLED INTO ROCK**: 0.0'

**TOTAL DEPTH OF HOLE**: 15.0'

**THICKNESS OF OVERBURDEN**: 15.0'

**CORE RECOVERY**

1. BAG SAMPLES
2. JAR SAMPLES
3. NO WATER ENCOUNTERED, HOLE BACKFILLED AFTER COMPLETION.
4. SEE REVISED DRILL REQUEST MAP FOR BORING LOCATION.
NOTE: LOCATE BUILDING RELATIVE TO EDGE OF EXISTING PAVEMENTS.

PROPOSED MISSILE ASSEMBLY BLDG.

SR-1

PT-1

CONC. HEADWALL

LEGEND

= BORING LOCATIONS
= PERCOLATION TEST
PT-1 LOCATION
= SOIL RESISTIVITY
SR-1 TEST LOCATION

FORT WINGATE, NEW MEXICO
TMD TARGET LAUNCH FACILITIES
BORING LOCATIONS AND RELATED INVESTIGATIONS

PLATE 5
ACCOMPANYING AMENDMENT NO. 0001 TO SOLICITATION NO. DACA63-95-B-0150

SECTION 00200 - INFORMATION AVAILABLE TO BIDDERS

00200
Geotechnical Data
Boring Locations and Drilling Log
d. DRAWINGS

(1) The drawings listed below shall be voided and the attached new drawings of the same number, each bearing AM 0001 notation in the title block, shall be substituted therefor:

<table>
<thead>
<tr>
<th>Sheet Reference Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>G-1, Rev a</td>
</tr>
<tr>
<td>A-CE-9, Rev a</td>
</tr>
<tr>
<td>D-E-2, Rev a</td>
</tr>
<tr>
<td>A-CE-1, Rev a</td>
</tr>
<tr>
<td>B-C-1, Rev a</td>
</tr>
<tr>
<td>E-E-1, Rev a</td>
</tr>
<tr>
<td>A-CE-2, Rev a</td>
</tr>
<tr>
<td>B-C-2, Rev a</td>
</tr>
<tr>
<td>E-E-2, Rev a</td>
</tr>
<tr>
<td>A-CE-6, Rev a</td>
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<td>B-E-1, Rev a</td>
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<tr>
<td>E-E-3, Rev a</td>
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<tr>
<td>A-CE-7, Rev a</td>
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<tr>
<td>C-E-1, Rev a</td>
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<tr>
<td>E-E-4, Rev a</td>
</tr>
<tr>
<td>A-CE-8, Rev a</td>
</tr>
<tr>
<td>D-E-1, Rev a</td>
</tr>
</tbody>
</table>

(2) New drawing listed below which accompanies this amendment, bearing an AM 0001 notation, shall be added to and become a part of the Contract Drawings.

<table>
<thead>
<tr>
<th>Sheet Reference Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>A-CE-10</td>
</tr>
</tbody>
</table>
Item 14. Continued

c. SPECIFICATIONS

(1) SECTION 03300 PAGE 4 - This page shall be deleted and the attached new page SECTION 03300 PAGE 4, bearing the notation "ACCOMPANYING AMENDMENT NO. 0001 TO SOLICITATION NO. DACA63-95-B-0150," shall be substituted therefor.

(2) SECTION 03300 PAGE 7 - This page shall be deleted and the attached new page SECTION 03300 PAGE 7, bearing the notation "ACCOMPANYING AMENDMENT NO. 0001 TO SOLICITATION NO. DACA63-95-B-0150," shall be substituted therefor.

(3) SECTION 03300 PAGE 14 - This page shall be deleted and the attached new page SECTION 03300 PAGE 14, bearing the notation "ACCOMPANYING AMENDMENT NO. 0001 TO SOLICITATION NO. DACA63-95-B-0150," shall be substituted therefor.

(4) SECTION 03300 PAGE 16 - This page shall be deleted and the attached new page SECTION 03300 PAGE 16, bearing the notation "ACCOMPANYING AMENDMENT NO. 0001 TO SOLICITATION NO. DACA63-95-B-0150," shall be substituted therefor.

(5) SECTION 15895 PAGE 6 - This page shall be deleted and the attached new page SECTION 15895 PAGE 6, bearing the notation "ACCOMPANYING AMENDMENT NO. 0001 TO SOLICITATION NO. DACA63-95-B-0150," shall be substituted therefor.

(6) SECTION 16375 PAGE 17 - This page shall be deleted and the attached new page SECTION 16375 PAGE 17, bearing the notation "ACCOMPANYING AMENDMENT NO. 0001 TO SOLICITATION NO. DACA63-95-B-0150," shall be substituted therefor.

(7) SECTION 16375 PAGE 20 - This page shall be deleted and the attached new page SECTION 16375 PAGE 20, bearing the notation "ACCOMPANYING AMENDMENT NO. 0001 TO SOLICITATION NO. DACA63-95-B-0150," shall be substituted therefor.

(8) SECTION 16375 PAGE 25 and PAGE 26 - These pages shall be deleted and the attached new pages SECTION 16375 PAGE 25 and SECTION 16375 PAGE 26, bearing the notation "ACCOMPANYING AMENDMENT NO. 0001 TO SOLICITATION NO. DACA63-95-B-0150," shall be substituted therefor.

(9) SECTION 16375 PAGE 45 - This page shall be deleted and the attached new page SECTION 16375 PAGE 45, bearing the notation "ACCOMPANYING AMENDMENT NO. 0001 TO SOLICITATION NO. DACA63-95-B-0150," shall be substituted therefor.

(10) SECTION 16375 PAGE 51 - This page shall be deleted and the attached new page SECTION 16375 PAGE 51, bearing the notation "ACCOMPANYING AMENDMENT NO. 0001 TO SOLICITATION NO. DACA63-95-B-0150," shall be substituted therefor.

(11) SECTION 16415 PAGE 9 and PAGE 10 - These pages shall be deleted and the attached new pages SECTION 16415 PAGE 9 and SECTION 16415...

a. Page 00110-2. - After this page, add the accompanying new SECTION 00200 - INFORMATION AVAILABLE TO BIDDERS, (which includes Geotechnical Data - Boring Locations and Drilling Log), bearing the notation "ACCOMPANYING AMENDMENT NO. 0001 TO SOLICITATION NO. DACA63-95-B-0150," and add to the Table of Contents.

b. Special Clauses.

(1) Page 00800-3, Paragraph 4.b. - Change the weather delay work days as follows:

JAN: From 6 to 8  
FEB: From 4 to 6  
NOV: From 3 to 5  
DEC: From 6 to 8  

(2) Page 00800-6, Paragraph 10.a, 10.b. and NOTE. - Delete paragraphs 10.a, 10.b and NOTE and replace these as follows:

"NOTE: UTILITIES ARE NOT AVAILABLE FROM GOVERNMENT SOURCES."
INSTRUCTIONS

Instructions for items other than those that are self-explanatory, are as follows:

(1) Item 1 (Contract ID Code). Insert the contract type identification code that appears in the title block of the contract being modified.

(2) Item 3 (Effective date).

(1) For a solicitation amendment, change order, or administrative change, the effective date shall be the issue date of the amendment, change order, or administrative change.

(2) For a supplemental agreement, the effective date shall be the date agreed to by the contracting parties.

(3) For a modification issued as an initial or confirm - notice of termination for the convenience of the Government, the effective date and the modification number of the confirming notice shall be the same as the effective date and modification number of the initial notice.

(4) For a modification converting a termination for default to a termination for the convenience of the Government, the effective date shall be the same as the effective date of the termination for default.

(5) For a modification confirming the contracting officer’s determination of the amount due in settlement of a contract termination, the effective date shall be the same as the effective date of the initial decision.

(6) Item 6 (Issued By). Insert the name and address of the issuing office. If applicable, insert the appropriate issuing office code in the code block.

(7) Item 8 (Name and Address of Contractor). For modifications to a contract or order, enter the contractor’s name, address, and code as shown in the original contract or order, unless changed by this or a previous modification.

(8) Items 9, (Amendment of Solicitation No.—Dated), and 10, (Modification of Contract/Order No.—Dated). Check the appropriate box and in the corresponding blanks insert the number and date of the original solicitation, contract, or order.

(9) Item 12 (Accounting and Appropriation Data). When appropriate, indicate the impact of the modification on each affected accounting classification by inserting one of the following entries:

(1) Accounting classification

   Net increase $ ______________________

(2) Accounting classification

   Net decrease $ ______________________

NOTE: If there are changes to multiple accounting classifications that cannot be placed in block 12, insert an asterisk and the words “See continuation sheet”.

(g) Item 13. Check the appropriate box to indicate the type of modification. Insert in the corresponding blank the authority under which the modification is issued. Check whether or not contractor must sign this document. (See FAR 43.103.)

(h) Item 14 (Description of Amendment/Modification).

(1) Organize amendments or modifications under the appropriate Uniform Contract Format (UCF) section headings from the applicable solicitation or contract. The UCF table of contents, however, shall not be set forth in this document.

(2) Indicate the impact of the modification on the overall total contract price by inserting one of the following entries:

   (i) Total contract price increased by $ _______

   (ii) Total contract price decreased by $ _______

   (iii) Total contract price unchanged.

(3) State reason for modification.

(4) When removing, reinstating, or adding funds, identify the contract items and accounting classifications.

(5) When the SF 30 is used to reflect a determination by the contracting officer of the amount due in settlement of a contract terminated for the convenience of the Government, the entry in Item 14 of the modification may be limited to —

   (i) A reference to the letter determination; and

   (ii) A statement of the net amount determined to be due in settlement of the contract.

(6) Include subject matter or short title of solicitation/contract where feasible.

(i) Item 16B. The contracting officer’s signature is not required on solicitation amendments. The contracting officer’s signature is normally affixed last on supplemental agreements.

STANDARD FORM 30 BACK (REV. 10-63)
AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

2. AMENDMENT MODIFICATION NO. 0001

3. EFFECTIVE DATE 95 AUG 31

4. REQUISITION/PURCHASE REQ. NO.

5. PROJECT NO. (If applicable) 

6. ISSUED BY

Department of the Army

Corps of Engineers

Fort Worth District

7. ADMINISTERED BY (If other than Item 6)

9A. AMENDMENT OF SOLICITATION NO.

DACA63-95-B-0150

9B. DATED (SEE ITEM 11)

17 AUGUST 1995

10A. MODIFICATION OF CONTRACT/ORDER NO.

10B. DATED (SEE ITEM 13)

CODE FACILITY CODE

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 is extended, as previously announced.

Bid opening date is 18 September 1995, as previously announced.

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 one copies of the amendment; (b) By acknowledging receipt of this amendment on 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: (Specify authority) 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 (such as changes in paying office, appropriation date, etc.) 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 (Specify type of modification and authority)

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 UCP section headings, including solicitation/contract subject matter where feasible.)

Information to Bidders, Special Clauses, Specifications and Drawings for Theater Missile Defense (TMD) Target Launch Facilities, Fort Wingate Depot Activity, Fort Wingate, New Mexico, are hereby modified as follows:

See Continuation Sheets.

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 (Type or print)

16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print)

15B. CONTRACTOR/OFFEROR

15C. DATE SIGNED

16B. UNITED STATES OF AMERICA

16C. DATE SIGNED

(Signature of person authorized to sign)

(Signature of Contracting Officer)
SECTION 01590 - CONTRACTOR FURNISHED TRAILER

PART 1 - GENERAL

1.1 CONTRACTOR FURNISHED TRAILER

   a. Contractor shall furnish, set up complete and ready for use a
      relocatable modular unit consisting of one (1) each 40' x 11'-9"
      (excluding towing tongue) unit and be equal to or better than
      Morgan Building System's No. 12445 model complete with hot and
      cold running water, waste systems, heating, air conditioning,
      lighting, window shades, front and rear desk, plan rack, plan
      table, closet, skirting, and stairs with handrail.
      Manufacturer will be regularly engaged in the construction and
      on-site erection of relocatable modular buildings. Unit will be
      set up at a location designated by the Government in the
      Administrative Area of Fort Wingate. The unit will be
      waterproofed and made ready for use within 30 days after notice
      to proceed.

   b. Exterior utilities shall be permanently installed to the modular
      unit (including electoral transformer) and connected with existing
      utilities. Exposed utilities shall be insulated to prevent freezing.

1.2 DISPOSITION: The unit shall become the property of the Contractor at
      completion of the contract. The Contractor shall remove the unit, all
      associated equipment and utilities from Government property.

1.3 SUBMITTALS: Contractor shall provide shop drawings for approval by the
      Contracting Officer, verifying all dimensions, fixtures and equipment
      herein. Deviations shall be noted. Approval of shop drawings, fixtures
      and equipment will not relieve the Contractor of the responsibility for
      any errors which may exist and the Contractor shall be responsible for
      the satisfactory construction of all work.
<table>
<thead>
<tr>
<th>SUB SYSTEM</th>
<th>SYSTEM</th>
<th>UOM</th>
<th>TITLE</th>
</tr>
</thead>
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<tr>
<td>17</td>
<td>AC</td>
<td></td>
<td>SITE PREPARATION</td>
</tr>
<tr>
<td>17</td>
<td>01</td>
<td></td>
<td>AC SITE CLEARING</td>
</tr>
<tr>
<td>17</td>
<td>02</td>
<td></td>
<td>SY SITE DEMOLITION &amp; RELOCATION</td>
</tr>
<tr>
<td>17</td>
<td>03</td>
<td></td>
<td>CY SITE EARTHWORK</td>
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<td>SY SITE CLEANUP</td>
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<td>9*</td>
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<td>** OTHER SITE PREPARATION</td>
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<td>18</td>
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<td>SITE IMPROVEMENTS</td>
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<td>18</td>
<td>01</td>
<td></td>
<td>SY ROADWAYS</td>
</tr>
<tr>
<td>18</td>
<td>02</td>
<td></td>
<td>SPA PARKING LOTS</td>
</tr>
<tr>
<td>18</td>
<td>03</td>
<td></td>
<td>SF WALKS, STEPS, RAMPS,&amp; TERRACES</td>
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<tr>
<td>18</td>
<td>04</td>
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<td>EA SITE DEVELOPMENT</td>
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<td>06</td>
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<td>EA SPECIAL CONSTRUCTION</td>
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<td>18</td>
<td>9*</td>
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<td>** OTHER SITE IMPROVEMENTS</td>
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<td>SITE CIVIL &amp; MECHANICAL UTILITIES</td>
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<td>LF WATER SUPPLY AND DISTRIBUTION SYSTEMS</td>
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<td>LF SANITARY SEWER SYSTEMS</td>
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<td>LF HEATING DISTRIBUTION SYSTEMS</td>
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9. Tri-Service Cost Engineering System (TRACES) Work Breakdown Structure (WBS) - The following information is supplied to the bidder for use in preparation of the required "Supplemental Bidding Schedule" [Units of
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<td>01.14b</td>
<td>System 14 Furnishings</td>
<td>Job</td>
<td>Sum</td>
<td>***</td>
<td>$</td>
</tr>
<tr>
<td>01.15b</td>
<td>System 15 Special Construction</td>
<td>Job</td>
<td>Sum</td>
<td>***</td>
<td>$</td>
</tr>
<tr>
<td>01.16b</td>
<td>System 16 Selective Building Demolition</td>
<td>Job</td>
<td>Sum</td>
<td>***</td>
<td>$</td>
</tr>
</tbody>
</table>

**TOTAL (BID ITEM NOS. 01.01b through 01.16b)** $ \\

**Asbestos Abatement**

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Description</th>
<th>Estimated Quantity</th>
<th>Unit</th>
<th>Unit Price</th>
<th>Estimated Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>02.00</td>
<td>Asbestos Abatement:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>02.aa</td>
<td>Pipe Insulation</td>
<td>Job</td>
<td>Sum</td>
<td>***</td>
<td>$</td>
</tr>
<tr>
<td>02.ab</td>
<td>Boiler/Flue Insulation</td>
<td>Job</td>
<td>Sum</td>
<td>***</td>
<td>$</td>
</tr>
<tr>
<td>02.ac</td>
<td>VAT (floor tile)</td>
<td>Job</td>
<td>Sum</td>
<td>***</td>
<td>$</td>
</tr>
<tr>
<td>02.ad</td>
<td>Pipe Fitting Insulation and all other asbestos abatement not separately listed</td>
<td>Job</td>
<td>Sum</td>
<td>***</td>
<td>$</td>
</tr>
</tbody>
</table>

**TOTAL (BID ITEM NOS. 02.aa through 02.ad)** $ \\

**Drilled Pier Shafts**

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Description</th>
<th>Estimated Quantity</th>
<th>Unit</th>
<th>Unit Price</th>
<th>Estimated Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>03.00</td>
<td>Drilled Pier Shafts:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>03.aa</td>
<td>18&quot; diameter</td>
<td>Job</td>
<td>Sum</td>
<td>***</td>
<td>$</td>
</tr>
<tr>
<td>03.ab</td>
<td>24&quot; diameter</td>
<td>Job</td>
<td>Sum</td>
<td>***</td>
<td>$</td>
</tr>
<tr>
<td>Item No.</td>
<td>Description</td>
<td>Estimated Quantity</td>
<td>Unit</td>
<td>Estimated Amount</td>
<td></td>
</tr>
<tr>
<td>---------</td>
<td>-----------------------------------------</td>
<td>--------------------</td>
<td>------</td>
<td>------------------</td>
<td></td>
</tr>
<tr>
<td>01.12a</td>
<td>System 12 Electrical Systems</td>
<td>Job Sum</td>
<td>***</td>
<td>$ ____________</td>
<td></td>
</tr>
<tr>
<td>01.13a</td>
<td>System 13 Equipment</td>
<td>Job Sum</td>
<td>***</td>
<td>$ ____________</td>
<td></td>
</tr>
<tr>
<td>01.14a</td>
<td>System 14 Furnishings</td>
<td>Job Sum</td>
<td>***</td>
<td>$ ____________</td>
<td></td>
</tr>
<tr>
<td>01.15a</td>
<td>System 15 Special Construction</td>
<td>Job Sum</td>
<td>***</td>
<td>$ ____________</td>
<td></td>
</tr>
<tr>
<td>01.16a</td>
<td>System 16 Selective Building Demolition</td>
<td>Job Sum</td>
<td>***</td>
<td>$ ____________</td>
<td></td>
</tr>
</tbody>
</table>

**TOTAL (BID ITEM NOS. 01.01a through 01.16a)** $ ______________

Building ###2: Complete, including all utilities to the five foot line, and exclusive of all work listed separately

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Description</th>
<th>Estimated Quantity</th>
<th>Unit</th>
<th>Estimated Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>01.01b</td>
<td>System 01 Substructure</td>
<td>Job Sum</td>
<td>***</td>
<td>$ ____________</td>
</tr>
<tr>
<td>01.02b</td>
<td>System 02 Superstructure</td>
<td>Job Sum</td>
<td>***</td>
<td>$ ____________</td>
</tr>
<tr>
<td>01.03b</td>
<td>System 03 Exterior Closure</td>
<td>Job Sum</td>
<td>***</td>
<td>$ ____________</td>
</tr>
<tr>
<td>01.04b</td>
<td>System 04 Roofing</td>
<td>Job Sum</td>
<td>***</td>
<td>$ ____________</td>
</tr>
<tr>
<td>01.05b</td>
<td>System 05 Interior Construction</td>
<td>Job Sum</td>
<td>***</td>
<td>$ ____________</td>
</tr>
<tr>
<td>01.06b</td>
<td>System 06 Interior Finishes</td>
<td>Job Sum</td>
<td>***</td>
<td>$ ____________</td>
</tr>
<tr>
<td>01.07b</td>
<td>System 07 Conveying Systems</td>
<td>Job Sum</td>
<td>***</td>
<td>$ ____________</td>
</tr>
<tr>
<td>01.08b</td>
<td>System 08 Plumbing</td>
<td>Job Sum</td>
<td>***</td>
<td>$ ____________</td>
</tr>
<tr>
<td>01.09b</td>
<td>System 09 HVAC</td>
<td>Job Sum</td>
<td>***</td>
<td>$ ____________</td>
</tr>
</tbody>
</table>

00010-7
### SUPPLEMENTAL BIDDING SCHEDULE

**Base Bid:** All work required by the plans and specifications exclusive of additive bid items:

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Description</th>
<th>Estimated Quantity</th>
<th>Unit</th>
<th>Unit Price</th>
<th>Estimated Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Building #1:</strong> Complete, including all utilities to the five foot line, and exclusive of all work listed separately</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>01.01a</td>
<td>System 01 Substructure</td>
<td>Job</td>
<td>Sum</td>
<td>***</td>
<td>$ _________</td>
</tr>
<tr>
<td>01.02a</td>
<td>System 02 Superstructure</td>
<td>Job</td>
<td>Sum</td>
<td>***</td>
<td>$ _________</td>
</tr>
<tr>
<td>01.03a</td>
<td>System 03 Exterior Closure</td>
<td>Job</td>
<td>Sum</td>
<td>***</td>
<td>$ _________</td>
</tr>
<tr>
<td>01.04a</td>
<td>System 04 Roofing</td>
<td>Job</td>
<td>Sum</td>
<td>***</td>
<td>$ _________</td>
</tr>
<tr>
<td>01.05a</td>
<td>System 05 Interior Construction</td>
<td>Job</td>
<td>Sum</td>
<td>***</td>
<td>$ _________</td>
</tr>
<tr>
<td>01.06a</td>
<td>System 06 Interior Finishes</td>
<td>Job</td>
<td>Sum</td>
<td>***</td>
<td>$ _________</td>
</tr>
<tr>
<td>01.07a</td>
<td>System 07 Conveying Systems</td>
<td>Job</td>
<td>Sum</td>
<td>***</td>
<td>$ _________</td>
</tr>
<tr>
<td>01.08a</td>
<td>System 08 Plumbing</td>
<td>Job</td>
<td>Sum</td>
<td>***</td>
<td>$ _________</td>
</tr>
<tr>
<td>01.09a</td>
<td>System 09 HVAC</td>
<td>Job</td>
<td>Sum</td>
<td>***</td>
<td>$ _________</td>
</tr>
<tr>
<td>01.10a</td>
<td>System 10 Fire Protection Systems</td>
<td>Job</td>
<td>Sum</td>
<td>***</td>
<td>$ _________</td>
</tr>
<tr>
<td>01.11a</td>
<td>System 11 Electric Power and Lighting</td>
<td>Job</td>
<td>Sum</td>
<td>***</td>
<td>$ _________</td>
</tr>
</tbody>
</table>
NOTES: (cont)

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.

7. Supplemental Information - These items are for information only and must be prepared and submitted by all bidders within 48 hours after bid opening. Further explanation of the Tri-Service Cost Engineering System (TRACES) Work Breakdown Structure (WBS) is included in Note 9. The first two numerical digits of each item listed in the Supplemental Bidding Schedule below correspond to the Bid Item Number, the second two numerical digits to the TRACES WBS System Level, and the third two numerical digits to the TRACES WBS Subsystem Level. Listed Systems or Subsystems not applicable to this project should have a value of $0.00 entered.
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)

2. If a modification to a bid based on unit prices is submitted, which
   provides for a lump sum adjustment to the total estimated cost, the
   application of the lump sum adjustment to each unit price in the 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. Bid Items for O&M Manuals and As-Built Drawings.– Refer to SECTION:
   CONTRACT CLOSEOUT, Paragraph, "Operation and Maintenance Instructions, Spare
   Parts Lists, Spare Parts, Special Tools, Inventories of Installed Properties
   and Training of Operating and Service Personnel" and Paragraph, "As-Built
   Drawings."
## BIDDING SCHEDULE

(To be attached to SF 1442)

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Description</th>
<th>Estimated Quantity</th>
<th>Unit</th>
<th>Unit Price</th>
<th>Estimated Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>0001.00</td>
<td>Launch Pad, complete:</td>
<td>Job</td>
<td>Sum</td>
<td>***</td>
<td>$______________</td>
</tr>
<tr>
<td>0002.00</td>
<td>Missile Assembly Building, including all utilities to the five-foot line of the building.</td>
<td>Job</td>
<td>Sum</td>
<td>***</td>
<td>$______________</td>
</tr>
<tr>
<td>0003.00</td>
<td>Launch Operations Trailer Shelter, including all utilities to the five-foot line of the building.</td>
<td>Job</td>
<td>Sum</td>
<td>***</td>
<td>$______________</td>
</tr>
<tr>
<td>0004.00</td>
<td>Launch Equipment Building, including all utilities to the five-foot line of the building.</td>
<td>Job</td>
<td>Sum</td>
<td>***</td>
<td>$______________</td>
</tr>
<tr>
<td>0005.00</td>
<td>Site Work/Supporting Facilities; complete, including all utilities outside the buildings' five-foot lines, and all other work not separately listed:</td>
<td>Job</td>
<td>Sum</td>
<td>***</td>
<td>$______________</td>
</tr>
<tr>
<td>0006.00</td>
<td>Operations and Maintenance Manuals</td>
<td>Job</td>
<td>Sum</td>
<td>***</td>
<td>$3,000.00</td>
</tr>
<tr>
<td>0007.00</td>
<td>Final As-Built Drawings</td>
<td>Job</td>
<td>Sum</td>
<td>***</td>
<td>$5,000.00</td>
</tr>
</tbody>
</table>

**TOTAL** (BID ITEM NOS. 0001 through 0007) $______________

a. **Bidding Schedule.** - Delete the note pertaining to the Bidding Schedule and add the attached Bidding Schedule bearing the notation "ACCOMPANYING AMENDMENT NO. 0002 TO SOLICITATION NO. DACA63-95-B-0150."

b. **Specifications.** - The following listed accompanying new section, bearing the notation "ACCOMPANYING AMENDMENT NO. 0002 TO SOLICITATION NO. DACA63-95-B-0150" shall be added to the specifications and add to the Table of Contents:

<table>
<thead>
<tr>
<th>Section No.</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>01590</td>
<td>CONTRACTOR FURNISHED TRAILER</td>
</tr>
</tbody>
</table>
INSTRUCTIONS

Instructions for items other than those that are self-explanatory, are as follows:

(a) Item 1 (Contract ID Code). Insert the contract type identification code that appears in the title block of the contract being modified.

(b) Item 3 (Effective date).

(1) For a solicitation amendment, change order, or administrative change, the effective date shall be the issue date of the amendment, change order, or administrative change.

(2) For a supplemental agreement, the effective date shall be the date agreed to by the contracting parties.

(3) For a modification issued as an initial or confirming notice of termination for the convenience of the Government, the effective date and the modification number of the confirming notice shall be the same as the effective date and modification number of the initial notice.

(4) For a modification converting a termination for default to a termination for the convenience of the Government, the effective date shall be the same as the effective date of the termination for default.

(5) For a modification confirming the contracting officer's determination of the amount due in settlement of a contract termination, the effective date shall be the same as the effective date of the initial decision.

(c) Item 6 (Issued By). Insert the name and address of the issuing office. If applicable, insert the appropriate issuing office code in the code block.

(d) Item 8 (Name and Address of Contractor). For modifications to a contract or order, enter the contractor's name, address, and code as shown in the original contract or order, unless changed by this or a previous modification.

(e) Items 9, (Amendment of Solicitation No.—Dated), and 10, (Modification of Contract/Order No.—Dated). Check the appropriate box and in the corresponding blanks insert the number and date of the original solicitation, contract, or order.

(f) Item 12 (Accounting and Appropriation Data). When appropriate, indicate the impact of the modification on each affected accounting classification by inserting one of the following entries:

(i) Accounting classification
Net increase $……………………….

(2) Accounting classification
Net decrease $……………………….

NOTE: If there are changes to multiple accounting classifications that cannot be placed in block 12, insert an asterisk and the words "See continuation sheet".

(g) Item 13. Check the appropriate box to indicate the type of modification. Insert in the corresponding blank the authority under which the modification is issued. Check whether or not contractor must sign this document. (See FAR 43.103.)

(h) Item 14 (Description of Amendment/Modification).

(1) Organize amendments or modifications under the appropriate Uniform Contract Format (UCF) section headings from the applicable solicitation or contract. The UCF table of contents, however, shall not be set forth in this document.

(2) Indicate the impact of the modification on the overall total contract price by inserting one of the following entries:

   (i) Total contract price increased by $…………

   (ii) Total contract price decreased by $…………

   (iii) Total contract price unchanged.

(3) State reason for modification.

(4) When removing, reinstating, or adding funds, identify the contract items and accounting classifications.

(5) When the SF 30 is used to reflect a determination by the contracting officer of the amount due in settlement of a contract terminated for the convenience of the Government, the entry in Item 14 of the modification may be limited to —

   (i) A reference to the letter determination; and

   (ii) A statement of the net amount determined to be due in settlement of the contract.

(6) Include subject matter or short title of solicitation/order where feasible.

(i) Item 16B. The contracting officer's signature is not required on solicitation amendments. The contracting officer's signature is normally affixed last on supplemental agreements.

STANDARD FORM 30 BACK (REV. 10-83)
Department of the Army  
Corps of Engineers  
Fort Worth District

8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, State and ZIP Code)  
DACA63-95-B-0150  

9A. AMENDMENT OF SOLICITATION NO.  
9B. DATED (SEE ITEM 11)  
17 AUGUST 1995  

10A. MODIFICATION OF CONTRACT/ORDER NO.  
10B. DATED (SEE ITEM 14)

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 □ is extended, □ is not extended. Bid opening date is 18 September 1995, as previously announced. 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 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 it 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: (Specify authority) 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 (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(5).

C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:

D. OTHER (Specify type of modification and authority)

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

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

The Bidding Schedule and Specifications for Theater Missile Defense (TMD) Target Launch Facilities, Fort Wingate Depot Activity, Fort Wingate, New Mexico, are hereby modified as follows:

See Continuation Sheet.

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 (Type or print)  

16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print)

15B. CONTRACTOR/OFFEROR  

15C. DATE SIGNED  

16B. UNITED STATES OF AMERICA  

16C. DATE SIGNED  

(Signature of person authorized to sign)  

(Signature of Contracting Officer)

STANDARD FORM 30 (REV. 10-83)  
Prescribed by GSA  
FAR (48 CFR) 9.243

NSN 7540-01-152-8070  
PREVIOUS EDITION UNUSABLE  

30-105-02
Instructions for items other than those that are self-explanatory, are as follows:

(a) Item 1 (Contract ID Code). Insert the contract type identification code that appears in the title block of the contract being modified.

(b) Item 3 (Effective date).

(1) For a solicitation amendment, change order, or administrative change, the effective date shall be the issue date of the amendment, change order, or administrative change.

(2) For a supplemental agreement, the effective date shall be the date agreed to by the contracting parties.

(3) For a modification issued as an initial or confirming notice of termination for the convenience of the Government, the effective date and the modification number of the confirming notice shall be the same as the effective date and modification number of the initial notice.

(4) For a modification converting a termination for default to a termination for the convenience of the Government, the effective date shall be the same as the effective date of the termination for default.

(5) For a modification confirming the contracting officer’s determination of the amount due in settlement of a contract termination, the effective date shall be the same as the effective date of the initial decision.

(c) Item 8 (Issued By). Insert the name and address of the issuing office. If applicable, insert the appropriate issuing office code in the code block.

(d) Item 8 (Name and Address of Contractor). For modifications to a contract or order, enter the contractor’s name, address, and code as shown in the original contract or order, unless changed by this or a previous modification.

(e) Items 9, (Amendment of Solicitation No.—Dated), and 10, (Modification of Contract/Order No.—Dated). Check the appropriate box and in the corresponding blanks insert the number and date of the original solicitation, contract, or order.

(f) Item 12 (Accounting and Appropriation Data). When appropriate, indicate the impact of the modification on each affected accounting classification by inserting one of the following entries:

(1) Accounting classification
   Net increase $……………………

(2) Accounting classification
   Net decrease $……………………

NOTE: If there are changes to multiple accounting classifications that cannot be placed in block 12, insert an asterisk and the words “See continuation sheet.”

(g) Item 13. Check the appropriate box to indicate the type of modification. Insert in the corresponding blank the authority under which the modification is issued. Check whether or not contractor must sign this document. (See FAR 43.103.)

(h) Item 14 (Description of Amendment/Modification).

(1) Organize amendments or modifications under the appropriate Uniform Contract Format (UCF) section headings from the applicable solicitation or contract. The UCF table of contents, however, shall not be set forth in this document.

(2) Indicate the impact of the modification on the overall total contract price by inserting one of the following entries:

   (i) Total contract price increased by $………………

   (ii) Total contract price decreased by $………………

   (iii) Total contract price unchanged.

(3) State reason for modification.

(4) When removing, reinstating, or adding funds, identify the contract items and accounting classifications.

(5) When the SF 30 is used to reflect a determination by the contracting officer of the amount due in settlement of a contract terminated for the convenience of the Government, the entry in Item 14 of the modification may be limited to —

   (i) A reference to the letter determination; and

   (ii) A statement of the net amount determined to be due in settlement of the contract.

(6) Include subject matter or short title of solicitation/contract where feasible.

(i) Item 18B. The contracting officer’s signature is not required on solicitation amendments. The contracting officer’s signature is normally affixed last on supplemental agreements.
Department of the Army
Corps of Engineers
Fort Worth District

8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, State and ZIP Code)

9. AMENDMENT OF SOLICITATION NO.
   DACA3-95-B-0150

10. DATED (SEE ITEM 11)
    17 AUGUST 1995

10A. MODIFICATION OF CONTRACT/ORDER NO.

10B. DATED (SEE ITEM 13)

The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers is extended, as previously announced. Bid opening date is 18 September 1995, as previously announced.

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 ______ copies of the amendment;
(b) By acknowledging receipt of this amendment on each copy of the offer submitted, or
(c) By a 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.

E. IMPORTANT: Contractor is not required to sign this document. 

14. DESCRIPTION OF AMENDMENT/MODIFICATION

The Bidding Schedule for Theater Missile Defense (TMD) Target Launch Facilities, Fort Wingate Depot Activity, Fort Wingate, New Mexico, is hereby modified as follows:

(1) Page 00010-5.- Delete Note No. 7. Supplemental Information.
(2) Pages 00010-6 through 00010-12.- Void these pages.
INSTRUCTIONS

Instructions for items other than those that are self-explanatory, are as follows:

(a) Item 1 (Contract ID Code). Insert the contract type identification code that appears in the title block of the contract being modified.

(b) Item 3 (Effective date).

(1) For a solicitation amendment, change order, or administrative change, the effective date shall be the issue date of the amendment, change order, or administrative change.

(2) For a supplemental agreement, the effective date shall be the date agreed to by the contracting parties.

(3) For a modification issued as an initial or confirming notice of termination for the convenience of the Government, the effective date and the modification number of the confirming notice shall be the same as the effective date and modification number of the initial notice.

(4) For a modification converting a termination for default to a termination for the convenience of the Government, the effective date shall be the same as the effective date of the termination for default.

(5) For a modification confirming the contracting officer's determination of the amount due in settlement of a contract termination, the effective date shall be the same as the effective date of the initial decision.

(c) Item 6 (Issued By). Insert the name and address of the issuing office. If applicable, insert the appropriate issuing office code in the code block.

(d) Item 8 (Name and Address of Contractor). For modifications to a contract or order, enter the contractor's name, address, and code as shown in the original contract or order, unless changed by this or a previous modification.

(e) Items 9, (Amendment of Solicitation No.—Dated), and 10, (Modification of Contract/Order No.—Dated). Check the appropriate box and in the corresponding blanks insert the number and date of the original solicitation, contract, or order.

(f) Item 12 (Accounting and Appropriation Data). When appropriate, indicate the impact of the modification on each affected accounting classification by inserting one of the following entries:

(1) Accounting classification
Net increase $........................

(2) Accounting classification
Net decrease $........................

NOTE: If there are changes to multiple accounting classifications that cannot be placed in block 12, insert an asterisk and the words "See continuation sheet".

(g) Item 13. Check the appropriate box to indicate the type of modification. Insert in the corresponding blank the authority under which the modification is issued. Check whether or not contractor must sign this document. (See FAR 43.103.)

(h) Item 14 (Description of Amendment/Modification).

(1) Organize amendments or modifications under the appropriate Uniform Contract Format (UCF) section headings from the applicable solicitation or contract. The UCF table of contents, however, shall not be set forth in this document.

(2) Indicate the impact of the modification on the overall total contract price by inserting one of the following entries:

(i) Total contract price increased by $..............

(ii) Total contract price decreased by $..............

(iii) Total contract price unchanged.

(3) State reason for modification.

(4) When removing, reinstating, or adding funds, identify the contract items and accounting classifications.

(5) When the SF 30 is used to reflect a determination by the contracting officer of the amount due in settlement of a contract terminated for the convenience of the Government, the entry in Item 14 of the modification may be limited to —

(i) A reference to the letter determination; and

(ii) A statement of the net amount determined to be due in settlement of the contract.

(6) Include subject matter or short title of solicitation/contract where feasible.

(i) Item 16B. The contracting officer's signature is not required on solicitation amendments. The contracting officer's signature is normally affixed last on supplemental agreements.

STANDARD FORM 30 BACK (REV. 10-83)
Amendment of Solicitation/Modification of Contract

Department of the Army
Corps of Engineers
Fort Worth District

8. Name and address of Contractor (No., street, county, State and ZIP code)

9A. Amendment of Solicitation No.

DA-01-95-0150

B. Dated (see item 11)

17 August 1995

10A. Modification of Contract/Order No.

10B. Dated (see item 13)

X 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 is extended, and is not extended.

Bid opening date is 18 September 1995, as previously announced.

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 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: (Specify authority) 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 (such as changes in paying office, appropriation date, etc.) 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 (Specify type of modification and authority)

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

14. Description of Amendment (Specify by UCF section headings, including solicitation/contract subject matter where feasible.)

The Instructions, conditions and Notices to Bidders for Theater Missile Defense (TMD) Target Launch Facilities, Fort Wingate Depot Activity, Fort Wingate, New Mexico, are hereby modified as follows:

Add the following new paragraph:

"36. NTP (Notice to Proceed) may not be issued for a period of up to 180 days after date of award to insure that all land agreements, permits, etc. have been finalized prior to the start of any construction activities."

Exhibit 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 (Type or print)

15B. Contractor/Offeror

15C. Date signed

16A. Name and title of contracting officer (Type or print)

16B. United States of America

16C. Date signed by (Signature of Contracting Officer)
Instructions for items other than those that are self-explanatory, are as follows:

1. Item 1 (Contract ID Code). Insert the contract type identification code that appears in the title block of the contract being modified.

2. Item 3 (Effective date).

   (1) For a solicitation amendment, change order, or administrative change, the effective date shall be the issue date of the amendment, change order, or administrative change.

   (2) For a supplemental agreement, the effective date shall be the date agreed to by the contracting parties.

   (3) For a modification issued as an initial or confirming notice of termination for the convenience of the Government, the effective date and the modification number of the confirming notice shall be the same as the effective date and modification number of the initial notice.

   (4) For a modification converting a termination for default to a termination for the convenience of the Government, the effective date shall be the same as the effective date of the termination for default.

   (5) For a modification confirming the contracting officer’s determination of the amount due in settlement of a contract termination, the effective date shall be the same as the effective date of the initial decision.

3. Item 6 (Issued By). Insert the name and address of the issuing office. If applicable, insert the appropriate issuing office code in the code block.

4. Item 8 (Name and Address of Contractor). For modifications to a contract or order, enter the contractor’s name, address, and code as shown in the original contract or order, unless changed by this or a previous modification.

5. Items 9, (Amendment of Solicitation No.—Dated), and 10, (Modification of Contract/Order No.—Dated). Check the appropriate box and in the corresponding blanks insert the number and date of the original solicitation, contract, or order.

6. Item 12 (Accounting and Appropriation Data). When appropriate, indicate the impact of the modification on each affected accounting classification by inserting one of the following entries:

   (1) Accounting classification
       Net increase $______________

   (2) Accounting classification
       Net decrease $______________

   NOTE: If there are changes to multiple accounting classifications that cannot be placed in block 12, insert an asterisk and the words “See continuation sheet”.

7. Item 13. Check the appropriate box to indicate the type of modification. Insert in the corresponding blank the authority under which the modification is issued. Check whether or not contractor must sign this document. (See FAR 43.103.)

8. Item 14 (Description of Amendment/Modification).

   (1) Organize amendments or modifications under the applicable Uniform Contract Format (UCF) section headings from the applicable solicitation or contract. The UCF table of contents, however, shall not be set forth in this document.

   (2) Indicate the impact of the modification on the overall contract price by inserting one of the following entries:

       (i) Total contract price increased by $______________

       (ii) Total contract price decreased by $______________

       (iii) Total contract price unchanged.

   (3) State reason for modification.

   (4) When removing, reinstating, or adding funds, identify the contract items and accounting classifications.

   (5) When the SF 30 is used to reflect a determination by the contracting officer of the amount due in settlement of a contract terminated for the convenience of the Government, the entry in Item 14 of the modification may be limited to—

       (i) A reference to the letter determination; and

       (ii) A statement of the net amount determined to be due in settlement of the contract.

   (6) Include subject matter or short title of solicitation/contract where feasible.

   (i) Item 16B. The contracting officer's signature is not required on solicitation amendments. The contracting officer's signature is normally affixed last on supplemental agreements.
Department of the Army
Corps of Engineers
Fort Worth District

8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, State and ZIP Code)

9A. AMENDMENT OF SOLICITATION NO.
DACA63-95-B-0150

9B. DATED (SEE ITEM 11)
17 AUGUST 1995

10A. MODIFICATION OF CONTRACT/ORDER NO.

10B. DATED (SEE ITEM 13)

X The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers \(\checkmark\) is extended, \(\Box\) is not extended.

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 \(\Box\) 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: (Specify authority) 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 (such as changes in paying office, appropriation date, etc.) 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 (Specify type of modification and authority)

E. IMPORTANT: Contractor \(\Box\) is not, \(\Box\) is required to sign this document and return \(\Box\) copies to the issuing office.

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

Standard Form 1442 for Theater Missile Defense (TMD) Target Launch Facilities, Fort Wingate Depot Activity, Fort Wingate, New Mexico, is hereby modified as follows:

First Page, Item 13.A.- Change the bid opening time and date from "2 p.m. local time, 18 September 1995" to "10 a.m. local time, 25 September 1995."

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 (Type or print)

15B. CONTRACTOR/OFFEROR

15C. DATE SIGNED

16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print)

16B. UNITED STATES OF AMERICA

16C. DATE SIGNED

(Signature of person authorized to sign) (Signature of Contracting Officer)
cable sheaths shall be by means of tinned terminals soldered to ground wires and to cable sheaths. Care shall be taken in soldering not to damage metallic cable sheaths or shields. Ground rods shall be protected with a double wrapping of pressure-sensitive plastic tape for a distance of 2 inches above and 6 inches below concrete penetrations. Grounding electrode conductors shall be neatly and firmly attached to manhole walls and the amount of exposed bare wire shall be held to a minimum.

* 3.9.6 Deleted

3.9.7 Riser Pole Grounding

A single continuous vertical grounding electrode conductor shall be installed on each riser pole and connected directly to the grounding electrodes indicated on the drawings or required by these specifications. All equipment, neutrals, surge arresters, and items required to be grounded shall be connected directly to this vertical conductor. The grounding electrode conductor shall be sized as shown. Grounding electrode conductors shall be stapled to wood poles at intervals not exceeding 2 feet.

3.9.8 Lighting Pole

One ground rod shall be provided at each pole. Bases of metal or concrete lighting poles shall be connected to ground rods by means of No. 8 AWG bare copper wire. Lighting fixture brackets on wood and concrete poles shall be grounded to a No. 6 AWG bare copper grounding conductor connected to the ground rod.

3.10 LIGHTING POLE INSTALLATION

Pole lengths shall provide a luminaire mounting height of 25 feet. Luminaire mounting height may be increased by the height of the transformer base where required. Electrical cabling shall be provided to the light pole as specified in this Section. The mount interfaces shall have ac power connected, and the pole wiring harness shall be connected to the luminaire. Light poles shall not be installed outside the site or inside the perimeter zone. Pole installation shall conform to the manufacturer's recommendations, NFPA 70, and ANSI C2. Poles shall be set straight and plumb.

3.10.1 Pole Brackets

Brackets shall be installed as specified by the manufacturer and as shown on drawings. Mounting hardware shall be sized appropriately to secure the mount, luminaire, and housing with wind and ice loading normally encountered at the site. Where indicated on drawings, adjustable heads shall be installed on the brackets to position the luminaires. Identical brackets shall be used with one type of luminaire.
b. Ground mat - A ground mat shall be installed as shown consisting of bare copper conductors installed 18 inches, plus or minus 3 inches, below the finished top of soil grade. Mat conductors shall be bonded to all rod electrodes, electrolytic electrodes, and to all other intersecting mat conductors. Mat conductors shall be sized as shown on the drawings.

c. Ground ring - A ground ring shall be installed as shown consisting of bare copper conductors installed 18 inches, plus or minus 3 inches, below finished top of soil grade.

d. Additional electrodes - When the required ground resistance is not met, additional electrodes shall be provided interconnected with grounding conductors to achieve the specified ground resistance. The additional electrodes will be up to three, 10 feet rods spaced a minimum of 12 feet apart. In high ground resistance, UL listed chemically charged ground rods may be used. If the resultant resistance exceeds 25 ohms measured not less than 48 hours after rainfall, the Contracting Officer shall be notified immediately.

3.9.2 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. Where grounding conductors are connected to aluminum-composition conductors, specially treated or lined copper-to-aluminum connectors suitable for this purpose shall be used.

3.9.3 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.

3.9.4 Surge Arrester Grounding

Surge arresters and neutrals shall be bonded directly to the transformer enclosure and then to the grounding electrode system with a bare copper conductor, sized as shown. Lead lengths shall be kept as short as practicable with no kinks or sharp bends.

3.9.5 Grounding at Cable Terminating/Sectionalizing Enclosures, Handhole, or Concrete Pullbox

Ground rods shall be connected to enclosures, cable racks, cable-pulling irons, the cable shielding, metallic sheath, and armor at each cable joint or splice by means of a No. 4 AWG braided copper wire. Connections to metallic
### Paperhangers:
**New work**
- Zone I: 16.00, 2.38
- Zone II: 17.00, 2.38
- Zone III: 18.50, 2.38
**Repaint/remodel**
- Zone I: 13.60, 2.38
- Zone II: 14.60, 2.38
- Zone III: 16.10, 2.38

### All Other Work; Commercial:
**Brush & Roller, Hand Texture**
**New work**
- Zone I: 13.70, 2.38
- Zone II: 14.70, 2.38
- Zone III: 16.20, 2.38
**Repaint/remodel**
- Zone I: 11.95, 2.38
- Zone II: 12.95, 2.38
- Zone III: 14.45, 2.38

### Spray, Special Coating Application
**Sandblaster, Steel Painter, Stripling**

### Machine Operator
**New work**
- Zone I: 14.20, 2.38
- Zone II: 15.20, 2.38
- Zone III: 16.70, 2.38
**Repaint/remodel**
- Zone I: 12.45, 2.38
- Zone II: 13.45, 2.38
- Zone III: 14.95, 2.38

### Sign Painter
**New work**
- Zone I: 14.55, 2.38
- Zone II: 15.55, 2.38
- Zone III: 17.05, 2.38

### Paper Hanger
**New work**
- Zone I: 14.70, 2.38
- Zone II: 15.70, 2.38
- Zone III: 17.20, 2.38
**Repaint/Remodel**
- Zone I: 12.95, 2.38
- Zone II: 13.95, 2.38
- Zone III: 13.45, 2.38

### Ames Tool Operator
**New work**
- Zone I: 14.25, 2.38
- Zone II: 15.25, 2.38
- Zone III: 16.75, 2.38
**Grant, Luna, Otero and Sierra**  
15.76  2.79  
**Hidalgo**  
16.26  2.79  

**PAIN0063B  04/01/1994**

**Painters:**
Mines, Mills, Power Plants, energy plants, refineries, coal gasification plants, nuclear related facilities & all steel work incidental thereto including stacks of all description:
- Brush, roller, pot tender, sandblaster grinder operator:
  - **New work:**
    - Zone I  15.00  2.38
    - Zone II  16.00  2.38
    - Zone III  17.50  2.38
  - **Repaint/remodel:**
    - Zone I  12.75  2.38
    - Zone II  13.75  2.38
    - Zone III  15.25  2.38
- **Spray Preparation for and application of Epoxy & Special Coatings:**
  - **New Work**
    - Zone I  15.50  2.38
    - Zone II  16.50  2.38
    - Zone III  18.00  2.38
  - **Repaint/remodel**
    - Zone I  13.18  2.38
    - Zone II  14.18  2.38
    - Zone III  15.68  2.38
- **Drywall Finisher & Ames Tool Op.**:
  - **New Work**
    - Zone I  15.50  2.38
    - Zone II  16.50  2.38
    - Zone III  18.00  2.38
  - **Repaint/remodel**
    - Zone I  13.18  2.38
    - Zone II  14.18  2.38
    - Zone III  15.68  2.38
- **Handfinisher, machine textures:**
  - **New Work**
    - Zone I  15.30  2.38
    - Zone II  16.30  2.38
    - Zone III  17.80  2.38
IRON0840C 08/01/1994

REMAINING COUNTIES

IRONWORKERS

15.00 3.55

LAB0016A 10/01/1993

LABORERS:

GROUP I
9.94 2.21

GROUP II
10.51 2.21

GROUP III
11.60 2.21

LABORER CLASSIFICATIONS

GROUP I: Chairmen -- Stakedrivers -- Demolition -- Hand Flagmen -- Heater Tender -- Pick and Shovel Work -- Window Cleaning and Clean-up, (Chairman and Stakedrivers working

GROUP II: Sandblaster (potman); Cement Mason Tender; hod Carrier; Mortar Mixers; Plaster Tenders and Brick Masons Tenders;

Powermen and Blasters; Sandblaster; Gunnite Workers; Terrazzo Grinders; Air power Tool Operators; Power Buggy Operator; Cutting Torch Operator; Wagon Drill Operators; Pipelayers; Pumpcrete Nozzlmen; Water Pump Operator; Kettle And Pot Men; All Pipe Cleaning and Wrapping; Mortar and Plaster Mixing Machine, Grout Machines; Pumpcrete machine.

GROUP III: Asbestos Abatement Laborer; Toxic and Hazardous Waste Removal Laborer; Lead Base Paint Removal Laborer.

MAR0002C 06/01/1995

MARBLE MASON, TILE LAYERS & TERRAZZO WORKERS

Bernalillo County and the Townships of Belen, Bernalillo, Edgewood, Los Lunas, Moriarty, Rio Rancho and Santa Fe

15.47 2.97

Catron, Colfax, Cibola, Harding, Los Alamos, McKinley, Mora, Rio Arriba, Sandoval, San Juan, San Miguel, Socorro, Taos, Torrence, Union and Valencia Counties

17.97 2.97
Locomotive op., Winch Truck, Front End Loaders (under 2 CY), Power Plants which generate Over 15 KW., Welding Machines.

GROUP III
Bituminous Distributors, Boilers, Retort & Hot Oil Heaters
Concrete Mixers, (1 CY & Over), Conc. Paver-Single Drum,
Drilling Equip., (Refrigeration, Slusher, Jumbo forms),
Trenching Machines (all Types), Pumpcrete & Gunite Machines
Slipfrom Paver, Mechanical Bullfloats, Concrete Slab Spreading
Machine, Conc. Slab Finishing Machine, Asphalt Plants,
Bituminous Finishing Machines, Crushing Plants.

GROUP IV
Front End Loaders (2 thru 10 CY), Rollers Steel Wheeled-All
Types, Bulldozer, Scrapers (Motor or Towed), Elevating Graders
Concrete Batching Plants, Self-Propelled Rollers - Equipped
W/Dozer, Twin-Bowl Scrapers and Quad 8 or 9 Pushers (35: Over
Basic Rate).

GROUP V
Hydraulic Cranes-With less than 50 feet of Boom (20 Tons and
Under), Concrete Paver-Double Drum, Cat Cranes, Hysters, Side
and Swingboom Cats, 2 Drum Hoist, Auto Fine Grader.

GROUP VI
Mucking Machines-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, Hydraulic & Stiff Leg, Pipemobile (No 2 Operator)
Piledriver, Hydraulic Cranes (20 Tons & Over), Mine Hoist,
Belt Loader ("C.M.I." Type), Boom and Jibs 150 ft. Through
199 ft.-$. 25 per hour above base pay 200 ft and over- 50:
per hour above base pay. Shovel (Wheel Type), Boring Machine
(Tunnel or Shaft Mole), Pipe Mobile.

IRON0495A 07/01/1995
Rates Fringes
BERNALILLO, CATRON, CIBOLA, COLFAX, DEBACA, GUADALUPE, LINCOLN,
LOS ALAMOS, TAOS, MCKINLEY, MORA, RIO ARRIBA, SAN JUAN, SAN
MIGUEL, SANDOVAL, SANTA FE, SOCORRO, TORRANCE, VALENCIA COUNTIES

IRONWORKERS 14.90 5.31
| GROUP IV  | 13.55 | 2.65 |
| GROUP V   | 13.61 | 2.65 |
| GROUP VI  | 13.73 | 2.65 |
| GROUP VII | 13.83 | 2.65 |
| GROUP VIII| 15.12 | 2.65 |

HAZARDOUS PAY - The following pay shall be applicable for every hour an operating engineer is required by governmental regulations and does wear special equipment for hazardous work at the designated levels. This is applicable in all three zones:

- **LEVEL C** - 10% above regular hourly wage
- **LEVEL B** - 10% above regular hourly wage
- **LEVEL A** - 15% above regular hourly wage

**ZONE PAY**

| ZONE I | Albuquerque - 0 to 50 mile radius of Bernalillo County Court House shall be a Free Zone |
|        | Farmington - 0 to 15 mile radius of Farmington City Hall shall be a Free Zone |
|        | Santa Fe - 0 to 25 mile radius of the State capitol Building shall be a free zone |

**Zone II** - Shall be $1.50 per hour above base pay. Will apply outside of above parameters up to 35 miles

**Zone III** - Shall be $.75 cents per hour above Zone II for a total of $2.25 per hour and will apply after 35 miles of Zone I's parameters.

**POWER EQUIPMENT OPERATOR CLASSIFICATIONS**

**GROUP I**
- Fireman, Oiler, Screedman, Scale op. such as Bin-a-Batch, Rubber Tired Farm Type Tractor, Tractors under 50 hp w/o Attachments, Breakman, Concrete Paving Curing Machine (BridgeType).

**GROUP II**
- Rollers, Sheepsfoot or Pneumatic Self-Propelled w/o Dozer, Concrete Conveyors, Service Truck op. (Head Oiler), Air Compressor (300 CFM & Over), Pumps (6" & Over), Screening Plants, Concrete Mixers (Under 1 CY), Concrete Saw or Grinder-Span Type, 1 Drum Hoist, Air Tugger, Elevating Belt Type Loaders, Forklift, Lumber Stacker, Tractor Farm Type (under 50 HP w/Attachments), Motorman and Industrial
TECHNICIANS
14.01  3.45+4%
INSTALLERS
11.54  3.45+4%

FROM THE MAIN POST OFFICE OF ARTESIA,
CARLSBAD, HOBBS & LOVINGTON, NEW MEXICO

ZONE I - 0 to 12 miles
ZONE II - 12 miles to 22 miles
ZONE III - 22 miles to 40 miles
ZONE IV - 40 miles and beyond

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FOOTNOTE: a. Under 5 years service 6%; over 5 years service 8%.

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<p>| HEAVY CONSTRUCTION: |
| GROUP I              |
| 12.00                | 2.65   |
| GROUP II             |
| 13.23                | 2.65   |
| GROUP III            |
| 13.32                | 2.65   |</p>
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<tr>
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<td>4.15+4%</td>
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| ZONE II              |                  |                  |
| ELECTRICIANS         | 17.50            | 4.15+4%          |
| CABLE SPLICERS       | 17.85            | 4.15+4%          |

| ZONE III             |                  |                  |
| ELECTRICIANS         | 17.65            | 4.15+4%          |
| CABLE SPLICERS       | 18.00            | 4.15+4%          |

| ZONE IV              |                  |                  |
| ELECTRICIANS         | 17.90            | 4.15+4%          |
| CABLE SPLICERS       | 18.25            | 4.15+4%          |

| ZONE I               |                  |                  |
| SOUNDMEN             | 16.45            | 3.45+4%          |
| TECHNICIANS          | 13.16            | 3.45+4%          |
| INSTALLERS           | 10.69            | 3.45+4%          |

| ZONE II              |                  |                  |
| SOUNDMEN             | 16.90            | 3.45+4%          |
| TECHNICIANS          | 13.61            | 3.45+4%          |
| INSTALLERS           | 11.14            | 3.45+4%          |

| ZONE III             |                  |                  |
| SOUNDMEN             | 17.05            | 3.45+4%          |
| TECHNICIANS          | 13.76            | 3.45+4%          |
| INSTALLERS           | 11.29            | 3.45+4%          |

| ZONE IV              |                  |                  |
| SOUNDMEN             | 17.30            | 3.45+4%          |
Zone 3  
Electricians  21.39  4.15+4%  
Cable Splicers  23.25  4.15+4%

Zone 4  
Electricians  23.44  4.15+4%  
Cable Splicers  25.30  4.15+4%

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<tr>
<th>City</th>
<th>Miles From Main Post Office</th>
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<td>Las Vegas</td>
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<td>Belen</td>
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<td>Los Lunas</td>
<td>12 miles</td>
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<td>Tucumcari</td>
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<td>Ruidoso</td>
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<td>Portales</td>
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<td>Carrizozo</td>
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<td>Clovis</td>
<td>12 miles</td>
</tr>
<tr>
<td>Gallup</td>
<td>10 miles</td>
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*The eastern edge of the Albuquerque Zone extends no further than the western boundary of the Village of Tijeras.

Zone 2 extending up to twenty (20) miles beyond Zone 1, EXCEPT ALBUQUERQUE, rates per hour shall be increased by nine percent (9%) of the journeyman rate for Zone 1.

Zone 3 extending up to thirty (30) miles beyond Zone 1, EXCEPT ALBUQUERQUE, rates per hour shall be increased by fifteen percent (15%) of the journeyman rate for Zone 1.

Zone 4 anything beyond thirty (30) miles from Zone 1, EXCEPT ALBUQUERQUE, rates per hour shall be increased by twenty-six percent (26%) of the journeyman rate for Zone 1.

FOR ESTABLISHING THE OUTLYING ZONES FROM THE ALBUQUERQUE FREE ZONE ONLY, ZONE 2 SHALL EXTEND UP TO TEN (10) MILES BEYOND ZONE 1, ZONE 3 SHALL EXTEND UP TO TWENTY (20) MILES BEYOND ZONE 1, AND ZONE 4 ANYTHING BEYOND TWENTY (20) MILES FROM ZONE 1.
Switching stations adjacent to power plants in Eddy and Lea Cos.; the following zones listed shall be designated from post office of Artesia, Carlsbad, Hobbs & Lovington:

Zone I - 0 to 12 miles
Zone II - 12 to 22 miles
Zone III - 22 to 40 miles
Zone IV - 40 miles

Lineman - Technicians:
- Zone I: 17.05, 4.15+3.75%
- Zone II: 17.50, 4.15+3.75%
- Zone III: 17.65, 4.15+3.75%
- Zone IV: 17.90, 4.15+3.75%

Cable Splicers:
- Zone I: 17.40, 4.15+3.75%
- Zone II: 17.85, 4.15+3.75%
- Zone III: 18.00, 4.15+3.75%
- Zone IV: 18.25, 4.15+3.75%

- Zone I: 16.20, 4.15+3.75%
- Zone II: 16.65, 4.15+3.75%
- Zone III: 16.80, 4.15+3.75%
- Zone IV: 17.05, 4.15+3.75%

Powderman:
- Zone I: 14.83, 4.15+3.75%
- Zone II: 15.28, 4.15+3.75%
- Zone III: 15.43, 4.15+3.75%
- Zone IV: 15.68, 4.15+3.75%

Groundman - Jackhammer Op.:
- Zone I: 12.11, 4.15+3.75%
- Zone II: 12.56, 4.15+3.75%
- Zone III: 12.71, 4.15+3.75%
- Zone IV: 12.96, 4.15+3.75%

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ELEC0611C 07/01/1995

ELECTRICIANS:
Bernalillo, Santa Fe, Torrance, DeBaca, Guadalupe, Quay, San Miguel, Mora, Harding, Union, Colfax, Taos, Rio Arriba, Grant, Sandoval, Valencia, Socorro, Catron, McKinley, Sierra, San Juan, Chaves, Curry, Lincoln, Cibola & Roosevelt Counties

Zone 1
- Electricians: 18.60, 4.15+4%
- Cable Splicers: 20.46, 4.15+4%

Zone 2
- Electricians: 20.27, 4.15+4%
- Cable Splicers: 22.13, 4.15+4%
Switching stations and sub-stations adjacent to power plants in Zones I and II in Luna, Dona Ana, Otero & Hidalgo Cos., exclusive of White Sands Missile Range & that portion of Fort Bliss in New Mexico.

**Linemen - Technicians**
- Zone I: 15.15, 2.90+3.75%
- Zone II: 17.10, 2.90+3.75%

**Cable Splicers**
- Zone I: 15.45, 2.90+3.75%
- Zone II: 17.44, 2.90+3.75%

**Equipment Op. (includes Helicopter Op.):**
- Zone I: 13.18, 2.90+3.75%
- Zone II: 14.88, 2.90+3.75%

**Equipment Mechanic (includes Helicopter Mech.):**
- Zone I: 13.18, 2.90+3.75%
- Zone II: 14.88, 2.90+3.75%

**Powderman:**
- Zone I: 12.73, 2.90+3.75%
- Zone II: 14.36, 2.90+3.75%

**Groundman - Jackhammer Op.:**
- Zone I: 10.76, 2.90+3.75%
- Zone II: 12.14, 2.90+3.75%

**ZONE I:**

a. The area within a 25 mile radius from the Downtown Post Office in El Paso, Texas. Fort Bliss and Biggs Field Property to be included in this Free Zone. Fort Bliss and Biggs Field to be defined by official U.S. Government Map.

b. The area within a five mile radius of any city, town, or municipality within which an employer establishes or maintains his permanent place of business.

c. The area within a fifteen mile radius from the Post Office in Las Cruces, New Mexico, and within a five mile radius from the Post Office in Alamogordo, Deming, and Lordsburg, New Mexico.

d. The area ten miles East and ten miles West of Interstate 10, between El Paso, Texas and Las Cruces, New Mexico.

**ZONE II:** All other areas of the jurisdiction except those specified in Zone I.
Equipment Mechanic (includes helicopter mechanic):
Zone I 17.67 4.15+3.75%
Zone II 19.34 4.15+3.75%
Zone III 20.46 4.15+3.75%
Zone IV 22.51 4.15+3.75%
Powderman:
Zone I 16.18 4.15+3.75%
Zone II 17.85 4.15+3.75%
Zone III 18.97 4.15+3.75%
Zone IV 21.05 4.15+3.75%
Groundman - Jackhammer Op.:
Zone I 13.21 3.90+3.75%
Zone II 14.88 3.90+3.75%
Zone III 16.00 3.90+3.75%
Zone IV 18.05 3.90+3.75%

Zone 1 City Basic Wage Rates Miles From Main Post Office
*Albuquerque 25 miles
Santa Fe 10 miles
Las Vegas 8 miles
Farmington 6 miles
Raton 6 miles
Tucumcari 6 miles
Gallup 10 miles
Roswell 12 miles
Ruidoso 12 miles
Portales 12 miles
Carrizozo 12 miles
Clovis 12 miles
Belen 12 miles
Los Lunas 12 miles
Espanola 14 miles

*The eastern edge of the Albuquerque Zone extends no further than the western boundary of the Village of Tijeras.

Zone 2 extending up to twenty (20) miles beyond Zone 1, EXCEPT ALBUQUERQUE, rates per hour shall be increased by nine percent (9%) of the journeyman rate for Zone 1.

Zone 3 extending up to thirty (30) miles beyond Zone 1, EXCEPT ALBUQUERQUE, rates per hour shall be increased by fifteen percent (15%) of the journeyman rate for Zone 1.

Zone 4 anything beyond thirty (30) miles from Zone 1, EXCEPT ALBUQUERQUE, rates per hour shall be increased by twenty-six percent (26%) of the journeyman rate for Zone 1.
ELECO583B 01/01/1995

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<td>CABLE SPLICERS:</td>
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<td>Zone I</td>
<td>15.40</td>
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<td>Zone II</td>
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Zone 1: The area within a 25 mile radius from the downtown Post Office in El Paso, TX. Ft Bliss and Biggs Field proper to be included in this free zone. The area within a 15 mile radius from the Post Office in Las Cruces, NM and within a 5 mile radius from the Post Office in Alamogordo, Deming and Lordsburg. The area 10 miles East and 10 miles West of Interstate 10 between El Paso, Texas and Las Cruces NM.

Zone 2: Dona Ana, Otero, Luna and Hidalgo Counties (except that area in Zone 1).

* ELECO611B 07/01/1995

COMMERICAL LINE WORK:

Bernalillo, Catron, Chaves, Colfax, Curry, DeBaca, Grant, Guadalupe, Harding, Lincoln, Los Alamos, McKinley, Mora, Quay, Rio Arriba, Roosevelt, Sandoval, San Juan, San Miguel, Santa Fe, Sierra, Socorro, Taos, Torrance, Union, Valencia & White Sands Missile Range and that portion of Fort Bliss in New Mexico.

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General Decision Number NM950001

Superseded General Decision No. NM940001

State: New Mexico

Construction Type:
BUILDING
HEAVY

County(ies):
STATEWIDE

STATEWIDE - EXCLUDING EDDY AND LEA COUNTRIES FOR BUILDING CONSTR.

GENERAL BUILDING AND HEAVY ENGINEERING CONSTRUCTION shall include the construction, alteration, repair and demolition of buildings including office buildings, warehouses, industrial and commercial buildings, institutional and public buildings, and all air conditioning, conduit, heating and other mechanical and electrical works and site preparation for building or heavy engineering projects under this classification, stadia; and shall include electrical, gas, water, sewer lines, and other such utility construction which are part of projects under this classification and included within the property line or less than five (5) feet from the building or heavy engineering structure, whichever is closer, provided, however, regard to electrical utilities such construction shall include construction from the first attachment of incoming power source without regard to the property line or proximity to the building or the heavy engineering structure; and include construction, alteration, repair and demolition of heavy engineering work such as power generating plants, pump stations, natural gas compressing stations; covered reservoirs and covered sewage and water treatment facilities; concrete linings for canals, ditches and channels; concrete dams; earth dams of one million (1,000,000) cubic yards or over; radio towers, ovens, furnaces, kilns, silos shafts and tunnels (other than highway shafts and tunnels), hydro-electric projects; and well drilling, telephone and electrical transmission lines which are part of GENERAL BUILDING AND HEAVY ENGINEERING PROJECTS: mining appurtenances such as tipples, washeries and loading and discharging chutes, and specialized structures for testing, launching and recovering space and other rocket-type missiles.
<p>| | | |</p>
<table>
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<tr>
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| **99** | 52.246-12 | INSPECTION OF CONSTRUCTION (JUL 1986)  
(Reference 46.312) |
| **100** | 52.246-21 | WARRANTY OF CONSTRUCTION (APR 1984)  
(Reference 46.710(e)(1)) |
| **101** | 252.247-7023 | TRANSPORTATION OF SUPPLIES BY SEA (DEC 1991)  
(Reference 47.573(b)) |
| **102** | 252.247-7024 | NOTIFICATION OF TRANSPORTATION OF SUPPLIES BY SEA (DEC 1991)  
(Reference 47.573(c)) |
| **103** | 52.248-3 | VALUE ENGINEERING--CONSTRUCTION (MAR 1989)--ALTERNATE I (APR 1984)  
(Reference 48.202) |
| **104** | 52.249-2 | TERMINATION FOR CONVENIENCE OF THE GOVERNMENT (FIXED-PRICE) (APR 1984)--ALTERNATE I (APR 1984)  
(Reference 49.502(b)(1)) |
| **105** | 52.249-10 | DEFAULT (FIXED-PRICE CONSTRUCTION) (APR 1984)  
(Reference 49.502(c)(1)) |
| **106** | 52.252-6 | AUTHORIZED DEVIATIONS IN CLAUSES (APR 1984)  
(Reference 52.107(f)) |
| **107** | 52.253-1 | COMPUTER GENERATED FORMS (JAN 1991)  
(Reference 53.111) |

END OF SECTION 00700
(ii) The most significant considerations controlling establishment of initial or revised prices;

(iii) The reason cost or pricing data were or were not required;

(iv) The extent, if any, to which the Contractor did not rely on the subcontractor's cost or pricing data in determining the price objective and in negotiating the final price;

(v) The extent, if any, to which it was recognized in the negotiation that the subcontractor's cost or pricing data were not accurate, complete, or current; the action taken by the Contractor and subcontractor; and the effect of any such defective data on the total price negotiated;

(vi) The reasons for any significant difference between the Contractor's price objective and the price negotiated; and

(vii) A complete explanation of the incentive fee or profit plan when incentives are used. The explanation shall identify each critical performance element, management decisions used to quantify each incentive element, reasons for the incentives, and a summary of all trade-off possibilities considered.

(d) The Contractor shall obtain the Contracting Officer's written consent before placing any subcontract for which advance notification is required under paragraph (b) above. However, the Contracting Officer may ratify in writing any such subcontract. Ratification shall constitute the consent of the Contracting Officer.

(e) Even if the Contractor's purchasing system has been approved, the Contractor shall obtain the Contracting Officer's written consent before placing subcontracts identified below: None.

(f) Unless the consent or approval specifically provides otherwise, neither consent by the Contracting Officer to any subcontract nor approval of the Contractor's purchasing system shall constitute a determination (1) of the acceptability of any subcontract terms or conditions, (2) of the acceptability of any subcontract price or of any amount paid under any subcontract, or (3) to relieve the Contractor of any responsibility for performing this contract.

(g) No subcontract placed under this contract shall provide for payment on a cost-plus-a-percentage-of-cost basis, and any fee payable under cost-reimbursement subcontracts shall not exceed the fee limitations in subsection 15.903(d) of the Federal Acquisition Regulation (FAR).

(h) The Government reserves the right to review the Contractor's purchasing system as set forth in FAR Subpart 44.3.

(End of clause)
This clause does not apply to firm-fixed-price contracts and fixed-price contracts with economic price adjustment. However, it does apply to subcontracts resulting from unpriced modifications to such contracts.

(b) "Subcontract," as used in this clause, includes but is not limited to purchase orders, and changes and modifications to purchase orders. The Contractor shall notify the Contracting Officer reasonably in advance of entering into any subcontract if the Contractor does not have an approved purchasing system and if the subcontract--

(1) Is proposed to exceed $100,000; or
(2) Is one of a number of subcontracts with a single subcontractor, under this contract, for the same or related supplies or services, that in the aggregate are expected to exceed $100,000.

(c) The advance notification required by paragraph (b) above shall include--

(1) A description of the supplies or services to be subcontracted;
(2) Identification of the type of subcontract to be used;
(3) Identification of the proposed subcontractor and an explanation of why and how the proposed subcontractor was selected, including the competition obtained;
(4) The proposed subcontract price and the Contractor's cost or price analysis;
(5) The subcontractor's current, complete, and accurate cost or pricing data and Certificate of Current Cost or Pricing Data, if required by other contract provisions;
(6) The subcontractor's Disclosure Statement or Certificate relating to Cost Accounting Standards when such data are required by other provisions of this contract; and
(7) A negotiation memorandum reflecting--

(i) The principal elements of the subcontract price negotiations;
73 52.233-1 DISPUTES (MAR 1994)
    (Reference 33.215)
74 52.233-3 PROTEST AFTER AWARD (AUG 1989)
    (Reference 33.106(b))
75 252.233-7000 CERTIFICATION OF CLAIMS AND REQUESTS FOR ADJUSTMENT OR RELIEF (MAY 1994)
    (Reference 33.7001-7)
76 52.236-2 DIFFERING SITE CONDITIONS (APR 1984)
    (Reference 36.502)
77 52.236-3 SITE INVESTIGATION AND CONDITIONS AFFECTING THE WORK (APR 1984)
    (Reference 36.503)
78 52.236-5 MATERIAL AND WORKMANSHIP (APR 1984)
    (Reference 36.505)
79 52.236-6 SUPERINTENDENCE BY THE CONTRACTOR (APR 1984)
    (Reference 36.506)
80 52.236-7 PERMITS AND RESPONSIBILITIES (NOV 1991)
    (Reference 36.507)
81 52.236-8 OTHER CONTRACTS (APR 1984)
    (Reference 36.508)
82 52.236-9 PROTECTION OF EXISTING VEGETATION, STRUCTURES, EQUIPMENT, UTILITIES, AND
    IMPROVEMENTS (APR 1984)
    (Reference 36.509)
83 52.236-10 OPERATIONS AND STORAGE AREAS (APR 1984)
    (Reference 36.510)
84 52.236-11 USE AND POSSESSION PRIOR TO COMPLETION (APR 1984)
    (Reference 36.511)
85 52.236-12 CLEANING UP (APR 1984)
    (Reference 36.512)
86 52.236-13 ACCIDENT PREVENTION (NOV 1991)
    (Reference 36.513(a))
87 52.236-14 AVAILABILITY AND USE OF UTILITY SERVICES (APR 1984)
    (Reference 36.514)
88 52.236-15 SCHEDULES FOR CONSTRUCTION CONTRACTS (APR 1984)
    (Reference 36.515)
89 52.236-16 QUANTITY SURVEYS (APR 1984)
    (Reference 36.516)
90 52.236-17 LAYOUT OF WORK (APR 1984)
    (Reference 36.517)
91 52.236-21 SPECIFICATIONS AND DRAWINGS FOR CONSTRUCTION (APR 1984)
    (Reference 36.521)
92 252.236-7000 MODIFICATION PROPOSALS--PRICE BREAKDOWN (DEC 1991)
    (Reference 36.570(a))
first-tier subcontractor, or shall incur an obligation to pay a late payment interest penalty to such first-tier subcontractor computed at the rate of interest established by the Secretary of the Treasury, and published in the Federal Register, for interest payments under section 12 of the Contracts Disputes Act of 1978 (41 U.S.C. 611) in effect at the time the Contractor accrues the obligation to pay an interest penalty.

(g) A written notice of any withholding shall be issued to a subcontractor (with a copy to the Contracting Officer of any such notice issued by the Contractor), specifying--

(1) The amount to be withheld;

(2) The specific causes for the withholding under the terms of the subcontract; and

(3) The remedial actions to be taken by the subcontractor in order to receive payment of the amounts withheld.

(h) The Contractor may not request payment from the Government of any amount withheld or retained in accordance with paragraph (d) of this clause until such time as the Contractor has determined and certified to the Contracting Officer that the subcontractor is entitled to the payment of such amount.

(i) A dispute between the Contractor and subcontractor relating to the amount or entitlement of a subcontractor to a payment or a late payment interest penalty under a clause included in the subcontract pursuant to paragraph (c) of this clause does not constitute a dispute to which the United States is a party. The United States may not be interpled in any judicial or administrative proceeding involving such a dispute.

(jj) Except as provided in paragraph (i) of this clause, this clause shall not limit or impair any contractual, administrative, or judicial remedies otherwise available to the Contractor or a subcontractor in the event of a dispute involving late payment or nonpayment by the Contractor or deficient subcontract performance or nonperformance by a subcontractor.

(k) The Contractor's obligation to pay an interest penalty to a subcontractor pursuant to the clauses included in a subcontract under paragraph (c) of this clause shall not be construed to be an obligation of the United States for such interest penalty. A cost reimbursement claim may not include any amount for reimbursement of such interest penalty.

(End of clause)

72 252.232-7006 REDUCTION OR SUSPENSION OF CONTRACT PAYMENTS UPON FINDING OF FRAUD (Aug 1992)
(Reference 32.111-70)
under section 12 of the Contracts Disputes Act of 1978 (41 U.S.C. 611) in effect at the time the Contractor accrues the obligation to pay an interest penalty;

(5) Notify the Contracting Officer upon—
   (i) Reduction of the amount of any subsequent certified application for payment; or
   (ii) Payment to the subcontractor of any withheld amounts of a progress payment, specifying—
      (A) The amounts withheld under subparagraph (e)(1) of this clause; and
      (B) The dates that such withholding began and ended; and

(6) Be obligated to pay to the Government an amount equal to interest on the withheld payments (computed in the manner provided in 31 U.S.C. 3903(c)(1)), from the 8th day after receipt of the withheld amounts from the Government until—

(i) The day the identified subcontractor performance deficiency is corrected; or

(ii) The date that any subsequent payment is reduced under subdivision (e)(5)(i) of this clause.

(f)(1) If a Contractor, after making payment to a first-tier subcontractor, receives from a supplier or subcontractor of the first-tier subcontractor (hereafter referred to as a "second-tier subcontractor") a written notice in accordance with section 2 of the Act of August 24, 1935 (40 U.S.C. 270b, Miller Act), asserting a deficiency in such first-tier subcontractor's performance under the contract for which the Contractor may be ultimately liable, and the Contractor determines that all or a portion of future payments otherwise due such first-tier subcontractor is subject to withholding in accordance with the subcontract agreement, then the Contractor may, without incurring an obligation to pay an interest penalty under subparagraph (e)(6) of this clause—

(i) Furnish to the first-tier subcontractor a notice conforming to the standards of paragraph (g) of this clause as soon as practicable upon making such determination; and

(ii) Withhold from the first-tier subcontractor's next available progress payment or payments an amount not to exceed the amount specified in the notice of withholding furnished under subdivision (f)(1)(i) of this clause.

(2) As soon as practicable, but not later than 7 days after receipt of satisfactory written notification that the identified subcontract performance deficiency has been corrected, the Contractor shall pay the amount withheld under subdivision (f)(1)(ii) of this clause to such
subcontract, giving such recognition as the parties deem appropriate to
the ability of a subcontractor to furnish a performance bond and a
payment bond;

(2) Permit the Contractor or subcontractor to make a determination that
part or all of the subcontractor's request for payment may be withheld in
accordance with the subcontract agreement; and

(3) Permit such withholding without incurring any obligation to pay a
late payment penalty if--

(i) a notice conforming to the standards of paragraph (g) of this
clause has been previously furnished to the subcontractor; and

(ii) a copy of any notice issued by a Contractor pursuant to
subdivision (d)(3)(i) of this clause has been furnished to the
Contracting Officer.

(e) If a Contractor, after making a request for payment to the
Government but before making a payment to a subcontractor for the
subcontractor's performance covered by the payment request, discovers that
all or a portion of the payment otherwise due such subcontractor is
subject to withholding from the subcontractor in accordance with the
subcontract agreement, then the Contractor shall--

(1) Furnish to the subcontractor a notice conforming to the standards
of paragraph (g) of this clause as soon as practicable upon ascertaining
the cause giving rise to a withholding, but prior to the due date for
subcontractor payment;

(2) Furnish to the Contracting Officer, as soon as practicable, a copy
of the notice furnished to the subcontractor pursuant to subparagraph
(e)(1) of this clause;

(3) Reduce the subcontractor's progress payment by an amount not to
exceed the amount specified in the notice of withholding furnished under
subparagraph (e)(1) of this clause;

(4) Pay the subcontractor as soon as practicable after the correction
of the identified subcontract performance deficiency, and--

(i) Make such payment within--

(A) Seven days after correction of the identified subcontract
performance deficiency (unless the funds therefor must be recovered
from the Government because of a reduction under subdivision
(e)(5)(i) of this clause; or

(B) Seven days after the Contractor recovers such funds from the
Government; or

(ii) Incure an obligation to pay a late payment interest penalty
computed at the rate of interest established by the Secretary of the
Treasury, and published in the Federal Register, for interest payments
the event that an audit or other review of a specific financing request is required to ensure compliance with the terms and conditions of the contract, the designated payment office is not compelled to make payment by the due date specified. For advance payments, loans, or other arrangements that do not involve recurrent submissions of contract financing requests, payment shall be made in accordance with the corresponding contract terms or as directed by the Contracting Officer. Contract financing payments shall not be assessed an interest penalty for payment delays.

(c) The Contractor shall include in each subcontract for property or services (including a material supplier) for the purpose of performing this contract the following:

(1) A payment clause which obligates the Contractor to pay the subcontractor for satisfactory performance under its subcontract not later than 7 days from receipt of payment out of such amounts as are paid to the Contractor under this contract.

(2) An interest penalty clause which obligates the Contractor to pay to the subcontractor an interest penalty for each payment not made in accordance with the payment clause—

(i) For the period beginning on the day after the required payment date and ending on the date on which payment of the amount due is made; and

(ii) Computed at the rate of interest established by the Secretary of the Treasury, and published in the Federal Register, for interest payments under section 12 of the Contract Disputes Act of 1978 (41 U.S.C. 611) in effect at the time the Contractor accrues the obligation to pay an interest penalty.

(3) A clause requiring each subcontractor to include a payment clause and an interest penalty clause conforming to the standards set forth in subparagraphs (c)(1) and (c)(2) of this clause in each of its subcontracts, and to require each of its subcontractors to include such clauses in their subcontracts with each lower-tier subcontractor or supplier.

(d) The clauses required by paragraph (c) of this clause shall not be construed to impair the right of Contractor or a subcontractor at any tier to negotiate, and to include in their subcontract, provisions which—

(1) Permit the Contractor or a subcontractor to retain (without cause) a specified percentage of each progress payment otherwise due to a subcontractor for satisfactory performance under the subcontract without incurring any obligation to pay a late payment interest penalty, in accordance with terms and conditions agreed to by the parties to the
(B) The period between the defects notice and resubmission of the corrected invoice by the Contractor.

(iii) Interest penalties will not continue to accrue after the filing of a claim for such penalties under the clause at 52.233-1, Disputes, or for more than 1 year. Interest penalties of less than $1.00 need not be paid.

(iv) Interest penalties are not required on payment delays due to disagreement between the Government and Contractor over the payment amount or other issues involving contract compliance, or on amounts temporarily withheld or retained in accordance with the terms of the contract. Claims involving disputes, and any interest that may be payable, will be resolved in accordance with the clause at 52.233-1, Disputes.

(5) An interest penalty shall also be paid automatically by the designated payment office, without request from the Contractor, if a discount for prompt payment is taken improperly. The interest penalty will be calculated on the amount of discount taken for the period beginning with the first day after the end of the discount period through the date when the Contractor is paid.

(6) If this contract was awarded on or after October 1, 1989, a penalty amount, calculated in accordance with regulations issued by the Office of Management and Budget, shall be paid in addition to the interest penalty amount if the Contractor:

(i) Is owed an interest penalty;

(ii) Is not paid the interest penalty within 10 days after the date the invoice amount is paid; and

(iii) Makes a written demand, not later than 40 days after the date the invoice amount is paid, that the agency pay such a penalty.

(b) Contract Financing Payments.

(1) For purposes of this clause, if applicable, "contract financing payment" means a Government disbursement of monies to a Contractor under a contract clause or other authorization prior to acceptance of supplies or services by the Government, other than progress payments based on estimates of amount and value of work performed. Contract financing payments include advance payments and interim payments under cost-type contracts.

(2) If this contract provides for contract financing, requests for payment shall be submitted to the designated billing office as specified in this contract or as directed by the Contracting Officer. Contract financing payments shall be made on the 30th day after receipt of a proper contract financing request by the designated billing office.
Contractor.

(4) The interest penalty shall be at the rate established by the Secretary of the Treasury under section 12 of the Contract Disputes Act of 1978 (41 U.S.C. 611) that is in effect on the day after the due date, except where the interest penalty is prescribed by other governmental authority. This rate is referred to as the "Renegotiation Board Interest Rate," and it is published in the Federal Register semiannually on or about January 1 and July 1. The interest penalty shall accrue daily on the invoice payment amount approved by the Government and be compounded in 30-day increments inclusive from the first day after the due date through the payment date. That is, interest accrued at the end of any 30-day period will be added to the approved invoice payment amount and be subject to interest penalties if not paid in the succeeding 30-day period. If the designated billing office failed to notify the Contractor of a defective invoice within the periods prescribed in subparagraph (a)(2) of this clause, then the due date on the corrected invoice will be adjusted by subtracting the number of days taken beyond the prescribed notification of defects period. Any interest penalty owed the Contractor will be based on this adjusted due date. Adjustments will be made by the designated payment office for errors in calculating interest penalties, if requested by the Contractor.

(i) For the sole purpose of computing an interest penalty that might be due the Contractor for payments described in subdivision (a)(1)(ii) of this clause, Government acceptance or approval shall be deemed to have occurred constructively on the 7th day after the Contractor has completed the work or services in accordance with the terms and conditions of the contract. In the event that actual acceptance or approval occurs within the constructive acceptance or approval period, the determination of an interest penalty shall be based on the actual date of acceptance or approval. Constructive acceptance or constructive approval requirements do not apply if there is a disagreement over quantity, quality, or Contractor compliance with a contract provision. These requirements also do not compel Government officials to accept work or services, approve Contractor estimates, perform contract administration functions, or make payment prior to fulfilling their responsibilities.

(ii) The following periods of time will not be included in the determination of an interest penalty:

(A) The period taken to notify the Contractor of defects in invoices submitted to the Government, but this may not exceed 7 days.
contract settlement actions (e.g., release of claims), acceptance shall be deemed to have occurred on the effective date of the contract settlement.

(2) An invoice is the Contractor's bill or written request for payment under the contract for work or services performed under the contract. An invoice shall be prepared and submitted to the designated billing office. A proper invoice must include the items listed in subdivisions (a)(2)(i) through (a)(2)(ix) of this clause. If the invoice does not comply with these requirements, the Contractor will be notified of the defect within 7 days after receipt of the invoice at the designated billing office. Untimely notification will be taken into account in the computation of any interest penalty owed the Contractor in the manner described in subparagraph (e)(4) of this clause:

(i) Name and address of the Contractor.
(ii) Invoice date.
(iii) Contract number or other authorization for work or services performed (including order number and contract line item number).
(iv) Description of work or services performed.
(v) Delivery and payment terms (e.g., prompt payment discount terms).
(vi) Name and address of Contractor official to whom payment is to be sent (must be the same as that in the contract or in a proper notice of assignement).
(vii) Name (where practicable), title, phone number, and mailing address of person to be notified in event of a defective invoice.
(viii) For payments described in subdivision (a)(1)(c) of this clause, substantiation of the amounts requested and certification in accordance with the requirements of the clause at 52.232-5, Payments Under Fixed-Price Construction Contracts.
(ix) Any other information or documentation required by the contract.

(3) An interest penalty shall be paid automatically by the designated payment office, without request from the Contractor, if payment is not made by the due date and the conditions listed in subdivisions (a)(3)(i) through (a)(3)(iii) of this clause are met, if applicable.

(i) A proper invoice was received by the designated billing office.
(ii) A receiving report or other Government documentation authorizing payment was processed and there was no disagreement over quantity, quality, Contractor compliance with any contract term or condition, or requested progress payment amount.
(iii) In the case of a final invoice for any balance of funds due the Contractor for work or services performed, the amount was not subject to further contract settlement actions between the Government and the
and conditions specified in this clause. Payment shall be considered as being made on the day a check is dated or an electronic funds transfer is made. Definitions of pertinent terms are set forth in 32.902. All days referred to in this clause are calendar days, unless otherwise specified.

(a) Invoice Payments.

(1) For purposes of this clause, there are several types of invoice payments which may occur under this contract, as follows:

(i) Progress payments, if provided for elsewhere in this contract, based on Contracting Officer approval of the estimated amount and value of work or services performed, including payments for reaching milestones in any project:

(A) The due date for making such payments shall be 14 days after receipt of the payment request by the designated billing office. However, if the designated billing office fails to annotate the payment request with the actual date of receipt, the payment due date shall be deemed to be the 14th day after the date the Contractor’s payment request is dated, provided a proper payment request is received and there is no disagreement over quantity, quality, or Contractor compliance with contract requirements.

(B) The due date for payment of any amounts retained by the Contracting Officer in accordance with the clause at 52.232-5, Payments Under Fixed-Price Construction Contracts, shall be as specified in the contract or, if not specified, 30 days after approval for release to the Contractor by the Contracting Officer.

(ii) Final payments based on completion and acceptance of all work and presentation of release of all claims against the Government arising by virtue of the contract, and payments for partial deliveries that have been accepted by the Government (e.g., each separate building, public work, or other division of the contract for which the price is stated separately in the contract):

(A) The due date for making such payments shall be either the 30th day after receipt by the designated billing office of a proper invoice from the Contractor, or the 30th day after Government acceptance of the work or services completed by the Contractor, whichever is later. However, if the designated billing office fails to annotate the invoice with the date of actual receipt, the invoice payment due date shall be deemed to be the 30th day after the date the Contractor’s invoice is dated, provided a proper invoice is received and there is no disagreement over quantity, quality, or Contractor compliance with contract requirements.

(B) On a final invoice where the payment amount is subject to
FOREIGN SOURCE RESTRICTIONS (APR 1993)
(Reference 25.7105)

RESTRICTION ON ACQUISITION OF CARBON, ALLOY, AND ARMOR STEEL PLATE (OCT 1992)
(Reference 25.7017-4)

SECONDARY ARAB BOYCOTT OF ISRAEL (JUN 1992)
(Reference 25.770-5)

UTILIZATION OF INDIAN ORGANIZATIONS AND INDIAN-OWNED ECONOMIC ENTERPRISES
(AUG 1991)
(Reference 26.104(a) &)

AUTHORIZATION AND CONSENT (APR 1984)
(Reference 27.201-2(a))

NOTICE AND ASSISTANCE REGARDING PATENT AND COPYRIGHT INFRINGEMENT
(APR 1984)
(Reference 27.202-2)

PATENT INDEMNITY—CONSTRUCTION CONTRACTS (APR 1984)
(Reference 27.203-5)

RIGHTS IN SHOP DRAWINGS (APR 1946)
(Reference 27.405-78(b))

BID GUARANTEE (APR 1984)
(Reference 28.101-3(b))

ADDITIONAL BOND SECURITY (APR 1984)
(Reference 28.106-4)

INSURANCE—WORK ON A GOVERNMENT INSTALLATION (SEP 1989)
(Reference 28.310)

PLEDGE OF ASSETS (FEB 1990)
(Reference 28.203-6)

PROSPECTIVE SUBCONTRACTOR REQUESTS FOR BONDS (SEP 1992)
(Reference 28.106-4-70)

FEDERAL, STATE, AND LOCAL TAXES (JAN 1991)
(Reference 29.401-3)

PAYMENTS UNDER FIXED-PRICE CONSTRUCTION CONTRACTS (APR 1989)
(Reference 32.111(a)(5)

INTEREST (JAN 1991)
(Reference 32.617(a)(1))

ASSIGNMENT OF CLAIMS (JAN 1986)
(Reference 32.806(a)(1))

PROMPT PAYMENT FOR CONSTRUCTION CONTRACTS (MAR 1994)

Notwithstanding any other payment terms in this contract, the Government
will make invoice payments and contract financing payments under the terms
COMPLIANCE WITH COPELAND ACT REQUIREMENTS (FEB 1988)
(Reference 22.407(a)(5))

SUBCONTRACTS (LABOR STANDARDS) (FEB 1988)
(Reference 22.407(a)(6))

CONTRACT TERMINATION--DEBARMENT (FEB 1988)
(Reference 22.407(a)(7))

COMPLIANCE WITH DAVIS-BACON AND RELATED ACT REGULATIONS (FEB 1988)
(Reference 22.407(a)(8))

DISPUTES CONCERNING LABOR STANDARDS (FEB 1988)
(Reference 22.407(a)(9))

CERTIFICATION OF ELIGIBILITY (FEB 1988)
(Reference 22.407(a)(10))

EQUAL OPPORTUNITY (APR 1984)
(Reference 22.810(e))

AFFIRMATIVE ACTION COMPLIANCE REQUIREMENTS FOR CONSTRUCTION (APR 1984)
(Reference 22.810(f))

AFFIRMATIVE ACTION FOR SPECIAL DISABLED AND VIETNAM ERA VETERANS
(APR 1984)
(Reference 22.1308)

AFFIRMATIVE ACTION FOR HANDICAPPED WORKERS (APR 1984)
(Reference 22.1408)

EMPLOYMENT REPORTS ON SPECIAL DISABLED VETERANS AND VETERANS OF THE
VIETNAM ERA (JAN 1988)
(Reference 22.1308(b))

RIGHT OF FIRST REFUSAL OF EMPLOYMENT--CLOSURE OF MILITARY INSTALLATIONS
(APR 1993)
(Reference 22.7102)

CLEAN AIR AND WATER (APR 1984)
(Reference 23.105(b))

DRUG-FREE WORKPLACE (JUL 1990)
(Reference 23.505(b))

HAZARD WARNING LABELS (DEC 1991)
(Reference 23.303)

PROHIBITION ON STORAGE AND DISPOSAL OF TOXIC AND HAZARDOUS MATERIALS (APR
1993)
(Reference 23.7103)

BUY AMERICAN ACT--CONSTRUCTION MATERIALS (MAY 1992)
(Reference 25.205)

RESTRICTIONS ON CERTAIN FOREIGN PURCHASES (MAY 1992)
(Reference 25.704)

RESTRICTION ON ACQUISITION OF ANTIifrCTION BEARINGS (APR 1993)
(Reference 25.7019-4)
(b) The contractor may discover Native American human remains and objects, as defined in the Act, during contract execution. In the event of such discovery the contractor shall immediately cease activity in the area of the discovery and shall immediately notify the contracting officer of the discovery. The contractor shall make a reasonable effort to protect the items discovered in accordance with the Act and before resuming activity in the area. Fines and penalties for illegal trafficking in Native American human remains and cultural items are as defined in the Act.

(c) Upon receipt of notification of the discovery, the contracting officer will notify the appropriate authorities as required by the Act. The cessation of the activity in the area shall be for a minimum period of 30 days after the contracting officer has received certification of receipt of notification from the appropriate authorities, in accordance with the Act.

(d) The contractor shall not resume activity in the area of the discovery until the contracting officer has given the contractor notice that the contractor may resume the activity.

27 252.219-7009  CERTIFICATE OF COMPETENCY (APR 1993)
    (Reference 19.602-70)
28 52.222-1  NOTICE TO THE GOVERNMENT OF LABOR DISPUTES (APR 1984)
    (Reference 22.103-5(a))
29 52.222-3  CONVICT LABOR (APR 1984)
    (Reference 22.202)
30 52.222-4  CONTRACT WORK HOURS AND SAFETY STANDARDS ACT--OVERTIME COMPENSATION
    (MAR 1986)
    (Reference 22.305)
31 52.222-6  DAVIS-BACON ACT (FEB 1995)
    (Reference 22.407(a)(1))
32 52.222-7  WITHHOLDING OF FUNDS (FEB 1988)
    (Reference 22.407(a)(2))
33 52.222-8  PAYROLLS AND BASIC RECORDS (FEB 1988)
    (Reference 22.407(a)(3))
34 52.222-9  APPRENTICES AND TRAINEES (FEB 1988)
    (Reference 22.407(a)(4))
Name and Telephone Number of Individual Submitting Report:
Commercial Transactions with the Government of a Terrorist Country:

<table>
<thead>
<tr>
<th>Country</th>
<th>Nature of Commercial Transaction</th>
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(4) The Contractor shall submit reports annually by September 30, but not beyond September 30, 1996. Each report shall include transactions conducted during the preceding one-year period of contract performance.

(5) The Contractor shall submit reports to:
Deputy Director of Defense Procurement (Foreign Contracting),
PDUSD (A&T) DP (FC), Washington, DC 20301-3060.
(End of clause)

18  52.212-8  DEFENSE PRIORITY AND ALLOCATION REQUIREMENTS (SEP 1990)
     (Reference 12.304(b))
19  52.212-11 VARIATION IN ESTIMATED QUANTITY (APR 1984)
    (Reference 12.403(c))
20  52.212-12 SUSPENSION OF WORK (APR 1984)
    (Reference 12.505(a))
21  52.214-26 AUDIT--SEALED BIDDING (APR 1985)
    (Reference 14.201-7(a))
22  52.214-27 PRICE REDUCTION FOR DEFECTIVE COST OR PRICING DATA--MODIFICATIONS--SEALED BIDDING (DEC 1994)
    (Reference 14.201-7(b))
23  52.214-28 SUBCONTRACTOR COST OR PRICING DATA--MODIFICATIONS--SEALED BIDDING (DEC 1994)
    (Reference 14.201-7(c))
24  52.219-8  UTILIZATION OF SMALL BUSINESS CONCERNS AND SMALL DISADVANTAGED BUSINESS CONCERNS (FEB 1990)
    (Reference 19.708(a))
25  52.219-13 UTILIZATION OF WOMEN-OWNED SMALL BUSINESSES (AUG 1986)
    (Reference 19.902)
26  52.0219-4001  NATIVE AMERICAN GRAVES PROTECTION (JAN 1993) (52.0219-4001)

(a) The Native American Graves Protection and Repatriation Act, hereinafter referred to as "the Act", enacted November 16, 1990, (Public Law 101-601, 25 U.S. Code) is applicable to this contract.
(a) Definitions.
   As used in this clause--
   (1) "Government of a terrorist country" includes the state and the
government of a terrorist country, as well as any political subdivision,
agency, or instrumentality thereof.
   (2) "Terrorist country" means a country determined by the Secretary of
State, under section 6(j)(1)(A) of the Export Administration Act of 1979
(50 U.S.C. App. 2405(j)(1)(A)), as of 60 days before the contract award
date, to be a country the government of which has repeatedly provided
support for acts of international terrorism. As of the date of this
clause, terrorist countries include: Cuba, Iran, Iraq, Libya, North
Korea, Sudan, and Syria.

(b) Reporting.
   (1) In accordance with section 843 of the National Defense
Authorization Act for Fiscal Year 1996 (Pub. L. 103-760), if this
contract exceeds $5,000,000, the Contractor shall report each commercial
transaction that it conducts with the government of a terrorist country
during the period of performance of this contract (but not beyond
September 30, 1996).
   (2) This reporting requirement does not apply to--
      (i) Transactions conducted by affiliates or subsidiaries of the
Contractor; or
      (ii) Payment or receipt of payment of a judgment or award ordered by
a court or arbitral tribunal of competent jurisdiction.
   (3) The Contractor shall submit reports in the following format:

   Title of Report: Report of Commercial Transactions with the Government
   of a Terrorist Country

   Date of Report:
   Contract Number:
   Contractor's Name and Address:
Authorized alternate versions of the clauses are sometimes used, and are identified in the applicable regulation by sequential Roman numeral identifiers. When an alternate version is used the SAACONS clause number will be followed by the appropriate Roman numeral identified. For example, FAR Clause 52.202-1 in its Alternate I version is entitled "DEFINITIONS (APR 1984)--ALTERNATE I (APR 1984)". The clause number will appear as "52.202-1 I". An Alternate II version of a clause would appear as "52.xxx-xxxx II".

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CONTRACT CLAUSES

1  52.252-2  CLAUSES INCORPORATED BY REFERENCE (JUN 1980)

This contract incorporates one or more clauses by reference, with the same force and effect as if they were given in full text. Upon request, the Contracting Officer will make their full text available.

(End of clause)

2  CONTRACT CLAUSE AND SOLICITATION PROVISION NUMBERING (JAN 1990) (LOCAL)
(32.0000-4000)

This document is computer generated by the Standard Army Automated Contracting System (SAACONS). The numbering system used by the computer for contract clauses and solicitation provisions differs slightly from the procurement regulations. It is similar and easily recognizable. The Federal Acquisition Regulation (FAR) numbering format for contract clauses and solicitation provisions is 52.2xx-x, with the specific FAR provision or clause number being a sequence assigned within each section or subpart 52.2. SAACONS always uses a 9 digit number (e.g. 52.2XX.XXXX).

FAR contract clauses and solicitation provisions are recognized by a "0" in the 6th digit of the SAACONS number. Department of Defense Federal Acquisition Regulation Supplement (DFARS) contract clauses and solicitation provisions are recognized by a "7" in the 6th digit of the SAACONS number. Army Federal Acquisition Regulation Supplement (AFARS) contract clauses and solicitation provisions are recognized by a "9" in the 6th digit of the SAACONS number. Engineer Federal Acquisition Regulation Supplement (EFARS) contract clauses and solicitation provisions and local instructions and provisions which were previously referred to by paragraph number only, now appear as "local clauses" with local clause numbers. They are recognizable by a "4" in the 6th digit of the SAACONS number. The word "(EFARS)" will appear in parenthesis at the end of the title of the clause/provision from that supplement; The word "(local)" will appear in like manner to identify local implementation. (FAR, DFARS AND AFARS clauses and provisions that have recently been modified or added may also be numbered as local clauses pending their integration into the SAACONS database by the SAACONS contractor. Until the integration is complete the title line will identify the regulatory source. Examples of the difference in the numbering are provided below:

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<td>5</td>
<td>52.203-1</td>
<td>OFFICIALS NOT TO BENEFIT (APR 1984)</td>
<td>00700-2</td>
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<td>6</td>
<td>52.203-3</td>
<td>GRATUITIES (APR 1984)</td>
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<td>7</td>
<td>52.203-5</td>
<td>COVENANT AGAINST CONTINGENT FEES (APR 1984)</td>
<td>00700-2</td>
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<tr>
<td>8</td>
<td>52.203-7</td>
<td>ANTI-KICKBACK PROCEDURES (OCT 1988)</td>
<td>00700-2</td>
</tr>
<tr>
<td>9</td>
<td>52.203-9</td>
<td>REQUIREMENT FOR CERTIFICATE OF PROCUREMENT INTEGRITY--MODIFICATION</td>
<td>00700-2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(NOV 1990)</td>
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</tr>
<tr>
<td>10</td>
<td>52.203-10</td>
<td>PRICE OR FEE ADJUSTMENT FOR ILLEGAL OR IMPROPER ACTIVITY (SEP 1990)</td>
<td>00700-2</td>
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<td>11</td>
<td>52.203-12</td>
<td>LIMITATION ON PAYMENTS TO INFLUENCE CERTAIN FEDERAL TRANSACTIONS (JAN</td>
<td>00700-2</td>
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<td></td>
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<td>1990)</td>
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<tr>
<td>12</td>
<td>252.203-7000</td>
<td>STATUTORY PROHIBITION ON COMPENSATION TO FORMER DEPARTMENT OF DEFENSE</td>
<td>00700-2</td>
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<td>EMPLOYEES (DEC 1991)</td>
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<td>13</td>
<td>252.203-7001</td>
<td>SPECIAL PROHIBITION ON EMPLOYMENT (APR 1993)</td>
<td>00700-2</td>
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<td>14</td>
<td>252.203-7003</td>
<td>PROHIBITION AGAINST RETALIATORY PERSONNEL ACTIONS (APR 1992)</td>
<td>00700-3</td>
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<td>15</td>
<td>252.205-7000</td>
<td>PROVISION OF INFORMATION TO COOPERATIVE AGREEMENT HOLDERS (DEC 1991)</td>
<td>00700-3</td>
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<tr>
<td>16</td>
<td>52.209-6</td>
<td>PROTECTING THE GOVERNMENT'S INTEREST WHEN SUBCONTRACTING WITH CONTRACTOR</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>DEBARRED, SUSPENDED, OR PROPOSED FOR DEBARMENT (NOV 1992)</td>
<td></td>
</tr>
</tbody>
</table>
INSTRUCTIONS FOR COMPLETION OF SF-LLL, DISCLOSURE OF LOBBYING ACTIVITIES

This disclosure form shall be completed by the reporting entity, whether subawardee or prime Federal recipient, at the initiation or receipt of a covered Federal action, or a material change to a previous filing, pursuant to title 31 U.S.C. section 1352. The filing of a form is required for each payment or agreement to make payment to any lobbying entity for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with a covered Federal action. Use the SF-LLL-A Continuation Sheet for additional information if the space on the form is inadequate. Complete all items that apply for both the initial filing and material change report. Refer to the implementing guidance published by the Office of Management and Budget for additional information.

1. Identify the type of covered Federal action for which lobbying activity is and/or has been secured to influence the outcome of a covered Federal action.
2. Identify the status of the covered Federal action.
3. Identify the appropriate classification of this report. If this is a follow-up report caused by a material change to the information previously reported, enter the year and quarter in which the change occurred. Enter the date of the last previously submitted report by this reporting entity for this covered Federal action.
4. Enter the full name, address, city, state and zip code of the reporting entity. Include Congressional District, if known. Check the appropriate classification of the reporting entity that designates if it is, or expects to be, a prime or subawardee recipient. Identify the tier of the subawardee, e.g., the first subawardee of the prime is the 1st tier. Subawards include but are not limited to subcontracts, subgrants and contract awards under grants.
5. If the organization filing the report in item 4 checks "Subawardee", then enter the full name, address, city, state and zip code of the prime Federal recipient. Include Congressional District, if known.
6. Enter the name of the Federal agency making the award or loan commitment. Include at least one organizational level below agency name, if known. For example, Department of Transportation, United States Coast Guard.
7. Enter the Federal program name or description for the covered Federal action (Item 1). If known, enter the full Catalog of Federal Domestic Assistance (CFDA) number for grants, cooperative agreements, loans, and loan commitments.
8. Enter the most appropriate Federal identifying number available for the Federal action identified in item 1 (e.g. Request for Proposal (RFP) number; invitation for Bid (IFB) number; grant announcement number; the contract, grant, or loan award number, the application/proposal control number assigned by the Federal agency). Include prefix, e.g., "RFP-DE-90-001."
9. For a covered Federal action where there has been an award or loan commitment by the Federal agency, enter the Federal amount of award/loan commitment for the prime entity identified in items 4 or 5.
10. (a) Enter full name, address, city, state and zip code of the lobbying entity engaged by the reporting entity identified in item 4 to influence the covered Federal action.
(b) Enter the full names of the individual(s) performing services, and include full address if different from (a). Enter Last Name, First Name, and Middle Initial (MI).
11. Enter the amount of compensation paid or reasonably expected to be paid by the reporting entity (item 4) to the lobbying entity (item 10). Indicate whether the payment has been made (actual) or will be made (planned). Check all boxes that apply. If this is a material change report, enter the cumulative amount of payment made or planned to be made.
12. Check the appropriate box(es). Check all boxes that apply. If payment is made through an in-kind contribution, specify the nature and value of the in-kind payment.
13. Check the appropriate box(es). Check all boxes that apply. If other, specify nature.
14. Provide a specific and detailed description of the services that the lobbyist has performed, or will be expected to perform, and the date(s) of any services rendered. Include all preparatory and related activity, not just time spent in actual contact with Federal officials. Identify the Federal official(s) or employee(s) contacted or the officer(s), employee(s), or Member(s) of Congress that were contacted.
15. Check whether or not a SF-LLL-A Continuation Sheet(s) is attached.
16. The certifying official shall sign and date the form, print his/her name, title and telephone number.

Public reporting burden for this collection of information is estimated to average 30 minutes per response, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding the burden estimate or any other aspects of this collection of information, including suggestions for reducing this burden, to the Office of Management and Budget, Paperwork Reduction Project (034-00-3045), Washington, D.C. 20573.
Complete this form to disclose lobbying activities pursuant to 31 U.S.C. 1352.

<table>
<thead>
<tr>
<th>Type of Federal Actions:</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Contract</td>
</tr>
<tr>
<td>b. Grant</td>
</tr>
<tr>
<td>c. Cooperative Agreement</td>
</tr>
<tr>
<td>d. Loan</td>
</tr>
<tr>
<td>e. Loan Guarantee</td>
</tr>
<tr>
<td>f. Loan Insurance</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2. Status of Federal Action:</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Bid/Offer/Application</td>
</tr>
<tr>
<td>b. Initial Award</td>
</tr>
<tr>
<td>c. Post-Award</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>3. Report Type:</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Initial filing</td>
</tr>
<tr>
<td>b. Material Change</td>
</tr>
<tr>
<td>Quarter: _____</td>
</tr>
<tr>
<td>Date of Last Report: _____</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>4. Name and Address of Reporting Entity:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prime □ Subawardee □</td>
</tr>
<tr>
<td>The: _____, if known:</td>
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<table>
<thead>
<tr>
<th>Congressional District, if known:</th>
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<table>
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<tr>
<th>6. Federal Department/Agency:</th>
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<table>
<thead>
<tr>
<th>7. Federal Program Name/Description:</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>5. Federal Action Number, if known:</th>
</tr>
</thead>
</table>

| 9. Award Amount, if known: $          |

<table>
<thead>
<tr>
<th>10. a. Name and Address of Lobbying Entity (if individual, last name, first name, M.I.):</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>b. Individuals Performing Services (including address if different from No. 10a):</th>
</tr>
</thead>
<tbody>
<tr>
<td>(last name, first name, M.I.)</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>11. Amount of Payment (check all that apply):</th>
</tr>
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<tbody>
<tr>
<td>$</td>
</tr>
<tr>
<td>□ actual</td>
</tr>
<tr>
<td>□ planned</td>
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</tbody>
</table>

<table>
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<tr>
<th>12. Form of Payment (check all that apply):</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ a. cash</td>
</tr>
<tr>
<td>□ b. In-kind; specify: nature</td>
</tr>
<tr>
<td>value</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>13. Type of Payment (check all that apply):</th>
</tr>
</thead>
<tbody>
<tr>
<td>^ a. Retainer</td>
</tr>
<tr>
<td>□ b. One-time Fee</td>
</tr>
<tr>
<td>□ c. Commission</td>
</tr>
<tr>
<td>□ d. Contingent Fee</td>
</tr>
<tr>
<td>□ e. Deferred</td>
</tr>
<tr>
<td>□ f. Other, specify:</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>14. Brief Description of Services Performed or to be Performed and Date(s) of Service, including officer(s), employee(s), or Member(s) contacted, for Payment Indicated in Item 11:</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>15. Continuation Sheet(s) SF-LLL-A attached:</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Yes □ No</td>
</tr>
</tbody>
</table>

| 16. Information required through this form is authorized by title 31 U.S.C. section 1352. This disclosure of lobbying activities is a partial representation of fact upon which reliance was placed by the date above when this transaction was made or entered into. This disclosure is required pursuant to 31 U.S.C. 1352. This information will be reported to the Congress semi-annually and will be available for public inspection. Any person who fails to file the required disclosures shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure. |

<table>
<thead>
<tr>
<th>Signature:</th>
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<tbody>
<tr>
<td>Print Name:</td>
</tr>
<tr>
<td>------------------------------------------------</td>
</tr>
<tr>
<td>Title:</td>
</tr>
<tr>
<td>------------------------------------------------</td>
</tr>
<tr>
<td>Telephone No.:</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Authorized for Legal Representation</th>
</tr>
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<tbody>
<tr>
<td>Standard Form: L.L.L.</td>
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</tbody>
</table>
making an offer of any dollar value, certifies and agrees that the offeror will not engage in the unlawful manufacture, distribution, dispensing, possession, or use of a controlled substance in the performance of the contract resulting from this solicitation.

(d) Failure of the offeror to provide the certification required by paragraphs (b) or (c) of this provision, renders the offeror unqualified and ineligible for award. (See FAR 9.104-1(g) and 19.602-1(a)(2)(i).)

(e) In addition to other remedies available to the Government, the certification in paragraphs (b) or (c) of this provision concerns a matter within the jurisdiction of an agency of the United States and the making of a false, fictitious, or fraudulent certification may render the maker subject to prosecution under Title 18, United States Code, Section 1001.

(End of provision)

252.247-7022 REPRESENTATION OF EXTENT OF TRANSPORTATION BY SEA (AUG 1992)

(a) The Offeror shall indicate by checking the appropriate blank in paragraph (b) of this provision whether transportation of supplies by sea is anticipated under the resultant contract. The term "supplies" is defined in the Transportation of Supplies by Sea clause of this solicitation.

(b) Representation. The Offeror represents that it---

____ Does anticipate that supplies will be transported by sea in the performance of any contract or subcontract resulting from this solicitation.

____ Does not anticipate that supplies will be transported by sea in the performance of any contract or subcontract resulting from this solicitation.

(c) Any contract resulting from this solicitation will include the Transportation of Supplies by Sea clause. If the Offeror represents that it will not use ocean transportation, the resulting contract will also include the Defense FAR Supplement clause at 252.247-7024, Notification of Transportation of Supplies by Sea.

(End of provision)

END OF SECTION 00600
manufacture, distribution, dispensing, possession or use of a controlled
substance is prohibited in the Contractor's workplace and specifying the
actions that will be taken against employees for violations of such
prohibition;

(2) Establish an ongoing drug-free awareness program to inform such
employees about—

(i) The dangers of drug abuse in the workplace;

(ii) The Contractor's policy of maintaining a drug-free workplace;

(iii) Any available drug counseling, rehabilitation, and employee
assistance programs; and

(iv) The penalties that may be imposed upon employees for drug abuse
violations occurring in the workplace;

(3) Provide all employees engaged in performance of the contract with
a copy of the statement required by subparagraph (b)(1) of this
provision;

(4) Notify such employees in writing in the statement required by
subparagraph (b)(1) of this provision, that as a condition of continued
employment on the contract resulting from this solicitation, the
employee will—

(i) Abide by the terms of the statement; and

(ii) Notify the employer in writing of the employee's conviction
under a criminal drug statute for a violation occurring in the
workplace no later than 5 calendar days after such conviction;

(5) Notify the Contracting Officer in writing within 10 calendar days
after receiving notice under subdivision (b)(4)(ii) of this provision,
from an employee or otherwise receiving actual notice of such
conviction. The notice shall include the position title of the
employee; and

(6) Within 30 calendar days after receiving notice under subdivision
(b)(4)(ii) of this provision of a conviction, take one of the following
actions with respect to any employee who is convicted of a drug abuse
violation occurring in the workplace:

(i) Take appropriate personnel action against such employee, up to
and including termination; or

(ii) Require such employee to satisfactorily participate in a drug
abuse assistance or rehabilitation program approved for such purposes
by a Federal, State, or local health, law enforcement, or other
appropriate agency.

(7) Make a good faith effort to maintain a drug-free workplace through
implementation of subparagraphs (b)(1) through (b)(6) of this provision.

(c) By submission of its offer, the offeror, if an individual who is
this certification, including this paragraph (c), in every nonexempt subcontract.

(End of provision)

(AV 7-2003.71 1977 JUN)

(AV 1-1.2302-1)

(a) Definitions. As used in this provision,

"Controlled substance" means a controlled substance in schedules I through V of section 202 of the Controlled Substances Act (21 U.S.C. 812) and as further defined in regulation at 21 CFR 1308.11 - 1308.15.

"Conviction" means a finding of guilt (including a plea of nolo contendere) or imposition of sentence, or both, by any judicial body charged with the responsibility to determine violations of the Federal or State criminal drug statutes.

"Criminal drug statute" means a Federal or non-Federal criminal statute involving the manufacture, distribution, dispensing, possession or use of any controlled substance.

"Drug-free workplace" means the site(s) for the performance of work done by the Contractor in connection with a specific contract at which employees of the Contractor are prohibited from engaging in the unlawful manufacture, distribution, dispensing, possession, or use of a controlled substance.

"Employee" means an employee of a Contractor directly engaged in the performance of work under a Government contract. "Directly engaged" is defined to include all direct cost employees and any other Contractor employee who has other than a minimal impact or involvement in contract performance.

"Individual" means an offeror/contractor that has no more than one employee including the offeror/contractor.

(b) By submission of its offer, the offeror, if other than an individual, who is making an offer that equals or exceeds $25,000, certifies and agrees that, with respect to all employees of the offeror to be employed under a contract resulting from this solicitation, it will--no later than 30 calendar days after contract award (unless a longer period is agreed to in writing), for contracts of 30 calendar days or more performance duration; or as soon as possible for contracts of less than 30 calendar days performance duration, but in any case, by a date prior to when performance is expected to be completed--

(1) Publish a statement notifying such employees that the unlawful
OF NONSEGREGATED FACILITIES.
A Certification of nonsegregated facilities must be submitted before the award of a subcontract under which the subcontractor will be subject to the Equal Opportunity clause. The certification may be submitted either for each subcontract or for all subcontracts during a period (i.e., quarterly, semiannually, or annually).
NOTE: The penalty for making false statements in offers is prescribed in 18 U.S.C. 1001.

(End of provision)
(R 7-2003.14(b)(1)(A) 1970 AUG)
(R 1-12.803-10(d))

15 52.222-22 PREVIOUS CONTRACTS AND COMPLIANCE REPORTS (APR 1984)

The offeror represents that--
(a) If /\ has, /\ has not, participated in a previous contract or subcontract subject either to the Equal Opportunity clause of this solicitation, the clause originally contained in Section 318 of Executive Order No. 10925, or the clause contained in Section 201 of Executive Order No. 11114;
(b) If /\ has, /\ has not, filed all required compliance reports; and
(c) Representations indicating submission of required compliance reports, signed by proposed subcontractors, will be obtained before subcontract awards.

(End of provision)
(R 7-2003.14(b)(1)(B) 1973 APR)

16 52.223-1 CLEAN AIR AND WATER CERTIFICATION (APR 1984)

The Offeror certifies that--
(a) Any facility to be used in the performance of this proposed contract is /\ is not /\ listed on the Environmental Protection Agency (EPA) List of Violating Facilities;
(b) The Offeror will immediately notify the Contracting Officer, before award, of the receipt of any communication from the Administrator, or a designee, of the EPA, indicating that any facility that the Offeror proposes to use for the performance of the contract is under consideration to be listed on the EPA List of Violating Facilities; and
(c) The Offeror will include a certification substantially the same as
Was found by SBA not to be socially and economically disadvantaged but circumstances which caused the determination have changed.

(d) Penalties and Remedies. Anyone who misrepresents the status of a concern as a small disadvantaged business for the purpose of securing a contract or subcontract shall--

(1) Be punished by imposition of a fine, imprisonment, or both;
(2) Be subject to administrative remedies, including suspension and debarment; and
(3) Be ineligible for participation in programs conducted under authority of the Small Business Act.

(End of provision)
term also means a small business concern owned and controlled by an economically disadvantaged Indian tribe or Native Hawaiian organization which meets the requirements of 13 CFR 124.112 or 13 CFR 124.113, respectively. In general, 13 CFR Part 124 describes a small disadvantaged business concern as a small business concern—

1) Which is at least 51 percent unconditionally owned by one or more socially and economically disadvantaged individuals; or

2) In the case of any publicly owned business, at least 51 percent of the voting stock is unconditionally owned by one or more socially and economically disadvantaged individuals; and

3) Whose management and daily business operations are controlled by one or more such individuals.

(b) Representations. Check the category in which your ownership falls—

_____ Subcontinent Asian (Asian-Indian) American (U.S. citizen with origins from India, Pakistan, Bangladesh, Sri Lanka, Bhutan, or Nepal)

_____ Asian-Pacific American (U.S. citizen with origins from Japan, China, the Philippines, Vietnam, Korea, Samoa, Guam, U.S. Trust Territory of the Pacific Islands (Republic of Palau), the Northern Mariana Islands, Laos, Kampuchea (Camodia), Taiwan, Burma, Thailand, Malaysia, Indonesia, Singapore, Brunei, Republic of the Marshall Islands, or the Federated States of Micronesia)

_____ Black American (U.S. citizen)

_____ Hispanic American (U.S. citizen with origins from South America, Central America, Mexico, Cuba, the Dominican Republic, Puerto Rico, Spain, or Portugal)

_____ Native American (American Indians, Eskimos, Aleuts, or Native Hawaiians, including Indian tribes or Native Hawaiian organizations)

_____ Individual/concern, other than one of the preceding, currently certified for participation in the Minority Small Business and Capital Ownership Development Program under Section 8(a) of the Small Business Act

_____ Other

(c) Certifications. Complete the following—

1) The offeror is ______ a small disadvantaged business concern.

2) The Small Business Administration (SBA) has ______ has not ______ made a determination concerning the offeror’s status as a small disadvantaged business concern. If the SBA has made a determination, the date of the determination was _______ and the offeror—______ was found by SBA to be socially and economically disadvantaged and no circumstances have changed to vary that determination.
"Emerging small business" as used in this solicitation, means a small business concern whose size is no greater than 50 percent of the numerical size standard applicable to the standard industrial classification code assigned to a contracting opportunity.

(b) (Complete only if the Offeror has certified itself under the provision at 52.219-1 as a small business concern under the size standards of this solicitation.)

The Offeror represents and certifies as part of its offer that it /__/ is, /__/ is not an emerging small business.

(c) (Complete only if the Offeror is a small business or an emerging small business, indicating its size range.)

Offeror’s number of employees for the past 12 months (check this column if size standard stated in solicitation is expressed in terms of number of employees) or Offeror’s average annual gross revenue for the last 3 fiscal years (check this column if size standard stated in solicitation is expressed in terms of annual receipts). (Check one of the following.)

<table>
<thead>
<tr>
<th>No. of Employees</th>
<th>Avg. Annual Gross Revenues</th>
</tr>
</thead>
<tbody>
<tr>
<td>50 or fewer</td>
<td>$1 million or less</td>
</tr>
<tr>
<td>51-100</td>
<td>$1,000,001-$2 million</td>
</tr>
<tr>
<td>101-250</td>
<td>$2,000,001-$3.5 million</td>
</tr>
<tr>
<td>251-500</td>
<td>$3,500,001-$5 million</td>
</tr>
<tr>
<td>501-750</td>
<td>$5,000,001-$10 million</td>
</tr>
<tr>
<td>751-1,000</td>
<td>$10,000,001-$17 million</td>
</tr>
<tr>
<td>Over 1,000</td>
<td>Over $17 million</td>
</tr>
</tbody>
</table>

(End of provision)

13 252.219-7000 SMALL DISADVANTAGED BUSINESS CONCERN REPRESENTATION (DOO CONTRACTS) (APR 1994)

(a) Definition. "Small disadvantaged business concern," as used in this provision, means a small business concern, owned and controlled by individuals who are both socially and economically disadvantaged, as defined by the Small Business Administration at 13 CFR Part 124, the majority of earnings of which directly accrue to such individuals. This
contracts, and qualified as a small business under the criteria and size
standards in this solicitation.

(c) Notice. (1) If this solicitation is for supplies and has been set
aside, in whole or in part, for small business concerns, then the clause in
in this solicitation providing notice of the set-aside contains
restrictions on the source of the end items to be furnished.

(2) Under 15 U.S.C. 645(d), any person who misrepresents a firm's
status as a small business concern in order to obtain a contract to be
awarded under the preference programs established pursuant to sections
8(a), 8(d), 9, or 15 of the Small Business Act or any other provision of
Federal law that specifically references section 8(d) for a definition of
program eligibility, shall--
(i) Be punished by imposition of a fine, imprisonment, or both;
(ii) Be subject to administrative remedies, including suspension and
debarment; and
(iii) Be ineligible for participation in programs conducted under the
authority of the Act.

(End of provision)

11 52.219-3  WOMEN-OWNED SMALL BUSINESS REPRESENTATION (APR 1984)

(a) Representation. The offeror represents that it / / is, / / is not a
women-owned small business concern.

(b) Definitions.
"Small business concern," as used in this provision, means a concern,
including its affiliates, that is independently owned and operated, not
dominant in the field of operation in which it is bidding on Government
contracts, and qualified as a small business under the criteria and size
standards in 13 CFR 121.
"Women-owned," as used in this provision, means a small business that is
at least 51 percent owned by a woman or women who are U.S. citizens and who
also control and operate the business.

(End of provision)

(RFP Temp. Reg. 48 1978 DEC)

12 52.219-19 SMALL BUSINESS CONCERN REPRESENTATION FOR THE SMALL BUSINESS
COMPETITIVENESS DEMONSTRATION PROGRAM (JUL 1991)

(a) Definition.
(1) Section 843 of the National Defense Authorization Act for Fiscal Year 1994 (Pub. L. 103-160) requires offerors to disclose commercial transactions conducted with the government of a terrorist country. If this offer exceeds $5,000,000, and if the Offeror has conducted such transactions, the Offeror shall disclose, in an attachment to its offer, each commercial transaction that it has conducted with the government of a terrorist country since February 28, 1994. The disclosure shall include:

(i) Identification of the government with which each transaction was conducted; and

(ii) The nature of each transaction.

(2) This disclosure requirement does not apply to-

(i) Transactions conducted by affiliates or subsidiaries of the Offeror; or

(ii) Payment or receipt of payment of a judgment or award ordered by a court or arbitral tribunal of competent jurisdiction.

(End of provision)

9 52.214-2 TYPE OF BUSINESS ORGANIZATION--SEALE BIDDING (JUL 1987)

The bidder, by checking the applicable box, represents that--

(a) It operates as // a corporation incorporated under the laws of the State of ____________, // an individual, // a partnership, // a nonprofit organization, or // a joint venture; or

(b) If the bidder is a foreign entity, it operates as // an individual, // a partnership, // a nonprofit organization, // a joint venture, or // a corporation, registered for business in ___________________.

(End of provision)

10 52.219-1 SMALL BUSINESS CONCERN REPRESENTATION (FEB 1995)

(a) Representation. The offeror represents and certifies as part of its offer that it is: // a small business concern, // not a small business concern.

(b) Definition.

"Small business concern," as used in this provision, means a concern, including its affiliates, that is independently owned and operated, not dominant in the field of operation in which it is bidding on Government
Iraq, Libya, North Korea, Sudan, and Syria.

(3) "Significant interest" means--

(i) Ownership of or beneficial interest in 5 percent or more of the firm's or subsidiary's securities. Beneficial interest includes holding 5 percent or more of any class of the firm's securities in "nominee shares," "street names," or some other method of holding securities that does not disclose the beneficial owner;

(ii) Holding a management position in the firm, such as a director or officer;

(iii) Ability to control or influence the election, appointment, or tenure of directors or officers in the firm;

(iv) Ownership of 10 percent or more of the assets of a firm such as equipment, buildings, real estate, or other tangible assets of the firm; or

(v) Holding 50 percent or more of the indebtedness of a firm.

(b) Prohibition on award.

In accordance with 10 U.S.C. 2327, no contract may be awarded to a firm or a subsidiary of a firm if the government of a terrorist country has a significant interest in the firm or subsidiary, unless a waiver is granted by the Secretary of Defense.

(c) Disclosure.

If the government of a terrorist country has a significant interest in the offeror or a subsidiary of the Offeror, the Offeror shall disclose such interest in an attachment to its offer. If the Offeror is a subsidiary, it shall also disclose any significant interest the government of a terrorist country has in any firm that owns or controls the subsidiary. The disclosure shall include--

(1) Identification of each government holding a significant interest; and

(2) A description of the significant interest held by each government.

(End of provision)
CERTIFICATION MAY RENDER THE MAKER SUBJECT TO PROSECUTION UNDER SECTION 1001, TITLE 18, UNITED STATES CODE.

(b) The Offeror shall provide immediate written notice to the Contracting Officer if, at any time prior to contract award, the Offeror learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.

(c) A certification that any of the items in paragraph (a) of this provision exists will not necessarily result in withholding of an award under this solicitation. However, the certification will be considered in connection with a determination of the Offeror's responsibility. Failure of the Offeror to furnish a certification or provide such additional information as requested by the Contracting Officer may render the Offeror nonresponsible.

(d) Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render, in good faith, the certification required by paragraph (a) of this provision. The knowledge and information of an Offeror is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

(e) The certification in paragraph (a) of this provision is a material representation of fact upon which reliance was placed when making award. If it is later determined that the Offeror knowingly rendered an erroneous certification, in addition to other remedies available to the Government, the Contracting Officer may terminate the contract resulting from this solicitation for default.

(End of provision)

252.209-7001 DISCLOSURE OF OWNERSHIP OR CONTROL BY THE GOVERNMENT OF A TERRORIST COUNTRY (SEP 1994)

(a) Definitions.

As used in this provision--

(1) "Government of a terrorist country" includes the state and the government of a terrorist country, as well as any political subdivision, agency, or instrumentality thereof.

(2) "Terrorist country" means a country determined by the Secretary of State, under section 6(j)(1)(A) of the Export Administration Act of 1979 (50 U.S.C. App. 2405(j)(1)(A)), to be a country the government of which has repeatedly provided support for acts of international terrorism. As of the date of this provision, terrorist countries include: Cuba, Iran,
(e) Common Parent.

// Offeror is not owned or controlled by a common parent as defined in paragraph (e) of this clause.

// Name and TIN of common parent:

Name: ________________________________
TIN: ________________________________

(End of provision)

6 52.209-5 CERTIFICATION REGARDING DEBARMENT, SUSPENSION, PROPOSED DEBARMENT, AND OTHER RESPONSIBILITY MATTERS (MAY 1999)

(a)(1) The Offeror certifies, to the best of its knowledge and belief, that:

(i) The Offeror and/or any of its Principals--

(A) Are // are not // presently debarred, suspended, proposed for debarment, or declared ineligible for the award of contracts by any Federal agency;

(B) Have // have not //, within a three-year period preceding this offer, been convicted of or had a civil judgment rendered against them for: commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, state, or local) contract or subcontract; violation of Federal or state antitrust statutes relating to the submission of offers; or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property; and

(C) Are // are not // presently indicted for, or otherwise criminally or civilly charged by a governmental entity with, commission of any of the offenses enumerated in subdivision (a)(1)(i)(B) of this provision.

(ii) The Offeror has // has not //, within a three-year period preceding this offer, had one or more contracts terminated for default by any Federal agency.

(2) "Principals," for the purposes of this certification, means officers; directors; owners; partners; and, persons having primary management or supervisory responsibilities within a business entity (e.g., general manager; plant manager; head of a subsidiary, division, or business segment; and similar positions).

THIS CERTIFICATION CONCERNS A MATTER WITHIN THE JURISDICTION OF AN AGENCY OF THE UNITED STATES AND THE MAKING OF A FALSE, FICTITIOUS, OR FRAUDULENT
(a) Definitions.
"Common parent," as used in this solicitation provision, means that a corporate entity that owns or controls an affiliated group of corporations that files its Federal income tax returns on a consolidated basis, and of which the offeror is a member.

"Corporate status," as used in this solicitation provision, means a designation as to whether the offeror is a corporate entity, an unincorporated entity (e.g., sole proprietorship or partnership), or a corporation providing medical and health care services.

"Taxpayer Identification Number (TIN)," as used in this solicitation provision, means the number required by the IRS to be used by the offeror in reporting income tax and other returns.

(b) All offerors are required to submit the information required in paragraphs (c) through (e) of this solicitation provision in order to comply with reporting requirements of 26 U.S.C. 6041, 6041A, and 6050M and implementing regulations issued by the Internal Revenue Service (IRS). If the resulting contract is subject to the reporting requirements described in FAR 4.903, the failure or refusal by the offeror to furnish the information may result in a 31 percent reduction of payments otherwise due under the contract.

(c) Taxpayer Identification Number (TIN).
// TIN: ________________________
// TIN has been applied for.
// TIN is not required because:
// Offeror is a nonresident alien, foreign corporation, or foreign partnership that does not have income effectively connected with the conduct of a trade or business in the U.S. and does not have an office or place of business or a fiscal paying agent in the U.S.;
// Offeror is an agency or instrumentality of a foreign government;
// Offeror is an agency or instrumentality of a federal, state, or local government;
// Other. ________________________________

(d) Corporate status.
// Corporation providing medical and health care services, or engaged in the billing and collecting of payments for such services;
// Other corporate entity;
// Not a corporate entity;
// Sole proprietorship
// Partnership
// Hospital or extended care facility described in 26 CFR 501(c)(3) that is exempt from taxation under 26 CFR 501(a).
FEDERAL TRANSACTIONS (APR 1991)

(a) The definitions and prohibitions contained in the clause, at FAR 52.203-12, Limitation on Payments to Influence Certain Federal Transactions, included in this solicitation, are hereby incorporated by reference in paragraph (b) of this certification.

(b) The offeror, by signing its offer, hereby certifies to the best of his or her knowledge and belief that on or after December 23, 1989,

(1) No Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress on his or her behalf in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment or modification of any Federal contract, grant, loan, or cooperative agreement;

(2) If any funds other than Federal appropriated funds (including profit or fee received under a covered Federal transaction) have been paid, or will be paid, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress on his or her behalf in connection with this solicitation, the offeror shall complete and submit, with its offer, OMB standard form LLL, Disclosure of Lobbying Activities, to the Contracting Officer; and

(3) He or she will include the language of this certification in all subcontract awards at any tier and require that all recipients of subcontract awards in excess of $100,000 shall certify and disclose accordingly.

(c) Submission of this certification and disclosure is a prerequisite for making or entering into this contract imposed by section 1352, title 31, United States Code. Any person who makes an expenditure prohibited under this provision or who fails to file or amend the disclosure form to be filed or amended by this provision, shall be subject to a civil penalty of not less than $10,000, and not more than $100,000, for each such failure.

(End of provision)
Subpart 14.5). For those procurements, the certifications shall be submitted with submission of the step two sealed bids. A certificate is not required for indefinite delivery contracts (see Subpart 16.5) unless the total estimated value of all orders eventually to be placed under the contract is expected to exceed $100,000.

(2) For contracts and contract modifications which include options, a certificate is required when the aggregate value of the contract or contract modification and all options (see 3.104-4(e)) exceeds $100,000.

(3) Failure of a bidder to submit the signed certificate with its bid shall render the bid nonresponsive.

(d) Pursuant to FAR 3.104-9(d), the Offeror may be requested to execute additional certifications at the request of the Government. Failure of an Offeror to submit the additional certifications shall cause its offer to be rejected.

(e) A certification containing a disclosure of a violation or possible violation will not necessarily result in the withholding of award under this solicitation. However, the Government, after evaluation of the disclosure, may cancel this procurement or take any other appropriate actions in the interests of the Government, such as disqualification of the Offeror.

(f) In making the certification in paragraph (2) of the certificate, the officer or employee of the competing Contractor responsible for the offer may rely upon a one-time certification from each individual required to submit a certification to the competing Contractor, supplemented by periodic training. These certifications shall be obtained at the earliest possible date after an individual required to certify begins employment or association with the Contractor. If a Contractor decides to rely on a certification executed prior to the suspension of section 27 (i.e., prior to December 1, 1989), the Contractor shall ensure that an individual who has so certified is notified that section 27 has been reinstated. These certifications shall be maintained by the Contractor for 6 years from the date a certifying employee’s employment with the company ends or, for an agent, representative, or consultant, 6 years from the date such individual ceases to act on behalf of the Contractor.

(g) Certifications under paragraphs (b) and (d) of this provision are material representations of fact upon which reliance will be placed in awarding a contract.

(End of provision)
of any information described in this certificate, I have no information concerning a violation or possible violation of subsection 27(a), (b), (d), or (f) of the Office of Federal Procurement Policy Act, as amended (41 U.S.C. 423), (hereinafter referred to as "the Act"), as implemented in the FAR, occurring during the conduct of this procurement ________ (solicitation number).

(2) As required by subsection 27(e)(1)(B) of the Act, I further certify that, to the best of my knowledge and belief, each officer, employee, agent, representative, and consultant of ______________________ (Name of Offeror) who has participated personally and substantially in the preparation or submission of this offer has certified that he or she is familiar with, and will comply with, the requirements of subsection 27(a) of the Act, as implemented in the FAR, and will report immediately to me any information concerning a violation or possible violation of subsections 27(a), (b), (d), or (f) of the Act, as implemented in the FAR, pertaining to this procurement.

(3) Violations or possible violations: (Continue on plain bond paper if necessary and label Certificate of Procurement Integrity (Continuation Sheet), ENTER NONE IF NONE EXIST)

(4) I agree that, if awarded a contract under this solicitation, the certifications required by subsection 27(e)(1)(B) of the Act shall be maintained in accordance with paragraph (f) of this provision.

__________________________ (Signature of the officer or employee responsible for the offer and date)

[Typed name of the officer or employee responsible for the offer]

+ Subsections 27(a), (b), and (d) are effective on December 1, 1990. Subsection 27(f) is effective on June 1, 1991.

THIS CERTIFICATION CONCERNS A MATTER WITHIN THE JURISDICTION OF AN AGENCY OF THE UNITED STATES AND THE MAKING OF A FALSE, FICTITIOUS, OR FRAUDULENT CERTIFICATION MAY RENDER THE MAKER SUBJECT TO PROSECUTION UNDER TITLE 18, UNITED STATES CODE, SECTION 1001.

(End of certification)

(ce)(1) For procurements using sealed bidding procedures, the signed certifications shall be submitted by each bidder with the bid submission except for procurements using two-step sealed bidding procedure (see
52.203-4 CONTINGENT FEE REPRESENTATION AND AGREEMENT (APR 1984)

(a) Representation. The offeror represents that, except for full-time bona fide employees working solely for the offeror, the offeror—
(Note: The offeror must check the appropriate boxes. For interpretation of the representation, including the term "bona fide employee," see Subpart 3.4 of the Federal Acquisition Regulation.)
(1) /✓/ has, /✓/ has not employed or retained any person or company to solicit or obtain this contract; and
(2) /✓/ has, /✓/ has not paid or agreed to pay to any person or company employed or retained to solicit or obtain this contract any commission, percentage, brokerage, or other fee contingent upon or resulting from the award of this contract.

(b) Agreement. The offeror agrees to provide information relating to the above Representation as requested by the Contracting Officer and, when subparagraph (a)(1) or (a)(2) is answered affirmatively, to promptly submit to the Contracting Officer—
(1) A completed Standard Form 119, Statement of Contingent or Other Fees, (SF 119); or
(2) A signed statement indicating that the SF 119 was previously submitted to the same contracting office, including the date and applicable solicitation or contract number, and representing that the prior SF 119 applies to this offer or quotation.

(End of provision)
(R 7-2002.1 1974 APR)
(R 1-1.505)

52.203-8 REQUIREMENT FOR CERTIFICATE OF PROCUREMENT INTEGRITY (NOV 1990)

(a) Definitions. The definitions at FAR 3.104-4 are hereby incorporated in this provision.

(b) Certifications. As required in paragraph (c) of this provision, the officer or employee responsible for this offer shall execute the following certification:

CERTIFICATE OF PROCUREMENT INTEGRITY

(1) I, __________________ (Name of certifier), as the officer or employee responsible for the preparation of this offer and hereby certify that, to the best of my knowledge and belief, with the exception
(a) The offeror certifies that—
(1) The prices in this offer have been arrived at independently, without, for the purpose of restricting competition, any consultation, communication, or agreement with any other offeror or competitor relating to (i) those prices, (ii) the intention to submit an offer, or (iii) the methods or factors used to calculate the prices offered;
(2) The prices in this offer have not been and will not be knowingly disclosed by the offeror, directly or indirectly, to any other offeror or competitor before bid opening (in the case of a sealed bid solicitation) or contract award (in the case of a negotiated solicitation) unless otherwise required by law; and
(3) No attempt has been made or will be made by the offeror to induce any other concern to submit or not to submit an offer for the purpose of restricting competition.
(b) Each signature on the offer is considered to be a certification by the signatory that the signatory—
(1) Is the person in the offeror's organization responsible for determining the prices being offered in this bid or proposal, and that the signatory has not participated and will not participate in any action contrary to subparagraphs (a)(1) through (a)(3) above; or
(2) Has been authorized, in writing, to act as agent for the following principals in certifying that those principals have not participated, and will not participate in any action contrary to subparagraphs (a)(1) through (a)(3) above.

(insert full name of person(s) in the offeror's organization responsible for determining the prices offered in this bid or proposal, and the title of his or her position in the offeror's organization);
(ii) As an authorized agent, does certify that the principals named in subdivision (b)(2)(i) above have not participated, and will not participate, in any action contrary to subparagraphs (a)(1) through (a)(3) above; and
(iii) As an agent, has not personally participated, and will not participate, in any action contrary to subparagraphs (a)(1) through (a)(3) above.
(c) If the offeror deletes or modifies subparagraph (a)(2) above, the offeror must furnish with its offer a signed statement setting forth in detail the circumstances of the disclosure.

(End of provision)
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## SECTION 00600

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DACA63-95-8-0150
BIDDERS CHECKLIST (Cont'd)

☐ Will your bid arrive on time? Late hand-carried bids will not be considered. Late mailed bids may be considered if sent by Registered or Certified Mail, 5 days prior to bid opening; if late receipt was due to delay in mails, or if specific requirements have been met. (See paragraph pertaining to "Late Submissions, Modifications, and Withdrawals of Bids.")

☐ Telegraphic modifications to a bid: The District's capability to receive messages is limited and could become saturated when numerous bidders are trying to send modifications to their bids. It is the bidder's responsibility to insure that telegraphic modifications are received prior to the time established for bid opening. Telephonic verification of the receipt of a telegraphic bid modification cannot be provided. Late telegraphic modifications cannot be considered except under the conditions contained herein.
BIDDERS CHECKLIST

All information required by the terms of the Solicitation must be furnished. MISTAKES OR OMISSIONS CAN BE COSTLY. Important items for you to check are included in but not limited to, those listed below. This checklist is furnished only to assist you in submitting a proper bid. Check as you read.

☐ Have you acknowledged all amendments?

☐ Have you completed the Bidder's Representations and Certifications?

☐ Is your bid properly signed?

☐ Have DUNS number and CAGE code been included in the block with your name and address?

☐ Is a bid bond included with your bid? (A late bid bond is treated the same as a late bid.)

☐ Is your bid bond in the proper amount? (Usually 20% of total bid price.)

☐ Is the bond properly signed by both the bidder and surety and are all required seals affixed?

☐ Is the name in which you submitted the bid the same on your bid as on your bid bond?

☐ If required, have you entered a unit price for each bid item? (The solicitation will specifically state when this is necessary.)

☐ Are decimals in unit prices in the proper places? Are your figures legible?

☐ Are the extensions of your unit prices, and your total bid price correct?

☐ Are all erasures or corrections initialed by the person signing the bid?

☐ Have you restricted your bid by altering the provisions of the solicitation?

☐ Is the envelope containing your bid properly identified that it is a sealed bid and does it contain the correct solicitation number and bid opening time?
FT WINGATE ADMINISTRATION AREA

- CONTRACTORS MEET AT BLDG 34
A site visit will be conducted on 30 August 1995 from 0900 to 1200 at Fort Wingate Army Depot. There is limited access to the site, therefore, contractors must provide the names and SSAN of all personnel that will be attending the site visit. Contractors shall provide this information to the Southwestern Area Office, (505) 678-5516, FAX (505) 678-1662 by 28 August 1995 so that an access roster to the site can be prepared. Entry to the Fort Wingate administration area is from U.S. Highway 40 onto Navajo Blvd. Contractors will report to the Area Office representative who will be located in front of Bldg 34, Fort Wingate Army Depot.
Fort Worth, Texas. Collect calls not accepted.

C. Bids will be publicly opened, at the time and date stated in the solicitation, in Room 13A41, 819 Taylor Street, Fort Worth, Texas.

D. Hand Carried Bids: Hand carried bids prior to 30 minutes before bid opening must be deposited in the "Bid Depository," Room 13A42, 819 Taylor Street, Fort Worth, Texas. Hand carried bids within 30 minutes of the stated bid opening time must be deposited in the "Bid Depository" in Room 13A31, prior to the time stated for bid opening.

(End of Clause)

END OF SECTION 00100

Add the following new paragraph:

"36. NTP (Notice to Proceed) may not be issued for a period of up to 180 days after date of award to insure that all land agreements, permits, etc. have been finalized prior to the start of any construction activities."
52.232-18  AVAILABILITY OF FUNDS (APR 1984)

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

(End of clause)

(55 7-104.91(a) 1962 SEP)

52.233-2  SERVICE OF PROTEST (NOV 1988)

(a) Protests, as defined in section 33.101 of the Federal Acquisition Regulation, that are filed directly with an agency, and copies of any protests that are filed with the General Accounting Office (GAO) or the General Services Administration Board of Contract Appeals (GSBCA), shall be served on the Contracting Officer (addressed as follows) by obtaining written and dated acknowledgment of receipt from Chief, Contracting Division
819 Taylor Street, Room 13A42
Fort Worth, TX 76102

(b) The copy of any protest shall be received in the office designated above on the same day a protest is filed with the GSBCA or within one day of filing a protest with the GAO.

(End of provision)

52.236-4303  PROJECT INFORMATION

A. For technical information regarding plans and specifications contact Fort Worth District Office, Corps of Engineers, Fort Worth, Texas, telephone 817/334-2762.

B. For information regarding bidding procedures or bonds, contact Contracting Division, 817/334-2721, or visit Room 13A42, 819 Taylor Street,
bonds furnished shall be furnished by the Contractor to the Government prior to commencement of contract performance. The penal sums of such bonds will be as follows:

(1) Performance Bond. The penal sum of the performance bond shall equal one hundred percent (100%) of the contract price.

(2) Payment Bonds.

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

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

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

(d) The performance bond shall specifically provide for payment to the Government the full amount of the taxes imposed by the Government which are collected, deducted, or withheld from wages paid by the principal in carrying out the construction contract with respect to which this bond is furnished.

FAILURE TO INCLUDE BID BOND OR OTHER BID SECURITY ON TIME MAY BE CAUSE FOR REJECTION OF THE BID AS NONRESPONSIVE. LATE BOND OR OTHER SECURITY WILL BE TREATED IN THE SAME MANNER AS PROVIDED IN THIS SOLICITATION FOR LATE BIDS. FACSIMILE BONDS ARE NOT ACCEPTABLE.

SPECIAL NOTICE CONCERNING INDIVIDUAL SURETIES (FEB 1990) (52.0228-4203)

The Security interest, including pledged assets as set forth in contract clause entitled "PLEDGES OF ASSETS", and executed Standard Form 2B entitled "AFFIDAVIT OF INDIVIDUAL SURETY" shall be furnished with the bond.

FAILURE TO PROVIDE WITH THE BID BOND A PLEDGE OF ASSETS (SECURITY INTEREST) IN ACCORDANCE WITH FAR 28.203-1 WILL RESULT IN REJECTION OF A BID WHICH IS BONDED BY INDIVIDUAL SURETIES.
acquisition is 1629.

(b)(1) The small business size standard is $17,000,000.00.

(2) The small business size standard for a concern which submits an
offer in its own name, other than on a construction or service contract,
but which proposes to furnish a product which it did not itself
manufacture, is 500 employees.

(End of provision)

31

BONDS (DEC 1991) (52.0228-4102 CON)

(a) Bonds listed below are required when the bid amount exceeds $25,000.
The name and business address of the surety shown on the executed bond
forms submitted in response to this solicitation must be the same as the
name and business address listed for the surety in Department of Treasury
Circular 570. Any bidder/offeror required to furnish a bond has an
option to furnish such bond in the form of a firm commitment with good
and sufficient surety or sureties acceptable to the Government, such
as Standard Form 24 (for Bid Bond); Standard Form 25 (for Performance
Bond); Standard Form 25-A (for Payment Bond); postal money order,
certified check, cashier's check, bank draft, irrevocable letter of
credit, or, under Treasury Department regulations, certain bonds or
notes of the United States.

(b) Bid Bonds. Each bidder shall submit with his bid a bid guarantee
in a form acceptable to the Government and in the required amount as
specified below. In accordance with FAR 28.101-1 only separate bid
guarantees are acceptable in connection with construction contracts
(anual bid bonds are not acceptable). The amount of bid guarantee
required is twenty (20) percent of the bid price or Three Million
Dollars ($3,000,000), whichever is lesser. The bid guarantee amount
may be expressed in terms of a percentage of the bid price or may be
expressed in dollars and cents. When the penal sum is expressed as a
percentage, a maximum dollar limitation may be stated.

(c) Performance and Payment Bond. Within 10 days after notification of
award of the contract, the contractor shall execute and furnish two bonds,
each with good and sufficient surety or sureties acceptable to the
Government, namely a performance bond and a payment bond. (Standard Form
25, Performance Bond, and Standard Form 25-A, Payment Bond, may be obtained
from the solicitation issuing office for execution by the contractor). Any
AND AFARS clauses and provisions that have recently been modified or added may also be numbered as local clauses pending their integration into the SAACONS database by the SAACONS contractor. Until the integration is complete the title line will identify the regulatory source. Examples of the difference in the numbering are provided below:

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<td>52.XXX.4XXX L</td>
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Authorized alternate versions of the clauses are sometimes used, and are identified in the applicable regulation by sequential Roman numeral identifiers. When an alternate version is used the SAACONS clause number will be followed by the appropriate Roman numeral identified. For example, FAR Clause 52.202-1 in its Alternate I version is entitled "DEFINITIONS (APR 1984)--ALTERNATE I (APR 1984)". The clause number will appear as "52.202-1 I". An Alternate II version of a clause would appear as "52.XXX-XXXX II".

29

AMENDMENT OF INVITATION FOR BIDS (52.0214-4208)

Pursuant to FAR 14.208, the right is reserved, as the interest of the Government may require, to revise or amend the specifications or drawings or both prior to the date set for opening of bids. Such revisions and amendments, if any, will be announced by an amendment or amendments to this Invitation for Bids. If revisions and amendments are of a nature which requires material changes in quantities or bid prices or both, the date set for opening bids may be postponed by such number of days, as in the opinion of the issuing officer, will enable bidders to revise their bids. In such cases, the amendment will include an announcement of the new date for opening bids.

30

52.219-22 SIC CODE AND SMALL BUSINESS SIZE STANDARD (JAN 1991)

(a) The standard industrial classification (SIC) code for this

DACA63-95-B-0150 00100-13
CCITT Group 2 and 3; Communications: Half Duplex.

(g) If the bidder chooses to transmit a facsimile bid, the Government will not be responsible for any failure attributable to the transmission or receipt of the facsimile bid including, but not limited to, the following:

1. Receipt of garbled or incomplete bid.
2. Availability or condition of the receiving facsimile equipment.
3. Incompatibility between the sending and receiving equipment.
4. Delay in transmission or receipt of bid.
5. Failure of the bidder to properly identify the bid.
6. Illegibility of bid.
7. Security of bid data.

(End of provision)
52.214-19  CONTRACT AWARD--SEALED BIDDING--CONSTRUCTION (FEB 1986)

(a) The Government will evaluate bids in response to this solicitation without discussions and will award a contract to the responsible bidder whose bid, conforming to the solicitation, will be most advantageous to the Government, considering only price and the price-related factors specified elsewhere in the solicitation.

(b) The Government may reject any or all bids, and waive informalities or minor irregularities in bids received.

(c) The Government may accept any item or combination of items, unless doing so is precluded by a restrictive limitation in the solicitation or the bid.

(End of provision)

52.214-31  FACSIMILE BIDS (DEC 1989)

(a) Definition. "Facsimile bid," as used in this solicitation, means a bid, modification of a bid, or withdrawal of a bid that is transmitted to and received by the Government via electronic equipment that communicates and reproduces both printed and handwritten material.

(b) Bidders may submit facsimile bids as responses to this solicitation. These responses must arrive at the place and by the time, specified in the solicitation.

(c) Facsimile bids that fail to furnish required representations or information or that reject any of the terms, conditions, and provisions of the solicitation may be excluded from consideration.

(d) Facsimile bids must contain the required signatures.

(e) The Government reserves the right to make award solely on the facsimile bid. However, if requested to do so by the Contracting Officer, the apparently successful bidder agrees to promptly submit the complete original signed bid.

(f) Facsimile receiving data and compatibility characteristics are as follows:

(1) Telephone number of receiving facsimile equipment: 817/334-3166

(2) Compatibility characteristics of receiving facsimile equipment (e.g., make and model number, receiving speed, communications protocol):

Digital Facsimile Transceiver; Make: Lanier; Model: 2230; Compatibility:
post office receiving clerk on the "Express Mail Next Day Service-Post Office to Addressee" label and the postmark on the envelope or wrapper and on the original receipt from the U.S. Postal Service. "Postmark" has the same meaning as defined in paragraph (c) of this provision, excluding postmarks of the Canadian Postal Service. Therefore, bidders should request the postal clerk to place a legible hand cancellation bull's-eye postmark on both the receipt and the envelope or wrapper.

(f) Notwithstanding paragraph (a) of this provision, a late modification of an otherwise successful bid that makes its terms more favorable to the Government will be considered at any time it is received and may be accepted.

(g) Bids may be withdrawn by written notice or telegram (including mailgram) received at any time before the exact time set for receipt of bids. If the solicitation authorizes facsimile bids, bids may be withdrawn via facsimile received at any time before the exact time set for receipt of bids, subject to the conditions specified in the provision entitled "Facsimile Bids." A bid may be withdrawn in person by a bidder or its authorized representative if, before the exact time set for receipt of bids, the identity of the person requesting withdrawal is established and the person signs a receipt for the bid.

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

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

(2) Was sent by mail or, if authorized by the solicitation, was sent by telegram or via facsimile, and it is determined by the Government that the late receipt was due solely to mishandling by the Government after receipt at the Government installation; or

(3) Was sent by U.S. Postal Service Express Mail Next Day Service-Post Office To Addressee, not later than 5:00 P.M. at the place of mailing two working days prior to the date specified for receipt of bids. The term "working days" excludes weekends and U.S. Federal holidays.

(b) Any modification or withdrawal of a bid is subject to the same conditions as in paragraph (a) of this provision.

(c) The only acceptable evidence to establish the date of mailing of a late bid, modification, or withdrawal sent either by registered or certified mail is the U.S. or Canadian Postal Service postmark both on the envelope or wrapper and on the original receipt from the U.S. or Canadian Postal Service. Both postmarks must show a legible date or the bid, modification, or withdrawal shall be processed as if mailed late. "Postmark" means a printed, stamped, or otherwise placed impression (exclusive of a postage meter machine impression) that is readily identifiable without further action as having been supplied and affixed by employees of the U.S. or Canadian Postal Service on the date of mailing. Therefore, bidders should request the postal clerk to place a legible hand cancellation bull's-eye postmark on both the receipt and the envelope or wrapper.

(d) The only acceptable evidence to establish the time of receipt at the Government installation is the time/date stamp of that installation on the bid wrapper or other documentary evidence of receipt maintained by the installation.

(e) The only acceptable evidence to establish the date of mailing of a late bid, modification, or withdrawal sent by U.S. Postal Service Express Mail Next Day Service-Post Office to Addressee is the date entered by the
52.214-3 AMENDMENTS TO INVITATIONS FOR BIDS (DEC 1989)

(a) If this solicitation is amended, then all terms and conditions which are not modified remain unchanged.
(b) Bidders shall acknowledge receipt of any amendment to this solicitation (1) by signing and returning the amendment, (2) by identifying the amendment number and date in the space provided for this purpose on the form for submitting a bid, (3) by letter or telegram, or (4) by facsimile, if facsimile bids are authorized in the solicitation. The Government must receive the acknowledgment by the time and at the place specified for receipt of bids.

(End of provision)

52.214-5 SUBMISSION OF BIDS (DEC 1989)

(a) Bids and bid modifications shall be submitted in sealed envelopes or packages (unless submitted by electronic means) (1) addressed to the office specified in the solicitation, and (2) showing the time specified for receipt, the solicitation number, and the name and address of the bidder.
(b) Telegraphic bids will not be considered unless authorized by the solicitation; however, bids may be modified or withdrawn by written or telegraphic notice.
(c) Facsimile bids, modifications, or withdrawals, will not be considered unless authorized by the solicitation.

(End of provision)

52.214-6 EXPLANATION TO PROSPECTIVE BIDDERS (APR 1984)

Any prospective bidder desiring an explanation or interpretation of the solicitation, drawings, specifications, etc., must request it in writing soon enough to allow a reply to reach all prospective bidders before the submission of their bids. Oral explanations or instructions given before the award of a contract will not be binding. Any information given a prospective bidder concerning a solicitation will be furnished promptly to all other prospective bidders as an amendment to the solicitation, if that information is necessary in submitting bids or if the lack of it would be prejudicial to other prospective bidders.

(End of provision)
(R SF 33A, Para 3, 1978 JAN)
OTHER PERTINENT DOCUMENTS (DEC 1991)

Offerors may obtain the specifications, standards, plans, drawings, data item descriptions, and other pertinent documents cited in this solicitation by submitting a request to:

U.S. Army Corps of Engineers, Fort Worth
ATTN: CESMF-CT
819 Taylor/P.O. Box 17300
Fort Worth, Texas 76102-0300

Include the number of the solicitation and the title and number of the specification, standard, plan, drawing, or other pertinent document. Sets of drawings, reduced to half size, and of specifications will be furnished upon receipt of payment of $32.50 per set. Sets of drawings full-size, and of specifications will be furnished upon receipt of payment of $57.50 per set. No refund of the payment for drawings will be made and drawings need not be returned to the District Engineer. Additional copies of the specifications alone will be furnished an applicant at the rate of $10.00 per copy. Payment will be made by check or money order and made payable to the F&A Officer, USAED, FTW.

(End of provision)

52.212-7 NOTICE OF PRIORITY RATING FOR NATIONAL DEFENSE USE (SEP 1990)

Any contract awarded as a result of this solicitation will be /_____ /
/ DX rated order; /X/ DO rated order certified for national defense use under the Defense Priorities and Allocations System (DPAS) (15 CFR 700), and the Contractor will be required to follow all of the requirements of this regulation.

(End of provision)

52.214-1 SOLICITATION DEFINITIONS--SEALED BIDDING (JUL 1987)

"Government" means United States Government.
"Offer" means "bid" in sealed bidding.
"Solicitation" means an invitation for bids in sealed bidding.

(End of provision)
(a) The Offeror is requested to enter its CAGE code on its offer in the block with its name and address. The CAGE code entered must be for that name and address. Enter CAGE before the number.

(b) If the Offeror does not have a CAGE code, it may ask the Contracting Officer to request one from the Defense Logistics Services Center (DLSC). The Contracting Officer will---

(1) Ask the Contractor to complete section B of a DD Form 2051, Request for Assignment of a Commercial and Government Entity (CAGE) Code;
(2) Complete section A and forward the form to DLSC; and
(3) Notify the Contractor of its assigned CAGE code.

(c) Do not delay submission of the offer pending receipt of a CAGE code.

(End of provision)

52.210-2 AVAILABILITY OF SPECIFICATIONS LISTED IN THE DOD INDEX OF SPECIFICATIONS AND STANDARDS (DODISS) (MAR 1994)

Single copies of specifications cited in this solicitation may be obtained by submitting a written request to the supply point listed below. The request must contain the title of the specification, its number, date, applicable amendment(s), and the solicitation or contract number. A telephone order entry system is available with the use of a touch tone telephone. A Customer number is required to use this system and may be obtained by written request to the address listed below or by telephone (215-697-2179). In case of urgency, telegraphic requests are acceptable. Voluntary standards, which are not available to Offerors and Contractors from Government sources, may be obtained from the organization responsible for their preparation, maintenance, or publication.

Standardization Document
Order Desk, Building 4, Section D
700 Robbins Avenue
Philadelphia, PA 19111-5094
Facsimile No......215-697-2978
Telephone Order Entry System (TOES) Numbers......215-697-1187 through and including 215-697-1197

(End of provision)

AVAILABILITY OF SPECIFICATIONS AND STANDARDS NOT LISTED IN DODISS, DATA ITEM DESCRIPTIONS NOT LISTED IN DOD 5010.12-L, AND PLANS, DRAWINGS, AND

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BIDDING SCHEDULE (cont)

Measure (UOM), are to be superseded by the Supplemental Bid Schedule units of measure.:

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<td>MBH</td>
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(SYSTEMS 17 through 20 continued below)
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<td><strong>BID ITEM NOS. 04.20.01 through 04.20.91</strong></td>
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9. Tri-Service Cost Engineering System (TRACES) Work Breakdown Structure (WBS) - The following information is supplied to the bidder for use in preparation of the required "Supplemental Bidding Schedule" [Units of
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<thead>
<tr>
<th>Item No.</th>
<th>Description</th>
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<th>Unit</th>
<th>Unit Price</th>
<th>Estimated Amount</th>
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<td>Site Demolition and Relocation</td>
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<td>Sum</td>
<td>***</td>
<td>$</td>
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<td>04.17.03</td>
<td>Site Earthwork</td>
<td>Job</td>
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<td>Site Cleanup</td>
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<td>Other Site Preparation</td>
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<td>Parking Lots</td>
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<td>04.18.03</td>
<td>Walks, Steps, Ramps, and Terraces</td>
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<td>04.18.04</td>
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<td>Other Site Improvements</td>
<td>Job</td>
<td>Sum</td>
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<td>Storm Sewer Systems</td>
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<td>Industrial Waste Systems</td>
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<td>04.19.05</td>
<td>Heating Distribution Systems</td>
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<td>Cooling Distribution Systems</td>
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<td>Natural and Propane Gas Distribution Systems</td>
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<td>Other Civil and Mechanical Utilities</td>
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<td>01.10b</td>
<td>System 10 Fire Protection Systems</td>
<td>Job</td>
<td>Sum</td>
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<td>01.11b</td>
<td>System 11 Electric Power and Lighting</td>
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<td>01.12b</td>
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<td>01.13b</td>
<td>System 13 Equipment</td>
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<td>01.14b</td>
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<td>01.15b</td>
<td>System 15 Special Construction</td>
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<td>01.16b</td>
<td>System 16 Selective Building Demolition</td>
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**TOTAL (BID ITEM NOS. 01.01b through 01.16b)** $  

**Asbestos Abatement**  

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<td>02.b</td>
<td>Boiler/Flue Insulation</td>
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<td>Pipe Fitting Insulation and all other asbestos abatement not separately listed</td>
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**TOTAL (BID ITEM NOS. 02.a through 02.d)** $  

**Drilled Pier Shafts**  

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<td>Drilled Pier Shafts:</td>
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<td>03.a</td>
<td>18&quot; diameter</td>
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<tr>
<td>03.b</td>
<td>24&quot; diameter</td>
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00010-8
<table>
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<td>01.12a</td>
<td>System 12 Electrical Systems</td>
<td>Job Sum</td>
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<tr>
<td>01.13a</td>
<td>System 13 Equipment</td>
<td>Job Sum</td>
<td>***</td>
<td>$ _____________</td>
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<tr>
<td>01.14a</td>
<td>System 14 Furnishings</td>
<td>Job Sum</td>
<td>***</td>
<td>$ _____________</td>
</tr>
<tr>
<td>01.15a</td>
<td>System 15 Special Construction</td>
<td>Job Sum</td>
<td>***</td>
<td>$ _____________</td>
</tr>
<tr>
<td>01.16a</td>
<td>System 16 Selective Building Demolition</td>
<td>Job Sum</td>
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**TOTAL (BID ITEM NOS. 01.01a through 01.16a)** $ _____________

Building #2: Complete, including all utilities to the five foot line, and exclusive of all work listed separately.

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<td>Job Sum</td>
<td>***</td>
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<tr>
<td>01.02b</td>
<td>System 02 Superstructure</td>
<td>Job Sum</td>
<td>***</td>
<td>$ _____________</td>
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<tr>
<td>01.03b</td>
<td>System 03 Exterior Closure</td>
<td>Job Sum</td>
<td>***</td>
<td>$ _____________</td>
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<tr>
<td>01.04b</td>
<td>System 04 Roofing</td>
<td>Job Sum</td>
<td>***</td>
<td>$ _____________</td>
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<tr>
<td>01.05b</td>
<td>System 05 Interior Construction</td>
<td>Job Sum</td>
<td>***</td>
<td>$ _____________</td>
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<tr>
<td>01.06b</td>
<td>System 06 Interior Finishes</td>
<td>Job Sum</td>
<td>***</td>
<td>$ _____________</td>
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<tr>
<td>01.07b</td>
<td>System 07 Conveying Systems</td>
<td>Job Sum</td>
<td>***</td>
<td>$ _____________</td>
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<tr>
<td>01.08b</td>
<td>System 08 Plumbing</td>
<td>Job Sum</td>
<td>***</td>
<td>$ _____________</td>
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<tr>
<td>01.09b</td>
<td>System 09 HVAC</td>
<td>Job Sum</td>
<td>***</td>
<td>$ _____________</td>
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SUPPLEMENTAL BIDDING SCHEDULE

Base Bid: All work required by the plans and specifications exclusive of additive bid items:

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<th>Item No.</th>
<th>Description</th>
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<th>Unit</th>
<th>Unit Price</th>
<th>Estimated Amount</th>
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<td>$ ________</td>
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<tr>
<td>01.02a</td>
<td>System 02 Superstructure</td>
<td>Job</td>
<td>Sum</td>
<td>***</td>
<td>$ ________</td>
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<tr>
<td>01.03a</td>
<td>System 03 Exterior Closure</td>
<td>Job</td>
<td>Sum</td>
<td>***</td>
<td>$ ________</td>
</tr>
<tr>
<td>01.04a</td>
<td>System 04 Roofing</td>
<td>Job</td>
<td>Sum</td>
<td>***</td>
<td>$ ________</td>
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<td>01.05a</td>
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<td>Job</td>
<td>Sum</td>
<td>***</td>
<td>$ ________</td>
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<tr>
<td>01.06a</td>
<td>System 06 Interior Finishes</td>
<td>Job</td>
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<td>01.07a</td>
<td>System 07 Conveying Systems</td>
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<td>Sum</td>
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<tr>
<td>01.08a</td>
<td>System 08 Plumbing</td>
<td>Job</td>
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<td>$ ________</td>
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<tr>
<td>01.09a</td>
<td>System 09 HVAC</td>
<td>Job</td>
<td>Sum</td>
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<td>$ ________</td>
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<tr>
<td>01.10a</td>
<td>System 10 Fire Protection Systems</td>
<td>Job</td>
<td>Sum</td>
<td>***</td>
<td>$ ________</td>
</tr>
<tr>
<td>01.11a</td>
<td>System 11 Electric Power and Lighting</td>
<td>Job</td>
<td>Sum</td>
<td>***</td>
<td>$ ________</td>
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</tbody>
</table>

Building #01: Complete, including all utilities to the five foot line, and exclusive of all work listed separately
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.

7. Supplemental Information - These items are for information only and must be prepared and submitted by all bidders within 48 hours after bid opening. Further explanation of the Tri-Service Cost Engineering System (TRACES) Work Breakdown Structure (WBS) is included in Note 9. The first two numerical digits of each item listed in the Supplemental Bidding Schedule below correspond to the Bid Item Number, the second two numerical digits to the TRACES WBS System Level, and the third two numerical digits to the TRACES WBS Subsystem Level. Listed Systems or Subsystems not applicable to this project should have a value of $0.00 entered.

△ POSTED 10/18/95

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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)

2. If a modification to a bid based on unit prices is submitted, which provides for a lump sum adjustment to the total estimated cost, the application of the lump sum adjustment to each unit price in the 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.

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<tr>
<th>Item No.</th>
<th>Description</th>
<th>Estimated Quantity</th>
<th>Unit Price</th>
<th>Estimated Amount</th>
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<td>0001.00</td>
<td>Launch Pad, complete: Job</td>
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<td>Missile Assembly Building, including all utilities to the five-foot line of the building.</td>
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<td>Launch Operations Trailer Shelter, including all utilities to the five-foot line of the building.</td>
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<td>Launch Equipment Building, including all utilities to the five-foot line of the building.</td>
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<td>0005.00</td>
<td>Site Work/Supporting Facilities; complete, including all utilities outside the buildings' five-foot lines, and all other work not separately listed:</td>
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**TOTAL** (BID ITEM NOS. 0001 through 0007) $-------------------

00010-3
17. The offeror agrees to perform the work required at the prices specified below in strict accordance with the terms of this solicitation, if this offer is accepted by the Government in writing within calendar days after the date offers are due. (Insert any number equal to or greater than the minimum requirement stated in Item 13D. Failure to insert any number means the offeror accepts the minimum in Item 13D.)

AMOUNTS
Set forth in attached Bid Schedule.

18. The offeror agrees to furnish any required performance and payment bonds.

19. ACKNOWLEDGMENT OF AMENDMENTS
(The offeror acknowledges receipt of amendments to the solicitation – give number and date of each)

20A. NAME AND TITLE OF PERSON AUTHORIZED TO SIGN OFFER
(Type or print)

20B. SIGNATURE

20C. OFFER DATE

AWARD (To be completed by Government)

21. ITEMS ACCEPTED:

22. AMOUNT

23. ACCOUNTING AND APPROPRIATION DATA

24. SUBMIT INVOICES TO ADDRESS SHOWN IN
(4 copies unless otherwise specified)

25. OTHER THAN FULL AND OPEN COMPETITION PURSUANT TO

going to

26. ADMINISTERED BY

27. PAYMENT WILL BE MADE BY

CONTRACTING OFFICER WILL COMPLETE ITEM 28 OR 29 AS APPLICABLE

☐ 28. NEGOTIATED AGREEMENT  (Contractor is required to sign this document and return ___ copies to issuing office.) Contractor agrees to furnish and deliver all items or perform all work, requisitions identified on this form and any continuation sheets for the consideration stated in this contract. The rights and obligations of the parties to this contract shall be governed by (a) this contract award, (b) the solicitation, and (c) the clauses, representations, certifications, and specifications incorporated by reference in or attached to this contract.

☐ 29. AWARD  (Contractor is not required to sign this document.) Your offer on this solicitation, is hereby accepted as to the items listed. This award constitutes the contract, which consists of (a) the Government solicitation and your offer, and (b) this contract award. No further contractual document is necessary.

30A. NAME AND TITLE OF CONTRACTOR OR PERSON AUTHORIZED TO SIGN (Type or print)

30B. SIGNATURE

30C. DATE

31A. NAME OF CONTRACTING OFFICER (Type or print)

31B. UNITED STATES OF AMERICA

31C. AWARD DATE

STANDARD FORM 1442 BACK  (REV. 4-85)
# SOLICITATION, OFFER, AND AWARD

**Construction, Alteration, or Repair**

**SOLICITATION**

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

10. **THE GOVERNMENT REQUIRES PERFORMANCE OF THE WORK DESCRIBED IN THESE DOCUMENTS (Title, identifying no., date):**

   Theater Missile Defense (TMD) Target Launch Facilities, Fort Wingate Depot

   Activity, New Mexico

11. The Contractor shall begin performance within __3__ calendar days and complete it within __240__ calendar days after receiving __award__, __notice to proceed__. This performance period is __mandatory__, __negotiable__. (See [ ] )

12A. **THE CONTRACTOR MUST FURNISH ANY REQUIRED PERFORMANCE AND PAYMENT BONDS?**

   (If "YES," indicate within how many calendar days after award in Item 12B.)

   YES  NO

12B. **CALENDAR DAYS**

   [ ] 10

13. **ADDITIONAL SOLICITATION REQUIREMENTS:**

   A. Sealed offers in original and __0__ copies to perform the work required are due at the place specified in Item 8 by __10:00 AM__ (hour) local time __09/13/95__ (date). If this is a sealed bid solicitation, offers must be publicly opened at that time. Sealed envelopes containing offers shall be marked to show the offeror's name and address, the solicitation number, and the date and time offers are due.

   B. An offer guarantee __is__, __is not required.

   C. All offers are subject to the (1) work requirements, and (2) other provisions and clauses incorporated in the solicitation in full text or by reference.

   Offers providing less than __60__ calendar days for Government acceptance after the date offers are due will not be considered and will be rejected.
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09250 GYPSUM WALLBOARD
09510 ACOUSTICAL CEILINGS
09650 RESILIENT FLOORING
09900 PAINTING, GENERAL

DIVISION 10 - SPECIALTIES (NONE IN THIS JOB)

DIVISION 11 - EQUIPMENT (NONE IN THIS JOB)

DIVISION 12 - FURNISHINGS (NONE IN THIS JOB)

DIVISION 13 - SPECIAL CONSTRUCTION

13120 STANDARD METAL BUILDING SYSTEMS
13977 BLAST RESISTANT DOORS

DIVISION 14 - CONVEYING SYSTEM

14630 OVERHEAD PNEUMATIC CRANE

DIVISION 15 - MECHANICAL

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16415 ELECTRICAL WORK, INTERIOR
16670 LIGHTNING PROTECTION SYSTEM
16721 FIRE DETECTION AND ALARM SYSTEM
16770 RADIO AND PUBLIC ADDRESS SYSTEMS
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ENG FORM 4288, May 91

01305-15
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ENG FORM 4288, May 91
EDITION OF AUG 89 IS OBSOLETE
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ENG FORM 4288, May 91

EDITION OF AUG 89 IS OBSOLETE

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3.10 DISPOSAL OF SUBMITTAL SAMPLES

When submittal samples, such as those for paint, asphalt, and concrete, are no longer required for review or testing, the Contractor shall, upon notification from the Contracting Officer, pick up and dispose of the samples in accordance with manufacturers' Material Safety Data Sheets (MSDS), all applicable Federal, State, and local regulations, and in a manner approved by the Contracting Officer.
3.6 CONTROL OF SUBMITTALS

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

3.7 GOVERNMENT APPROVED SUBMITTALS

Upon completion of review of submittals requiring Government approval, the submittals will be identified as having received approval by being so stamped and date. One (1) copy of the submittal will be returned to the Contractor. The remainder will be retained by the Government.

3.8 INFORMATION ONLY SUBMITTALS

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

3.9 STAMPS

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

<table>
<thead>
<tr>
<th>CONTRACTOR</th>
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<td>(Firm Name)</td>
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___ Approved

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

SIGNATURE: ________________________________

TITLE: ________________________________

DATE: ________________________________
3.5.1.5.1 Mechanical and Electrical Systems, and fire protection and fire
detection} submittals. See paragraph "Special Reviews."

3.5.1.5.2 Color/finish sample boards submittal.

3.5.1.6 Certificates of Compliance

Any certificates required for demonstrating proof of compliance of
materials with specification requirements shall be executed in the number
of copies required by the above paragraph "Number of Copies." Each
certificate shall be signed by an official authorized to certify in behalf
of the manufacturing company and shall contain the name and address of the
Contractor, the project name and location, and the quantity and date or
dates of shipment or delivery to which the certificates apply. Copies of
laboratory test reports submitted with certificates shall contain the name
and address of the testing laboratory and the date or dates of the tests
to which the report applies. Certification shall not be construed as
relieving the Contractor from furnishing satisfactory material, if, after
tests are performed on selected samples, the material is found not to meet
the specific requirements.

3.5.1.7 Special Reviews

3.5.1.7.1 Fire Protection/Detection Submittals

The Contractor shall prepare and submit, as one integrated submittal, shop
drawings for the fire protection/detection system. This submittal shall
also include sprinkler plans and sections, fire detection and alarm plans
and risers, and catalog cuts of proposed equipment. The Contractor shall
submit proof that the shop drawings were prepared by an engineer regularly
engaged in fire protection/detection systems for at least 2 years, and
that they are sealed by a registered professional engineer. Shop drawings
for the fire protection/detection system shall be prepared on full-size
mylar sheets. The shop drawings submitted for review shall be submitted
on full-size blue-line sheets. After updating all deviations,
modifications, and changes, the final submittal shall be on mylar sheets
and will represent the final as-built drawings.

3.5.1.7.2 Mechanical and Electrical Systems

The Contractor shall furnish one reproducible, unfolded copy of all wiring
and control diagrams and approved system layout drawings with the
operating instructions called for under the various headings of these
specifications for mechanical and electrical systems.

3.5.2 Deviations

For submittals which include proposed deviations requested by the
Contractor, the column "variation" of ENG Form 4025 shall be checked. The
Contractor shall set forth in writing the reason for any deviations and
annotate such deviations on the submittal. The Government reserves the
right to rescind inadvertent approval of submittals containing unannotated
deviations.
for time lost in late submittals. An additional 7 calendar days shall be allowed and shown on the register for review and approval of submittals for refrigeration and HVAC control systems.

3.4 TRANSMITTAL FORM (ENG Form 4025)

The sample transmittal form (ENG Form 4025) attached to this section shall be used for submitting both Government approved and information only submittals in accordance with the instructions on the reverse side of the form. These forms will be furnished to the Contractor. This form shall be properly completed by filling out all the heading blank spaces and identifying each item submitted. Special care will be exercised to ensure proper listing of the specification paragraph and/or sheet number of the contract drawings pertinent to the data submitted for each item.

3.5 SUBMITTAL PROCEDURE

Submittals shall be made as follows:

3.5.1 Procedures

3.5.1.1 Additional Instructions

In addition to the requirements of this section, additional instructions are specified in the attachment "INSTRUCTIONS TO CONTRACTORS FOR TRANSMITTAL REQUIREMENTS" located at the end of this section.

3.5.1.2 Contractor Review

The Contractor's quality control representative shall review the listing at least every 30 days and take appropriate action to maintain an effective and updated system. A copy of the register shall be maintained at the job site. Revised and/or updated registers shall be submitted to the Contracting Officer at least every 60 days in quadruplicate (complete register need not be provided, only those portions containing additions or changes).

3.5.1.3 Number of Copies

The Contractor shall provide four (4) sets of all submittals.

3.5.1.4 Address to Receive Submittals

Submittals shall be sent to the Corps of Engineers' Area Office assigned to the project.

3.5.1.5 Additional Government Approved Submittals

In addition to those specified in PART I paragraph SUBMITTAL CLASSIFICATION, the following classifications of submittals also require Governmental approval:
PART 3 - EXECUTION

3.1 GENERAL

The Contractor shall make submittals as required by the specifications. The Contracting Officer may request submittals in addition to those specified when deemed necessary to adequately describe the work covered in the respective sections. Units of weights and measures used on all submittals shall be the same used in the contract drawings. Submittals shall be made in the respective number of copies and to the respective addresses set forth below. Each submittal shall be complete and in sufficient detail to allow ready determination of compliance with contract requirements. Prior to submittal, all items shall be checked and approved by the Contractor's Quality Control (CQC) representative and each item shall be stamped, signed, and dated by the CQC representative indicating action taken. Proposed deviations from the contract requirements shall be clearly identified. Submittals shall include items such as: Contractor's, manufacturer's, or fabricator's drawings; descriptive literature including (but not limited to) catalog cuts, diagrams, operating charts or curves; test reports; test cylinders; samples; O&M manuals (including parts list); certifications; warranties; and other such required submittals. Submittals requiring Government approval shall be scheduled and made prior to the acquisition of the material or equipment covered thereby. Samples remaining upon completion of the work shall be picked up and disposed of in accordance with manufacturers Material Safety Data Sheets (MSDS) and in compliance with existing laws and regulations.

3.2 SUBMITTAL REGISTER (ENG Form 4288)

At the end of this section is one set of ENG Form 4288 listing items of equipment and materials for which submittals are required by the specifications; this list may not be all inclusive and additional submittals may be required. The Contractor will also be given the submittal register as a diskette containing the computerized ENG Form 4288 and instructions on the use of the diskette. Columns "d" through "f" have been completed by the Government; the Contractor shall complete columns "a" and "g" through "i" and submit the forms (hard copy plus associated electronic file) to the Contracting Officer for approval within 21 calendar days after Notice to Proceed. The Contractor shall keep this diskette up to date and shall submit it to the Government together with the monthly payment request. The approved submittal register will become the scheduling document and will be used to control submittals throughout the life of the contract. The submittal register and the progress schedules shall be coordinated.

3.3 SCHEDULING

Submittals covering component items forming a system or items that are interrelated shall be scheduled to be coordinated and submitted concurrently. Certifications to be submitted with the pertinent drawings shall be so scheduled. Adequate time (a minimum of 60 calendar days exclusive of mailing time) shall be allowed and shown on the register for review and approval. No delays damages or time extensions will be allowed.
SECTION 01305 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUBMITTAL CLASSIFICATION

Submittals are classified as follows:

1.1.1 Government Approved

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

1.1.2 Information Only

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

1.2 APPROVED SUBMITTALS

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

1.3 DISAPPROVED SUBMITTALS

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

1.4 WITHHOLDING OF PAYMENT

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

PART 2 - PRODUCTS (Not Applicable)
SD-13 Certificates

Statement signed by an official authorized to certify on behalf of the manufacturer of a product, system or material, attesting that the product, system or material meets specified requirements. The statement must be dated after the award of this contract, must state the Contractor’s name and address, must name the project and location, and must list the specific requirements which are being certified.

SD-14 Samples

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

SD-18 Records

Documentation to record compliance with technical or administrative requirements.

SD-19 Operation and Maintenance Manuals

Data which forms a part of an operation and maintenance manual.

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1.1 SUBMITTALS

The submittals described below are those required and further described in other sections of the specifications. Other requirements pertaining to submittals are included in the SPECIAL CLAUSES and Section 01305 SUBMITTAL PROCEDURES. Submittals required by the CONTRACT CLAUSES and other nontechnical parts of the contract are not included in this section.

SD-01 Data

Submittals which provide calculations, descriptions, or documentation regarding the work.

SD-04 Drawings

Submittals which graphically show relationship of various components of the work, schematic diagrams of systems, details of fabrication, layouts of particular elements, connections, and other relational aspects of the work.

SD-06 Instructions

Preprinted material describing installation of a product, system or material, including special notices and material safety data sheets, if any, concerning impedances, hazards, and safety precautions.

SD-07 Schedules

Tabular lists showing location, features, or other pertinent information regarding products, materials, equipment, or components to be used in the work.

SD-08 Statements

A document, required of the Contractor, or through the Contractor, from a supplier, installer, manufacturer, or other lower tier Contractor, the purpose of which is to confirm the quality or orderly progression of a portion of the work by documenting procedures, acceptability of methods or personnel, qualifications, or other verifications of quality.

SD-09 Reports

Reports of inspections or tests, including analysis and interpretation of test results. Each report shall be properly identified. Test methods used shall be identified and test results shall be recorded.
SECTION 01200 - PROJECT MEETINGS

PART 1 - GENERAL

1.1 PRECONSTRUCTION CONFERENCE

Approximately three weeks after award of the construction contract and prior to the start of any construction work an authorized representative of the Contracting Officer will schedule and conduct a preconstruction conference. The Contractor's Project Manager, Superintendent and his Quality Control Manager will attend this meeting. The Contractor is encouraged to have an officer of his company and representation from his sub-contractors at this conference. This conference will be held at the location specified by the Contracting Officer's authorized representative.

1.1.1 Start of Construction Work

If the Contractor has submitted his Accident Prevention (Safety) Plan, Quality Control Plan, and Environmental Protection Plan for review prior to this meeting, these may be accepted in toto or accepted with comments at the conference. Construction work will not proceed until after this meeting has been held, these three plans noted above have been accepted and the Notice to Proceed has been received and acknowledged by the Contractor.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)
TARGET LAUNCH FACILITIES, PHASE 1, FT WINGATE, NM

STEEL DOOR INSTITUTE (SDOI)
30200 Detroit Rd.
Cleveland, OH 44145-1967
Ph: 216-899-0010
Fax: 216-892-1404

SHEET METAL & AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION (SMACNA)
P.O. Box 221230
Chantilly, VA 22022
Ph: 703-803-2980
Fax: 703-803-3732

STEEL STRUCTURES PAINTING COUNCIL (SSPC)
4516 Henry St., Suite 301
Pittsburgh, PA 15213-3728
Ph: 412-687-1113
Fax: 412-687-1153

UNDERWRITERS LABORATORIES (UL)
333 Pfingsten Rd.
Northbrook, IL 60062
Ph: 708-272-8800, ext 42612
Fax: 708-272-8129

PART 2 PRODUCTS

PART 3 EXECUTION

--- END ---

SECTION 01090 PAGE 7
TARGET LAUNCH FACILITIES, PHASE 1, FT WINGATE, NM

Building 4, Section D
700 Robbins Ave.
Philadelphia, PA 19111-5094
Ph: 215-697-2179
Fax: 215-697-2978

MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY (MSS)
127 Park St., NE
Vienna, VA 22180
Ph: 203-281-6613

NATIONAL ASSOCIATION OF ARCHITECTURAL METAL MANUFACTURERS (NAAMM)
11 So. LaSalle St., Suite 1400
Chicago, IL 60603
Ph: 312-201-0101
FAX: 312-201-0214

NATIONAL ASSOCIATION OF PLUMBING-HEATING-COOLING CONTRACTORS (NAPHCC)
P.O. Box 6808
Falls Church, VA 22046
Ph: 703-237-8100
Fax: 703-237-7442

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)
2101 L St., NW, Suite 300
Washington, DC 20037-1526
Ph: 202-457-8476
Fax: 202-457-8473

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)
P.O. Box 9146
Quincy, MA 02269
Ph: 800-344-3555
Fax: 617-984-7057

NATIONAL READY-MIXED CONCRETE ASSOCIATION (NRMCA)
900 Spring St.
Silver Spring, MD 20910
Ph: 301-587-1400
Fax: 301-585-4219

NSF INTERNATIONAL (NSF)
3475 Plymouth Rd.
P.O. Box 130140
Ann Arbor, MI 48113-0140
Ph: 313-769-8010
Fax: 313-769-0109

PLUMBING AND DRAINAGE INSTITUTE (PDI)
1106 West 77th, South Dr.
Indianapolis, IN 46260-3318
Ph: 317-251-6970

SECTION 01090 PAGE 6
TARGET LAUNCH FACILITIES, PHASE I, FT WINGATE, NM

FACTORY MUTUAL ENGINEERING AND RESEARCH (FM)
1151 Boston-Providence Turnpike
P.O. Box 9102
Norwood, MA 02062-9957
Ph: 617-762-4300
Fax: 617-762-9375

FEDERAL SPECIFICATIONS (FS)
Order from:
Standardization Documents Order Desk
Bldg 4D
700 Robbins Av
Philadelphia, PA 19111-5094
Ph: 215-697-2179
Fax: 215-697-2978

INSULATED CABLE ENGINEERS ASSOCIATION (ICEA)
P.O. Box 440
South Yarmouth, MA 02664
Ph: 508-394-4424
Fax: 508-394-1194
Order From:
American National Standards Institute
Customer Service Dept.
1430 Broadway
New York, NY 10018
Ph: 212-642-4900
Fax: 212-302-1286

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)
445 Hoes Ln.
Piscataway, NJ 08855-1331
Ph: 800-678-4333
Fax: 908-981-9667

METAL BUILDING MANUFACTURERS ASSOCIATION (MBMA)
1300 Summer Ave.
Cleveland, OH 44115-2851
Ph: 216-241-7333
Fax: 216-241-0105

MATERIAL HANDLING INSTITUTE (MHI)
8720 Red Oak Blvd., Suite 201
Charlotte, NC 28217
Ph: 704-522-8644
Fax: 704-522-7826

MIDWEST INSULATION CONTRACTORS ASSOCIATION (MICCA)
2017 So. 139th Cir.
Omaha, NE 68144
Ph: 402-342-3463

MILITARY SPECIFICATIONS (MS)
Order from:
Standardization Documents Order Desk
TARGET LAUNCH FACILITIES, PHASE 1, FT WINGATE, NM

CAST IRON SOIL PIPE INSTITUTE (CISPI)
5959 Shallowford Rd., Suite 419
Chattanooga, TN 37421
Ph: 615-892-0137
Fax: 615-892-0817

CORPS OF ENGINEERS (COE)
Order from:
U.S. Army Engineer Waterways Experiment Station
ATTN: Technical Report Distribution Section, Services Branch, TIC
3909 Halls Ferry Rd.
Vicksburg, MS 39180-6199
Ph: 601-634-2355
Fax: 601-634-2506

CONCRETE REINFORCING STEEL INSTITUTE (CRSI)
933 No. Plum Grove Rd.
Schaumburg, IL 60173-4758
Ph: 708-517-1200
Fax: 708-517-1206

DOOR AND HARDWARE INSTITUTE (DHI)
14170 Newbrook Dr.
Chantilly, VA 22021-2223
Ph: 703-222-2010
Fax: 703-222-2410

DEPARTMENT OF COMMERCE (DOC)
Order From:
National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161
Ph: 703-487-4650
Fax: 703-321-8547

ELECTRONIC INDUSTRIES ASSOCIATION (EIA)
Order From:
Global Engineering Documents
7730 Carondelet Ave., Suite 407
Clayton, MO 63105
Ph: 800-854-7179
or 714-979-8135
Fax: 314-726-6418

FEDERAL STANDARDS (FED-STD)
Order from:
Standardization Documents Order Desk
Bldg 4D
700 Robbins Av
Philadelphia, PA 19111-5094
Ph: 215-697-2179
Fax: 215-697-2978
AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS (ASHRAE)
1791 Tuilie Cir., NE
Atlanta, GA 30329
Ph: 404-636-8400
Fax: 404-321-5478

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)
22 Law Dr., Box 2300
Fairfield, NJ 07007-2300
Ph: 800-843-2763
Fax: 201-882-1717

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)
1916 Race St.
Philadelphia, PA 19103
Ph: 215-299-5585
Fax: 215-977-9679

AMERICAN WELDING SOCIETY (AWS)
P.O. Box 351040
Miami, FL 33135
Ph: 800-443-9353
Fax: 305-443-7559

AMERICAN WATER WORKS ASSOCIATION (AWWA)
6666 West Quincy
Denver, CO 80235
Ph: 800-926-7337
Fax: 303-795-1989

BUILDERS HARDWARE MANUFACTURERS ASSOCIATION (BHMA)
355 Lexington Ave.
New York, NY 10017
Ph: 212-661-4261
FAX: 212-370-9047

CODE OF FEDERAL REGULATIONS (CFR)
Order from:
Government Printing Office
Washington, DC 20402
Ph: 202-783-3238
Fax: 202-275-7703

COMMERCIAL ITEM DESCRIPTIONS (CID)
Order from:
Standardization Documents Order Desk
Bldg 4D
700 Robbins Av
Philadelphia, PA 19111-5094
Ph: 215-697-2179
Fax: 215-697-2978
AIR DIFFUSION COUNCIL (ADC)
11 S. LaSalle St., Suite 1400
Chicago, IL 60603
Ph: 312-201-0101
Fax: 312-201-0214

ASSOCIATION OF EDISON ILLUMINATING COMPANIES (AEIC)
600 No. 18th St.
P.O. Box 2641
Birmingham, AL 35291-0992
Ph: 205-250-2530
Fax: 205-250-2540

AMERICAN GEAR MANUFACTURERS ASSOCIATION (AGMA)
1500 King St., Suite 201
Alexandria, VA 22314
Ph: 703-684-0211
Fax: 703-684-0242

AMERICAN HARDBOARD ASSOCIATION (AHA)
1210 W. Northwest Highway
Palatine, IL 60067
Ph: 708-934-8800
Fax: 708-934-8803

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)
One E. Wacker Dr., Suite 3100
Chicago, IL 60601-2001
Ph: 312-670-2400
Fax: 312-670-5403

AMERICAN IRON AND STEEL INSTITUTE (AISI)
1101 Seventeenth St., NW, Suite 1300
Washington, DC 20036
Ph: 202-452-7100
Fax: 202-463-6573

AIR MOVEMENT AND CONTROL ASSOCIATION (AMCA)
30 W. University Dr.
Arlington Heights, IL 60004-1893
Ph: 708-394-0404
Fax: 708-253-0088

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)
11 West 42nd St
New York, NY 10036
Ph: 212-642-4900
Fax: 212-302-1286

AIR CONDITIONING AND REFRIGERATION INSTITUTE (ARI)
4301 Fairfax Dr., Suite 425
ATTN: Pubs Dept.
Arlington, VA 22203
Ph: 703-524-8800
Fax: 703-528-3816
1.1 REFERENCES

Various publications are referenced in other sections of the specifications to establish requirements for the work. These references are identified in each section by document number, date and title. The document number used in the citation is the number assigned by the sponsoring organization, e.g. UL 1 (1985; Rev thru Nov 1992) Flexible Metal Conduit. However, when the sponsoring organization has not assigned a number to a document, an identifying number has been assigned for convenience, e.g. UL’s unnumbered 1992 edition of their Building Materials Directory is identified as UL-01 (1992) Building Materials Directory. The sponsoring organization number (UL 1) can be distinguished from an assigned identifying number (UL-1) by the dash mark (-).

1.2 ORDERING INFORMATION

The addresses of the organizations whose publications are referenced in other sections of these specifications are listed below, and if the source of the publications is different from the address of the sponsoring organization, that information is also provided. Documents listed in the specifications with numbers which were not assigned by the sponsoring organization should be ordered from the source by title rather than by number.

ALUMINUM ASSOCIATION (AA)
Pubs Department
P.O. Box 753
Waldorf, MD 20601
Ph: 301-645-0756
Fax: 301-843-0159

AMERICAN BEARING MANUFACTURERS ASSOCIATION (ABEMA)
1101 Connecticut Ave., NW, Suite 700
Washington, DC 20036-4303
Ph: 202-429-5155
Fax: 202-223-4579

AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS (ACGIH)
1330 Camper Meadow Dr.
Cincinnati, OH 45240
Ph: 513-742-2020
Fax: 513-742-3355

AMERICAN CONCRETE INSTITUTE (ACI)
P.O. Box 19150
Detroit, MI 48219-0150
Ph: 313-532-2600
Fax: 313-538-0655
TECHNICAL
SPECIFICATIONS
DIVISION 1 - 16
c. Upon receipt of notification of the discovery, the Contracting Officer will notify the appropriate authorities as required by the Act. The cessation of the activity in the area shall be for a minimum period of 30 days after the contracting officer has received certification of receipt of notification from the appropriate authorities, in accordance with the Act.

d. The Contractor shall not resume activity in the area of the discovery until the Contracting officer has given the Contractor notice that the Contractor may resume the activity.
d. Ownership costs (depreciation) will be determined using the contractor's depreciation schedule (subject to the provisions of FAR 31.205-11).

e. License, taxes, storage and insurance costs are normally recovered as an indirect expense and unless the contractor charges these costs directly to contracts, they will be recovered through the indirect expense rate.

17. EVALUATION OF CONTRACTOR PERFORMANCE

a. As a minimum, the Contractor's performance will be evaluated upon final acceptance of the work. However, interim evaluation may be prepared at any time during contract performance when determined to be in the best interest of the Government.

b. The format for the evaluation will be SF 1420, and the Contractor will be rated either outstanding, satisfactory, or unsatisfactory in the areas of Contractor Quality Control, Timely Performance, Effectiveness of Management, Compliance with Labor Standards, and Compliance with Safety Standards. The Contractor will be advised of any unsatisfactory rating, either in an individual element or in the overall rating, prior to completing the evaluation, and all contractor comments will be made a part of the official record. Performance Evaluation Reports will be available to all DOD Contracting offices for their future use in determining Contractor responsibility, in compliance with DFARS 236.201(c)(1).

18. VALUE ENGINEERING CONTRACTOR PROPOSAL - VECP (AUG 86) (CESWF-CD)

a. Reference the Contract Clause "VALUE ENGINEERING - CONSTRUCTION."

b. After receipt of an approved VECP modification signed by the Contracting Officer, the Contractor may include its share of the Instant Contract Savings as part of the next scheduled Progress Payment estimate.

c. Payment of the Contractor's share of the Instant Contract Savings may be withheld at the discretion of the Contracting Officer, until a revised NAS or BAR CHART for the affected activity has been submitted and approved.

19. NATIVE AMERICAN GRAVES PROTECTION (JAN 1993)(52.219-4001) (CESWF)

a. The Native American Graves Protection and Repatriation Act, hereinafter referred to as "the Act", enacted November 16, 1990, (Public Law 101-601, 25 U.S. Code) is applicable to this contract.

b. The Contractor may discover Native American human remains and objects, as defined in the Act, during contract execution. In the event of such discovery the contractor shall immediately cease activity in the area of the discovery and shall immediately notify the Contracting Officer of the discovery. The Contractor shall make a reasonable effort to protect the items discovered in accordance with the Act and before resuming activity in the area. Fines and penalties for illegal trafficking in Native American human remains and cultural items are as defined in the Act.
Government can determine both ownership and operating costs for each piece of equipment or equipment groups of similar serial and series from the Contractor’s accounting records. When both ownership and operating costs cannot be determined from the Contractor’s accounting records, equipment costs shall be based upon the applicable provisions of EP 1110-1-8, "Construction Equipment Ownership and Operating Expense Schedule," Region VI. Working conditions shall be considered to be average for determining equipment rates using the schedule unless specified otherwise by the Contracting Officer. For equipment not included in the schedule, rates for comparable pieces of equipment may be used or a rate may be developed using the formula provided in the schedule. For forward pricing, the schedule in effect at the time of negotiations shall apply. For retrospective pricing, the Schedule in effect at the time the work was performed shall apply.

b. Equipment rental costs are allowable, subject to the provisions of FAR 31.105(d)(ii) and FAR 31.205-36, substantiated by certified copies of paid invoices. Rates for equipment rented from an organization under common control, lease-purchase or sale-leaseback arrangements will be determined using the schedule except that rental costs leased from an organization under common control that has an established practice of leasing the same or similar equipment to unaffiliated lessees are allowable. Costs for major repairs and overhaul are unallowable.

c. When actual equipment costs are proposed and the total amount of the pricing action is over $25,000, cost or pricing data shall be submitted on Standard Form 1411, "Contract Pricing Proposal Cover Sheet." By submitting cost or pricing data, the Contractor grants to the Contracting Officer or an authorizing representative the right to examine those books, records, documents and other supporting data that will permit evaluation of the proposed equipment costs. After price agreement the Contractor shall certify that the equipment costs or pricing data submitted are accurate, complete and current.

d. This does not apply to terminations. See EFARS 49.113(100) and FAR Part 49.

16. BASIS FOR SETTLEMENT OF PROPOSALS (JUL 1989) (EFARS 49.113(100))

Actual costs will be used to determine equipment cost for a settlement proposal submitted on the total cost basis under FAR 49.206-2b). In evaluating a termination settlement proposal using the total cost basis, the following principles will be applied to determine allowable equipment costs:

a. Actual costs for each piece of equipment, or groups of similar serial or series equipment, need not be available in the contractor's accounting records to determine total actual equipment costs.

b. If equipment costs have been allocated to a contract using predetermined rates, those charges will be adjusted to actual costs.

c. Recorded job costs adjusted for unallowable and unallocable expenses will be used to determine equipment operating expenses.
11. PAYMENT FOR UTILITY SERVICES (FAR 36.303)

Water, gas, and electricity are available from Government-owned and operated systems and will be furnished without charge to the Contractor.

12. LAYOUT OF WORK (APR 1984) (FAR 52.236-17)

The Contractor shall lay out his work from Government-established base lines and bench marks indicated on the drawings and shall be responsible for all measurements in connection with the layout. The Contractor shall furnish, at his own expense, all stakes, templates, platforms, equipment, tools, and materials and labor required to lay out any part of the work. The Contractor shall be responsible for the executing the work to the lines and grades that may be established or indicated by the Contracting Officer. The Contractor shall also be responsible for maintaining and preserving all stakes and other marks established by the Contracting Officer until authorized to remove them. If such marks are destroyed, by the Contractor or through his negligence before their removal is authorized, the Contracting Officer may replace them and deduct the expense of the replacement from any amounts due or to become due to the Contractor.

13. PAYMENT FOR MATERIALS DELIVERED OFF-SITE (JUL 1989) (EFARS 32-111(71))

Pursuant to the Contract Clause in this contract entitled "Payments Under Fixed-Price Construction Contract," materials delivered to the Contractor at locations other than the site of the work may be taken into consideration in making payments if included in payment estimates and if all the conditions of the Contract Clauses are fulfilled. Payment for items delivered to locations other than the work site will be limited to those materials which have been approved, if required by the technical provisions; those materials which have been fabricated to the point where they are identifiable to an item of work required under this contract. Such payment will be made only after receipt of paid or receipted invoices or invoices with cancelled check showing title to the items in the prime Contractor and including the value of materials and labor incorporated into the item. In addition to petroleum products, this clause will be limited to the following items: None.

14. PROCUREMENT AUTHORITY FOR FEDERAL INFORMATION RESOURCES

Pursuant to the Federal Information Resources Management Regulation (FIRMRR), Section 201-39.5202-3, this acquisition is not being conducted under the FIRMRR, however any modifications requiring Federal Information Processing (FIP) resources will be conducted under specific agency delegation of GSA's exclusive procurement authority for FIP resources. The specific GSA DPA case number is KAA-95-AD-002.


a. Allowable cost for construction and marine plant and equipment in sound workable condition owned or controlled and furnished by a Contractor or subcontractor at any tier shall be based on actual cost data when the
(3) General Construction. The concern will perform at least 15 percent of the cost of the contract, not including the cost of materials, with its own employees.

(4) Construction by Special Trade Contractors. The concern will perform at least 25 percent of the cost of the contract, not including the cost of materials, with its own employees.

9. PHYSICAL DATA (APR 1984) (FAR 52.236-4)

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

a. The physical conditions indicated on the drawings and in the specifications are the result of site investigations by surveys and borings.

b. Ground water levels

It has been observed that ground water levels in heavily timbered or grassed areas quite often undergo a significant temporary rise when the area is cleared and/or stripped. This increase in water level can hinder traffic and construction progress in the affected areas. The duration of the ground water rise varies considerably, depending on prevailing weather and/or climatic conditions. Ref: Yearbook of Agriculture, 1957, copy available for inspection in Fort Worth District Office.

10. AVAILABILITY AND USE OF UTILITY SERVICES (APR 1984) (FAR 52.236-14)

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

b. The Contractor, at its expense and in a workmanlike manner satisfactory to the Contracting Officer, shall install and maintain all necessary temporary connections and distribution lines, and all meters required to measure the amount of each utility used for the purpose of determining charges. Before final acceptance of the work by the Government, the Contractor shall remove all temporary connections, distribution lines, meters, and associated paraphernalia.

NOTE: Utilities are available at Administration Building Area only; None at project sites.
7. REQUIRED INSURANCE (FAR 28.307-2)

   a. The Contractor shall procure and maintain during the entire period of his performance under this contract the following minimum insurance.

       (1) Workers’ compensation and employers’ liability insurance in compliance with applicable state statutes, with a minimum employers’ liability coverage of $100,000.

       (2) Comprehensive general liability insurance for bodily injury in the minimum limits of $500,000 per occurrence. No property damage liability insurance is required.

       (3) Comprehensive automobile liability insurance covering the operation of all automobiles used in connection with the performance of the contract in the minimum limits of $200,000 per person and $500,000 per occurrence for bodily injury and $20,000 per occurrence for property damage. (See Contract Clause entitled Insurance—Work on a Government Installation)

8. LIMITATIONS ON SUBCONTRACTING (JAN 1991) (FAR 52.219-14)

   a. This clause does not apply to the unrestricted portion of a partial set-aside.

   b. By submission of an offer and execution of a contract, the Offeror/Contractor agrees that in performance of the contract in the case of a contract for—

       (1) Services (except construction). At least 50 percent of the cost of contract performance incurred for personnel shall be expended for employees of the concern,

       (2) Supplies (other than procurement from a regular dealer in such supplies). The concern shall perform work for at least 50 percent of the cost of manufacturing the supplies, not including the cost of materials.
5. AVAILABILITY OF FUNDS (APR 1984) (FAR 52.232-18)

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

6. CONTRACT DRAWINGS, MAPS AND SPECIFICATIONS (DEC 1991)
   (DFARS 252.236-7001)

a. The Government--

   (1) Will provide the Contractor, without charge, one set of reproducible large-scale drawings and ten (10) sets of specifications except for publications incorporated into the technical provisions by reference;

   (2) Will furnish additional sets on request, for the cost of reproduction.

b. The Contractor shall--

   (1) Check all drawings furnished immediately upon receipt;

   (2) Compare all drawings and verify the figures before laying out the work;

   (3) Promptly notify the Contracting Officer of any discrepancies; and

   (4) Be responsible for any errors which might have been avoided by complying with this paragraph.

c. Large scale drawings shall, in general, govern small scale drawings. Figures marked on drawings shall, in general, be followed in preference to scale measurements.

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

e. The work shall conform to the specifications and the contract drawings identified on the following index of drawings:
may further provide for an equitable readjustment of liquidated damages under the new completion schedule.

4. TIME EXTENSIONS FOR UNUSUALLY SEVERE WEATHER (OCT 1989) (ER 415-1-15)

a. This provision specifies the procedure for determination of time extensions for unusually severe weather in accordance with the contract clause entitled "Default: (Fixed Price Construction)." In order for the Contracting Officer to award a time extension under this clause, the following conditions must be satisfied:

(1) The weather experienced at the project site during the contract period must be found to be unusually severe, that is, more severe than the adverse weather anticipated for the project location during any given month.

(2) The unusually severe weather must actually cause a delay to the completion of the project. The delay must be beyond the control and without the fault or negligence of the contractor.

b. The following schedule of monthly anticipated adverse weather delays is based on National Oceanic and Atmospheric Administration (NOAA) or similar data for the project location and will constitute the base line for monthly weather time evaluations. The contractor's progress schedule must reflect these anticipated adverse weather delays in all weather dependent activities.

MONTHLY ANTICIPATED ADVERSE WEATHER DELAY
WORK DAYS BASED ON (5) DAY WORK WEEK

<table>
<thead>
<tr>
<th>JAN</th>
<th>FEB</th>
<th>MAR</th>
<th>APR</th>
<th>MAY</th>
<th>JUN</th>
<th>JUL</th>
<th>AUG</th>
<th>SEP</th>
<th>OCT</th>
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<td>6</td>
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<td>1</td>
<td>3</td>
<td>4</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>5</td>
</tr>
</tbody>
</table>

Adm. 1

188-5788

90800-3
c. Utility Outages

The Contractor shall coordinate all requests for utility outages with the Contracting Officer in writing 7 days prior to date of requested outage.

(1) Water, gas, steam, and sewer outages shall be held to a maximum duration of 4 hours unless otherwise approved in writing.

(2) Electrical outages shall have a maximum duration of 4 hours.

d. Street Closings

The Contractor shall coordinate all requests for street closings with the Contracting Officer in writing 7 days prior to date of requested outage.

(1) One lane traffic shall be maintained at all times (except that a total closure may be allowed for specific 8-hour periods).

(2) 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.

e. Special Work Conditions: Utilities are available at Admin. Area only; None at Project site.

2. LIQUIDATED DAMAGES - CONSTRUCTION (APR 1984) (FAR 52.212-5)

a. If the Contractor fails to complete the work within the time specified in the contract, or any extension, the Contractor shall pay to the Government as liquidated damages, the sums for each day of delay as set forth in the Schedule in Paragraph 1-a above.

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

c. If the Government does not terminate the Contractor's right to proceed, the resulting damage will consist of liquidated damages until the work is completed or accepted.

3. TIME EXTENSIONS (APR 1984) (FAR 52.212-6)

Notwithstanding any other provisions of this contract it is mutually understood that the time extensions for changes in the work will depend upon the extent, if any, by which the changes cause delay in the completion of the various elements of construction. The change order granting the time extension may provide that the contract completion date will be extended only for those specific elements so delayed and that the remaining contract completion dates for all other portions of the work will not be altered and
1. COMMENCEMENT, PROSECUTION AND COMPLETION OF WORK (APR 1984) (FAR 52.212-3)

   a. The Contractor shall be required to (a) commence work under this contract within ten (10) days after the date the Contractor receives the notice to proceed, (b) prosecute the work diligently, and (c) complete the entire work ready for use not later than the dates or the number of calendar days set forth in the schedule below. The time stated for completion shall include final cleanup of the premises.

   **SCHEDULE**

<table>
<thead>
<tr>
<th>Item of Work</th>
<th>Commencement of Work (calendar days)</th>
<th>Completion of Work (calendar days)</th>
<th>Liquidated Damages per calendar day</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) All Work</td>
<td>**</td>
<td>240</td>
<td>$960.00</td>
</tr>
<tr>
<td>(2) Final As-Built Drawings</td>
<td>*</td>
<td>*</td>
<td>$53.00</td>
</tr>
<tr>
<td>(3) Operation and Maintenance (O &amp; M) Manuals</td>
<td>**</td>
<td>**</td>
<td>$53.00</td>
</tr>
</tbody>
</table>

   *As-Built Drawings

   The Contractor shall commence work on final as-built drawings upon his receipt of the approved preliminary as-built drawings and the reproducible original mylar contract drawings and CADD tapes or disks. The Contractor shall have 30 calendar days to complete and return to the Contracting Officer all specified final as-built drawing work. Upon satisfactory completion of this work the Contractor shall have earned the amount shown for Final As-Built Drawings in the Bid Schedule.

   **O & M Manuals

   O & M Manuals shall be developed and submitted in accordance with Section 01700 CONTRACT CLOSEOUT, at least 60 calendar days prior to the scheduled contract completion date. Upon approval of fully developed O & M Manuals the Contractor shall have earned the amount shown for "Operations and Maintenance Manuals" in the Bid Schedule.

   b. 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.

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<td>AVAILABILITY OF FUNDS (APR 1984)(FAR 52.232-18)</td>
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<td>6.</td>
<td>CONTRACT DRAWINGS, MAPS AND SPECIFICATIONS (FAR SUPP 252.236-7001)</td>
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<td>REQUIRED INSURANCE (FAR 28.307-2)</td>
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<td>8.</td>
<td>LIMITATIONS ON SUBCONTRACTING (FAR 52.219-14)</td>
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<td>9.</td>
<td>PHYSICAL DATA (APR 1984)(FAR 52.236-4)</td>
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<td>10.</td>
<td>AVAILABILITY AND USE OF UTILITY SERVICES (FAR 52.236-14)</td>
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<td>PAYMENT FOR UTILITY SERVICES (FAR 36.303)</td>
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<td>LAYOUT OF WORK (FAR 52.236-17)</td>
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<td>13.</td>
<td>PAYMENT FOR MATERIALS DELIVERED OFF-SITE (EFARS 32-111(71))</td>
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<td>EQUIPMENT OWNERSHIP AND OPERATING EXPENSE SCHEDULE (EFARS 31.105(d)(2)(1)(A))</td>
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<td>16.</td>
<td>BASIS FOR SETTLEMENT OF PROPOSALS (EFARS 49.113(100))</td>
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<td>EVALUATION OF CONTRACTOR PERFORMANCE (DAEN-PRP)</td>
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<td>VALUE ENGINEERING CONTRACTOR PROPOSAL - VEC (CESWF-CD)</td>
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<td>19.</td>
<td>NATIVE AMERICAN GRAVES PROTECTION (52.219-4001)</td>
<td>9</td>
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</table>
(1) Name, address, and telephone number of the subcontractor;
(2) Employer identification number of the subcontractor;
(3) Estimated dollar amount of the subcontract;
(4) Estimated starting and completion dates of the subcontract; and
(5) Geographical area in which the subcontract is to be performed.

(e) As used in this Notice, and in any contract resulting from this solicitation, the "covered area" is:

the New Mexico counties of Catron, Colfax, De Baca, Guadalupe, Lincoln, Los Alamos, McKinley, Mora, Rio Arriba, San Juan, San Miguel, Santa Fe, Socorro, Taos, Torrance, and Valencia.
ALBUQUERQUE, NM, ECO AREA

NOTICE OF REQUIREMENT FOR AFFIRMATIVE ACTION TO ENSURE
EQUAL EMPLOYMENT OPPORTUNITY (APR 1984) (FAR 52.222-23)

(a) The offeror's attention is called to the Equal Opportunity clause
and the Affirmative Action Compliance Requirements for Construction clause
of this solicitation.

(b) The goals for minority and female participation, expressed in
percentage terms for the Contractor's aggregate workforce in each trade on
all construction work in the covered area, are as follows:

<table>
<thead>
<tr>
<th>Goals for minority participation for each trade</th>
<th>Goals for female participation for each trade</th>
</tr>
</thead>
<tbody>
<tr>
<td>45.9%</td>
<td>6.9%</td>
</tr>
</tbody>
</table>

These goals are applicable to all the Contractor's construction work
performed in the covered area. If the Contractor performs construction
work in a geographical area located outside of the covered area, the
contractor shall apply the goals established for the geographical area
where the work is actually performed. Goals are published periodically in
the Federal Register in notice form, and these notices may be obtained from
any Office of Federal Contract Compliance Programs Office.

(c) The Contractor's compliance with Executive Order 11246, as
amended, and the regulations in 41 CFR 60-4 shall be based on (1) its
implementation of the Equal Opportunity clause, (2) specific affirmative
action obligations required by the clause entitled "Affirmative Action
Compliance Requirements for Construction," and (3) its efforts to meet the
goals. The hours of minority and female employment and training must be
substantially uniform throughout the length of the contract, and in each
trade. The Contractor shall make a good faith effort to employ minorities
and women evenly on each of its projects. The transfer of minority or
female employees or trainees from Contractor to Contractor, or from project
to project, for the sole purpose of meeting the Contractor's goals shall be
a violation of the contract, Executive Order 11246, as amended, and the
regulations in 41 CFR 60-4. Compliance with the goals will be measured
against the total work hours performed.

(d) The Contractor shall provide written notification to the Director,
Office of Federal Contract Compliance Programs, within 10 working days
following award of any construction subcontract in excess of $10,000 at any
tier for construction work under the contract resulting from this
solicitation. The notification shall list the--
area by the construction industry; and (3) the proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination (for the given area and type of construction). (See 29 CFR 5.5(a)(v)).

In the listing above, the "SU" designation means that rates listed under that identifier do not reflect collectively bargained wage and fringe benefit rates. Other designations indicate unions whose rates have been determined to be prevailing.

END OF GENERAL DECISION
Including Tank Wagon Drivers, Semi-Trailer Driver (Flat-Bed or Van Tandems); Light Equipment Mechanic; Dump Trucks (Including All Highway and Off-Highway) 35 C.Y.W.L.C. and Over; Truck and Trailer or Semi-Trailer (Flated); eject all.

GROUP IX:
Lowboy (Heavy Equipment Double Gooseneck); Heavy Equipment Mechanic; Welder (Body and Fender Men).

TRUCK DRIVERS ZONE PAY BASING POINTS AND DEFINITIONS LISTED BELOW FOR BUILDING AND HEAVY CONSTRUCTION - BASING POINTS ARE AS FOLLOWS:

ALAMOGORDO, ALBUQUERQUE, ARTESIA, BAYARD, BELEN, CARLSBAD, CLOVIS, DEMING, ESPAÑOLA, EUNICE, FARMINGTON, GALLUP, GRANTS, HOBBS, LAS CRUCES, LAS VEGS, LORDSBURG, LOVINGTON, PORTALES, RATON, ROSWELL, RUIDOSO, SANTA FE, SANTA ROSE, SILVER CITY, SOCORRO, TAOS, TUCUMCARI

ZONE I
Projects within 15 miles from the starting points above

ZONE II
Projects 15 or more road miles but less than 35 miles from above, includes all of Los Alamos County

ZONE III
Projects more than 35 road miles, or more from above.

--------------------------------------------------------------------------------------------------------------------------

FOOTNOTE:

**LIGHT COMMERCIAL DEFINITION

Construction, erection, alteration, repair, modification, addition to or improvement in whole or in part of structures for which the major support system is wood frame construction and will also include all apartments over 4 stories, all convenience stores, fast food restaurants, automobile service stations & motels up to 2 stories high.

--------------------------------------------------------------------------------------------------------------------------

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

--------------------------------------------------------------------------------------------------------------------------

Requests for additional classifications and wage rates may be submitted to the contracting officer after award, and may be approved only if: (1) the work to be performed by the classification requested is not performed by a classification in the wage determination; (2) the classification is utilized in the
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<tr>
<td>IX</td>
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</table>

**TRUCK DRIVER (BUILDING & HEAVY CONSTRUCTION) CLASSIFICATIONS**

**GROUP I:**
Pickup 3/4 Ton and Under, Lubrication, Light Tire Repair and Washer, Swamper, 2 or 4 and up.

**GROUP II:**
Dump or Batch Truck Under 8 C.Y.W.L.: Flat Bed (bobtail) 2 Ton and Under, Warehouseman including Material Check, Fork Lift Under 5 Ton MRC.

**GROUP III:**
Dump Trucks (Including All Highway and Off Highway) 8 up to 16 C.Y.W.L.C.; Water, Fuel or Oil Trucks Less Than 3,000 gal. Flat Bed (bobtail) Over 2 Tons.

**GROUP IV:**
Distributor Driver, Heavy Tire Repair, Lumber Carrier Driver, Young Buggy or Similar Equipment, Transit Mix or Agitator 2 or 3 Axle Bobtail Equipment, Scissor Truck, Bulk Cement Bobtail 2 or 3 Axle, Semi-Trailer Flat Bed or Van Single Axle Forklift 5 Ton and over M.R.C.

**GROUP V:**
Dumpsters and Dumpcrete Driver; Water, Fuel or Oil Trucks 3,000 to 6,000 Gallons; Lowboys and Light Equipment Driver; Euclid Type Tank Wagon Under 6,000 Gallons.

**GROUP VI:**
Vacuum Truck; Dump Trucks (including all highway and off-highway 16 up to 22 C.Y.W.L.C.

**GROUP VII:**
Transit Mix or Agitator Semi or 4 Axle Equipment Driver; Flaherty Truck Type Spreader Box Driver; Slurry Truck Driver Bulk Cement Driver; Semi-Doubles; 5 Axle Bobtail; Winch Truck and "A" Frame; Dump Truck (including all Highway and Off-Highway) 22 CY up to 35 C.Y.W.L.C.

**GROUP VIII:**
Euclid Diesel Power Turnarocker; Terra Coba-DW20-Tourneau Pulls and Similar Diesel Powered Equipment when used to haul Materials and Assigned to a Teamster-Lowboy Heavy Equipment Driver; Water, Fuel and Oil Trucks 6,000 Gallons and Over
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<td>SHEET METAL WORKERS</td>
<td>20.75 5.08</td>
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**NM950001**

<table>
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<tr>
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<tr>
<td>Zone I</td>
<td>12.55</td>
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<tr>
<td>Zone II</td>
<td>13.55</td>
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<tr>
<td>Zone III</td>
<td>15.05</td>
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<table>
<thead>
<tr>
<th>Hand finisher, machine texture New work</th>
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<tbody>
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<td>Zone I</td>
<td>14.05</td>
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<tr>
<td>Zone II</td>
<td>15.05</td>
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<td>Zone III</td>
<td>16.55</td>
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<table>
<thead>
<tr>
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<tr>
<td>Zone II</td>
<td>13.30</td>
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<tr>
<td>Zone III</td>
<td>14.80</td>
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</table>

**DONA ANA, OTERO, LUNA COUNTIES**

**Commercial:**

- Brush, Roller, Drywall, Paperhanger: 9.40 2.02
- Spray, Sandblast, Swing Stage, Steam Cleaning: 11.00 2.02

**Heavy:**

- Brush, Roller: 10.25 2.02
- Spray, Sandblast, Swing Stage, Steam Cleaning: 11.50 2.02

- Water Tanks, Towers, Smoke Stacks: 12.50 2.02

**PAINTERS ZONE DEFINITIONS**

**ALBUQUERQUE, SANTA FE, AND BELEN SHALL BE CONSIDERED IN ZONE I**

- Zone I - BASE PAY UP TO 30 MILES

**Zone II - Extending 30 miles to 75 miles beyond Zone I.**

**Zone III - Extending 75 miles and beyond Zone II.**

---

**PAIN1665A 04/01/1994**

<table>
<thead>
<tr>
<th>Soft Floor Layers</th>
<th>Rates</th>
<th>Fringes</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZONE I</td>
<td>13.70</td>
<td>2.38</td>
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<tr>
<td>ZONE II</td>
<td>14.70</td>
<td>2.38</td>
</tr>
<tr>
<td>ZONE III</td>
<td>16.20</td>
<td>2.38</td>
</tr>
</tbody>
</table>

**SOFT FLOOR LAYERS ZONE DEFINITIONS**

- **Zone I** -- Cities and Towns Basing Points - Miles from Main Post Office
- **Albuquerque, Santa Fe, and Belen shall be considered Zone I.**
- **Albuquerque - 30 mile radius**
### Paperhangers:
- **New work**
  - Zone I: 16.00
  - Zone II: 17.00
  - Zone III: 18.50
- **Repaint/remodel**
  - Zone I: 13.60
  - Zone II: 14.60
  - Zone III: 16.10

### All Other Work; Commercial:
- **Brush & Roller, Hand Texture**
  - **New work**
    - Zone I: 13.70
    - Zone II: 14.70
    - Zone III: 16.20
  - **Repaint/remodel**
    - Zone I: 11.95
    - Zone II: 12.95
    - Zone III: 14.45

- **Spray, Special Coating Application**
- **Sandblaster, Steel Painter, Stripling**

### Machine Operator
- **New work**
  - Zone I: 14.20
  - Zone II: 15.20
  - Zone III: 16.70
- **Repaint/remodel**
  - Zone I: 12.45
  - Zone II: 13.45
  - Zone III: 14.95

### Sign Painter
- **New work**
  - Zone I: 14.55
  - Zone II: 15.55
  - Zone III: 17.05

### Paper Hanger
- **New work**
  - Zone I: 14.70
  - Zone II: 15.70
  - Zone III: 17.20
- **Repaint/Remodel**
  - Zone I: 12.95
  - Zone II: 13.95
  - Zone III: 15.45

### Ames Tool Operator
- **New work**
  - Zone I: 14.25
  - Zone II: 15.25
  - Zone III: 16.75
Grant, Luna, Otero and Sierra 15.76 2.79
Hidalgo 16.26 2.79

PAINO063B 04/01/1994

PAINTERS:
Mines, Mills, Power Plants, energy
plants, refineries, coal gassifica-
tion plants, nuclear related facili-
ties & all steel work incidental
thereeto including stacks of all
description:
Brush, roller, pot tender, sand-
blaster grinder operator:
New work:
Zone I 15.00 2.38
Zone II 16.00 2.38
Zone III 17.50 2.38
Repaint/remodel:
Zone I 12.75 2.38
Zone II 13.75 2.38
Zone III 15.25 2.38

Spray Preparation for and application of
Epoxy & Special Coatings:
New Work
Zone I 15.50 2.38
Zone II 16.50 2.38
Zone III 18.00 2.38
Repaint/remodel
Zone I 13.18 2.38
Zone II 14.18 2.38
Zone III 15.68 2.38

Drywall Finisher & Ames Tool Op.:
New Work
Zone I 15.50 2.38
Zone II 16.50 2.38
Zone III 18.00 2.38
Repaint/remodel
Zone I 13.18 2.38
Zone II 14.18 2.38
Zone III 15.68 2.38

Handfinisher, machine textures:
New Work
Zone I 15.30 2.38
Zone II 16.30 2.38
Zone III 17.80 2.38
IRON0840C  08/01/1994

REMAINING COUNTRIES

IRONWORKERS

<table>
<thead>
<tr>
<th>Rates</th>
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LAB00016A  10/03/1993

LABORERS:

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<tbody>
<tr>
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<tr>
<td>GROUP II</td>
<td>10.51</td>
<td>2.21</td>
</tr>
<tr>
<td>GROUP III</td>
<td>11.60</td>
<td>2.21</td>
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</table>

LABORER CLASSIFICATIONS

GROUP I: Chairman -- Stake Drivers -- Demolition -- Hand Flagmen -- Heater Tender -- Pick and Shovel Work -- Window Cleaning and Clean-up, (Chairman and Stake Drivers working

GROUP II: Sandblaster (potman); Cement Mason Tender; hod Carrier; Mortar Mixers; Plaster Tenders and Brick Masons Tenders;

Powermen and Blasters; Sandblaster; Gunnite Workers; Terrazzo Grinders; Air power Tool Operators; Power Buggy Operator; Cutting Torch Operator; Wagon Drill Operators; Pipelayers; Pumpcrete Nozzlemen; Water Pump Operator; Kettle And Pot Men; All Pip Cleaning and Wrapping; Mortar and Plaster Mixing Machine, Grout Machines; Pumpcrete machine.

GROUP III: Asbestos Abatement Laborer; Toxic and Hazardous Waste Removal Laborer; Lead Base Paint Removal Laborer.

* MARB00002C  06/01/1995

MARBLE MASON, TILE LAYERS & TERRAZZO WORKERS

Bernalillo County and the Townships of Belen, Bernalillo, Edgewood, Los Lunas, Moriarty, Rio Rancho and Santa Fe

<table>
<thead>
<tr>
<th>Rates</th>
<th>Fringes</th>
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<tbody>
<tr>
<td>15.47</td>
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Catron, Colfax, Cibola, Harding, Los Alamos, McKinley, Mora, Rio Arriba, Sandoval, San Juan, San Miguel, Socorro, Taos, Torrance, Union and Valencia Counties

<table>
<thead>
<tr>
<th>Rates</th>
<th>Fringes</th>
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</thead>
<tbody>
<tr>
<td>17.97</td>
<td>2.97</td>
</tr>
</tbody>
</table>
Locomotive op., Winch Truck, Front End Loaders (under 2 CY), Power Plants which Generate Over 15 KW., Welding Machines.

GROUP III
Bituminous Distributors, Boilers, Retort & Hot Oil Heaters
Concrete Mixers, (1 CY & Over), Conc. Paver—Single Drum,
Drilling Equip., (Refrigeration, Slusher, Jumbo forms),
Trenching Machines (all Types), Pumpcrete & Gunite Machines
Slipform Paver, Mechanical Bullfloats, Concrete Slab Spreading
Machine, Conc. Slab Finishing Machine, Asphalt Plants,
Bituminous Finishing Machines, Crushing Plants.

GROUP IV
Front End Loaders (2 thru 10 CY), Rollers Steel Wheeled—All
Types, Bulldozer, Scrapers (Motor or Towed), Elevating Graders
Concrete Batching Plants, Self-Propelled Rollers — Equipped
W/Dozer, Twin-Bowl Scrapers and Quad 8 or 9 Pushers (35: Over
Basic Rate).

GROUP V
Hydraulic Cranes—With less than 50 feet of Boom (20 Tons and
Under), Concrete Paver—Double Drum, Cat Cranes, Hysters, Side
and Swingboom Cats, 2 Drum Hoist, Auto Fine Grader.

GROUP VI
Mucking Machines—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, Hydraulic & Stiff Leg, Pipemobile (No 2 Operator)
Piledriver, Hydraulic Cranes (20 Tons & Over), Mine Hoist,
Belt Loader ("C.M.I." Type), Boom and Jibs 150 ft. Through
199 ft. —$. 25 per hour above base pay 200 ft and over—50:
per hour above base pay. Shovel (Wheel Type), Boring Machine
(Tunnel or Shaft Mole), Pipe Mobile.

IRON0495A 07/01/1995
Rates Fringes
BERNALILLO, CATRON, CIBOLA, COLFAX, DEBACA, GUADALUPE, LINCOLN,
LOS ALAMOS, TAOS, MCKINLEY, MORA, RIO ARRIBA, SAN JUAN, SAN
MIGUEL, SANDOVAL, SANTA FE, SOCORRO, TORRANCE, VALENCIA COUNTIES
IRONWORKERS 14.90 5.31
HAZARDOUS PAY - The following pay shall be applicable for every
hour an operating engineer is required by governmental
regulations and does wear special equipment for hazardous work at
the designated levels. This is applicable in all three zones

LEVEL C - 10% above regular hourly wage
LEVEL B - 10% above regular hourly wage
LEVEL A - 15% above regular hourly wage

ZONE PAY

ZONE I - Albuquerque - 0 to 50 mile radius of
Bernalillo County Court House shall
be a Free Zone

- Farmington - 0 to 15 mile radius of Farmington
City Hall shall be a Free Zone

- Santa Fe - 0 to 25 mile radius of the State capitol
Building shall be a free zone

Zone II - Shall be $1.50 per hour above base pay. Will apply
outside of above parameters up to 35 miles

Zone III - Shall be $.75 cents per hour above Zone II for a
total of $2.25 per hour and will apply after 35
miles of Zone I’s parameters.

POWER EQUIPMENT OPERATOR CLASSIFICATIONS

GROUP I
Fireman, Oiler, Screedman, Scale op. such as Bin-a-Batch,
Rubber Tired Farm Type Tractor, Tractors under 50 hp w/o
Attachments, Breakman, Concrete Paving Curing Machine
(Bridgetype).

GROUP II
Rollers, Sheepsfoot or Pneumatic Self-Propelled w/o Dozer,
Concrete Conveyors, Service Truck op. (Head Oiler), Air
Compressor (300 CFM & Over), Pumps (6" & Over), Screening
Plants, Concrete Mixers (Under 1 CY), Concrete Saw or
Grinder-Span Type, 1 Drum Hoist, Air Tugger, Elevating Belt
Type Loaders, Forklift, Lumber Stacker, Tractor Farm Type
(under 50 HP w/Attachments), Motorman and Industrial
| TECHNICIANS | 14.01 | 3.45+4% |
| INSTALLERS | 11.54 | 3.45+4% |

FROM THE MAIN POST OFFICE OF ARTESIA, CARLSBAD, HOBBS & LOVINGTON, NEW MEXICO

ZONE I - 0 to 12 miles
ZONE II - 12 miles to 22 miles
ZONE III - 22 miles to 40 miles
ZONE IV - 40 miles and beyond

---

ELEV0128B 11/01/1993
CHAVES, HIDALGO, DONA ANA, GRANT, LUNA, OTERO & SIERRA COUNTIES

**ELEVATOR CONSTRUCTORS:**
**MECHANIC**

<table>
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ELEV0131A 02/01/1995
REMAINDER OF COUNTIES:

**ELEVATOR CONSTRUCTORS:**
**MECHANIC**

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<tbody>
<tr>
<td>17.24</td>
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</table>

**FOOTNOTE:** a. Under 5 years service 6%; over 5 years service 8%.

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ENGI0953C 11/01/1993

**POWER EQUIPMENT OPERATORS:**
**BUILDING CONSTRUCTION:**

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<thead>
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<tr>
<td>II</td>
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<td>III</td>
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</tr>
<tr>
<td>IV</td>
<td>13.11</td>
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<td>V</td>
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<tr>
<td>VI</td>
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<td>VII</td>
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<td>VIII</td>
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**HEAVY CONSTRUCTION:**

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<tr>
<td>II</td>
<td>13.23</td>
<td>2.65</td>
</tr>
<tr>
<td>III</td>
<td>13.32</td>
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00710-11
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<th></th>
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<td>21.39</td>
<td>4.15+4%</td>
</tr>
<tr>
<td>CABLE SPLICERS</td>
<td>23.25</td>
<td>4.15+4%</td>
</tr>
<tr>
<td></td>
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<td></td>
</tr>
<tr>
<td>ELEC0611E 07/01/1995</td>
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</tr>
<tr>
<td>ZONE I</td>
<td></td>
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</tr>
<tr>
<td>ELECTRICIANS</td>
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<td>4.15+4%</td>
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<td>CABLE SPLICERS</td>
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<tr>
<td>ZONE II</td>
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<tr>
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<tr>
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<tr>
<td>CABLE SPLICERS</td>
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<td>4.15+4%</td>
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<tr>
<td>ZONE IV</td>
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<td>4.15+4%</td>
</tr>
<tr>
<td>CABLE SPLICERS</td>
<td>18.25</td>
<td>4.15+4%</td>
</tr>
<tr>
<td>ZONE I</td>
<td></td>
<td></td>
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<tr>
<td>SOUNDMEN</td>
<td>16.45</td>
<td>3.45+4%</td>
</tr>
<tr>
<td>TECHNICIANS</td>
<td>13.16</td>
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<td>INSTALLERS</td>
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<td>ZONE III</td>
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<tr>
<td>SOUNDMEN</td>
<td>17.05</td>
<td>3.45+4%</td>
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<tr>
<td>TECHNICIANS</td>
<td>13.76</td>
<td>3.45+4%</td>
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<tr>
<td>INSTALLERS</td>
<td>11.29</td>
<td>3.45+4%</td>
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<tr>
<td>ZONE IV</td>
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<tr>
<td>SOUNDMEN</td>
<td>17.30</td>
<td>3.45+4%</td>
</tr>
</tbody>
</table>
Zone 2
Electricians
21.39
Cable Splicers
23.25

Zone 4
Electricians
23.44
Cable Splicers
25.30

Basic Wage Rates

City
Miles From
Main Post Office

*Albuquerque
Santa Fe
Las Vegas
Farmington
Raton
Belen
Espanola
Los Lunas
Tucumcari
Roswell
Ruidoso
Portales
Carrizozo
Clovis
Gallup

25 miles
10 miles
8 miles
6 miles
6 miles
12 miles
14 miles
12 miles
6 miles
12 miles
12 miles
12 miles
12 miles
12 miles
10 miles

*The eastern edge of the Albuquerque Zone extends no further than the western boundary of the Village of Tijeras.

Zone 2 extending up to twenty (20) miles beyond Zone 1, EXCEPT ALBUQUERQUE, rates per hour shall be increased by nine percent (9%) of the journeyman rate for Zone 1.

Zone 3 extending up to thirty (30) miles beyond Zone 1, EXCEPT ALBUQUERQUE, rates per hour shall be increased by fifteen percent (15%) of the journeyman rate for Zone 1.

Zone 4 anything beyond thirty (30) miles from Zone 1, EXCEPT ALBUQUERQUE, rates per hour shall be increased by twenty-six percent (26%) of the journeyman rate for Zone 1.

FOR ESTABLISHING THE OUTLYING ZONES FROM THE ALBUQUERQUE FREE ZONE ONLY, ZONE 2 SHALL EXTEND UP TO TEN (10) MILES BEYOND ZONE 1, ZONE 3 SHALL EXTEND UP TO TWENTY (20) MILES BEYOND ZONE 1, AND ZONE 4 ANYTHING BEYOND TWENTY (20) MILES FROM ZONE 1.
Switching stations adjacent to power plants in Eddy and Lea Cos.; the following zones listed shall be designated from post office of Artersia, Carlsbad, Hobbs & Lovington:

Zone I - 0 to 12 miles  Zone III - 22 to 40 miles
Zone II - 12 to 22 miles  Zone IV - 40 miles

Lineman - Technicians:
 Zone I  17.05  4.05+3.75%
 Zone II  17.50  4.05+3.75%
 Zone III  17.65  4.05+3.75%
 Zone IV  17.90  4.05+3.75%

Cable Splicers:
 Zone I  17.40  4.05+3.75%
 Zone II  17.85  4.05+3.75%
 Zone III  18.00  4.05+3.75%
 Zone IV  18.25  4.05+3.75%

Equipment Op. and Mechanics
(includes Helicopter Op. & Mechanics): 8
 Zone I  16.20  4.05+3.75%
 Zone II  16.65  4.05+3.75%
 Zone III  16.80  4.05+3.75%
 Zone IV  17.05  4.05+3.75%

Powderman:
 Zone I  14.83  4.05+3.75%
 Zone II  15.28  4.05+3.75%
 Zone III  15.43  4.05+3.75%
 Zone IV  15.68  4.05+3.75%

Groundman - Jackhammer Op.:
 Zone I  12.11  4.05+3.75%
 Zone II  12.56  4.05+3.75%
 Zone III  12.71  4.05+3.75%
 Zone IV  12.96  4.05+3.75%

---

ELECO611C  07/01/1995

**ELECTRICIANS:**
Bernalillo, Santa Fe, Torrance, DeBaca, Guadalupe, Quay, San Miguel, Mora, Harding, Union, Colfax, Taos, Rio Arriba, Grant, Sandoval, Valencia, Socorro, Catron, McKinley, Sierra, San Juan, Chaves, Curry, Lincoln, Cibola & Roosevelt Counties

| Zone 1 | Electricians | 18.60 | 4.15+4% |
| Zone 1 | Cable Splicers | 20.46 | 4.15+4% |

| Zone 2 | Electricians | 20.27 | 4.15+4% |
| Zone 2 | Cable Splicers | 22.13 | 4.15+4% |
Switching stations and sub-stations adjacent to power plants in Zones I and II in Luna, Dona Ana, Otero & Hidalgo Cos., exclusive of White Sands Missile Range & that portion of Fort Bliss in New Mexico.

Linemen - Technicians
Zone I  15.15  2.90+3.75%
Zone II 17.10  2.90+3.75%

Cable Splicers
Zone I  15.45  2.90+3.75%
Zone II 17.44  2.90+3.75%

Equipment Op. (includes Helicopter Op.):
Zone I  13.18  2.90+3.75%
Zone II 14.88  2.90+3.75%

Equipment Mechanic (includes Helicopter Mech.):
Zone I  13.18  2.90+3.75%
Zone II 14.88  2.90+3.75%

Powderman:
Zone I  12.73  2.90+3.75%
Zone II 14.36  2.90+3.75%

Groundman - Jackhammer Op.:
Zone I  10.76  2.90+3.75%
Zone II 12.14  2.90+3.75%

ZONE I:

a. The area within a 25 mile radius from the Downtown Post Office in El Paso, Texas. Fort Bliss and Biggs Field Property to be included in this Free Zone. Fort Bliss and Biggs Field to be defined by official U.S. Government Map

b. The area within a five mile radius of any city, town, or municipality within which an employer establishes or maintains his permanent place of business.

c. The area within a fifteen mile radius from the Post Office in Las Cruces, New Mexico, and within a five mile radius from the Post Office in Alamogordo, Deming, and Lordsburg, New Mexico.

d. The area ten miles East and ten miles West of Interstate 10, between El Paso, Texas and Las Cruces, New Mexico.

ZONE II: All other areas of the jurisdiction except those specified in Zone I.
Equipment Mechanic (includes helicopter mechanic):
Zone I  17.67  4.15+3.75%
Zone II  19.34  4.15+3.75%
Zone III 20.46  4.15+3.75%
Zone IV  22.51  4.15+3.75%

Powderman:
Zone I  16.18  4.15+3.75%
Zone II  17.85  4.15+3.75%
Zone III 18.97  4.15+3.75%
Zone IV  21.05  4.15+3.75%

Groundman – Jackhammer Op.:
Zone I  13.21  3.90+3.75%
Zone II  14.88  3.90+3.75%
Zone III 16.00  3.90+3.75%
Zone IV  18.05  3.90+3.75%

Zone 1 Basic Wage Rates Miles From Main Post Office
City  Miles From
*Albuquerque  25 miles
Santa Fe  10 miles
Las Vegas  8 miles
Farmington  6 miles
Raton  6 miles
Tucumcari  6 miles
Gallup  10 miles
Roswell  12 miles
Ruidoso  12 miles
Portales  12 miles
Carrizozo  12 miles
Clovis  12 miles
Belen  12 miles
Los Lunas  12 miles
Espanola  14 miles

*The eastern edge of the Albuquerque Zone extends no further than the western boundary of the Village of Tijeras.

Zone 2 extending up to twenty (20) miles beyond Zone 1, EXCEPT ALBUQUERQUE, rates per hour shall be increased by nine percent (9%) of the journeyman rate for Zone 1.

Zone 3 extending up to thirty (30) miles beyond Zone 1, EXCEPT ALBUQUERQUE, rates per hour shall be increased by fifteen percent (15%) of the journeyman rate for Zone 1.

Zone 4 anything beyond thirty (30) miles from Zone 1, EXCEPT ALBUQUERQUE, rates per hour shall be increased by twenty-six percent (26%) of the journeyman rate for Zone 1.
<table>
<thead>
<tr>
<th></th>
<th>Rates</th>
<th>Fringes</th>
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<tr>
<td><strong>ELECTRICIANS</strong></td>
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<td></td>
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<tr>
<td>Zone I</td>
<td>15.15</td>
<td>2.50+3.5%</td>
</tr>
<tr>
<td>Zone II</td>
<td>17.10</td>
<td>2.50+3.5%</td>
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<tr>
<td><strong>CABLE SPICLERS:</strong></td>
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<tr>
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<td>15.40</td>
<td>2.50+3.5%</td>
</tr>
<tr>
<td>Zone II</td>
<td>17.35</td>
<td>2.50+3.5%</td>
</tr>
</tbody>
</table>

Zone 1: The area within a 25 mile radius from the downtown Post Office in El Paso, TX. Ft Bliss and Biggs Field proper to be included in this free zone. The area within a 15 mile radius from the Post Office in Las Cruces, NM and within a 5 mile radius from the Post Office in Alamogordo, Deming and Lordsburg. The area 10 miles East and 10 miles West of Interstate 10 between El Paso, Texas and Las Cruces, NM.

Zone 2: Doña Ana, Otero, Luna and Hidalgo Counties (except that area in Zone 1).

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<thead>
<tr>
<th></th>
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<th>Fringes</th>
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<td><strong>COMMERCIAL LINE WORK:</strong></td>
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<tr>
<td>Bernalillo, Catron, Chaves, Colfax, Curry, DeBaca, Grant, Guadalupe, Harding, Lincoln, Los Alamos, McKinley, Mora, Quay, Rio Arriba, Roosevelt, Sandoval, San Juan, San Miguel, Santa Fe, Sierra, Socorro, Taos, Torrance, Union, Valencia &amp; White Sands Missile Range and that portion of Fort Bliss in New Mexico.</td>
<td></td>
<td></td>
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<tr>
<td><strong>Lineman - Technicians:</strong></td>
<td></td>
<td></td>
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<tr>
<td>Zone I</td>
<td>18.60</td>
<td>4.15+3.75%</td>
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<td>Zone II</td>
<td>20.27</td>
<td>4.15+3.75%</td>
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<td>Zone III</td>
<td>21.39</td>
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<td>Zone IV</td>
<td>23.44</td>
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<td><strong>Cable Splicers:</strong></td>
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<td>Zone I</td>
<td>20.46</td>
<td>4.15+3.75%</td>
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<td>Zone II</td>
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<tr>
<td>Zone IV</td>
<td>25.30</td>
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**Equipment Op. (includes helicopter op.):**

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<td>Zone I</td>
<td>17.67</td>
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<td>Zone III</td>
<td>20.46</td>
<td>4.15+3.75%</td>
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<td>Zone IV</td>
<td>22.51</td>
<td>4.15+3.75%</td>
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BELEN, BERNALILLO, RIO RANCHO
EDGWOOD, LOS LUNAS, MORIAERTY
AND SANTA FE COUNTY 16.86 3.12

CATRON, COLFAX, CIBOLA, HARDING
LOS ALAMOS, MCKINLEY, MORA, RIO
ARRIBA, SANDOVAL, SAN JUAN, SAN
MIGUEL, SOCORRO, TAOS, TORRENCE,
UNION & VALENCIA COUNTIES 16.86 3.12

* BRNM0003A 06/01/1995

BRICKLAYERS AND STONEMASONS:

CURRY AND ROOSEVELT COS. 16.86 3.12

DEBACA, GUADALUPE AND QUAY
COUNTRIES; AND MINE AND
REFINERY SITES LOCATED
OUTSIDE OF MUNICIPAL LIMITS 16.86 3.12

BRNM0004A 10/01/1994

BRICKLAYERS-STONEMASONS:

CHAVES COUNTY 16.36 2.92

LINCOLN COUNTY, AND MINE AND
REFINERY SITES OUTSIDE OF
MUNICIPAL LIMITS 16.36 2.92

CARP0092A 10/01/1994

CARPENTERS, LATHERS,
& PILEDRIVERMEN 15.70 2.90

LIGHT COMMERCIAL CONSTRUCTION** 10.65 2.20
**SEE DEFINITION AT THE END OF TRUCK DRIVERS

MILLWRIGHTS:
ZONE I 16.85 2.90
ZONE II 19.10 2.90

LIGHT COMMERCIAL CONSTRUCTION** 10.65 2.22

BASING POINTS FOR MILLWRIGHTS ONLY FROM ALBUQUERQUE CITY HALL

ZONE I 0 TO 15 ROAD MILES
ZONE II 15 TO 35 ROAD MILES
<table>
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<td>14.01</td>
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<tr>
<td>15.76</td>
<td>2.79</td>
</tr>
<tr>
<td>16.26</td>
<td>2.79</td>
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</tbody>
</table>

**County(ies):**

STATEWIDE

ASBESTOS WORKERS/INSULATORS
(Includes application of all insulating materials, protective coverings, coatings and finishings to all types of mechanical systems and asbestos removal)

**ASBESTOS WORKERS/INSULATORS**
(Includes application of all insulating materials, protective coverings, coatings and finishings to all types of mechanical systems and asbestos removal)

**Bricklayers & Stonemasons:**

Dona Ana and Communities of Silver City, Bayard, Central, Hurley and Town Site of Tyrone & Community of Alamogordo (Area Residents)

**BRICKLAYERS & STONEMASONs:**

<table>
<thead>
<tr>
<th>Rates</th>
<th>Fringes</th>
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<td>15.76</td>
<td>2.79</td>
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<tr>
<td>16.26</td>
<td>2.79</td>
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</tbody>
</table>

**Bernalillo County and Townships of**
GENERAL BUILDING AND HEAVY ENGINEERING CONSTRUCTION shall include the construction, alteration, repair and demolition of buildings including office buildings, warehouses, industrial and commercial buildings, institutional and public buildings, and all air conditioning, conduit, heating and other mechanical and electrical works and site preparation for building or heavy engineering projects under this classification, stadia; and shall include electrical, gas, water, sewer lines, and other such utility construction which are part of projects under this classification and included within the property line or less than five (5) feet from the building or heavy engineering structure, whichever is closer, provided, however, regard to electrical utilities such construction shall include construction from the first attachment of incoming power source without regard to the property line or proximity to the building or the heavy engineering structure; and include construction, alteration, repair and demolition of heavy engineering work such as power generating plants, pump stations, natural gas compressing stations; covered reservoirs and covered sewage and water treatment facilities; concrete linings for canals, ditches and channels; concrete dams; earth dams of one million (1,000,000) cubic yards or over; radio towers, ovens, furnaces, kilns, silos shafts and tunnels (other than highway shafts and tunnels), hydro-electric projects; and well drilling, telephone and electrical transmission lines which are part of GENERAL BUILDING AND HEAVY ENGINEERING PROJECTS: mining appurtenances such as tipples, washeries and loading and discharging chutes, and specialized structures for testing, launching and recovering space and other rocket-type missiles.
area by the construction industry; and (1) the proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination (for the given area and type of construction). (See 29 CFR 5.5(a)(v)).

In the listing above, the "SU" designation means that rates listed under that identifier do not reflect collectively bargained wage and fringe benefit rates. Other designations indicate unions whose rates have been determined to be prevailing.

END OF GENERAL DECISION
Including Tank Wagon Drivers, Semi-Trailer Driver (Flat-Bed or Van Tandems); Light Equipment Mechanic; Dump Trucks (Including All Highway and Off-Highway) 35 C.Y.W.L.C. and Over; Truck and Trailer or Semi-Trailer (Flated); eject all.

GROUP IX:
Lowboy (Heavy Equipment Double Gooseneck); Heavy Equipment Mechanic; Welder (Body and Fender Men).

TRUCK DRIVERS ZONE PAY BASING POINTS AND DEFINITIONS LISTED BELOW FOR BUILDING AND HEAVY CONSTRUCTION – BASING POINTS ARE AS FOLLOWS:

ALAMOGORDO, ALBUQUERQUE, ARTESIA, BAYARD, BELEN, CARLSBAD, CLOVIS, DEMING, ESPANOLA, EUNICE, FARMINGTON, GALLUP, GRANTS, HOBB, LAS CRUCES, LAS VEGS, LORDSBUG, LOVINGTON, PORTALES, RATON, ROSWELL, RUIDOSO, SANTA FE, SANTA ROSE, SILVER CITY, SOCORRO, TAOS, TUCUMCARI

ZONE I
Projects within 15 miles from the starting points above

ZONE II
Projects 15 or more road miles but less than 35 miles from above, includes all of Los Alamos County

ZONE III
Projects more than 35 road miles, or more from above.

FOOTNOTE:

**LIGHT COMMERCIAL DEFINITION

Construction, erection, alteration, repair, modification, addition to or improvement in whole or in part of structures for which the major support system is wood frame construction and will also include all apartments over 4 stories, all convenience stores, fast food restaurants, automobile service stations & motels up to 2 stories high.

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

Requests for additional classifications and wage rates may be submitted to the contracting officer after award, and may be approved only if: (1) the work to be performed by the classification requested is not performed by a classification in the wage determination; (2) the classification is utilized in the
<table>
<thead>
<tr>
<th>GROUP</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>V</td>
<td>Pickup 3/4 Ton and Under, Lubrication, Light Tire Repair and Washer, Swamper, 2 or 4 and up.</td>
</tr>
<tr>
<td>VI</td>
<td>Dump or Batch Truck Under 8 C.Y.W.L.: Flat Bed (bobtail) 2 Ton and Under, Warehouseman including Material Check, Fork Lift Under 5 Ton MRC.</td>
</tr>
<tr>
<td>VII</td>
<td>Dump Trucks (Including All Highway and Off Highway) 8 up to 16 C.Y.W.L.C.; Water, Fuel or Oil Trucks Less Than 3,000 gal. Flat Bed (bobtail) Over 2 Tons.</td>
</tr>
<tr>
<td>VIII</td>
<td>Distributor Driver, Heavy Tire Repair, Lumber Carrier Driver, Young Buggy or Similar Equipment, Transit Mix or Agitator 2 or 3 Axle Bobtail Equipment, Scissor Truck, Bulk Cement Bobtail 2 or 3 Axle, Semi-Trailer Flat Bed or Van Single Axle Forklift 5 Ton and over M.R.C.</td>
</tr>
<tr>
<td>IX</td>
<td>Dumpsters and Dumpcrete Driver; Water, Fuel or Oil Trucks 3,000 to 6,000 Gallons; Lowboys and Light Equipment Driver; Euclid Type Tank Wagon Under 6,000 Gallons.</td>
</tr>
<tr>
<td>VI</td>
<td>Vacuum Truck; Dump Trucks (including all highway and off-highway) 16 up to 22 C.Y.W.L.C.</td>
</tr>
<tr>
<td>VII</td>
<td>Transit Mix or Agitator Semi or 4 Axle Equipment Driver; Flaherty Truck Type Spreader Box Driver; Slurry Truck Driver Bulk Cement Driver; Semi-Doubles; $ Axle Bobtail; Winch Truck and &quot;A&quot; Frame; Dump Truck (including all Highway and Off-Highway) 22 CY up to 35 C.Y.W.L.C.</td>
</tr>
<tr>
<td>VIII</td>
<td>Euclid Diesel Power Turnarocker; Terra Coba-DW20-Tourneau Pulls and Similar Diesel Powered Equipment when used to haul Materials and Assigned to a Teamster-Lowboy Heavy Equipment Driver; Water, Fuel and Oil Trucks 6,000 Gallons and Over</td>
</tr>
<tr>
<td>Group</td>
<td>Zones</td>
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<tr>
<td>GROUP VI</td>
<td>Zone I:</td>
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<td>GROUP VII</td>
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<td>Zone III:</td>
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<td>Zone III:</td>
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<td>HEAVY CONSTRUCTION:</td>
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### Sprinkler Fitters:

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<thead>
<tr>
<th>Location</th>
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<th>Fringes</th>
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<tr>
<td>Bernalillo, Los Alamos &amp; Santa Fe, Counties</td>
<td>15.55</td>
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<tr>
<td>Otero County</td>
<td>17.45</td>
<td>3.75</td>
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<tr>
<td>Remaining Cos. (Except Dona Ana)</td>
<td>16.06</td>
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### Truck Drivers:

#### Building Construction:

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#### Light Commercial Construction:

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### Zone II — Extending 30 miles to 75 miles beyond Zone I

### Zone III — Extending 75 miles and beyond Zone II

<table>
<thead>
<tr>
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<td>PLAS0254A 10/01/1994</td>
<td>Rates</td>
<td>Fringes</td>
</tr>
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<td>CEMENT MASONs</td>
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<td>PLAS0254B 12/01/1994</td>
<td>Rates</td>
<td>Fringes</td>
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<td>PLASTERERS</td>
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**DONA ANA, OTERO, LUNA COUNTIES**

**Commercial:**
- Brush, Roller, Drywall, Paperhanger: 9.40 2.02
- Spray, Sandblast, Swing Stage, Steam Cleaning: 11.00 2.02

**Heavy:**
- Brush, Roller: 10.25 2.02
- Spray, Sandblast, Swing Stage, Steam Cleaning: 11.50 2.02
- Water Tanks, Towers, Smoke Stacks: 12.50 2.02

**PAINTERS ZONE DEFINITIONS**

**ALBUQUERQUE, SANTA FE, AND BELEN SHALL BE CONSIDERED IN ZONE I**

Zone I - BASE PAY UP TO 30 MILES

Zone II - Extending 30 miles to 75 miles beyond Zone I.

Zone III - Extending 75 miles and beyond Zone II.

---

**PAIN1665A 04/01/1994**

**SOFT FLOOR LAYERS**

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**SOFT FLOOR LAYERS ZONE DEFINITIONS**

Zone I -- Cities and Towns Basing Points - Miles from Main Post Office

Albuquerque, Santa Fe, and Belen shall be considered Zone I.

Albuquerque - 30 mile radius
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INSTRUCTIONS TO CONTRACTORS
FOR
TRANSMITTAL REQUIREMENTS
FORT WORTH DISTRICT
FOR INFORMATION ONLY (FIO) AND GOVERNMENT APPROVED (GA)
SUBMITTALS

1. General Requirements

   a. General requirements for transmittal of FIO and GA submittals is contained in the preceding specifications. Specific requirements on how to transmit FIO and GA Submittals are outlined herein.

   b. GA and FIO submittal data shall be transmitted under separate ENG Form 4025s and assigned different Transmittal Numbers. If GA and FIO submittal data is included in the same submittal, using the same ENG Form 4025, they will be considered an FIO submittal until the contractor corrects the error.

   c. The Contractor shall designate on each Eng Form 4025, above the Transmittal No., either FIO or GA to show the transmittal type. This procedure allows ready identification of FIO or GA submittals. The Government reserves the right to redesignate the category (GA or FIO) of submittals incorrectly identified by the Contractor.

   d. The Contractor shall assure all FIO submittals for each technical section are submitted prior to or concurrent with the GA submittals for that technical section. If appropriate FIO submittals have not been submitted, the GA submittal will be returned disapproved.

   e. Data transmitted with ENG Form 4025 shall be identified by marking it with the same item number(s) appearing in the "Item No." column on the form. The model number, part number, color, etc., of proposed materials or equipment shall be highlighted or otherwise identified.

2. Specific Requirements for For Information Only (FIO) Submittals

   a. One fully coordinated FIO submittal shall be made for each technical section. Each FIO submittal listed on the ENG Form 4288, shall be submitted as a separate item on the ENG Form 4025 in the order they appear on the ENG Form 4288. Technical data provided with the ENG Form 4025 shall conform to the "Submittals" paragraph in each Technical Section. (Example: SD-04 Drawings as outlined herein and as described in Section 01300 - Submittal Descriptions.)

   b. Items such as mill certificates or other test data unavailable until the equipment/material is manufactured/fabricated shall be identified on the initial ENG Form 4025. An explanation in the "Remarks" section shall explain this data will be submitted by Transmittal Number [ ] (fill in transmittal number) after materials are manufactured/fabricated (or other explanations as appropriate). A separate submittal for long lead time equipment or material may be made if sufficient data is furnished to show contract compliance. An explanation shall be provided in the "Remarks" section or on a separate sheet, if necessary, explaining why a partial
submittal is being made. Explanation shall include the estimated delivery date of the above equipment/material and the Transmittal Number of the submittal that will contain data required by the particular specification section for the remaining equipment/materials. For contracts with several buildings/structures, separate transmittals for each technical section may be used if each building/structure is noted in the "Remarks" section of the ENG Form 4025. Samples of materials shall be submitted along with technical data, not under separate transmittals.

2.1 FIO Submittal Review

a. The Contractor's Quality Control (CQC) Representative has full responsibility for reviewing and certifying that all FIO submittal data and all equipment and/or materials comply with the contract. FIO Submittals are provided to the Government "For Information Purposes Only." Contracting Officer approval is not required and will not be given. The Government will not code any FIO submittals. Copies of FIO Submittals will not be returned to the Contractor.

b. However, the Government may perform QA reviews and re-reviews of FIO submittals at any time during the contract. If the Government determines submittal data is incomplete or not in compliance with contract, comments will be provided. Comments will state, "Disagree with Contractor's Certified Compliance" and list items not in compliance or not provided as required by the contract. The Contractor shall respond to all comments by return FIO resubmittal on a new ENG Form 4025. Repeated incomplete or non-complying FIO submittals with improper certifications may result in disapproval of the Contractor's Quality Control (CQC) Program and/or possible replacement of the Contractor Quality Control (CQC) personnel.

c. Performance of, or failure to perform QA submittal reviews or Government requirement to submit additional data on FIO submittals, will not prevent the Contracting Officer from requiring removal and replacement of non-conforming material incorporated into the work. No adjustment for time or money will be allowed for corrections required because of non-compliance with contract plans and/or specifications.

3. Specific Requirements for Government (GA) Approved Submittals

a. The Contractor's Quality Control Representative is responsible for assuring all data submitted is complete and in compliance with contract requirements. The Contractor shall assure all FIO submittals are submitted prior to or concurrent with the GA submittal for each technical section. If the FIO submittals have not been submitted, the GA submittal will be returned disapproved.

b. A separate submittal shall be made for each technical section with GA submittals. FIO submittal data shall not be mixed with GA submittal data.

c. The Government will provide written comments as appropriate and assign action codes to each item outlined on the back of the ENG Form 4025. One (1) stamped and dated copy of the submittal, along with any comments, will be provided to the Contractor. Action Code "A"- Approved As Submitted, and Code "B"- Approved Except As Noted, constitutes Government Approval. The Contractor shall resubmit under a separate Transmittal Number all data
necessary to show compliance with Government comments on all other action
codes.

   d. Government review time, as stated in Paragraph 3.3 - Scheduling, is a
minimum of sixty (60) calendar days unless otherwise specified. Government
review time is exclusive of mailing time. Review time starts the day of
receipt by the Government and continues until the day comments or notice of
approval is provided the Contractor.

   e. If the Contractor considers any Government review comment to
constitute a change to the contract, notice shall be given promptly as
required under the Contract Clause entitled "Changes." No request for
"Equitable Adjustment" will be honored unless the Contractor complies fully
with the prompt notice provisions of the contract.

4. Variations/Deviations/Departures from the Contract Drawings or
   Specifications

   Contractor proposed variations, deviations, or departures from the
contract drawings or specifications shall be noted in the "Variation" column
of ENG Form 4025 with an asterisk, for each FIO submittal. A brief
explanation, and the Transmittal Number of the appropriate GA submittal (as
explained below), shall be added to the "Remarks" section of the Form (or a
separate sheet, if necessary). Each variation, deviation, or departure
shall be listed as an item on a separate GA submittal, which may contain
other GA submittal items. Variations, deviations, or departures will be
processed and approved the same as GA submittals, provided they are included
in a GA submittal. Variations, deviations, or departures will not be
approved in the FIO submittal, and will be disapproved, until they are
properly submitted on a GA submittal. Variations, deviations, or departures
shall contain sufficient information to permit complete evaluation.
Additional sheets may be used to fully explain why a variation, deviation,
or departure is requested. The Government reserves the right to disapprove
or rescind inadvertent approval of submittals containing unnoted variations,
deviations, or departures.

5. Submittal Numbering

   Each submittal shall cover only one specification section. For
purposes of consistency and to provide compatibility with the Government's
computerized submittal register, submittal numbers shall include a
specification section prefix and special suffixes. Note the following
examples (for Technical Section 07416):

   a. New submittals - 07416-01, 07416-02, etc.

   b. Resubmittals -

      (1) First resubmittal - 07416-01.01, 07416-02.01, etc.

      (2) Second resubmittal - 07416-01.02, 07416-02.02, etc.

      (3) Third resubmittal - 07416-01.03, 07416-02.03, etc.
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* See SECTION 01300 for descriptions of the Types of Submittals.

* CLASS = CLASSIFICATION where GA indicates "Government Approved" submittals AND F10 indicates "For Information Only" submittals.
### SECTION I - REQUEST FOR APPROVAL OF THE FOLLOWING ITEMS

**Corps of Engineers, Fort Worth Dist (Central Texas Area Office)**

- **From:** "XYZ" Construction Co., Inc.
- **To:** Aircraft Operations Facility, Building 100, Fort Hood, Texas

**PROJECT NAME AND LOCATION:** Aircraft Operations Facility, Building 100, Fort Hood, Texas

**TRANSMITTAL NO.:** 05120.01

**DATE:** 1 May 1994

**CONTRACT NO.:** DACAG3-93-C-0100

**CHECK ONE:**
- [X] THIS IS A NEW TRANSMITTAL
- [ ] THIS IS A RESUBMITTAL OF TRANSMITTAL

---

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**REMARKS:**

Item 2. Variation requested to provide W12x54 beam (Mk 3B5 on fabrication drawing No. S3), in lieu of W12x40 beam indicated in Detail 5 on Sequence No. 45, due to availability at mill.

*See fabrication drawing S-3 submitted under "F10" Transmittal No. 05120.01.

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**SECTION II - APPROVAL ACTION**

**ENCLUSIRES RETURNED (list by Item No.)**

**NAME, TITLE AND SIGNATURE OF APPROVING AUTHORITY**

**DATE**

---

**ENG FORM 4025, May 91**

(Prepared: CEMP-CE)
INSTRUCTIONS

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2. Each transmittal shall be numbered consecutively in the space provided for "Transmittal No.". This number, in addition to the contract number, will form a serial number for identifying each transmittal. For new submittals or resubmittals mark the appropriate box; on resubmittals, insert transmittal number of last submission as well as the new transmittal number.

3. The "Item No." will be the same "Item No." as indicated on ENG FORM 4288 for each entry on this form.

4. Submittals requiring expeditious handling will be submitted on a separate form.

5. Separate transmittal form will be used for submittals under separate sections of the specifications.

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9. U.S. Army Corps of Engineers approving authority will assign action codes as indicated below in space provided in Section I, column i to each item submitted. In addition they will ensure enclosures are indicated and attached to the form prior to return to the contractor. The Contractor will assign action codes as indicated below in Section I, column g, to each item submitted.

THE FOLLOWING ACTION CODES ARE GIVEN TO ITEMS SUBMITTED

A --- Approved as submitted
B --- Approved, except as noted on drawings.
C --- Approved, except as noted on drawings. Refer to attached sheet resubmission required.
D --- Will be returned by separate correspondence.
E --- Disapproved (See attached)
F --- Receipt acknowledged
FX --- Receipt acknowledged, does not comply as noted with contract requirements
G --- Other (Specify)

10. Approval of items does not relieve the contractor from complying with all the requirements of the contract plans and specifications.

Reverse of ENG Form 4025

**SECTION I - REQUEST FOR APPROVAL OF THE FOLLOWING ITEMS**

<table>
<thead>
<tr>
<th>ITEM NO.</th>
<th>DESCRIPTION OF ITEM SUBMITTED</th>
<th>MTD ON CONTORGI CAT., CURVE DRAWING OR INSTRUCTION NO. (See Instruction No. 0)</th>
<th>NO. OF COPIES</th>
<th>CONTRACT NUMBER/REFERENCE DOCUMENT</th>
<th>FOR USE CODE</th>
<th>VARIATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Structural Steel Systems</td>
<td>Dwgs/Details</td>
<td>4</td>
<td>1.3</td>
<td>S-1/S-9</td>
<td>A</td>
</tr>
<tr>
<td>2.</td>
<td>Erection Plan</td>
<td>Detailed Plan</td>
<td>4</td>
<td>1.2 &amp; 1.3</td>
<td>--</td>
<td>A</td>
</tr>
<tr>
<td>3. **</td>
<td>Materials &amp; Welders</td>
<td>Certification</td>
<td>4</td>
<td>1.3</td>
<td>--</td>
<td>A</td>
</tr>
<tr>
<td>4.</td>
<td>Fabrication</td>
<td>Certification</td>
<td>4</td>
<td>1.1 &amp; 1.3</td>
<td>--</td>
<td>A</td>
</tr>
<tr>
<td>5.</td>
<td>High Strength Bolts</td>
<td>Sample</td>
<td>1</td>
<td>2.5 &amp; 1.3</td>
<td>S-1/S-9</td>
<td>A</td>
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<tr>
<td>6.</td>
<td>Carbon Steel Bolts</td>
<td>Sample</td>
<td>1</td>
<td>2.6 &amp; 1.3</td>
<td>S-1/S-9</td>
<td>A</td>
</tr>
<tr>
<td>7.</td>
<td>Carbon Steel Nuts</td>
<td>Sample</td>
<td>1</td>
<td>2.7 &amp; 1.3</td>
<td>S-1/S-9</td>
<td>A</td>
</tr>
<tr>
<td>8.</td>
<td>Washers</td>
<td>Sample</td>
<td>1</td>
<td>2.7 &amp; 1.3</td>
<td>S-1/S-9</td>
<td>A</td>
</tr>
</tbody>
</table>

**REMARKS**

* See "GA" Transmittal No. 05120.02 for variation proposing use of W12x54 heam (Mk 305 on fabrication drawing No. S3) in lieu of W12x40 indicated in Detail 5 on Sequence No. 45.

** Certified copies of mill test reports for structural steel will not be available until after fabrication has been completed. They will be submitted at a later date under Transmittal No. 05120.03

**JOHN DOE, CQC
"XYZ" Construction Co., Inc.
NAME AND SIGNATURE OF CONTRACTOR**

**SECTION II - APPROVAL ACTION**

ENCLOSURES RETURNED (List by Item No.)

NAME, TITLE AND SIGNATURE OF APPROVAL AUTHORITY

DATE
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Reverse of ENG Form 4025
# Transmittal of Shop Drawings, Equipment Data, Material Samples, or Manufacturer's Certificates of Compliance

(Read instructions on the reverse side prior to initiating this form)

## Section I - Request for Approval of the Following Items
(This section will be initiated by the contractor)

<table>
<thead>
<tr>
<th>ITEM NO.</th>
<th>DESCRIPTION OF ITEM SUBMITTED (Type size, model number/etc.)</th>
<th>MFG OR CONTR. CAT., CURVE DRAWING OR BROCHURE NO. (See instruction no. 6)</th>
<th>NO. OF COPIES</th>
<th>CONTRACT REFERENCE DOCUMENT</th>
<th>FOR CONTRACTOR USE CODE</th>
<th>VARIATION (See instruction No. 6)</th>
<th>FOR USE CODE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ASC. PARA. NO.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SHEET NO.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Remarks**

I certify that the above submitted items have been reviewed in detail and are correct and in strict conformance with the contract drawings and specifications except as otherwise stated.

**Name and Signature of Contractor**

## Section II - Approval Action

**Enclosures Returned** (List by Item No.)

**Name, Title and Signature of Approving Authority**

**Date**

---

**Eng Form 4025, May 91**

Edition of Aug 89 is Obsolete.

Sheet ___ of ___
INSTRUCTIONS

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Reverse of ENG Form 4025

SECTION 01310 - PROGRESS SCHEDULES

PART 1 - GENERAL (Not Applicable)

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 CONSTRUCTION PROGRESS CHART

Pursuant to the contract clause entitled "SCHEDULE FOR CONSTRUCTION CONTRACTS" the Contractor shall prepare a schedule of construction utilizing a construction progress chart as described herein. Construction progress charts shall be prepared on ENG Form 2454. The Contractor shall submit three (3) copies of the Construction Progress Chart for approval. No progress payments will be made without an approved progress chart.

The Contractor shall prepare the chart with the following considerations. The contract work shall be divided into definable contract features. As a minimum, the Contractor shall address each specification section as a principle contract feature. The weighted value (WT.) column should indicate the percentage of the contract for which each principle contract feature accounts. The vertical lines shall be identified by specific time frames, (i.e., weekly, bi-weekly, monthly) with one space accounting for no more than one month. The Contractor shall identify the date when Notice to Proceed is acknowledged on the chart. The Contractor shall also identify the contract completion date on the chart.

The Contractor shall place bars on the chart to indicate scheduled progress for each feature of work. The Contractor shall note the anticipated percentage complete for each item at the end of each month and at the end of each scheduled block. Activities shall be identifiable by bid item if applicable.
PART 1 - GENERAL (Not Applicable)

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 CONTRACTOR VERIFICATION OF CONTRACT SURVEY DATA

During initial site layout and before existing conditions are disturbed the Contractor shall verify, in writing, the basic survey data provided on the contract drawings. Verification shall be initiated from the point shown on the contract drawings or from the contract drawing reference point designated by the Contracting Officer’s Authorized Representative and shall include, as a minimum, benchmark elevations, horizontal control points, and sufficient spot checks of critical elevations to ensure that the survey data adequately reflects existing conditions. The Contractor shall not proceed with construction until survey verification is provided to the Contracting Officer’s Authorized Representative. Before an existing benchmark referenced on the contract drawings is disturbed the Contractor shall establish a new benchmark which has been approved by the Contracting Officer’s Authorized Representative. Benchmarks which are destroyed without authorization from the Contracting Officer’s Authorized Representative must be replaced at the Contractor’s expense as prescribed in Section 00800 Special Clause, "Layout of Work." The Contractor shall refer to Contract Clauses, "Differing Site Conditions" and "Site Investigation and Conditions Affecting the Work," for additional requirements.
SECTION 01340 - COLOR/FINISH SAMPLE BOARDS

PART 1 - GENERAL

PART 2 - PRODUCTS

2.1 COLOR/FINISH SAMPLE BOARDS

Color/finish board(s) shall have attached samples of all interior appearance related construction items the Contractor proposes to furnish, including, but not limited to, such items as interior paints and finishes; wall covering; trim items; carpet; floor, wall and ceiling tiles; doors; plastic laminates for cabinet work, signage, etc. Each sample shall indicate color, texture, and finish; and, if patterned, shall be large enough to define full pattern. Samples shall be identified as to type of material, area of installation, manufacturer, and transmittal number under which certification of the material represented has been submitted in accordance with the requirements of Section 01300 SUBMITTAL DESCRIPTIONS. Samples shall be mounted on 8-1/2 inch by 11 inch by 1/16 inch thick mat board, and shall be contained in three (3) ring binders. Epoxy glue, hot-melt glue, or contact cement shall be used to attach samples; Scotch tape, double-backed tape, or rubber cement will not be acceptable. Cover of binders shall contain title of contract, contract number, and name of Contractor.

PART 3 - EXECUTION

3.1 SUBMITTAL PROCEDURES

One (1) complete set of coordinated color/finish sample board(s) shall be submitted to the Contracting Officer for approval within a period of time not to exceed 65 calendar days after notice to proceed (NTP). Contractor shall ensure that interior finish item technical data submittals are timely and that submittal actions have been completed before submitting sample board(s). Samples shall not be submitted with technical data, as approvals will not be given for samples submitted separately from the color/finish sample board(s). Upon receipt of the sample board(s), a 60-day review period by the Government can be anticipated.

3.2 GOVERNMENT APPROVAL

Approval of the total color/finish sample board(s) shall be obtained before start of finish work involving items included on the board(s). Work done prior to obtaining such approval will be at the Contractor's risk.

3.3 FINAL SUBMITTAL

After receipt of final approval from the Government, one set of approved and corrected color-finish sample boards shall be prepare and submitted to the Contracting Officer.
SECTION 01440 - CONTRACTOR QUALITY CONTROL

PART 1 - GENERAL

1.1 REFERENCES

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

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)


ASTM E 329 (1993b) Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction

1.2 PAYMENT

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

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 GENERAL

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

3.2.1 General

The Contractor shall furnish for review by the Government, not later than 10 days after receipt of notice to proceed, the Contractor Quality Control (CQC) Plan proposed to implement the requirements of the Contract Clause entitled "Inspection of Construction." The plan shall identify personnel, procedures, control, instructions, test, records, and forms to be used. The Government will consider an interim plan for the first 60 days of operation. Construction will be permitted to begin only after acceptance of the CQC Plan or acceptance of an interim plan applicable to the particular feature of work to be started. Work outside of the features of work included in an accepted interim plan will not be permitted to begin until acceptance of a CQC Plan or another interim plan containing the additional features of work to be started.

3.2.2 Content of the CQC Plan

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

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

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

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

d. Procedures for scheduling, reviewing, certifying, and managing submittals, including those of subcontractors, offsite fabricators, suppliers, and purchasing agents. These procedures shall be in accordance with Section 01305 SUBMITTAL PROCEDURES.

e. Control, verification, and acceptance testing procedures for each specific test to include the test name, specification paragraph requiring test, feature of work to be tested, test frequency, and person responsible for each test. (Laboratory facilities will be approved by the Contracting Officer.)
f. Procedures for tracking preparatory, initial, and follow-up control phases and control, verification, and acceptance tests including documentation.

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

h. Reporting procedures, including proposed reporting formats.

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

3.2.3 Acceptance of Plan

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

3.2.4 Notification of Changes

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

3.3 COORDINATION MEETING

After the Preconstruction Conference, before start of construction, and prior to acceptance by the Government of the CQC Plan, the Contractor shall meet with the Contracting Officer or Authorized Representative and discuss the Contractor's quality control system. The CQC Plan shall be submitted for review a minimum of five (5) calendar days prior to the Coordination Meeting. During the meeting, a mutual understanding of the system details shall be developed, including the forms for recording the CQC operations, control activities, testing, administration of the system for both onsite and offsite work, and the interrelationship of Contractor's Management and control with the Government's Quality Assurance. Minutes of the meeting shall be prepared by the Government and signed by both the Contractor and the Contracting Officer. The minutes shall become a part of the contract file. There may be occasions when subsequent conferences will be called by either party to reconfirm mutual

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understandings and/or address deficiencies in the CQC system or procedures which may require corrective action by the Contractor.

3.4 QUALITY CONTROL ORGANIZATION

3.4.1 General

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

3.4.2 CQC System Manager

The Contractor shall identify as CQC System Manager an individual within his organization at the site of the work who shall be responsible for overall management of CQC and have the authority to act in all CQC matters for the Contractor. The CQC System Manager shall be a graduate engineer, graduate architect, or a graduate of construction management, with a minimum of one year construction experience on construction similar to this contract or a construction person with a minimum of five years in related work. This CQC System Manager shall be on the site at all times during construction and will be employed by the prime Contractor. The CQC System Manager shall be assigned as System Manager but may have duties as project superintendent in addition to quality control. An alternate for the CQC System Manager will be identified in the plan to serve in the event of the System Manager’s absence. The requirements for the alternate will be the same as for the designated CQC System Manager.

3.4.3 CQC Personnel

3.4.3.1 CQC Staff

A staff shall be maintained under the direction of the CQC system manager to perform all QC activities. The staff must be of sufficient size to ensure adequate QC coverage of all work phases, work shifts and work crews involved with the construction. These personnel may perform other duties, but must be fully qualified by experience and technical training to perform their assigned QC responsibilities and must be allowed sufficient time to carry out these responsibilities.
3.4.4 Additional Requirement

In addition to the above experience and education requirements the CQC System Manager shall have completed the course entitled "Construction Quality Management For Contractors". This course is periodically offered at the Fort Worth District, Corps of Engineers Office, Federal Building, Room LA03, 819 Taylor Street, Fort Worth, Texas. It will be offered at the following times:

8 August 1995
7 November 1995
6 February 1996
7 May 1996
6 August 1996

There is no charge for the course; however, the Contractor will pay travel and per diem costs. If the CQC manager has not attended the course, he/she will have 90 days from the Notice to Proceed to take it. This is an eight hour, one-day course. For information and scheduling, call (817) 334-2161 or 4957. Each class will be limited to 30 students. If the demand is greater than what is currently scheduled, additional classes will be scheduled.

3.4.5 Organizational Changes

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

3.5 SUBMITTALS

Submittals shall be made as specified in Section 01305 SUBMITTAL PROCEDURES. The CQC organization shall be responsible for certifying that all submittals are in compliance with the contract requirements.

3.6 CONTROL

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

3.6.1 Preparatory Phase

This phase shall be performed prior to beginning work on each definable feature of work and shall include:

a. A review of each paragraph of applicable specifications.


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

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

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

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

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

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

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

j. Discussion of the initial control phase.

k. The Government shall be notified at least 72 hours in advance of beginning the preparatory control phase. This phase shall include a meeting conducted by the CQC System Manager and attended by the superintendent, other CQC personnel (as applicable), and the foreman responsible for the definable feature. The results of the preparatory phase actions shall be documented by separate minutes prepared by the CQC System Manager and attached to the daily CQC report. The Contractor shall instruct applicable workers as to the acceptable level of workmanship required in order to meet contract specifications.

3.6.2 Initial Phase

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

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

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

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

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

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

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

3.6.3 Follow-up Phase

Daily checks shall be performed to assure control activities, including control testing, are providing continued compliance with contract requirements, until completion of the particular feature of work. The checks shall be made a matter of record in the CQC documentation. Final follow-up checks shall be conducted and all deficiencies corrected prior to the start of additional features of work which may be affected by the deficient work. The Contractor shall not build upon or conceal non-conforming work.

3.6.4 Additional Preparatory and Initial Phases

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

3.7 TESTS

3.7.1 Testing Procedure

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

a. Verify that testing procedures comply with contract requirements.

b. Verify that facilities and testing equipment are available and comply with testing standards.
c. Check test instrument calibration data against certified standards.

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

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

3.7.2 Testing Laboratories

3.7.2.1 Capability Check

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

3.7.2.2 Capability Recheck

If the selected laboratory fails the capability check, the Contractor will be assessed a charge of $500 to reimburse the Government for each succeeding recheck of the laboratory or the checking of a subsequently selected laboratory. Such costs will be deducted from the contract amount due the Contractor.

3.7.3 On-Site Laboratory

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

3.7.4 Furnishing or Transportation of Samples for Testing

Costs incidental to the transportation of samples or materials will be borne by the Contractor. Samples of materials for test verification and
acceptance testing by the Government shall be delivered to the Corps of Engineers Division Laboratory, f.o.b., at the following address:

For delivery by mail and
For other deliveries:  Corps of Engineers
Southwestern Division Laboratories
4815 Cass Street
Dallas, Texas  75235.

Coordination for each specific test, exact delivery location, and dates will be made through the Area Office.

3.8 COMPLETION INSPECTION

3.8.1 Pre-Final Inspection

At the completion of all work or any increment thereof established by a completion time stated in the Special Clause entitled "Commencement, Prosecution, and Completion of Work," or stated elsewhere in the specifications, the CQC System Manager shall conduct an inspection of the work and develop a "punch list" of items which do not conform to the approved drawings and specifications. Such a list of deficiencies shall be included in the CQC documentation, as required by paragraph DOCUMENTATION below, and shall include the estimated date by which the deficiencies will be corrected. Once this is accomplished the Contractor shall notify the Government that the facility is complete and is ready for the Government's "Prefinal" inspection. The Government will perform this inspection to verify that the facility is complete and ready to be occupied. A Government "Prefinal Punch List" will be developed as a result of this inspection. The Contractor's CQC System Manager shall ensure that all items on this list have been corrected and so notify the Government so that a "Final" inspection with the customer can be scheduled. Any items noted on the "Final" inspection shall be corrected in a timely manner. These inspections and any deficiency corrections required by this paragraph will be accomplished within the time stated for completion of the entire work or any particular increment thereof if the project is divided into increments by separate completion dates.

3.8.2 Final Acceptance Inspection

The Contractor's Quality Control Inspection personnel, his superintendent or other primary management person and the contracting Officer's representative will be in attendance at this inspection. Additional Government personnel including, but not limited to, those from Base/Post Civil Facility Engineer user groups, and major commands may also be in attendance. The final acceptance inspection will be formally scheduled by the Contracting Officer based upon notice from the Contractor. This notice will be given to the Contracting Officer at least 14 days prior to the final acceptance inspection and must include the Contractor's assurance that all specific items previously identified to the Contractor as being acceptable, along with all remaining work performed under the
contract, will be complete and acceptable by the date scheduled for the final acceptance inspection. Failure of the Contractor to have all contract work acceptably complete for this inspection will be cause for the Contracting Officer to bill the Contractor for the Government's additional inspection cost in accordance with the contract clause entitled "Inspection of Construction".

3.9 DOCUMENTATION

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

a. Contractor/subcontractor and their area of responsibility.

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

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

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

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

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

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

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

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

j. Contractor's verification statement.

These records shall indicate a description of trades working on the project; the number of personnel working; weather conditions encountered; and any delays encountered. These records shall cover both conforming and deficient features and shall include a statement that equipment and materials incorporated in the work and workmanship comply with the contract. The original and one copy of these records in report form shall be furnished to the Government daily within 12 hours after the date(s)
covered by the report, except that reports need not be submitted for days on which no work is performed. As a minimum, one report shall be prepared and submitted for every seven days of no work and on the last day of a no work period. All calendar days shall be accounted for throughout the life of the contract. The first report following a day of no work shall be for that day only. Reports shall be signed and dated by the CQC System Manager. The report from the CQC System Manager shall include copies of test reports and copies of reports prepared by all subordinate quality control personnel.

3.10 SAMPLE FORMS

a. Minimum construction quality control report and the required preparatory and initial inspection documentation.

b. All tests of piping systems or portions thereof shall be recorded on the "Piping System Test Report."

c. When operation and maintenance instructions for equipment are furnished to Government representatives by the Contractor, the Contractor's representative shall record on a form similar to that attached hereto the applicable data, including the name, organization, and signature of each person attending the instructions.

Sample forms enclosed at the end of this section.

3.11 NOTIFICATION OF NONCOMPLIANCE

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

CONTRACTOR'S NAME
(Address)

DAILY CONSTRUCTION QUALITY CONTROL REPORT

Date: ____________ Report No. ____________

Contract No.: ____________________________

Description and Location of work: ____________________________

WEATHER: (Clear) (P. Cloudy) (Cloudy); Temperature: ____________ Min. ____________ Max; Rainfall ____________ inches.

Contractor/Subcontractors and Area of Responsibility with Labor Count for Each
a. ____________________________
b. ____________________________
c. ____________________________
d. ____________________________

Equipment Data: (Indicate items of construction equipment, other than hand tools, at the job site, and whether or not used.)

1. Work Performed Today: (Indicate location and description of work performed. Refer to work performed by prime and/or subcontractors by letter in Table above. If no work is performed, report the reason.)

2. Results of Surveillance: (Include satisfactory work completed, or deficiencies with action to be taken.)
   a. Preparatory Inspection:
   b. Initial Inspection:
   c. Follow-up Inspections:

3. Tests Required by Plans and/or Specifications Performed and Results of Tests:
4. Verbal Instructions Received: (List any instructions given by Government personnel on construction deficiencies, retesting required, etc., with action to be taken.)

5. Remarks: (Cover any conflicts in plans, specifications, or instructions or any delay to the job.)

6. Results of Safety Inspection: (Include safety violations and corrective actions taken.)

 Contractor's Inspector

CONTRACTOR'S VERIFICATION: The above report is complete and correct and all material and equipment used and work performed during this reporting period are in compliance with the contract plans and specifications except as noted above.

 Contractor's Chief of Quality Control

NOTE

DO NOT LEAVE REPORT ITEMS BLANK

Items 1. through 6. must be reported every day. If there is no other report on an item, enter the word "none" in the reporting space. Reports with items left blank will be returned as incomplete.
PREPARATORY PHASE CHECKLIST

Contract No.________________ Date:______________
Definable Feature:__________ Spec Section:________
Gov't Rep Notified ____ Hours in Advance Yes____ No ____

I. Personnel Present:

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<th>Position</th>
<th>Company/Government</th>
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(List additional personnel on reverse side)
II. Submittals

1. Review submittals and/or submittal log 4288. Have all submittals been approved? Yes_____ No_____

If no, what items have not been submitted?

a. __________________________________________________________

b. __________________________________________________________

c. __________________________________________________________

2. Are all materials on hand? Yes_____ No_____

If no, what items are missing?

a. __________________________________________________________

b. __________________________________________________________

c. __________________________________________________________

3. Check approved submittals against delivered material. (This should be done as material arrives.)

Comments____________________________________________________

III. Material storage

Are materials stored properly? Yes_____ No_____

If No, what action is taken? ______________________________________
IV. Specifications
1. Review each paragraph of specifications.

2. Discuss procedure for accomplishing the work.

3. Clarify any differences.

V. Preliminary Work and Permits
Ensure preliminary work is correct and permits are on file.
If not, what action is taken?

VI. Testing
1. Identify test to be performed, frequency, and by whom.

2. When required?

3. Where required?


5. Have test facilities been approved?
VII. Safety

1. Review applicable portion of EM 385-1-1.

2. Activity Hazard Analysis approved? Yes____ No____

VIII. Corps of Engineers comments during meeting.

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

CQC REP
# INITIAL PHASE CHECKLIST

Contract No. ___________________  

Date: ________________  

Definable Feature: ____________  

Gov't Rep Notified ____ Hours in Advance  

Yes ____ No ____  

I. Personnel Present:  

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<th>Position</th>
<th>Company/Government</th>
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(List additional personnel on reverse side)
II. Identify full compliance with procedures identified at preparatory. Coordinate plans, specifications, and submittals.

Comments

III. Preliminary Work. Ensure preliminary work is complete and correct. If not, what action is taken?

Comments

IV. Establish Level of Workmanship.

1. Where is work located? __________________________

2. Is a sample panel required? Yes _____ No _____

3. Will the initial work be considered as a sample?  
   Yes _____ No _____  
   (If yes, maintain in present condition as long as possible.)

V. Resolve any differences.

Comments

Comments
VI. Check Safety.

Review job conditions using EM 385-1-1 and job hazard analysis.

Comments


CQC REP
PIPING SYSTEM TEST REPORT

STRUCTURE OR BUILDING ________________________

CONTRACT NO. ________________________

DESCRIPTION OF SYSTEM OR PART OF SYSTEM TESTED:

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

DESCRIPTION OF TEST:

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

NAME AND TITLE OF PERSON IN CHARGE OF PERFORMING TESTS FOR CONTRACTOR:

NAME ________________________

TITLE ________________________

SIGNATURE ________________________

I HEREBY CERTIFY THAT THE ABOVE DESCRIBED SYSTEM HAS BEEN TESTED AS
INDICATED ABOVE AND FOUND TO BE ENTIRELY SATISFACTORY AS REQUIRED IN
THE CONTRACT SPECIFICATIONS.

SIGNATURE OF INSPECTOR ________________________

DATE ________________________

REMARKS:

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________
OPERATION AND MAINTENANCE INSTRUCTIONS

CONTRACT NO.:________________________________________

DESCRIPTION_________________________________________

LOCATION:___________________________________________

DATE_______________________________________________

Operation and maintenance instructions were conducted for ________
__________ required by section ________, paragraph ________.

on ________________________

(Date)

The following personnel were present:

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SECTION 01500 - CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART 1 - GENERAL

1.1 REFERENCES

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

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI A92.6 (1979) Self-Propelled Elevating Work Platforms

CORPS OF ENGINEERS (COE)


1.2 SAFETY MEASURES

1.2.1 OSHA Requirements

The Contractor shall comply with Occupational Safety and Health Act (OSHA) Standards. OSHA Standards are subject to change. It is the Contractor’s responsibility to maintain familiarity with OSHA Standards which are current.

1.2.2 Electrical Work

Electrical work will not be performed on or near energized lines or equipment unless specified in the plans and specifications.

1.2.2.1 Upon request by the Contractor, arrangements will be made for de-energizing lines and equipment so that work may be performed. All outages shall be requested through the authorized representative of the Contracting Officer a minimum of 14 days, unless otherwise specified, prior to the beginning of the requested outages. Dates and duration will be specified.

1.2.2.2 Upon approval of the Contracting Officer’s representative, the following work may be performed with the lines energized using certified hot line equipment, on lines above 600 volts, when the following conditions have been met.

1.2.2.2.1 Work below the conductors no closer than the clearance required in COE EM 385-1-1 from the energized conductors.

1.2.2.2.2 Setting and connection of new pretrimmed poles in energized lines which do not replace an existing pole.
1.2.2.2.3 Setting and removing transformers or other equipment on poles.

1.2.2.2.4 Installation or removal of hot line connectors, jumpers, dead-end insulators for temporary isolation, etc., which are accomplished with hot line equipment from an insulated bucket truck.

1.2.2.3 Work Plan for Energized Lines

The Contractor shall submit a plan, in writing, describing his method of operation and the equipment to be used on energized lines. Proper certification from an approved source of the safe condition of all tools and equipment will be provided with the plan. The work will be planned and scheduled so that proper supervision is maintained. The Contractor will review his plan with the Contracting Officer's representative prior to being granted permission to perform the work.

1.2.2.4 No work on lines greater than 600 volts will be performed from the pole or without the use of an insulated bucket truck.

1.2.2.5 No work will be done on overbuilt lines while underbuilt lines are energized, except for temporary isolation and switching in accordance with 1.4.2.2.4 hereinbefore.

1.2.3 Roll-off Protective Structures

1.2.3.1 R.O.P.S. for rollers and compactors will be certified to meet SAE requirement J1040C.

1.2.3.2 ROPS, as required by paragraph 18.B.20, COE EM 385-1-1, includes self-propelled pulverizers.

1.2.4 Radiation Permits or Authorizations

1.2.4.1 Contractors contemplating the use of radioactive materials or radiation producing equipment while performing work on this contract must obtain written authorization from the Department of the Army or Department of the Air Force, as applicable.

1.2.4.2 A 45-day lead time should be programmed for obtaining this written authorization.

1.2.4.3 When requested, the Contracting Officer's Authorized Representative will assist Contractor in obtaining the required permit or authorization.

1.2.5 Self-Propelled Elevating Work Platforms

All self-propelled elevating work platforms will be designed, constructed, maintained, used, and operated in accordance with the guidance provided in American National Standard for Self-Propelled Elevating Work Platforms (ANSI A92.6-1979) together with any amendments which may be in force at time contract is awarded.

01500-2
1.2.6 Supporting Systems

To COE EM 385-1-1, 23.B.02, add "Supporting systems, i.e., piling, cribbing, shoring, etc., shall be designed by a qualified person to meet accepted engineering requirements. Submit supporting systems construction details and design calculations, which bear the seal of a licensed professional engineer, for Contracting Officer review."

1.2.7 Telephone

A telephone or equivalent means to immediately initiate emergency response services shall be accessible at the job site at all times while work is underway.

1.2.8 Language

For each work group that has employees who do not speak English, the Contractor will provide a bilingual foreman who is fluent in English and in the language of the workers. The Contractor will implement the requirements of COE EM 385-1-1, paragraphs 01.B.01, 01.B.02, and 01.C.02 through these foremen.

1.2.9 Doctor's Report

The Contractor shall provide, in the event of any Contractor/subcontractor employee lost time injury accident, a doctor's report of examination which states the number of days that the physician recommends the employee recuperate before returning for work. This requirement shall be in addition to other reporting requirements and may, in specific instances, be waived by the Contracting Officer.

1.2.10 Guarding of Roofs and Open-Sided Floors

A passive means of fall protection, such as guardrails or catch platforms, will be used on all roofs where the fall distance exceeds 6 feet. To supplement and emphasize the requirements of Contract Clause "Accident Prevention" and the safety manual, COE EM 385-1-1, the following is provided:

a. Guard Rails

Perimeter guard rails will be installed on all open-sided floors on multi-storied buildings, and on all roof perimeters. Guard rails will be installed as the decking crew completes an area and before any other work starts and will remain intact as long as construction work is in progress in the area. See Attachment 1, Typical Roof Safety Rail Detail.

Other devices which will provide the same protection afforded by perimeter guard rails may be used subject to the approval of the Contracting Officer.
b. Catch Platforms

Catch platforms used to meet this requirement shall be constructed in accordance with provisions for scaffolds of Section 22 of COE EM 385-1-1. The guardrail side of catch platforms shall be netted or fully planked with a vertical backstop. The catch platform shall be a minimum of 44 inches from front to backstop and may be constructed with floor level a maximum of 4 feet below the top of the eaves.

1.3 CONSTRUCTION/ERECTION SUPPORTS AND LOADS

1.3.1 The lateral stability of this structure is dependent on the total completion of all interconnected structural roof, wall, and floor framing/decking systems. The Contractor shall provide and adequately install and maintain all temporary supports such as temporary guys, lateral bracing, falsework, cribbing, and any other type structural supports required for a safe erection operation to maintain stability of the structure until all structural systems are interconnected as required by the contract plans and specifications.

1.3.2 At least 60 days prior to the start of vertical construction and prior to the commencement of structural steel, concrete or masonry walls, elevated floors, and roofs, the Contractor shall submit detailed drawings, catalog data and calculations for all temporary supports as described in paragraph above, which will be used on this contract. These detailed drawings, catalog data, and calculations shall be prepared and certified by a Registered Structural Engineer. The minimum for vertical loads shall be actual dead loads plus a minimum live load of 25 psf, but use higher live loads if needed due to the Contractor’s plan of erection. No load reductions will be allowed. Bracing shall be designed for a minimum wind load of 20 psf. Wind loadings will not be reduced from the design wind load provided and all temporary supports will be designed with a minimum safety factor of 1.5.

1.3.3 After approval of the temporary support system and calculations, the Contractor shall install and maintain the temporary structural support system in strict compliance with the approved drawings. Daily inspections will be conducted by the Contractor’s Quality Control Inspector to assure all supports are installed as approved and properly maintained.

1.3.4 Temporary supports for architectural or structural precast or tilt-up wall panels will be designed as indicated above. Pipe or other approved bracing shall have lateral cross bracing between each pipe support. Tension guy wires or cables will not be acceptable. Bolted or welded connections into the concrete floors and concrete wall panels will be designed with a safety factor of 3.0. Immediately after erecting each concrete wall panel, the bottom of the panel shall be secured by welding the weld plates or by bolting in place. Panels will not be temporarily placed in a vertical position until they are ready to be erected in their final position. If possible, all structural steel will be erected prior to erection of wall panels. If not, the structural steel will be commenced immediately after the last wall panel is set in the smallest section/bay.
possible. The Contractor shall not start a new wall section/bay until the structural steel is completed in the last section/bay.

1.4 MOWING

Grass and weedy vegetation within the areas utilized by the Contractor, including work areas, administrative areas, and storage areas, shall be kept mowed to control vegetative growth.

1.4.1 Mowing

Vegetation shall be mowed when it reaches a height of 6 inches. Mowing shall be to a height of 3 inches. Mowing shall be accomplished with a rotary mower that leaves the clippings evenly distributed on the soil surface. Mowing shall be accomplished during periods and in such manner that the soil and grass will not be damaged. Towed or self-propelled riding mowers shall not be operated within 3 feet of trees or shrubs. Areas adjacent to trees and shrubs shall be mowed with hand-propelled mowers.

1.4.1.1 Government may immediately after notice to the Contractor and at the discretion of the Contracting Officer mow the Contractor's areas at any time the vegetation height exceeds 6 inches.

1.4.2 Payment

No separate payment will be made for mowing as required under this section and all costs incurred by the Government for performing such work shall be deducted from the contract.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)
NOTE:
1. Leave stud plates in place and carry post and wire rope from job to job for temporary use.
2. Use turnbuckles to reduce deflection in cable between posts to maximum 1 1/2" from horizontal.
3. Items left permanent on roof will be galvanized.

TYPICAL SAFETY RAIL
PART 1 - GENERAL

1.1 SUMMARY

The work covered by this section consists of furnishing all labor, materials and equipment and performing all work required for the prevention of environmental pollution during and as the result of construction operations under this contract except for those measures set forth in other Technical Provisions of these specifications. For the purpose of this specification environmental pollution is defined as the presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances of importance to human life; affect other species of importance to man; or degrade the utility of the environment for aesthetic and recreational purposes. The control of environmental pollution requires consideration of air, water, and land, and involves noise, solid waste management and management of radiant energy and radioactive materials, as well as other pollutants.

1.2 REFERENCES

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

CORPS OF ENGINEERS (COE)


1.3 SUBMITTALS

Temporary Field Structures

The Contractor shall submit for approval drawings showing the locations, details, and landscaping plans for all temporary field structures, including field office, storage and other construction buildings, roads, embankments, and excavations. See PART 3 paragraphs "Location of Temporary Field Offices, Storage, and Other Construction Buildings" and "Temporary Excavation and Embankments."

Environmental Protection Proposals

Prior to commencement of the work the Contractor shall submit in writing his environmental protection proposals for implementing the provisions of this section and other sections of these specifications for environmental pollution control. The Contractor shall address by separate submittals the plans to prevent and control each of the following: (a) soil contamination, (b) water pollution, and (c) dust control.
Pest Control Personnel

Prior to application of pesticides, the Contractor shall submit the qualifications and state certification of pest control personnel who will apply the pesticides and the proposed delivery, storage, application, and disposal procedures.

Storm Water Pollution Prevention Plan

Submit a copy of the Contractor's Pollution Prevention Plan (SWPPP) developed in accordance with PART 3 paragraph "Storm Water Pollution Prevention Plan" and the Environmental Protection Agency's storm water discharge regulations.

Hazardous Substance Reporting

The Contractor shall submit a copy of the attached Emergency Planning and Community Right to Know notification and other reports to the Contracting Officer and to the Facility Emergency Coordinator (FEC) as specified in PART 3 paragraph EMERGENCY PLANNING AND COMMUNITY RIGHT-TO-KNOW REQUIREMENTS.

1.4 IMPLEMENTATION MEETING

Prior to commencement of the work the Contractor shall meet with representatives of the Contracting Officer to develop mutual understandings relative to compliance with these provisions and administration of the environmental pollution control program in accordance with Section 01200 PROJECT MEETINGS.

1.5 APPLICABLE REGULATIONS

In order to prevent, and to provide for abatement and control of, any environmental pollution arising from the construction activities of the Contractor and his subcontractors in the performance of this contract, they shall comply with all applicable Federal, State, and local laws and regulations concerning environmental pollution control and abatement, and all applicable provisions of the COE EM 385-1-1, entitled "Safety and Health Requirements Manual," as well as the specific requirements stated in this section and elsewhere in the contract specifications.

1.6 NOTIFICATION OF NON-COMPLIANCE

The Contracting Officer will notify the Contractor in writing of any observed non-compliance with the foregoing provisions. The Contractor shall, after receipt of such notice, immediately take corrective action. Such notice, when delivered to the Contractor or his authorized representative at the site of the work, shall be deemed sufficient for the purpose. If the Contractor fails or refuses to promptly take corrective action, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to any such stop orders shall be
made the subject of a claim for extension of time or for excess costs or
damages by the Contractor unless it was later determined that the
Contractor was in compliance.

1.7 SUBCONTRACTORS

Compliance with the provisions of this section by subcontractors will be
the responsibility of the Contractor.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 PROTECTION OF LAND RESOURCES

The land resources within the property of the Government but outside the
limits of permanent work performed under this contract shall be preserved
in their present condition or be restored to a condition after completion
of construction that will appear to be natural and not detract from the
appearance of the project. Insofar as possible, the Contractor shall
confine his construction activities to areas defined by the plans or
specifications, to areas to be cleared for other operations, or to
quarry, borrow or waste areas indicated on the plans. At the onset of
borrow excavation, topsoil shall be saved for use in restoring the borrow
area. Waste and borrow areas shall be leveled or trimmed to regular
lines and shaped to provide a neat appearance. In all instances the
restored area shall be well drained, so as to prevent the accumulation of
stagnant water. The following additional requirements are intended to
supplement and clarify the requirements of Contract Clauses entitled
Protection of Existing Vegetation, Structures, Equipment, Utilities, and
Improvements; Operations and Storage Areas; and Cleaning Up.

3.1.1 Prevention of Landscape Defacement

Except in areas shown on the plans or specified to be cleared, the
Contractor shall not deface, injure, or destroy trees or shrubs, nor
remove or cut them without special authority from the Contracting
Officer. Trees designated to be saved shall be protected from either
evacuation or filling within the root zone closer than the normal drip
line of the tree. No ropes, cables, or guys shall be fastened to or
attached to any existing trees for anchorages unless specifically
authorized by the Contracting Officer. Where such special emergency use
is permitted, the Contractor shall first adequately wrap the trunk with a
sufficient thickness of burlap or rags over which softwood cleats shall
be tied before any rope, cable, or wire is placed. The Contractor shall
in any event be responsible for any damage resulting from such use.
Where, in the opinion of the Contracting Officer, trees may possibly be
defaced, bruised, injured, or otherwise damaged by the Contractor’s
equipment or by his blasting, dumping, or other operations, he may direct
the Contractor to protect adequately such trees by placing boards,
planks, or poles around them. When earthwork operations are liable, in
the opinion of the Contracting Officer, to cause rock to roll or
otherwise be displaced into uncleared areas, the Contractor shall construct barriers to protect the trees. Rocks that are displaced into uncleared areas shall be removed. Monuments, markers, and works of art shall be protected similarly before beginning operations near them.

3.1.2 Restoration of Landscape Damage

Any trees or other landscape feature scarred or damaged by the Contractor's equipment or operations shall be restored as nearly as possible to its original condition at the Contractor's expense. The Contracting Officer will decide what method of restoration shall be used, and whether damaged trees shall be treated or removed and disposed of under requirements for clearing and grubbing. All scars made on trees (not designated on the plans to be removed) by equipment, construction operations, or by the removal of limbs larger than 25 mm (1 inch) in diameter shall be coated as soon as possible with an approved tree wound dressing. All trimming or pruning shall be performed in an approved manner by experienced workmen with saws or pruning shears. Tree trimming with axes will not be permitted. Where tree climbing is necessary, the use of climbing spurs will not be permitted. The use of climbing ropes will be required by the Contracting Officer where deemed necessary for safety. Trees that are to remain, either within or outside established clearing limits, that are subsequently damaged by the Contractor and are beyond saving in the opinion of the Contracting Officer, shall be immediately removed and replaced with a nursery-grown tree of the same species and size approved by the Contracting Officer.

3.1.3 Location of Temporary Field Offices, Storage, and Other Construction Buildings

The location on Government property of the Contractor's temporary field office, storage, and other construction buildings, required temporarily in the performance of the work, shall be upon cleared portions of the job site or areas to be cleared, and shall require written approval of the Contracting Officer. The preservation of the landscape shall be an imperative consideration in the selection of all sites and in the construction of buildings. Plans showing temporary field office, storage, and other construction buildings shall be submitted for approval of the Contracting Officer. Where buildings or tent platforms are constructed on sidehills, the Contracting Officer may require cribbing to be used to obtain level foundations. Benching or leveling of earth may not be allowed, depending on the location of the proposed facility.
3.1.4 Temporary Excavation and Embankments

If the Contractor proposes to construct temporary roads or embankments and excavations for plant and/or work areas, he shall submit the following for approval at least thirty (30) days prior to scheduled start of such temporary work:

a. A layout of all temporary roads, excavations, and embankments to be constructed within the work area.

b. Details of road construction and stabilization.

c. Details of the completed quarry or borrow excavation.

d. Plans and cross sections of proposed embankments and their foundations, including a description of proposed materials and methods of embankment stabilization.

e. A landscaping plan prepared by a competent landscape architect showing the proposed restoration of the area. Removal of any necessary trees and shrubs outside the limits of required clearing or quarry, borrow, or waste areas shall be indicated. The plan shall also indicate location of required guard posts or barriers required to control vehicular traffic passing close to trees and shrubs to be maintained undamaged. The plan shall also provide for the obliteration of construction scars as such and shall provide for a reasonably natural appearing final condition of the area. Modification of the Contractor's plans shall be made only with the written approval of the Contracting Officer. No unauthorized road construction, excavation or embankment construction (including disposal areas) will be permitted.

f. A revision of the Pollution Prevention Plan to include temporary excavation and embankments.

3.1.5 Post-Construction Cleanup or Obliteration

The Contractor shall obliterate all signs of temporary construction facilities such as haul roads, work areas, structures, foundations of temporary structures, stockpiles of excess or waste materials, or any other vestiges of construction, as directed by the Contracting Officer.

It is anticipated that excavation, filling, and plowing of roadways will be required to restore the area to near natural conditions which will permit the growth of vegetation thereon. The disturbed areas shall be graded and filled as required, sufficient topsoil shall be spread to provide a minimum depth of 100 mm (4 inches) of suitable soil for the growth of grass, the entire area seeded, and a uniform perennial vegetative cover with a density of 70 percent established. Restoration to original contours is not required.
3.2 PROTECTION OF THE STRATOSPHERIC OZONE

The Contractor shall comply with 40 CFR Part 82 "Protection of Stratospheric Ozone." To the maximum extent practicable, the Contractor shall choose safe alternatives and products made with or containing safe alternatives to Class I or II ozone depleting substances, identified under 42 U.S.C. 7671k. The Contractor shall screen the contract specifications and inform the Contracting Officers Representative when the specifications require the use of materials or equipment that use ozone depleting substances in their manufacture or operation so the Government can revise the guide specifications when appropriate.

3.3 PROTECTION OF HISTORICAL AND ARCHEOLOGICAL RESOURCES

3.3.1 Preservation of Existing Historical, Archeological, and Cultural Resources

Any known existing historical, archeological and cultural resources within the Contractor's work area are designated on the contract drawings. The Contractor shall take precautions during this contract to preserve all resources as they existed at the time of contract award. The Contractor shall install all protective devices such as off limits markings, fencing, barricades or other devices as designated on the contract drawings and shall be responsible for preservation of the sites during this contract.

3.3.2 Recording and Preserving Historical and Archeological Finds

All items having any apparent historical or archeological interest outside of designated areas which are discovered in the course of any construction activities shall be carefully preserved. The Contractor shall leave the archeological find undisturbed and shall flag an area of 15 meters (50 feet) radius around the find, and shall immediately report the find to the Contracting Officer so that the proper authorities may be notified. Any work required to preserve or protect these finds will be accomplished by change order under the clause entitled Changes of the CONTRACT CLAUSES.

3.4 PROTECTION OF WATER RESOURCES

The Contractor shall not pollute streams, lakes, or reservoirs with fuels, oils, bitumens, calcium chloride, acids, construction wastes, or other harmful materials. It is the responsibility of the Contractor to investigate and comply with all applicable Federal, State, County, and Municipal laws concerning pollution of rivers and streams. All work under this contract shall be performed in such a manner that objectionable conditions will not be created in lakes, reservoirs, or streams through or adjacent to the project areas. For construction sites less than 20,230 square meters (5 acres) in size and prior to start of construction, the Contractor shall submit to the Contracting Officer a plan showing his scheme for controlling erosion and disposing of wastes.
3.4.1 Storm Water Pollution Prevention Plan

For project sites greater than 20,230 square meters (5 acres) in size (including all temporary access roads, trailer sites, storage areas, and any other disturbed area associated with the project), the Contractor shall develop a Storm Water Pollution Prevention Plan (SWPPP) and complete a Notice of Intent (NOI) for Storm Water Discharges as required for an NPDES General Permit administered by the Environmental Protection Agency (EPA). The Contractor's detailed SWPPP shall be developed within the guidelines of the basic SWPPP provided as Attachment A to this section of the specifications. The Contractor shall submit his NOI to EPA not later than 48 hours prior to start of work. A dated copy of the Contractor's SWPPP and NOI shall be submitted to the Contracting Officer prior to commencement of construction activities. In addition, the Contractor shall post a copy of the Corps' NOI, the Contractor's NOI, and a brief project description on the project bulletin board. For the project description, the Contractor may use Section 1.1 of the SWPPP or write a brief description.

3.4.2 Erosion and Sediment Control

All cuts and fills within the construction limits, whether or not completed, and borrow and waste disposal areas shall be provided with erosion and sediment control measures such as earthen dikes, silt fences, drainage swales, sediment traps, check dams, level spreaders, subsurface drains, pipe slope drains, temporary storm drain diversions, storm drain inlet protection, rock outlet protection and any other measures necessary to prevent water from crossing disturbed areas and to remove sediment from site runoff before it leaves the site. Disturbed areas shall be graded to control erosion. The area of bare soil exposed at any one time by construction operations shall be held to a minimum. Unless otherwise approved by the Contracting Officer, the Contractor shall stabilize denuded ground within 14 days after construction activity on a particular portion of the site has temporarily or permanently ceased, except for areas where construction activities will resume within 21 days from when construction activities ceased. Stabilization may be achieved with temporary seeding, mulching, geotextiles, vegetative buffer strips, or a combination of these methods. Stream crossings by fording with equipment shall be limited to control turbidity and in areas of frequent crossings temporary culverts or bridge structures shall be installed. Any temporary culverts or bridge structures shall be removed upon completion of the project. Fills and waste areas shall be constructed by selective placement to eliminate to the extent practicable silts or clays on the surface that will erode and contaminate adjacent streams or lakes.

3.5 SPILLAGES AND DISPOSAL OF WASTE MATERIALS

3.5.1 Spillages

Prevent chemicals, fuels, oils, greases, bituminous materials, waste washings, herbicides and insecticides, and cement from entering streams, rivers, or lakes.
3.5.2 Disposal

No solid materials, including building material wastes, shall be disposed of at the construction site unless approved by the Contracting Officer. Disposal of any materials, wastes, effluents, trash, garbage, oil, grease, chemicals, etc., in areas adjacent to streams shall be subject to the approval of the Contracting Officer. If any waste material is dumped in unauthorized areas the Contractor shall remove the material and restore the area to the condition of the adjacent undisturbed area. If necessary, contaminated ground shall be excavated, disposed of as directed by the Contracting Officer, and replaced with suitable fill material, compacted and finished with topsoil all at the expense of the Contractor.

3.6 PROTECTION OF FISH AND WILDLIFE

The Contractor shall at all times perform all work and take such steps required to prevent any interference or disturbance to fish and wildlife. The Contractor will not be permitted to alter water flows or otherwise disturb native habitat adjacent to the project area which, in the opinion of the Contracting Officer, are critical to fish or wildlife. Construction of check dams in live streams will not be permitted. Fouling or polluting of water will not be permitted. Wash waters and wastes shall be processed, filtered, ponded, or otherwise treated prior to their release into a river or other body of water.

3.7 JANITOR SERVICES

The Contractor shall furnish daily janitorial services for the temporary field office, storage, and other construction buildings on the project site and perform any required maintenance of facilities and grounds as deemed necessary by the Contracting Officer during the entire life of the contract. Toilet facilities shall be kept clean and sanitary at all times. Services shall be performed at such a time and in such a manner to least interfere with the operations but will be accomplished only when the buildings are occupied. Services shall be accomplished to the satisfaction of the Contracting Officer. The Contractor shall also provide daily trash collection and cleanup of the buildings and adjacent outside areas, snow removal in season, and shall dispose of all discarded debris, aggregate samples and concrete test samples in a manner approved by the Contracting Officer.

3.8 BURNING

No material shall be burned at the project site unless otherwise specified in other sections of these specifications or authorized by the Contracting Officer.
3.9 DUST CONTROL

The Contractor will be required to maintain all excavations, embankments, stockpiles, haul roads, permanent access roads, plant sites, waste areas, borrow areas, and all other work areas within or without the project boundaries free from dust in accordance with all applicable local, state, and Federal regulations for the control of dust and particulate emissions. Approved temporary methods of stabilization consisting of sprinkling, chemical treatment, light bituminous treatment or similar methods will be permitted to control dust. Sprinkling, to be approved, must be repeated at such intervals as to keep all parts of the disturbed area at least damp at all times, and the Contractor must have sufficient competent equipment on the job to accomplish this if sprinkling is used. Dust control shall be performed as the work proceeds to minimize vehicle offsite tracking of sediment and generation of dust. Gravel paving or light bituminous treatment shall be provided for entrance and exit drives, parking areas, and unpaved roads carrying more than 25 vehicles per day on the construction site.

3.10 MAINTENANCE OF POLLUTION CONTROL FACILITIES DURING CONSTRUCTION

During the life of this contract the Contractor shall maintain all facilities constructed for pollution control under this contract as long as the operations creating the particular pollutant are being carried out or until the material concerned has become stabilized to the extent that pollution is no longer being created. During the construction period the Contractor shall conduct frequent training courses for his maintenance personnel. The curricula shall include methods of detection of pollution, familiarity with pollution standards, and installation and care of vegetation covers, plants, and other facilities to prevent and correct environmental pollution.

3.10.1 For construction sites covered by a General Permit for Storm Water Discharges, the Contractor's quality control organization shall inspect pollution control structures and activities a minimum of once every seven calendar days and within 24 hours after any storm event of greater than 13 mm (1/2 inch) until final stabilization is achieved. A sample Inspection and Maintenance Report form is attached as Attachment B. An inspection report for each inspection shall be retained on site by the Contractor. In addition, the Contractor shall furnish a copy of each report to the Contracting Officer. When the inspection reveals inadequacies, the pollution prevention measures in the Contractor's Pollution Prevention Plan must be revised and changes implemented within seven days after the inspection. After final stabilization has been achieved, the Contractor shall inspect the site once a month until final inspection and project acceptance by the Corps. After project acceptance, the Contractor shall halt all inspections and shall independently submit a Notice of Termination (NOT) to EPA for the Contractor's General Permit.
3.11 PESTICIDES (INSECTICIDES, FUNGICIDES, HERBICIDES, ETC.)

Application of all pesticides shall be accomplished by certified pest control personnel or under the supervision of a certified pest control operator. Delivery and storage of pesticides will be monitored by certified personnel to insure the adequacy of containers and the safe storage of toxic materials. Disposal of containers and chemicals will be monitored to prevent pollution of natural drainage systems.

3.12 EMERGENCY PLANNING AND COMMUNITY RIGHT-TO-KNOW REQUIREMENTS

The Contractor shall comply with the requirements of Sections 301 through 312 of the Emergency Planning and Community Right-to-Know Act (EPCRA), also known as Superfund Amendments and Reauthorization Act (SARA) Title III, as published in 40 CFR Part 355. The Contractor shall also comply with all state regulations and procedures which result from EPCRA and the hazard communication program requirements of COE EM 385-1-1. The following planning and reporting requirements involve the Contractor's reporting requirements but are not all inclusive; i.e. transport regulations are not addressed. It is the Contractor's responsibility to comply with all Federal, state, and local emergency planning and reporting requirements.

3.12.1 Definitions and Acronyms

3.12.1.1 CERCLA Hazardous Substance (CHS)

A CERCLA Hazardous Substance (CHS) is any substance listed in Section 101(14) of the Comprehensive Environmental Response, Compensation, and Liability Act, also referred to as Superfund; the list of substances also appears in Table 302.4 of 40 CFR 302.

3.12.1.2 Contracting Officer (CO)

The Contracting Officer (CO) is the site owner or operator's construction representative.

3.12.1.3 Extremely Hazardous Substance (EHS)

An Extremely Hazardous Substance (EHS) is any substance listed in Appendices A and B of 40 CFR 355.

3.12.1.4 Facility Emergency Coordinator (FEC)

Facility Emergency Coordinator (FEC) is the representative of the facility Owner or Operator. The Contractor shall identify the FEC and notify the FEC as described below each time the Contractor brings a hazardous substance onto the construction site.
3.12.1.5 Hazardous Chemical Substance (HCS)

A Hazardous Chemical Substance (HCS) is any substance defined as hazardous under 29 CFR 1910.1200, with exceptions as listed in 40 CFR 370.2; generally any substance with a Material Safety Data Sheet (MSDS).

3.12.1.6 Reportable Quantity (RQ)

Reportable Quantity (RQ) is a specified minimum amount of a CHS or an EHS which, if released, must be reported immediately to the FEC. The RQ for a CHS is listed in Table 302.4 of 40 CFR 302; the RQ for an EHS is 0.45 kg (1 pound).

3.12.1.7 Threshold Planning Quantity (TPQ)

Threshold Planning Quantity (TPQ) is a specified minimum amount of an EHS which, if brought onto the construction site, must be reported within a stated time to the FEC. The TPQ for an EHS is listed in Appendices A and B of 40 CFR 355 or is the quantity published in state code, whichever is less.

3.12.2 Hazardous Substance Reporting

Whenever a HCS or an EHS substance is brought onto the construction site, the Contractor shall submit the attached reporting form to the FEC, the fire department with jurisdiction over the site, and the Contracting Officer as described below:

a. within 5 days for an EHS substance which (1) equals or exceeds its TPQ, or (2) is a solid or liquid weighing 225 kg (500 pounds) or more, whichever is less, or

b. within 10 days for a HCS substance which equals or exceeds 4,500 kg (10,000 pounds) for a solid or 208 liters (55 gallons) for a liquid.

3.12.3 Emergency Release Notification for Listed Hazardous Substances

The Contractor shall immediately notify the FEC and the Contracting Officer if there is a release of an EHS or a CHS substance whose quantity equals or exceeds its RQ.

3.12.3.1 Emergency Notification Information

Emergency notifications shall consist of the following information:

a. The Contractor's name, the name and telephone number of the person making the report, and the name and telephone number of the Contractor's contact person;

b. The chemical name and identification;
c. An estimate of the quantity released;
d. The location of the release;
e. The time and duration of the release;
f. The medium receiving the release (air, land, water);
g. Known acute or chronic health risks;
h. Medical advice when necessary; and
i. Recommended community precautions.

3.12.3.2 Follow-Up Notice

Within 5 days of the release, a written follow-up notice of the release shall be provided to the FEC and the Contracting Officer. The written notice shall update information provided in the initial report, provide detailed information on the response actions taken, and provide advice regarding medical attention necessary for exposed individuals.

3.12.3.3 State EPCRA Agency

The Contractor may call the following agency for information about EPCRA requirements:

New Mexico Department of Public Safety
New Mexico Emergency Response Commission
P.O. Box 1628
Santa Fe, New Mexico 87504-1628
Telephone Number 505-827-9923

- - o 0 o - -

01510-12
State of ____________________

EMERGENCY PLANNING COMMUNITY RIGHT TO KNOW
NOTIFICATION FORM

Date ________________

This is a notification that the facility named below stores or has stored a Hazardous Chemical Substance (HCS) or an Extremely Hazardous Substance (EHS) as listed in Section 302(c), Title III of SARA - Emergency Planning and Community Right-to-Know Act of 1986.

INSTRUCTIONS: Print or type all information, except signature.

<table>
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<th>Name of Construction</th>
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<tbody>
<tr>
<td>Facility</td>
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<td>Address</td>
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<td>City</td>
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<tr>
<td>State</td>
</tr>
<tr>
<td>Zip</td>
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<tr>
<td>Code</td>
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<td>Name and Company of Person Completing Form</td>
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CHEMICAL DESCRIPTION

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</tr>
<tr>
<td>Maximum Quantity On-Site</td>
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<tr>
<td>Average Daily Quantity On Site</td>
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FOR EHS or CHS

| Threshold Planning Quantity |

Reportable Quantity

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<th>Storage Location of HS/EHS</th>
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<tr>
<td>Facility Emergency Coordinator</td>
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<tr>
<td>Telephone Number</td>
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<td>Signature of Person Completing Form</td>
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CHEMICAL CHARACTERISTICS

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<td>Liquid</td>
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TYPE OF HAZARDOUS SUBSTANCE

<table>
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<th>EHS</th>
<th>CHS</th>
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</table>
ATTACHMENT A

BASIC POLLUTION PREVENTION PLAN (SITE SPECIFIC, WRITTEN BY THE CORPS OF ENGINEERS, AND ATTACHED TO SECTION 01510).
ATTACHMENT B

STORM WATER POLLUTION PREVENTION PLAN

INSPECTION AND MAINTENANCE REPORT

INSPECTOR: ________________________________ DATE: ____________

INSPECTOR'S QUALIFICATIONS:
_________________________________________________________________
_________________________________________________________________
_________________________________________________________________

DAYS SINCE LAST RAINFALL: ________ AMOUNT OF LAST RAINFALL: ________ INCHES

STABILIZATION MEASURES

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<tr>
<th>AREA</th>
<th>DATE SINCE LAST DISTURBANCE</th>
<th>DATE OF NEXT DISTURBANCE</th>
<th>STABILIZED? (YES/NO)</th>
<th>STABILIZED WITH?</th>
<th>CONDITION</th>
</tr>
</thead>
</table>

STABILIZATION REQUIRED:
_________________________________________________________________
_________________________________________________________________
_________________________________________________________________

01510-15

Attachment B
**STORM WATER POLLUTION PREVENTION PLAN**

**INSPECTION AND MAINTENANCE REPORT**

**STRUCTURAL CONTROLS - EARTH DIKE(S)**

<table>
<thead>
<tr>
<th>FROM</th>
<th>TO</th>
<th>IS DIKE STABILIZED?</th>
<th>IS THERE EVIDENCE OF WASH-OUT OR OVERTOPPING?</th>
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**MAINTENANCE REQUIRED FOR THE EARTH DIKE(S):**

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

**TO BE PERFORMED BY: ____________________________ ON OR BEFORE: ___________**

**STRUCTURAL CONTROLS - SEDIMENT BASIN(S)**

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<thead>
<tr>
<th>DEPTH OF SEDIMENT</th>
<th>CONDITION OF BASIN</th>
<th>ANY EVIDENCE OF OVERTOPPING OF THE EMBANKMENT?</th>
<th>CONDITION OF OUTFALL FROM THE SEDIMENT BASIN?</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>IN BASIN</th>
<th>SIDE SLOPES</th>
<th></th>
<th></th>
</tr>
</thead>
</table>

---

01510-17

Attachment B
MAINTENANCE REQUIRED FOR SEDIMENT BASIN(S):

TO BE PERFORMED BY: ____________________________ ON OR BEFORE: __________

STRUCTURAL CONTROLS - SILT FENCE(S)

<table>
<thead>
<tr>
<th>FROM</th>
<th>TO</th>
<th>IS THE BOTTOM OF THE FABRIC STILL BURIED?</th>
<th>IS THE FABRIC IN GOOD CONDITION?</th>
<th>HOW DEEP IS THE SEDIMENT?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

MAINTENANCE REQUIRED FOR THE SILT FENCE(S):

TO BE PERFORMED BY: ____________________________ ON OR BEFORE: __________
| IS MUCH SEDIMENT TRACKED ONTO THE ROAD? | ARE DUST AND SEDIMENT CONTROL MEASURES WORKING? | DOES ALL TRAFFIC USE THE STABILIZED ENTRANCE TO THE SITE? | ARE ASSOCIATED DRAINAGE STRUCTURES WORKING? |

MAINTENANCE REQUIRED FOR CONSTRUCTION ENTRANCE:


TO BE PERFORMED BY:_________________________ ON OR BEFORE:___________________

OTHER CONTROLS - DEVELOP SITE SPECIFIC TABLES AS NEEDED

FOR ALL STABILIZATION MEASURES, STRUCTURAL AND NON-STRUCTURAL CONTROLS

CHANGES REQUIRED TO THE POLLUTION PREVENTION PLAN:


01510-19
STORM WATER POLLUTION PREVENTION PLAN

INSPECTION AND MAINTENANCE REPORT

REASONS FOR CHANGES:

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

INSPECTOR'S SIGNATURE: ____________________________ DATE: ____________
PART 1 - GENERAL

1.1 SUMMARY

This section covers a project bulletin board, complete.

1.2 REFERENCES

The Federal Standard (FED-STD or FSN) listed below forms a part of this specification to the extent referenced. The publication is referred to in the text by the basic designation only.

FED-STD 595  (Rev A; Change Notices 2, 3, 4, 5, 7, and Errata, 8, and 9) Colors.

AAMA 603.8  (1992) Voluntary Performance Requirements and Test Procedures for Pigmented Organic Coatings on Extruded Aluminum

1.3 PAYMENT

No separate payment will be made for the work covered under this section of the specifications and all costs in connection therewith will be considered as a subsidiary obligation of the Contractor, covered by the contract prices in this contract.

PART 2 - PRODUCTS

2.1 BULLETIN BOARD

Immediately upon beginning of work under this contract, the Contractor shall provide a weatherproof glass-covered bulletin board not less than 36 by 48 inches in size, for displaying the Equal Employment Opportunity Poster, a copy of the wage decision contained in the contract, Wage Rate Information Poster, and other information approved by the Contracting Officer. The bulletin board shall be located at the site of work in a conspicuous place easily accessible to all employees as approved by the Contracting Officer. Legible copies of the aforementioned data shall be displayed until work under the contract is complete. Upon completion of work under this contract the bulletin board shall be removed by and remain the property of the Contractor.
PART 3 - EXECUTION

3.1 GENERAL

Immediately upon beginning of work under this contract, the Contractor shall accomplish the work covered under this section of the specifications. Location of the bulletin board shall be as determined by the Contracting Officer.

- o 0 o -
PART 1 - GENERAL

1.1 CONTRACTOR FURNISHED TRAILER

a. Contractor shall furnish, set up complete and ready for use a relocatable modular unit consisting of one (1) each 40' x 11'-9" (excluding towing tongue) unit and be equal to or better than Morgan Building System's No. 12445 model complete with hot and cold running water, waste systems, heating, air conditioning, lighting, window shades, front and rear desk, plan rack, plan table, closet, skirting, and stairs with handrail. Manufacturer will be regularly engaged in the construction and on-site erection of relocatable modular buildings. Unit will be set up at a location designated by the Government in the Administrative Area of Fort Wingate. The unit will be waterproofed and made ready for use within 30 days after notice to proceed.

b. Exterior utilities shall be permanently installed to the modular unit (including electrical transformer) and connected with existing utilities. Exposed utilities shall be insulated to prevent freezing.

1.2 DISPOSITION: The unit shall become the property of the Contractor at completion of the contract. The Contractor shall remove the unit, all associated equipment and utilities from Government property.

1.3 SUBMITTALS: Contractor shall provide shop drawings for approval by the Contracting Officer, verifying all dimensions, fixtures and equipment herein. Deviations shall be noted. Approval of shop drawings, fixtures and equipment will not relieve the Contractor of the responsibility for any errors which may exist and the Contractor shall be responsible for the satisfactory construction of all work.
PART 1 - GENERAL

1.1 OPERATION AND MAINTENANCE MANUALS, SPARE PARTS LISTS, SPARE PARTS, SPECIAL TOOLS, INVENTORIES OF INSTALLED PROPERTIES AND TRAINING OF OPERATING AND SERVICE PERSONNEL

The Contractor shall be responsible for the preparation, coordination, execution and submittal of all operation and maintenance manuals, spare parts lists, special tools, inventories of equipment manuals and maintenance instructions, and shall conduct all training of operating and service personnel. Operation and maintenance manuals shall cover all system installations provided in this contract and shall be in sufficient detail to facilitate normal maintenance and troubleshooting by persons with minimum experience with the installed equipment.

1.1.1 Submittal Requirements

All of the above listed items required in the Technical Provisions of these specifications shall be submitted to the Contracting Officer not less than 60 days prior to the scheduled contract completion date. Fully developed and approved operation and maintenance instructions shall be provided 30 days prior to scheduling training of operating and service personnel. The Contractor shall coordinate the content of each instruction period required in the Technical Provisions of these specifications with the Contracting Officer's representative prior to the actual start of the training period.

1.1.1.1 Videotaping of Training for Operating and Service Personnel

Each instruction or training period as discussed above, shall be videotaped in VHS FORMAT by the Contractor. The taping shall include the entire session; and the original video tape(s) shall be labeled and turned over to the Contracting Officer. The video camera and tapes utilized by the Contractor, shall be of a quality to enable clear and understandable playbacks of the recorded events.

1.1.2 Bidding Schedule

A separate Bid Item entitled "O&M Manuals" has been placed in the Bidding Schedule for the above listed items. The amount of this Bid Item has been established by the Contracting Officer and entered into the Bidding Schedule. This Bid Item becomes a part of the overall Contractor's bid, but payment of the amount shown shall not be made until all the above listed items have been received and approved. On those systems where complete and comprehensive operation and maintenance instructions cannot be fully developed until the system is checked, tested, and/or balanced, a proposed draft of those system manuals shall be submitted. Liquidated damages for O & M Manuals shall begin if the complete O & M Manuals submittal package with drafts is not submitted 60 days prior to the scheduled contract completion date and shall continue until the complete
package is submitted. Fully developed O & M Manuals of the drafts shall be submitted for approval after the systems have been checked, tested and/or balanced. Failure to submit all specified O & M manuals, spare parts listings, spare parts, special tools and inventories of installed property in a timely manner shall be cause for delaying substantial completion of the work. Commencement of warranty under the Contract Clause WARRANTY OF CONSTRUCTION will not occur until all these items are delivered, and approved by the Contracting Officer, but not earlier than the date of final acceptance of the work by the Government. When the O & M Manuals with drafts are approved they will not constitute a reason for delaying the start of the warranty period. Payment for O & M Manuals will be made after approval of all the fully developed manuals.

1.1.3 Government Possession of Work

The Government may take possession of any completed or partially completed work, as provided for under Contract Clause entitled "USE AND POSSESSION PRIOR TO COMPLETION." If the installed equipment and/or systems thereto, have not been accepted by the Government due to the Contractor's failure to submit the above specified items, the Contractor shall operate and maintain such plant or system at no additional cost to the Government until such time that the specified items have been received, approved and any subsequent testing, check-out and/or training has been completed.

1.2 EQUIPMENT OPERATING, MAINTENANCE, AND REPAIR MANUALS

1.2.1 Scope

This paragraph establishes general requirements for the preparation and submission of equipment operating, maintenance, and repair manuals, as called for in the various sections of the specifications. Specific instruction(s) relating to a particular system or piece of equipment shall be incorporated into the manuals in accordance with the applicable specification requirement.

1.2.2 General Requirements

1.2.2.1 Hard Cover Binders

The manuals shall be permanently bound and have a hard cover. The following identification shall be inscribed on the cover: the words "EQUIPMENT OPERATING, MAINTENANCE, AND REPAIR MANUAL:" and the name, building number, location, and indication of utility or systems covered. Manuals shall be approximately 8-1/2 by 11 inches with large sheets folded in and capable of being easily pulled out for reference. All manuals for a single facility must be similar in appearance.

1.2.2.2 Warning Page

A warning page shall be provided to warn of potential dangers (if they exist), such as high voltage, toxic chemicals, flammable liquids, explosive
materials, carcinogens, or high pressures. The warning page shall be placed inside the front cover, in front of the title page.

1.2.2.3 Title Page

The title page shall show the name of the preparing firm (designer or contractor) and the date of publication.

1.2.2.4 Table of Contents

Provide in accordance with standard commercial practice.

1.2.3 Equipment Operating, Maintenance, and Repair Manuals

1.2.3.1 General

Separate manuals shall be provided for each utility system as defined hereinafter. Manuals shall be provided in the number of copies specified in the applicable technical section. Manuals shall include, in separate sections, the following information for each item of equipment:

a. Performance sheets and graphs showing capacity data, efficiencies, electrical characteristics, pressure drops, and flow rates. Marked-up catalogs or catalog pages do not satisfy this requirement. Performance information shall be presented as concisely as possible and contain only data pertaining to equipment actually installed.

b. Catalog cuts showing application information.

c. Installation information showing minimum acceptable requirements.

d. Operation and maintenance requirements. Include adequate illustrative material to identify and locate operating controls, indicating devices and locations of areas or items requiring maintenance.

(1) Describe, in detail, starting and stopping procedures for components, adjustments required to obtain optimum equipment performance, and corrective actions for malfunctions.

(2) Maintenance instructions describing the nature and frequency of routine maintenance and procedures to be followed. Indicate any special tools, materials, and test equipment that may be required.

e. Repair information including diagrams and schematics, guidance for diagnosing problems, and detailed instructions for making repairs. Provide troubleshooting information that includes a statement of the indication or symptom of trouble and the sequential instructions necessary. Include test hookups to determine the cause, special tools and test equipment, and methods for returning the equipment to operating conditions. Information may be in chart form or in tabular format with appropriate headings.
f. Parts lists and names and addresses of closest parts supply agencies.

g. Names and addresses of local manufacturers representatives.

1.2.3.2 Facility Heating Systems

Information shall be provided on the following equipment: Boilers, water treatment, chemical feed pumps and tanks, converters, heat exchangers, pumps, unit heaters, fin-tube radiation, air handling units (both heating only and heating and cooling), and valves (associated with heating systems).

1.2.3.3 Air-Conditioning Systems

Provide information on chillers, packaged air-conditioning equipment, towers, water treatment, chemical feed pumps and tanks, air-cooled condensers, pumps, compressors, air handling units, and valves (associated with air-conditioning systems).

1.2.3.4 Temperature Control and HVAC Distribution Systems

1.2.3.4.1 Provide the information described for the following equipment:

Valves, fans, air handling units, pumps, boilers, converters, and heat exchangers, chillers, water cooled condensers, cooling towers, and fin-tube radiation.

1.2.3.4.2 Provide all information described for the following equipment:

Control air compressors, control components (sensors, controllers, adapters, and actuators), and flow measuring equipment.

1.2.3.5 Central Heating Plants

Provide the information described for the following equipment: Boilers, converters, heat exchangers, pumps, fans, steam traps, pollution control equipment, chemical feed equipment, control systems, fuel handling equipment, de-aerators, tanks (flash, expansion, return water, etc.), water softeners, and valves.

1.2.3.6 District Heating Distribution Systems

Provide the information described for the following equipment: Valves, fans, pumps, converters and heat exchangers, steam traps, tanks (expansion, flash, etc.) and piping systems.

1.2.3.7 Exterior Electrical Systems

Information shall be provided on the following equipment: Power transformers, relays, reclosers, breakers, and capacitor bank controls.
1.2.3.8 Interior Electrical Systems

Information shall be provided on the following equipment: Relays, motor control centers, switchgear, solid state circuit breakers, motor controller, and EPS lighting systems, control systems (wire diagrams and troubleshooting flow chart), and special grounding systems.

1.2.3.9 Energy Management and Control System

The maintenance manual shall include descriptions of maintenance for all equipment, including inspection, periodic preventive maintenance, fault diagnosis, and repair or replacement of defective components.

1.2.3.10 Domestic Water Systems

The identified information shall be provided on the following equipment: Tanks, unit process equipment, pumps, motors, control and monitoring instrumentation, laboratory test equipment, chemical feeders, valves, switching gear, and automatic controls.

1.2.3.11 Wastewater Treatment Systems

The identified information shall be provided on the following equipment: Tanks, unit process equipment, pumps, motors, control and monitoring instrumentation, laboratory test equipment, chemical feeders, valves, scrapers, skimmers, comminutors, blowers, switching gear, and automatic controls.

1.2.3.12 Fire Protection Systems

Information shall be provided on the following equipment: Alarm valves, manual valves, regulators, foam and gas storage tanks, piping materials, sprinkler heads, nozzles, pumps, and pump drivers.

1.2.3.13 Fire Detection Systems

The maintenance manual shall include description of maintenance for all equipment, including inspection, periodic preventive maintenance, fault diagnosis, and repair or replacement of defective components.

1.2.3.14 Plumbing Systems

Information shall be provided on the following equipment: Water heaters, valves, pressure regulators, backflow preventors, piping materials, and plumbing fixtures.

1.2.3.15 Liquid Fuels Systems

Information shall be provided on the following equipment: Tanks, automatic valves, manual valves, filter separators, pumps, mechanical loading arms, nozzles, meters, electronic controls, electrical switch gear, and fluidic controls.
1.2.3.16 Cathodic Protection Systems

Information shall be provided on the following material and equipment: Rectifiers, meters, anodes, anode backfill, anode lead wire, insulation material and wire size, automatic controls (if any), rheostats, switches, fuses and circuit breakers, type and size of rectifying elements, type of oil in oil-immersed rectifiers, and rating of shunts.

1.2.3.17 Generator Installations

Information shall be provided on the following equipment: Generator sets, automatic transfer panels, governors, exciters, regulators, starting systems, switchgear, and protective devices.

1.2.3.18 Miscellaneous Systems

Information shall be provided on the following: Communication and ADP systems, security and intrusion alarm, elevators, material handling, active solar, photovoltaic, and other similar type special systems not otherwise specified.

1.3 AS-BUILT DRAWINGS

1.3.1 Scope

This paragraph covers as-built drawings technical requirements and provides information on preliminary and final as-built drawing submittals.

1.3.1.1 General

The as-built drawings shall be a record of the construction as installed and completed by the Contractor. They shall include all the information shown on the contract set of drawings and a record of all deviations, modifications, or changes from those drawings, however minor, which were incorporated in the work, all additional work not appearing on the contract drawings, all changes which are made after final inspection of the contract work and the location and size of all uncharted existing utilities encountered. In event the Contractor accomplishes additional work which changes the as-built conditions of the facility after submission of the as-built drawings, the Contractor shall furnish revised and/or additional drawings as required to depict as-built conditions. The requirements for these additional drawings will be the same as for the as-built drawings included in the original submission.
1.3.1.2 Submittals of preliminary and final as-built drawings shall be as outlined:

1.3.1.2.1 Contracts Having Multiple Items of Work

A copy of the preliminary as-built drawings which the Contractor has reproduced from the approved preliminary as-built drawing sepias, shall be furnished to the Contracting Officer's representative at the time of the final inspection on each interim item of work.

1.3.1.2.2 Contracts Having a Single Item of Work and the Chronologically Last Item of Work on Contracts Having Multiple Items of Work

At the time of final inspection on the last/only item of work, the Contractor shall deliver a copy of the approved preliminary as-built drawing sepias and blue lines to the Contracting Officer's representative.

1.3.1.2.3 All Contracts, Final As-Built Drawings

Final as-built drawing submittal requirements are as stated later in this specification.

1.3.2 Preliminary As-Built Drawings

The Contractor shall mark up both a sepia set and a blue line set of prints to show as-built conditions. These two sets, hereafter called preliminary as-built drawings, or singly, sepias or blue lines, shall be kept current and available on the jobsite at all times, except as noted below. A member of the Contractor’s Quality Control Organization shall be assigned responsibility for the maintenance and currency of preliminary as-built drawings. This assignment and any reassignment of duties concerning the maintenance of the as-built drawings shall be promptly reported to the Contracting Officer's representative for his approval. All changes from the contract plans which are made in the work or additional information which might be uncovered in the course of construction, including uncharted utilities, shall be accurately and neatly recorded as they occur by means of details and notes. All changes and/or required additions to the preliminary as-built drawings shall be clearly identified in a color contrasting to blue and which is compatible with reproduction of the preliminary as-built sepias. During periods when the sepias are being copied and are therefore not available at the jobsite, the Contractor shall continue posting all required data to the blue lines. The Contractor shall minimize the time that the sepias are away from the jobsite and he shall update them with all as-built data immediately upon their return. The sepias and blue lines will be jointly inspected for accuracy and completeness by the Contracting Officer’s representative and the assigned representative of the Contractor’s Quality Control Organization prior to submission of each monthly pay estimate. (See paragraph: Withholding for Preliminary As-Builts.) The as-built drawings shall show the following information, but not be limited thereto.
The Contractor shall mark up copies of the drawings attached in the specifications to show as-built conditions. These copies hereafter called preliminary as-built drawings, shall be kept current and available on the jobsite at all times, except as noted below. A member of the Contractor's Quality Control Organization shall be assigned responsibility for the maintenance and currency of preliminary as-built drawings. This assignment and any reassignment of duties concerning the maintenance of the as-built drawings shall be promptly reported to the Contracting Officer's representative for his approval. All changes from the contract plans which are made in the work or additional information which might be uncovered in the course of construction, including uncharted utilities, shall be accurately and neatly recorded as they occur by means of details and notes. All changes and/or required additions to the preliminary as-built drawings shall be clearly identified in red. The marked up drawings will be jointly inspected for accuracy and completeness by the Contracting Officer's representative and the assigned representative of the Contractor's Quality Control Organization prior to submission of each monthly pay estimate. (See paragraph: Withholding for Preliminary As-Builts.) The as-built drawings shall show the following information, but not be limited thereto.

1.3.2.1 The location and description of any utility lines or other installation of any kind or description known to or found to exist within the construction area. The location of exterior utilities includes actual measured horizontal distances from utilities to permanent facilities/ features. These measurements shall be within an accuracy range of six inches and shall be shown at sufficient points to permit easy location of utilities for future maintenance purposes. Measurements shall be shown for all change of direction points and all surface or underground components such as valves, manholes, drop inlets, cleanouts, meter, etc. The general depth range of each underground utility line shall be shown (i.e., 3 to 4 feet in depth). The description of exterior utilities includes the actual quantity, size, and material of utility lines.

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

1.3.2.1.2 Correct grade or alignment of roads, structures or utilities if any changes were made from contract plans.

1.3.2.1.3 Correct elevations if changes were made in site grading.

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

1.3.2.1.5 The topography and grades of all drainage installed or affected as a part of the project construction.
1.3.2.1.6 Options

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

1.3.2.2 As part of the prefinal inspection for each item of work, the preliminary as-built drawings will be reviewed. They must comply with this specification prior to scheduling the final inspection, and/or prior to substantial completion of the item of work.

1.3.2.3 Preliminary As-Built Drawing Final Submittal

Prior to scheduling the final acceptance inspection of the last/only bid schedule item of work, the preliminary as-built drawings shall be completed and delivered to the Contracting Officer’s representative for his review and approval. If upon review, the drawings are found to contain errors and/or omissions, they will be returned to the Contractor for corrections. Failure of the Contractor to make timely delivery of the preliminary as-built drawings on any/all items of work will be cause for the Government to delay substantial completion, and to assess liquidated damages in accordance with the terms and conditions of the contract.

1.3.2.4 Withholding for Preliminary As-Built Drawings

Failure by the Contractor to maintain current and satisfactory preliminary as-built drawings in accordance with these requirements will result in withholding from progress payments an amount determined by the Contracting Officer’s Authorized Representative as the value of the subject as-built drawings, and will indicate this unearned amount on monthly payment estimates until the Contractor has fulfilled the contract requirements.

1.3.3 Final As-Built Information

Upon approval of the preliminary as-built drawings, the Contracting Officer will furnish the Contractor the approved blue lines and the original set of contract drawings or tracings and the computer generated graphics files (CADD files) of the contract drawings. The CADD files will be provided to the Contractor in Intergraph Microstation Version 4 format. CADD files will be delivered to the Contractor on one of the following types of media: 90 megabyte Bernoulli disk; up to 10, 3-1/2-inch floppy disks in DOS 5 format using PKZIP compression; 2.3 gigabyte 8mm cartridge tape using scpio or cpio and CLIX Unix format; or 9 track tape using VAX tape backup. The Contractor shall provide the Contracting Officer, upon approval of the preliminary as-built drawings, the preferred media on which to copy the CADD files. The Contractor will then modify these original drawings or tracings and CADD files as may be necessary to correctly show all the features of the project as it was constructed by bringing the contract set into agreement with the preliminary as-built drawings, including adding additional drawings and CADD files as may be necessary. The original drawings or tracings and CADD files are part of the permanent records of this project and the Contractor shall be responsible for the protection and
safety thereof until returned to the Contracting Officer. Any drawings or tracings or CADD files damaged or lost by the Contractor shall be satisfactorily replaced by the Contractor at his expense. If additional drawings are required, they shall be prepared on blank sheets furnished by the Government and added to the CADD files.

1.3.3.1 Drafting

Only personnel proficient in the preparation of engineering drawings and CADD shall be employed to modify the original contract drawings or prepare additional new drawings. All additions and corrections to the contract drawings shall be neat, clean, and legible and shall match the adjacent existing linework and/or lettering being annotated in type, density, size, and style. All modifications, CADD information, and new drawings shall, in addition to the above, conform to applicable requirements of the Southwestern Division Architectural and Engineering Instruction Manual (and the Fort Worth District CADD Operating Procedures Manual) available from the Area or Resident Engineer's Office. The Contracting Officer will review all as-built drawings for accuracy and conformance to the above specified drafting and CADD standards. The Contractor will make all corrections, changes, additions, and deletions required to meet these standards.

1.3.3.1.1 Final Revisions

When final revisions have been completed, each drawing and CADD file shall be lettered with the words "DRAWING OF WORK AS BUILT" in letters at least 3/16" high placed below the title block between the border and the trim line. The date of completion and the words "REVISED AS-BUILT" shall be placed in the revision block above the latest existing revision notation.

1.3.3.1.2 Title Blocks

The title block to be used for any new as-built drawings shall be similar to that used on the original drawings.

1.3.3.2 Copies of the Final As-Built Drawings

1.3.3.2.1 35 mm Microfilm Aperture Cards

35 mm microfilm aperture cards shall be furnished and shall meet the following criteria:

a. 35 mm film negatives shall be produced from the drawings as corrected to reflect as-built conditions, using a camera designed for micro-filming engineering drawings. Reduction ratio shall be between 1:29 and 1:30. Finished film image outside these limits will not be acceptable.

b. Microfilm shall have a high-contrast emulsion capable of resolving at least 135 lines per mm, and shall be processed in accordance with manufacturer's standards. Film shall be processed and washed to meet archival standards for cleanliness of .005 mg of "hypo" per square inch.

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c. Finished microfilm negatives shall have a uniform background density of .8 to 1.1 as read on a standard transmission densitometer. Image lines shall not be blurred or "blocked up" so as to be indistinguishable. Negatives shall be capable of photographic enlargement up to the original size of the drawing without appreciable loss of definition as compared to the original drawing.

d. Finished negatives shall be free of scratches, light paths, fogged areas, water marks and/or air bells.

e. Film shall be mounted in standard aperture cards, 7-3/8" by 3-1/4", with the title block positioned in the upper left hand corner of the aperture and with the emulsion side of the film down.

f. Each aperture card shall be identified with the following information typed or legibly written across the top of the card: (1) Name of installation; (2) Contract Number; (3) Plate or sequence number; (4) Title of job (first card only).

g. See attached sketch of sample aperture card (Attachment 1).

1.3.3.2.2 Blue Line or Black Line Prints

Blue line or black line prints shall be full size, 28" x 40" image on 30" x 42" sheet. All blue or black line prints shall exhibit good readable print with clear, sharp, dark lines, and shall not be smeared, faded, double imaged, or have torn or ragged edges.

1.3.3.3 Submittal Requirements

The Contractor shall submit to the Contracting Officer the final as-built drawings, consisting of three sets of the 35 mm aperture cards, one set for the District and two sets for the user; one set of full size blue line or black line prints; two sets of corrected CADD files in Intergraph Microstation version 4 format, one for the District and one for the user on the media as determined by the Contracting officer; the approved preliminary blue lines; and all required reproduced items. All paper prints, reproducible drawings, CADD files, and microfilms will become the property of the Government upon final approval. Failure to submit as-built information as required herein shall be cause for withholding payment due the Contractor for final as-built drawings under this contract and for assessment of the specified liquidated damages. Approval and acceptance of final as-built information shall be accomplished before final payment is made to the Contractor.

1.3.3.4 Payment for Final As-Built Drawings

Payment for the performance of the work outlined above will be made after its acceptance by the Contracting Officer. This work is a subsidiary portion of the contract work, therefore an amount, as specified in the Bid Schedule will be paid upon acceptable performance of the work.
1.4 ADDITIONAL WARRANTY REQUIREMENTS

The warranty requirements specified in this paragraph are in addition to those specified in the Contract Clause WARRANTY OF CONSTRUCTION in Section 00700 CONTRACT CLAUSES.

1.4.1 Performance Bond

It is understood that the Contractor’s Performance Bond will remain effective throughout the life of all warranties and warranty extensions. This paragraph is applicable to the Contractor’s Warranty of Construction only and does not apply to manufacturers’ warranties on equipment, roofing, and other products.

(a) In the event the Contractor or his designated representative fails to commence and diligently pursue any work required under the Warranty of Construction Paragraph within a reasonable time after receipt of written notification pursuant to the requirements thereof, the Contracting Officer shall have a right to demand that said work be performed under the Performance Bond by making written notice on the surety. If the surety fails or refuses to perform the obligation it assumed under the Performance Bond, the Contracting Officer shall have the work performed by others, and after completion of the work, shall make demand for reimbursement of any or all expenses incurred by the Government while performing the work, including, but not limited to administrative expenses.

(b) Warranty repair work which arises to threaten the health or safety of personnel, the physical safety of property or equipment, or which impairs operations, habitability of living spaces, etc., will be handled by the Contractor on an immediate basis as directed verbally by the Contracting Officer or his authorized representative. Written verification will follow verbal instructions. Failure of the Contractor to respond as verbally directed will be cause for the Contracting Officer or his authorized representative to have the warranty repair work performed by others and to proceed against the Contractor as outlined in the paragraph (a) above.

1.4.2 Pre-Warranty Conference

Prior to contract completion and at a time designated by the Contracting Officer or his authorized representative, the Contractor shall meet with the Contracting Officer to develop a mutual understanding with respect to the requirements of Contract Clause WARRANTY OF CONSTRUCTION. Communication procedures for Contractor notification of warranty defects, priorities with respect to the type of defect, reasonable time required for Contractor response, and other details deemed necessary by the Contracting Officer or his authorized representative for the execution of the construction warranty shall be established/reviewed at this meeting.

In connection with these requirements and at the time of the Contractor’s quality control completion inspection, the Contractor will furnish the name, telephone number and address of a licensed and bonded company which
is authorized to initiate and pursue warranty work action on behalf of the Contractor. This single point of contact will be located within the local service area of the warranted construction, will be continuously available, and will be responsive to Government inquiry on warranty work action and status. This requirement does not relieve the Contractor of any of his responsibilities in connection with Contract Clause WARRANTY OF CONSTRUCTION.

1.4.3 Equipment Warranty Identification Tags

The Contractor shall provide warranty identification tags on all equipment installed under this contract. Tags and installation shall be in accordance with the requirements of Paragraph: EQUIPMENT WARRANTY IDENTIFICATION TAGS.

1.5 EQUIPMENT WARRANTY IDENTIFICATION TAGS

1.5.1 General Requirements

The Contractor shall provide warranty identification tags on all Contractor and Government furnished equipment which he has installed.

1.5.1.1 Tag Description and Installation

The tags shall be similar in format and size to the exhibits provided by this specification, they shall be suitable for interior and exterior locations, resistant to solvents, abrasion, and to fading caused by sunlight, precipitation, etc. These tags shall have a permanent pressure-sensitive adhesive back, and they shall be installed in a position that is easily (or most easily) noticeable. Contractor furnished equipment that has differing warranties on its components will have each component tagged.

1.5.1.2 Sample Tags

Sample tags shall be submitted to the Contracting Officer's Authorized Representative for his review and approval. These tags shall be filled out representative of how the Contractor will complete all other tags.

1.5.1.3 Tags for Warranted Equipment

The tag for this equipment shall be similar to the following. Exact format and size will be as approved by the Contracting Officer's Authorized Representative. The Contractor warranty expires (warranty expiration date) and the final manufacturer's warranty expiration dates will be determined as specified by the Paragraph "WARRANTY OF CONSTRUCTION."
1.5.1.4 Duplicate Information

If the manufacturer's name (MFG), model number and serial number are on the manufacturer's equipment data plate and this data plate is easily found and fully legible, this information need not be duplicated on the equipment warranty tag.

1.5.2 Execution

The Contractor will complete the required information on each tag and install these tags on the equipment by the time of and as a condition of final acceptance of the equipment. The Contractor will schedule this activity in the Contractor progress reporting system. The final acceptance inspection is scheduled based upon notice from the Contractor, thus if the Contractor is at fault in this inspection being delayed, the Contractor will, at his own expense, update the in-service and warranty expiration dates on these tags.
1.5.3 Payment

The work outlined above is a subsidiary portion of the contract work, and has a value to the Government approximating 5% of the value of the Contractor furnished equipment. The Contractor will assign up to that amount, as approved by the Contracting Officer's Authorized Representative.

1.5.4 Equipment Warranty Tag Replacement

Under the terms of this contract, the Contractor's warranty with respect to work repaired or replaced shall run for one year from the date of repair or replacement. Such activity shall include an updated warranty identification tag on the repaired or replaced equipment. The tag shall be furnished and installed by the Contractor, and shall be identical to the original tag, except that the Contractor's warranty expiration date will be one year from the date of acceptance of the repair or replacement.

1.6 INVENTORY OF CONTRACTOR FURNISHED AND INSTALLED EQUIPMENT

A list of equipment or units of equipment that require electrical power or fuel, or may require removal or replacement such as AHUs, fans, air conditioners, compressors, condensers, boiler, thermal exchangers, pumps, cooling towers, tanks, fire hydrants, sinks, water closets, lavatories, urinals, shower stalls, and any other large plumbing fixtures, light fixtures, etc., shall be made and kept up to date as installed. The list shall be reviewed periodically by the Government to insure completeness and accuracy. Partial payment will be withheld for equipment not incorporated in the list. List shall include on each item as applicable: Description, Manufacturer, Model or Catalog No., Serial No., Input (power, voltage, BTU, etc.), Output (power, voltage, BTU, tons, etc.), Size or Capacity (tanks), and net inventory costs; any other data necessary to describe item and shall list all warrantors and warranty periods for each item of equipment. Final list shall be turned over to the Authorized Representative of the Contracting Officer at the time of the Contractor's quality control completion inspection.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)
FORT BLISS
EAGLE I
CAGLE I - 75-0-026

GUNNERY RANGES

APERTURE CARD
SCALE: 3/4" = 1'

FILM NOTES:
1. GLOSSY SIDE UP.
2. REDUCTION TOLERANCE 1:25 TO 1:50.
PART 1 GENERAL

1.1 DEFINITIONS

1.1.1 Clearing

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

1.1.2 Grubbing

Grubbing shall consist of the removal and disposal of stumps, roots larger than 3 inches in diameter, and matted roots from the designated grubbing areas.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.1 CLEARING

Trees, stumps, roots, brush, and other vegetation in areas to be cleared shall be cut off flush with or below the original ground surface, except such trees and vegetation as may be indicated or directed to be left standing. Trees designated to be left standing within the cleared areas shall be trimmed of dead branches 1-1/2 inches or more in diameter and shall be trimmed of all branches the heights indicated or directed. Limbs and branches to be trimmed shall be neatly cut close to the bole of the tree or main branches. Cuts more than 1-1/2 inches in diameter shall be painted with an approved tree-wound paint. Trees and vegetation to be left standing shall be protected from damage incident to clearing, grubbing, and construction operations by the erection of barriers or by such other means as the circumstances require. Clearing shall also include the removal and disposal of structures that obstruct, encroach upon, or otherwise obstruct the work.

3.2 GRUBBING

Material to be grubbed, together with logs and other organic or metallic debris not suitable for foundation purposes, shall be removed to a depth of not less than 18 inches below the original surface level of the ground in areas indicated to be grubbed and in areas indicated as construction areas under this contract, such as areas for buildings, and areas to be paved. Depressions made by grubbing shall be filled with suitable material and compacted to make the surface conform with the original adjacent surface of the ground.
3.3 DISPOSITION OF MATERIALS

3.3.1 Salable Timber

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

3.3.2 Materials Other Than Salable Timber

Logs, stumps, roots, brush, rotten wood, and other refuse from the clearing and grubbing operations, except for salable timber, shall not be disposed of by burning. The disposal of such products shall be in a designated waste disposal area.

-- End of Section --
PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 1556 (1990) 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 (1984; R 1990) Density and Unit Weight of Soil in Place by the Rubber Balloon Method

ASTM D 2216 (1992) Laboratory Determination of Water (Moisture) Content of Soil, and Rock

ASTM D 2487 (1992) 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) Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)


1.2 DEFINITIONS

1.2.1 Degree of Compaction

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

1.3 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

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

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

Blasting Safety Plan; GA

Plan for storing and transporting explosives and conducting safe blasting operations at least 15 days prior to the start of blasting operations.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Satisfactory Materials

Satisfactory materials include materials classified in ASTM D 2487 as GW, GP, SW, SM, SP, SC, GM, GC and CL and shall be free of trash, debris, roots or other organic matter, or stones larger than 3 inches in any dimension.

2.1.2 Unsatisfactory Materials

Unsatisfactory materials include materials classified in ASTM D 2487 as Pt, OH, OL, MH, ML, and CH and any other materials not defined as satisfactory.

2.1.3 Cohesionless and Cohesive Materials

Cohesionless materials include materials classified in ASTM D 2487 as GW, GP, SW, and SP. Cohesive materials include materials classified as GC, SC, ML, CL, MH, and CH. Materials classified as GM and SM will be identified as cohesionless only when the fines are nonplastic.

2.1.4 Non-Expansive Soils

Non-expansive soils are defined as soils that have a plasticity index not less than 4 nor greater than 12 when tested in accordance with ASTM D 4318.

2.1.5 Nonfrost Susceptible (NFS) Material

Nonfrost susceptible material shall be a uniformly graded washed sand with a maximum particle size of 3/4 inch and less than 5 percent passing the No. 200 size sieve, and with not more than 3 percent by weight finer than 0.02 mm grain size.
2.2 CAPILLARY WATER BARRIER

Capillary Water Barrier shall consist of clean, crushed, nonporous rock, crushed gravel, or uncrushed gravel. The maximum particle size shall be 1-1/2 inches and no more than 2 percent by weight shall pass the No. 4 size sieve.

2.3 RIPRAP

Riprap shall consist of sound and durable stone, cobbles, or pebbles. The material shall have a maximum size of 12 inches and be reasonably well-graded between the maximum size stone permitted and 3 inch stone, with not more than 5 percent by weight smaller than the 3 inch size. The least dimension of a stone shall be considered its size.

PART 3 EXECUTION

3.1 PROTECTION OF HISTORICAL AND ARCHAEOLOGICAL RESOURCES

All items having any apparent historical or archaeological interest which are discovered in the course of any construction activities shall be carefully preserved. The Contractor shall leave archaeological finds undisturbed, flag an area of 50 feet radius around finds, and immediately report finds to the Contracting Officer.

3.2 CLEARING AND GRUBBING

The areas within lines 5 feet outside of each building and structure line shall be cleared and grubbed of trees, stumps, roots, brush and other vegetation, debris, existing foundations, pavements, utility lines, structures, fences, and other items that would interfere with construction operations. Stumps, logs, roots, and other organic matter shall be completely removed and the resulting depressions shall be filled with satisfactory material, placed and compacted in accordance with paragraph FILLING AND BACKFILLING. Materials removed shall be disposed of in the designated waste disposal area or outside the limits of Government-controlled property at the Contractor's responsibility.

3.3 EXCAVATION

Excavation shall conform to the dimensions and elevations indicated for each building, structure, and footing except as specified hereinafter, and shall include trenching for utility and foundation drainage systems to a point 5 feet beyond the building line of each building and structure, excavation for outside grease interceptors, underground fuel tanks, and all work incidental thereto. Excavation shall extend a sufficient distance from walls and footings to allow for placing and removal of forms. Excavations below indicated depths will not be permitted except to remove unsatisfactory material. Unsatisfactory material encountered below the grades shown shall be removed as directed and replaced with satisfactory material. Satisfactory material removed below the depths indicated without specific direction of the Contracting Officer shall be replaced at no additional cost to the Government to the indicated excavation grade with satisfactory materials, except that concrete footings shall be increased in thickness to the bottom of the overdepth excavations and over-break in rock.
TARGET LAUNCH FACILITIES, PHASE 1, FT WINGATE, NM

excavation. Satisfactory material shall be placed and compacted as specified in paragraph FILLING AND BACKFILLING. Determination of elevations and measurements of approved overdepth excavation of unsatisfactory material below grades indicated shall be done under the direction of the Contracting Officer.

3.4 DRAINAGE AND DEWATERING

3.4.1 Drainage

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

3.5 SHORING

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

3.6 CLASSIFICATION OF EXCAVATION

Rock excavation shall consist of the removal and disposal of boulders 1 cubic yard or more in volume; solid rock; materials that cannot be removed without systematic drilling and blasting such as rock material in ledges or aggregate conglomerate deposits that are so firmly cemented as to possess the characteristics of solid rock; and concrete or masonry structures exceeding 1 cubic yard in volume, except sidewalks and paving. Hard and compact materials such as cemented gravel, glacial till, and relatively soft or disintegrated rock that can be removed without continuous and systematic drilling and blasting will not be considered as rock excavation. Rock excavation will not be considered as such because of intermittent drilling and blasting that is performed merely to increase production. Excavation of the material claimed as rock shall not be performed until the material has been cross-sectioned by the Contractor and approved by the Contracting Officer. Common excavation shall consist of all excavation not classified as rock excavation.

3.7 BLASTING

Blasting will not be permitted.

3.8 UTILITY AND DRAIN TRENCHES

Trenches for underground utilities systems and drain lines shall be excavated to the required alignments and depths. The bottoms of trenches shall be graded to secure the required slope and shall be tamped if necessary to provide a firm pipe bed. Trenches shall be excavated to accommodate bells and joints so that pipe will be uniformly supported for
2.2 CAPILLARY WATER BARRIER

Capillary Water Barrier shall consist of clean, crushed, nonporous rock, crushed gravel, or uncrushed gravel. The maximum particle size shall be 1-1/2 inches and no more than 2 percent by weight shall pass the No. 4 size sieve.

2.3 RIPRAP

Riprap shall consist of sound and durable stone, cobbles, or spalls. The material shall have a maximum size of 12 inches and be reasonably well-graded between the maximum size stone permitted and 3 inch stone, with not more than 5 percent by weight smaller than the 3 inch size. The least dimension of a stone shall be considered its size.

2.5 MEDIUM GRADATION SAND

Medium sand shall pass the #28 sieve, and be retained on the #65 sieve.

PART 3 EXECUTION

3.1 PROTECTION OF HISTORICAL AND ARCHAEOLOGICAL RESOURCES

All items having any apparent historical or archaeological interest which are discovered in the course of any construction activities shall be carefully preserved. The Contractor shall leave archaeological finds undisturbed, flag an area of 50 feet radius around finds, and immediately report finds to the Contracting Officer.

3.2 CLEARING AND GRUBBING

The areas within lines 5 feet outside of each building and structure line shall be cleared and grubbed of trees, stumps, roots, brush and other vegetation, debris, existing foundations, pavements, utility lines, structures, fences, and other items that would interfere with construction operations. Stumps, logs, roots, and other organic matter shall be completely removed and the resulting depressions shall be filled with satisfactory material, placed and compacted in accordance with paragraph FILLING AND BACKFILLING. Materials removed shall be disposed of in the designated waste disposal areas or outside the limits of government-controlled property at the Contractor's responsibility.

3.3 EXCAVATION

Excavation shall conform to the dimensions and elevations indicated for each building, structure, and footing except as specified hereinafter, and shall include trenching for utility and foundation drainage systems to a point 5 feet beyond the building line of each building and structure, excavation for outside grease interceptors, underground fuel tanks, and all work incidental thereto. Excavation shall extend a sufficient distance from walls and footings to allow for placing and removal of forms. Excavations below indicated depths will not be permitted except to remove unsatisfactory material. Unsatisfactory material encountered below the grades shown shall be removed as directed and replaced with satisfactory material. Satisfactory material removed below the depths indicated without specific direction of the Contracting Officer shall be replaced at no additional cost to the Government to the indicated excavation grade with satisfactory materials, except that concrete footings shall be increased in thickness to the bottom of the overdepth excavations and over-break in rock
excavation. Satisfactory material shall be placed and compacted as specified in paragraph FILLING AND BACKFILLING. Determination of elevations and measurements of approved overdepth excavation of unsatisfactory material below grades indicated shall be done under the direction of the Contracting Officer.

3.4 DRAINAGE AND DEWATERING

3.4.1 Drainage

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

3.5 SHORING

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

3.6 CLASSIFICATION OF EXCAVATION

Rock excavation shall consist of the removal and disposal of boulders 1 cubic yard or more in volume; solid rock; materials that cannot be removed without systematic drilling and blasting such as rock material in ledges or aggregate conglomerate deposits that are so firmly cemented as to possess the characteristics of solid rock; and concrete or masonry structures exceeding 1 cubic yard in volume, except sidewalks and paving. Hard and compact materials such as cemented gravel, glacial till, and relatively soft or disintegrated rock that can be removed without continuous and systematic drilling and blasting will not be considered as rock excavation. Rock excavation will not be considered as such because of intermittent drilling and blasting that is performed merely to increase production. Excavation of the material claimed as rock shall not be performed until the material has been cross sectioned by the Contractor and approved by the Contracting Officer. Common excavation shall consist of all excavation not classified as rock excavation.

3.7 BLASTING

Blasting will not be permitted.

3.8 UTILITY AND DRAIN TRENCHES

Trenches for underground utilities systems and drain lines shall be excavated to the required alignments and depths. The bottoms of trenches shall be graded to secure the required slope and shall be tamped if necessary to provide a firm pipe bed. Recesses shall be excavated to accommodate bells and joints so that pipe will be uniformly supported for
the entire length. Rock, where encountered, shall be excavated to a depth of at least 6 inches below the bottom of the pipe, and the overdepth shall be backfilled with satisfactory material placed and compacted in conformance with paragraph FILLING AND BACKFILLING.

3.9 BORROW

Where satisfactory materials are not available in sufficient quantity from required excavations, approved materials shall be obtained as specified in Section 02225 EARTHWORK FOR ROADWAYS.

3.10 EXCAVATED MATERIALS

Satisfactory excavated material required for fill or backfill shall be placed in the proper section of the permanent work required under this section or shall be separately stockpiled if it cannot be readily placed. Satisfactory material in excess of that required for the permanent work and all unsatisfactory material shall be disposed of as specified in Section 02225 EARTHWORK FOR ROADWAYS.

3.11 FINAL GRADE OF SURFACES TO SUPPORT CONCRETE

Excavation to final grade shall not be made until just before concrete is to be placed. Approximately level surfaces shall be roughened, and sloped surfaces shall be cut as indicated into rough steps or benches to provide a satisfactory bond. Shales shall be protected from slaking or other erosion resulting from ponding or flow of water.

3.12 SUBGRADE PREPARATION

Unsatisfactory material in surfaces to receive fill or in excavated areas shall be removed and replaced with satisfactory materials. The surface shall be scarified to a depth of 6 inches before the fill is started. Sloped surfaces steeper than 1 vertical to 4 horizontal shall be plowed, stepped, benched, or broken up so that the fill material will bond with the existing material. When subgrades are less than the specified density, the ground surface shall be broken up to a minimum depth of 6 inches, pulverized, and compacted to the specified density. When the subgrade is part fill and part excavation or natural ground, the excavated or natural ground portion shall be scarified to a depth of 12 inches and compacted as specified for the adjacent fill. Material shall not be placed on surfaces that are muddy, frozen, or contain frost. Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, or other approved equipment well suited to the soil being compacted. Material shall be moistened or aerated as necessary to provide the moisture content that will readily facilitate obtaining the specified compaction with the equipment used. Minimum subgrade density shall be as specified in paragraph FILLING AND BACKFILLING.

3.13 FILLING AND BACKFILLING

Satisfactory materials shall be used in bringing fills and backfills to the lines and grades indicated and for replacing unsatisfactory materials. Satisfactory materials shall be placed in horizontal layers not exceeding 8 inches in loose thickness, or 6 inches when hand-operated compactors are
used. After placing, each layer shall be plowed, disked, or otherwise broken up, moistened or aerated as necessary, thoroughly mixed and compacted as specified. Backfilling shall not begin until construction below finish grade has been approved, underground utilities systems have been inspected, tested and approved, forms removed, and the excavation cleaned of trash and debris. Backfill shall be brought to indicated finish grade and shall include backfill for outside grease interceptors and underground fuel tanks. Backfill shall not be placed in wet or frozen areas. Where pipe is coated or wrapped for protection against corrosion, the backfill material up to an elevation 2 feet above sewer lines and 1 foot above other utility lines shall be free from stones larger than 1 inch in any dimension. Heavy equipment for spreading and compacting backfill shall not be operated closer to foundation or retaining walls than a distance equal to the height of backfill above the top of footing; the area remaining shall be compacted in layers not more than 4 inches in compacted thickness with power-driven hand tampers suitable for the material being compacted. Backfill shall be placed carefully around pipes or tanks to avoid damage to coatings, wrappings, or tanks. Backfill shall not be placed against foundation walls prior to 7 days after completion of the walls. As far as practicable, backfill shall be brought up evenly on each side of the wall and sloped to drain away from the wall. Each layer of fill and backfill shall be compacted to not less than the percentage of maximum density specified below:

<table>
<thead>
<tr>
<th>Percent Laboratory maximum density</th>
<th>Cohesive material</th>
<th>Cohesionless material</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fill, embankment, and backfill</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Under structures, building slabs,</td>
<td>90</td>
<td>95</td>
</tr>
<tr>
<td>steps, paved areas, around</td>
<td></td>
<td></td>
</tr>
<tr>
<td>footings, and in trenches</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Under sidewalks and grassed areas</td>
<td>85</td>
<td>90</td>
</tr>
<tr>
<td>Non-Expansive materials</td>
<td></td>
<td>Compacted to not less than 92 percent</td>
</tr>
<tr>
<td>Nonfrost susceptible materials</td>
<td></td>
<td>95</td>
</tr>
<tr>
<td>Subgrade</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Under building slabs, steps, and</td>
<td>90</td>
<td>95</td>
</tr>
<tr>
<td>paved areas, top 12 inches</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Under sidewalks, top 6 inches</td>
<td>85</td>
<td>90</td>
</tr>
</tbody>
</table>

Approved compacted subgrades that are disturbed by the Contractor's operations or adverse weather shall be scarified and compacted as specified.
herein before to the required density prior to further construction thereon. Recompaction over underground utilities and heating lines shall be by hand tamping.

3.14 TESTING

Testing shall be the responsibility of the Contractor and shall be performed at no additional cost to the Government. Testing shall be performed by an approved commercial testing laboratory or may be performed by the Contractor subject to approval. Field in-place density shall be determined in accordance with ASTM D 1556, ASTM D 2157, or ASTM D 2922. When ASTM D 2922 is used, the calibration curves shall be checked and adjusted if necessary by the procedure described in ASTM D 2922, paragraph ADJUSTING CALIBRATION CURVE. ASTM D 2922 results in a wet unit weight of soil and when using this method ASTM D 3017 shall be used to determine the moisture content of the soil. The calibration curves furnished with the moisture gauges shall also be checked along with density calibration checks as described in ASTM D 3017. The calibration checks of both the density and moisture gauges shall be made at the beginning of a job on each different type of material encountered and at intervals as directed by the Contracting Officer. The following number of tests, if performed at the appropriate time, shall be the minimum acceptable for each type operation.

3.14.1 In-Place Densities

3.14.1.1 In-Place Density of Subgrades

One test per 5,000 square foot or fraction thereof.

3.14.1.2 In-Place Density of Fills and Backfills

One test per 5,000 square foot or fraction thereof of each lift for fill or backfill areas compacted by other than hand or hand-operated machines. The density for each lift of fill or backfill materials for trenches, pits, building perimeters or other structures or areas less than 6 feet in width, which are compacted with hand or hand-operated machines shall be tested as follows: One test per each area less than 500 square feet, or one test for each 50 linear feet of long narrow fills 100 feet or more in length. If ASTM D 2922 is used, in-place densities shall be checked by ASTM D 1556 as follows: One check per lift for each 250 linear feet of long narrow fills, and a minimum of 2 checks per lift for other fill and backfill areas.

3.14.2 Moisture Content

In the stockpile, excavation or borrow areas, a minimum of two tests per day per type of material or source of materials being placed is required during stable weather conditions. During unstable weather, tests shall be made as dictated by local conditions and approved moisture content shall be tested in accordance with ASTM D 2216.
3.14.3 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 1,000 cubic yards of fill and backfill, or when any change in material occurs which may affect the optimum moisture content or laboratory maximum density will be made.

3.15 CAPILLARY WATER BARRIER

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

3.16 GRADING

Areas within 5 feet outside of each building and structure line shall be constructed true-to-grade, shaped to drain, and shall be maintained free of trash and debris until final inspection has been completed and the work has been accepted.

3.17 PROTECTION

Settlement or washing that occurs in graded or backfilled areas prior to acceptance of the work shall be repaired and grades reestablished to the required elevations and slopes.

-- End of Section --
PART 1  GENERAL

1.1  REFERENCES

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

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 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  (1984; R 1990) Density and Unit Weight of Soil in Place by the Rubber Balloon Method

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)

1.2  DEFINITIONS

1.2.1  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.

1.3  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 DESCRIPTIONS:

SD-09 Reports
Field Density Tests; GA. Testing of Backfill Materials; GA.

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 SM, SP, SC, GM, GC, CL, GW, GP, and SW.

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 3 inches, and materials classified in ASTM D 2487, as MH, ML, CH, PT, OH, and OL. Unsatisfactory materials also include man-made fills, refuse, or backfills from previous construction.

2.1.3 Cohesionless and Cohesive Materials

Cohesionless materials shall include materials classified in ASTM D 2487 as GW, GP, SW, and SP. Cohesive materials 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.

2.1.4 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 1-1/2 inches, or the maximum size recommended by the pipe manufacturer, whichever is smaller.

2.1.5 Initial Backfill Material

Initial backfill shall consist of select granular material or satisfactory materials free from rocks 1-1/2 inches 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 1 inch in any dimension or as recommended by the pipe manufacturer, whichever is smaller.
2.1.6 Plastic Marking Tape

Plastic marking tape shall be acid and alkali-resistant polyethylene film, 6 inches wide with minimum thickness of 0.004 inch. Tape shall have a minimum strength of 1750 psi lengthwise and 1500 psi crosswise. The tape shall be manufactured with integral wires, foil backing or other means to enable detection by a metal detector when the tape is buried up to 3 feet deep. The tape shall be of a type specifically manufactured for marking and locating underground utilities. The metallic core of the tape shall be encased in a protective jacket or provided with other means to protect it from corrosion. Tape color shall be as specified in TABLE 1 and shall bear a continuous printed inscription describing the specific utility.

<table>
<thead>
<tr>
<th>Color</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red</td>
<td>Electric</td>
</tr>
<tr>
<td>Yellow</td>
<td>Gas, Oil, Dangerous Materials</td>
</tr>
<tr>
<td>Orange</td>
<td>Telephone, Telegraph, Television, Police, and Fire Communications</td>
</tr>
<tr>
<td>Green</td>
<td>Sewer Systems</td>
</tr>
</tbody>
</table>

2.1.7 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.

PART 3 EXECUTION

3.1 PROTECTION OF HISTORICAL AND ARCHAEOLOGICAL RESOURCES

As specified in Section 02221 EXCAVATION, FILLING, AND BACKFILLING FOR BUILDINGS.

3.2 EXCAVATION

Earth excavation shall include removal and disposition of material not classified as rock excavation. Excavation shall be performed to the lines and grades indicated. 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 or shall be disposed of by spreading. 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.
3.2.1 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. Trench walls more than 5 feet high shall be shored, cut back to a stable slope, or provided with equivalent means of protection for employees who may be exposed to moving ground or cave in. Vertical trench walls more than 5 feet high shall be shored. Trench walls which are cut back shall be excavated to at least the angle of repose of the soil. Special attention shall be given to slopes which may be adversely affected by weather or moisture content. The trench width below the top of pipe shall not exceed 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.

3.2.1.1 Bottom Preparation

The bottoms of trenches shall be accurately graded to provide uniform bearing and support for the bottom quadrant of each section of the pipe. Bell holes shall be excavated to the necessary size at each joint or coupling to eliminate point bearing. Stones of 1-1/2 inches or greater in any dimension, or as recommended by the pipe manufacturer, whichever is smaller, shall be removed to avoid point bearing.

3.2.1.2 Excavation for Appurtenances

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

3.2.1.3 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.

3.2.1.4 Stockpiles

Stockpiles of satisfactory and unsatisfactory 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.

3.3 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.

3.3.1 Trench Backfill

Trenches shall be backfilled to the grade shown. The trench shall not be backfilled until all specified tests are performed.

3.3.1.1 Bedding and Initial Backfill

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

3.3.1.2 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.

3.3.2 Backfill for Appurtenances

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

3.4 SPECIAL REQUIREMENTS

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

3.4.1 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.

3.4.2 Electrical Distribution System

Direct burial cable and conduit or duct line shall have a minimum cover of 24 inches from the finished grade, unless otherwise indicated.

3.4.3 Plastic Marking Tape

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

3.5 TESTING

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

3.5.1 Testing Facilities

Tests shall be performed by an approved commercial testing laboratory or may be tested by facilities furnished by the Contractor. No work requiring testing will be permitted until the facilities have been inspected and approved by the Contracting Officer. The first inspection shall be at the expense of the Government. Cost incurred for any subsequent inspection required because of failure of the first inspection will be charged to the Contractor.

3.5.2 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.

3.5.3 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 200 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 1556, ASTM D 2167, or ASTM D 2922. When ASTM D 2922 is used, the calibration curves shall be checked and adjusted 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. 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 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.

-- End of Section --
PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)


ASTM D 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 2167 (1984; R 1990) Density and Unit Weight of Soil in Place by the Rubber Balloon Method

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)


1.2 DEFINITIONS

1.2.1 Satisfactory Materials

Satisfactory materials shall comprise any materials classified by, ASTM D 2487 as GW, GP, SW, SP, SM, SC, GM, GC, and CL. Satisfactory materials for grading shall be free from roots and other organic matter, trash,
debris, and frozen materials and stones larger than 6 inches in any dimension.

1.2.2 Unsatisfactory Materials

Materials which do not comply with the requirements for satisfactory materials are unsatisfactory. Materials classified in ASTM D 2487 as ML, MH, CH, Pt, OH, and OL are unsatisfactory. Unsatisfactory materials also include man-made fills, refuse, or backfills from previous construction.

1.2.3 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.

1.2.4 Degree of Compaction

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

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-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; GA.

Within 24 hours of conclusion of physical tests, 4 copies of test results, including calibration curves and results of calibration tests.

SD-13 Certificates

Testing; GA.

Qualifications of the commercial testing laboratory or Contractor’s testing facilities.
1.4 SUBSURFACE DATA

Subsurface soil boring logs are shown on the drawings or appended to the SPECIAL CLAUSES. These data represent the best subsurface information available; however, variations may exist in the subsurface between boring locations.

1.5 CLASSIFICATION OF EXCAVATION

Excavations shall be classified as rock and common excavation as specified in Section 02221 EXCAVATION, FILLING AND BACKFILLING FOR BUILDINGS.

1.6 BLASTING

Blasting will be permitted.

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 PROTECTION OF HISTORICAL AND ARCHAEOLOGICAL RESOURCES

As specified in Section 02221, EXCAVATION, FILLING, AND BACKFILLING FOR BUILDINGS.

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.

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 sources, either private or within the limits of the project site, selected by the Contractor and approved by the Contracting Officer. 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. 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 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 EMBANKMENTS

3.7.1 Earth Embankments

Earth embankments shall be constructed from satisfactory materials free of organic or frozen material and rocks with any dimension greater than 3 inches. The material shall be placed in successive horizontal layers of loose material not more than 8 inches in depth. Each layer shall be spread uniformly on a soil surface that has been moistened or aerated as necessary and scarified or otherwise broken up in such a manner that the fill will bond with the surface on which it is placed. After spreading, each layer shall be plowed, disked, or otherwise broken up; moistened or aerated as necessary; thoroughly mixed; and compacted to at least 90 percent laboratory maximum density for cohesive materials or 95 percent laboratory maximum density for cohesionless materials. Compaction requirements for the upper portion of earth embankments forming subgrade for pavements shall be identical with those requirements specified in paragraph SUBGRADE.

SECTION 02225 PAGE 5
PREPARATION. Compaction shall be accomplished by sheepfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment.

3.8 SUBGRADE PREPARATION

3.8.1 Construction

Subgrade shall be shaped to line, grade, and cross section, and compacted as specified. This operation shall include plowing, disk ing, 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 3/4 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.

3.8.2 Compaction

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

3.8.2.1 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.

3.8.2.2 Subgrade for Shoulders

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

3.9 SHOULDERS CONSTRUCTION

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

3.10 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 turfed materials.

3.11 TESTING

Testing shall be performed by an approved commercial testing laboratory or by the Contractor subject to approval. If the Contractor elects to establish testing facilities, no work requiring testing will be permitted until the Contractor's facilities have been inspected and approved by the Contracting Officer. The first inspection be at the expense of the Government. Cost incurred for any subsequent inspections required because of failure of the first inspection will be charged to the Contractor. Field in-place density shall be determined in accordance with ASTM D 1556, ASTM D 2167 or ASTM D 2922. When ASTM D 2922 is used, the calibration curves shall be checked and adjusted using only the sand cone method as described in ASTM D 1556. ASTM D 2922 results in a wet unit weight of soil and when using this method ASTM D 3017 shall be used to determine the moisture content of the soil. The calibration curves furnished with the moisture gauges shall also be checked along with density calibration checks as described in ASTM D 3017; the calibration checks of both the density and moisture gauges shall be made at the beginning of a job on each different type of material encountered and at intervals as directed by the Contracting Officer. When test results indicate, as determined by the Contracting Officer, that compaction is not as specified, the material shall be removed, replaced and recompacted to meet specification requirements. Tests on recompacted areas shall be performed to determine conformance with specification requirements. Inspections and test results shall be certified by a registered professional civil engineer. These certifications shall state that the tests and observations were performed by or under the direct supervision of the engineer and that the results are representative of the materials or conditions being certified by the tests. The following number of tests, if performed at the appropriate time, will be the minimum acceptable for each type operation.

3.11.1 Fill and Backfill Material Gradation

One test per 1500 cubic yards stockpiled or in-place source material. Gradation of fill and backfill material shall be determined in accordance with ASTM C 136 and ASTM D 1140.
3.11.2 In-Place Densities

a. One test per 5,000 square feet, or fraction thereof, of each lift of fill or backfill areas compacted by other than hand-operated machines.

b. One test per 2,500 square feet, or fraction thereof, of each lift of fill or backfill areas compacted by hand-operated machines.

c. One test per 250 linear feet, or fraction thereof, of each lift of embankment or backfill for roads.

3.11.3 Check Tests on In-Place Densities

If ASTM D 2922 is used, in-place densities shall be checked by ASTM D 1556 as follows:

a. One check test per lift for each 15,000 square feet, or fraction thereof, of each lift of fill or backfill compacted by other than hand-operated machines.

b. One check test per lift for each 7,500 square feet, of fill or backfill areas compacted by hand-operated machines.

c. One check test per lift for each 1,250 linear feet, or fraction thereof, of embankment or backfill for roads.

3.11.4 Moisture Contents

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

3.11.5 Optimum Moisture and Laboratory Maximum Density

Tests shall be made for each type material or source of material including borrow material to determine the optimum moisture and laboratory maximum density values. One representative test per 1,500 cubic yards of fill and backfill, or when any change in material occurs which may affect the optimum moisture content or laboratory maximum density.

3.11.6 Tolerance Tests for Subgrades

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

3.12 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 --
PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)


ASTM D 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.))


1.2 DEGREE OF COMPACTION

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

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 DESCRIPTIONS:

SD-01 Data

Equipment; FIO.

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

SD-09 Reports

Sampling and Testing; FIO. Density Test; 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. Test results from samples, not less than 30 days before material is required for the work. Results of laboratory tests for quality control purposes, for approval, prior to using the material.

1.4 EQUIPMENT

All plant, equipment, and tools used in the performance of the work covered by this section will be subject to approval by the Contracting Officer before the work is started and shall be maintained in satisfactory working condition at all times. The equipment shall be adequate and shall have the capability of producing the required compaction, and meeting the grade controls, thickness controls, and smoothness requirements set forth herein.

1.5 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. If the Contractor elects to establish testing facilities of his own, approval of such facilities shall be based on compliance with ASTM D 3740, and no work requiring testing will be permitted until the Contractor's facilities have been inspected and approved.

1.5.1 Sampling

Sampling for material gradation, liquid limit, and plastic limit tests shall be taken in conformance with ASTM D 75. When deemed necessary, the sampling will be observed by the Contracting Officer.

1.5.2 Testing
1.5.2.1 Gradation

Aggregate gradation shall be made in conformance with ASTM C 117, ASTM C 136, and ASTM D 422. Sieves shall conform to ASTM E 11.

1.5.2.2 Liquid Limit and Plasticity Index

Liquid limit and plasticity index shall be determined in accordance with ASTM D 4318.

1.5.3 Approval of Materials

The source of the material to be used for producing aggregates shall be selected 30 days prior to the time the material will be required in the work. Approval of sources not already approved by the Corps of Engineers will be based on an inspection by the Contracting Officer. Tentative approval of materials will be based on appropriate test results on the aggregate source. Final approval of the materials will be based on tests for gradation, liquid limit, and plasticity index performed on samples taken from the completed and compacted surface course.

1.6 WEATHER LIMITATIONS

Aggregate courses shall not be constructed when the ambient temperatures is below 35 degrees F and on subgrades that are frozen or contain frost. It shall be the responsibility of the Contractor to protect, by approved method or methods, all areas of surfacing that have not been accepted by the Contracting Officer. Surfaces damaged by freeze, rainfall, or other weather conditions shall be brought to a satisfactory condition by the Contractor.

PART 2 PRODUCTS

2.1 AGGREGATES

Aggregates shall consist of clean, sound, durable particles of natural gravel, crushed gravel, crushed stone, sand, slag, soil, or other approved materials processed and blended or naturally combined. Aggregates shall be free from lumps and balls of clay, organic matter, objectionable coatings, and other foreign materials. The Contractor shall be responsible for obtaining materials that meet the specification and can be used to meet the grade and smoothness requirements specified herein after all compaction operations have been completed.

2.1.1 Coarse Aggregates

The material retained on the No. 4 sieve shall be known as coarse aggregate. Coarse aggregates shall be reasonably uniform in density and quality. The coarse aggregate shall have a percentage of wear not to exceed 50 percent after 500 revolutions as determined by ASTM C 131. The amount of flat and/or elongated particles shall not exceed 20 percent. A flat particle is one having a ratio of width to thickness greater than three; an elongated particle is one having a ratio of length to width greater than three. When the coarse aggregate is supplied from more than one source, aggregate from each source shall meet the requirements set
forth herein.

2.1.2 Fine Aggregates

The material passing the No. 4 sieve shall be known as fine aggregate. Fine aggregate shall consist of screenings, sand, soil, or other finely divided mineral matter that is processed or naturally combined with the coarse aggregate.

2.1.3 Gradation Requirements

Gradation requirements specified in TABLE I shall apply to the completed aggregate base and surface course. It shall be the responsibility of the Contractor to obtain materials that will meet the gradation requirements after mixing, placing, compacting, and other operations. Capillary water barrier and base course shall consist of coarse aggregate only. Sieves shall conform to ASTM E 11.

TABLE I. GRADATION FOR AGGREGATE SURFACE COURSES

<table>
<thead>
<tr>
<th>Sieve Designation</th>
<th>Surface</th>
<th>Base</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 in.</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>3/4 in.</td>
<td>---</td>
<td>90-100</td>
</tr>
<tr>
<td>1/2 in.</td>
<td>---</td>
<td>20-55</td>
</tr>
<tr>
<td>3/8 in.</td>
<td>50-65</td>
<td>0-15</td>
</tr>
<tr>
<td>No. 4</td>
<td>35-65</td>
<td>0-5</td>
</tr>
<tr>
<td>No. 10</td>
<td>25-50</td>
<td>---</td>
</tr>
<tr>
<td>No. 40</td>
<td>15-30</td>
<td>---</td>
</tr>
<tr>
<td>No. 200</td>
<td>8-15</td>
<td>---</td>
</tr>
</tbody>
</table>

NOTE: For the surface course the percent by weight finer than 0.02mm shall not exceed 3 percent.

2.1.4 Liquid Limit and Plasticity Index

The portion of the completed aggregate surface course passing the No. 40 sieve shall have a maximum liquid limit of 35 and a plasticity index of 4 to 9.

PART 3 EXECUTION

3.1 OPERATION OF AGGREGATE SOURCES

Clearing, stripping, and excavating shall be the responsibility of the Contractor. The aggregate sources shall be operated to produce the quantity and quality of materials meeting these specification requirements in the specified time limit. Upon completion of the work, the aggregate sources on Government reservations shall be conditioned to drain readily and be left in a satisfactory condition. Aggregate sources on private lands shall be conditioned in agreement with local laws or authorities.
TARGET LAUNCH FACILITIES, PHASE 1, FT WINGATE, NM

1.5.2.1 Gradation

Aggregate gradation shall be made in conformance with ASTM C 117, ASTM C 136, and ASTM D 422. Sieves shall conform to ASTM B 11.

1.5.2.2 Liquid Limit and Plasticity Index

Liquid limit and plasticity index shall be determined in accordance with ASTM D 4318.

1.5.3 Approval of Materials

The source of the material to be used for producing aggregates shall be selected 30 days prior to the time the material will be required in the work. Approval of sources not already approved by the Corps of Engineers will be based on an inspection by the Contracting Officer. Tentative approval of materials will be based on appropriate test results on the aggregate source. Final approval of the materials will be based on tests for gradation, liquid limit, and plasticity index performed on samples taken from the completed and compacted surface course.

1.6 WEATHER LIMITATIONS

Aggregate courses shall not be constructed when the ambient temperatures is below 35 degrees F and on subgrades that are frozen or contain frost. It shall be the responsibility of the Contractor to protect, by approved method or methods, all areas of surfacing that have not been accepted by the Contracting Officer. Surfaces damaged by freeze, rainfall, or other weather conditions shall be brought to a satisfactory condition by the Contractor.

PART 2 PRODUCTS

2.1 AGGREGATES

Aggregates shall consist of clean, sound, durable particles of natural gravel, crushed gravel, crushed stone, sand, slag, soil, or other approved materials processed and blended or naturally combined. Aggregates shall be free from lumps and balls of clay, organic matter, objectionable coatings, and other foreign materials. The Contractor shall be responsible for obtaining materials that meet the specification and can be used to meet the grade and smoothness requirements specified herein after all compaction operations have been completed.

2.1.1 Coarse Aggregates

The material retained on the No. 4 sieve shall be known as coarse aggregate. Coarse aggregate shall be reasonably uniform in density and quality. The coarse aggregate shall have a percentage of wear not to exceed 50 percent after 500 revolutions as determined by ASTM C 131. The amount of flat and/or elongated particles shall not exceed 20 percent. A flat particle is one having a ratio of width to thickness greater than three; an elongated particle is one having a ratio of length to width greater than three. When the coarse aggregate is supplied from more than one source, aggregate from each source shall meet the requirements set
TARGET LAUNCH FACILITIES, PHASE 1, FT WINGATE, NM
SECTION 02831
CHAIN LINK FENCE

PART 1  GENERAL

1.1  REFERENCES

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

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)
ASTM C 94  (1992a) Ready-Mixed Concrete
ASTM F 883  (1990) Padlocks

AMERICAN WELDING SOCIETY (AWS)
AWS WZC  (1972) Welding Zinc-Coated Steels

FEDERAL SPECIFICATIONS (FS)
FS RR-F-191/GEN  (Rev K) Fencing, Wire and Post Metal (and Gates, Chain-Link Fence Fabric, and Accessories)
FS RR-F-191/1  (Rev D) Fencing, Wire and Post, Metal (Chain-Link Fence Fabric)
FS RR-F-191/2  (Rev D) Fencing, Wire and Post, Metal (Chain-Link Fence Gates)
FS RR-F-191/3  (Rev D) Fencing, Wire and Post, Metal (Chain-Link Fence Posts, Top Rails and Braces)
FS RR-F-191/4  (Rev D) Fencing, Wire and Post, Metal (Chain-Link Fence Accessories)

PART 2  PRODUCTS

2.1  MATERIALS

Materials shall conform to the following:

2.1.1  Chain Link Fence

FS RR-F-191/GEN.
2.1.1.1 Fabric

FS RR-F-191/1, Type I, zinc-coated steel wire with minimum coating weight of 1.2 ounces of zinc per square foot of coated surface, or Type II, aluminum-coated steel wire. Fabric shall be fabricated of 9-gauge wire woven in 2-inch mesh. Fabric height shall be 6 feet. Fabric shall be twisted and barbed on the top selvage and knuckled on the bottom selvage.

2.1.1.2 Gates

FS RR-F-191/2. Gate shall be the type and swing shown. Gate frames shall be constructed of Class 1 Grade A or B, steel pipe, size SP2, as specified in FS RR-F-191/3. Gate fabric shall be as specified for chain-link fabric. Each end member of gate frames shall be extended sufficiently above the top member to carry three strands of barbed wire in horizontal alignment with barbed wire strands on the fence. Gate leaves more than 8 feet wide shall have either intermediate members and diagonal truss rods or shall have tubular members as necessary to provide rigid construction, free from sag or twist. Gate leaves less than 8 feet wide shall have truss rods or intermediate braces. Intermediate braces shall be provided on all gate frames with an electro-mechanical lock. Gate fabric shall be attached to the gate frame by method standard with the manufacturer except that welding will not be permitted. Latches, hinges, stops, keepers, rollers, and other hardware items shall be furnished as required for the operation of the gate. Latches shall be arranged for padlocking so that the padlock will be accessible from both sides of the gate. Stops shall be provided for holding the gates in the open position.

2.1.1.3 Posts

FS RR-F-191/3, zinc-coated; Class 1 Grade A or B, steel pipe; Class 3, formed steel sections; or Class 6, steel square sections. Class 4, steel H-section may be used for line posts in lieu of line post shapes specified for the other classes. Sizes shall be as shown on the drawings. Line posts and terminal (corner, gate, and pull) posts selected shall be of the same class throughout the fence. Gate post shall be either round or square, subject to the limitation specified in FS RR-F-191/3.

2.1.1.4 Braces and Rails

FS RR-F-191/3, zinc-coated, Class 1, Grade A or B, steel pipe, size SP1. Class 3, formed steel sections, size FS1, conforming to FS RR-F-191/3, may be used as braces and rails if Class 3 line posts are furnished.

2.1.1.5 Accessories

FS RR-F-191/4. Ferrous accessories shall be zinc or aluminum coated. Truss rods shall be furnished for each terminal post. Truss rods shall be provided with turnbuckles or other equivalent provisions for adjustment. Barbed wire shall be zinc or aluminum coated, 4 point barbed type, steel wire. Barbed wire support arms shall be the single arm type and of the design required for the post furnished. Tie wire for attaching fabric to
2.1.2 Concrete

ASTM C 94, using 3/4-inch maximum size aggregate, and having minimum compressive strength of 3000 psi at 28 days. Grout shall consist of one part portland cement to three parts clean, well-graded sand and the minimum amount of water to produce a workable mix.

2.1.3 Padlocks

ASTM F 883, Type P01, Grade 2, Size 1-3/4 inch. Padlocks shall be keyed alike and each lock shall be furnished with two keys.

PART 3 EXECUTION

3.1 GENERAL

Fence shall be installed to the lines and grades indicated. Line posts shall be spaced equidistant at intervals not exceeding 10 feet. Terminal (corner, gate, and pull) posts shall be set at abrupt changes in vertical and horizontal alignment. Fabric shall be continuous between terminal posts; however, runs between terminal posts shall not exceed 500 feet. Damage to the galvanized surface due to welding shall be repaired with "repair sticks" of zinc-cadmium alloys or zinc-tin-lead alloys per AWS WZC.

3.2 EXCAVATION

Post holes shall be cleared of loose material. Waste material shall be spread where directed. The ground surface irregularities along the fence line shall be eliminated to the extent necessary to maintain a 1-inch clearance between the bottom of the fabric and finish grade.

3.3 POSTS

Posts shall be set plumb and in alignment. Except where solid rock is encountered, posts shall be set in concrete to the depth indicated on the drawings. Where solid rock is encountered with no overburden, posts shall be set to a minimum depth of 18 inches in rock. Where solid rock is covered with an overburden of soil or loose rock, posts shall be set to the minimum depth indicated on the drawing unless a penetration of 18 inches in solid rock is achieved before reaching the indicated depth, in which case depth of penetration shall terminate. All portions of posts set in rock shall be grouted. Portions of posts not set in rock shall be set in concrete from the rock to ground level. Posts set in concrete shall be set in holes not less than the diameter shown on the drawings. Diameters of holes in solid rock shall be at least 1 inch greater than the largest cross section of the post. Concrete and grout shall be thoroughly consolidated around each post, shall be free of voids and finished to form a dome. Concrete and grout shall be allowed to cure for 72 hours prior to attachment of any item to the posts. Class 3 line posts may be mechanically driven, for temporary fence construction only, if rock is not encountered. Driven posts shall be set to a minimum depth of 3 feet and shall be protected with drive caps when being set. Fence post rigidity
shall be tested by applying a 50-pound force on the post, perpendicular to the fabric, at 5 feet above ground. Post movement measured at the point where the force is applied shall be less than or equal to 3/4 inch from the relaxed position. Every tenth post shall be tested for rigidity. When a post fails this test, further tests on the next four posts on either side of the failed post shall be made. All failed posts shall be removed, replaced, and retested at the Contractor's expense.

3.4 RAILS

3.4.1 Top Rail

Top rail shall be supported at each post to form a continuous brace between terminal posts. Where required, sections of top rail shall be joined using sleeves or couplings that will allow expansion or contraction of the rail.

3.5 BRACES AND TRUSS RODS

Braces and truss rods shall be installed as indicated and in conformance with the standard practice for the fence furnished. Horizontal (compression) braces and diagonal truss (tension) rods shall be installed as shown. Braces and truss rods shall extend from corner, end, or pull posts to line posts. Diagonal braces shall form an angle of approximately 40 to 50 degrees with the horizontal.

3.6 TENSION WIRES

Tension wires shall be installed along the bottom of the fence line and attached to the terminal posts of each stretch of the fence. Bottom tension wire shall be installed within the bottom 6 inches of the installed fabric. Tension wire shall be pulled taut and shall be free of sag.

3.7 CHAIN LINK FABRIC

Chain link fabric shall be installed on the side of the post indicated. Fabric shall be attached to terminal posts with stretcher bars and tension bands. Bands shall be spaced at approximately 15-inch intervals. The fabric shall be installed and pulled taut to provide a smooth and uniform appearance free from sag, without permanently distorting the fabric diamond or reducing the fabric height. Fabric shall be fastened to line posts at approximately 15-inch intervals and fastened to all rails and tension wires at approximately 24-inch intervals. Fabric shall be cut by untwisting and removing pickets. Splicing shall be accomplished by weaving a single picket into the ends of the rails to be joined. The bottom of the installed fabric shall be 1-inch plus or minus 1/2 inch above the ground.

3.8 BARBED WIRE SUPPORTING ARMS AND BARBED WIRE

Barbed wire supporting arms and barbed wire shall be installed as indicated and as recommended by the manufacturer. Supporting arms shall be anchored to the posts in a manner to prevent easy removal with hand tools.
3.9 GATES

Gates shall be installed at the locations shown. Hinged gates shall be mounted to swing as indicated. Latches, stops, and keepers shall be installed as required. Padlocks shall be attached to gates or gate posts with chains and hinge pins, and hardware shall be welded or otherwise secured to prevent removal.

3.10 GROUNDING

Fences crossed by overhead powerlines in excess of 600 volts shall be grounded as specified in Section 16670 LIGHTNING PROTECTION SYSTEM. Fences crossed by powerlines of 600 volts or more shall be grounded at or near the point of crossing and at distances not exceeding 150 feet on each side of crossing. Ground conductor shall consist of No. 8 AWG solid copper wire. Grounding electrodes shall be 3/4-inch by 10-foot long copper-clad steel rod. Electrodes shall be driven into the earth so that the top of the electrode is at least 6 inches below the grade. Where driving is impracticable, electrodes shall be buried a minimum of 12 inches deep and radially from the fence. The top of the electrode shall be not less than 2 feet or more than 8 feet from the fence. Ground conductor shall be clamped to the fence and electrodes with bronze grounding clamps to create electrical continuity between fence posts, fence fabric, and ground rods. After installation the total resistance of fence to ground shall not be greater than 25 ohms.

-- End of Section --
TARGET LAUNCH FACILITIES, PHASE 1, FT WINGATE, NM
SECTION 03100
STRUCTURAL CONCRETE FORMWORK

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 CONCRETE INSTITUTE (ACI)


DEPARTMENT OF COMMERCE (DOC)

DOC PS 1  (1983) Construction and Industrial Plywood

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

Design; FIO.

Design analysis and calculations for form design and methodology used in the design.

SD-04 Drawings

Concrete Formwork; FIO.

Drawings showing details of formwork including, dimensions of fiber voids, joints, supports, studding and shoring, and sequence of form and shoring removal.

SD-06 Instructions

Form Releasing Agents; FIO.

Manufacturer's recommendation on method and rate of application of form releasing agents.

SECTION 03100  PAGE 1
1.3 DESIGN

Formwork shall be designed in accordance with methodology of ACI 347R for anticipated loads, lateral pressures, and stresses. Forms shall be capable of producing a surface which meets the requirements of the class of finish specified in Section 03300 CONCRETE FOR BUILDING CONSTRUCTION. Forms shall be capable of withstanding the pressures resulting from placement and vibration of concrete.

1.4 STORAGE AND HANDLING

Fiber voids shall be stored above ground level in a dry location. Fiber voids shall be kept dry until installed and overlaid with concrete.

PART 2 PRODUCTS

2.1 FORM MATERIALS

2.1.1 Forms For Class B Finish

Forms for Class B finished surfaces shall be plywood panels conforming to DOC PS 1, Grade B-B concrete form panels, Class I or II. Other form materials or liners may be used provided the smoothness and appearance of concrete produced will be equivalent to that produced by the plywood concrete form panels.

2.1.2 Forms For Class D Finish

Forms for Class D finished surfaces, except where concrete is placed against earth, shall be wood or steel or other approved concrete form material.

2.1.3 Form Ties

Form ties shall be factory-fabricated metal ties, shall be of the removable or internal disconnecting or snap-off type, and shall be of a design that will not permit form deflection and will not spall concrete upon removal. Solid backing shall be provided for each tie. Except where removable tie rods are used, ties shall not leave holes in the concrete surface less than 1/4 inch nor more than 1 inch deep and not more than 1 inch in diameter. Removable tie rods shall be not more than 1-1/2 inches in diameter.

2.1.4 Form Releasing Agents

Form releasing agents shall be commercial formulations that will not bond with, stain or adversely affect concrete surfaces. Agents shall not impair subsequent treatment of concrete surfaces depending upon bond or adhesion nor impede the wetting of surfaces to be cured with water or curing compounds.
TARGET LAUNCH FACILITIES, PHASE 1, FT WINGATE, NM

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Formwork

Forms shall be mortar tight, properly aligned and adequately supported to produce concrete surfaces meeting the surface requirements specified in Section 03300 CONCRETE FOR BUILDING CONSTRUCTION and conforming to construction tolerance given in TABLE 1. Where concrete surfaces are to have a Class B finish, joints in form panels shall be arranged as approved. Where forms for continuous surfaces are placed in successive units, care shall be taken to fit the forms over the completed surface so as to obtain accurate alignment of the surface and to prevent leakage of mortar. Forms shall not be reused if there is any evidence of surface wear and tear or defects which would impair the quality of the surface. Surfaces of forms to be reused shall be cleaned of mortar from previous concreting and of all other foreign material before reuse. Form ties that are to be completely withdrawn shall be coated with a nonstaining bond breaker.

3.2 CHAMFERING

Except as otherwise shown, external corners that will be exposed shall be chamfered, beveled, or rounded by moldings placed in the forms.

3.3 COATING

Forms for Class B finished surfaces shall be coated with a form releasing agent before the form or reinforcement is placed in final position. The coating shall be used as recommended in the manufacturer’s printed or written instructions. Forms for Class D finished surfaces may be wet with water in lieu of coating immediately before placing concrete, except that in cold weather with probable freezing temperatures coating shall be mandatory. Surplus coating on form surfaces and coating on reinforcing steel and construction joints shall be removed before placing concrete.

3.4 REMOVAL OF FORMS

Forms shall be removed in a manner that will prevent injury to the concrete and ensure the complete safety of the structure. Formwork for columns, walls, side of beams and other parts not supporting the weight of concrete may be removed when the concrete has attained sufficient strength to resist damage from the removal operation but not before at least 24 hours has elapsed since concrete placement. Supporting forms and shores shall not be removed from beams, floors and walls until the structural units are strong enough to carry their own weight and any other construction or natural loads. In no case will supporting forms or shores be removed before the concrete strength has reached 70 percent of design strengths as determined by field cured cylinders or other approved methods. This strength shall be demonstrated by job-cured test specimens, and by a structural analysis considering the proposed loads in relation to these test strengths and the strength of forming and shoring system. The job-cured test specimens for form removal purposes shall be provided in numbers as directed and shall be in addition to those required for concrete quality control. The specimens shall be removed from molds at the age of 24 hours and shall receive,
insofar as possible, the same curing and protection as the structures they represent.

**TABLE 1**

**TOLERANCES FOR FORMED SURFACES**

<table>
<thead>
<tr>
<th>1. Variations from the plumb:</th>
<th>In any 10 feet of length ----- 1/4 inch</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. In the lines and surfaces of columns, piers, walls and in arises</td>
<td>Maximum for entire length ----- 1 inch</td>
</tr>
<tr>
<td>b. For exposed corner columns, control-joint grooves, and other conspicuous lines</td>
<td>In any 20 feet of length ----- 1/4 inch</td>
</tr>
<tr>
<td></td>
<td>Maximum for entire length ----- 1/2 inch</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2. Variation from the level or from the grades indicated on the drawings:</th>
<th>In any 10 feet of length ----- 1/4 inch</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. In slab soffits, ceilings, beam soffits, and in arises, measured before removal of supporting shores</td>
<td>In any bay or in any 20 feet of length ---------------- 3/8 inch</td>
</tr>
<tr>
<td>b. In exposed lintels, sills, parapets, horizontal grooves, and other conspicuous lines</td>
<td>Maximum for entire length ----- 3/4 inch</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>3. Variation of the linear building lines from established position in plan</th>
<th>In any 20 feet ---------------- 1/2 inch</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Maximum ------------------- 1 inch</td>
</tr>
</tbody>
</table>

| 4. Variation of distance between walls, columns, partitions | 1/4 inch per 10 feet of distance, but not more than 1/2 inch in any one bay, and not more than 1 inch total variation |

| 5. Variation in the sizes and locations of sleeves, floor openings, and wall opening | Minus ---------------- 1/4 inch |
|                                                                                     | Plus ---------------- 1/2 inch |

| 6. Variation in cross-sectional dimensions of columns and beams and in the thickness of slabs and walls | Minus ---------------- 1/4 inch |
|                                                                                     | Plus ---------------- 1/2 inch |

<table>
<thead>
<tr>
<th>7. Footings:</th>
<th>Minus ---------------- 1/2 inch</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Variation of dimensions in plan</td>
<td>Plus ---------------- 2 inches when formed or plus 3 inches when placed</td>
</tr>
</tbody>
</table>

**SECTION 03100 PAGE 4**
<table>
<thead>
<tr>
<th>Description</th>
<th>Tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td>b. Misplacement of eccentricity</td>
<td>Against unformed excavation</td>
</tr>
<tr>
<td>c. Reduction in thickness</td>
<td>2 percent of the footing width in the direction of misplacement but not more than 2 inches</td>
</tr>
<tr>
<td></td>
<td>Minus 5 percent of specified thickness</td>
</tr>
</tbody>
</table>

--- End of Section ---
TARGET LAUNCH FACILITIES, PHASE 1, FT WINGATE, NM

TABLE 1

TOLERANCES FOR FORMED SURFACES

<table>
<thead>
<tr>
<th>Description</th>
<th>Tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td>b. Misplacement of eccentricity</td>
<td>2 percent of the footing width in the direction of misplacement but not more than 2 inches</td>
</tr>
<tr>
<td>c. Reduction in thickness</td>
<td>Minus 5 percent of specified thickness</td>
</tr>
</tbody>
</table>

--- End of Section ---
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 CONCRETE INSTITUTE (ACI)

ACI 318/318R (1989; Rev 1992; Errata) Building Code Requirements for Reinforced Concrete

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 53 (1993a) Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless

ASTM A 184 (1990) Fabricated Deformed Steel Bar Mats for Concrete Reinforcement

ASTM A 185 (1990a) Steel Welded Wire Fabric, Plain, for Concrete Reinforcement

ASTM A 497 (1990b) Steel Welded Wire Fabric, Deformed, for Concrete Reinforcement

ASTM A 499 (1989) Steel Bars and Shapes, Carbon Rolled from "T" Rails

ASTM A 615 (1992b) Deformed and Plain Billet-Steel Bars for Concrete Reinforcement

ASTM A 675 (1990a) Steel Bars, Carbon, Hot-Wrought, Special Quality, Mechanical Properties

ASTM A 706 (1992b) Low-Alloy Steel Deformed Bars for Concrete Reinforcement

AMERICAN WELDING SOCIETY (AWS)

AWS D1.4 (1992) Structural Welding Code - Reinforcing Steel

CONCRETE REINFORCING STEEL INSTITUTE (CRSI)

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 PROCEDURES:

SD-04 Drawings

Concrete Reinforcement System; GA.

Detail drawings showing reinforcing steel schedules, sizes, grades, and splicing and bending details. Drawings shall show support details including types, sizes and spacing.

SD-08 Statements

Qualifications; FIO.

A list of names of qualified welders.

1.3 QUALIFICATIONS

Welders shall be qualified in accordance with AWS D1.4. Qualification test shall be performed at the worksite and the Contractor shall notify the Contracting Officer 24 hours prior to conducting tests. Special welding procedures and welders qualified by others may be accepted as permitted by AWS D1.4.

1.4 DELIVERY AND STORAGE

Reinforcement and accessories shall be stored off the ground on platforms, skids, or other supports.

PART 2 PRODUCTS

2.1 DOWELS

Dowels shall conform to ASTM A 675, Grade 80, or ASTM A 499. Steel pipe conforming to ASTM A 53, Schedule 80, may be used as dowels provided the ends are closed with metal or plastic inserts or with mortar.

2.2 FABRICATED BAR MATS

Fabricated bar mats shall conform to ASTM A 184.

2.3 REINFORCING STEEL

Reinforcing steel shall be deformed bars conforming to ASTM A 615 or ASTM A 706, grades and sizes as indicated.

2.4 WELDED WIRE FABRIC

Welded wire fabric shall conform to ASTM A 185 or ASTM A 497.
2.5 WIRE TIES

Wire ties shall be 16 gauge or heavier black annealed steel wire.

2.6 SUPPORTS

Bar supports for formed surfaces shall be designed and fabricated in accordance with CRSI MSP-1 and shall be steel or precast concrete blocks. Precast concrete blocks shall have wire ties and shall be not less than 4 inches square when supporting reinforcement on ground. Precast concrete block shall have compressive strength equal to that of the surrounding concrete. Where concrete formed surfaces will be exposed to weather or where surfaces are to be painted, steel supports within 1/2 inch of concrete surface shall be galvanized, plastic protected or of stainless steel. Concrete supports used in concrete exposed to view shall have the same color and texture as the finish surface. For slabs on grade, supports shall be precast concrete blocks, plastic coated steel fabricated with bearing plates, or specifically designed wire-fabric supports fabricated of plastic.

PART 3 EXECUTION

3.1 REINFORCEMENT

Reinforcement shall be fabricated to shapes and dimensions shown and shall conform to the requirements of ACI 318/318R. Reinforcement shall be cold bent unless otherwise authorized. Bending may be accomplished in the field or at the mill. Bars shall not be bent after embedment in concrete. Safety caps shall be placed on all exposed ends of vertical concrete reinforcement bars that pose a danger to life safety. Wire tie ends shall face away from the forms.

3.1.1 Placement

Reinforcement shall be free from loose rust and scale, dirt, oil, or other deleterious coating that could reduce bond with the concrete. Reinforcement shall be placed in accordance with ACI 318/318R at locations shown plus or minus one bar diameter. Reinforcement shall not be continuous through expansion joints and shall be as indicated through construction or contraction joints. Concrete coverage shall be as indicated or as required by ACI 318/318R. If bars are moved more than one bar diameter to avoid interference with other reinforcement, conduits or embedded items, the resulting arrangement of bars, including additional bars required to meet structural requirements, shall be approved before concrete is placed.

3.1.2 Splicing

Splices of reinforcement shall conform to ACI 318/318R and shall be made only as required or indicated. Splicing shall be by lapping only. Lapped bars shall be placed in contact and securely tied or spaced transversely apart to permit the embedment of the entire surface of each bar in concrete. Lapped bars shall not be spaced farther apart than one-fifth the required length of lap or 6 inches. In the Launch Equipment Building and Launch Operations Trailer Shelter, lapped splices shall be at

SECTION 03200 PAGE 3
least 40 bar diameters in length unless otherwise indicated.

3.2 WELDED-WIRE FABRIC

Welded-wire fabric shall be placed in slabs as indicated. Fabric placed in slabs on grade shall be continuous between expansion, construction, and contraction joints. Fabric placement at joints shall be as indicated. Lap splices shall be made in such a way that the overlapped area equals the distance between the outermost crosswires plus 2 inches. Laps shall be staggered to avoid continuous laps in either direction. Fabric shall be wired or clipped together at laps at intervals not to exceed 4 feet. Fabric shall be positioned by the use of supports.

3.3 DOWELS

Dowels shall be installed in slabs on grade at locations indicated and at right angles to joint being doweled. Dowels shall be accurately positioned and aligned parallel to the finished concrete surface before concrete placement. Dowels shall be rigidly supported during concrete placement. One end of dowels shall be coated with a bond breaker.

-- End of Section --
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 HARDBOARD ASSOCIATION (AHA)

AHA A135.4 (1982; R 1988) Basic Hardboard

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 1751 (1983; R 1991) Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)


ASTM D 2835 (1989) Lubricant for Installation of Preformed Compression Seals in Concrete Pavements

CORPS OF ENGINEERS (COE)


COE CRD-C 572 (1974) Corps of Engineers Specifications for Polyvinylchloride Waterstops

FEDERAL SPECIFICATIONS (FS)

FS SS-S-1401 (Rev C; Notice 1) Sealant, Joint, Non-Jet-Fuel-Resistant, Hot-Applied, for Portland Cement and Asphalt Concrete Pavements
1.2 DELIVERY AND STORAGE

Material delivered and placed in storage shall be stored off the ground and protected from moisture, dirt, and other contaminants. Sealants shall be delivered in the manufacturer's original unopened containers. Sealants whose shelf life has expired shall be removed from the site.

PART 2 PRODUCTS

2.1 CONTRACTION-JOINT STRIPS

Contraction-joint strips shall be 1/8-inch thick tempered hardboard conforming to AHA Al35.4, Class 1. In lieu of hardboard strips, rigid polyvinylchloride (PVC) insert strips specifically designed to induce controlled cracking in slabs on grade may be used. Such insert strips shall have removable top section.

2.2 EXPANSION-JOINT FILLER

Expansion-joint filler shall be premolded material conforming to ASTM D 1751 or ASTM D 1752. Unless otherwise indicated, filler material shall be 3/8-inch thick and of a width applicable for the joint formed.

2.3 JOINT SEALANT

Joint sealant shall conform to the following:

2.3.1 Preformed Polychloroprene Elastomeric Joint Seals

ASTM D 2628.

2.3.2 Lubricant for Installation of Preformed Compression Seals

ASTM D 2835.

2.3.3 Hot-Poured Type

FS SS-S-1401.

2.4 WATERSTOPS

Waterstops shall conform to COE CRD-C 513 or COE CRD-C 572.

PART 3 EXECUTION

3.1 JOINTS

Joints shall be installed at locations indicated and as authorized.

3.1.1 Contraction Joints

Contraction joints may be constructed by inserting tempered hardboard strips or rigid PVC insert strips into the plastic concrete or by cutting the concrete with a saw after concrete has set. Joints shall be approximately 1/8-inch wide and shall extend into the slab approximately
one-fourth the slab thickness but not less than 1 inch.

3.1.1.1 Joint Strips

Strips shall be of the required dimensions and as long as practicable. After the first floating, the concrete shall be grooved with a tool at the joint locations. The strips shall be inserted in the groove and depressed until the top edge of the vertical surface is flush with the surface of the slab. The slab shall be floated and finished as specified. Working of the concrete adjacent to the joint shall be the minimum necessary to fill voids and consolidate the concrete. Where indicated, the top portion of the strip shall be sawed out after the curing period to form a recess for sealer. The removable section of PVC strips shall be discarded and the insert left in place. Means shall be provided to insure true alignment of the strips is maintained during insertion.

3.1.1.2 Sawed Joints

Joint sawing shall be early enough to prevent uncontrolled cracking in the slab, but late enough that this can be accomplished without appreciable spalling. Concrete-sawing machines shall be adequate in number and power, and with sufficient replacement blades to complete the sawing at the required rate. Joints shall be cut to true alignment and shall be cut in sequence of concrete placement. Sludge and cutting debris shall be removed.

3.1.2 Expansion Joints

Premolded expansion joint filler shall be used in expansion and isolation joints in slabs around columns and between slabs on grade and vertical surfaces where indicated. The filler shall extend the full slab depth, unless otherwise indicated. The edges of the joint shall be neatly finished with an edging tool of 1/8-inch radius, except where a resilient floor surface will be applied. Where the joint is to receive a sealant, the filler strips shall be installed at the proper level below the finished floor with a slightly tapered, dressed-and-oiled wood strip temporarily secured to the top thereof to form a recess 3/4-inch deep to be filled with sealant. The wood strip shall be removed after the concrete has set. In lieu of the wood strip a removable expansion filler cap designed and fabricated for this purpose may be used.

3.1.3 Joint Sealant

Sawed contraction joints and expansion joints in slabs shall be filled with joint sealant, unless otherwise shown. Types and locations of sealants shall be as indicated. Joint surfaces shall be clean, dry, and free of oil or other foreign material which would adversely affect the bond between sealant and concrete. Joint sealant shall be applied as recommended by the manufacturer of the sealant. Joints sealed with field molded sealant shall be completely filled with sealant.

3.2 WATERSTOPS

Waterstops shall be of the type indicated and shall be installed at the locations shown to form a continuous water-tight diaphragm. Adequate
provision shall be made to support and completely protect the waterstops during the progress of the work. Any waterstop punctured or damaged shall be repaired or replaced. Splices shall be made in conformance with the recommendations of the waterstop manufacturer. Continuity of cross sectional features shall be maintained across the splice. Splices showing evidence of separation after bending shall be remade.

-- End of Section --
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 CONCRETE INSTITUTE (ACI)

ACI 117  (1990; Errata) Standard Tolerances for Concrete Construction and Materials
ACI 301  (1989) Structural Concrete for Buildings
ACI 305R  (1991) Hot Weather Concreting
ACI 318  (1989; Rev 1992; Errata) Building Code Requirements for Reinforced Concrete

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 31  (1991) Making and Curing Concrete Test Specimens in the Field
ASTM C 33  (1990) Concrete Aggregates
ASTM C 39  (1986) Compressive Strength of Cylindrical Concrete Specimens
ASTM C 42  (1990) Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
ASTM C 78  (1984) Flexural Strength of Concrete (Using Simple Beam With Third-Point Loading)
ASTM C 94  (1992) Ready-Mixed Concrete
ASTM C 109  (1992) Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or 50-mm Cube Specimens)
ASTM C 143  (1990a) Slump of Hydraulic Cement Concrete
ASTM C 171  (1992) Sheet Materials for Curing Concrete
ASTM C 172  (1990) Sampling Freshly Mixed Concrete
ASTM C 173  (1978) Air Content of Freshly Mixed Concrete by the Volumetric Method
ASTM C 192  (1990a) Making and Curing Concrete Test Specimens in the Laboratory
ASTM C 231  (1991b) Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C 260  (1986) Air-Entraining Admixtures for Concrete
ASTM C 309  (1991) Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C 494  (1992) Chemical Admixtures for Concrete
ASTM C 595  (1992a) Blended Hydraulic Cements
ASTM C 597  (1983; R 1991) Pulse Velocity Through Concrete
ASTM C 618  (1992a) Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete
ASTM C 803  (1990) Penetration Resistance of Hardened Concrete
ASTM C 805  (1985) Rebound Number of Hardened Concrete
ASTM C 989  (1989) Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars
ASTM C 1017  (1992) Chemical Admixtures for Use in Producing Flowing Concrete
ASTM C 1107  (1991a) Packaged Dry, Hydraulic-Cement Grout (Nonshrink)
ASTM D 98  (1987) Calcium Chloride
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 PROCEDURES:

SD-08 Statements

Proportions of Mix; FIO.

The results of trial mix along with a statement giving the maximum nominal coarse aggregate size and the proportions of all ingredients that will be used in the manufacture of each strength of concrete, at least 14 days prior to commencing concrete placing operations. Aggregate weights shall be based on the saturated surface dry condition. The statement shall be accompanied by test results from an independent commercial testing laboratory, attesting that the proportions selected will produce concrete of the qualities indicated. No substitutions shall be made in the materials used in the work without additional tests to show that the quality of the concrete is satisfactory.

SD-09 Reports

Sampling and Testing; FIO.

Certified copies of laboratory test reports, including all test data, for aggregate, admixtures, and curing compound. These tests shall be made by an approved commercial laboratory or by a laboratory maintained by the manufacturers of the materials.

SD-13 Certificates

Cementitious Materials; FIO.

Manufacturer's certification of compliance, accompanied by mill test reports attesting that the materials meet the requirements of the specification under which it is furnished, for cement, pozzolan, and ground iron blast-furnace slag. No cement, pozzolan, or slag shall be used until notice of acceptance has been given. Cement, pozzolan, and slag may be
subjected to check testing by the Government from samples obtained at the mill, at transfer points, or at the project site.

1.3 GENERAL REQUIREMENTS

Tolerances for concrete construction and materials shall be in accordance with ACI 117.

1.3.1 Strength Requirements

Structural concrete for all work shall have a 28-day compressive strength of 4000 pounds per square inch. Concrete slabs on-grade shall have a 28-day flexural strength of 650 pounds per square inch. Concrete made with high-early strength cement shall have a 7-day strength equal to the specified 28-day strength for concrete made with Type I or II portland cement.

1.3.2 Air Entrainment

Concrete shall be air entrained to produce concrete with 3 to 5 percent total air.

1.3.3 Special Properties

Concrete may contain other admixtures, such as water reducers, superplasticizers, or set retarding agents to provide special properties to the concrete, if approved.

1.3.4 Slump

Slump shall be within the following limits:

<table>
<thead>
<tr>
<th>Structural Element</th>
<th>Slump in inches</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Minimum</td>
</tr>
<tr>
<td>Walls, columns and beams</td>
<td>2</td>
</tr>
<tr>
<td>Foundation walls, substructure walls, footings, pavement, and slabs</td>
<td>1</td>
</tr>
<tr>
<td>Any structural concrete approved for placement by pumping</td>
<td>None</td>
</tr>
</tbody>
</table>

*Where use of superplasticizers are approved to produce flowing concrete these slump requirements do not apply.

1.3.5 Technical Service for Specialized Concrete

The service of a technical representative shall be obtained to oversee proportioning, batching, mixing, placing, consolidating and finishing of specialized structural concrete, such as lightweight or flowing concrete until field controls indicate concrete of specified quality is furnished.

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1.4 PROPORTIONS OF MIX

1.4.1 Mixture Proportioning, Normal Weight Concrete

Trial batches shall contain materials proposed to be used in the project. Trial mixtures having proportions, consistencies and air content suitable for the work shall be made based on methodology described in ACI 211.1, using at least three different water-cement ratios. Trial mixes shall be proportioned to produce concrete strengths specified. In the case where ground iron blast-furnace slag is used, the weight of the slag will be substituted in the equations for the term P which is used to denote the weight of pozzolan. Trial mixtures shall be designed for maximum permitted slump and air content. The temperature of concrete in each trial batch shall be reported. For each water-cement ratio at least three test cylinders or beams for each test age shall be made and cured in accordance with ASTM C 192. They shall be tested at 7 and 28 days in accordance with ASTM C 39 or ASTM C 78. From these test results a curve shall be plotted showing the relationship between water-cement ratio and strength. For each strength of concrete the maximum allowable water-cement ratio shall be that shown by these curves to produce an average strength as specified in paragraph AVERAGE STRENGTH.

1.4.2 Average Strength

In meeting the strength requirements specified, the selected mixture proportion shall produce an average compressive strength exceeding the specified strength by the amount indicated below. Where a concrete production facility has test records, a standard deviation shall be established. Test records from which a standard deviation is calculated shall represent materials, quality control procedures, and conditions similar to those expected; shall represent concrete produced to meet a specified strength or strengths within 1000 psi of that specified for proposed work; and shall consist of at least 30 consecutive tests. A strength test shall be the average of the strengths of two cylinders made from the same sample of concrete and tested at 28 days or at other test age designated for determination of the specified strength.

1.4.2.1 Test Records Exceeding 29

Required average compressive strength used as the basis for selection of concrete proportions shall be the larger of the specified strength plus the standard deviation multiplied by 1.34 or the specified strength plus the standard deviation multiplied by 2.33 minus 500.

1.4.2.2 Test Records Less Than 29

Where a concrete production facility does not have test records meeting the above requirements but does have a record based on 15 to 29 consecutive tests, a standard deviation may be established as the product of the calculated standard deviation and a modification factor from the following table:

SECTION 03300 PAGE 5
TARGET LAUNCH FACILITIES, PHASE 1, FT WINGATE, NM

<table>
<thead>
<tr>
<th>No. of tests (1)</th>
<th>Modification factor for standard deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>less than 15</td>
<td>See Note</td>
</tr>
<tr>
<td>15</td>
<td>1.16</td>
</tr>
<tr>
<td>20</td>
<td>1.08</td>
</tr>
<tr>
<td>25</td>
<td>1.03</td>
</tr>
<tr>
<td>30 or more</td>
<td>1.00</td>
</tr>
</tbody>
</table>

(1) Interpolate for intermediate numbers of tests.

When a concrete production facility does not have field strength test records for calculation of standard deviation or the number of tests is less than 15, the required average strength shall be 5200 psi.

1.5 STORAGE OF MATERIALS

Cement and pozzolan shall be stored in weathertight buildings, bins, or silos which will exclude moisture and contaminants. Aggregate stockpiles shall be arranged and used in a manner to avoid excessive segregation and to prevent contamination with other materials or with other sizes of aggregate. Reinforcing bars and accessories shall be stored above the ground on platforms, skids or other supports. Other materials shall be stored in such a manner as to avoid contamination and deterioration. Admixtures which have been in storage at the project site for longer than 6 months or which have been subjected to freezing shall not be used unless retested and proven to meet the specified requirements.

PART 2 PRODUCTS

2.1 ADMIXTURES

Admixtures shall conform to the following:

2.1.1 Accelerating Admixture

ASTM C 494, Type C or E; or calcium chloride conforming to ASTM D 98.

2.1.2 Air-Entraining Admixture

ASTM C 260.

2.1.3 Flowing Concrete Admixture

ASTM C 1017, Type 1 or 2.

2.1.4 Water-Reducing or Retarding Admixture

ASTM C 494, Type A, B, D, F, or G.
2.2 CEMENTITIOUS MATERIALS

Cementitious materials shall each be of one type and from one source when used in concrete which will have surfaces exposed in the finished structure. Cementitious materials shall conform to one of the following:

2.2.1 Cement

ASTM C 150, Type I or II.

2.2.2 Portland Blast-Furnace-Slag Cement

ASTM C 595, Type IS.

2.2.3 Portland-Pozzolan Cement

ASTM C 595, Type IP.

2.2.4 Pozzolan

ASTM C 618, Class F. Pozzolan may be blended with Type I or II portland cement. When a pozzolan is used in a flexural strength concrete mix design, the solid volume of pozzolan when combined with portland cement shall not exceed 25 percent of the solid volume of portland cement plus pozzolan. Only one class of pozzolan, from a single source, shall be used.

2.2.5 Ground Iron Blast-Furnace Slag

ASTM C 989, Grade 120.

2.3 AGGREGATES

Aggregates shall conform to the following:

2.3.1 Normal Weight Aggregate

ASTM C 33. Grading requirement for coarse aggregate shall conform to size number 467.

2.4 CURING MATERIALS

2.4.1 Burlap

FS CCC-C-467.

2.4.2 Impervious Sheets

ASTM C 171, type optional, except that polyethylene film, if used, shall be white opaque.

2.4.3 Membrane-Forming Compounds

ASTM C 309, Type 1-D, Class A or B.
2.5 EMBEDDED ITEMS

Embedded items shall be of the size and type indicated or as needed for the application. Dovetail slots shall be galvanized steel. Hangers for suspended ceilings shall be as specified in Section 09510 ACOUSTICAL CEILINGS. Inserts for shelf angles and bolt hangers shall be of malleable iron or cast or wrought steel.

2.6 NONSHRINK GROUT

Nonshrink grout shall conform to ASTM C 1107 Grade A, B, or C and shall be a formulation suitable for the application.

2.7 FLOOR HARDENER

Floor hardener shall be a colorless aqueous solution containing zinc silicofluoride, magnesium silicofluoride, or sodium silicofluoride. These silicofluorides can be used individually or in combination. Proprietary hardeners may be used if approved by the contracting officer.

2.8 VAPOR BARRIER

Vapor barrier shall be polyethylene sheeting with a minimum thickness of 6 mils or other equivalent material having a vapor permeance rating not exceeding 0.5 perms as determined in accordance with ASTM E 96.

2.9 WATER

Water shall be potable, except that nonpotable water may be used if it produces mortar cubes having 7- and 28-day strengths at least 90 percent of the strength of similar specimens made with water from a municipal supply. The strength comparison shall be made on mortars, identical except for mixing water, prepared and tested in accordance with ASTM C 109. Water for curing shall not contain any substance injurious to concrete, or which causes staining.

PART 3 EXECUTION

3.1 PREPARATION OF SURFACES

Surfaces to receive concrete shall be clean and free from frost, ice, mud, and water. Conduit and other similar items shall be in place and clean of any deleterious substance.

3.1.1 Foundations

Earthwork shall be as specified in Section 02221 EXCAVATION, FILLING, AND BACKFILLING FOR BUILDINGS. Flowing water shall be diverted without washing over freshly deposited concrete. Rock foundations shall be cleaned by high velocity air-water jets, sandblasting, or other approved methods. Debris and loose, semi-detached or unsound fragments shall be removed. Rock surfaces shall be moist but without free water when concrete is placed. Semiporous subgrades for foundations and footings shall be damp when concrete is placed. Pervious subgrades shall be sealed by blending impervious material with the top 6 inches of the in-place pervious material.
or by covering with an impervious membrane.

3.1.2 Vapor Barrier

Unless otherwise indicated, subgrades for slabs in buildings shall be covered with a vapor barrier. Vapor barrier edges shall be lapped at least 4 inches and ends shall be lapped not less than 6 inches. Patches and lapped joints shall be sealed with pressure-sensitive adhesive or tape not less than 2 inches wide and compatible with the membrane.

3.1.3 Preparation of Previously Placed Concrete

Concrete surfaces to which other concrete is to be bonded shall be roughened in an approved manner that will expose sound aggregate uniformly without damaging the concrete. Laittance and loose particles shall be removed. Surfaces shall be moist but without free water when concrete is placed.

3.2 INSTALLATION OF EMBEDDED ITEMS

Embedded items shall be free from oil, loose scale or rust, and paint. Embedded items shall be installed at the locations indicated and required to serve the intended purpose. Voids in sleeves, slots and inserts shall be filled with readily removable material to prevent the entry of concrete.

3.3 BATCHING, MIXING AND TRANSPORTING CONCRETE

Ready-mixed concrete shall be batched, mixed and transported in accordance with ASTM C 94, except as otherwise specified. Truck mixers, agitators, and nonagitating units shall comply with NRMCA TMMB. Ready-mix plant equipment and facilities shall be certified in accordance with NRMCA QC 3. Site-mixed concrete shall be mixed in accordance with ACI 301. On-site plant shall conform to the NRMCA CPMB 100.

3.3.1 Admixtures

Admixtures shall be batched within an accuracy of 3 percent. Where two or more admixtures are used in the same batch, they shall be batched separately and must be compatible. Retarding admixture shall be added within one minute after addition of water is complete or in the first quarter of the required mixing time, whichever is first. Superplasticizing admixtures shall be added as recommended by manufacturer. Concrete that shows evidence of total collapse or segregation caused by the use of admixture shall be removed from the site.

3.3.2 Control of Mixing Water

No water from the truck system or elsewhere shall be added after the initial introduction of mixing water for the batch except when on arrival at the jobsite, the slump of the concrete is less than that specified. Water added to bring the slump within the specified range shall not change the total water in the concrete to a point that the approved water-cement ratio is exceeded. The drum shall be turned an additional 30 revolutions, or more, if necessary, until the added water is uniformly mixed into the concrete. Water shall not be added to the batch at any later time.
3.4 SAMPLING AND TESTING

Sampling and Testing is the responsibility of the Contractor and shall be performed by an approved testing agency.

3.4.1 Aggregates

Aggregates for normal weight concrete shall be sampled and tested in accordance with ASTM C 33. Gradation tests shall be performed on the first day and every other day thereafter during concrete construction.

3.4.2 Sampling of Concrete

Samples of concrete for air, slump, unit weight, and strength tests shall be taken in accordance with ASTM C 172.

3.4.2.1 Air Content

Test for air content shall be performed in accordance with ASTM C 173 or ASTM C 231. A minimum of 1 test per day shall be conducted.

3.4.2.2 Slump

At least 2 slump tests shall be made on randomly selected batches of each mixture of concrete during each day's concrete placement. Tests shall be performed in accordance with ASTM C 143.

3.4.3 Evaluation and Acceptance of Concrete

3.4.3.1 Frequency of Testing

Samples for strength tests of each class of concrete placed each day shall be taken not less than once a day, nor less than once for each 150 cubic yards of concrete, nor less than once for each 5000 square feet of surface area for slabs or walls. If this sampling frequency results in less than 5 strength tests for a given class of concrete, tests shall be made from at least 5 randomly selected trucks or from each truck if fewer than 5 truck loads are used. Field cured specimens for determining form removal time or when a structure may be put in service shall be made in numbers directed to check the adequacy of curing and protection of concrete in the structure. The specimens shall be removed from the molds at the age of 24 hours and shall be cured and protected, insofar as practicable, in the same manner as that given to the portion of the structure the samples represent.

3.4.3.2 Testing Procedures

Cylinders and beams for acceptance tests shall be molded and cured in accordance with ASTM C 31. Cylinders shall be tested in accordance with ASTM C 39 and beams shall be tested in accordance with ASTM C 78. A strength test shall be the average of the strengths of two cylinders or beams made from the same sample of concrete and tested at 28 days or at another specified test age.
3.4.3.3 Evaluation of Results

Concrete specified on the basis of compressive strength will be considered satisfactory if the averages of all sets of three consecutive strength test results equal or exceed the specified strength and no individual strength test result falls below the required strength by more than 500 pounds per square inch. For flexural strength concrete, the strength level of the concrete will be considered satisfactory if the averages of all sets of five consecutive strength test results equal or exceed the required flexural strength, and not more than 20 percent of the strength test results fall below the required strength by more than 50 pounds per square inch.

3.4.4 Investigation of Low-Strength Test Results

When any strength test of standard-cured test cylinder falls below the specified strength requirement by more than 500 pounds per square inch, or if tests of field-cured cylinders indicate deficiencies in protection and curing, steps shall be taken to assure that load-carrying capacity of the structure is not jeopardized. Nondestructive testing in accordance with ASTM C 597, ASTM C 803 or ASTM C 805 may be permitted by the Contracting Officer to determine the relative strengths at various locations in the structure as an aid in evaluating concrete strength in place or for selecting areas to be cored. Such tests, unless properly calibrated and correlated with other test data, shall not be used a basis for acceptance or rejection. When strength of concrete in place is considered potentially deficient, cores shall be obtained and tested in accordance with ASTM C 42. At least three representative cores shall be taken from each member or area of concrete in place that is considered potentially deficient. The location of cores shall be determined by the Contracting Officer to least impair the strength of the structure. If the concrete in the structure will be dry under service conditions, the cores shall be air dried (temperature 60 to 80 degrees F, relative humidity less than 60 percent) for seven days before testing and shall be tested dry. If the concrete in the structure will be more than superficially wet under service conditions, the cores shall be tested after moisture conditioning in accordance with ASTM C 42. Concrete in the area represented by the core testing will be considered adequate if the average strength of the cores is equal to or at least 85 percent of the specified strength requirement and if no single core is less than 75 percent of the specified strength requirement. If the core tests are inconclusive or impractical to obtain, or if structural analysis does not confirm the safety of the structure, load tests may be directed by the Contracting Officer in accordance with the requirements of ACI 318. Concrete work evaluated by structural analysis or by results of a load test and found deficient shall be corrected in a manner satisfactory to the Contracting Officer. All investigations, testing, load tests, and correction of deficiencies shall be performed, and approved by the Contracting Officer, at the expense of the Contractor.

3.5 CONVEYING CONCRETE

Concrete shall be conveyed from mixer to forms as rapidly as possible and within the time interval specified in paragraph CONCRETE PLACEMENT by methods which will prevent segregation or loss of ingredients.
3.5.1 Chutes

When concrete can be placed directly from a truck mixer or other transporting equipment, chutes attached to this equipment may be used. Separate chutes will not be permitted except when specifically approved.

3.5.2 Buckets

Bucket design shall be such that concrete of the required slump can be readily discharged. Bucket gates shall be essentially grout tight when closed. The bucket shall provide means for positive regulations of the amount and rate of deposit of concrete in each dumping position.

3.5.3 Belt Conveyors

Belt conveyors may be used when approved. Belt conveyors shall be designed for conveying concrete and shall be operated to assure a uniform flow of concrete to the final place of deposit without segregation or loss of mortar. Conveyors shall be provided with positive means for preventing segregation of the concrete at transfer points and point of placement.

3.5.4 Pumps

Concrete may be conveyed by positive displacement pumps when approved. Pump shall be the piston or squeeze pressure type. Pipeline shall be steel pipe or heavy duty flexible hose. Inside diameter of the pipe shall be at least three times the maximum size of the coarse aggregate. Distance to be pumped shall not exceed the limits recommended by the pump manufacturer. Concrete shall be supplied to the pump continuously. When pumping is completed, the concrete remaining in the pipeline shall be ejected without contaminating the concrete in place. After each use, the equipment shall be thoroughly cleaned. Flushing water shall be wasted outside the forms.

3.6 CONCRETE PLACEMENT

Mixed concrete which is transported in truck mixers or agitators or concrete which is truck mixed, shall be discharged within 1-1/2 hours or before the drum has revolved 300 revolutions, whichever comes first after the introduction of the mixing water to the cement and aggregates or the introduction of the cement to the aggregates. These limitations may be waived by the Government if the concrete is of such slump after the 1-1/2 hour time or 300 revolution limit has been reached that it can be placed, without the addition of water to the batch. When the concrete temperature exceeds 85 degrees F, the time shall be reduced to 45 minutes. Concrete shall be placed within 15 minutes after it has been discharged from the truck.

3.6.1 Placing Operation

Concrete shall be handled from mixer to forms in a continuous manner until the approved unit of operation is completed. Adequate scaffolding, ramps and walkways shall be provided so that personnel and equipment are not supported by in-place reinforcement. Placing will not be permitted when the sun, heat, wind, or limitations of facilities furnished by the Contractor prevent proper consolidation, finishing and curing. Concrete
shall be deposited as close as possible to its final position in the forms, and there shall be no vertical drop greater than 8 feet except where suitable equipment is provided to prevent segregation and where specifically authorized. Depositing of the concrete shall be so regulated that it will be effectively consolidated in horizontal layers not more than 12 inches thick, except that all slabs shall be placed in a single layer. Concrete to receive other construction shall be screeded to the proper level to avoid excessive shimming or grouting.

3.6.2 Consolidation

Immediately after placing, each layer of concrete shall be consolidated by internal vibrators, except for slabs 4 inches or less. The vibrators shall at all times be adequate in effectiveness and number to properly consolidate the concrete; a spare vibrator shall be kept at the jobsite during all concrete placing operations. The vibrators shall have a frequency of not less than 8000 vibrations per minute, and the head diameter and amplitude shall be appropriate for the concrete mixture being placed. Vibrators shall be inserted vertically at uniform spacing over the area of placement. The distance between insertions shall be approximately 1-1/2 times the radius of action of the vibrator so that the area being vibrated will overlap the adjacent just-vibrated area by a few inches. The vibrator shall penetrate rapidly to the bottom of the layer and at least 6 inches into the preceding layer if there is such. Vibrator shall be held stationary until the concrete is consolidated and then withdrawn slowly. The use of form vibrators must be specifically approved. Vibrators shall not be used to transport concrete within the forms. Slabs 4 inches and less in thickness shall be consolidated by properly designed vibrating screeds or other approved technique.

3.6.3 Cold Weather Requirements

Special protection measures, approved by the Contracting Officer, shall be used if freezing temperatures are anticipated before the expiration of the specified curing period. The ambient temperature of the air where concrete is to be placed and the temperature of surfaces to receive concrete shall be not less than 40 degrees F. The temperature of the concrete when placed shall be not less than 50 degrees F nor more than 75 degrees F. Heating of the mixing water or aggregates will be required to regulate the concrete placing temperature. Materials entering the mixer shall be free from ice, snow, or frozen lumps. Salt, chemicals or other materials shall not be incorporated in the concrete to prevent freezing. Upon written approval, calcium chloride or chemical admixture conforming to ASTM C 494 Type C or E may be used. The amount of calcium chloride shall not exceed 2 percent by weight of the cement, and it shall be batched in solution form. Calcium chloride shall not be used where concrete will be in contact with aluminum or zinc-coated items, or where sulfate resistant or prestressed concrete is specified.

3.6.4 Warm Weather Requirements

The temperature of the concrete placed during warm weather shall not exceed 85 degrees F except where an approved retarder is used. The mixing water and/or aggregates shall be cooled, if necessary, to maintain a satisfactory placing temperature. In no case shall the placing temperature exceed 95
3.7 CONSTRUCTION JOINTS

Construction joints shall be located as indicated or approved. Where concrete work is interrupted by weather, end of work shift or other similar type of delay, location and type of construction joint shall be subject to approval of the Contracting Officer. Unless otherwise indicated and except for slabs on grade, reinforcing steel shall extend through construction joints. Construction joints in slabs on grade shall be keyed or doweled as shown. Concrete columns, walls, or piers shall be in place at least 2 hours, or until the concrete is no longer plastic, before placing concrete for beams, girders, or slabs thereon. In walls having door window openings, lifts shall terminate at the top and bottom of the opening. Other lifts shall terminate at such levels as to conform to structural requirements or architectural details. Where horizontal construction joints are required, a strip of 1-inch square-edge lumber, bevelled and oiled to facilitate removal, shall be tacked to the inside of the forms at the construction joint. Concrete shall be placed to a point 1 inch above the underside of the strip. The strip shall be removed 1 hour after the concrete has been placed, and any irregularities in the joint line shall be leveled off with a wood float, and all laitance shall be removed. Prior to placing additional concrete, horizontal construction joints shall be prepared as specified in paragraph PREPARATIONS OF SURFACES.

3.8 FINISHING CONCRETE

3.8.1 Formed Surfaces

All above grade formed concrete surfaces shall have a Class B finish. All below grade formed concrete surfaces shall be given a Class D finish.

3.8.1.1 Repair of Surface Defects

Surface defects shall be repaired within 24 hours after the removal of forms. Honeycombed and other defective areas shall be cut back to solid concrete or to a depth of not less than 1 inch, whichever is greater. Edges shall be cut perpendicular to the surface of the concrete. The prepared areas shall be dampened and brush-coated with neat cement grout. The repair shall be made using mortar consisting of not more than 1 part cement to 2-1/2 parts sand. The mixed mortar shall be allowed to stand to stiffen (approximately 45 minutes), during which time the mortar shall be intermittently remixed without the addition of water. After the mortar has attained the stiffest consistency that will permit placing, the patching mix shall be thoroughly tamped into place by means approved by the Contracting Officer and finished slightly higher than the surrounding surface. For Class B finished surfaces the cement used in the patching mortar shall be a blend of job cement and white cement proportioned to produce a finished repair surface matching, after curing, the color of adjacent surfaces. Holes left after the removal of form ties shall be cleaned and filled with patching mortar. Holes left by the removal of tie rods shall be reamed and filled by dry-packing. Repaired surfaces shall be cured as required for adjacent surfaces. The temperature of concrete,
m mortar patching material, and ambient air shall be above 50 degrees F while making repairs and during the curing period. Concrete with defects which affect the strength of the member or with excessive honeycombs will be rejected, or the defects shall be corrected as directed.

3.8.1.2 Class B Finish

Where a Class B finish is indicated, fins shall be removed. Concrete surface shall be smooth with a texture at least equal to that obtained through the use of Grade B-B plywood forms.

3.8.1.3 Class D Finish

Where a Class D finish is indicated, fins exceeding 1/4 inch in height shall be chipped or rubbed off. Concrete surfaces shall be left with the texture imparted by the forms used.

3.8.2 Unformed Surfaces

In cold weather, the air temperature in areas where concrete is being finished shall not be less than 50 degrees F. In hot windy weather when the rate of evaporation of surface moisture, as determined by methodology presented in ACI 305R, may reasonably be expected to exceed 0.2 pounds per square foot per hour; coverings, windbreaks, or fog sprays shall be provided as necessary to prevent premature setting and drying of the surface. The dusting of surfaces with dry materials or the addition of water during finishing will not be permitted. Finished surfaces shall be plane, with no deviation greater than 1/2 inch when tested with a 10-foot straightedge. Floor tolerance measurements shall be made as soon as possible after finishing. When forms or shoring are used the measurements shall be made prior to their removal. Surfaces shall be pitched to drains.

3.8.2.1 Rough-Slab Finish

Slabs to receive fill or mortar setting beds shall be screeded with straightedges immediately after consolidation to bring the surface to the required finish level with no coarse aggregate visible.

3.8.2.2 Float Finish

Slabs shall be given a float finish. Screeding shall be followed immediately by darbying or bull floating before bleeding water is present, to bring the surface to a true, even plane. After the concrete has stiffened to permit the operation and the water sheen has disappeared, it shall be wood floated. Lightweight concrete or concrete that portrays stickiness shall be finished with a magnesium float in lieu of a wood float, and left free of ridges and other projections.

3.8.2.3 Trowel Finish

Interior slabs, the Launch Pad, and the Environmental Shelter Floor Slab shall be given a trowel finish immediately following floating. Surfaces shall be trowelled to produce smooth, dense slabs free from blemishes including trowel marks. In lieu of hand finishing, an approved power
finishing machine may be used in accordance with the directions of the machine manufacturer. A final hard steel troweling shall be done by hand.

3.8.2.4 Broom Finish

After floating, exterior slabs shall be lightly trowelled, and then broomed with a fiber-bristle brush in a direction transverse to that of the main traffic.

3.8.2.5 FLOOR HARDENER

Floor hardener shall be applied to interior slabs in the Missile Assembly Building and the Launch Equipment Building. Floor hardener shall be applied after the concrete had been air dried for 14 days. Three coats shall be applied, each the day after the preceding coat was applied. For the first application, one pound of the silicofluoride shall be dissolved in one gallon of water. For subsequent applications, the solution shall be two pounds of silicofluoride to each gallon of water. Floor should be mopped with clear water shortly after the preceding application has dried to remove encrusted salts. Proprietary hardeners shall be applied in accordance with the manufacturer's instructions. During application, area should be well ventilated. Precautions shall be taken when applying silicofluorides due to the toxicity of the salts. Any compound that contacts glass or aluminum should be immediately removed with clear water.

3.9 CURING AND PROTECTION

3.9.1 General

All concrete shall be cured by an approved method for the period of time given below:

- Concrete with Type I, II, IP or IS cement
  - 7 days
- Concrete with Type I or Type II cement blended with pozzolan
  - 7 days

Immediately after placement, concrete shall be protected from premature drying extremes in temperatures, rapid temperature change, mechanical injury and injury from rain and flowing water. Air and forms in contact with concrete shall be maintained at a temperature above 50 degrees F for the first 3 days and at a temperature above 32 degrees F for the remainder of the specified curing period. Exhaust fumes from combustion heating units shall be vented to the outside of the enclosure and heaters and ducts shall be placed and directed so as not to cause areas of overheating and drying of concrete surfaces or to create fire hazards. All materials and equipment needed for adequate curing and protection shall be available and at the site prior to placing concrete. No fire or excessive heat shall be permitted near or in direct contact with the concrete at any time. Curing shall be accomplished by any of the following methods, or combination thereof, as approved.
3.9.2 Moist Curing

Concrete to be moist-cured shall be maintained continuously wet for the entire curing period. If water or curing materials used stains or discolors concrete surfaces which are to be permanently exposed, the concrete surfaces shall be cleaned. When wooden forms are left in place during curing, they shall be kept wet at all times. If the forms are removed before the end of the curing period, curing shall be carried out as on unformed surfaces, using suitable materials. Horizontal surfaces shall be cured by ponding, by covering with a 2-inch minimum thickness of continuously saturated sand, or by covering with waterproof paper, polyethylene sheet, polyethylene-coated burlap or saturated burlap.

3.9.3 Membrane Curing

Membrane curing shall not be used on surfaces that are to receive any subsequent treatment depending on adhesion or bonding to the concrete; except a styrene acrylate or chlorinated rubber compound meeting ASTM C 309, Class B requirements may be used for surfaces which are to be painted or are to receive bituminous roofing or waterproofing, or floors that are to receive adhesive applications of resilient flooring. The curing compound selected shall be compatible with any subsequent paint, roofing, waterproofing or flooring specified. Membrane curing compound shall not be used on surfaces that are maintained at curing temperatures with free steam. Curing compound shall be applied to formed surfaces immediately after the forms are removed and prior to any patching or other surface treatment except the cleaning of loose sand, mortar, and debris from the surface. Surfaces shall be thoroughly moistened with water and the curing compound shall be applied to slab surfaces as soon as the bleeding water has disappeared, with the tops of joints being temporarily sealed to prevent entry of the compound and to prevent moisture loss during the curing period. Compound shall be applied in a one-coat continuous operation by mechanical spraying equipment, at a uniform coverage in accordance with the manufacturer’s printed instructions. Concrete surfaces which have been subjected to rainfall within 3 hours after curing compound has been applied shall be resprayed by the method and at the coverage specified. On surfaces permanently exposed to view, the surface shall be shaded from direct rays of the sun for the duration of the curing period. Surfaces coated with curing compound shall be kept free of foot and vehicular traffic, and from other sources of abrasion and contamination during the curing period.

3.10 SETTING BASE PLATES AND BEARING PLATES

After being properly positioned, column base plates, bearing plates for beams and similar structural members, and machinery and equipment base plates shall be set to the proper line and elevation with damp-pack bedding mortar, except where nonshrink grout is indicated. The thickness of the mortar or grout shall be approximately 1/24 the width of the plate, but not less than 3/4 inch. Concrete and metal surfaces in contact with grout shall be clean and free of oil and grease, and concrete surfaces in contact with grout shall be damp and free of laitance when grout is placed.
3.10.1 Damp-Pack Bedding Mortar

Damp-pack bedding mortar shall consist of 1 part cement and 2-1/2 parts fine aggregate having water content such that a mass of mortar tightly squeezed in the hand will retain its shape but will crumble when disturbed. The space between the top of the concrete and bottom of the bearing plate or base shall be packed with the bedding mortar by tamping or ramming with a bar or rod until it is completely filled.

3.10.2 Nonshrink Grout

Nonshrink grout shall be mixed and placed in accordance with material manufacturer's written recommendations. Forms of wood or other suitable material shall be used to retain the grout. The grout shall be placed quickly and continuously, completely filling the space without segregation or bleeding of the mix.

3.10.3 Treatment of Exposed Surfaces

For metal-oxidizing nonshrink grout, exposed surfaces shall be cut back 1 inch and immediately covered with a target coat of mortar consisting of 1 part portland cement and 2-1/2 parts fine aggregate by weight, with sufficient water to make a plastic mixture. The parged coat shall have a smooth finish. For other mortars or grouts, exposed surfaces shall be left untreated. Curing shall comply with paragraph CURING AND PROTECTION.

-- End of Section --
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 INSTITUTE OF STEEL CONSTRUCTION (AISC)


AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 6 (1993b) General Requirements for Rolled Steel Plates, Shapes, Sheet Piling, and Bars for Structural Use

ASTM A 36 (1993a) Structural Steel

ASTM A 53 (1993a) Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless

ASTM A 242 (1993) High-Strength Low-Alloy Structural Steel

ASTM A 307 (1993a) Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength

ASTM A 325 (1993) Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength

ASTM A 490 (1993) Heat-Treated Steel Structural Bolts, 150 ksi Minimum Tensile Strength
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.

ALUMINUM ASSOCIATION (AA)

AA DAF-45 (1980) Designation System for Aluminum Finishes

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 53 (1993) Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless

ASTM A 123 (1989a) Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products


ASTM A 446 (1993) Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality

ASTM A 525 (1993) General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process

ASTM D 2047 (1982; R 1988) Static Coefficient of Friction of Polish-Coated Floor Surfaces as Measured by the James Machine

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1 (1994) Structural Welding Code - Steel

FEDERAL SPECIFICATIONS (FS)

FS RR-G-1602 (Rev C) Grating, Metal, Other Than Bar Type (Floor, Except for Naval Vessels)

NATIONAL ASSOCIATION OF ARCHITECTURAL METAL MANUFACTURERS (NAAMM)

NAAMM-01 (1988) Metal Finishes Manual for Architectural and Metal Products
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 PROCEDURES:

SD-04 Drawings

Miscellaneous Metal Items; FIO.

Detail drawings indicating material thickness, type, grade, and class; dimensions; and construction details. Drawings shall include catalog cuts, erection details, manufacturer's descriptive data and installation instructions, and templates.

1.3 GENERAL REQUIREMENTS

The Contractor shall verify all measurements and shall take all field measurements necessary before fabrication. Welding to or on structural steel shall be in accordance with AWS D1.1. Items specified to be galvanized, when practicable and not indicated otherwise, shall be hot-dip galvanized after fabrication. Galvanizing shall be in accordance with ASTM A 123, ASTM A 446, or ASTM A 525, as applicable. Exposed fastenings shall be compatible materials, shall generally match in color and finish, and shall harmonize with the material to which fastenings are applied. Materials and parts necessary to complete each item, even though such work is not definitely shown or specified, shall be included. Poor matching of holes for fasteners shall be cause for rejection. Fastenings shall be concealed where practicable. Thickness of metal and details of assembly and supports shall provide strength and stiffness. Joints exposed to the weather shall be formed to exclude water.

1.4 DISSIMILAR MATERIALS

Where dissimilar metals are in contact, or where aluminum is in contact with concrete, mortar, masonry, wet or pressure-treated wood, or absorptive materials subject to wetting, the surfaces shall be protected with a coat of bituminous paint or asphalt varnish.

1.5 WORKMANSHIP

Miscellaneous metalwork shall be well formed to shape and size, with sharp lines and angles and true curves. Drilling and punching shall produce clean true lines and surfaces. Welding shall be continuous along the entire area of contact except where tack welding is permitted. Exposed connections of work in place shall not be tack welded. Exposed welds shall be ground smooth. Exposed surfaces of work in place shall have a smooth finish, and unless otherwise approved, exposed riveting shall be flush. Where tight fits are required, joints shall be milled. Corner joints shall be coped or mitered, well formed, and in true alignment. Work shall be accurately set to established lines and elevations and securely fastened in place. Installation shall be in accordance with manufacturer's installation instructions and approved drawings, cuts, and details.
1.6 ANCHORAGE

Anchorage shall be provided where necessary for fastening miscellaneous metal items securely in place. Anchorage not otherwise specified or indicated shall include slotted inserts made to engage with the anchors, expansion shields, and power-driven fasteners when approved for concrete; toggle bolts and through bolts for masonry; machine and carriage bolts for steel; and lag bolts and screws for wood.

PART 2 PRODUCTS

2.1 ALUMINUM FINISHES

Unless otherwise specified, aluminum items shall have standard mill finish. The thickness of the coating shall be not less than that specified for protective and decorative type finishes for items used in interior locations or architectural Class I type finish for items used in exterior locations in AA DAF-45. Items to be anodized shall receive a polished satin finish pretreatment and a clear lacquer overcoating.

2.2 SHOP PAINTING

Surfaces of ferrous metal except galvanized surfaces, shall be cleaned and shop coated with the manufacturer's standard protective coating unless otherwise specified. Surfaces of items to be embedded in concrete shall not be painted. Items to be finish painted shall be prepared according to manufacturer's recommendations or as specified.

2.3 CORNER GUARDS AND SHIELDS

Corner guards and shields for jambs and sills of openings and edges of platforms shall be steel shapes and plates anchored in masonry or concrete with welded steel straps or end weld stud anchors. Corner guards for use with glazed or ceramic tile finish on walls shall be formed of 0.0625 inch thick corrosion-resisting steel with polished or satin finish, shall extend 5 feet above the top of cove base or to the top of the wainscot, whichever is less, and shall be securely anchored to the supporting wall. Corner guards on exterior shall be galvanized.

2.4 PIPE GUARDS

Pipe guards shall be heavy duty steel pipe conforming to ASTM A 53, Type E or S, weight STD, black finish.

2.5 FLOOR GRATINGS AND FRAMES

Steel grating shall be designed in accordance with NAAMM-01 for bar type floor gratings and FS RR-G-1602 for floor gratings other than bar types to meet the indicated load requirements. Edges shall be banded with bars 1/4 inch less in height than bearing bars for grating sizes above 3/4 inch. Banding bars shall be flush with the top of bearing grating. Frames shall be of welded steel construction finished to match the grating. Floor gratings and frames shall be galvanized after fabrication.
2.6 FLOOR PLATES

Floor plates shall be 1/4 inch thick, slip-resistant, carbon steel conforming with ASTM A 283 having a minimum static coefficient of friction of 0.50 when tested in accordance with ASTM D 2047. Wearing surface shall be aluminum oxide or silicon carbide.

2.7 MISCELLANEOUS

Miscellaneous plates and shapes for items that do not form a part of the structural steel framework, such as lintels, sill angles, miscellaneous mountings, and frames, shall be provided to complete the work.

2.8 STEEL DOOR FRAMES

Steel door frames built from structural shapes shall be neatly mitered and securely welded at the corners with all welds ground smooth. Jambs shall be provided with 2 by 1/4 by 12 inch bent, adjustable metal anchors spaced not over 2 feet 6 inches on centers. Provision shall be made to stiffen the top member for all spans over 3 feet. Continuous door stops shall be made of 1-1/2 by 5/8 inch bars.

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

All items shall be installed at the locations shown and according to the manufacturer's recommendations. Items listed below require additional procedures as specified.

3.2 DOOR FRAMES

Door frames shall be secured to the floor slab by means of angle clips and expansion bolts. Continuous door stops shall be welded to the frame or tap screwed with countersunk screws at no more than 18 inch centers, assuring in either case full contact with the frame. Any necessary reinforcements shall be made and the frames shall be drilled and tapped as required for hardware.

--- End of Section ---
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.

FEDERAL SPECIFICATIONS (FS)

FS TT-P-115 (Rev F) Paint, Traffic (Highway, White, and Yellow)

1.2 DELIVERY AND STORAGE

All materials shall be delivered and stored in sealed containers that plainly show the designated name, formula or specification number, batch number, color, date of manufacture, manufacturer’s name, and directions, all of which shall be plainly legible at time of use.

1.3 EQUIPMENT

All machines, tools and equipment used in the performance of the work shall be approved and maintained in satisfactory operating condition.

1.3.1 Paint Application Equipment

The equipment to apply paint to pavements shall be a self-propelled or mobile-drawn pneumatic spraying machine with suitable arrangements of atomizing nozzles and controls to obtain the specified results. The machine shall have a speed during application not less than 5 mph, and shall be capable of applying the stripe widths indicated, at the paint coverage rate specified in paragraph APPLICATION, and of even uniform thickness with clear-cut edges. The paint applicator shall have paint reservoirs or tanks of sufficient capacity and suitable gauges to apply paint in accordance with requirements specified. Tanks shall be equipped with suitable air-driven mechanical agitators. The spray mechanism shall be equipped with quick-action valves conveniently located, and shall include necessary pressure regulators and gauges in full view and reach of the operator. Paint strainers shall be installed in paint supply lines to ensure freedom from residue and foreign matter that may cause malfunction of the spray guns. The paint applicator shall be readily adaptable for attachment of an air-actuated dispenser for the reflective media approved for use. Pneumatic spray guns shall be provided for hand application of paint in areas where the mobile paint applicator cannot be used.

1.3.2 Surface Preparation Equipment
1.3.2.1 Sandblasting Equipment

Sandblasting equipment shall include an air compressor, hoses, and nozzles of proper size and capacity as required for cleaning surfaces to be painted. The compressor shall be capable of furnishing not less than 150 cfm of air at a pressure of not less than 90 psi at each nozzle used, and shall be equipped with traps that will maintain the compressed air free of oil and water.

1.3.2.2 Waterblast Equipment

The water pressure shall be specified at 2600 psi at 140 degrees F in order to adequately clean the surfaces to be marked.

1.4 HAND-OPERATED, PUSH-TYPE MACHINES

All machines, tools, and equipment used in performance of the work shall be approved and maintained in satisfactory operating condition. Hand-operated push-type machines of a type commonly used for application of paint to pavement surfaces shall be acceptable for marking parking areas. Applicator machine shall be equipped with the necessary paint tanks and spraying nozzles, and shall be capable of applying paint uniformly at coverage specified. Sandblasting equipment shall be provided as required for cleaning surfaces to be painted. Hand-operated spray guns shall be provided for use in areas where push-type machines cannot be used.

PART 2 PRODUCTS

2.1 PAINT

The paint shall be homogeneous, easily stirred to smooth consistency, and shall show no hard settlement or other objectionable characteristics during a storage period of 6 months. Paint for roads and streets shall conform to FS TT-P-115, color as indicated.

2.2 SAMPLING AND TESTING

Materials proposed for use shall be stored on the project site in sealed and labeled containers, or segregated at source of supply, sufficiently in advance of needs to allow 60 days for testing. Upon notification by the Contractor that the material is at the site or source of supply, a sample shall be taken by random selection from sealed containers by the Contractor in the presence of a representative of the Contracting Officer. Samples shall be clearly identified by designated name, specification number, batch number, manufacturer's formulation number, project contract number, intended use, and quantity involved. Testing shall be performed in an approved independent laboratory. If materials are approved based on reports furnished by the Contractor, samples will be retained by the Government for possible future testing should the material appear defective during or after application.
PART 3 EXECUTION

3.1 SURFACE PREPARATION

Surfaces to be marked shall be thoroughly cleaned before application of the pavement marking material. Dust, dirt, and other granular surface deposits shall be removed by sweeping, blowing with compressed air, rinsing with water or a combination of these methods as required. Rubber deposits, surface laitance, existing paint markings, and other coatings adhering to the pavement shall be completely removed with scrapers, wire brushes, sandblasting, approved chemicals, or mechanical abrasion as directed. Areas of old pavement affected with oil or grease shall be scrubbed with several applications of trisodium phosphate solution or other approved detergent or degreaser, and rinsed thoroughly after each application. After cleaning, oil-soaked areas shall be sealed with cut shellac to prevent bleeding through the new paint. Pavement surfaces shall be allowed to dry, when water is used for cleaning, prior to striping or marking. Surfaces shall be re-cleaned, when work has been stopped due to rain.

3.2 APPLICATION

All pavement markings and patterns shall be placed as shown on the plans.

3.2.1 Paint

Paint shall be applied to clean, dry surfaces, and only when air and pavement temperatures are above 40 degrees F and less than 95 degrees F. Paint temperature shall be maintained within these same limits. New asphalt pavement surfaces and new Portland concrete cement shall be allowed to cure for a period of not less than 30 days before applications of paint. Paint shall be applied pneumatically with approved equipment at rate of coverage specified herein. The Contractor shall provide guide lines and templates as necessary to control paint application. Special precautions shall be taken in marking numbers, letters, and symbols. Edges of markings shall be sharply outlined.

3.2.1.1 Rate of Application

Nonreflective Markings: Paint shall be applied evenly to the pavement surface to be coated at a rate of 105 (plus or minus 5) square feet per gallon.

3.2.1.2 Drying

The maximum drying time requirements of the paint specifications will be strictly enforced to prevent undue softening of bitumen, and pickup, displacement, or discoloration by tires of traffic. If there is a delay in drying of the markings, painting operations shall be discontinued until cause of the slow drying is determined and corrected.

-- End of Section --
FORT WINGATE DEPOT ACTIVITY
FORT WINGATE, NEW MEXICO

SPECIFICATIONS
FOR
THEATER MISSILE DEFENSE (TMD) TARGET LAUNCH FACILITIES

VOLUME II
OF TWO VOLUMES

NOTE
THIS IS A 100% SET ASIDE FOR SMALL DISADVANTAGED BUSINESS CONCERNS
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02221 EXCAVATION, FILLING AND BACKFILLING FOR BUILDINGS
02222 EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS
02225 EARTHWORK FOR ROADWAYS
02546 AGGREGATE FOR SURFACE AND STABILIZED BASE COURSE AND CAPILLARY WATER BARRIER
02580 PAVEMENT MARKINGS
02831 CHAIN LINK FENCE

DIVISION 3 - CONCRETE

03100 STRUCTURAL CONCRETE FORMWORK
03200 CONCRETE REINFORCEMENT
03250 EXPANSION JOINTS, CONTRACTION JOINTS, AND WATERSTOPS
03300 CONCRETE FOR BUILDING CONSTRUCTION

DIVISION 4 - MASONRY (NONE IN THIS JOB)

DIVISION 5 - METALS

05120 STRUCTURAL STEEL
05500 MISCELLANEOUS METAL

DIVISION 6 - WOOD AND PLASTICS (NONE IN THIS JOB)

VOLUME II - DIVISION 7 THROUGH DIVISION 16

DIVISION 7 - THERMAL & MOISTURE PROTECTION

07416 STANDING SEAM METAL ROOF SYSTEM
07920 JOINT SEALING

DIVISION 8 - DOORS AND WINDOWS

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09650  RESILIENT FLOORING
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DIVISION 13 - SPECIAL CONSTRUCTION

13120  STANDARD METAL BUILDING SYSTEMS
13977  BLAST RESISTANT DOORS

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DIVISION 16 - ELECTRICAL

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16415  ELECTRICAL WORK, INTERIOR
16670  LIGHTNING PROTECTION SYSTEM
16721  FIRE DETECTION AND ALARM SYSTEM
16770  RADIO AND PUBLIC ADDRESS SYSTEMS
PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 446 (1991) Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality

ASTM A 463 (1988) Steel Sheet, Cold-Rolled, Aluminum-Coated, Type 1 and Type 2

ASTM A 792 (1989) Steel Sheet, Aluminum-Zinc Alloy-Coated by the Hot-Dip Process

ASTM B 117 (1990) Salt Spray (Fog) Testing

ASTM B 209 (1992a) Aluminum and Aluminum-Alloy Sheet and Plate


ASTM D 523 (1989) Specular Gloss


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ASTM D 1654 (1992) Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments

ASTM D 2244 (1989) Calculation of Color Differences from Instrumentally Measured Color Coordinates


ASTM D 3359 (1992a) Measuring Adhesion by Tape Test


ASTM E 84 (1991a) Surface Burning Characteristics of Building Materials


UNDERWRITERS LABORATORIES (UL)


1.2 GENERAL

1.2.1 Manufacturer

Standing seam metal roof system (SSMRS) shall be the product of a recognized SSMRS manufacturer who has been in the practice of manufacturing SSMRS for a period of not less than 3 years and has been involved in at least 5 projects similar in size and complexity to this project.

1.2.2 Manufacturer’s Representative

A representative of the SSMRS manufacturer, who is familiar with the design of the roof system supplied and experienced in the erection of roof systems similar in size to the one required under this contract, shall be present.
at the job site during installation of the SSMRS to assure that the roof system meets the specified requirements. The manufacturer's representative shall be either an employee of the manufacturer with at least two years experience in installing the roof system or an employee of an independent installer that is certified by the SSMRS manufacturer to have two years of experience installing similar roof systems.

1.2.3 Installer

The installer shall have a minimum of 2 years experience and shall have been involved in installing at least 3 projects that are of comparable size, scope and complexity as this project for the particular roof system furnished.

1.3 DESIGN REQUIREMENTS

The SSMRS shall be designed by the Contractor as a complete system. Members and connections not indicated on the drawings shall be designed by the Contractor.

1.3.1 Design Conditions

Loading criteria and design procedure shall be in accordance with Section 13120 "Standard Metal Building Systems". The structural section properties used in the design of the framing members shall be determined using the unloaded shape of the roof panels. Roof panels, components, transitions, and assemblies shall be the products of the same manufacturer. There shall be a minimum of two fasteners per clip; single fasteners will be allowed when the supporting structural members are prepunched or predrilled.

1.3.1.1 Thermal Loads

Roof panels shall be free to move in response to the expansion and contraction forces resulting from a total 200 degree temperature range during the life of the structure.

1.3.2 Accessories and Fasteners

Accessories shall be capable of resisting the specified design wind uplift loads and shall allow for movement of the roof panel system. Exposed fasteners shall not restrict free movement of the roof panel system resulting from thermal forces.

1.4 PERFORMANCE REQUIREMENTS

The uplift resistance of the SSMRS shall be established as indicated in the STANDARD TEST METHOD FOR STRUCTURAL PERFORMANCE OF SSMRS BY UNIFORM STATIC AIR PRESSURE DIFFERENCE at the end of this Section. The SSMRS design shall be adequate for uplift if the established allowable pressure from testing causes no failure as defined in the STANDARD TEST METHOD FOR STRUCTURAL PERFORMANCE OF SSMRS BY UNIFORM STATIC AIR PRESSURE DIFFERENCE. Testing to ultimate capacity is not required.
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-08 Statements

Qualifications; FIO.

Qualifications of the manufacturer, installer, and field representative.

SD-09 Reports

Tests; FIO.

Test report for uplift resistance of the SSMRS.

If a copy of the test report has previously been submitted to HQUSACE, a copy of the letter from HQUSACE acknowledging certification of acceptance of the system tested shall be submitted with the report.

If a copy of the test report has not been submitted to HQUSACE, a copy of the report shall be sent to: U.S. Army Corps of Engineers, HQUSACE (CEMP-ET), 20 Massachusetts Ave., NW, Washington, D.C. 20314-1000, concurrent with the submittal of the report to the Contracting Officer and this fact shall be noted on the copy of the report submitted to the Contracting Officer.

SD-13 Certificates

Standing Seam Metal Roof System; FIO.

a. Certification that the actual thickness of uncoated steel sheets used in SSMRS components including roofing panels, subpurlins, and concealed anchor clips comply with specified requirements.

b. Certification that materials used in the installed components are made from certified steel coil materials.

c. Certification that the SSMRS covered by the test report is the same type, quality and manufacture as that proposed for this project.

d. Certification that the sheets to be furnished are produced under a continuing quality control program and that a representative sample consisting of not less than 5 pieces has been tested and has met the quality standards specified for factory color finish.
PART 2 PRODUCTS

2.1 ROOF PANELS

Panels shall be either steel or aluminum and shall have a factory color finish. Roof deck assemblies shall be Class 90 as defined in UL 580. Length of sheets shall be sufficient to cover the entire length of any unbroken roof slope when such slope is 30 feet or less. When length of run exceeds 30 feet and panel splices are provided, each sheet in the run shall extend over three or more supports. Sheets longer than 30 feet may be furnished if approved by the Contracting Officer. Width of sheets shall provide not more than 24 inches of coverage in place. SSMRS with roofing panels greater than 12 inches in width shall have standing seams rolled during installation by an electrically driven seaming machine. Height of standing seams shall be not less than 2 inches. All sheets shall be either square-cut or miter-cut except that gable end wall sheets may be cut in the shop to correspond to the roof slope and may have a horizontal joint at the eave line.

2.1.1 Steel Panels

Zinc-coated steel conforming to ASTM A 446, G 90 coating designation; aluminum-zinc alloy coated steel conforming to ASTM A 792, AZ 55 coating; or aluminum-coated steel conforming to ASTM A 463, Type 2, coating designation T2 65. Panels shall be 0.024-inch thick minimum, except that when the mid field of the roof is subject to design wind uplift pressures of 60 psf or greater the entire roof system shall have a minimum thickness of 0.030-inch. Prior to shipment, mill finish panels shall be treated with a passivating chemical and oiled to inhibit the formation of oxide corrosion products. Panels that have become wet during shipment but have not started to oxidize shall be dried, retreated, and re-oiled.

2.1.2 Aluminum Panels

Alloy conforming to ASTM B 209, temper as required for the forming operation, minimum 0.032-inch thick.

2.2 FACTORY COLOR FINISH

Wall and roof panels shall have a factory applied polyvinylidene fluoride finish on the exposed side. The exterior finish shall consist of a baked-on fluoropolymer enamel topcoat with an appropriate prime coat. Color shall be the manufacturer’s standard color most nearly matching the color indicated in Section 09915 COLOR SCHEDULE. The exterior coating shall be a nominal 2 mil thick consisting of a polyvinylidene fluoride topcoat of not less than 0.7 mil dry film thickness and the paint manufacturer’s recommended primer of not less than 1.0 mil thick. The interior color finish shall consist of a 0.2 mil thick prime coat. The exterior color finish shall meet the test requirements specified below.

2.2.1 Salt Spray Test

A sample of the sheets shall withstand a salt spray test for a minimum of 1000 hours in accordance with ASTM B 117, including the scribe
requirement in the test. Immediately upon removal of the panel from the
cast, the coating shall receive a rating of not less than 8F, few No. 8
blisters, as determined by ASTM D 714; and a rating of 6, 1/8 inch
failure at scribe, as determined by ASTM D 1654.

2.2.2 Formability Test

When subjected to a 180-degree bend over the larger of a 1/8 inch or 3t
diameter mandrel in accordance with ASTM D 522, the coating film shall show
no evidence of fracturing to the naked eye.

2.2.3 Accelerated Weathering, Chalking Resistance and Color Change

A sample of the sheets shall withstand a weathering test a minimum of
500 hours in accordance with ASTM G 23 using a Type E11 apparatus
with cycles of 60 minutes radiation and 60 minutes condensing humidity.
The coating shall withstand the weathering test without cracking,
peeling, blistering, loss of adhesion of the protective coating, or
corrosion of the base metal. Protective coating that can be readily
removed from the base metal with tape in accordance with ASTM D 3359,
Test Method B, shall be considered as an area indicating loss of adhesion.
Following the accelerated weathering test, the coating shall have a chalk
rating not less than No. 8 in accordance with ASTM D 4214 test
procedures, and the color change shall not exceed 5 CIE or Hunter Lab color
difference (E) units in accordance with ASTM D 2244. For sheets
required to have a low gloss finish, the chalk rating shall be not less
than No. 6 and the color difference shall be not greater than 7 units.

2.2.4 Humidity Test

When subjected to a humidity cabinet test in accordance with ASTM D
2247 for 1500 hours, a scored panel shall show no signs of blistering,
cracking, creepage or corrosion.

2.2.5 Impact Resistance

Factory-painted sheet shall withstand direct and reverse impact in
accordance with ASTM D 2794 equal to 1.5 times metal thickness in
mils, expressed in inch-pounds, with no loss of adhesion.

2.2.6 Abrasion Resistance Test

When subjected to the falling sand test in accordance with ASTM D 968,
the coating system shall withstand a minimum of 80 liters of sand before
the appearance of the base metal. The term "appearance of base metal"
refers to the metallic coating on steel or the aluminum base metal.

2.2.7 Specular Gloss

 Finished roof surfaces for building shall have a specular gloss value of
10 or less at an angle of 85 degrees when measured in accordance with
ASTM D 523.
2.2.8 Pollution Resistance

Coating shall show no visual effects when immersion tested in a 10 percent hydrochloric acid solution for 24 hours in accordance with ASTM D 1308.

2.3 ACCESSORIES

Accessories shall be compatible with the covering furnished. Flashing, trim, metal closure strips, caps, and similar metal accessories shall be not less than the minimum thicknesses specified for roofing panels. Exposed metal accessories shall be finished to match the panels furnished. Molded closure strips shall be closed-cell or solid-cell synthetic rubber or neoprene, or polyvinyl chloride premolded to match configuration of the covering and shall not absorb or retain water. Thermal spacer blocks and other thermal barriers at concealed clip fasteners shall be as recommended by the manufacturer.

2.4 FASTENERS

Fasteners for steel roof panels shall be zinc-coated steel, aluminum, corrosion resisting steel, or nylon capped steel, type and size specified below or as otherwise approved for the applicable requirements. Fasteners for aluminum roof panels shall be aluminum or corrosion resisting steel. Fasteners for structural connections shall provide both tensile and shear strength of not less than 750 pounds per fastener. Fasteners for accessories shall be the manufacturer’s standard. Exposed roof fasteners shall be gasketed or have gasketed washers on the exterior side of the covering to waterproof the fastener penetration. Washer material shall be compatible with the covering; have a minimum diameter of 3/8 inch for structural connections; and gasketed portion of fasteners or washers shall be neoprene or other equally durable elastomeric material approximately 1/8-inch thick.

2.4.1 Screws

Screws shall be as recommended by the manufacturer to meet the strength design requirements of the panels.

2.4.2 Bolts

Bolts shall be not less than 1/4-inch diameter, shoulder or plain shank as required, with locking washers and nuts.

2.4.3 Structural Blind Fasteners

Blind screw-type expandable fasteners shall be not less than 1/4-inch diameter. Blind (pop) rivets shall be 9/32-inch minimum diameter.

2.5 INSULATION

Thermal resistance of insulation shall be not less than the R-values shown. R-values shall be determined at 75 degrees F in accordance with ASTM C 518. Insulation shall have a flame spread not in excess of 25 and a smoke developed rating not in excess of 50 when tested in accordance with ASTM E 84; shall be a standard product of a manufacturer, factory-marked or
identified with manufacturer's name or trademark and R-value. Identification shall be on individual pieces or individual packages. Insulation shall have a facing providing a permeability of 0.02 perm or less when tested in accordance with ASTM E 96. Facing shall be of 2 mil thick white vinyl backed with 6 inch by 6 inch glass scrim and 0.7 mil thick metal foil laminate. Reinforced foil with a natural finish may be used for facing in concealed locations. Facings and finishes shall be factory applied.

2.5.1 Blanket Insulation

Blanket insulation shall conform to ASTM C 553. Exposed insulation shall have a white sheet vinyl cover on the exposed side.

2.6 INSULATION RETAINERS

Insulation retainers shall be type, size, and design necessary to adequately hold the insulation and to provide a neat appearance. Metallic retaining members shall be nonferrous or have a nonferrous coating. Nonmetallic retaining members, including adhesives used in conjunction with mechanical retainers or at insulation seams, shall have a fire resistance classification not less than that permitted for the insulation.

2.7 CONCEALED ANCHOR CLIPS

Concealed anchor clips shall be as recommended by the manufacturer for the roofing system furnished. Clip bases shall have factory punched or drilled holes for attachment. Clips used with panel width greater than 12 inches shall be made from multiple pieces with the allowance for the total thermal movement required to take place within the clip.

2.8 SEALANT

Except as stated below, sealants shall be elastomeric type containing no oil or asphalt. Exposed sealant shall cure to a rubberlike consistency. All sealants shall be the nonhardening type. Roof panel standing seam ribs shall have a continuous sealant that is factory installed.

2.9 GASKETS AND INSULATING COMPOUNDS

Gaskets and insulating compounds shall be nonabsorptive and suitable for insulating contact points of incompatible materials. Insulating compounds shall be nonrunning after drying.

2.10 SUBPURLINS

Subpurlins, when required by the system design, shall be formed from steel sheet as standard with the manufacturer. The uncoated thickness may be a minimum of 0.059-inches if bolts or structural blind fasteners are used for attachment of the concealed anchor clips to the subpurlins.

2.11 VAPOR RETARDER

...or retarder material shall be polyethylene sheeting conforming to the requirements of ASTM D 4397. A fully compatible tape shall be provided...
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which has equal or better water vapor control characteristics than the vapor retarder material. A general purpose tape which has some resiliency and cushioning abilities shall also be provided.

2.12 EPDM RUBBER BOOTS

Flashing devices around pipe penetrations shall be flexible, one-piece devices molded from weather-resistant EPDM rubber. Rubber boot material shall be as recommended by the manufacturer. The boots shall have base rings made of aluminum or corrosion resisting steel that conform to the contours of the roof panel to form a weather-tight seal.

PART 3 EXECUTION

3.1 INSTALLATION

Installation shall be in accordance with the approved erection instructions and drawings. Dissimilar materials which are not compatible when contacting each other shall be insulated from each other by means of gaskets or insulating compounds. Molded closure strips shall be installed wherever covering sheets terminate in open-end configurations, exclusive of flashings. The closure strip installation shall be weather-tight and sealed. Improper or mislocated drill holes shall be plugged with an oversize screw fastener and gasketed washer; however, sheets with an excess of such holes or with such holes in critical locations shall not be used. Exposed surfaces and edges shall be kept clean and free from sealant, metal cuttings, hazardous burrs, and other foreign material. Stained, discolored, or damaged sheets shall be removed from the site.

3.1.1 Subpurlins

Unless otherwise shown, subpurlins shall be anchored to the purlins or other roof members with bolts or screws. The subpurlin spacing shall not exceed 30 inches on centers at the corners, eaves, and roof edges, and five foot maximum for the remainder of the roof unless otherwise specified.

3.1.2 Roof Panel Installation

Roof panels shall be installed with the standing seams in the direction of the roof slope. The side seam connections for installed panels shall be completed at the end of each day’s work. Method of applying joint sealant shall conform to the manufacturer’s recommendation as needed to achieve a complete weather-tight installation. End laps, when approved by the Contracting Officer, shall be made over framing members. Closures, flashings, EPDM rubber boots and related accessories shall be installed according to the drawings. Fasteners shall not puncture covering sheets except as approved for flashing, closures, and trim. Exposed fasteners shall be installed in straight lines and shall be permitted only at the rakes, eaves, panel splices, and where required for the attachment of flashings, gutter and other similar accessories. Expansion joints shall be installed at locations indicated on the drawings.
3.1.3 Field Forming of Panels

Roofing panels may be formed from factory-color-finished steel coils at the project site, in which case the same care and quality control measures that are taken in shop forming of roofing panels shall be observed. In cold weather conditions, preheating of the steel coils to be field formed shall be performed as necessary just prior to the rolling operations.

3.1.4 Concealed Anchor Clips

Roof panels shall be fastened to framing members with concealed fastening clips or other concealed devices. Clips shall be attached to the building structural system (concrete or steel members) or to the subpurlins with bolts or screws. The maximum distance, parallel to the seams, between clips shall be 30 inches on center in all areas of the roof shown as high wind uplift areas on the drawings, including corners, ridges, eaves, and edges. In no case shall that distance be greater than 5 feet on center.

3.2 VAPOR RETARDER INSTALLATION

General purpose tape shall be installed over all the seams of the structural roof decking at any penetrating edges, and at all surface areas exhibiting sharp burrs or similar protrusions. A single ply of 10 mil polyethylene sheet or, at the Contractor's option, a double ply of 5 mil polyethylene sheet shall be installed over the entire deck surface. Tape shall be used to seal the edges of the sheets to the decking, to the edge of the roof supporting structures, or to the sheet below. Sheet edges shall be lapped not less than six inches. Sufficient material shall be provided to avoid inducing stresses in the sheets due to stretching or binding. All tears or punctures that are visible in the finished surface at any time during the construction process shall be sealed with the tape.

3.3 CLEANING AND TOUCH-UP

Exposed SSMRS shall be cleaned at completion of installation. Debris that could cause discoloration and harm to the panels, flashings, closures and other accessories shall be removed. Grease and oil films, excess sealants, and handling marks shall be removed and the work shall be scrubbed clean. Exposed metal surfaces shall be free of dents, creases, waves, scratch marks, and solder or weld marks. Immediately upon detection, abraded or corroded spots on shop-painted surfaces shall be wire brushed and touched up with the same material used for the shop coat. Factory color finished surfaces shall be touched up as necessary with the manufacturer's recommended touch up paint.
STANDARD TEST METHOD FOR STRUCTURAL PERFORMANCE OF SSMRS BY UNIFORM STATIC AIR PRESSURE DIFFERENCE

1. Scope

1.1 This test method covers the determination of the structural performance of standing seam metal roof systems under uniform static air pressure differences, using a test chamber.

1.2 The proper use of this test method requires a knowledge of principles of pressure and deflection measurement.

1.3 This test method describes the apparatus to be used for applying specific test loads uniformly distributed to a specimen.

1.4 The values stated in inch-pound units are to be regarded as the standard.

1.5 This standard may involve hazardous materials, operations, and equipment. This standard does not purport to address all of the safety problems associated with its use. It is the responsibility of whoever uses this standard to consult and establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

2. Descriptions of terms specific to this standard.

2.1 Specimen - the entire assembled unit submitted for test as described in Section 6.

2.2 Test Load - the specified difference in static air pressure (positive or negative) for which the specimen is to be tested, expressed in pounds-force per square foot.

2.3 Ultimate Load - the difference in static air pressure (positive or negative) at which failure of the specimen occurs, expressed in pounds per square foot.

2.4 Permanent Deformation - the permanent displacement from an original position that remains after an applied load has been removed.

2.5 Failure - the inability to carry additional load, permanent separation of the panels or of any of the component parts or connections, or when permanent deformation is sufficient to compromise the weatherability of the roof system.

3. Summary of Method

This test method consists of sealing the test specimen onto the face of a test chamber, supplying air to or exhausting air from the chamber at the rate required to maintain the test-pressure difference across the specimen, and observing, measuring, and recording the deflections, deformations, and nature of any failures of principal or critical members.

4. Significance and Use
4.1 This test method is a standard procedure for determining structural performance under uniform static air pressure difference. This typically is intended to represent the effects of wind loads on building roof systems.

4.2 The test loads shall be the roof uplift pressures multiplied by the factor of safety. The factor of safety against yielding of the panels shall be 1.3. The factor of safety against all other failure modes shall be 1.65 or 140 psf, whichever is less. The pressure multiplied by 1.65 or 140 psf shall be the maximum pressure required in the test.

5. Apparatus

5.1 The description of the apparatus is general in nature; any equipment capable of performing the test procedure within the allowable tolerances is permitted.

5.2 Major components

5.2.1 Test Chamber - A test chamber or box with an open top upon which the specimen is installed. At least one static pressure tap shall be provided to measure the chamber pressure and shall be so located that the reading is unaffected by the velocity of the air supply to or from the chamber or any other air movement. The air supply opening into the chamber shall be arranged so the air does not impinge directly onto the test specimen with any significant velocity. A means of access into the chamber may be provided to facilitate adjustments and observations after the specimen has been installed.

5.2.2 The test chamber or the specimen mounting frame, or both, must not deflect under the test load in such a manner that the performance of the specimen will be affected.

5.2.3 Air system - A controllable blower, compressed air supply, an exhaust system, or reversible controllable blower designed to provide the required maximum air pressure difference across the specimen. The system shall provide an essentially constant air pressure difference for the required test period.

5.2.4 Pressure-Measuring Apparatus - A device to measure the test pressure difference within a tolerance of plus or minus 2 percent.

5.2.5 Deflection-Measuring Apparatus - A means of measuring deflections within a tolerance of plus or minus 0.01 inch.

5.2.5.1 Deflections shall be measured at the midpoint between supporting roof members. These measurements shall be taken along the standing seam and at the midpoint of the panels between standing seams. Deflection of edge members that are part of the roof system shall also be measured at similar locations. Additional measurements may be required by the specifier.

5.2.5.2 When deflections are to be measured, the deflection gauges shall be installed so that the deflections of the components can be measured...
without being influenced by possible movements of, or movements within, the specimen or member supports.

6. Test Specimens

6.1 Specimens shall be of sufficient size to determine the performance of all parts of the system (approximately 10 feet by 20 feet.) All parts of the test specimen shall be full size, using the same materials, details and methods of construction and anchorage as in the manufacturer’s established system. Two specimens shall be required to perform the test. There shall be one specimen representing the corner condition and a second specimen representing the construction in the middle portion of the roof.

6.2 Width: Edge seals shall not contain structural attachments that restrict deflection of the test panels other than through the normal gable conditions.

6.3 Length: Spacing of the supports shall be the actual spacing of the panel spans being evaluated with appropriate panel overhangs, if any, at end supports. The minimum number of spans to be tested is three and the minimum length is 15 feet.

7. Calibration

Calibration of manometers and deflection-measuring devices is required prior to start of the test.

8. Required Information

8.1 In specifying this method the following information shall be supplied by the specifying authority:

8.1.1 The number of incremental loads and the positive and negative test loads at these increments at which deflection measurements are required, if different from paragraphs 9.2 and 9.3.

8.1.2 The duration of incremental and maximum loads, if different for paragraph 9.3.

8.1.3 The number and location of required deflection measurements. See paragraph 5.2.5.1.

9. Procedure

9.1 Fit the specimen upon the chamber opening. Support and secure the specimen by the same number and type of anchors used in installing the manufacturer’s established system.

9.1.1 If air leakage through the test specimen is excessive, tape may be used to cover any cracks and joints through which the leakage is occurring. Tape shall not be used when there is a probability that it may significantly restrict differential movement between adjoining members. It is also permissible to cover the entire specimen and mounting panel with a single thickness of polyethylene film no thicker than 0.006 in. Panels should be tested in such a manner that 100 percent of the exposed panel
surface has a uniform static air pressure difference applied giving particular attention to insuring that this load is applied between or behind all framing support members. The technique of application is important in order that full load is permitted to be transferred to the specimen and that the membrane does not prevent movement or failure of the specimen. Apply the film loosely with extra folds of material at each corner and at all offsets and recesses. When the load is applied, there will be no fillet caused by tightness of plastic film that will have a significant effect on the results.

9.2 Install any required deflection-measuring devices at their specified locations. A minimum of 6 points on the load-deflection curve shall be obtained.

9.3 Apply a nominal pressure equal to at least four times the dead weight of the specimen. Use this nominal pressure as the "reference zero load" and record initial readings after the applied load has been applied for 60 seconds and until dial gauges indicate no further increase in deflection. The next load, unless otherwise specified, shall be a load equal to one-quarter the design wind uplift load and shall be applied for not less than 60 seconds. Thereafter, reduce the pressure difference to no load and then back to "reference zero load". Take readings to determine the permanent deformation or failure. Continue to apply loading in 5 increments reducing loading after each increment back down to no load and then back to "reference zero load" until the design wind uplift load is achieved. After completion of the above portion of the test, reduce the pressure difference to no load and then back to "reference zero load." Multiply the design wind uplift load by the factor of safety. Using one-third increments of this value, increase the load in three steps until this factored load is reached. Follow the same procedure as used to test to design load. Hold the test at final load for a minimum of 60 seconds then reduce the load to zero. If failure occurs prior to the full load, record the load at the time of failure.

10. Report

10.1 The report shall include the following information:

10.1.1 Date of the test and the report.

10.1.2 Identification of the specimen (manufacturer, source of supply, dimensions, model types, materials, and other pertinent information).

10.1.3 Detailed drawings of the specimen, showing dimensioned section profiles, framing location, panel arrangement, installation and spacing of anchorage, and any other pertinent construction details. Any modifications made on the specimen to obtain the reported values shall be noted on the drawings.

10.1.4 A tabulation of the number of the test load increments, the pressure differences exerted across the specimen at these increments, the pertinent deflections at these pressure differences, and permanent deformations at locations specified for each specimen tested.

10.1.5 The duration of test loads, including incremental loads.
10.1.6 A record of visual observations of performance.

10.1.7 When the tests are made to check conformity of the specimen to a particular specification, an identification or description of that specification.

10.1.8 A statement that the tests were conducted in accordance with this test method, or a full description of any deviations from this test method.

10.1.9 A statement as to whether or not tape or film, or both, were used to seal against air leakage, and whether in the judgment of the test engineer, the tape or film influenced the results of the test.

10.1.10 If several essentially identical specimens of a component are tested, results for all specimens shall be reported, each specimen being properly identified particularly with respect to distinguishing features or differing adjustments. A separate drawing for each specimen will not be required if all differences between them are noted on the drawing provided.

10.1.11 The test shall be performed by an independent testing laboratory or at the manufacturer's laboratory if an independent Registered Professional Engineer witnesses the test. In either case, the test report shall be signed and sealed by the engineer who witnessed the test.

---END OF TEST---

-- End of Section --
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SECTION 07920

JOINT SEALING

PART 1  GENERAL

1.1 REFERENCES

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

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 570  (1972; R 1989) Oil- and Resin-Base Caulking Compound for Building Construction
ASTM C 834  (1991) Latex Sealants
ASTM C 1184 (1991) Structural Silicone-Sealants

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 PROCEDURES:

SD-01 Data

Backing; FIO.

Bond-Breaker; FIO.

Sealant; FIO.

Manufacturer's descriptive data including storage requirements, shelf life, curing time, instructions for mixing and application, and primer data (if
required). A copy of the Material Safety Data Sheet shall be provided for each solvent, primer or sealant material.

SD-13 Certificates

Sealant: F10.

Certificates of compliance stating that the materials conform to the specified requirements.

1.3 ENVIRONMENTAL REQUIREMENTS

The ambient temperature shall be within the limits of 40 to 90 degrees F when the sealants are applied.

1.4 DELIVERY AND STORAGE

Materials shall be delivered to the job in the manufacturer's original unopened containers. The container label or accompanying data sheet shall include the following information as applicable: manufacturer, name of material, formula or specification number, lot number, color, date of manufacture, mixing instructions, shelf life, and curing time at the standard conditions for laboratory tests. Materials shall be handled and stored to prevent inclusion of foreign materials. Materials shall be stored at temperatures between 40 and 90 degrees F unless otherwise specified by the manufacturer.

PART 2 PRODUCTS

2.1 BACKING

Backing shall be 25 to 33 percent oversize for closed cell and 40 to 50 percent oversize for open cell material, unless otherwise indicated.

2.1.1 Rubber Backing

Cellular rubber sponge backing A shall be ASTM D 1056, Type 2, closed cell, Class A, Grade 1, round cross section.

2.1.2 PVC Backing

Polyvinyl chloride (PVC) backing B shall be ASTM D 1565, Grade VO 12, open-cell foam, round cross section.

2.1.3 Synthetic Rubber Backing

Synthetic rubber backing C shall be ASTM C 509, Option I, Type I preformed rods.

2.2 BOND-BREAKER

Bond-breaker shall be as recommended by the sealant manufacturer to prevent adhesion of the sealant to backing or to bottom of the joint.
2.3 PRIMER
Primer shall be non-staining type as recommended by sealant manufacturer for the application.

2.4 CAULKING
Oil- and resin-based caulking, A shall be ASTM C 570, Type 1.

2.5 LATEX SEALANT
Latex Sealant A shall be ASTM C 834.

2.6 ELASTOMERIC SEALANTS
Elastomeric sealants shall conform to ASTM C 920 and the following:

a. Polysulfide Sealant B: Polysulfide sealant, Type S, Grade NS, Class 25, Use NT.

b. Polyurethane Sealant C: Polyurethane sealant, Grade NS, Class 25, Use NT.

c. Silicone Sealant D: Silicone sealant, Type S, Grade NS, Class 25, Use NT.

d. Structural Silicone Sealant E: Structural silicone sealant, ASTM C 1184, Type S, use G.

2.7 BUTYL SEALANT
Butyl sealant, G shall be ASTM C 1085.

2.8 SOLVENTS AND CLEANING AGENTS
Solvents, cleaning agents, and accessory materials shall be provided as recommended by the manufacturer.

PART 3 EXECUTION

3.1 GENERAL

3.1.1 Surface Preparation
The surfaces of joints to be sealed shall be dry. Oil, grease, dirt, chalk, particles of mortar, dust, loose rust, loose mill scale, and other foreign substances shall be removed from surfaces of joints to be in contact with the sealant. Oil and grease shall be removed with solvent and surfaces shall be wiped dry with clean cloths.

3.1.2 Concrete and Masonry Surfaces
Where surfaces have been treated with curing compounds, oil, or other such materials, the materials shall be removed by sandblasting or wire brushing.
3.1.3 Steel Surfaces

Steel surfaces to be in contact with sealant shall be sandblasted or, if sandblasting would not be practical or would damage adjacent finish work, the metal shall be scraped and wire brushed to remove loose mill scale. Protective coatings on steel surfaces shall be removed by sandblasting or by a solvent that leaves no residue.

3.1.4 Aluminum Surfaces

Aluminum surfaces to be in contact with sealants shall be cleaned of temporary protective coatings. When masking tape is used for a protective cover, the tape and any residual adhesive shall be removed just prior to applying the sealant. Solvents used to remove protective coating shall be as recommended by the manufacturer of the aluminum work and shall be non-staining.

3.1.5 Wood Surfaces

Wood surfaces to be in contact with sealants shall be free of splinters and sawdust or other loose particles.

3.2 APPLICATION

3.2.1 Masking Tape

Masking tape may be placed on the finish surface on one or both sides of a joint cavity to protect adjacent finish surfaces from primer or sealant smears. Masking tape shall be removed within 10 minutes after joint has been filled and tooled.

3.2.2 Backing

Backing shall be installed to provide the indicated sealant depth. The installation tool shall be shaped to avoid puncturing the backing.

3.2.3 Bond-Breaker

Bond-breaker shall be applied to fully cover the bottom of the joint without contaminating the sides where sealant adhesion is required.

3.2.4 Primer

Primer shall be used on concrete masonry units, wood, or other porous surfaces in accordance with instructions furnished with the sealant. Primer shall be applied to the joint surfaces to be sealed. Surfaces adjacent to joints shall not be primed.

3.2.5 Sealant

Sealant shall be used before expiration of shelf life. Multi-component sealants shall be mixed according to manufacturer's printed instructions.
Sealant in guns shall be applied with a nozzle of proper size to fit the width of joint. Sealant shall be forced into joints with sufficient pressure to expel air and fill the groove solidly. Unless otherwise indicated, specified, or recommended by the manufacturer, the installed sealant shall be tooled so that the surface is uniformly smooth and free of wrinkles and to assure full adhesion to the sides of the joint. Sealants shall be installed free of air pockets, foreign embedded matter, ridges and sags. Sealer shall be applied over the sealant when and as specified by the sealant manufacturer.

3.3 CLEANING

The surfaces adjoining the sealed joints shall be cleaned of smears and other soiling resulting from the sealant application as work progresses.

-- End of Section --
PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)


ASTM C 976 (1990) Thermal Performance of Building Assemblies by Means of a Calibrated Hot Box


ASTM E 152 (1981a) Fire Tests of Door Assemblies

ASTM E 283 (1991) Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen

DOOR AND HARDWARE INSTITUTE (DHI)

DHI-02 (1986) Installation Guide for Doors and Hardware

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 80 (1992) Fire Doors and Windows


STEEL DOOR INSTITUTE (SDOI)

SDOI SDI-100 (1991) Standard Steel Doors and Frames

SDOI SDI-106 (1991) Standard Door Type Nomenclature

SDOI SDI-107 (1984) Hardware on Steel Doors
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 PROCEDURES:

SD-04 Drawings

Steel Doors and Frames; GA.

Drawings using standard door type nomenclature in accordance with SDOI SDI-106 indicating the location of each door and frame, elevation of each model of door and frame, details of construction, method of assembling sections, location and extent of hardware reinforcement, hardware locations, type and location of anchors for frames, and thicknesses of metal. Drawings shall include catalog cuts or descriptive data for the doors, frames, and weatherstripping including air infiltration data and manufacturers printed instructions.

SD-09 Reports

Fire Rated Doors; FIO.

A letter by a nationally recognized testing laboratory which identifies the product manufacturer, type, and model; certifying that the laboratory has tested a sample assembly in accordance with ASTM E 152 and issued a current listing for same.

1.3 DELIVERY AND STORAGE

During shipment, welded unit type frames shall be strapped together in pairs with heads at opposite ends or shall be provided with temporary steel spreaders at the bottom of each frame; and knockdown type frames shall be securely strapped in bundles. Materials shall be delivered to the site in undamaged condition, and stored out of contact with the ground and under a weathertight covering permitting air circulation. Doors and assembled frames shall be stored in an upright position in accordance with DHI-02. Abraded, scarred, or rusty areas shall be cleaned and touched up with matching finishes.

1.4 WARRANTY

Manufacturer's standard performance guarantees or warranties that extend beyond a 1 year period shall be provided.

PART 2 PRODUCTS

2.1 DOORS AND FRAMES

Doors and frames shall be factory fabricated in accordance with SDOI "I 100 and the additional requirements specified herein. Door grade shall be heavy duty (Grade II) unless otherwise indicated on the door and
door frame schedules. Exterior doors and frames shall be designation A40 galvanized. Indicated interior doors and frames shall be designation A40 galvanized. Doors and frames shall be prepared to receive hardware conforming to the templates and information provided under Section 08700 BUILDERS' HARDWARE. Doors and frames shall be reinforced, drilled, and tapped to receive mortised hinges, locks, latches, and flush bolts as required. Doors and frames shall be reinforced for surface applied hardware. Frames shall be welded type located as shown. Rubber silencers shall be furnished for installation into factory predrilled holes in door frames; adhesively applied silencers are not acceptable. Where frames are installed in plaster or masonry walls, plaster guards shall be provided on door frames at hinges and strike bolts. Full glass doors shall conform to SDOI SDI-100, Model 3, and shall include provisions for glazing. Reinforcing of door assemblies for closer and other required hardware shall be in accordance with SDOI SDI-100 and the conditions of the fire door assembly listing when applicable. Exterior doors shall have top edges closed flush and sealed against water penetration.

2.2 THERMAL INSULATED DOORS

The interior of thermal insulated doors shall be completely filled with rigid plastic foam permanently bonded to each face panel. The thermal conductance (U-value) through the door shall not exceed 0.41 when tested as an operational assembly in accordance with ASTM C 236 or ASTM C 976. Doors with cellular plastic cores shall have a minimum oxygen index rating of 22 percent when tested in accordance with ASTM D 2863.

2.3 WEATHERSTRIPPING

Unless otherwise specified in Section 08700 BUILDERS' HARDWARE, weatherstripping shall be as follows: Weatherstripping for head and jamb shall be manufacturer's standard elastomeric type of synthetic rubber, vinyl, or neoprene and shall be installed at the factory or on the jobsite in accordance with the door frame manufacturer's recommendations. Weatherstripping for bottom of doors shall be as shown. Air leakage rate of weatherstripping shall not exceed 0.20 cfm per linear foot of crack when tested in accordance with ASTM E 283 at standard test conditions.

2.4 LOUVERS

Where indicated, doors shall be provided with louver sections. Louvers shall be sightproof type inserted into the door. Pierced louvers shall not be used. Inserted louvers shall be stationary. Louvers shall be nonremovable from the outside of exterior doors or the unsecure side of interior doors. On exterior doors, insect screens shall be a removable type with 18 by 16 mesh aluminum or bronze cloth.

2.5 GLAZING

Removable glazing beads shall be screw-on or snap-on type.
2.6 FACTORY FINISH

Doors and frames shall be phosphatized and primed with standard factory primer system. Color shall be in accordance with Section 09915 COLOR SCHEDULE.

PART 3 EXECUTION

3.1 INSTALLATION

Installation shall be in accordance with DHI-02. Preparation for surface applied hardware shall be in accordance with SDOI SDOI-107. Rubber silencers shall be installed in door frames after finish painting has been completed; adhesively applied silencers are not acceptable. Weatherstripping shall be installed at exterior door openings to provide a weathertight installation. Installation and operational characteristics of fire doors shall be in accordance with NFPA 80, NFPA 80A and NFPA 101. Hollow metal door frames shall be solid grouted steel stud walls.

3.1.1 Thermal Insulated Doors

Hardware and perimeter seals shall be adjusted for proper operation. Doors shall be sealed weathertight after installation of hardware and shall be in accordance with Section 07920 JOINT SEALING.

3.1.2 Security Doors

Door frames shall be rigidly anchored in place and provided with antispread space filler reinforcements to prevent disengagement of the lock bolt by prying or jacking of the frame. Jambs shall be filled solid with concrete grout.

3.2 FIELD PAINTED FINISH

Steel doors and frames shall be field painted in accordance with Section 09900 PAINTING, GENERAL. Weatherstrips shall be protected from paint. Finish shall be free of scratches or other blemishes. Color shall be in accordance with Section 09915 COLOR SCHEDULE.

-- End of Section --
PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 525 (1993) General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process

ASTM E 84 (1991a) Surface Burning Characteristics of Building Materials

AMERICAN SOCIETY OF HEATING, REFRIGERATING, AND AIR-CONDITIONING ENGINEERS (ASHRAE)


NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA ICS 2 (1993) Industrial Control Devices, Controllers and Assemblies

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

NEMA MG 1 (1993) Motors and Generators

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)


NFPA 80 (1992) Fire Doors and Windows

1.2 DESCRIPTION

Overhead rolling doors shall be spring counterbalanced, rolling type, with interlocking slats, complete with guides, fastenings, hood, brackets, and operating mechanisms, and shall be designed for use on openings as indicated.

1.2.1 Wind Load Requirements

Doors and components shall be designed to withstand the minimum design wind load of 20 psf. Doors shall be constructed to sustain a superimposed load,
both inward and outward, equal to 1-1/2 times the minimum design wind load. The door shall support the superimposed loads for a minimum period of 10 seconds without evidence of serious damage and shall be operable after conclusion of the tests. Calculations shall be provided that prove the door design meets the design windload requirements.

1.2.2 Operational Cycle Life

All portions of the door and door operating mechanism that are subject to movement, wear, or stress fatigue shall be designed to operate through a minimum of 100,000 cycles. (One complete cycle of door operation will begin with the door in the closed position, move to the full open position and return to the closed position.

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-01 Data
Overhead Rolling Door Unit; FIO.
Manufacturer's catalog data, test data, and summary of forces and loads on the walls/jambs.

SD-04 Drawings
Overhead Rolling Door Unit; GA.
Drawings showing the location of each door including schedules. Drawings shall include elevations of each door type, details and method of anchorage, details of construction, location and installation of hardware, shape and thickness of materials, details of joints and connections, and details of guides, power operators, controls, and other fittings.

SD-06 Instructions
Overhead Rolling Door Unit; FIO.
Manufacturer's preprinted installation instructions.

SD-09 Reports
Tests; FIO.
Written record of fire door drop test.

SD-13 Certificates
Fire Doors; FIO.
Certificates stating that the overhead rolling doors conform to
requirements of this section. Certificates for oversize fire doors stating that the doors and hardware are manufactured in compliance with the requirements for doors of this type and class and have been tested and meet the requirements for the class indicated.

SD-19 Operation and Maintenance Manuals

Overhead Rolling Door Unit; FIO.

Six complete copies of operating instructions outlining the step-by-step procedures required for motorized door and shutter operation. The instructions shall include the manufacturer's name, model number, service manual, parts list, and brief description of all equipment and their basic operating features. Six complete copies of maintenance instructions listing routine maintenance procedures, possible breakdowns and repairs, troubleshooting guides, and simplified diagrams for the equipment as installed. Also spare parts data for each different item of material and equipment specified. The data shall include a complete list of parts and supplies, source of supply, and a list of the high mortality maintenance parts.

1.4 DELIVERY AND STORAGE

Doors shall be delivered to the jobsite wrapped in a protective covering with the brands and names clearly marked thereon. Doors shall be stored in a dry location that is adequately ventilated and free from dirt and dust, water, and other contaminants, and in a manner that permits easy access for inspection and handling.

1.5 WARRANTY

Manufacturer's standard performance guarantees or warranties that extend beyond a 1-year period shall be provided.

PART 2 PRODUCTS

2.1 OVERHEAD ROLLING DOORS

Doors shall be surface-mounted type with guides at jambs set back a sufficient distance to clear the opening. Exterior doors shall be mounted on interior side of walls.

2.1.1 Curtains

The curtains shall roll up on a barrel supported at the head of opening on brackets, and shall be balanced by helical springs. Steel slats for doors from 15 feet wide to 21 feet wide shall be minimum bare metal thickness of 0.0329 inches (20 gauge). Steel slats for doors 21 feet wide and wider shall be minimum bare metal thickness of 0.0438 inches (18 gauge).

2.1.1.1 Insulated Curtains

The slat system shall supply a minimum R-value of 5 when calculated in accordance with ASHRAE-03. Slats shall be of the flat type as standard with the manufacturer. Slats shall consist of a urethane core not less
than 11/16 inch thick, completely enclosed within metal facings. Exterior face of slats shall be gauge as specified for curtains. Interior face shall be not lighter than 24 gauge. Insulation shall have a flame spread rating of not more than 25 and a smoke development factor of not more than 50 when tested in accordance with ASTM E 84.

2.1.2 Endlocks and Windlocks

The ends of each alternate slat for interior doors shall have malleable endlocks of manufacturer's stock design. In addition to endlocks, exterior doors shall have the manufacturer's standard windlocks as required to withstand the wind load. Windlocks shall prevent the curtain from leaving guides because of deflection from specified wind pressure.

2.1.3 Bottom Bar

The curtain shall have a standard bottom bar consisting of two hot-dip galvanized steel angles for steel doors.

2.1.4 Guides

Guides shall be steel structural shapes or formed steel shapes, of a size and depth to provide proper clearance for operation and resistance under the design windload. Guides shall be attached to adjoining construction with fasteners recommended by the manufacturer. Spacing of fasteners shall be as required to meet the minimum design windload.

2.1.5 Barrel

The barrel shall be steel pipe or commercial welded steel tubing of proper diameter for the size of curtain. Deflection shall not exceed 0.03 inch per foot of span. Ends of the barrel shall be closed with cast-iron or steel plugs, machined to fit the pipe.

2.1.6 Springs

Oil tempered helical steel counter-balance torsion springs shall be installed within the barrel and shall be capable of producing sufficient torque to assure easy operation of the door curtain. Access shall be provided for spring tension adjustment from outside of the bracket without removing the hood.

2.1.7 Brackets

Brackets shall be of steel plates to close the ends of the roller-shaft housing, and to provide mounting surfaces for the hood. An operation bracket hub and shaft plugs shall have sealed prelubricated ball bearings.

2.1.8 Hoods

Hoods shall be steel with minimum bare metal thickness of 0.0209 (24 gauge), formed to fit contour of the end brackets, and shall be reinforced with steel rods, rolled beads, or flanges at top and bottom edges. Multiple segment and single piece hoods shall be provided with support brackets of the manufacturer's standard design as required for adequate
support.

2.1.9 Weatherstripping

Exterior doors shall be fully weatherstripped. A compressible and replaceable weather seal shall be attached to the bottom bar. Weather seal at door guides shall be continuous vinyl or neoprene, bulb or leaf type, or shall be nylon-brush type. A weather baffle shall be provided at the lintel or inside the hood. Weatherstripping shall be easily replaced without special tools.

2.1.10 Slat Openings

2.1.11 Operation

Doors shall be operated by means of electric power with auxiliary chain hoist.

2.1.11.1 Electric Power Operator With Auxiliary Chain Hoist Operation

Electric power operators shall be heavy-duty industrial type. The unit shall operate the door through the operational cycle life specified. The electric power operator shall be complete with electric motor, auxiliary operation, necessary means of reduction, brake, mounting brackets, push button controls, limit switches, magnetic reversing starter, and all other accessories necessary to operate components specified in other paragraphs of this section. The operator shall be so designed that the motor may be removed without disturbing the limit-switches settings and without affecting the emergency chain operator. Doors shall be provided with an auxiliary operator for immediate emergency manual operation of the door in case of electrical failure. The emergency manual operating mechanism shall be so arranged that it may be operated from the floor without affecting the settings of the limit switches. A mechanical device shall be included that will disconnect the motor from the drive operating mechanism when the auxiliary operator is used. Where control voltages differ from motor voltage, a control voltage transformer shall be provided in and as part of the electric power operator system. Control voltage shall not exceed 120 volts.

a. Motors: Drive motors shall conform to NEMA MG 1, shall be high-starting torque, reversible type, and shall be of sufficient horsepower and torque output to move the door in either direction from any position at a speed range of 6 to 8 inches per second without exceeding the rated capacity. Motors shall be suitable for operation on 480 volts, 60 hertz, 3-phase current and shall be suitable for across-the-line starting. Motors shall be designed to operate at full capacity over a supply voltage variation of plus or minus 10 percent of the motor voltage rating. Motors shall be provided with overload protection.

b. Controls: Control equipment shall conform to NEMA ICS 2. Enclosures shall conform to NEMA ICS 6, Type 12 (industrial use), Type 7 or 9 in hazardous locations, in accordance with NFPA 70, Article 501, Section 50. Exterior control stations shall be weatherproof key-operated type with corrosion-resistant cast-metal cover. Each control station shall be of the three position button type, marked "OPEN," "CLOSE,"
and "STOP." The "OPEN" and "STOP" controls shall be of the momentary contact type with seal-in contact. The "CLOSE" control shall be of the momentary contact type. When the door is in motion and the "STOP" control is pressed, the door shall stop instantly and remain in the stop position; from the stop position, the door shall be operable in either direction by the "OPEN" or "CLOSE" controls. Controls shall be of the full-guarded type to prevent accidental operation. Readily adjustable limit switches shall be provided to automatically stop the doors at their fully open and closed positions.

c. Sensing Edge Device: The bottom edge of electric power operated doors shall have a pneumatic sensing edge that will immediately reverse the door movement upon contact with an obstruction and cause the door to return to its full open position. The sensing edge shall not substitute for a limit switch. Exterior doors shall be provided with a combination compressible weather seal and sensing edge.

d. Electrical Work: Conduit and wiring necessary for proper operation shall be provided under Section 16415 ELECTRICAL WORK, INTERIOR. Flexible connections between doors and fixed supports shall conform to NFPA 70, Article 501, 502, 503, or 504 as appropriate. The cable shall have a spring-loaded automatic take up reel or a coil cord equivalent device.

2.1.12 Locking

Locking shall consist of locking disc, suitable for padlock by others, for crank operated doors.

2.1.13 Finish

Steel slats and hoods shall be hot-dip galvanized G90 in accordance with ASTM A 525, and shall be treated for paint adhesion and shall receive a baked on prime coat. Surfaces other than slats, hood, and faying surfaces shall be cleaned and treated to assure maximum paint adherence and shall be given a factory dip or spray coat of rust inhibitive metallic oxide or synthetic resin primer. Color shall be in accordance with Section 09915 COLOR SCHEDULE.

PART 3 EXECUTION

3.1 INSTALLATION

Doors shall be installed in accordance with approved detail drawings and manufacturer's instructions. Anchors and inserts for guides, brackets, motors, switches, hardware, and other accessories shall be accurately located. Upon completion, doors shall be free from warp, twist, or distortion. Doors shall be lubricated, properly adjusted, and demonstrated to operate freely. Fire doors shall be installed in conformance with the requirements of NFPA 80 and the manufacturer's instructions. Field painting shall be in accordance with Section 09900 PAINTING, GENERAL.

-- End of Section --
PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM E 283 (1991) Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls and Doors Under Specified Pressure Differences Across the Specimen

BUILDERS HARDWARE MANUFACTURERS ASSOCIATION (BHMA)

BHMA-01 (Effective thru Jun 1994) Directory of Certified Locks & Latches
BHMA-02 (Effective thru Jul 1994) Directory of Certified Door Closers
BHMA A156.1 (1988) Butts and Hinges
BHMA A156.2 (1989) Bored and Preassembled Locks and Latches
BHMA A156.3 (1989) Exit Devices
BHMA A156.4 (1992) Door Controls - Closers
BHMA A156.5 (1992) Auxiliary Locks & Associated Products
BHMA A156.6 (1986) Architectural Door Trim
BHMA A156.7 (1988) Template Hinge Dimensions
BHMA A156.13 (1987) Mortise Locks & Latches
BHMA A156.16 (1989) Auxiliary Hardware
BHMA A156.18 (1987) Materials and Finishes
BHMA A156.21 (1989) Thresholds

DOOR AND HARDWARE INSTITUTE (DHI)

DHI-02 (1986) Installation Guide for Doors and

SECTION 08700  PAGE 1
TARGET LAUNCH FACILITIES, PHASE 1, FT WINGATE, NM

Hardware

DHI-03  (1989) Keying Systems and Nomenclature

DHI-04  (1976) Recommended Locations for Builders' Hardware for Custom Steel Doors and Frames

DHI-05  (1990) Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames

DHI All5-W  (1993) Wood Door Hardware Standards
(Incl All5-W1 thru All5-W9)

FEDERAL STANDARDS (FED-STD)

FED-STD 795  (Basic) Uniform Federal Accessibility Standards

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 80  (1992) Fire Doors and Windows

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

Hardware and Accessories; FIO.

Manufacturer's descriptive data, technical literature, catalog cuts, and installation instructions. Spare parts data for locksets, exit devices, closers, electric locks, electric strikes, electro-magnetic closer holder release devices, and electric exit devices, after approval of the detail drawings, and not later than 3 month(s) prior to the date of beneficial occupancy. The data shall include a complete list of parts and supplies, with current unit prices and source of supply.

SD-07 Schedules

Hardware Schedule; GA.

Hardware schedule listing all items to be furnished. The schedule shall include for each item: the quantities; manufacturer's name and catalog numbers; sizes; detail information or catalog cuts; finishes; door and frame size and materials; location and hardware set identification cross-references to drawings; corresponding reference standard type number or function number from manufacturer's catalog if not covered by ANSI or BHMA; and list of abbreviations and template numbers.
Keying Schedule; GA.

Keying schedule developed in accordance with DHI-03, after the keying meeting with the user.

SD-13 Certificates

Hardware and Accessories; FIO.

The material supplier’s or hardware manufacturer’s certificates of compliance stating that the supplied material or hardware item 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. A statement that the proposed hardware items appear in BHMA-01 and BHMA-02 directories of certified products may be submitted in lieu of certificates. A separate Certificate of Compliance attesting that hardware items conform to the "Buy American Act" shall be included.

SD-19 Operation and Maintenance Manuals

Hardware and Accessories; FIO.

Six complete copies of maintenance instructions listing routine maintenance procedures, possible breakdowns and repairs, and troubleshooting guides. The instructions for electric locks, electric strikes, electro-magnetic closer holder release devices, and electric exit devices shall include simplified diagrams as installed.

1.3 DELIVERY, STORAGE, AND HANDLING

Hardware shall be delivered to the project site in the manufacturer’s original packages. Each article of hardware shall be individually packaged in the manufacturer’s standard commercial carton or container, and shall be properly marked or labeled to be readily identifiable with the approved hardware schedule. Each change key shall be tagged or otherwise identified with the door for which its cylinder is intended. Where double cylinder functions are used or where it is not obvious which is the key side of a door, appropriate instructions shall be included with the lock and on the hardware schedule. Manufacturer’s printed installation instructions, fasteners, and special tools shall be included in each package.

1.4 SPECIAL TOOLS

Special tools, such as those supplied by the manufacturer, unique wrenches, and dogging keys, shall be provided as required to adjust hardware items.
PART 2 PRODUCTS

2.1 GENERAL HARDWARE REQUIREMENTS

Hardware shall conform to the requirements specified herein and the HARDWARE SETS listing at the end of this section. Hardware set numbers correspond to the set numbers shown on the drawings. Hardware items providing accessibility and usability for physically handicapped shall comply with FED-STD 795.

2.2 TEMPLATES

Requirements for hardware to be mounted on metal doors or metal frames shall be coordinated between hardware manufacturer and door or frame manufacturer by use of templates and other information to establish location, reinforcement required, size of holes, and similar details. Templates of hinges shall conform to BHMA A156.7.

2.3 HINGES

Hinges shall conform to BHMA A156.1. Hinges used on metal doors and frames shall also conform to BHMA A156.7. Except as otherwise specified, hinge sizes shall conform to the hinge manufacturer's printed recommendations.

2.3.1 Hinges for Reverse Bevel Doors with Locks

Hinges for reverse bevel doors with locks shall have pins that are made nonremovable by means such as a set screw in the barrel, or safety stud, when the door is in the closed position.

2.3.2 Contractor's Option

Hinges with antifriction bearings may be furnished in lieu of ball bearing hinges, except where prohibited for fire doors by the requirements of NFPA 80.

2.4 LOCKS AND LATCHES

To the maximum extent possible, locksets, latchsets and deadlocks shall be the products of a single manufacturer. Lock fronts for double-acting doors shall be rounded. Strikes for wood frames and pairs of wood doors shall be furnished with wrought boxes. Lock and latch set trim levers and escutcheons shall be of a simple design in accordance with manufacturer's standard practice. Knob diameter shall be 2-1/8 to 2-1/4 inches.

2.4.1 Mortise Lock and Latchsets

Mortise lock, latchsets, and strikes shall be series 1000 and shall conform to BHMA A156.13, operational Grade 1. Strikes for security doors shall be rectangular without curved lip. Mortise type locks and latches for doors 1-3/4 inches thick and over shall have adjustable bevel fronts or otherwise conform to the shape of the door. Mortise locks shall have armored fronts.
2.4.2 Cypher Lock

The cypher lock is an electronic access control with spy-proof, pushbutton panel and electronic control box. The electric door strike is activated by the cypher lock giving an output of 24 Vdc.

2.4.3 Auxiliary Locks and Associated Products

Bored and mortise deadlocks and latchsets, narrow style locks, rim locks, and electric strikes shall conform to BHMA A156.5. Bolt and latch retraction shall be dead bolt style. Strike boxes shall be furnished with dead bolt and latch strikes for Grade 1.

2.4.4 Lock Cylinders (Mortise, Rim and Bored)

Lock cylinders shall comply with BHMA A156.5. Lock cylinder shall have not less than seven pins. Cylinders shall have key removable type cores.

All locksets, exit devices, and padlocks shall accept same interchangeable cores.

2.4.5 Push/Pull Latches

2.4.6 Lock Trim

Lock trim shall be cast, forged, or heavy wrought construction of commercial plain design. In addition to meeting the test requirement of BHMA A156.2 or BHMA A156.13, lever handles, roses, and escutcheons shall be 0.050 inch thick, if unreinforced. If reinforced, the outer shell shall be 0.035 inch thick and the combined thickness shall be 0.070 inch except that knob shanks shall be 0.060 inch thick.

2.5 EXIT DEVICES AND EXIT DEVICE ACCESSORIES

Exit devices and exit device accessories shall conform to BHMA A156.3, Grade 1.

2.5.1 Exit Devices and Auxiliary Items

Trim shall be of wrought construction and commercial plain design with straight, beveled, or smoothly rounded sides, corners, and edges. Adjustable strikes shall be provided for rim type and vertical rod devices. Open back strikes shall be provided for pairs of doors with mortise and vertical rod devices; except open back strikes shall be used on labeled doors only where specifically provided for in the published listings. Touch bars may be provided in lieu of conventional crossbars and arms. Escutcheons shall be provided not less than 7 by 2-1/4 inches. Escutcheons will be cut to suit cylinders and operating trim.

2.6 KEYING

Locks shall be keyed in sets or subsets as scheduled. Locks shall be furnished with the manufacturer's standard construction key system. Change keys for locks shall be stamped with change number and the inscription "U.S. Property - Do Not Duplicate."

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The keys shall be furnished to the Contracting Officer arranged in a container in sets or subsets as scheduled.

2.7 DOOR CLOSING DEVICES

Door closing devices shall conform to BHMA A156.4, Grade 1. Closing devices shall be products of one manufacturer for each type specified.

2.7.1 Surface Type Closers

Surface type closers shall be Grade 1, Series C02000 Full Cover with options PT-4K, Size 1 or 2 through Size 6, and PT-4D with back check position valve. Except as otherwise specified, sizes shall conform to the manufacturer's published recommendations. Closers for outswinging exterior doors shall have parallel arms or shall be top jamb mounted. Closers for doors close to a wall shall be of narrow projection so as not to strike the wall at the 90-degree open position.

2.8 ARCHITECTURAL DOOR TRIM

Architectural door trim shall conform to BHMA A156.6.

2.8.1 Push Plates

2.8.1.1 Combination Push-Pull Plates

Combination push-pull plates shall be Category J300, 1/8 inch thick minimum stainless steel beveled four edges.

2.8.1.2 Flat Plates

Flat plates shall be Category J300, stainless steel. Edges of metal plates shall be beveled.

2.9 AUXILIARY HARDWARE

Auxiliary hardware, consisting of door holders and door stops shall conform to BHMA A156.16.

2.10 MISCELLANEOUS

2.10.1 Metal Thresholds

Thresholds shall conform to BHMA A156.21. Thresholds for exterior doors shall be extruded aluminum of the type indicated and shall provide proper clearance and an effective seal with specified weather stripping. Where required, thresholds shall be modified to receive projecting bolts of flush bolts. Thresholds for doors accessible to the handicapped shall be beveled with slopes not exceeding 1:2 and with heights not exceeding 1/2 inch. Air leakage rate of weatherstripping shall not exceed 0.5 cubic feet per minute per linear foot of crack when tested in accordance with ASTM E 283 at standard test conditions.
2.10.2 Rain Drips

Extruded aluminum, not less than 0.07 inch thick, bronze anodized. Door sill rain drips shall be 1-1/2 inches to 1-3/4 inches high by 5/8 inch projection. Overhead rain drips shall be approximately 1-1/2 inches high by 2-1/2 inches projection and shall extend 2 inches on either side of the door opening width.

2.10.3 Aluminum Housed Type Weatherseals

Weatherseals of the type indicated shall consist of extruded aluminum retainers not less than 0.07 inch wall thickness with vinyl, neoprene, silicone rubber, polyurethane or vinyl brush inserts. Aluminum shall be bronze anodized. Weatherseal material shall be of an industrial/commercial grade. Seals shall remain functional through all weather and temperature conditions. Air leakage rate of weatherstripping shall not exceed 0.5 cubic feet per minute per lineal foot of crack when tested in accordance with ASTM E 283 at standard test conditions.

2.10.4 Gasketing

Gasketing shall be a compression type seal, silicon based, self-adhesive product for use on steel door frames with steel doors for 1-1/2 hour B-label. Color shall be bronze. Air leakage rate of weatherstripping shall not exceed 0.5 cubic feet per minute per lineal foot of crack when tested in accordance with ASTM E 283 at standard test conditions.

2.11 FINISHES

Unless otherwise specified, finishes shall conform to those identified in BHMA A156.18. Where painting of primed surfaces is required, painting is specified in Section 09900 PAINTING, GENERAL.

PART 3 EXECUTION

3.1 APPLICATION

Hardware shall be located in accordance with DHI-04 and DHI-05. When approved, slight variations in locations or dimensions will be permitted. Application shall be in accordance with DHI-02 or DHI A115-W. Door control devices for exterior doors such as closers and holders, shall normally attach to doors with thru bolts and nuts or sex bolts. Electric hardware items and access control devices shall be installed in accordance with manufacturer’s printed installation procedures.

3.1.1 Door-Closing Devices

Door-closing devices shall be installed and adjusted in accordance with the templates and printed instructions supplied by the manufacturer of the devices. Insofar as practicable, doors opening to or from halls and corridors shall have the closer mounted on the room side of the door.
3.1.2 Auxiliary Hardware

Lever extension flush bolts shall be installed at the top and bottom of the inactive leaf of pairs of doors. The bottom bolt shall operate into a dust-proof floor strike or threshold.

3.1.3 Thresholds

Thresholds shall be secured with a minimum of 3 fasteners per single door width and 6 fasteners per double door width with a maximum spacing of 12 inches. Exterior thresholds shall be installed in a bed of sealant with expansion anchors and stainless steel screws, except that bronze or anodized bronze thresholds shall be installed with expansion anchors with brass screws. Minimum screw size shall be No. 10 length, dependent on job conditions, with a minimum of 3/4 inch thread engagement into the floor or anchoring device used.

3.1.4 Rain Drips

Door sill rain drips shall align with the bottom edge of the door. Overhead rain drips shall align with bottom edge of door frame rabbet. Drips shall be set in sealant and fastened with stainless steel screws.

3.1.5 Weatherseals

Weatherseals shall be located as indicated, snug to door face and fastened in place with color matched metal screws after door and frames have been finish painted. Screw spacing shall be as recommended by manufacturer.

3.1.6 Gasketing

Gasketing shall be installed at the inside edge of the hinge and head and latch sides of door frame. Frames shall be tolerated for a 1/8 inch clearance between door and frame. Frames shall be treated with tape primer prior to installation.

3.2 OPERATIONAL TESTS

Prior to acceptance of any electrical hardware system, an operational test shall be performed to determine if devices are operating as intended by the specifications. Wiring shall be tested for correct voltage, current carrying capacity, and proper grounding. Stray voltages in lock wiring shall be eliminated to prevent locking devices from releasing in critical situations.

3.3 HARDWARE SETS

<table>
<thead>
<tr>
<th>HW-1</th>
<th>1-1/2 pr.</th>
<th>Hinges, A5112</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 ea.</td>
<td>Exit Device, Type 1,01</td>
</tr>
<tr>
<td></td>
<td>1 ea.</td>
<td>Closer, C02021, w/PT-4G (Stop at 90 Degrees)</td>
</tr>
<tr>
<td></td>
<td>1 ea.</td>
<td>Threshold, J 32100 - Full Width</td>
</tr>
<tr>
<td></td>
<td>1 ea.</td>
<td>Weather stripping - 3 sides</td>
</tr>
<tr>
<td></td>
<td>1 ea.</td>
<td>Rain Drip</td>
</tr>
</tbody>
</table>

| HW-2  | 3 pr. | Hinges, A5112 |

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TARGET LAUNCH FACILITIES, PHASE 1, FT WINGATE, NM

1 ea. Lockset, F05, Active Leaf (Classroom Lock)
1 ea. Cylinder Lock, Keyed
1 ea. Surface Bolt, L04161, Universal Top (inactive leaf)
1 ea. Surface Bolt, L04161, Floor Strike (inactive leaf)

HW-3 1-1/2 pr. Hinges, 5112
1 ea. Lockset, F05, (Classroom Lock)
1 ea. Cylinder Lock, Keyed

HW-4 1-1/2 pr. Hinges, A5112
1 ea. Exit Device - Lever, Type 1.08
1 ea. Closer, C02021
1 ea. Weather Stripping - 3 Sides for Air Sealing

HW-5 1-1/2 pr. Hinges, A5112
1 ea. Lockset (Classroom Lock-Lever), F05
1 ea. Cylinder Lock, Keyed
1 ea. Closer, C02021

HW-6 1-1/2 pr. Hinges, A5112
1 ea. Lockset (Passage-Lever), F01
1 ea. Closer, C02021
1 ea. Wall Type Bumper, L02101

HW-7 1-1/2 pr. Hinges, A5112
1 ea. Closer, C02021
1 ea. Push Plate, J302
1 ea. Pull Plate, J303
1 ea. Wall Type Bumper, L02101

.. End of Section ..

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PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 580  (1991b) Stainless and Heat Resisting Steel Wire
ASTM A 853  (1991) Steel Wire, Carbon, for General Use
ASTM C 36   (1993) Gypsum Wallboard
ASTM C 475  (1989) Joint Compound and Joint Tape for Finishing Gypsum Board
ASTM C 514  (1990) Nails for the Application of Gypsum Board
ASTM C 645  (1992) Non-Load (Axial) Bearing Steel Studs, Runners (Track), and Rigid Furring Channels for Screw Application of Gypsum Board
ASTM C 754  (1988) Installation of Steel Framing Members to Receive Screw-Attached Gypsum
ASTM C 1002 (1993) Steel Drill Screws for the Application of Gypsum Board or Metal Plaster Bases

FEDERAL SPECIFICATIONS (FS)

FS QQ-N-281  (Rev D; Am 2) Nickel-Copper Alloy Bar, Rod, Plate, Sheet, Strip, Wire, Forgings and Structural and Special Shaped Sections
1.2 SYSTEM DESCRIPTION

1.2.1 Fire-Rated Construction

Joints of fire-rated gypsum board enclosures shall be closed and sealed in accordance with UL requirements, and as required to meet pressurization requirements. Penetrations through rated partitions and ceilings shall be sealed tight with rated firestopping materials. Fire ratings shall be as indicated.

1.2.2 Pressurized Enclosures

Pressurized fire-rated gypsum board enclosures shall allow the mechanical and electrical life-safety systems to operate in accordance with the design intent. Air pressure within elevator shaft shall be 7.5 pounds per square foot. Air pressure within stair shaft shall be 5.0 pounds per square foot. Maximum mid-span deflection shall be L/360.

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-04 Drawings

Steel Framing; FIO. Control Joints; FIO. Fire-Resistant Assemblies; FIO.

Drawings and installation details for ceiling framing, furring, special wall framing, and framed openings in walls and ceilings.

SD-13 Certificates

Gypsum Wallboard; FIO. Water-Resistant Gypsum Board; FIO. Steel Framing; FIO.

Certificates stating that the steel framing and gypsum wallboard meet the specified requirements.

1.4 QUALIFICATIONS

Manufacturer shall specialize in manufacturing the types of material specified and shall have a minimum of 10 years of documented successful experience. Installer shall specialize in the type of gypsum board work required and shall have a minimum of 5 years of documented successful experience.

1.5 DELIVERY, STORAGE AND HANDLING

Materials shall be delivered in original containers bearing the name of manufacturer, contents, and brand name. Materials shall be stored off the ground in a weathertight structure for protection. Gypsum boards shall be
TARGET LAUNCH FACILITIES, PHASE 1, FT WINGATE, NM

stacked flat, off floor and supported to prevent sagging and warpage. Adhesives and joint materials shall be stored in accordance with manufacturer’s printed instructions. Damaged or deteriorated materials shall be removed from jobsite.

1.6 ENVIRONMENTAL CONDITIONS

Environmental conditions for application and finishing of gypsum board shall be in accordance with ASTM C 840. During the application of gypsum board without adhesive, a room temperature of not less than 40 degrees F shall be maintained. During the application of gypsum board with adhesive, a room temperature of not less than 50 degrees F shall be maintained for 48 hours prior to application and continuously afterwards until completely dry. Building spaces shall be ventilated to remove water not required for drying joint treatment materials. Drafts shall be avoided during dry hot weather to prevent materials from drying too rapidly.

PART 2 MATERIALS

2.1 NON-LOADBEARING STUD WALLS

2.1.1 Studs

Studs for non-loadbearing walls shall conform to ASTM C 645. Studs shall be prefabricated 18 gauge steel, C-shaped, punched web for utility access, G60 hot-dip galvanized after fabrication, or truss-designed studs fabricated of 16 gauge steel angles with a single No. 7 gauge rod forming an open-web truss-like pattern between flanges with all points contact welded.

2.1.2 Runner Tracks

Floor and ceiling runner tracks shall conform to ASTM C 645. Tracks shall be prefabricated, U-shaped with minimum 7/8 inch flanges, unpunched web, gauge to match studs, G60 hot-dip galvanized after fabrication.

2.2 SUSPENDED CEILING FRAMING

Main carrying channels and cross furring members for suspended gypsum board ceilings shall conform to ASTM C 645. Carrying channels shall be formed from 16 gauge cold-rolled steel, hot-dipped galvanized after fabrication, 1-1/2 x 3/4 inch deep. Furring members shall be formed from cold-rolled steel, hot-dip galvanized after fabrication, 3/4 inch high x 3/4 inch deep.

2.3 GYPSUM BOARD

Gypsum board shall have square-cut ends, tapered or beveled edges and shall be maximum possible length.

2.3.1 Standard Gypsum Board

Regular gypsum board shall conform to ASTM C 36, and shall be 48 inches wide.
2.4 ACCESSORIES

2.4.1 Taping and Embedding Compound

Taping and embedding compound shall conform to ASTM C 475. Compound shall be specifically formulated and manufactured for use in embedding tape at gypsum wallboard joints and fastener heads, and shall be compatible with tape and substrate.

2.4.2 Finishing or Topping Compound

Finishing or topping compound shall conform to ASTM C 475. Compound shall be specifically formulated and manufactured for use as a finishing compound for gypsum board.

2.4.3 All-Purpose Compound

All-purpose compound shall be specifically formulated and manufactured to use as a taping and finishing compound, and shall be compatible with tape and substrate.

2.4.4 Joint Tape

Joint tape shall conform to ASTM C 475 and shall be as recommended by gypsum board manufacturer.

2.4.5 Nails

Nails shall conform to ASTM C 514. Nails shall be hard-drawn low or medium-low carbon steel, suitable for intended use. Special nails for predecorated gypsum board shall be as recommended by predecorated gypsum board manufacturer.

2.4.6 Screws

Screws shall conform to ASTM C 1002. Screws shall be self-drilling and self-tapping steel, Type S for wood or light-gauge steel framing.

2.4.7 Adhesives

Adhesives shall conform to ASTM C 557. Adhesives shall be formulated to bond gypsum board to wood framing members. For securing gypsum board to metal framing, adhesive shall be as recommended by gypsum board manufacturer.

2.4.8 Hangers

Suspended ceiling runner channel hangers shall be soft, annealed steel wire not less than 0.1620 inch nominal diameter, conforming to ASTM A 853 or flat iron or steel straps, at least 3/32 by 7/8 inch size, coated with zinc, cadmium, or rust-inhibiting paint.
2.4.9 Fastenings

Tie wire, clips, rings, and other fastenings shall be corrosion-resisting steel conforming to ASTM A 580, composition 302, 304, or 316, Condition A, or nickel-copper alloy conforming to FS QQ-N-281, Class A or B, annealed condition except that walls, partitions, and other vertical surfaces not incorporated in ceiling construction may be erected with soft, annealed steel conforming to ASTM A 853.

2.4.9.1 Tie Wire

Tie wire for constructing partitions and vertical furring, for securing metal lath to supports, and for lacing shall be not less than 0.0475 inch diameter. Tie wire for other applications shall be not less than 0.0625 inch diameter.

2.4.9.2 Clips

Clips used in lieu of tie wire for securing the furring channels to the runner channels in ceiling construction shall be made from strip not less than 1/8 inch thick or shall be hairpin clip, formed of wire not less than 0.01620 inch nominal diameter. Other clips and rings or fastenings of similar materials shall be equivalent in holding power to that provided by tie wire for the specific application.

PART 3 EXECUTION

3.1 INTERIOR WALL FRAMING

Steel framing and furring members shall be installed in accordance with ASTM C 754. Members shall be in alignment with spacings not to exceed the maximum spacings indicated on drawings. Runners shall be aligned accurately at the floor and ceiling and securely anchored.

3.1.1 Wall Openings

The framing system shall provide for the installation and anchorage of the required subframes or finish frames for wall openings at doors, pass-through openings, and access panels. Partitions abutting continuous suspended ceilings shall be strengthened for rigidity at rough openings of more than 30 inches wide. Studs at openings shall be 20 gauge minimum bare metal thickness and spot grouted at jamb anchor inserts. Double studs shall be fastened together with screws and secured to floor and overhead runners. Two studs placed back-to-back shall be used for framing solid-core doors, doors over 3 feet 0 inches wide and extra-heavy doors such as X-ray room doors.

3.1.2 Wall Control Joints

Control joints for expansion and contraction shall be constructed with double studs installed 1/2 inch apart in interior walls or wall furrings where indicated on drawings, but shall not exceed 30 feet between control joints. Ceiling-height door frames may be used as vertical control joints. Door frames of less than ceiling height may be used as control joints only if standard control joints extend to ceiling from both corners of top of
door frame. Control joints between studs shall be filled with firesafing insulation.

3.2 SHAFT WALL FRAMING

The shaft wall system shall be reinforced in accordance with the system manufacturer's published instructions. Bucks, anchors, blocking and other items placed in or behind shaft wall framing shall be coordinated with electrical and mechanical work. Fireproofing materials which are damaged or removed during shaft wall construction shall be patched or replaced.

3.3 SUSPENDED CEILING FRAMING

Suspended ceiling system framing shall be installed in accordance with ASTM C 754.

3.3.1 Hangers

Hangers shall be spaced not more than 48 inches along runner channels and 36 inches in the other direction or 42 inches in both directions unless otherwise indicated. Locations of hanger wires shall be coordinated with other work. Hangers at ends of runner channels shall be located not more than 6 inches from wall. Hanger wire shall be looped around bottom chord of open-web steel joists, structural steel members, or center I-beam clamps with three full turns around itself. Sags or twists which develop in the suspended system shall be adjusted. Damaged or faulty parts shall be replaced.

3.3.2 Main Runners

Main runner channels shall be installed in accordance with ASTM C 754. Hanger wires shall be double strand saddle-tied to runner channels and the ends of hanger wire shall be twisted three times around itself. Main runners shall be located to within 6 inches of the paralleling wall to support the ends of cross furring. Main runners shall not come in contact with abutting masonry or concrete walls. Where main runners are spliced, ends shall be overlapped 12 inches with flanges of channels interlocked, and shall be securely tied at each end of splice with wire looped twice around the channels.

3.3.3 Furring Channels

Furring channels shall be spaced in accordance with ASTM C 754. Furring channels shall be secured to the runner channels and to structural supports at each crossing with tie wire, hairpin clips, or equivalent fastenings. Furring channels shall be located within 2 inches of parallel walls and beams, and shall be cut 1/2 inch short of abutting walls.

3.3.4 Ceiling Openings

Support members shall be provided as required at ceiling openings for access panels, recessed light fixtures, and air supply or exhaust. Support members shall be not less than 1-1/2 inch main runner channels and vertically installed suspension wires or straps shall be located to provide at least the minimum support specified herein for furring and wallboard

SECTION 09250  PAGE 6
attachment. Intermediate structural members not a part of the structural system, shall be provided for attachment or suspension of support members.

3.3.5 Light Fixtures

Light fixtures shall not be supported directly from suspended ceiling runners. Hanger wires for recessed or surface mounted light fixtures shall be anchored to structure at four corners of light fixtures, and additional wires shall be provided at appropriate locations to carry the weight of light fixtures.

3.3.6 Control Joints

Control joints for expansion and contraction shall not exceed 2500 square feet in area nor more than 50 feet in either direction.

3.4 APPLICATION OF GYPSUM BOARD

Gypsum board shall be installed in accordance with ASTM C 840 and as specified. Edges and ends of gypsum boards shall be cut to obtain neat fitting joints. End joints of adjoining boards shall be staggered, and shall be staggered on opposite sides of wall. Boards shall be applied with moderate contact without forcing in place. Holes for pipes, fixtures or other small openings shall be cut with a tool which will provide a neat fit. Screws shall be driven so that the heads are slightly below the plane of paper face. Fracturing the paper face or damaging the core shall be avoided. Trim shall be installed at external and internal angles formed by the intersecting gypsum board surfaces with other surfaces. Corner beads shall be installed to vertical and horizontal corners in accordance with manufacturer’s published instructions.

3.4.1 Two-Ply Gypsum Board

Second layer of gypsum board shall be applied perpendicular to first layer with joints staggered and secured with mechanical fasteners.

3.4.2 Foil-Backed Gypsum Board

Foil-backed gypsum board shall be placed with reflective surface against framing members.

3.4.3 Backing Board

Gypsum board and water-resistant gypsum backing board used as a substrate to receive wall panels shall be in accordance with ASTM C 840, System X.

3.4.4 Adhesively-Applied Gypsum Board

Walls scheduled to receive adhesively-applied gypsum board shall be dry, free of dust, oil, or form release agents, protrusions or voids, or foreign matter that would affect a proper bond.
3.5 TAPING AND FINISHING

Gypsum board taping and finishing shall be performed in accordance with ASTM C 840. Boards shall be kept free of dirt, oil and other foreign matter that could cause a lack of bond. Screw heads, dents, gouges, and cut-outs shall be filled with joint compound and sanded. Accessories at exposed joints, edges, corners, openings, and similar locations shall be taped, floated with joint compound, and sanded to produce surfaces ready for gypsum board finishes.

3.6 PATCHING

Surface defects and damage shall be corrected as required to leave gypsum board smooth, uniform in appearance, and ready to receive finish as specified.

-- End of Section --
PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)


ASTM C 636 (1991) Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels

ASTM E 1264 (1990) Standard Classification for Acoustical Ceiling Products

1.2 GENERAL REQUIREMENTS

Acoustical treatment shall consist of sound controlling units mechanically mounted on a suspended ceiling system. The unit size, texture, finish, and color shall be as specified herein. The location and extent of acoustical treatment shall be as shown on the drawings.

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-01 Data
Acoustical Ceiling System; FIO.
Manufacturer's descriptive data and installation instructions.

SD-04 Drawings
Acoustical Ceiling System; FIO.
Drawings shall show suspension system, method of anchoring and fastening, and reflected ceiling plan.

SD-14 Samples
Acoustical Units; GA.

Two samples of each type of acoustical unit showing texture, finish, and color.

1.4 DELIVERY AND STORAGE

Materials shall be delivered to the site in the manufacturer's original unopened containers with brand name and type clearly marked. Materials shall be carefully handled and stored in dry, watertight enclosures. Immediately before installation, acoustical units shall be stored for not less than 24 hours at the same temperature and relative humidity as the space where they will be installed to assure temperature and moisture conditions.

1.5 ENVIRONMENTAL REQUIREMENTS

A uniform temperature of not less than 60 degrees F nor more than 80 degrees F and a relative humidity of not more than 70 percent shall be maintained before, during, and after installation of acoustical units.

1.6 SCHEDULING

Interior finish work such as plastering, concrete and terrazzo work shall be complete and dry before installation. Mechanical, electrical, and other work above the ceiling line shall be completed and heating, ventilating, and air conditioning systems shall be installed and operating in order to maintain temperature and humidity requirements.

PART 2 PRODUCTS

2.1 ACOUSTICAL UNITS

Acoustical units shall conform to ASTM E 1264, Class A.

2.2 SUSPENSION SYSTEM

Suspension system shall be exposed-grid, and shall conform to ASTM C 635 for intermediate-duty systems. Surfaces exposed to view shall be aluminum or steel with a factory-applied white baked-enamel finish. Wall molding shall have a flange of not less than 15/16 inch and shall be provided with outside corner caps. Inside corner caps shall be provided where, due to the configuration of the installation, they are needed to produce a workmanlike appearance.

2.3 HANGERS

Hangers shall be galvanized steel wire. Hangers and attachment shall support a minimum 300 pound ultimate vertical load without failure of supporting material or attachment.
PART 3 EXECUTION

3.1 INSTALLATION

Acoustical work shall be provided complete with all necessary fastenings, clips, and other accessories required for a complete installation. Mechanical fastenings shall not be exposed in the finished work. Hangers shall be laid out for each individual room or space. Hangers shall be placed to support framing around beams, ducts, columns, grilles, and other penetrations through ceilings. Main runners and carrying channels shall be kept clear of abutting walls and partitions. At least two main runners shall be provided for each ceiling span. Wherever required to bypass an object with the hanger wires, a subsuspension system shall be installed, so that all hanger wires will be plumb. Splayed hanger wires may be used if an opposite countersplayed wire of the same angle as the first wire is installed and attached to the same supporting member.

3.1.1 Suspension System

Suspension system shall be installed in accordance with ASTM C 636 and as specified herein. There shall be no hanger wires or other loads suspended from underside of steel decking.

3.1.1.1 Plumb Hangers

Hangers shall be plumb and shall not press against insulation covering ducts and pipes.

3.1.2 Wall Molding

Wall molding shall be provided where ceilings abut vertical surfaces. Wall molding shall be secured not more than 3 inches from ends of each length and not more than 16 inches on centers between end fastenings. Wall molding springs shall be provided at each acoustical unit in semiexposed or concealed systems.

3.1.3 Acoustical Units

Acoustical units shall be installed in accordance with the approved installation instructions of the manufacturer. Edges of acoustical units shall be in close contact with metal supports, with each other, and in true alignment. Acoustical units shall be arranged so that units less than one-half width are minimized. Units in exposed-grid system shall be held in place with manufacturer's standard hold-down clips, if units weigh less than 1 psf.

3.2 CLEANING

Following installation, dirty or discolored surfaces of acoustical units shall be cleaned and left free from defects. Units that are damaged or improperly installed shall be removed and new units provided as directed.

-- End of Section --
1.3 DELIVERY AND STORAGE

Materials shall be delivered to the building site in original unopened containers, shall be stored in a clean dry area with temperature maintained above 70 degrees F for 2 days prior to installation, and shall be stacked according to manufacturer's recommendations.

1.4 ENVIRONMENTAL REQUIREMENTS

Areas to receive resilient flooring shall be maintained at a temperature above 70 degrees F for 2 days before application, during application and 2 days after application. A minimum temperature of 55 degrees F shall be maintained thereafter.

1.5 SCHEDULING

Resilient flooring application shall be scheduled after the completion of other work which would damage the finished surface of the flooring.

1.6 EXTRA MATERIALS

Extra flooring material of each color and pattern shall be furnished at the rate of 20 tiles for each 1000 tiles. Extra materials shall be from the same lot as those installed. Extra base material composed of 20 linear feet of each color shall be furnished.

PART 2 PRODUCTS

2.1 RESILIENT BASE

Base shall conform to FS SS-W-40, Type I (rubber), Style B, (coved)-installed with resilient flooring. Base shall be 4 inches high and a minimum 1/8 inch thick. Preformed outside corners shall be furnished. Color shall be as indicated.

2.2 EDGE STRIP

Edge strip shall be vinyl, 1 inch wide, and of thickness to match the flooring. Color shall match wall base color unless otherwise indicated.

2.3 ADHESIVE

Adhesive for flooring and wall base shall be as recommended by the flooring manufacturer.

2.4 POLISH

Polish shall conform to FS P-F-430 or FS P-W-155.
PART 3 EXECUTION

3.1 EXAMINATION/VERIFICATION OF CONDITIONS

The Contractor shall verify that site conditions are in agreement with the design package and shall report all conditions that will prevent a proper installation. The Contractor shall not take any corrective action without written permission from the Government.

3.2 SURFACE PREPARATION

Flooring shall be in a true, level plane, except where indicated as sloped. Before any work under this section is begun, all defects such as rough or scaling concrete, low spots, high spots, and uneven surfaces shall have been corrected, and all damaged portions of concrete slabs shall have been repaired as recommended by the flooring manufacturer. Concrete curing compounds, other than the type that does not adversely affect adhesion, shall be entirely removed from the slabs.

3.3 MOISTURE TEST

The suitability of the concrete subfloor for receiving the resilient flooring with regard to moisture content shall be determined by a moisture test as recommended by the flooring manufacturer.

3.4 INSTALLATION OF VINYL-COMPOSITION TILE AND SOLID VINYL TILE

Tile flooring shall be installed with adhesive in accordance with the manufacturer's installation instructions. Tile lines and joints shall be kept square, symmetrical, tight, and even. Each floor shall be in a true, level plane, except where indicated as sloped. Edge width shall vary as necessary to maintain full-size tiles in the field, but no edge tile shall be less than one-half the field tile size, except where irregular shaped rooms make it impossible. Flooring shall be cut to, and fitted around, all permanent fixtures, built-in furniture and cabinets, pipes, and outlets. Edge tile shall be cut, fitted, and scribed to walls and partitions after field flooring has been applied.

3.5 INSTALLATION OF EDGE STRIPS

Edge strips shall be secured with adhesive as recommended by the manufacturer. Edge strips shall be provided at locations where flooring termination is higher than the adjacent finished flooring, except at doorways where thresholds are provided.

3.6 INSTALLATION OF RESILIENT BASE

Wall base shall be installed with adhesive in accordance with the manufacturer's instructions. Base joints shall be tight and base shall be even with adjacent resilient flooring.

3.7 CLEANING

Immediately upon completion of installation of tile in a room or an area, flooring and adjacent surfaces shall be cleaned to remove all surplus
adhesive. No sooner than 5 days after installation, flooring shall be washed with a nonalkaline cleaning solution, rinsed thoroughly with clear cold water, and, except for raised pattern flooring and static control vinyl tile, given two coats of polish. After each polish coat, floors shall be buffed to an even luster with an electric polishing machine.

3.8 PROTECTION

From the time of laying until acceptance, flooring shall be protected from damage. Flooring which becomes damaged, loose, broken, or curled shall be removed and replaced.

-- End of Section --
PART 1  GENERAL

1.1  REFERENCES

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

AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS (ACGIH)


COMMERCIAL ITEM DESCRIPTIONS (CID)

CID A-A-1500  (Rev A) Sealer, Surface (Latex Block Filler)

FEDERAL SPECIFICATIONS (FS)

FS TT-C-555  (Rev B; Am 1) Coating, Textured (for Interior and Exterior Masonry Surfaces)
FS TT-E-489  (Rev H) Enamel, Alkyd, Gloss, Low VOC Content
FS TT-E-505  (Rev B) Enamel (Odorless, Alkyd, Interior, High Gloss)
FS TT-E-506  (Rev K; Am 1) Enamel, Alkyd, Gloss, Tints and White (for Interior Use)
FS TT-E-508  (Rev C; Am 1) Enamel, Interior Semigloss, Tints and White
FS TT-E-509  (Rev C) Enamel, Odorless, Alkyd, Interior, Semigloss, White and Tints
FS TT-E-545  (Rev C) Primer (Enamel-Undercoat, Alkyd, Odorless, Interior, Flat, Tints and White)
FS TT-F-1098  (Rev D) Filler, Block, Solvent-Thinned, for Porous Surfaces (Concrete Block, Cinder Block, Stucco, Etc.)
FS TT-P-19  (Rev D; Am 1) Paint, Latex (Acrylic Emulsion, Exterior Wood and Masonry)
FS TT-P-29  (Rev K) Paint, Latex
TARGET LAUNCH FACILITIES, PHASE 1, FT WINGATE, NM

FS TT-P-30  (Rev E; Am 1) Paint, Alkyd, Odorless, Interior, Flat, White and Tints
FS TT-P-91  (Rev D; Am 2) Paint, Rubber-Base, for Interior Use (Concrete and Masonry Floors)
FS TT-P-95  (Rev C; Am 1) Paint, Rubber: for Swimming Pools and Other Concrete and Masonry Surfaces
FS TT-P-102 (Rev F) Paint, Oil, (Alkyd Modified, Exterior, Low VOC)
FS TT-P-645 (Rev B) Primer, Paint, Zinc-Molybdate, Alkyd Type
FS TT-P-1510 (Rev A; Am 1) Paint, Latex, Exterior, for Wood Surfaces, White and Tints

FEDERAL STANDARDS (FED-STD)

FED-STD 313  (Rev C) Material Safety Data, Transportation Data and Disposal Data for Hazardous Materials Furnished to Government Activities
FED-STD 595  (Rev B) Colors Used in Government Procurement

MILITARY SPECIFICATIONS (MS)

MS MIL-P-28582 (Basic; Notice 1) Primer Coating, Exterior, Lead Pigment-Free (Undercoat for Wood, Ready-Mixed, White and Tints)

STEEL STRUCTURES PAINTING COUNCIL (SSPC)

SSPC Paint 5  (1991) Zinc Dust, Zinc Oxide and Phenolic Varnish Paint
SSPC Paint 21 (1991) White or Colored Silicone Alkyd Paint
SSPC Paint 25 (1991) Red Iron Oxide, Zinc Oxide, Raw Linseed Oil and Alkyd Primer (without Lead and Chromate Pigments)
SSPC SP 1  (1982) Solvent Cleaning
SSPC SP 2  (1989) Hand Tool Cleaning

SECTION 09900  PAGE 2
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

Paint; GA.

The names, quantity represented, and intended use for the proprietary brands of materials proposed to be substituted for the specified materials when the required quantity of a particular batch is 50 gallons or less.

SD-06 Instructions

Mixing and Thinning; FIO. Application; FIO.

Manufacturer’s current printed product description, material safety data sheets (MSDS) and technical data sheets for each coating system. MSDS submittals shall meet the requirements of FED-STD 313. Detailed mixing, thinning and application instructions, minimum and maximum application temperature, and curing and drying times between coats for epoxy, moisture-curing polyurethane, and liquid glaze coatings. Detailed application instructions for textured coatings shall be provided.

SD-09 Reports

Paint; FIO.

A statement as to the quantity represented and the intended use, plus the following test report for batches in excess of 50 gallons:

a. A test report showing that the proposed batch to be used meets all specification requirements, or:

b. A test report showing that a previous batch of the same formulation as the batch to be used met all specification requirements, plus, on the proposed batch to be used, a report of test results for properties of weight per gallon, viscosity, fineness of grind, drying time, color, and gloss.

SD-13 Certificates

Lead; FIO. Mildewcide and Insecticide; FIO. Volatile Organic Compound (VOC) Content; FIO.

Certificate stating that paints for interior use contain no mercurial mildewcide or insecticide. Certificate stating that paints proposed for
use contain not more than 0.06 percent lead. Certificate stating that paints proposed for use meet the VOC regulations of the local Air Pollution Control Districts having jurisdiction over the geographical area in which the project is located.

Paint; FIO.

While the material is at the site or source of supply, and at a time agreeable to the Contractor and the Contracting Officer, a 1 quart sample of each color and batch, except for quantities of 50 gallons or less, shall be taken by random selection from the sealed containers by the Contractor in the presence of a representative of the Contracting Officer. The contents of the containers to be sampled shall be thoroughly mixed to ensure that the sample is representative. Samples shall be identified by designated name, specification number, manufacturer name and address, batch number, project contract number, intended use, and quantity involved.

1.3 PACKAGING, LABELING, AND STORING

Paints shall be in sealed containers that legibly show the designated name, formula or specification number, batch number, color, quantity, date of manufacture, manufacturer's formulation number, manufacturer's directions including any warnings and special precautions, and name of manufacturer. Pigmented paints shall be furnished in containers not larger than 5 gallons. Paints and thinner shall be stored in accordance with the manufacturer's written directions and as a minimum stored off the ground, under cover, with sufficient ventilation to prevent the buildup of flammable vapors and at temperatures between 40 and 95 degrees F. Paints shall be stored on the project site or segregated at the source of supply sufficiently in advance of need to allow 30 days for testing.

1.4 APPROVAL OF MATERIALS

When samples are tested, approval of materials will be based on tests of the samples; otherwise, materials will be approved based on test reports furnished with them. If materials are approved based on test reports furnished, samples will be retained by the Government for testing should the materials appear defective during or after application. In addition to any other remedies under the contract the cost of retesting defective materials will be at the Contractor's expense.

1.5 ENVIRONMENTAL CONDITIONS

Unless otherwise recommended by the paint manufacturer, the ambient temperature shall be between 45 and 95 degrees F when applying coatings other than water-thinned, epoxy, and moisture-curing polyurethane coatings. Water-thinned coatings shall be applied only when ambient temperature is between 50 and 90 degrees F. Epoxy, and moisture-curing polyurethane coatings shall be applied only within the minimum and maximum temperatures recommended by the coating manufacturer. Moisture-curing polyurethane shall not be applied when the relative humidity is below 30 percent.
1.6  SAFETY AND HEALTH

Work shall comply with applicable Federal, State, and local laws and regulations, and with the ACCIDENT PREVENTION PLAN, including the Activity Hazard Analysis as specified in the CONTRACT CLAUSES. The Activity Hazard Analysis shall include analyses of the potential impact of painting operations on painting personnel and on others involved in and adjacent to the work zone.

1.6.1  Worker Exposures

Exposure of workers to chemical substances shall not exceed limits as established by ACGIH-02, or as required by a more stringent applicable regulation.

1.6.2  Toxic Compounds

Toxic compounds having ineffective physiological properties, such as odor or irritation levels, shall not be used unless approved by the Contracting Officer.

1.6.3  Training

Workers having access to an affected work area shall be informed of the contents of the applicable material data safety sheets (MSDS) and shall be informed of potential health and safety hazard and protective controls associated with materials used on the project. An affected work area is one which may receive mists and odors from the painting operations. Workers involved in preparation, painting and clean-up shall be trained in the safe handling and application, and the exposure limit, for each material which the worker will use in the project. Personnel having a need to use respirators and masks shall be instructed in the use and maintenance of such equipment.

1.6.4  Coordination

Work shall be coordinated to minimize exposure of building occupants, other Contractor personnel, and visitors to mists and odors from preparation, painting and clean-up operations.

PART 2  PRODUCTS

2.1  PAINT

The term "paint" as used herein includes emulsions, enamels, paints, stains, varnishes, sealers, cement-emulsion filler, and other coatings, whether used as prime, intermediate, or finish coat. Paint shall conform to the respective specifications listed for use in the painting schedules at the end of this section, except when the required amount of a material of a particular batch is 50 gallons or less, an approved first-line proprietary paint material with similar intended usage and color to that specified may be used. Additional requirements are as follows:
2.1.1 Colors and Tints

Colors shall be as selected from manufacturer's standard colors, as indicated. Manufacturer's standard color is for identification of color only, selected from FED-STD 595. Tinting of epoxy, and urethane, paints shall be done by the manufacturer. Stains shall conform in shade to manufacturer's standard color. The color of the undercoats shall vary slightly from the color of the next coat.

2.1.2 Lead

Paints containing lead in excess of 0.06 percent by weight of the total nonvolatile content (calculated as lead metal) shall not be used.

2.1.3 Chromium

Paints containing zinc chromate or strontium chromate pigments shall not be used.

2.1.4 Volatile Organic Compound (VOC) Content

Paints shall comply with applicable state and local laws enacted to insure compliance with Federal Clean Air Standards and shall conform to the restrictions of the local air pollution control authority.

PART 3 EXECUTION

3.1 PROTECTION OF AREAS NOT TO BE PAINTED

Items not to be painted which are in contact with or adjacent to painted surfaces shall be removed or protected prior to surface preparation and painting operations. Items removed prior to painting shall be replaced when painting is completed. Following completion of painting, workmen skilled in the trades involved shall reinstall removed items. Surfaces contaminated by coating materials shall be restored to original condition.

3.2 SURFACE PREPARATION

Surfaces to be painted shall be clean and free of foreign matter before application of paint or surface treatments. Oil and grease shall be removed with clean cloths and cleaning solvents prior to mechanical cleaning. Cleaning solvents shall be of low toxicity with a flashpoint in excess of 100 degrees F. Cleaning shall be programmed so that dust and other contaminants will not fall on wet, newly painted surfaces. Exposed ferrous metals such as nail heads on or in contact with surfaces to be painted with water-chinned paints, shall be spot-prrimed with a suitable corrosion-inhibitive primer capable of preventing flash rusting and compatible with the coating specified for the adjacent areas.

3.2.1 Concrete Surfaces

Concrete surfaces shall be allowed to dry at least 30 days before painting, except concrete slab on grade which shall be allowed to cure 90 days before painting. Glaze, efflorescence, laitance, dirt, grease, oil, asphalt, surface deposits of free iron and other foreign matter shall be removed.
prior to painting. Surfaces to receive polyurethane, chlorinated rubber or epoxy coatings shall be acid-etched or mechanically abraded as specified by the coating manufacturer, rinsed with water, allowed to dry, and treated with the manufacturer's recommended conditioner prior to application of the first coat.

3.2.2 Ferrous Surfaces

Ferrous surfaces including those that have been shop-coated, shall be solvent-cleaned. Surfaces that contain loose rust, loose mill scale, and other foreign substances shall be cleaned mechanically with hand tools according to SSPC SP 2, power tools according to SSPC SP 3 or by sandblasting according to SSPC SP 7. Shop-coated ferrous surfaces shall be protected from corrosion by treating and touching up corroded areas immediately upon detection.

3.2.3 Nonferrous Metallic Surfaces

Galvanized, aluminum and aluminum-alloy, lead, copper, and other nonferrous metal surfaces shall be solvent-cleaned in accordance with SSPC SP 1.

3.2.4 Gypsum Board Surfaces

Gypsum board surfaces shall be dry and shall have all loose dirt and dust removed by brushing with a soft brush, rubbing with a cloth, or vacuum-cleaning prior to application of the first-coat material. A damp cloth or sponge may be used if paint will be water-based.

3.2.5 Mastic-Type Surfaces

Mastic-type surfaces shall be prepared by removing foreign material.

3.3 MIXING AND THINNING

When thinning is approved as necessary to suit surface, temperature, weather conditions, or application methods, paints may be thinned in accordance with the manufacturer's directions. When thinning is allowed, paints shall be thinned immediately prior to application with not more than 1 pint of suitable thinner per gallon. The use of thinner shall not relieve the Contractor from obtaining complete hiding, full film thickness, or required gloss. Thinning shall not cause the paint to exceed local limits on volatile organic compounds. Paints of different manufacturers shall not be mixed.

3.3.1 Two-Component Systems

Two-component systems shall be mixed in accordance with manufacturer's instructions. Any thinning of the first coat to ensure proper penetration and sealing shall be as recommended by the manufacturer for each type of substrate.

3.4 APPLICATION

Painting practices shall comply with applicable state and local laws enacted to insure compliance with Federal Clean Air Standards. Unless
otherwise specified or recommended by the paint manufacturer, paint may be applied by brush, roller, or spray. At the time of application, paint shall show no signs of deterioration. Uniform suspension of pigments shall be maintained during application. Each coat of paint shall be applied so dry film shall be of uniform thickness and free from runs, drops, ridges, waves, pinholes or other voids, laps, brush marks, and variations in color, texture, and finish. Hiding shall be complete. Rollers for applying paints and enamels shall be of a type designed for the coating to be applied and the surface to be coated. Special attention shall be given to insure that all edges, corners, crevices, welds, and rivets receive a film thickness equal to that of adjacent painted surfaces. Paints, except water-thinned types, shall be applied only to surfaces that are completely free of moisture as determined by sight or touch.

3.4.1 Ventilation

Affected areas shall be ventilated during paint application so that workers exposure to chemical substances shall not exceed limits as established by ACGIH-02, or as required by a more stringent applicable regulation. Interior work zones having a volume of 10,000 cubic feet or less shall be ventilated at a minimum of 2 air exchanges per hour. Ventilation in larger work zones shall be maintained by means of mechanical exhaust. Solvent vapors shall be exhausted outdoors, away from air intakes and workers. Return air inlets in the work zone shall be temporarily sealed before start of work until the coatings have dried.

3.4.2 Respirators

Operators and personnel in the vicinity of operating paint sprayers shall wear respirators.

3.4.3 First Coat

The first coat on plaster, gypsum wallboard, and other surfaces shall include repeated touching up of suction spots or overall application of primer or sealer to produce uniform color and gloss. Excess sealer shall be wiped off after each application. The first coat on both faces of wood doors shall be applied at essentially the same time. Glazed doors and sashes shall be given the specified coating system within 3 weeks of the time they are glazed, but not before the glazing material has set; paint shall overlay glass about 70 mils all around. Each varnish coat shall be sanded lightly prior to application of subsequent coats.

3.4.4 Timing

Surfaces that have been cleaned, pretreated, and otherwise prepared for painting shall be given a coat of the specified first coat as soon as practical after such pretreatment has been completed, but prior to any deterioration of the prepared surface. Sufficient time shall elapse between successive coats to permit proper drying. This period shall be modified as necessary to suit weather conditions. Oil-based or oleoresinous solvent-type paints shall be considered dry for recoating when the paint feels firm, does not deform or feel sticky under moderate pressure of the thumb, and the application of another coat of paint does not cause the undercoat to lift or lose adhesion. Manufacturer’s
3.4.5 Fillers

Concrete surface voids shall be filled; however, surface irregularities need not be completely filled. The dried filler shall be uniform and free of pinholes. Filler shall not be applied over caulking compound.

3.4.5.1 Cement-Emulsion Filler

Immediately before filler application, surfaces shall be dampened uniformly and thoroughly, with no free surface water visible, by several applications of potable water with a fog spray, allowing time between the sprayings for water to be absorbed. Cement-emulsion filler shall be scrubbed into the surface vigorously with a stiff-bristled brush having tampico or palmyra bristles not longer than 2-1/2 inches. At least 24 hours shall elapse before applying exterior emulsion paint over cement-emulsion filler. When the ambient temperature is over 85 degrees F, cement-emulsion filler surfaces shall be dampened lightly with a fog spray of potable water immediately prior to application of the subsequent paint coat.

3.4.5.2 Solvent-Thinned Filler

Solvent-thinned filler, FS TT-F-1098, shall be applied to dry surfaces only and may be applied by brush or roller. Filler shall be allowed to set for 3 to 5 minutes or until the filler becomes tacky, and the excess material shall then be removed with a rubber squeegee. Surface voids shall be filled; however, surface irregularities need not be completely filled. Surfaces to which solvent-thinned filler has been applied shall be given the specified topcoat as soon as practical but before the filler material starts to discolor or chalk.

3.4.6 Textured Coating

Application of textured coating, FS TT-C-555, shall be as specified in the manufacturer's printed directions at a rate of 45 to 55 square feet per gallon in one coat.

3.4.7 Ferrous-Metal Primer

Primer for ferrous-metal shall be applied to ferrous surfaces to receive paint other than asphalt varnish prior to deterioration of the prepared surface. The semitransparent film applied to some pipes and tubing at the mill is not to be considered a shop coat, but shall be overcoated with the specified ferrous-metal primer prior to application of finish coats.

3.5 MISCELLANEOUS PAINTING

3.5.1 Lettering

Lettering shall be provided as scheduled on the drawings, shall be block type, and shall be black enamel. Samples shall be approved before application.
3.6 SURFACES TO BE PAINTED

Surfaces listed in the painting schedules at the end of this section, other than those listed in paragraph SURFACES NOT TO BE PAINTED, shall be painted as scheduled.

3.7 SURFACES NOT TO BE PAINTED

Surfaces in the following areas are not to be painted: mechanical and electrical room. In addition surfaces of hardware, fittings, and other factory finished items shall not be painted.

3.8 CLEANING

Cloths, cotton waste and other debris that might constitute a fire hazard shall be placed in closed metal containers and removed at the end of each day. Upon completion of the work, staging, scaffolding, and containers shall be removed from the site or destroyed in an approved manner. Paint and other deposits on adjacent surfaces shall be removed and the entire job left clean and acceptable.

3.9 PAINTING SCHEDULES

The following painting schedules identify the surfaces to be painted and prescribe the paint to be used and the number of coats of paint to be applied. Contractor options are indicated by -----or------ between optional systems or coats.
## Exterior Painting Schedule

<table>
<thead>
<tr>
<th>Surface</th>
<th>First Coat</th>
<th>Second Coat</th>
<th>Third Coat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete, unless otherwise specified.</td>
<td>FS TT-P-19</td>
<td>FS TT-P-19</td>
<td>None</td>
</tr>
<tr>
<td>Concrete Roofs: @ LEB &amp; LOTS</td>
<td>SSPC Paint 18 thin with 1 part of approved thinner to 4 parts of paint by volume</td>
<td>SSPC Paint 18</td>
<td>SSPC Paint 18</td>
</tr>
<tr>
<td></td>
<td><strong>or</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>FS TT-P-95, Type I or II, Class 2 thin with 1 part approved thinner to 4 parts paint by volume</td>
<td>FS TT-P-95, Type I or II, Class 2</td>
<td>FS TT-P-95, Type I or II, Class 2</td>
</tr>
<tr>
<td>Wood, unless otherwise specified.</td>
<td>MS MIL-P-28582</td>
<td>FS TT-P-19</td>
<td>FS TT-P-19</td>
</tr>
<tr>
<td></td>
<td><strong>or</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>FS TT-P-1510</td>
<td>FS TT-P-1510</td>
<td></td>
</tr>
<tr>
<td>Ferrous metal unless otherwise specified.</td>
<td>SSPC Paint 25</td>
<td>FS TT-E-489,</td>
<td>FS TT-E-489</td>
</tr>
<tr>
<td>Galvanized.</td>
<td>SSPC Paint 5</td>
<td>FS TT-P-102</td>
<td>FS TT-P-102</td>
</tr>
<tr>
<td>Aluminum aluminum-alloy, and other non-ferrous metal (non-galvanized)</td>
<td>FS TT-P-645</td>
<td>FS TT-E-489,</td>
<td>FS TT-E-489</td>
</tr>
<tr>
<td></td>
<td><strong>or</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SSPC Paint 21, Type I</td>
<td>SSPC Paint 21, Type I</td>
<td></td>
</tr>
<tr>
<td>Surface</td>
<td>First Coat</td>
<td>Second Coat</td>
<td>Third Coat</td>
</tr>
<tr>
<td>------------------------------------------------------------------------</td>
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<td>------------</td>
</tr>
<tr>
<td>Gypsum board, and concrete unless otherwise specified.</td>
<td>FS TT-F-1098</td>
<td>FS TT-P-29</td>
<td>FS TT-P-29</td>
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<td>CID A-A-1500</td>
<td>FS TT-P-30</td>
<td>FS TT-P-30</td>
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<tr>
<td>Concrete: ceilings in following areas:</td>
<td>FS TT-C-555</td>
<td>FS TT-P-29</td>
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</tr>
<tr>
<td>LEB.</td>
<td>Type I</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>Concrete: floors in following areas:</td>
<td>FS TT-P-91</td>
<td>FS TT-P-91</td>
<td>None</td>
</tr>
<tr>
<td>Type I or II</td>
<td>Type I or II</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Room 1 &amp; 9 in MAB and LEB.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ferrous metal unless otherwise specified.</td>
<td>SSPC Paint 5</td>
<td>FS TT-P-30</td>
<td>FS TT-P-30</td>
</tr>
<tr>
<td>Metal: Convector enclosures, electrical conduit runs, metallic tubing,</td>
<td>Ferrous metal:</td>
<td>FS TT-E-545</td>
<td>FS TT-E-506</td>
</tr>
<tr>
<td>unsualized ducts and pipes, pipe hangers, louvers, grilles, and air</td>
<td>SSPC Paint 5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>outlets in areas having painted adjacent surfaces.</td>
<td>SSPC Paint 25</td>
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<td>FS TT-E-505</td>
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<tr>
<td></td>
<td>FS TT-P-645</td>
<td>FS TT-E-508</td>
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<tr>
<td></td>
<td>Aluminum:</td>
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<td>FS TT-P-645</td>
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<td></td>
<td>Galvanized surface:</td>
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<td></td>
<td>SSPC Paint 5</td>
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<td></td>
<td>FS TT-P-30</td>
<td>FS TT-P-30</td>
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<td>FS TT-E-489</td>
<td>FS TT-E-489</td>
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</table>
TARGET LAUNCH FACILITIES, PHASE 1, FT WINGATE, NM

-- End of Section --
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.

ALUMINUM ASSOCIATION (AA)

AA ASD-1 (1990) Aluminum Standards and Data

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

AISC FCD-90 (1990) AISC Quality Certification Program Description

AMERICAN IRON AND STEEL INSTITUTE (AISI)


AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 36 (1993a) Structural Steel
ASTM A 53 (1993a) Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless
ASTM A 252 (1990) Welded and Seamless Steel Pipe Piles
ASTM A 325  (1993) Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
ASTM A 446  (1993) Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality
ASTM A 463  (1988) Steel Sheet, Cold-Rolled, Aluminum-Coated, Type 1 and Type 2
ASTM A 490  (1993) Heat-Treated Steel Structural Bolts, 150 ksi Minimum Tensile Strength
ASTM A 500  (1993) Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
ASTM A 501  (1993) Hot-Formed Welded and Seamless Carbon Steel Structural Tubing
ASTM A 570  (1992) Steel, Sheet and Strip, Carbon, Hot-Rolled, Structural Quality
ASTM A 606  (1991a) Steel, Sheet and Strip, High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, with Improved Atmospheric Corrosion Resistance
ASTM A 607  (1992a) Steel, Sheet and Strip, High-Strength, Low-Alloy, Columbium or Vanadium, or Both, Hot-Rolled and Cold-Rolled
ASTM A 618  (1993) Hot-Formed Welded and Seamless High-Strength Low-Alloy Structural Tubing
ASTM A 792  (1989) Steel Sheet, Aluminum-Zinc Alloy-Coated by the Hot-Dip Process
ASTM B 209  (1992a) Aluminum and Aluminum-Alloy Sheet and Plate
ASTM B 221  (1992a) Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes
ASTM B 241  (1992a) Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube
ASTM B 429  (1992a) Aluminum-Alloy Extruded Structural Pipe and Tube
Properties by Means of the Heat Flow Meter Apparatus


ASTM D 523 (1989) Specular Gloss


ASTM D 1654 (1992) Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments

ASTM D 2244 (1989) Calculation of Color Differences from Instrumentally Measured Color Coordinates


ASTM D 3359 (1992a) Measuring Adhesion by Tape Test


AMERICAN WELDING SOCIETY (AWS)

AWS D1.1 (1994) Structural Welding Code - Steel

MATERIAL HANDLING INSTITUTE (MHI)

MHI CMAA 70 (1994) Electric Overhead Traveling

SECTION 13120 PAGE 3
1.2 GENERAL

1.2.1 Building Configuration

Buildings shall have vertical walls and gable roofs. Roof slope shall be as indicated. Buildings shall be single-span structures with one of the following framing systems: self-framing, column with single-span or continuous trusses, continuous beam frames, column with rigid frame, or rigid frame (tapered beam or plate girder). Building dimensions shall be as standard with the manufacturer and not less than those indicated, but exceeding the indicated dimensions only by the amount of the closest standard size thereto. Eave height shall be measured from the top of the finished floor to the intersection of the insides of the roof and sidewall sheets. The clear opening between the finished floor and the bottom of the roof steel shall be as indicated.

1.2.2 Manufacturer

Metal building shall be the product of a recognized metal building systems manufacturer who has been in the practice of manufacturing metal buildings for a period of no less than 5 years. The manufacturer shall be chiefly engaged in the practice of designing and fabricating metal building systems. The manufacturer shall have an AISC Quality Certification, category MB in accordance with AISC FCD-90.

1.2.3 Installer

Installer shall have specialized experience in the erection of metal building systems for a period of at least 3 years.

1.3 DESIGN REQUIREMENTS

1.3.1 Design Conditions

Loading combinations and definitions shall be in accordance with MBMA-01. Loading criteria as set out by MBMA-01 shall apply.

1.3.1.1 Dead Load

The dead load shall consist of the weight of the structural frame and all other materials of the building system.
1.3.1.2 Collateral Loads

Collateral load of 10 pounds per square foot shall be applied to the entire structure to account for the weight of additional permanent materials other than the building system, such as sprinklers, mechanical systems, electrical systems, hung partitions, and ceilings. This allowance does not include the weight of hung equipment weighing 50 pounds or more. Equipment loads of 50 pounds or more shall be investigated and the structure (frame, purlins, girts) shall be strengthened as required. The Contractor is responsible for providing the building manufacturer the magnitude and approximate location of all concentrated loads greater than 50 pounds.

1.3.1.3 Roof Live Loads

Roof live loads shall be determined and applied in accordance with MBMA-01. A minimum live load of 20 psf shall be used.

1.3.1.4 Roof Snow Loads

Roof snow loads shall be developed using a ground snow load of 10 pounds per square foot. Roof snow load shall be computed and applied in accordance with MBMA-01 using an importance factor of 1.02.

1.3.1.5 Wind Loads

Wind pressures shall be computed and applied in accordance with MBMA-01 using a fastest mile wind speed of 80 miles per hour and an importance factor of 1.0.

1.3.1.6 Auxiliary Loads

Auxiliary (dynamic live) loads such as superimposed loads resulting from building machinery, craneways, and vehicles shall be as shown in the drawings. The Contractor shall verify that the auxiliary loads shown on the drawings exceed the loads imposed by the equipment supplied.

1.3.1.7 Concentrated Loads

Concentrated loads shall be applied at locations indicated on the drawings.

1.3.1.8 Seismic Loads

Seismic loads shall be computed for seismic zone 1 in accordance with MBMA-01 using an importance factor of 1.02.

1.3.1.9 Impact Loads

Impact loads due to cranes shall be applied as indicated in MBMA-01.

1.3.2 Foundation Requirements

Foundation design shown on drawings shall be verified for an allowable soil bearing pressure of 2,000 pounds per square foot, a minimum bottom of
footing depth of 36 inches below finish grade elevation, a factor of safety of 1.5 for overturning, sliding and uplift, and a concrete compressive strength as specified in Section 03300 CONCRETE FOR BUILDING CONSTRUCTION.

1.3.3 Framing and Structural Members

Structural steel members and their connections shall be designed in accordance with AISC S335. Structural cold-formed steel framing members and their connections shall be designed in accordance with AISI SG-673. Framed openings shall be designed to structurally replace the covering and framing displaced. The allowable live load deflection of roof elements shall not exceed 1/180th of the span. Members with openings in their webs shall be designed with consideration of the additional stresses which will result due to the openings.

1.3.4 Exterior Covering

Except as otherwise specified, steel covering shall be designed in accordance with AISI SG-673. Aluminum covering shall be designed in accordance with the AA ASD-1. Section modulus and moment of inertia of aluminum sheet shall be determined for actual cross section dimensions by the conventional methods for actual design stresses and by effective width concept for deflection in accordance with AA SAS-30. Maximum deflection for wall and roof panels under full dead and live and/or wind loads shall not exceed 1/180th of the span between supports. The design analysis shall establish that the roof when deflected under dead plus live or snow loads, will not result in a negative gradient. Maximum deflections shall be based on sheets continuous across two or more supports with sheets unfastened and fully free to deflect. In addition to the loads indicated above, the roof decking shall be designed for a 200-pound concentrated load at midspan on a 12-inch wide section of deck. Panels thinner than 0.03 inches are not permitted to resist crane loads. The methods for resisting lateral loads shall be cross-bracing, rigid frames, or wind columns.

1.3.5 Gutters And Downspouts

Gutters and downspouts shall be designed according to the requirements of SMACNA-02 for storms which should be exceeded only once in 5 years and with adequate provisions for thermal expansion and contraction. Supports for gutters and downspouts shall be designed for the anticipated loads.

1.3.6 Drift Provision

Lateral deflections, or drift at the roof level of a structure in relation to the floor or slab on grade, caused by deflection of horizontal force resisting elements shall conform to MBMA-01.

1.3.7 Cranes

The metal building shall be designed to support the 20 ton overhead traveling crane. The crane loads shall be obtained from the crane manufacturer and shall be applied as per MBMA-01 for the design of the crane runways and supports. The cranes, girders, rails, end trucks, stops, and bumpers shall be provided by the crane manufacturer as specified in
TARGET LAUNCH FACILITIES, PHASE 1, FT WINGATE, NM

Section 14630 OVERHEAD PNEUMATIC CRANE.

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-01 Data

Design Analysis; GA.

Design analysis as one package with the detail drawings. The design analysis signed by a Registered Professional Engineer shall include a list of the design loads, and complete calculations for the building, its components, and the foundations. Formulas and references shall be identified. Assumptions and conclusions shall be explained, and cross-referencing shall be clear. The design analysis shall include, but not be limited to, the following wind and seismic information: wind forces on various parts of the structure. Both positive and negative pressures shall be calculated with the controlling pressure summarized.

SD-04 Drawings

Metal Building Systems; FIO.

Detail drawings consisting of catalog cuts, design and erection drawings containing an isometric view of the roof showing the design wind uplift pressure and dimensions of edge and corner zones; shop painting and finishing specifications, instruction manuals, manufacturer’s recommended erection methods and procedures and other data as necessary to clearly describe design, material, sizes, layouts, construction details, fasteners, and erection. Manufacturer’s recommended erection methods and procedures shall describe the basic sequence of assembly, temporary bracing, shoring, and related information necessary for erection of the metal building including its structural framework and components. A brief list of locations where buildings of similar design have been used shall be included with the detail drawings and shall include information regarding date of installation, name and address of owner, and how the structure is used.

1.5 DELIVERY AND STORAGE

Materials shall be delivered to the site in a dry and undamaged condition and stored out of contact with the ground. Materials other than framing and structural members shall be covered with weather-tight coverings and kept dry. Storage accommodations for roof and wall covering shall provide good air circulation and protection from surface staining.

1.6 GUARANTEE

The metal building system shall be guaranteed against water leaks arising out of or caused by ordinary wear and tear by the elements for a period of 20 years. Such guarantee shall start upon final acceptance of the work or
the date the Government takes possession, whichever is earlier.

PART 2  PRODUCTS

2.1  BUILDING COMPONENTS

Each piece or part of the assembly shall be clearly and legibly marked to correspond with the detail drawings.

2.2  FRAMING AND STRUCTURAL MEMBERS

Steel 1/8 inch or more in thickness shall conform to ASTM A 36. Uncoated steel less than 1/8 inch in thickness shall conform to ASTM A 570, ASTM A 606, or ASTM A 607. Galvanized steel shall conform to ASTM A 446, G 90 coating designation, 0.045-inch minimum thickness. Aluminum-zinc coated steel shall conform to ASTM A 792, AZ 55 coating designation, 0.045-inch minimum thickness. Aluminum sheet shall conform to ASTM B 209, 0.032-inch minimum thickness. Structural pipe shall conform to ASTM A 53, ASTM A 252, ASTM A 500, ASTM A 501, ASTM A 618, ASTM B 221, ASTM B 241 or ASTM B 429. Holes for bolts shall be made in the shop.

2.3  ROOF AND WALL COVERING

Panels shall be either steel or aluminum and shall have a factory color finish. Length of sheets shall be sufficient to cover the entire length of any unbroken roof slope or the entire height of any unbroken wall surface. Width of sheets with overlapping configurations shall provide not less than 24 inches of coverage in place. Design provisions shall be made for thermal expansion and contraction consistent with the type of system to be used. All sheets shall be square cut, except gable end wall sheets may be cut in the shop to correspond to the roof slope and may have a horizontal joint at the eave line.

2.3.1  Roof Panels

Roof Panels are specified in Section 07416 STANDING SEAM METAL ROOF SYSTEM.

2.3.2  Wall Panels

Wall panels shall have configurations for overlapping adjacent sheets. Wall covering shall be fastened to framework using exposed or concealed fasteners.

2.3.3  Steel Covering

Zinc-coated steel conforming to ASTM A 446, G 90 coating designation; aluminum-zinc alloy coated steel conforming to ASTM A 792, AZ 55 coating; or aluminum-coated steel conforming to ASTM A 463, Type 2, coating designation T2 65. Panels shall be 0.024-inch thick minimum, except that when the mid field of the roof is subject to design wind uplift pressures of 60 psf or greater or the steel covering is used as a diaphragm the entire roof system shall have a minimum thickness of 0.030-inch.
2.3.4 Aluminum Covering

Alloy conforming to ASTM B 209, temper as required for the forming operation, minimum 0.032-inch thick.

2.3.5 Factory Color Finish

Wall and roof panels shall have a factory applied polyvinylidene fluoride finish on the exposed side. The exterior finish shall consist of a baked-on fluoropolymer enamel topcoat with an appropriate prime coat. Color shall be the manufacturer's standard color most nearly matching the color indicated in Section 09915 COLOR SCHEDULE. The exterior coating shall be a nominal 2 mil thick consisting of a polyvinylidene fluoride topcoat of not less than 0.7 mil dry film thickness and the paint manufacturer's recommended primer of not less than (0.2) [1.0] mil thick. The interior color finish shall consist of the same coating and dry film thickness as the exterior. The exterior color finish shall meet the test requirements specified below.

2.3.5.1 Salt Spray Test

A sample of the sheets shall withstand a salt spray test for a minimum of 1000 hours in accordance with ASTM B 117, including the scribe requirement in the test. Immediately upon removal of the panel from the test, the coating shall receive a rating of [not less than 8F, few No. 8 blisters, as determined by ASTM D 714; and a rating of 6, 1/8 inch failurecess at scribe, as determined by ASTM D 1654.

2.3.5.2 Formability Test

When subjected to a 180-degree bend over the larger of a 1/8 inch or 3t diameter mandrel in accordance with ASTM D 522, the coating film shall show no evidence of fracturing to the naked eye.

2.3.5.3 Accelerated Weathering, Chalking Resistance and Color Change

A sample of the sheets shall withstand a weathering test a minimum of 500 hours in accordance with ASTM G 23, using a Type EH apparatus with cycles of 60 minutes radiation and 60 minutes condensing humidity. The coating shall withstand the weathering test without cracking, peeling, blistering, loss of adhesion of the protective coating, or corrosion of the base metal. Protective coating that can be readily removed from the base metal with tape in accordance with ASTM D 3359, Test Method B, shall be considered as an area indicating loss of adhesion. Following the accelerated weathering test, the coating shall have a chalk rating not less than No. 8 in accordance with ASTM D 4214 test procedures, and the color change shall not exceed 5 CIE or Hunter Lab color difference (E) units in accordance with ASTM D 2244. For sheets required to have a low gloss finish, the chalk rating shall be not less than No. 6 and the color difference shall be not greater than 7 units.

2.3.5.4 Humidity Test

When subjected to a humidity cabinet in accordance with ASTM D 2247 for 1500 hours, a scored panel shall show no signs of blistering, cracking,
creapage or corrosion.

2.3.5.5 Impact Resistance

Factory-painted sheet shall withstand direct and reverse impact in accordance with ASTM D 2794 equal to 1.5 times metal thickness in mils, expressed in inch-pounds, with no loss of adhesions.

2.3.5.6 Abrasion Resistant Test

When subjected to the falling sand test in accordance with ASTM D 968, the coating system shall withstand a minimum of 80 liters of sand before the appearance of the base metal. The term "appearance of base metal" refers to the metallic coating on steel or the aluminum base metal.

2.3.5.7 Specular Gloss

Finished roof surfaces for the building shall have a specular gloss value of 10 or less at an angle of 85 degrees when measured in accordance with ASTM D 523.

2.3.5.8 Pollution Resistance

Coating shall show no visual effects when immersion tested in a 10 percent hydrochloric acid solution for 24 hours in accordance with ASTM D 1308.

2.3.6 Accessories

Flashings, trim, metal closure strips and curbs, fascia, caps, diverters, and similar metal accessories shall be not less than the minimum thickness specified for covering. Accessories shall be compatible with the system furnished. Exposed metal accessories shall be finished to match the covering building finish. Molded closure strips shall be bituminous-saturated fiber, closed-cell or solid-cell synthetic rubber or neoprene, or polyvinyl chloride premolded to match configuration of the covering and shall not absorb or retain water.

2.4 FASTENERS

Fasteners for steel wall and roof panels shall be zinc-coated steel, aluminum, corrosion resisting steel, or nylon capped steel, type and size specified below or as otherwise approved for the applicable requirements. Fasteners for aluminum wall and roof panels shall be aluminum or corrosion resisting steel. Fasteners for structural connections shall provide both tensile and shear strength of not less than 750 pounds per fastener. Fasteners for accessories shall be the manufacturer's standard. Exposed roof fasteners shall be gasketed or have gasketed washers on the exterior side of the covering to waterproof the fastener penetration. Washer material shall be compatible with the covering; have a minimum diameter of 3/8 inch for structural connections; and gasketed portion of fasteners or washers shall be neoprene or other equally durable elastomeric material approximately 1/8-inch thick. When wall covering is factory color finished, exposed wall fasteners shall be color finished or provided with plastic color caps to match the covering. Nonpenetrating fastener system using concealed clips shall be manufacturer's standard for the system.
provided.

2.4.1 Screws

Screws shall be as recommended by the manufacturer to meet the strength design requirements of the panels.

2.4.2 End-Welded Studs

Automatic end-welded studs shall be shouldered type with a shank diameter of not less than 3/16 inch and cap or nut for holding covering against the shoulder.

2.4.3 Explosive Actuated Fasteners

Fasteners for use with explosive actuated tools shall have a shank diameter of not less than 0.145 inch with a shank length of not less than 1/2 inch for fastening panels to steel and not less than 1 inch for fastening panels to concrete.

2.4.4 Blind Rivets

Blind rivets shall be aluminum with 3/16-inch nominal diameter shank or stainless steel with 1/8-inch nominal diameter shank. Rivets shall be threaded stem type if used for other than the fastening of trim. Rivets with hollow stems shall have closed ends.

2.4.5 Bolts

Bolts shall be not less than 1/4-inch diameter, shouldered or plain shank as required, with proper nuts.

2.5 GUTTERS AND DOWNSPOUTS

Gutters and downspouts shall be fabricated of aluminum, zinc-coated steel or aluminum-zinc alloy coated steel and shall have manufacturer’s standard factory color finish. Minimum uncoated thickness of materials shall be 0.018 inch for steel and 0.032 inch for aluminum. All accessories necessary for the complete installation of the gutters and downspouts shall be furnished. Accessories shall include gutter straps, downspout elbows, downspout straps and fasteners fabricated from metal compatible with the gutters and downspouts.

2.6 LOUVERS

Louvers shall be fabricated of aluminum, zinc-coated steel, or aluminum-zinc alloy coated steel; shall have manufacturer’s standard factory color finish; and shall be furnished with bird screens. Minimum uncoated thickness of materials shall be 0.048 inch for steel and 0.064 inch for aluminum. Manually operated louvers shall be designed to be opened and closed from the operating floor.
2.7 DOORS

2.7.1 Hinged Doors

Hinged doors and frames shall conform to the requirements of Section 08110 STEEL DOORS AND FRAMES. Exterior doors shall have top edges closed flush and sealed against water penetration. Hardware shall be as specified in Section 08700 HARDWARE: BUILDERS' (GENERAL PURPOSE).

2.7.2 Overhead Doors

Overhead doors shall conform to the requirements in Section 08330 Overhead Rolling Doors.

2.8 INSULATION

Thermal resistance of insulation shall be not less than the R-values shown. R-values shall be determined at 75 degrees F in accordance with ASTM C 518. Insulation shall be a standard product of a manufacturer, factory marked or identified with manufacturer's name or trademark and R-value. Identification shall be on individual pieces or individual packages. Insulation shall have a facing providing a permeability of 0.02 perm or less when tested in accordance with ASTM E 96. Facing shall be of 2 mil thick white vinyl backed with 6 inch by 6 inch glass scrim and 0.7 mil thick metal foil laminate. Reinforced foil with a natural finish may be used for facing in concealed locations. Facings and finishes shall be factory applied.

2.8.1 Blanket Insulation

Blanket insulation shall conform to ASTM C 553. Exposed insulation shall have a white sheet vinyl facing.

2.8.2 Insulation Retainers

Retainers shall be type, size and design necessary to adequately hold the insulation and to provide a neat appearance. Metallic retaining members shall be nonferrous or have a nonferrous coating. Nonmetallic retaining members, including adhesives used in conjunction with mechanical retainers or at insulation seams, shall have a fire resistance classification not less than that permitted for the insulation.

2.9 SEALANT

Sealant shall be an elastomeric type containing no oil or asphalt. Exposed sealant shall cure to a rubberlike consistency. Concealed sealant may be the nonhardening type.

2.10 GASKETS AND INSULATING COMPOUNDS

Gaskets and insulating compounds shall be nonabsorptive and suitable for insulating contact points of incompatible materials. Insulating compounds shall be nonrunning after drying.
2.11 SHOP PRIMING

Ferrous surfaces shall be cleaned of oil, grease, loose rust, loose mill scale, and other foreign substances and shop primed. Primer coating shall be in accordance with the manufacturer's standard system.

PART 3  EXECUTION

3.1 ERECTION

3.1.1 General

Erection shall be in accordance with the approved erection instructions and drawings and with applicable provision of AISC S335. The completed buildings shall be free of excessive noise from wind-induced vibrations under the ordinary weather conditions to be encountered at the location where the building is erected, and meet all specified design requirements. Dissimilar materials which are not compatible when contacting each other shall be insulated from each other by means of gaskets or insulating compounds. Framing members fabricated or modified on site shall be saw or abrasive cut; bolt holes shall be drilled. On-site flame cutting of framing members, with the exception of small access holes in structural beam or column webs, shall not be permitted. Improper or mislocated drill holes shall be plugged with an oversize screw fastener and gasketed washer; however, sheets with an excess of such holes or with such holes in critical locations shall not be used. Improper or mislocated bolt holes in structural members or other misfits caused by improper fabrication or erection, shall be repaired in accordance with AISC S303. Exposed surfaces shall be kept clean and free from sealant, metal cuttings, excess material from thermal cutting, and other foreign materials. Exposed surfaces which have been thermally cut shall be finished smooth within a tolerance of 1/8 inch. Stained, discolored or damaged sheets shall be removed from the site. Welding of steel shall conform to AWS D1.1. High-strength bolting shall conform to AISC S329 using ASTM A 325 or ASTM A 490 bolts. Concrete work is specified in Section 03300 CONCRETE FOR BUILDING CONSTRUCTION.

3.1.2 Framing and Structural Members

Anchor bolts shall be accurately set by template while the concrete is in a plastic state. Uniform bearing under base plates and sill members shall be provided using a nonshrinking grout when necessary. Members shall be accurately spaced to assure proper fitting of covering. Separate leveling plates under column base plates shall not be used. As erection progresses, the work shall be securely fastened to resist the dead load and wind and erection stresses. Supports for pneumatic overhead traveling cranes shall be positioned and aligned in accordance with MHI CMGA 70.

3.1.3 Wall Covering and Roof Covering

Wall covering shall be applied with the longitudinal configurations in the vertical position. Roof covering shall be applied with the longitudinal configurations in the direction of the roof slope. Accessories shall be fastened into framing members, except as otherwise approved. Closure strips shall be provided as indicated and where necessary to provide
weathertight construction.

3.1.3.1 Concealed Fastener Wall Panels

Panels shall be fastened to framing members with concealed fastening clips or other concealed devices standard with the manufacturer. Spacing of fastening clips and fasteners shall be in accordance with the manufacturer's written instructions insofar as the maximum fastener spacings specified are not exceeded and provided such standard practice will result in a structure which will be free from water leaks and meet design requirements. Spacing of fasteners and anchor clips along the panel interlocking ribs shall not exceed 12 inches on center except when otherwise approved. Fasteners shall not puncture covering sheets except as approved for flashing, closures, and trim; exposed fasteners shall be installed in straight lines. Interlocking ribs shall be sealed according to manufacturer's recommendations. Joints at accessories shall be sealed.

3.1.4 Gutters and Downspouts

Gutters and downspouts shall be rigidly attached to the building. Spacing of cleats for gutters shall be 16 inches maximum. Spacing of brackets and spacers for gutters shall be 36 inches maximum. Supports for downspouts shall be spaced according to manufacturer's recommendations.

3.1.5 Louvers and Ventilators

Louvers and ventilators shall be rigidly attached to the supporting construction in a manner to assure a rain-tight installation.

3.1.6 Doors

Doors, including frames and hardware, shall be securely anchored to the supporting construction, shall be installed plumb and true, and shall be adjusted as necessary to provide proper operation. Joints at doors shall be sealed according to manufacturer's recommendations to provide weathertight construction.

3.1.7 Insulation

Insulation shall be installed as indicated and in accordance with manufacturer's instructions. Final appearance of installed insulation shall be free of unsightly sags and wrinkles.

3.2 FIELD PAINTING

Immediately upon detection, abraded or corroded spots on shop-painted surfaces shall be wire brushed and touched up with the same material used for the shop coat. Shop-primed ferrous surfaces exposed on the outside of the building and all shop-primed surfaces of doors shall be painted with two coats of an approved exterior enamel. Factory color finished surfaces shall be touched up as necessary with the manufacturer's recommended touch-up paint.

-- End of Section --
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 BEARING MANUFACTURERS ASSOCIATION (ABEMA)

ABEMA 9        (1990) Load Ratings and Fatigue Life for Ball Bearings
ABEMA 11       (1990) Load Ratings and Fatigue Life for Roller Bearings

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)


AMERICAN IRON AND STEEL INSTITUTE (AISI)

AISI SG-671     (1986; Addenda 1989; Errata 30, 1990) Specification for the Design of Cold-Formed Steel Structural Members (Part I of the Cold-Formed Steel Design Manual)

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 36      (1993a) Structural Steel
ASTM A 307     (1993a) Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength
ASTM A 325     (1993) Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
ASTM A 354     (1993) Quenched and Tempered Alloy Steel Bolts, Studs, and Other Externally
Threaded Fasteners

ASTM A 366  (1991) Steel, Sheet, Carbon, Cold-Rolled, Commercial Quality

ASTM A 446  (1993) Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality

ASTM A 449  (1993) Quenched and Tempered Steel Bolts and Studs

ASTM A 490  (1993) Heat-Treated Steel Structural Bolts, 150 ksi Minimum Tensile Strength

ASTM A 500  (1993) Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes

ASTM A 501  (1993) Hot-Formed Welded and Seamless Carbon Steel Structural Tubing

ASTM A 526  (1990) Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Commercial Quality

ASTM A 534  (1992a) Carburizing Steels for Anti-Friction Bearings


ASTM A 570  (1992; R 1993) Steel, Sheet and Strip, Carbon, Hot-Rolled, Structural Quality

ASTM A 574  (1992a) Alloy Steel Socket-Head Cap Screws

ASTM A 606  (1991a) Steel, Sheet and Strip, High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, with Improved Atmospheric Corrosion Resistance

ASTM A 607  (1992a) Steel, Sheet and Strip, High-Strength, Low-Alloy, Columbium or Vanadium, or Both, Hot-Rolled and Cold-Rolled

ASTM A 611  (1992) Steel, Sheet, Carbon, Cold-Rolled, Structural Quality

ASTM A 618  (1993) Hot-Formed Welded and Seamless High-Strength Low-Alloy Structural Tubing

ASTM A 687  (1993) High-Strength Nonheaded Steel Bolts and Studs
(1992a) Steel Sheet and Strip, High-Strength, Low-Alloy, Hot-Rolled, and Steel Sheet, Cold-Rolled, High-Strength, Low-Alloy, with Improved Formability

(1993a) Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process, General Requirements

(1981a) Fire Tests of Door Assemblies

(1991) Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen

(1992) Hardened Steel Washers

(1993a) Carbon and Alloy Steel Externally Threaded Metric Fasteners

(1993) Alloy Steel Socket Button and Flat Countersunk Head Cap Screws


(1992) Stainless Steel Electrodes for Shielded Metal Arc Welding

(1994) Structural Welding Code - Steel

(1989) Structural Welding Code - Sheet Steel

(1992) Door Controls - Closers

(1988) Door Controls - Overhead Holders

(1987) Mortise Locks & Latches

(1992) Fire Doors and Fire Windows


(1994) Safety to Life from Fire in
1.2 DESCRIPTION

Hollow metal doors shall be flush mounted in frames and shall be of unitized grid construction with two face sheets. Doors shall be manually operated, side hinged, swinging type. Each door assembly shall include the door, frame, anchors, hardware, and accessories and shall be provided by a single manufacturer. Frames and anchors shall be capable of transferring blast and rebound reactions to the adjacent supporting structure. Resistance to blast shall be demonstrated either by design calculations or tests on prototype door assemblies.

1.2.1 Design Requirements

1.2.1.1 Static Material Strength

The static values for minimum yield strength (or yield point) and (ultimate) tensile strength for steel shall be obtained from the applicable material specification. For tensile strength specified in terms of a tensile strength range, the lowest tensile strength specified shall be selected for design. Structural steel having a minimum static yield strength (or yield point) less than 50 ksi shall be designed using an average yield strength computed as 1.1 times the minimum static yield strength or yield point. When the minimum static yield for structural steel exceeds 50 ksi, the average yield strength shall be taken as equal to the minimum static yield strength or yield point without increase. The average yield stress for steel sheet and strip shall be computed as 1.21 times the static yield point.

1.2.1.2 Dynamic Material Strength

The dynamic material strength shall be computed by applying a dynamic increase factor that accounts for the increase in material strength due to strain rate effects. The dynamic increase factor for structural steel in flexure shall be applied to the average yield strength and shall be 1.29, 1.19, and 1.09 for structural steel having a minimum yield strength (or yield point) of 36, 50, and 100 ksi, respectively. The dynamic increase factor for structural steel having a minimum yield strength (or yield point) between these values shall be obtained by interpolation. Optionally, for structural steel in these yield ranges, the dynamic increase factor shall be determined by a detailed analysis that accounts for the time to yield. The dynamic increase factor for structural steel having a minimum yield exceeding 100 ksi shall be 1.0. The dynamic increase factor for steel sheet and strip used in flexure shall be 1.1 applied to the average yield stress.

1.2.1.3 Structural Member Design

Structural steel section properties for rolled shapes shall be obtained from AISC-01, AISC-03, or steel manufacturers’ catalogs. The plastic moment capacity for single plate sections and sections built up from plates and shapes shall be computed as the average of the elastic and plastic section modulus multiplied by the dynamic yield strength, unless otherwise approved. Shear, welds, local buckling, and web crippling of
structural steel shall be designed in accordance with AISC-02, the plastic design provisions of AISC-04, or by other approved methods except that for blast design, the load factors and resistance factors shall be equal to 1.0 and the dynamic yield strength shall be substituted for the static yield stress. Hollow metal doors shall be designed in accordance with AISI SG-671 except that for blast design, the dynamic yield strength shall be substituted for the static yield point.

1.2.1.4 Dynamic Analysis and Deformation

The door shall be designed using an equivalent single degree of freedom or other approved dynamic analysis method. The maximum door deformation shall be selected by the door manufacturer except that the maximum deformation in flexure shall not exceed the deformation limits specified or indicated. The deformation of structural steel members having a minimum yield strength or yield point greater than 65 ksi shall not exceed the elastic deflection. The ductility ratio for flexural members in hollow metal doors shall not exceed 1.0.

1.2.1.5 Rebound Resistance

Rebound resistance shall be the specified or indicated percentage of the door resistance at initial peak response.

1.2.2 Blast Effects

1.2.2.1 Overpressure

The spatial distribution of overpressure shall be uniform unless otherwise specified or indicated. For overpressure specified or indicated without duration, the overpressure waveform shall have a zero rise time and infinite duration.

1.2.2.2 Overpressure Direction

For overpressure identified as seating and for overpressure directions not otherwise specified or indicated, the positive phase overpressure shall be in the direction that causes the door to seat toward the frame.

1.2.3 Blast Door Operation

The force required to set the door in motion shall be measured from the 90-degree open position, and the force required to engage and release the latches shall be measured at the latch handle with the door in the normal closed position.

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 DESCRIPTIONS:

SD-01 Data
Blast Resistant Door; GA.

Data on standard blast doors consisting of catalog cuts, brochures, circulars, specifications, and product data that show complete dimensions and completely describe overpressure ratings, rebound ratings, doors, frames, anchors, hardware, and accessories.

Contractor Design Calculations; GA.

Detailed structural analysis and design calculations demonstrating resistance to blast when blast resistance is not demonstrated by prototype tests. Design calculations shall demonstrate adequacy under the blast effects specified or indicated. Design calculations shall include a sketch of the overpressure waveform; dimensioned sketches of blast resisting elements such as door members, frame members, latches, and hinges; section properties for blast resisting members including built-up sections; the standard under which steel is produced; static and dynamic material strength properties; the resistance, stiffness, mass, elastic natural period, and elastic deflection for flexural members; and the peak deflection, peak support rotation, and time to peak deflection for door members in flexure. Design calculations shall cover initial response, rebound, and all secondary items such as shear, welds, local buckling, web crippling, hinges, and latches.

Test on Prototype Door; GA.

Certified test reports demonstrating blast resistance. Test reports shall include the name and location of the testing agency or laboratory, a description of the testing apparatus, the date of the tests, a description of the door specimen tested, descriptions of loadings, and the value of measured peak door deflection and peak permanent set. Test reports shall include analysis and interpretation of test results.

SD-04 Drawings

Contractor Design of Blast Resistant Doors; GA.

For special doors or standard doors with appreciable modifications, detailed fabrication and assembly drawings indicating the door location and showing dimensions, materials, fabrication methods, hardware, and accessories in sufficient detail to enable the Contracting Officer to check compliance with contract documents. Weld symbols used shall conform to AWS A2.4. These drawings need not be submitted for standard doors for which manufacturer's catalog data is submitted.

SD-06 Instructions

Blast Resistant Door; FIO.

Manufacturer's instructions for installation and field testing.

SD-08 Statements

Manufacturer's Field Service; FIO.
Information describing training to be provided, training aids to be used, and background data on the personnel conducting the training.

SD-09 Reports

Blast Door Shop and Field Operating Tests; GA.

Shop and field operating test reports that include values for opening and closing forces and times, forces required to operate latches, and a description of all operating tests performed.

Fire Rated Blast Door; GA.

In lieu of a UL listing for fire door assemblies, a letter shall be submitted by the testing laboratory which identifies the submitted product by manufacturer and type or model and certifies that it has tested a sample assembly and issued a current listing.

SD-13 Certificates

Certificates of Compliance; GA.

Steel mill reports covering the number, chemical composition, and tension properties for structural quality steels. When blast resistance is demonstrated by calculations, a certificate stating that the door assembly provided was manufactured using the same materials, dimensions, and tolerances shown in the calculations. When blast resistance is demonstrated by prototype testing, a certificate stating that door and frame provided was manufactured using the same materials, dimensions, and tolerances as the tested prototype and listing the hardware and frame anchors required to achieve blast resistance. Each certificate shall be signed by an official authorized to certify in behalf of the manufacturer and shall identify the door assembly and date of shipment or delivery to which the certificate applies.

Fire Rated Blast Door; GA.

Certificate of inspection conforming to NFPA 80, NFPA 80A, and NFPA 101 for fire doors exceeding the size for which label service is available.

Thermal Insulated Blast Door; GA.

Certification or test report for thermal insulated doors listing the type of hardware used to achieve the rating.

SD-19 Operation and Maintenance Manuals

Blast Resistant Door; F10.

Information bound in manual form consisting of manufacturer’s safety precautions, preventative maintenance and schedules, troubleshooting procedures, special tools, parts list, and spare parts data. All material shall be cross referenced to the door designations shown on the drawings.
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1.4 QUALIFICATIONS

Welders, welding operators, and weld inspectors shall be qualified in accordance with AWS D1.1 except that welders performing arc welding of steel sheet and strip shall be qualified in accordance with AWS D1.3.

1.5 DELIVERY AND STORAGE

Door assemblies delivered and placed in storage shall be stored with protection from weather and dirt, dust, and contaminants.

1.6 WARRANTY

Manufacturer's written warranty covering the blast door assembly for 2 years after acceptance by the Government shall be furnished. This warranty shall provide for repair and replacement of the blast door assembly and individual hardware and accessory items in the event of malfunction due to defects in design, materials, and workmanship except that the warranty need not cover finishes provided by others.

PART 2 PRODUCTS

2.1 MATERIALS

Only structural quality steel materials for which tension properties have been obtained shall be used to resist blast except that commercial quality steel sheet and strip shall be permitted for prototype tested hollow metal doors. Steel used in the door, door frame, and door frame anchors and nonstainless steel fasteners that resist blast shall be selected from the materials specified.

2.1.1 Structural Tubing

Structural tubing shall conform to ASTM A 500, ASTM A 501, or ASTM A 618.

2.1.2 Structural Steel

Structural steel bars, plates, and shapes shall conform to ASTM A 36.

2.1.3 Steel Sheet and Strip

Steel sheet and strip shall conform to ASTM A 366; ASTM A 446, Grades A, B, C, D, and F; ASTM A 526; ASTM A 570; ASTM A 606; ASTM A 607; ASTM A 611, Grades A, B, C, and D; ASTM A 715, Grades 50 and 60; or ASTM A 792, Grades 33, 37, 40, and 50.

2.1.4 Fasteners

Steel studs and bolts shall conform to ASTM A 307, ASTM A 325, ASTM A 354, ASTM A 449, ASTM A 490, or ASTM A 687 as applicable. Steel nuts shall conform to ASTM A 563. Hardened circular, beveled, and clipped washers shall conform to ASTM F 436. Steel hex cap screws shall conform to ASTM F 568. Steel socket-headed

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cap screws shall conform to ASTM A 574. Steel button and flat-headed countersunk cap screws shall conform to ASTM F 835.

2.2 HARDWARE

2.2.1 Hinges

2.2.1.1 General Requirements

Hinges shall be specially manufactured to support the door and to resist any blast induced loading. The number of hinges shall be determined by the blast door manufacturer. Welds used in hinges shall be continuous. Hinges shall be attached to the door and frame using mechanical fasteners except that full surface hinges for doors with locks shall be attached to the door and frame by welding or approved tamper-resistant mechanical fasteners and hinges for doors with locks shall have approved nonremovable pins. Load ratings and fatigue life for ball and roller bearings shall be determined in accordance with ABEMA 9 and ABEMA II as applicable and, unless otherwise approved, the bearing steel shall conform to ASTM A 534. Hinges shall be capable of operating for the minimum number of cycles specified without failure or excessive wear under the door service loads where one cycle consists of swinging the door back and forth between the normal closed position and the 90-degree open position, where failure or excessive wear means that the latches do not seat properly or the door does not swing smoothly due to hinge failure or wear, and where door service loads consist of the door weight plus any loads produced by hardware. Rolling bearings shall be factory grease lubricated and either sealed or provided with easily accessible lubrication fittings.

2.2.1.2 Hinge Description

Hinge Type I shall be capable of smooth operation for a minimum of 250,000 cycles. This type of hinge shall be provided with structural quality steel pins and leafs and either rolling bearings in both the thrust and radial directions or hardened steel washer (disc) thrust bearings and rolling radial bearings except that rolling thrust bearings and metallic journal radial bearings shall be permitted for hollow metal doors when the specified overpressure is less than 3 psi.

2.2.2 Latching System

2.2.2.1 Latching Points

The number of latching points shall be determined by the door manufacturer. Latching points shall be provided at the jambs only.

2.2.2.2 Latching System Operation

Latching systems shall be capable of operating for the same number of cycles specified for the door hinges where one latch operating cycle consists of engaging and releasing using the handle. Latches shall remain engaged until manually released and shall not release under blast loads or rebound. Self-latching latches shall provide self-activating engagement when the door is swung to the normal closed position. Handles shall release latches under a clockwise motion.
2.2.2.3 Latching Mechanism

Latching mechanisms for hollow metal doors shall be mounted on the seating face of the door and safety covered. Latch handle axes shall be manufactured of hardened steel or stainless steel, and axes requiring lubrication shall be provided with easily accessible lubrication fittings.

2.2.2.4 Safety Cover

Safety covers shall consist of steel housings that enclose the latching mechanism such that only the operating rods are exposed.

2.2.2.5 Latches

Latches (latch bolts) shall be manufactured of structural quality steel and the latch bolt throw shall not be less than 3/4 inch. Latch bolts shall be the sliding type in which the latch bolt slides into a matching strike in the door frame.

2.2.2.6 Handle

Handles for doors with mortise lock and latch sets shall be manufactured of steel castings or stainless steel. Latch handles shall be firmly fastened to axes. Lever handles shall be perpendicular to the door edge when latches are engaged. Single lever handles shall be located at the stile opposite the hinges.

2.2.3 Mortise Lock and Latch Set

Lever handles shall release latches using a torque not exceeding 27 lb-in. Latches (latch bolts) shall be located at the stiles and operated from a single lever handle. Only one deadbolt shall be provided. The deadbolt shall be manufactured of structural quality steel and the deadbolt throw shall not be less than 1 inch. Mortise locks shall be provided with armored fronts. The function numbers for mortise locks shall be as defined in BHMA A 156.13.

2.2.4 Keying

Keying shall conform to Section 08700 BUILDERS' HARDWARE. Change keys for locks shall be stamped with change number and the inscription "U.S. Property - Do Not Duplicate." Unless otherwise specified, two change keys shall be provided for each lock. Locks shall be furnished with the manufacturer's standard construction key system.

2.2.5 Door Stop

Door stops shall be designed to resist the impact of the door. The stop shall not scratch or scar the door finish when the door is opened against the stop.
2.2.6 Surface Door Closer

The surface door closer shall conform to BHMA A 156.4. The size and grade shall be selected by the door manufacturer.

2.2.7 Overhead Door Holder

Overhead door holder shall be surface mounted. The holder shall have a spring or other device to cushion the door action and shall limit the door swing at 85 degrees. The holder shall have a built-in, hold-open capability at the swing limit specified. Overhead door holders for hollow metal doors weighing less than 200 pounds shall conform to BHMA A 156.8.

2.2.8 Door Silencer

Rubber door silencers shall cushion the impact of the door against the frame so that steel-to-steel contact is not made during closing.

2.3 ACCESSORIES

2.3.1 Subframe

At the Contractor’s option, a subframe can be provided and built into the structure prior to installation of the frame. The subframe and subframe anchors shall be capable of transferring blast and rebound reactions to the adjacent structure, and the frame shall be capable of transferring these reactions to the subframe. The subframe shall be fabricated in the same manner specified for the frame.

2.3.2 Nameplate

Each door assembly shall have a permanently affixed nameplate that displays the manufacturer’s name, place and year of manufacture, and the applicable peak overpressure, impulse, and rebound rating.

2.3.3 Removable Threshold

The sill shall be flush with the adjacent floor when the threshold is removed. The removable threshold shall be attached using approved countersunk mechanical fasteners.

2.4 FABRICATION

2.4.1 Shop Assembly

Welding shall be in accordance with AWS D1.1 except that arc welding of steel sheet and strip shall be in accordance with AWS D1.3. Stainless steel shall be welded using electrodes conforming to AWS A5.4. In order to reduce distortion and residual stresses, a welding sequence shall be used. All welds shall be stress relieved, and welded doors and frames shall be post-weld straightened. Fabricated steel shall be well-formed to shape and size, with sharp lines and angles. Intermediate and corner joints shall be coped or mitered. Exposed welds shall be dressed smooth. The stiles and top doors shall be closed using channel shapes or plates.
When feasible, faceplates shall be one piece. When one-piece faceplates are not feasible, plates shall be joined using full penetration groove weld butt joints or other approved welds. Hollow metal door frames shall be pressed steel or structural steel with welded joints. Steel frames or subframes installed in masonry walls shall be provided with adjustable anchors. Hollow metal doors shall be of unitized grid construction with welded grid junctions and shall have flat, one-piece face sheets spot welded to the grid system. The edges of hollow metal doors shall be closed with seams continuously welded. Hollow metal doors shall be neat in appearance, free from warpage and buckle, and suitable reinforcing shall be provided for hardware.

2.4.2 Thermal Insulation

The interior cells between the unitized grid shall be completely filled with thermal insulation material. The U value through the door (panel) shall not exceed 0.24.

2.4.3 Shop Finishing

Shop priming of steel surfaces shall conform to Section 09900 PAINTING, GENERAL except that surfaces that will be embedded in concrete need not be primed and hollow metal doors shall be either dipped in primer after welding is completed, or exposed surfaces shall be primed and interior surfaces coated with an approved rust inhibitor.

2.4.4 Clearance

The lateral clearance between hollow metal doors and frames shall not exceed 1/8 inch at the head and jambs and the clearance between the meeting edges of pairs of doors shall not exceed 1/4 inch. The clearance between the door bottom and threshold shall not exceed 3/4 inch.

2.5 BLAST DOOR ASSEMBLIES

2.5.1 Launch Equipment Building Door; Metal

2.5.1.1 Type

Type shall be hollow metal with thermal insulation and fire-rated.

2.5.1.2 Overpressure

Overpressure shall be 1.0 psi in the seating direction and 1.0 psi in the unseating direction.

2.5.1.3 Rebound

Rebound resistance shall be 100 percent.

2.5.1.4 Hardware

Mortise hinges shall be Type 1. Jamb latch points and a single lever handle operated from the seating face and opposite the seating face with self-latching latch engagement and sliding latch bolts shall be provided.
Mortise lock and latch set shall be provided. A padlock and hasp, and door stop, and surface door closer overhead door holder and door silencer shall be provided.

2.5.1.5 Operating Forces

Maximum operating forces shall be 20 pounds to set the door in motion and 15 pounds to swing the door. Operating forces shall conform to NFPA 101. Maximum force shall be 20 pounds to engage and release latches.

2.5.1.6 Accessories

A removable threshold shall be provided.

2.6 TESTS, INSPECTIONS, AND VERIFICATIONS

2.6.1 Prototype Static Test

Static tests on prototype door assemblies shall demonstrate that the door will resist the blast overpressure. Static tests will be accepted only if the door and frame proposed are manufactured using the same materials, dimensions, and tolerances as those in the prototype static test and the static overpressure used in the test is at least two times the blast overpressure. Static test reports shall be supplemented with calculations that demonstrate rebound resistance when rebound is not tested.

2.6.2 Prototype Blast Test

Blast tests on the prototype door assembly shall demonstrate that the door will resist the overpressure waveform. Blast tests will be accepted only if the door and frame proposed are manufactured using the same materials, dimensions, and tolerances as those in the prototype blast tests. The rise time of the test waveform shall be zero or subject to approval. For an overpressure with infinite duration, the over-pressure used in the test shall be not less than that specified or indicated for a duration equal to at least five times the natural period of the door and the test report shall be supplemented with calculations that demonstrate the specified or indicated rebound resistance.

2.6.3 Air Leakage Test

Each door assembly shall be factory tested for air leakage rate in accordance with ASTM E 283. The rate of air leakage per unit length of crack shall not exceed 0.20 cfm using a pressure difference of 1.57 psf. Prototype tests can be substituted for door assembly tests when the prototype door, frame, and hardware tested are equivalent to that provided or when otherwise approved.

2.6.4 Fire Rating Test and Inspection

Fire-rated door assemblies shall bear the listing identification label of the UL, or other nationally recognized testing laboratory qualified to perform tests of fire door assemblies in accordance with ASTM E 152 and having a listing for the tested assemblies. Doors exceeding the size for which listing, label service is offered shall be inspected in accordance
PART 3  EXECUTION

3.1  INSTALLATION

Doors and frames shall be installed in accordance with the manufacturer’s written instructions. Pressed steel frames for hollow metal doors shall be fully grouted. Exposed surfaces shall be finish painted in accordance with Section 09900 PAINTING, GENERAL.

3.2  TESTS

After installation is completed, each door shall be field tested for operation, clearance, fit, and seating by operating the door and hardware through at least 10 operating cycles. Door and hardware operation shall be tested using the forces specified. Personnel and equipment required to perform field testing shall be provided by the Contractor. Unless waived, all field tests shall be performed in the presence of the Contracting Officer. After testing is completed, test reports shall be prepared and three copies furnished.

3.3  MANUFACTURER’S FIELD SERVICE

Installation and testing of door assemblies shall be under the supervision of the door manufacturer’s erection engineer. Upon completion of the work, and at a time designated by the Contracting Officer, the services of one engineer and other technical personnel as required shall be provided for a period of not less than 4 hours to instruct Government personnel in the operation and maintenance of the blast doors and all other items furnished under this specification section. The instructions shall also include use of the operation and maintenance manual. The instructions shall include videotapes. An instruction outline and procedure shall be submitted and approved prior to scheduling the instruction. One copy of all instruction material shall be provided at the time of instruction.

-- End of Section --
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 GEAR MANUFACTURERS ASSOCIATION (AGMA)

AGMA 6010-E (1988; Errata Nov 91) Standard for Spur, Helical, Herringbone and Bevel Enclosed Drives

AGMA 6019-E (1989) Gearmotors Using Spur, Helical, Herringbone, Straight Bevel, or Spiral Bevel Gears

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)


AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 159 (1983; R 1993) Automotive Gray Iron Castings

ASTM A 325 (1993) Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength

ASTM A 668 (1993) Steel Forgings, Carbon and Alloy, for General Industrial Use

ASTM B 438 (1983a; R 1989) Sintered Bronze Bearings (Oil-Impregnated)

ASTM B 439 (1983; R 1989) Iron-Base Sintered Bearings (Oil-Impregnated)

ASTM B 612 (1991) Iron Bronze Sintered Bearings (Oil-Impregnated)

ASTM E 125 (1963; R 1993) Standard Reference Photographs for Magnetic Particle Indications on Ferrous Castings (R 1985)

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME B30.2 (1990; B30.2a; B30.2b; B30.2c) Overhead Crane Specifications
and Gantry Cranes (Top Running Bridge, Single or Multiple Girder, Top Running Trolley Hoist)

ASME B30.16 (1993; B30.16a) Overhead Hoist (Underhung)

ASME B30.17 (1990; Errata; B30.17a) Overhead and Gantry Cranes (Top Running Bridge, Single Girder, Underhung Hoist)

ASME HST-6M (1986) Air Wire Rope Hoists

AMERICAN WELDING SOCIETY (AWS)


MATERIAL HANDLING INSTITUTE (MHI)

MHI CMAA 70 (1994) Electric Overhead Traveling Cranes


NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)


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 PROCEDURES:

SD-01 Data

Overhead Crane System; GA.

A complete list of equipment and materials, including manufacturer's descriptive data and technical literature, performance charts and curves, catalog cuts, and installation instructions.

Spare Parts; FIO.

Spare parts data for each different item of material and equipment specified, after approval of the detail drawings and not later than 2 months prior to the date of beneficial occupancy. The data shall include a complete list of parts and supplies, with current unit prices and source of supply.

SD-04 Drawings
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Overhead Crane System; GA.

Detail drawings containing complete wiring and schematic diagrams. Diagrams shall indicate each numbered wire, where wire initiates, where wire terminates, and any other details required to demonstrate that the system has been coordinated and will properly function as a unit. Drawings shall show layout and anchorage of equipment and appurtenances, and equipment relationship to other parts of the work including clearances for maintenance and operation.

SD-06 Instructions

Framed Instructions GA.

Diagrams, instructions and safety requirements.

SD-09 Reports

Acceptance Testing; FIO.

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. The report shall include the information as required by paragraph ACCEPTANCE TESTING.

SD-18 Records

Hooks; FIO.

Hook material and any heat treatment performed, stamped on the hook shank or documented in certification papers furnished with the hooks. Crane test data recorded on appropriate test record forms suitable for retention for the life of the crane.

SD-19 Operation and Maintenance Manuals

Overhead Crane System; GA.

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

1.3 QUALIFICATION

Electric overhead cranes shall be designed and manufactured by a company with a minimum of 10 years of specialized experience in designing and
TARGET LAUNCH FACILITIES, PHASE 1, FT WINGATE, NM

manufacturing, the type of overhead crane required to meet requirements of the Contract Documents.

1.4 TESTING AND INSPECTIONS

1.4.1 Pre-Delivery Inspections

Contractor shall be responsible for performance of quality control inspections, testing and documentation of steel castings, hook assembly and nuclear safety as follows.

1.4.2 Inspection of Steel Castings

Load-carrying steel castings shall be visually inspected and tested using the magnetic-particle inspection method. Allowable degree of discontinuities shall be referenced to ASTM E 125, and shall be related to service loads and stresses, critical configuration, location and type. Methods of repairing the discontinuities shall be subject to review by the Contracting Officer.

1.4.3 Inspection of Hook Assembly

Hook and nut shall be inspected by a magnetic-particle type inspection or X-rayed prior to delivery. Documentation of hook inspection shall be furnished to Contracting Officer at the field operational testing. As part of the acceptance standard, linear indications will not be allowed. Welding repairs of hook will not be permitted. A hook showing linear indications, damage or deformation will not be accepted, and shall be replaced.

1.5 DESIGN CRITERIA

Cranes shall operate in the given spaces and shall match the runway dimensions and rails indicated. Hook coverage, hook vertical travel, clear hook height, lifting capacity, and load test weight shall not be less than that indicated.

1.5.1 General

The hoisting equipment shall include the following:

Number of cranes; 1, located in building name; MAB, with a number of tons; 20, pneumatic overhead traveling crane. 1.5.2 Classification

Crane shall be designed and constructed to MHI CMAA 70 Class C, moderate service requirements for operation in hazardous environment with hoist in accordance with ASME HST-6M.

1.5.3 Rated Capacity and Speeds

Rated capacity of crane shall be 20 tons. Lower load block or assembly of hook, swivel bearing sheaves, pins and frame suspended by the hoisting ropes shall not be considered part of the rated capacity. Rated speeds (in feet per minute) for the hoist, bridge and trolley at the rated load shall be as follows:

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<table>
<thead>
<tr>
<th>Description</th>
<th>Maximum</th>
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<tr>
<td>Trolley</td>
<td>18.0</td>
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<tr>
<td>Bridge</td>
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1.6 DELIVERY AND STORAGE

Equipment delivered and placed in storage shall be stored with protection from the weather, humidity and temperature variations, dirt and dust, and other contaminants.

1.7 FIELD MEASUREMENTS

Before performing any work, Contractor shall become familiar with all details of the work, verify all dimensions in the field, and submit a letter describing the results of this verification including discrepancies to the Contracting Officer and crane manufacture.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 General

Materials and equipment shall be standard products of manufacturers regularly engaged in the fabrication of complete and totally functional cranes including necessary ancillary equipment.

2.1.2 Use of Asbestos Products

Materials and products required for designing and manufacturing cranes shall not contain asbestos.

2.1.3 Capacity Plates

Two capacity plates indicating the crane capacity in tons are required, one secured to each side of bridge. Each capacity plate shall be fabricated of a steel backing plate and exterior quality/fade-resistant stick-on labels with lettering large enough to be easily read from the floor. Capacity plates shall be placed in a location visible to pendant operator’s position after the crane has been installed.

2.1.4 Safety Warnings

Readable warning labels shall be affixed to each lift block or control pendant in a readable position in accordance with ASME B30.16, ASME B30.2 and ASME B30.17. The word "WARNING" or other legend shall be designed to bring the label to the attention of the operator. Warning labels shall be durable type and display the following information.
concerning safe-operating procedures: Cautionary language against lifting more than the rated load; operating the hoist when the hook is not centered under the hoist; operating hoist with twisted, kinked or damaged rope; operating damaged or malfunctioning hoist; operating a rope hoist with a rope that is not properly seated in its hoist drum groove; lifting people; lifting loads over people; and removing or obscuring the warning label.

2.1.4.1 Directional Arrows

To avoid operation of crane in the wrong direction, the words "FORWARD" and "REVERSE" and accompanying directional arrows shall be affixed in a location on the trolley and bridge which are visible and readable to the operator from pendant station. The words "FORWARD" and "REVERSE" shall agree with the markings on control pendant. Directional arrows shall not be indicated on control pendant.

2.2 STRUCTURAL MATERIALS

2.2.1 Bolts, Nuts and Washers

High-strength bolted connections shall utilize SAE Grade 5 bolts with corresponding lockwashers, nuts, etc., conforming to requirements of AISC S329 bolts. Bolts, nuts and washers shall conform to ASTM A 325 bolts. Galvanized bolts are not acceptable.

2.2.2 Bridge Girders or Girders

Bridge girders shall be welded structural steel box sections.

2.2.3 Bridge Rails or Bars

Trolley runway rails, crane girders and other sections shall be straight and true. When loaded with motor driven cranes the deflection of rails shall not exceed 1/800 of the span. The deflection shall be calculated with the worst case of two loaded bridge cranes located adjacent each other. Rail joints shall be flush and true without misalignment of running tread and shall be designed to minimize vibration. The gap between adjacent rail'ends and the vertical misalignment of running treads shall not exceed 0.0625 inch. The bridge rail shall be leveled to a plus-or-minus 1/8 inch at all rail support joints. Bridge rail shall be fastened to top cover plate or centered on flange or offset near web plate for welded box sections, complete with welded clips. Bridge rail joints shall be bolted using standard joint bars. Rail joints shall be staggered. A positive stop shall be provided at bridge rail ends to prevent creep.

2.2.4 End Ties and Bridge Girder End Connections

Welded steel box sections shall be used for end ties, full depth diaphragms shall be provided at girder connections and jacking points. Horizontal gusset plates shall be provided at the elevation of top and bottom end tie flanges for connection to girder ends. End connections shall be made with high-strength bolts. Body-bound bolts fitted in drilled and reamed holes shall be used to maintain the crane square.
2.2.5 Bridge End Trucks

End trucks shall be the rotating or fixed axle type fabricated of structural tubes or from structural steel to provide a rigid box section structure. Jacking pads shall be provided for removal of wheel assemblies.

2.2.6 Trolley Frame

Trolley frame shall consist of 2 structural steel side frames or trucks welded together with one or more structural steel load girts to form a one-piece unit. Pads shall be provided for the use of jacks or wedges when changing truck wheels. All trolley yokes and load bars shall be of drop forged, cast or rolled steel.

2.2.7 Stops and Bumpers

Crane runways and bridge girders shall be fitted with structural steel end stops. Bridge end trucks and trolley frames shall be fitted with shock-absorbing, spring or hydraulic type bumpers capable of decelerating and stopping the bridge and/or trolley within the limits stated by OSHA and MHI CMMA. Trolley end stops shall be of sufficient strength to withstand the impact of a fully loaded trolley moving at 50 percent of maximum rated travel speed. When 2 bridge cranes are on the same runway, 1 crane shall be fitted with shock-absorbing bumpers on each end of each end-truck, and the other crane shall have shock-absorbing bumpers as per above on 1 end only of each end-truck which is the opposite end of the adjacent crane. The other end of the end-truck shall be fitted with a structural steel stop to engage the bumpers of the adjacent crane. Bridge bumper stops shall be provided as specified in Section 05120 STRUCTURAL STEEL.

2.2.8 Footwalks

A full-length structural platform is required on the driver's side of the bridge. The platform shall be checkered steel flooring, double member handrail and a suitable toe-guard, with 30 inch clearance in front of control equipment. Minimum 15 inch clearance is required in front of bridge machinery. Short and full rear platforms and cross-over walks are optional.

2.2.9 Runway Rails

The runway rail size shall be as recommended by crane manufacturer.

2.3 MECHANICAL EQUIPMENT

2.3.1 Explosion Proof Requirements

Equipment shall conform to NFPA 70 for Class I, Division 2 hazardous locations. Equipment shall be suitable for Groups C and D.

2.3.2 Drives
2.3.2.1 Bridge Drives

Bridge drives shall be A-4 drive arrangement as specified in MHI CMAA 70 or MHI CMAA 74. Bridge drive shall consist of a single pneumatic motor mechanically connected through gear reduction and drive shafts to the drive wheels or separate drive motors at each end of bridge. Acceleration and deceleration shall meet the requirements specified in this section. Gears shall conform to applicable AGMA standards. Gear reducers shall be oil tight and fully enclosed with pressure or splash type lubrication. Bridge-travel limit-switches are optional.

2.3.2.2 Trolley Drives

Trolley shall be complete with a drive arrangement with a minimum of 2 wheels driven by an integral pneumatic motor. Drive mechanism shall run in totally enclosed oil bath. Limit switches are optional for drive mechanism. Acceleration and deceleration controls shall meet requirements specified in this section.

2.3.3 Load Blocks

2.3.3.1 Main and Auxiliary Hoist Load Blocks

Load blocks shall be of welded steel construction. Load blocks shall be provided with hot-rolled or forged steel fixed crosshead separate from the sheave pin with swivel mounting for forged steel hook. Each lubrication fitting for sheave pins shall be an independent type recessed within the sheave pin or adequately guarded to prevent damage. The pitch diameter of the sheaves shall be not less than 16 times the rope diameter. Sheaves shall be supported by roller type bearings on steel sheave pins. Provisions for external lubrication shall be provided to allow pressure relief and purging of old grease. Sheave blocks shall be constructed to provide maximum personnel safety and to prevent the hoist rope from leaving the sheaves under normal operating condition.

2.3.3.2 Hook Assembly

Hooks shall be single barbed and shall be made of forged steel complying with ASTM A 668. Hook dimensions shall be as shown. Hooks shall be fitted with safety latches designed to preclude inadvertent displacement of slings from the hook saddle. Painting or welding shall not be performed on the hook. Hook nut shall be secured with a removable type set screw or other similar fastener, but shall not be welded. Hooks shall be designed and commercially rated with safety factors in accordance with MHI CMAA. The hook shall be free to rotate through 360 degrees when supporting the rated load.

2.3.4 Hoisting Ropes

Hoisting ropes shall be regular lay, preformed, uncoated, improved plow steel, 6 by 37 construction, with independent wire rope core. Ropes shall be suited to meet the service requirements. Rope socketing or U-bolt clip connections shall be made in accordance with clip or rope manufacturer's recommendation, and shall be equal to or greater than the rope strength. Hoisting ropes shall be the rated capacity load plus the load block weight.
divided by the number of rope parts, and shall not exceed 20 percent of the certified breaking strength of rope. Hoisting ropes shall be secured to hoist drum so that no less than 2 wraps of rope remain at each anchorage of hoist drum at the extreme low position (limit switch stop).

2.3.5 Sheaves

Sheaves shall be of cast, forged, rolled, or welded structural steel. Sheave grooves shall be accurately machined, smoothly finished and free of surface defects.

2.3.6 Hoist Drums

Hoist drums shall be of welded rolled structural steel, cast steel, or seamless steel pipe. Diameter of drum shall be not less than 24 times the diameter of hoist cable. Drums shall be machined and provided with right-hand and left-hand grooves to take the full run of cable for the required lift without overlapping, plus a minimum of 2 full wraps of cable when load is on floor. At least 1 groove shall remain unused when hook is at the highest position. Drum grooves shall be cut from solid stock and have sufficient depth for size of cable required. Drum flanges shall be guarded so that the cable cannot wedge between drum flange and hoist frame.

2.3.6.1 Gear Reducers

Gear reducers shall be standard items of manufacturers regularly engaged in the design and manufacture of gear reducers for Class D and G cranes or shall be integral components of standard hoists or hoist/trolley units of manufacturers regularly engaged in the design and manufacture of hoists or hoist/trolley units for Class A, B or C cranes. Gear reducers shall be designed, manufactured and rated in accordance with AGMA 6010-E, AGMA 6019-E (for trolley drives only), as applicable. Except for final reduction, the gear reduction units shall be fully enclosed in oil-tight housing. Gearing shall be designed to AGMA standards and shall operate in an oil bath. Operation shall be smooth and quiet.

2.3.7 Brakes

Brakes shall be of the shoe or disc type with thermal capacity suitable for class and service specified in this section. Brakes shall be self-aligning and provide for easy adjustment for torque setting and lining wear. Brake lining material shall be asbestos free. Brake wheels shall be cast iron conforming to ASTM A 159 or shall be the manufacturer’s standard high-strength ductile cast-iron, provided that the material exhibits wear characteristics in the form of powdered wear particles and is resistant to heat-checking. Disc brakes shall be totally enclosed and have multiple discs with stationary releasing magnets. Brake torque shall be easily adjustable over a 2:1 torque range.

2.3.7.1 Hoist Holding Brakes

Each hoist shall be equipped with at least 2 holding brakes. Holding brake shall be disc or shoe design, applied to one of the following: motor shaft or gear reducer shaft or rope drum. Braking system shall be designed to have zero hook lowering motion when a raise motion is initiated. Primary
brake shall be a spring-set, disc or shoe type brake. Brake shall have a
minimum torque rating of 150 percent of motor torque. Brake shall be
capable of holding the rated load with zero hook drift. Primary brake
shall be automatically set when controls are released or when power is
interrupted. Provisions shall be made to facilitate easy brake adjustment.
Hoists shall be furnished with mechanical-control braking or a
power-control braking system. Typical power means include dynamic
lowering, eddy-current braking, counter-torque, and regenerative braking.

2.3.7.2 Hoist Control Brake

Each hoist shall be equipped with an integral mechanical load brake of the
"Weston" type or multiple-disc type. Multiple disc-type brake shall be
provided with external adjustment for wear.

2.3.7.3 Trolley Brake

Braking system shall be automatically set when controls are released or
power is interrupted. Provisions shall be made to facilitate easy brake
adjustment. Brakes shall have a torque rating of at least 50 percent of
trolley drive motor rated torque.

2.3.7.4 Bridge Brakes

Braking system shall be automatically set when controls are released or
power is interrupted. Provisions shall be made to facilitate easy brake
adjustment. Brakes shall have a torque rating of at least 50 percent of
bridge drive motor rated torque.

2.3.8 Wheels

Wheels shall be manufactured of rolled or forged steel. Wheel treads and
flanges shall be rim toughened to between 320 and 370 Brinell hardness
number. Bridge and trolley wheels shall be double-flanged. Trolley wheels
shall have straight treads. Bridge wheels shall have straight treads.
Wheels shall be equipped with self-aligning double-row spherical
roller-bearings of capacity as recommended by bearing manufacturer for
design load of trolley or bridge.

2.3.9 Bearings

Bearings shall be antifriction type, except bearings which are subject only
to small rocker motion. Equalizer sheaves shall be equipped with sintered
oil-impregnated type bushings in accordance with ASTM B 438, ASTM B
439, or ASTM B 612.

2.3.10 Anti-Drip Provisions

Cranes shall be designed to preclude leakage of lubricants onto the lifted
loads or the floor. Equipment and components which cannot be made
leak-proof shall be fitted with suitable drip pans. Drip pans shall be
manufactured of steel and designed to permit removal of collected
lubricant.
2.3.11 Lubrication System

Splash-type oil lubrication system shall be provided for hoist, trolley and bridge gear cases; an oil pump shall be used on vertical-mounted gear cases exceeding 2 reductions. Oil pumps shall be the reversible type capable of maintaining the same oil flow direction and volume while being driven in either direction. Electric motor-driven pumps may be used when input shaft speed is too low at any operating condition to ensure adequate oil flow. In such applications, pump shall be energized whenever drive mechanism brakes are released.

PART 3 EXECUTION

3.1 ERECTION

The entire crane erection shall be performed in accordance with manufacturer's instructions under the full-time supervision of the manufacturer's representative. Contractor shall provide a written certificate from crane manufacturer indicating the crane is erected in accordance with manufacturer's recommendations before testing the completed installation.

3.1.1 Shop Assembly

Major crane components shall be shop assembled as completely as possible. Disassembled parts shall be match marked and electrical connections tagged after complete no-load shop testing. Parts and equipment at site shall be protected from weather, damage, abuse and loss of identification. Erection procedures shall ensure that the crane is erected without initial stresses, forced or improvised fits, misalignments, nicks of high-strength structural steel components, stress-raising welds and rough burrs. Damaged painted surfaces shall be cleaned and repainted after crane is erected.

3.1.2 Mechanical Alignment

Motors, couplings, brakes, gear boxes and drive components shall be aligned when reinstalled in accordance with manufacturer's instructions.

3.1.3 Welding

Welders, welding operations and welding procedures shall be qualified or prequalified in accordance with AWS D14.1. Welding shall be performed indoors and the surface of parts to be welded shall be free from rust, scale, paint, grease or other foreign matter. Minimum preheat and interpass temperatures shall conform to the requirements of AWS D14.1. Welding shall be performed in accordance with written procedures which specify the Contractor's standard dimensional tolerances for deviation from camber and sweep. Such tolerances shall not exceed those specified in accordance with AWS D14.1. Allowable stress ranges shall be in accordance with MHI CMAA 70. Welding of girders and beams shall conform with AWS D14.1.
3.1.4 Field Painting

Painting required for surfaces not otherwise specified, and finish painting of items only primed at the facility, shall be as specified in Section 09900 PAINTING, GENERAL. Bridge crane including bridge, trolley, hoist and all attached items shall be painted in accordance with the manufacturer's standard practice. The complete crane shall be of one color. Bridge rail, supports and bracing shall be painted in accordance with Section 09900 PAINTING, GENERAL. Items such as surfaces in contact with the rail wheels, wheel tread, hooks, wire rope, surfaces on the electrical collector bars in contact with the collector shoes and nameplates shall not be painted. The requirements of explosion proof cables shall be coordinated with cable manufacturer.

3.2 ACCEPTANCE TESTING

3.2.1 General

Contractor shall provide all personnel necessary to conduct the required testing which shall include but not be limited to crane operators, riggers, rigging gear and test weights. Testing shall be performed in the presence of Contracting Officer or his designated representative. Contractor shall notify Contracting Officer 21 days prior to testing operations. Contractor shall operate all equipment and make all necessary corrections and adjustments prior to the testing operations witnessed by Contracting Officer. A representative of the Contractor responsible for procuring and installing hoist equipment shall be present to direct the field testing. Test loads shall be compact and permit a minimum of 50 percent of vertical lift. Test loads shall be minus 0 percent to plus 5 percent of the required weight, and shall be verified prior to testing. Test weights required are 40,000 pounds, 50,000 pounds and 4000 pounds. Operational testing shall not be performed until after building interior has been painted. Three copies of all test reports shall be furnished to Contracting Officer.

3.2.1.1 Test Sequence

Crane shall be tested in accordance with applicable paragraphs of this procedure in the sequence provided.

3.2.1.2 Test Data

Operating and startup current measurements shall be recorded for coils, hoist, trolley, and bridge motors using the appropriate instrumentation. Speed measurements shall be recorded as required by facility evaluation tests (normally at 100 percent load). Recorded values shall be compared with design specifications or manufacturer's recommended values and the abnormal differences shall be justified in the remarks or appropriate adjustments performed. The high temperatures or abnormal operation of any equipment or machinery shall be noted, investigated and corrected. Hoist, trolley and bridge speeds shall be recorded during each test cycle.
3.2.1.3 Equipment Monitoring

Improper operation or poor condition of safety devices, electrical components, mechanical equipment and structural assemblies shall be monitored during the load test. Defects observed to be critical during the testing period shall be reported immediately to the Contracting Officer and the testing operations shall be suspended until the defects are corrected. During each load test and immediately following each load test, the following inspections shall be made:

a. Inspect for evidence of bending, warping, permanent deformation, cracking or malfunction of structural components.

b. Inspect for evidence of slippage in wire rope sockets and fittings.

c. Check for overheating in brake operation; check for proper stopping. All safety devices including emergency stop switches and POWER-OFF pushbuttons shall be tested and inspected separately to verify proper operation of the brakes. When provided, safety accessories including warning horn, lighting, gauges, warning lights and accuracy of wind indicating device and alarm shall be inspected.

d. Check for abnormal noise or vibration and overheating in machinery drive components.

e. Check wire rope sheaves and drum spooling for proper reeving and operation, freedom of movement, abnormal noise or vibration.

f. Inspect gears for abnormal wear patterns, damage, or inadequate lubrication.

g. Verify that locations of crane capacity plates are visible from pendant operator’s position.

3.2.1.4 Hooks

Hooks shall be measured for hook throat spread before and after load test. A throat dimension base measurement shall be established by installing 2 tram points and measuring the distance between the tram points to within 1/64 inch. This base dimension shall be recorded. Distance between tram points shall be measured before and after load test. An increase in throat opening by more than 1 percent from base measurement shall be cause for rejection.

3.2.2 No-Load Testing

3.2.2.1 Hoist Operating and Limit Switch Test

Load hook shall be raised and lowered through the full range of normal travel at rated speed and other crane speeds. Load hook shall be stopped below the geared limit-switch upper setting. The test shall be repeated a sufficient number of times (minimum of 3) to demonstrate proper operation. Brake action shall be tested in each direction. Proper time-delay shall be verified between the actuation of dual brakes.
3.2.2.2 Trolley Travel

Trolley shall be operated the full distance of bridge rails exercising all primary drive speed controls in each direction. Brake operation shall be verified in each direction. In slow speed, trolley bumpers shall contact trolley stops located on the bridge girders.

3.2.2.3 Bridge Travel

Bridge shall be operated in each direction the full distance of runway exercising all primary drive speed controls. Brake operation shall be verified in each direction.

3.2.3 Load Test

3.2.3.1 Hoist

Unless otherwise indicated, the following tests shall be performed using a test load of 125 percent (plus 5 percent, minus 0 percent) of rated load.

a. Hoist Static Load Test: Holding brakes and hoisting components shall be tested by raising the test load approximately 1 foot and manually releasing one of the holding brakes. Load shall be held for 10 minutes. First holding brake shall be reapplied and second holding brake released. Load shall be held for 10 minutes. Any lowering that may occur indicates a malfunction of brakes or lowering components.

b. Dynamic Load Test: Test load shall be raised and lowered through the full range operating in each speed. Machinery shall be completely stopped at least once in each direction to ensure proper brake operation.

c. Hoist Mechanical Load Brake: With test load raised approximately 5 feet and with the hoist controller in the neutral position, holding brake shall be released. Mechanical load brake shall be capable of holding the test load. With holding brake in released position, test load shall be lowered (first point) and the controller shall be returned to OFF position as the test load lowers. Mechanical load brake shall prevent the test load from accelerating.

d. Trolley Dynamic Load Test: While operating the crolley the full distance of bridge rails in each direction with test load on the hook (one cycle), proper functioning of all primary drive and micro-drive speed control points and proper brake action shall be tested.

e. Bridge Dynamic Load Test: With test load on hook, bridge shall be operated for the full length of runway in both directions with trolley at each extreme end of bridge. Proper functioning of all primary drive and micro-drive speed control points and brake action shall be verified.

3.2.3.2 Trolley and Bridge Loss of Power Test

A test load of 100 to 105 percent of rated load shall be raised clear of any obstructions on operating floor. Starting at a safe distance from walls or other obstructions, a slow speed shall be selected using the trolley and bridge primary drive. While maintaining a safe distance to
obstructions, the main power source shall be disconnected and brakes shall be verified to have set and that the equipment stops within the distance recommended by manufacturer.

3.2.4 Overload Tests

After the operational tests, bridge crane system and all functions of bridge crane shall be tested at 125 percent of rated load.

3.2.5 Acceleration and Deceleration Tests

The acceleration and deceleration of bridge and trolley shall be tested with approximately 10 percent of rated load at lowest possible location of hook. Bridge and trolley shall be operated to run up to high speed and then stopped without jarring or swinging the load.

3.2.6 Grounding Test

Hoist shall be tested to determine that the hoist, including hook and pendant, are grounded to building during all phases of hoist operation. The grounding of bridge and trolley shall be tested with approximately 10 percent of rated load on hook. Grounding shall be tested between hoist hook and the structure's grounding system.

3.2.7 Adjustments and Repairs

Adjustments and repairs shall be performed by Contractor under the direction of the Contracting Officer at no additional cost to the Government, until satisfactory conditions are maintained, and contract compliance is affected. After adjustments are made to assure correct functioning of the components, pertinent testing shall be repeated.

3.3 SCHEMATIC DIAGRAMS

Schematic diagrams for equipment shall be stored where indicated on drawings.

3.4 MANUFACTURER'S FIELD SERVICE REPRESENTATIVE

Contractor shall furnish a qualified experienced manufacturer's field service representative to supervise the crane installation, assist in the performance of the on site testing, and instruct personnel in the operational and maintenance features of the equipment.

3.5 FIELD TRAINING

Contractor shall conduct a training course for the operating staff. Training period shall consist of a total of 24 hours of normal working time and shall start after the system is functionally completed but prior to final acceptance. Course instructions shall cover pertinent points involved in operating, starting, stopping, and servicing the equipment, including all major elements of operation and maintenance manual. Course instructions shall demonstrate all routine maintenance operations such as lubrication and general inspection. Contracting Officer shall be given at least 2 weeks advance notice of field training.
3.6 ACCEPTANCE

Final acceptance of crane system will not be given until Contractor has successfully completed all testing operations, corrected all material and equipment defects, made all proper operation adjustments, and removed paint or overspray on wire rope and hook.

-- End of Section --
PART 1  GENERAL

1.1  REFERENCES

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

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)


ASTM A 641  (1992) Zinc-Coated (Galvanized) Carbon Steel Wire

ASTM B 209  (1992a) Aluminum and Aluminum-Alloy Sheet and Plate


ASTM C 795  (1992) Thermal Insulation for Use in Contact With Austenitic Stainless Steel


ASTM E 84  (1991a) Surface Burning Characteristics of Building Materials

FEDERAL SPECIFICATIONS (FS)

FS L-P-535  (Rev E; Notice 2) Plastic Sheet (Sheeting): Plastic Strip: Poly(Vinyl Chloride) and Poly(Vinyl Chloride-Vinyl Acetate), Rigid

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

MSS SP-69  (1991) Pipe Hangers and Supports -
TARGET LAUNCH FACILITIES, PHASE 1, FT WINGATE, NM

Selection and Application

MIDWEST INSULATION CONTRACTORS ASSOCIATION (MICA)

MICA-01 (1993) National Commercial & Industrial Insulation Standards

MILITARY SPECIFICATIONS (MS)

MS MIL-A-24179 (Rev A; Am 2; Notice 1) Adhesive, Flexible Unicellular-Plastic Thermal Insulation

MS MIL-C-19565 (Rev C; Am 1) Coating Compounds, Thermal Insulation, Fire- and Water-Resistant, Vapor-Barrier

MS MIL-C-20079 (Rev H) Cloth, Glass; Tape, Textile Glass; and Thread, Glass and Wire-Reinforced Glass

1.2 SYSTEM DESCRIPTION

Field-applied insulation and accessories on mechanical systems shall be as specified herein; factory-applied insulation is specified under the piping, duct or equipment to be insulated.

1.3 GENERAL QUALITY CONTROL

1.3.1 Standard Products

Materials shall be the standard products of manufacturers regularly engaged in the manufacture of such products and shall essentially duplicate items that have been in satisfactory use for at least 2 years prior to bid opening.

1.3.2 Installer's Qualifications

Qualified installers shall have successfully completed three or more similar type jobs within the last 5 years.

1.3.3 Surface Burning Characteristics

Unless otherwise specified, insulation not covered with a jacket shall have a flame spread rating no higher than 75 and a smoke developed rating no higher than 150. The outside surface of insulation systems which are located in air plenums, in ceiling spaces, and in attic spaces shall have a flame spread rating no higher than 25 and a smoke developed rating no higher than 50. Insulation materials located exterior to the building perimeter are not required to be fire-rated. Flame spread and smoke developed ratings shall be determined by ASTM E 84. Insulation shall be tested in the same density and installed thickness as the material that shall be used in the actual construction. Jackets shall comply with the flame spread and smoke developed ratings required by ASTM C 921.
1.3.4 Identification of Materials

Packages or standard containers of insulation, jacket material, cements, adhesives, and coatings delivered for use, and samples required for approval shall have manufacturer’s stamp or label attached giving the name of the manufacturer and brand, and a description of the material.

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-01 Data

Thermal Insulation Materials; GA.

A complete list of materials, including manufacturer’s descriptive and technical literature, performance data, catalog cuts, and installation instructions. Materials furnished under this section of the specification shall be submitted at one time. A schedule indicating the product number, k-value, thickness and furnished accessories for each mechanical system requiring insulation shall be included.

SD-18 Records

Thermal Insulation Materials; FIO.

Three copies of a booklet indicating the types of insulation by referencing MICA-01, at the jobsite. After approval of materials and prior to insulating any equipment, a booklet shall be prepared and submitted for approval which contains marked-up MICA-01 plates or detail drawings showing the insulation material and insulating system for each type of equipment which is required to be insulated per paragraph EQUIPMENT INSULATION INSTALLATION. The MICA plates shall be marked-up showing the materials to be installed in accordance with the requirements of this specification for the specific insulation application. The Contractor shall submit all MICA Plates required to show the entire insulating system, including Plates required to show insulation penetrations, vessel bottom and top heads, legs, and skirt insulation as applicable. If the Contractor elects to submit detailed drawings instead of marked-up MICA Plates, the detail drawings shall show cut-away, section views, and details indicating each component of the insulation system and showing provisions for insulating jacketing, and sealing portions of the equipment. The drawings shall be labeled with a description of each material type with materials and insulating systems, in accordance with this specification. Each material and insulating system that is used shall be identified by indicating the specification requirement for the material, and the material by each manufacturer that is intended to meet the requirement. Three copies of the booklet shall be submitted at the jobsite to the Contracting Officer. One copy of the approved booklet shall remain with the display sample and two copies shall be provided for Government use.
1.5 STORAGE

Materials shall be delivered in the manufacturer's unopened containers. Materials delivered and placed in storage shall be provided with protection from weather, humidity, dirt, dust and other contaminants by the Contractor. Insulation material and supplies that become dirty, dusty, wet, or otherwise contaminated may be rejected by the Contracting Officer.

PART 2 PRODUCTS

2.1 GENERAL MATERIALS

Materials shall be compatible and shall not contribute to corrosion, soften, or otherwise attack surfaces to which applied in either the wet or dry state. Materials to be used on stainless steel surfaces shall meet ASTM C 795 requirements. Materials shall be asbestos free and conform to the following:

2.1.1 Adhesives

- MS MIL-A-3316, Class 1, Grade B, or Class 2 as specified.

2.1.2 Contact Adhesive

MS MIL-A-24179, Type II, Class 1 or Type III.

2.1.3 Caulking

ASTM C 920, Type S, Grade NS, Class 25, Use A.

2.1.4 Corner Angles

Nominal 0.016 inch aluminum 1 by 1 inch with factory applied kraft backing. Aluminum shall be ASTM B 209, Alloy 3003, 3105, or 5005.

2.1.5 Finishing Cement

Mineral fiber hydraulic-setting thermal insulating cement ASTM C 449.

2.1.6 Glass Tape

MS MIL-C-20079 Type II, Class 1 or 3. Tape shall be 4 inch wide rolls. Class 3 shall be 4.5 ounce/square yard.

2.1.7 Glass Cloth

MS MIL-C-20079, Type I, Class 1, untreated.

2.1.8 Staples

Outward clinching type ASTM A 167, Type 304 or 316 stainless steel.
2.1.9  Jackets

ASTM C 921, Type I, moisture vapor transmission maximum 0.02 perms, puncture resistance minimum 50 Beach units on all surfaces except concealed ductwork, where a minimum puncture resistance of 25 Beach units is allowable, tensile strength minimum 35 pound/inch width; Type II, puncture resistance minimum 25 Beach units, tensile strength minimum 20 pound/inch width. Aluminum jackets shall be corrugated, embossed or smooth sheet, 0.016 inch nominal thickness; ASTM B 209, Temper H14, Temper H16, Alloy 3003, 5005, of 3105 with factory applied moisture barrier. Corrugated aluminum jacket shall not be used outdoors. Aluminum jacket securing bands shall be Type 304 stainless steel, 0.015 inch thick, 1/2 inch wide for pipe under 12 inch diameter and 3/4 inch wide for pipe over 12 inch diameter. Aluminum jacket circumferential seam bands shall be 2 by 0.016 inch aluminum matching jacket material. Bands for insulation belowground shall be 3/4 by 0.020 inch thick stainless steel, or fiberglass reinforced tape. The jacket may, at the option of the Contractor, be provided with a factory fabricated Pittsburg or "Z" type longitudinal joint. When the "Z" joint is used, the bands at the circumferential joints shall be designed by the manufacturer to seal the joints and hold the jacket in place. Polyvinyl chloride (PVC) jacket and fitting covers shall be FS L-P-535, Composition A, Type II, with minimum thickness 0.030 inch. Insulation under PVC jacket shall meet jacket manufacturer's written recommendations.

2.1.10  Vapor Barrier Coating

MS MIL-C-19565, Type II. Color shall be white.

2.1.11  Wire

Soft annealed galvanized wire, ASTM A 641, 16 gauge.

2.2  PIPE INSULATION MATERIALS

Pipe insulation materials shall be as follows:

2.2.1  Aboveground Cold Pipeline

Insulation for minus 30 degrees to Plus 60 degrees F shall be as follows:

2.2.1.1  Flexible Cellular Insulation

ASTM C 534, Type I.

2.2.2  Cellular Glass

ASTM C 552, Type I.
PART 3 EXECUTION

3.1 APPLICATION - GENERAL

3.1.1 Installation

Except as otherwise specified, material shall be installed in accordance with the manufacturer's written instructions. Insulation materials shall not be applied until tests specified in other sections of this specification are completed. Material such as rust, scale, dirt and moisture shall be removed from surfaces to receive insulation. Insulation shall be kept clean and dry. Insulation shall not be removed from its shipping containers until the day it is ready to use and shall be returned to like containers or equally protected from dirt and moisture at the end of each workday. Insulation that becomes dirty shall be thoroughly cleaned prior to use. If insulation becomes wet or if aforementioned cleaning does not restore the surfaces to like new condition, the insulation may be rejected, and if rejected, shall be immediately removed from the jobsite. Joints shall be staggered on multilayer insulation. Mineral fiber thermal insulating cement shall be mixed with demineralized water when used on stainless steel surfaces. Insulation, jacketing and accessories shall be installed in accordance with MICA-01 standard plates except where modified herein or on the drawings.

3.1.2 Painting and Finishing

Painting shall be as specified in Section 09900 PAINTING, GENERAL.

3.1.3 Flexible Cellular Insulation

Flexible cellular insulation shall be installed with seams and joints sealed with a contact adhesive. Flexible cellular insulation shall not be used on surfaces greater than 200 degrees F. Insulation exposed to weather and not shown to have jacketing shall be protected with two coats of UV resistant finish as recommended by the manufacturer after the adhesive is dry.

3.1.4 Welding

No welding shall be done on piping, duct or equipment without written approval of the Contracting Officer. The capacitor discharge welding process may be used for securing metal fasteners to duct.

3.2 PIPE INSULATION INSTALLATION

3.2.1 Pipe Insulation

3.2.1.1 General

Pipe insulation shall be continuous and installed on fittings and appurtenances unless specified otherwise. Installation shall be with full length units of insulation and using a single cut piece to complete a run. Cut pieces or scraps abutting each other shall not be used.
3.2.1.2 Pipes Passing Through Sleeves

a. Pipe insulation shall be continuous through the sleeve.

b. An aluminum jacket with factory applied moisture barrier shall be provided over the insulation wherever penetrations require sealing.

c. Where penetrating interior walls, the aluminum jacket shall extend 2 inches beyond either side of the wall and shall be secured on each end with a band.

d. Where penetrating exterior walls, the aluminum jacket required for pipe exposed to weather shall continue through the sleeve to a point 2 inches beyond the interior surface of the wall.

3.2.1.3 Pipes Passing Through Hangers

a. Insulation, whether hot or cold application, shall be continuous through hangers. Horizontal pipes 2 inches and smaller shall be supported on hangers with the addition of a Type 40 protection shield to protect insulation in accordance with MSS SP-69 without the use of a high density insulation insert.

b. On support points where Type 40 shield conforming to MSS SP-69 are required for a particular pipe attachment application, insulation or an insulation insert of a density at least 9 pcf shall be installed under each shield when:

   (1) the pipe size is 2 inches and larger

   (2) the pipe size is less than 2 inches when the insulation shows signs of being visibly compressed, or when the insulation or jacket shows visible signs of distortion at or near the support shield.

The insert shall cover not less than the bottom 180 degree arc of the pipe. Inserts shall be the same thickness as the insulation, and shall extend 2 inches on each end beyond the protection shield. Inserts are not required with Type 39 pipe saddles.

c. Horizontal pipes larger than 2 inches below 60 degrees F shall be supported on hangers with the addition of a Type 40 protection shield in accordance with MSS SP-69. An insulation insert of cellular glass or calcium silicate shall be installed above each shield. The insert shall cover not less than the bottom 180 degree arc of the pipe. Inserts shall be the same thickness as the insulation, and shall extend 2 inches on each end beyond the protection shield. When insulation inserts are required per the above, and the insulation thickness is less than 1 inch, wooden or cork dowels or blocks may be installed between the pipe and the shield to prevent the weight of the pipe from crushing the insulation as an option to installing insulation inserts. The insulation jacket shall be continuous over the wooden dowel, wooden block, or insulation insert.

d. Vertical pipes shall be supported with either Type 8 or Type 42 riser clamps with the addition of two Type 40 protection shields in accordance with MSS SP-69 covering the 360 degree arc of the
insulation. An insulation insert of cellular glass or calcium silicate shall be installed between each shield and the pipe. The insert shall cover the 360 degree arc of the pipe. Inserts shall be the same thickness as the insulation, and shall extend 2 inches on each end beyond the protection shield. When insulation inserts are required per the above, and the insulation thickness is less than 1 inch, wooden or cork dowels or blocks may be installed between the pipe and the shield to prevent the hanger from crushing the insulation as an option instead of installing insulation inserts. The insulation jacket shall be continuous over the wooden dowel, wooden block, or insulation insert. The verticle weight of the pipe shall be supported with hangers located in a horizontal section of the pipe. When the pipe riser is longer than 30 feet, the weight of the pipe shall be additionally supported hangers in the vertical run of the pipe which are directly clamped to the pipe, penetrating the pipe insulation. These hangers shall be insulated and the insulation jacket sealed as indicated herein for anchors in a similar service.

e. Inserts shall be covered with a jacket material of the same appearance and quality as the adjoining pipe insulation jacket, shall overlap the adjoining pipe jacket 1-1/2 inches, and shall be sealed as required for the pipe jacket. The jacket material used to cover inserts in flexible cellular insulation shall conform to ASTM C 921, Type 1, and is allowed to be of a different material than the adjoining insulation material.

3.2.1.4 Flexible Cellular Pipe Insulation

Flexible cellular pipe insulation shall be tubular form for pipe sizes 5 inches and less. Sweat fittings shall be insulated with miter-cut pieces the same size as on adjacent piping. Screwed fittings shall be insulated with sleeved fitting covers fabricated from miter-cut pieces and shall be overlapped and sealed to the adjacent pipe insulation.

3.2.2 Aboveground Cold Pipelines

The following shall be included for aboveground cold pipelines (minus 30 degrees to Plus 60 degrees F):

a. Refrigerant suction lines.

3.2.3 Insulation Thickness

Thickness of insulation shall be 3/4 inch minimum.

3.2.3.1 Insulation for Straight Runs (Fibrous and Cellular Glass)

a. Insulation shall be applied to the pipe with joints tightly butted. The ends of fibrous insulation shall be sealed off with vapor barrier coating at intervals not to exceed 15 feet.

b. Longitudinal laps of the jacket material shall overlap not less than 1-1/2 inches. Butt strips 3 inches wide shall be provided for circumferential joints.

c. Laps and butt strips shall be secured with adhesive and stapled on
4 inch centers if not factory self-sealing.

d. Factory self-sealing lap systems may be used when the ambient temperature is between 40 degrees and 120 degrees F during installation. The lap system shall be installed in accordance with manufacturer's recommendations. Stapler shall be used only if specifically recommended by the manufacturer. Where gaps occur, the section shall be replaced or the gap repaired by applying adhesive under the lap and then stapling.

e. Staples and seams, including those on self-sealing lap systems with adhesive on one side shall be coated with a vapor barrier coating. Double pressure-sensitive adhesive seams need not be coated.

f. Breaks and punctures in the jacket material shall be patched by wrapping a strip of jacket material around the pipe and securing it with adhesive, stapling, and coated with vapor barrier coating. The patch shall extend not less than 1-1/2 inches past the break.

g. At penetrations such as thermometers, the voids in the insulation shall be filled and sealed with vapor barrier coating.

3.2.3.2 Insulation for Fittings and Accessories

a. Pipe insulation shall have ends thoroughly coated with a vapor barrier coating not more than 6 inches from each flange, union, valve, anchor, or fitting in all directions.

b. Insulation may be premolded or segmented. Insulation of the same thickness and conductivity as the adjoining pipe insulation shall be used. If nesting size insulation is used, the insulation should be overlapped 2 inches or one pipe diameter. Loose fill mineral fiber or insulating cement shall be used to fill the voids. Insulation for elbows less than 3 inch size shall be premolded. Insulation for elbows 3 inch size and larger shall be either premolded or segmented. Elbows insulated using segments shall not have less than 3 segments per elbow. Insulation may be secured by wire or tape until finish is applied.

c. Upon completion of installation of insulation on flanges, unions, valves, anchors, fittings and accessories, terminations and insulation not protected by factory vapor barrier jackets or PVC fitting covers shall be protected with two coats of vapor barrier coating with a minimum total thickness of 1/16th inch, applied with glass tape embedded between coats. Tape seams shall overlap 1 inch. The coating shall extend out onto the adjoining pipe insulation 2 inches.

d. Anchors attached directly to the pipe shall be insulated for a sufficient distance to prevent condensation but not less than 6 inches from the insulation surface.

e. Flexible connections at pumps and other equipment shall be insulated with 1/2 inch flexible cellular insulation, unless otherwise indicated.

f. Insulation shall be marked showing the location of unions, strainers, and check valves.
3.2.4 Piping Exposed to Weather

Piping exposed to weather shall be insulated and jacketed as specified for the applicable service inside the building. After this procedure, an aluminum jacket shall be applied. PVC jacketing requires no factory applied jacket beneath it.

3.2.4.1 Aluminum Jacket

The jacket for hot piping may be factory applied. The jacket shall overlap not less than 2 inches at longitudinal and circumferential joints and shall be secured with bands at not more than 12 inch centers. Longitudinal joints shall be overlapped down to shed water and located at 4 or 8 o’clock positions. Joints on piping 60 degrees F and below shall be sealed with caulking while overlapping to prevent moisture penetration. Where jacketing on piping 60 degrees F and below abuts an uninsulated surface, joints shall be caulked to prevent moisture penetration. Joints on piping above 60 degrees F shall be sealed with a moisture barrier.

3.2.4.2 Insulation for Fittings

Flanges, unions, valves, fittings, and accessories shall be insulated and finished as specified for the applicable service. Two coats of an emulsion type weatherproof mastic recommended by the insulation manufacturer shall be applied with glass tape embedded between coats. Tape overlaps shall be not less than 1 inch and the adjoining aluminum jacket not less than 2 inches. Factory preformed aluminum jackets may be used in lieu of the above. Molded PVC fitting covers shall be used with PVC lagging and adhesive welded moisture tight.

3.2.4.3 PVC Lagging

PVC lagging shall be ultraviolet resistant and adhesive welded vapor tight with manufacturer’s recommended adhesive. Installation shall include provision for thermal expansion.

3.3 DUCT INSULATION INSTALLATION

Only exterior supplier and return ductwork shall be insulated.

3.3.1 Insulation and Vapor Barrier

Insulation for rectangular ducts shall be flexible type where concealed, minimum density 3/4 pcf and rigid type where exposed, minimum density 3 pcf. Insulation for round ducts shall be flexible type, minimum density 3/4 pcf with a factory Type I jacket. Fibrous and cellular glass insulation for exposed ducts shall be provided with either a factory-applied Type I vapor barrier jacket or a vapor barrier coating finish as specified. Fibrous and cellular glass insulation on concealed duct shall be provided with a factory-applied Type I vapor barrier jacket. Vapor barrier coating finish where indicated to be used shall be accomplished by applying two coats of vapor barrier coating with a layer of glass cloth embedded between the coats. The total dry film thickness shall be approximately 1/16 inch. Duct insulation shall be continuous through
sleeves and prepared openings except fire wall penetrations. Duct insulation terminating at fire dampers, shall be continuous over the damper collar and retaining angle of fire dampers, which are exposed to unconditioned air and which may be prone to condensate formation. Duct insulation and vapor barrier shall cover the collar and retaining angles of diffusers, registers and grills. Vapor barrier materials shall be applied to form a complete unbroken vapor seal over the insulation.

3.3.1.1 Installation on Concealed Duct

a. For rectangular, oval or round ducts, insulation shall be attached by applying Class 2 adhesive around the entire perimeter of the duct in 6 inch wide strips on 12 inch centers.

b. For rectangular and oval ducts, 24 inches and larger insulation shall be additionally secured to bottom of ducts by the use of mechanical fasteners. Fasteners shall be spaced on 18 inch centers and not more than 18 inches from duct corners.

c. For rectangular, oval and round ducts, mechanical fasteners shall be provided on sides of duct risers for all duct sizes. Fasteners shall be spaced on 18 inch centers and not more than 18 inches from duct corners.

d. Insulation shall be impaled on the mechanical fasteners where used and shall be pressed thoroughly into the adhesive. Care shall be taken to ensure vapor barrier jacket joints overlap 2 inches. The insulation shall not be compressed to a thickness less than that specified. Insulation shall be carried over standing seams and trapeze-type duct hanger.

e. Self-locking washers shall be installed where mechanical fasteners are used. The pin shall be trimmed back and bent over.

f. Jacket overlaps shall be secured under the overlap with Class 2 adhesive and stapled on 4 inch centers. Staples and seams shall be coated with a brush coat of vapor barrier coating.

g. Breaks in the jacket material shall be covered with patches of the same material as the vapor barrier. The patches shall extend not less than 2 inches beyond the break or penetration in all directions and shall be secured with Class 2 adhesive and staples. Staples and joints shall be sealed with a brush coat of vapor barrier coating.

h. At jacket penetrations such as hangers thermometers and damper operating rods, voids in the insulation shall be filled and the penetration sealed with a brush coat of vapor barrier coating.

i. Insulation terminations and pin punctures shall be sealed and flashed with a reinforced vapor barrier coating finish. The coating shall overlap the adjoining insulation and uninsulated surface 2 inches. Pin puncture coatings shall extend 2 inches from the puncture in all directions.

j. Where insulation standoff brackets occur, insulation shall be extended under the bracket and the jacket terminated at the bracket.
3.3.1.2 Installation on Exposed Duct Work

a. For rectangular ducts, rigid insulation shall be secured to the duct by mechanical fasteners on all four sides of the duct, spaced not more than 12 inches apart and not more than 3 inches from the edges of the insulation joints. A minimum of two rows of fasteners shall be provided for each side of duct 12 inches and larger. One row shall be provided for each side of duct less than 12 inches.

b. Duct insulation shall be formed with minimum jacket seams. Each piece of rigid insulation shall be fastened to the duct using mechanical fasteners. Insulation shall be brought up to standing seams, reinforcing, and other vertical projections and shall not be carried over. Vapor barrier jacket shall be continuous across seams, reinforcing, and projections. When height of projections is greater than the insulation thickness, insulation and jacket shall be carried over.

c. Insulation shall be impaled on the fasteners; self-locking washers shall be installed and the pin trimmed and bent over.

d. Joints in the insulation jacket shall be sealed with a 4 inch wide strip of the same material as the vapor barrier jacket. The strip shall be secured with Class 2 adhesive and stapled. Staples and seams shall be sealed with a brush coat of vapor barrier coating.

e. Breaks and ribs or standing seam penetrations in the jacket material shall be covered with a patch of the same material as the jacket. Patches shall extend not less than 2 inches beyond the break or penetration and shall be secured with Class 2 adhesive and stapled. Staples and joints shall be sealed with a brush coat of vapor barrier coating.

f. At jacket penetrations such as hangers, thermometers, and damper operating rods, the voids in the insulation shall be filled and the penetrations sealed with a brush coat of vapor barrier coating.

g. Insulation terminations and pin punctures shall be sealed and flashed with a reinforced vapor barrier coating finish. The coating shall overlap the adjoining insulation and uninsulated surface 2 inches. Pin puncture coatings shall extend 2 inches from the puncture in all directions.

h. Oval and round ducts, flexible type, shall be insulated with factory Type I jacket insulation with minimum density of 3/4 pcf attached by applying Class 2 adhesive around the entire perimeter of the duct in 6 inch wide stripe on 12 inch centers.

3.3.2 Duct Exposed to Weather

3.3.2.1 Installation

Ducts exposed to weather shall be insulated and finished as specified for the applicable service for exposed duct inside the building. After the above is accomplished, the insulation shall then be further finished. When polyethylene with ultraviolet resistant stabilizers is applied to external duct, it shall be finished with two coats of acrylic latex paint on exposed
surfaces.

3.3.2.2 Round Duct

Aluminum jacket with factory applied moisture barrier shall be applied with the joints lapped not less than 3 inches and secured with bands located at circumferential laps and at not more than 12 inch intervals throughout. Horizontal joints shall lap down to shed water and located at 4 or 8 o'clock position. Joints shall be sealed with caulking to prevent moisture penetration. Where jacketing abuts an uninsulated surface, joints shall be sealed with caulking.

3.3.2.3 Fittings

Fittings and other irregular shapes shall be finished as specified for rectangular ducts.

3.3.2.4 Rectangular Ducts

Two coats of waterproof mastic shall be applied to the entire surface with a layer of glass cloth embedded between coats. Glass cloth overlaps at joints and adjoining surfaces shall be not less than 2 inches. Each coat of waterproof mastic shall be 1/16 inch minimum thickness. The top of the exterior duct work shall be built up with insulation in such a manner as to ensure a positive drain of any rain water which may appear. The minimum pitch of the built up section shall be in accordance with the recommendation of the manufacturer of the vapor barrier/weatherproof mastic. Care should be taken in the construction of the built up section so that no low areas appear; this shall ensure no "pooling" of water on the vapor barrier which leads to premature degradation of the barrier and subsequent deterioration of the insulation.

-- End of Section --
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 SAMA Z236.1 (1983) Liquid-In-Glass Thermometers - General Purpose Laboratory Use

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 47 (1990) Ferritic Malleable Iron Castings
ASTM A 53 (1993) Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless
ASTM A 183 (1983; R 1990) Carbon Steel Track Bolts and Nuts
ASTM A 536 (1984; R 1993) Ductile Iron Castings
ASTM A 733 (1989) Welded and Seamless Carbon Steel and Austenitic Stainless Steel Pipe Nipples
ASTM B 32 (1993) Solder Metal
ASTM B 42 (1993) Seamless Copper Pipe, Standard Sizes
ASTM B 75 (1993) Seamless Copper Tube
ASTM B 88 (1993a) Seamless Copper Water Tube
ASTM B 152 (1992) Copper Sheet, Strip, Plate, and Rolled Bar
ASTM B 306  (1992) Copper Drainage Tube (DWV)
ASTM B 370  (1992) Copper Sheet and Strip for Building Construction
ASTM B 584  (1993a) Copper Alloy Sand Castings for General Applications
ASTM B 641  (1993) Seamless and Welded Copper Distribution Tube (Type D)
ASTM B 813  (1991) Liquid and Paste Fluxes for Soldering Applications of Copper and Copper Alloy Tube
ASTM D 1785  (1993) Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
ASTM D 2000  (1990) Rubber Products in Automotive Applications
ASTM D 2239  (1993) Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter
ASTM D 2447  (1993) Polyethylene (PE) Plastic Pipe, Schedules 40 and 80, Based on Outside Diameter
ASTM D 2661  (1993a) Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and
Vent Pipe and Fittings

ASTM D 2665  

ASTM D 2666  
(1993) Polybutylene (PB) Plastic Tubing

ASTM D 2672  
(1993) Joints for IPS PVC Pipe Using Solvent Cement

ASTM D 2683  
(1993) Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing

ASTM D 2737  
(1993) Polyethylene (PE) Plastic Tubing

ASTM D 2822  
(1991) Asphalt Roof Cement

ASTM D 2846  

ASTM D 2855  

ASTM D 2996  
(1988) Filament-Wound "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe

ASTM D 3000  
(1993) Polybutylene (PB) Plastic Pipe (SDR-PR) Based on Outside Diameter

ASTM D 3035  
(1993) Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Controlled Outside Diameter

ASTM D 3122  

ASTM D 3138  
(1993) Solvent Cements for Transition Joints Between Acrylonitrile-Butadiene-Styrene (ABS) and Poly(Vinyl Chloride) (PVC) Non-pressure Piping Components

ASTM D 3139  

ASTM D 3212  

ASTM D 3261  
ASTM F 439  (1993a) Socket-Type Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80
ASTM F 477  (1993) Elastomeric Seals (Gaskets) for Joining Plastic Pipe
ASTM F 493  (1993a) Solvent Cements for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe and Fittings
ASTM F 891  (1991) Coextruded Poly(Vinyl Chloride (PVC) Plastic Pipe with a Cellular Core

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME A112.6.1M  (1988) Supports for Off-the-Floor Plumbing Fixtures for Public Use
ASME A112.36.2M  (1991) Cleanouts
ASME B1.20.1  (1983; R 1992) Pipe Threads, General Purpose (Inch)
ASME B16.3  (1992) Malleable Iron Threaded Fittings, Classes 150 and 300
TARGET LAUNCH FACILITIES, PHASE 1, FT WINGATE, NM

| ASME B16.15 | (1985) Cast Bronze Threaded Fittings Classes 125 and 250 |
| ASME B16.22 | (1989) Wrought Copper and Copper Alloy Solder Joint Pressure Fittings |
| ASME B16.23 | (1992; Errata Jan 1994) Cast Copper Alloy Solder Joint Drainage Fittings - DWV |
| ASME B16.24 | (1991; Errata) Cast Copper Alloy Pipe Flanges, Class 150, 300, 400, 600, 900, 1500 and 2500, and Flanged Fittings, Class 150 and 300 |
| ASME B16.29 | (1986) Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV |
| ASME B31.1 | (1992; B31.1a; B31.1b) Power Piping |
| ASME B40.1 | (1991) Gauges - Pressure Indicating Dial Type - Elastic Element |
| ASME BPV VIII Div 1 | (1992; Addenda Dec 1992, Dec 1993) Boiler and Pressure Vessel Code; Section VIII, Pressure Vessels Division 1 - Basic Coverage |
| ASME BPV IX | (1992; Addenda Dec 1992, Dec 1993) Boiler and Pressure Vessel Code; Section IX, Welding and Brazing Qualifications |

AMERICAN WATER WORKS ASSOCIATION (AWWA)

| AWWA B300 | (1992) Hypochlorites |
| AWWA B301 | (1992) Liquid Chlorine |
| AWWA C105 | (1988) Polyethylene Encasement for Ductile-Iron Piping for Water and Other Liquids |
| AWWA C606 | (1987) Grooved and Shouldered Joints |

AMERICAN WELDING SOCIETY (AWS)

| AWS A5.8 | (1992) Filler Metals for Brazing and |

SECTION 15400 PAGE 5
TARGET LAUNCH FACILITIES, PHASE 1, FT WINGATE, NM

Braze Welding

CAST IRON SOIL PIPE INSTITUTE (CISPI)

CISPI Std 301  (1990) Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications

FEDERAL SPECIFICATIONS (FS)

FS QQ-B-654  (Rev A; Am 1; Notice 1) Brazing Alloys, Silver

FS TT-P-1536  (Rev A) Plumbing Fixture Setting Compound

FS WW-C-440  (Rev B; Am 2) Clamps, Hose, (Low-Pressure)

FS WW-U-516  (Rev B; Notice 1) Unions, Brass or Bronze, Threaded Pipe Connections and Solder-Joint Tube Connections

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

MSS SP-44  (1991) Steel Pipe Line Flanges


MSS SF-69  (1991) Pipe Hangers and Supports - Selection and Application

MSS SP-83  (1987) Steel Pipe Unions Socket-Welding and Threaded

MILITARY SPECIFICATIONS (MS)

MS MIL-T-27730  (Rev A) Tape, Antiseize, Polytetrafluoroethylene, With Dispenser

NATIONAL ASSOCIATION OF PLUMBING-HEATING-COOLING CONTRACTORS (NAPHCC)


NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)


SECTION 15400  PAGE 6
1.2 STANDARD PRODUCTS

Specified materials and equipment shall be standard products of a manufacturer regularly engaged in the manufacture of such products. Specified equipment shall essentially duplicate equipment that has performed satisfactorily at least two years prior to bid opening.

1.3 PERFORMANCE REQUIREMENTS

1.3.1 Welding

Piping shall be welded in accordance with qualified procedures using performance-qualified welders and welding operators. Procedures and welders shall be qualified in accordance with ASME BPV IX. Welding procedures qualified by others, and welders and welding operators qualified by another employer, may be accepted as permitted by ASME B31.1. The Contracting Officer shall be notified 24 hours in advance of tests, and the tests shall be performed at the work site if practicable. Welders or welding operators shall apply their assigned symbols near each weld they make as a permanent record.

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-01 Data
Welding; FIO.

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

Vibration-Absorbing Features; GA.
Details of vibration-absorbing features, including arrangement, foundation plan, dimensions and specifications.

Color Coding Scheme; GA

SD-04 Drawings

Plumbing System; GA.

Detail drawings consisting of illustrations, schedules, performance charts, instructions, brochures, diagrams, and other information to illustrate the requirements and operations of each system. Detail drawings for the complete plumbing system including piping layouts and locations of connections; dimensions for roughing-in, foundation, and support points; schematic diagrams and wiring diagrams or connection and interconnection diagrams. Detail drawings shall indicate clearances required for maintenance and operation. Where piping and equipment are to be supported other than as indicated, details shall include loadings and proposed support methods. Mechanical drawing plans, elevations, views, and details, shall be drawn to scale.

SD-06 Instructions

Plumbing System; FIO.

Diagrams, instructions, and other sheets proposed for posting. Manufacturer's recommendations for the installation of bell and spigot and hubless joints for cast iron soil pipe.

SD-09 Reports

Tests, Flushing and Sterilization; FIO.

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, completion and testing of the installed system. Each test report shall indicate the final position of controls.

SD-13 Certificates

Materials and Equipment; FIO.

Where materials or equipment are specified to comply with requirements of AGA, or ASME, proof of such compliance. The label or listing of the specified agency will be acceptable evidence. In lieu of the label or listing, a written certificate may be submitted from an approved, nationally recognized testing organization equipped to perform such services, stating that the items have been tested and conform to the requirements and testing methods of the specified agency. Where equipment is specified to conform to requirements of the ASME Boiler and Pressure Vessel Code, the design, fabrication, and installation shall conform to the code.

Bolts; FIO.
Written certification by the bolt manufacturer that the bolts furnished comply with the specified requirements. The certification shall include illustrations of product-required markings, the date of manufacture, and the number of each type of bolt to be furnished based on this certification.

SD-19 Operation and Maintenance Manuals

Plumbing System: FIO.

Three copies of the operation manual outlining the step-by-step procedures required for system startup, operation and shutdown. The manual shall include the manufacturer’s name, model number, service manual, parts list, and brief description of all equipment and their basic operating features. Three copies of the maintenance manual listing routine maintenance procedures, possible breakdowns and repairs. The manual shall include piping and equipment layout and simplified wiring and control diagrams of the system as installed.

1.5 REGULATORY REQUIREMENTS

1.5.1 Plumbing

Plumbing work shall be in accordance with NAPHECC-01, unless otherwise stated and installed in accordance with NAPHC-02.

1.6 PROJECT/SITE CONDITIONS

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

PART 2 PRODUCTS

2.1 MATERIALS

Materials for various services shall be in accordance with TABLES I and II. Pipe schedules shall be selected based on service requirements. Pipe fittings shall be compatible with the applicable pipe materials. Plastic pipe, fittings, and solvent cement shall meet NSF Std 14 and shall be NSF listed for the service intended. Plastic pipe, fittings, and solvent cement used for potable hot and cold water service shall bear the NSF seal "NSF-PW." Polypropylene pipe and fittings shall conform to dimensional requirements of Schedule 40, Iron Pipe size. Pipe threads (except dry seal) shall conform to ASME B1.20.1. Grooved pipe couplings and fittings shall be from the same manufacturer. Material or equipment containing lead shall not be used in any potable water system. Hubless cast-iron soil pipe shall not be installed under concrete floor slabs or in crawl spaces below kitchen floors. Plastic pipe shall not be installed under concrete floor slabs, or in air plenums. Plastic pipe shall not be installed in a pressure piping system in buildings greater than three stories including any basement levels.
2.1.1 Pipe Joint Materials

Grooved pipe shall not be used under ground. Joints and gasket materials shall conform to the following:


c. Couplings for Grooved Pipe: Ductile Iron ASTM A 536 (Grade 65-45-12).

e. Brazing Material: Brazing material shall conform to AWS A5.8, BCuF-5.

f. Brazing Flux: Flux shall be in paste or liquid form appropriate for use with brazing material. Flux shall be as follows: lead-free; have a 100 percent flushable residue; contain slightly acidic reagents; contain potassium borides; and contain fluorides. Silver brazing materials shall be in accordance with FS QQ-B-654.

g. Solder Material: Solder metal shall conform to ASTM B 32 95-5 tin-antimony.

h. Solder Flux: Flux shall be liquid form, non-corrosive, and conform to ASTM B 813, Standard Test 1.

i. PTFE Tape: PTFE Tape, for use with Threaded Metal or Plastic Pipe, MS MIL-T-27730.


2.1.2 Miscellaneous Materials

Miscellaneous materials shall conform to the following:

d. Hose Clamps: FS WW-C-440.
e. Supports for Off-The-Floor Plumbing Fixtures: ASME A12.6.1M.
f. Metallic Cleanout: ASME A12.36.2M.
g. Plumbing Fixture Setting Compound: FS TT-P-1536, Type II.
h. Coal-Tar Protective Coatings and Linings for Steel Water Pipelines: AWWA C203.
i. Hypochlorites: AWWA B300.
j. Liquid Chlorine: AWWA B301.
l. Gauges - Pressure and Vacuum Indicating Dial Type - Elastic Element: ASME B40.1.
m. Thermometers: ANSI SAMA Z236.1.

2.1.3 Pipe Insulation Material

Insulation shall be as specified in Section 15250 THERMAL INSULATION FOR MECHANICAL SYSTEMS.

2.2 PIPE HANERS, INSERTS, AND SUPPORTS

Pipe hangers, inserts, and supports shall conform to MSS SP-58 and MSS SP-69.

2.3 COMPRESSED AIR SYSTEM

2.3.1 Air Compressors

Air compressor unit, oil-free type, shall be a factory-packaged assembly, including 3 phase, 480 volt motor controls, switches, wiring, accessories, and motor controllers, in a NEMA 250, Type I enclosure. Tank-mounted air compressors shall be manufactured to comply with UL listing requirements. Air compressors shall have manufacturer’s name and address, together with trade name, and catalog number on a nameplate securely attached to the equipment. Each compressor shall start and stop automatically, at upper and lower pressure limits of the system. Guards shall shield exposed moving parts. Each duplex compressor system shall be
provided with automatic alternation system. Each compressor motor shall be provided with an across-the-line-type magnetic controller, complete with low-voltage release. An intake air filter and silencer shall be provided with each compressor. Means shall be provided for draining condensed moisture from the receiver by an automatic float type trap. Capacities of air compressors and receivers shall be as indicated.

2.3.2 Air Receivers

Receivers shall be designed for 200 psi working pressure. Receivers shall be factory air tested to 1-1/2 times the working pressure. Receivers shall be equipped with safety relief valves and accessories, including pressure gauges and automatic and manual drains. The outside of air receivers may be galvanized or supplied with commercial enamel finish. Receivers shall be designed and constructed in accordance with ASME BPV VIII Div 1 and shall have the design working pressures specified herein. A display of the ASME seal on the receiver or a certified test report from an approved independent testing laboratory indicating conformance to the ASME Code shall be provided.

2.3.3 Intake Air Supply Filter

Dry type air filter shall be provided having a collection efficiency of 99 percent of particles larger than 10 microns. Filter body and media shall withstand a maximum 125 psi, capacity as indicated.

2.3.4 Pressure Regulators

The air system shall be provided with the necessary regulator valves to maintain the desired pressure for the installed equipment. Regulators shall be designed for a maximum inlet pressure of 125 psi and a maximum temperature of 200 degrees F. Regulators shall be single-seated, pilot-operated with valve plug, bronze body and trim or equal, and threaded connections. The regulator valve shall include a pressure gauge and shall be provided with an adjustment screw for adjusting the pressure differential from 0 to 125 psi. Regulator shall be sized as indicated.

PART 3 EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

Piping located in air plenums shall conform to NFPA 90A requirements. Unprotected plastic pipe shall not be installed in air plenum. Installation of plastic pipe where in compliance with NFPA may be installed in accordance with PPFA-01. The plumbing system shall be installed complete with necessary fixtures, fittings, traps, valves, and accessories. Water and drainage piping shall be extended 5 feet outside the building, unless otherwise indicated. A gate valve and drain shall be installed on the water service line inside the building approximately 6 inches above the floor from point of entry. Piping shall be connected to the exterior service lines or capped or plugged if the exterior service is not in place. Sewer and water pipes shall be laid in separate trenches, except when otherwise shown. Exterior underground utilities shall be at least 12 inches below the finish grade or as indicated on the drawings. If trenches are closed or the pipes are otherwise covered before being connected to the
service lines, the location of the end of each plumbing utility shall be marked with a stake or other acceptable means. Valves shall be installed with control no lower than the valve body.

3.1.1 Water Pipe, Fittings, and Connections

3.1.1.1 Utilities

The piping shall be extended to fixtures, outlets, and equipment. The hot-water and cold-water piping system shall be arranged and installed to permit draining. The supply line to each item of equipment or fixture, except faucets, flush valves, or other control valves which are supplied with integral stops, shall be equipped with a shut-off valve to enable isolation of the item for repair and maintenance without interfering with operation of other equipment or fixtures. Supply piping to fixtures, faucets, hydrants, shower heads, and flushing devices shall be anchored to prevent movement.

3.1.1.2 Cutting and Repairing

The work shall be carefully laid out in advance, and unnecessary cutting of construction shall be avoided. Damage to building, piping, wiring, or equipment as a result of cutting shall be repaired by mechanics skilled in the trade involved.

3.1.1.3 Protection of Fixtures, Materials, and Equipment

Pipe openings shall be closed with caps or plugs during installation. Fixtures and equipment shall be tightly covered and protected against dirt, water, chemicals, and mechanical injury. Upon completion of the work, the fixtures, materials, and equipment shall be thoroughly cleaned, adjusted, and operated. Safety guards shall be provided for exposed rotating equipment.

3.1.1.4 Mains, Branches, and Runouts

Piping shall be installed as indicated. Pipe shall be accurately cut and worked into place without springing or forcing. Structural portions of the building shall not be weakened. Aboveground piping shall run parallel with the lines of the building, unless otherwise indicated. Branch pipes from service lines may be taken from top, bottom, or side of main, using crossover fittings required by structural or installation conditions. Supply pipes, valves, and fittings shall be kept a sufficient distance from other work and other services to permit not less than 1/2 inch between finished covering on the different services. Bare and insulated water lines shall not bear directly against building structural elements so as to transmit sound to the structure or to prevent flexible movement of the lines. Water pipe shall not be buried in or under floors. Changes in pipe sizes shall be made with reducing fittings. Use of bushings will not be permitted except for use in situations in which standard factory fabricated components are furnished to accommodate specific excepted installation practice. Change in direction shall be made with fittings, except that bending of pipe 4 inches and smaller will be permitted, provided a pipe bender is used and wide sweep bends are formed. The center-line radius of bends shall be not less than six diameters of the

SECTION 15400 PAGE 13
pipe. Bent pipe showing kinks, wrinkles, flattening, or other malformations will not be acceptable.

3.1.1.5 Pipe Drains

Pipe drains indicated shall consist of 3/4 inch hose bibb with renewable seat and ball valve ahead of hose bibb. At other low points, 3/4 inch brass plugs or caps shall be provided. Disconnection of the supply piping at the fixture is an acceptable drain.

3.1.1.6 Expansion and Contraction of Piping

Allowance shall be made throughout for expansion and contraction of water pipe. Each hot-water and hot-water circulation riser shall have expansion loops or other provisions such as offsets, changes in direction, etc., where indicated and/or required. Risers shall be securely anchored as required or where indicated to force expansion to loops. Branch connections from risers shall be made with ample swing or offset to avoid undue strain on fittings or short pipe lengths. Horizontal runs of pipe over 50 feet in length shall be anchored to the wall or the supporting construction about midway on the run to force expansion, evenly divided, toward the ends. Sufficient flexibility shall be provided on branch runouts from mains and risers to provide for expansion and contraction of piping. Flexibility shall be provided by installing one or more turns in the line so that piping will spring enough to allow for expansion without straining. If mechanical grooved pipe coupling systems are provided, the deviation from design requirements for expansion and contraction may be allowed pending approval of Contracting Officer.

3.1.2 Compressed Air Piping (Non-Oil Free)

Compressed air piping shall be installed as specified for water piping and suitable for 125 psig working pressure. Compressed air piping shall have supply lines and discharge terminals legibly and permanently marked at both ends with the name of the system and the direction of flow.

3.1.3 Joints

Installation of pipe and fittings shall be made in accordance with the manufacturer's recommendations. Mitering of joints for elbows and notching of straight runs of pipe for tees will not be permitted. Joints shall be made up with fittings of compatible material and made for the specific purpose intended.

3.1.3.1 Threaded

Threaded joints shall have American Standard taper pipe threads conforming to ASME B1.20.1. Only male pipe threads shall be coated with graphite or with an approved graphite compound, or with an inert filler and oil, or shall have a polytetrafluoroethylene tape applied.

3.1.3.2 Union and Flanged

Unions, flanges and mechanical couplings shall not be concealed in walls, ceilings, or partitions. Unions shall be used on pipe sizes 2-1/2
3.1.4 Pipe Sleeves and Flashing

Pipe sleeves shall be furnished and set in their proper and permanent location.

3.1.4.1 Sleeve Requirements

Pipes passing through concrete or masonry walls or concrete floors or roofs shall be provided with pipe sleeves fitted into place at the time of construction. Sleeves are not required for cast-iron soil pipe passing through concrete slab on grade, except where penetrating a membrane waterproof floor. A modular mechanical type sealing assembly may be installed in lieu of a waterproofing clamping flange and caulking and sealing of annular space between pipe and sleeve. The seals shall consist of interlocking synthetic rubber links shaped to continuously fill the annular space between the pipe and sleeve with corrosion-protected carbon steel bolts, nuts, and pressure plates. The links shall be loosely assembled with bolts to form a continuous rubber belt around the pipe with a pressure plate under each bolt head and each nut. After the seal assembly is properly positioned in the sleeve, tightening of the bolt shall cause the rubber sealing elements to expand and provide a watertight seal between the pipe and the sleeve. Each seal assembly shall be sized as recommended by the manufacturer to fit the pipe and sleeve involved. Sleeves shall not be installed in structural members, except where indicated or approved. Rectangular and square openings shall be as detailed. Each sleeve shall extend through its respective floor, or roof, and shall be cut flush with each surface, except for special circumstances. Pipe sleeves passing through floors in wet areas such as mechanical equipment rooms, lavatories, kitchens, and other plumbing fixture areas shall extend a minimum of 4 inches above the finished floor. Unless otherwise indicated, sleeves shall be of a size to provide a minimum of 1/4 inch clearance between bare pipe and inside of sleeve or between jacket over insulation and sleeves. Sleeves in bearing walls shall be steel pipe or cast-iron pipe. Sleeves for membrane waterproof floors shall be steel pipe, cast-iron pipe, or plastic pipe. Membrane clamping devices shall be provided on pipe sleeves for waterproof floors. Sleeves in nonbearing walls or ceilings may be steel pipe, cast-iron pipe, galvanized sheet metal with lock-type longitudinal seam, or moisture-resistant fiber or plastic. Plastic sleeves shall not be used in nonbearing fire walls, roofs, or floor/ceilings. Except as otherwise specified, the annular space between pipe and sleeve, or between jacket over insulation and sleeve, shall be sealed as indicated with sealants conforming to ASTM C 920 and with a primer, backstop material and surface preparation as specified in Section 07920 JOINT SEALING. Pipes passing through sleeves in concrete floors over crawl spaces shall be sealed as specified above. The annular space between pipe and sleeve or between jacket over insulation and sleeve shall not be sealed for interior walls which are not designated as fire rated. Sleeves through below-grade walls in contact with earth shall be recessed 1/2 inch from wall surfaces on both sides. Annular space between pipe and sleeve shall be filled with backing material and sealants in the joint between the pipe and concrete wall as specified above. Sealant selected for the earth side of the wall shall be compatible with dampproofing/waterproofing.
materials that are to be applied over the joint sealant.

3.1.4.2 Flashing Requirements

Pipes passing through roof or floor waterproofing membrane shall be installed through a 16 ounce copper flashing, each within an integral skirt or flange. Flashing shall be suitably formed, and the skirt or flange shall extend not less than 8 inches from the pipe and shall be set over the roof or floor membrane in a solid coating of bituminous cement. The flashing shall extend up the pipe a minimum of 10 inches. For cleanouts, the flashing shall be turned down into the hub and caulked after placing the ferrule. Pipes passing through pitched roofs shall be flashed, using lead or copper flashing, with an adjustable integral flange of adequate size to extend not less than 8 inches from the pipe in all directions and lapped into the roofing to provide a watertight seal. The annular space between the flashing and the bare pipe or between the flashing and the metal-jacket-covered insulation shall be sealed as indicated. Flashing for dry vents shall be turned down into the pipe to form a waterproof joint. Pipes, up to and including 10 inches in diameter, passing through roof or floor waterproofing membrane may be installed through a cast-iron sleeve with caulking recess, anchor lugs, flashing-clamp device, and pressure ring with brass bolts. Flashing shield shall be fitted into the sleeve clamping device. Pipes passing through wall waterproofing membrane shall be sleeved as described above. A waterproofing clamping flange shall be installed.

3.1.4.3 Waterproofing

Waterproofing at floor-mounted water closets shall be accomplished by forming a flashing guard from soft-tempered sheet copper. The center of the sheet shall be perforated and turned down approximately 1-1/2 inches to fit between the outside diameter of the drainpipe and the inside diameter of the cast-iron or steel pipe sleeve. The turned-down portion of the flashing guard shall be embedded in sealant to a depth of approximately 1-1/2 inches; then the sealant shall be finished off flush to floor level between the flashing guard and drainpipe. The flashing guard of sheet copper shall extend not less than 8 inches from the drainpipe and shall be lapped between the floor membrane in a solid coating of bituminous cement. If cast-iron water closet floor flanges are used, the space between the pipe sleeve and drainpipe shall be sealed with sealant and the flashing guard shall be upturned approximately 1-1/2 inches to fit the outside diameter of the drainpipe and the inside diameter of the water closet floor flange. The upturned portion of the sheet fitted into the floor flange shall be sealed.

3.1.4.4 Optional Counterflashings

Instead of turning the flashing down into a dry vent pipe, or caulking and sealing the annular space between the pipe and flashing or metal-jacket-covered insulation and flashing, counterflashings may be accomplished by utilizing the following:

a. A standard roof coupling for threaded pipe up to 6 inches in diameter.
b. A tack-welded or banded-metal rain shield around the pipe.

3.1.4.5 Pipe Penetrations of Slab on Grade Floors

Where pipes, fixture drains, floor drains, cleanouts or similar items penetrate slab on grade floors, except at penetrations of floors with waterproofing, membrane as specified in paragraphs Flashing Requirements and Waterproofing, a groove 1/4 to 1/2 inch wide by 1/4 to 3/8 inch deep shall be formed around the pipe, fitting or drain. The groove shall be filled with a sealant as specified in Section 07920 JOINT SEALING.

3.1.5 Supports

3.1.5.1 General

Hangers used to support piping 2 inches and larger shall be fabricated to permit adequate adjustment after erection while still supporting the load. Pipe guides and anchors shall be installed to keep pipes in accurate alignment, to direct the expansion movement, and to prevent buckling, swaying, and undue strain. Piping subjected to vertical movement when operating temperatures exceed ambient temperatures shall be supported by variable spring hangers and supports or by constant support hangers. In the support of multiple pipe runs on a common base member, a clip or clamp shall be used where each pipe crosses the base support member. Spacing of the base support members shall not exceed the hanger and support spacing required for an individual pipe in the multiple pipe run.

3.1.5.2 Pipe Hangers, Inserts, and Supports

Installation of pipe hangers, inserts and supports shall conform to MSS SP-58 and MSS SP-69, except as modified herein.

a. Types 5, 12, and 26 shall not be used.

b. Type 3 shall not be used on insulated pipe.

c. Type 18 inserts shall be secured to concrete forms before concrete is placed. Continuous inserts which allow more adjustment may be used if they otherwise meet the requirements for type 18 inserts.

d. Type 19 and 23 C-clamps shall be torqued per MSS SP-69 and shall have both locknuts and retaining devices furnished by the manufacturer. Field-fabricated C-clamp bodies or retaining devices are not acceptable.

e. Type 20 attachments used on angles and channels shall be furnished with an added malleable-iron heel plate or adapter.

f. Type 24 may be used only on trapeze hanger systems or on fabricated frames.

g. Type 39 saddles shall be used on insulated pipe 4 inches and larger when the temperature of the medium is 60 degrees F or higher. Type 39 saddles shall be welded to the pipe.
h. Type 40 shields shall:

(1) be used on insulated pipe less than 4 inches.

(2) be used on insulated pipe 4 inches and larger when the temperature of the medium is 60 degrees F or less.

(3) have a high density insert for pipe 2 inches and larger and for smaller pipe sizes when the insulation is suspected of being visibly compressed, or distorted at or near the shield/insulation interface. High density inserts shall have a density of 8 pcf or greater.

i. Horizontal pipe supports shall be spaced as specified in MSS SP-69 and a support shall be installed not over 1 foot from the pipe fitting joint at each change in direction of the piping. Pipe supports shall be spaced not over 5 feet apart at valves. Operating temperatures in determining hanger spacing for PVC or CPVC pipe shall be 120 degrees F for PVC and 180 degrees F for CPVC. Horizontal pipe runs shall include allowances for expansion and contraction.

j. Vertical pipe shall be supported at each floor, except at slab-on-grade, at intervals of not more than 15 feet nor more than 8 feet from end of risers, and at vent terminations. Vertical pipe risers shall include allowances for expansion and contraction.

k. Type 40 shields used on insulated pipe shall have high density inserts with a density of 8 pcf or greater.

l. Type 35 guides using steel, reinforced polytetrafluoroethylene (PTFE) or graphite slides shall be provided to allow longitudinal pipe movement. Slide materials shall be suitable for the system operating temperatures, atmospheric conditions, and bearing loads encountered. Lateral restraints shall be provided as needed. Where steel slides do not require provisions for lateral restraint the following may be used:

(1) On pipe 4 inches and larger when the temperature of the medium is 60 degrees F or higher, a Type 39 saddle, welded to the pipe, may freely rest on a steel plate.

(2) On pipe less than 4 inches a Type 40 shield, attached to the pipe or insulation, may freely rest on a steel plate.

(3) On pipe 4 inches and larger carrying medium less that 60 degrees F a Type 40 shield, attached to the pipe or insulation, may freely rest on a steel plate.

m. Pipe hangers on horizontal insulated pipe shall be the size of the outside diameter of the insulation. The insulation shall be continuous through the hanger on all pipe sizes and applications.

n. Where there are high system temperatures and welding to piping is not desirable, the type 35 guide shall include a pipe cradle, welded to the guide structure and strapped securely to the pipe. The pipe shall be separated from the slide material by at least 4 inches or by an amount adequate for the insulation, whichever is greater.
3.1.6 Pipe Cleanouts

Pipe cleanouts shall be the same size as the pipe except that cleanout plugs larger than 4 inches will not be required. A cleanout installed in connection with cast-iron soil pipe shall consist of a long-sweep 1/4 bend or one or two 1/8 bends extended to the place shown. An extra-heavy cast-brass or cast-iron ferrule with countersunk cast-brass head screw plug shall be caulked into the hub of the fitting and shall be flush with the floor. Cleanouts in connection with other pipe, where indicated, shall be T-pattern, 90-degree branch drainage fittings with cast-brass screw plugs, except plastic plugs shall be installed in plastic pipe. Plugs shall be the same size as the pipe up to and including 4 inches. Cleanout tee branches with screw plug shall be installed at the foot of soil and waste stacks, at the foot of interior downspouts, on each connection to building storm drain where interior downspouts are indicated, and on each building drain outside the building. Cleanout tee branches may be omitted on stacks in single story buildings with slab-on-grade construction or where less than 18 inches of crawl space is provided under the floor. Cleanouts on pipe concealed in partitions shall be provided with chromium plated bronze, nickel bronze, nickel brass or stainless steel flush type access cover plates. Round access covers shall be provided and secured to plugs with securing screw. Square access covers may be provided with matching frames, anchoring lugs and cover screws. Cleanouts in finished walls shall have access covers and frames installed flush with the finished wall. Cleanouts installed in finished floors subject to foot traffic shall be provided with a chrome-plated cast brass, nickel brass, or nickel bronze cover secured to the plug or cover frame and set flush with the finished floor. Heads of fastening screws shall not project above the cover surface. Where cleanouts are provided with adjustable heads, the heads shall be cast iron.

3.2 VIBRATION-ABSORBING FEATURES

Mechanical equipment, including compressors and pumps, shall be isolated from the building structure by approved vibration-absorbing features, unless otherwise shown. Each foundation shall include an adequate number of standard isolation units. Each unit shall consist of machine and floor or foundation fastening, together with intermediate isolation material, and shall be a standard product with printed load rating. Piping connected to mechanical equipment shall be provided with flexible connectors.

3.2.1 Tank- or Skid-Mounted Compressors

Floor attachment shall be as recommended by compressor manufacturer.

3.2.2 Foundation-Mounted Compressors

Foundation attachment shall be as recommended by the compressor manufacturer.
3.3 ESCUTCHEONS

Escutcheons shall be provided at finished surfaces where bare or insulated piping, exposed to view, passes through floors, walls, or ceilings, except in boiler, utility, or equipment rooms. Escutcheons shall be fastened securely to pipe or pipe covering and shall be satin-finish, corrosion-resisting steel, polished chromium-plated zinc alloy, or polished chromium-plated copper alloy. Escutcheons shall be either one-piece or split-pattern, held in place by internal spring tension or setscrew.

3.4 PAINTING

Painting of pipes, hangers, supports, and other iron work, either in concealed spaces or exposed spaces, is specified in Section 09900 PAINTING, GENERAL.

3.5 TESTS, FLUSHING, AND STERILIZATION

3.5.1 Plumbing System

The plumbing system shall be tested in accordance with NAPHCC-01.

3.5.1.1 Compressed Air Piping (Nonoil-Free)

Piping systems shall be filled with oil-free dry air or gaseous nitrogen to 150 psig and hold this pressure for 2 hours with no drop in pressure.

3.5.2 Defective Work

If inspection or test shows defects, such defective work or material shall be replaced or repaired as necessary and inspection and tests shall be repeated. Repairs to piping shall be made with new materials. Caulking of screwed joints or holes will not be permitted.

3.5.3 Operational Test

Upon completion of and prior to acceptance of the installation, the Contractor shall subject the plumbing system to operating tests to demonstrate satisfactory functional and operational efficiency. Such operating tests shall cover a period of not less than 8 hours for each system and shall include the following information in a report with conclusion as to the adequacy of the system:

a. Time, date, and duration of test.

b. Water pressures at the most remote and the highest fixtures.

c. Operation of each fixture and fixture trim.

d. Operation of each valve, hydrant, and faucet.

e. Pump suction and discharge pressures.

f. Temperature of each domestic hot-water supply.
g. Operation of each floor and roof drain by flooding with water.

h. Operation of each vacuum breaker and backflow preventer.

i. Complete operation of each water pressure booster system, including pump start pressure and stop pressure.

j. Compressed air readings at each compressor and at each outlet. Each indicating instrument shall be read at 1/2 hour intervals. The report of the test shall be submitted in quadruplicate. The Contractor shall furnish instruments, equipment, and personnel required for the tests; the Government will furnish the necessary water and electricity.

3.6 POSTED INSTRUCTIONS

Framed instructions under glass or in laminated plastic, including wiring and control diagrams showing the complete layout of the entire system, shall be posted where directed. Condensed operating instructions explaining preventive maintenance procedures, methods of checking the system for normal safe operation, and procedures for safely starting and stopping the system shall be prepared in typed form, framed as specified above for the wiring and control diagrams and posted beside the diagrams. The framed instructions shall be posted before acceptance testing of the systems.

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Pipe and Fitting Materials</th>
<th>A</th>
<th>B</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Cast iron soil pipe and fittings, hub and spigot, ASTM A 74 with compression gaskets</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>2</td>
<td>Cast iron pipe and fittings hubless, CISP1 Std 301 and ASTM A 888</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>3</td>
<td>Cast iron drainage fittings, threaded, ASME B16.12 for use with Item 10</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Cast iron screwed fittings (threaded) ASME B16.4 for use with Item 10</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>5</td>
<td>Grooved pipe couplings, ferrous and non-ferrous pipe ASTM A 536 and ASTM A 47</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>6</td>
<td>Ductile iron grooved joint fittings for ferrous pipe ASTM A 536 and ASTM A 47 for use with Item 5</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

TABLE I
PIPE AND FITTING MATERIALS FOR DRAINAGE, WASTE, AND VENT PIPING SYSTEMS

SERVICE
### TABLE I

**PIPE AND FITTING MATERIALS FOR DRAINAGE, WASTE, AND VENT PIPING SYSTEMS**

<table>
<thead>
<tr>
<th>Item No.</th>
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</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>Bronze sand casting grooved joint pressure fittings for non-ferrous pipe ASTM B 584, for use with Item 5</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>8</td>
<td>Wrought copper grooved joint pressure fittings for non-ferrous pipe ASTM B 75 C12200, ASTM B 152 C11000, ASME B16.22 ASME B16.22 for use with Item 5</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Malleable-iron threaded fittings, galvanized ASME B16.3 for use with Item 10</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>10</td>
<td>Steel pipe, seamless galvanized, ASTM A 53, Type S, Grade B</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Seamless red brass pipe, ASTM B 43</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>12</td>
<td>Bronzed flanged fittings, ASME B16.24 for use with Items 11 and 14</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>13</td>
<td>Cast copper alloy solder joint pressure fittings, ASME B16.18 for use with Item 14</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>14</td>
<td>Seamless copper pipe, ASTM B 42</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>15</td>
<td>Cast bronze threaded fittings, ASME B16.15</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>16</td>
<td>Copper drainage tube, (DWV), ASTM B 306</td>
<td>X*</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>17</td>
<td>Wrought copper and wrought alloy solder-joint drainage fittings, ASME B16.29</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td>18</td>
<td>Cast copper alloy solder joint drainage fittings, DWV, ASME B16.23</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td>19</td>
<td>Acrylonitrile-Butadiene-Styrene (ABS) plastic drain, waste, and vent pipe</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>
### TABLE I
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<th>C</th>
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</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>Polyvinyl Chloride plastic drain, waste and vent pipe and fittings, ASTM D 2665, ASTM F 891, (Sch 40)</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
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<tr>
<td>21</td>
<td>High-silicon content cast iron pipe and fittings (hub and spigot, and mechanical joint), ASTM A 518</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

**SERVICE:**

A - Underground Building Soil, Waste and Storm Drain  
B - Aboveground Soil, Waste, Drain In Buildings  
D - Aboveground Vent  
* - Hard Temper

### TABLE II
**PIPE AND FITTING MATERIALS FOR PRESSURE PIPING SYSTEMS**

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Pipe and Fitting Materials</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
</table>
| 1        | Malleable-iron threaded fittings,  
  a. Galvanized, ASME B16.3 for use with Item 4a | X | X | X | X |
|          | b. Same as "a" but not galvanized for use with Item 4b |   |   |   | X |
| 2        | Grooved pipe couplings, ferrous pipe,  
  ASTM A 536 and ASTM A 47,  
  non-ferrous pipe, ASTM A 536 and  
  ASTM A 47 | X | X |   |   |
| 3        | Ductile iron grooved joint fittings for ferrous pipe ASTM A 536 and  
  ASTM A 47 for use with Item 2 | X | X |   |   |
| 4        | Steel pipe:                                                                               | X | X | X | X |
## TABLE II
### PIPE AND FITTING MATERIALS FOR PRESSURE PIPING SYSTEMS

<table>
<thead>
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<tbody>
<tr>
<td>5</td>
<td>Seamless red brass pipe, ASTM B 43</td>
<td>X</td>
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<tr>
<td>6</td>
<td>Bronze flanged fittings, ASME B16.24 for use with Items 4 and 6</td>
<td>X</td>
</tr>
<tr>
<td>7</td>
<td>Seamless copper pipe, ASTM B 42</td>
<td>X</td>
</tr>
<tr>
<td>8</td>
<td>Seamless copper water tube, ASTM B 88</td>
<td>X**</td>
</tr>
<tr>
<td>9</td>
<td>Seamless and welded copper distribution tube (Type D) ASTM B 641</td>
<td>X**</td>
</tr>
<tr>
<td>10</td>
<td>Cast bronze threaded fittings, ASME B16.15 for use with Items 7 and 8</td>
<td>X</td>
</tr>
<tr>
<td>11</td>
<td>Wrought copper and bronze solder-joint pressure fittings, ASME B16.22 for use with Items 7 and 8</td>
<td>X</td>
</tr>
<tr>
<td>12</td>
<td>Cast copper alloy solder-joint pressure fittings, ASME B16.18 for use with Items 7 and 8</td>
<td>X</td>
</tr>
<tr>
<td>13</td>
<td>Bronze and sand castings grooved joint pressure fittings for non-ferrous pipe ASTM B 584, for use with Item 2</td>
<td>X</td>
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<tr>
<td>14</td>
<td>Polyethylene (PE) plastic pipe, Schedules 40 and 80, based on outside diameter ASTM D 2447</td>
<td>X</td>
</tr>
<tr>
<td>15</td>
<td>Polyethylene (PE) plastic pipe (SDR-PR), based on controlled outside diameter, ASTM D 3035</td>
<td>X</td>
</tr>
<tr>
<td>16</td>
<td>Polyethylene (PE) plastic pipe (SIDR-PR), based on controlled inside diameter, ASTM D 2239</td>
<td>X</td>
</tr>
</tbody>
</table>
## TABLE II
### PIPE AND FITTING MATERIALS FOR PRESSURE PIPING SYSTEMS

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Pipe and Fitting Materials</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>17</td>
<td>Butt fusion polyethylene (PE) plastic pipe fittings, ASTM D 3261 for use with Items 12, 13, and 16</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Socket-type polyethylene fittings for outside diameter-controlled polyethylene pipe, ASTM D 2683 for use with Item 13</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Polyethylene (PE) plastic tubing, ASTM D 2737</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Polybutylene (PB) plastic hot and cold water pipe and fittings, ASTM D 3309</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>Polybutylene (PB) plastic pipe (SDR-PR) based on outside diameter, ASTM D 3000</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>Polybutylene (PB) plastic tubing, ASTM D 2666</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>Chlorinated polyvinyl chloride (CPVC) plastic hot and cold water distribution system, ASTM D 2846</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>Chlorinated polyvinyl chloride (CPVC) plastic pipe, Schedule 40 and 80, ASTM F 441</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>Chlorinated polyvinyl chloride (CPVC) plastic pipe (SDR-PR) ASTM F 442</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>Threaded chlorinated polyvinyl chloride (CPVC) plastic pipe fittings, Schedule 80, ASTM F 437, for use with Items 23, 23, and 24</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>Socket-type chlorinated polyvinyl chloride (CPVC) plastic pipe fittings, Schedule 40, ASTM F 438 for use with Items 21, 22, and 23</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
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<tr>
<td>28</td>
<td>Socket-type chlorinated polyvinyl chloride (CPVC) plastic pipe fittings</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## TABLE II
### PIPE AND FITTING MATERIALS FOR PRESSURE PIPING SYSTEMS

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Pipe and Fitting Materials</th>
<th>Service</th>
</tr>
</thead>
<tbody>
<tr>
<td>29</td>
<td>Polyvinyl chloride (PVC) plastic pipe, Schedules 40, 80, and 120, ASTM D 1785</td>
<td>A X</td>
</tr>
<tr>
<td>30</td>
<td>Polyvinyl chloride (PVC) pressure-rated pipe (SDR Series), ASTM D 2241</td>
<td>A X</td>
</tr>
<tr>
<td>31</td>
<td>Polyvinyl chloride (PVC) plastic pipe fittings, Schedule 40, ASTM D 2466</td>
<td>A X</td>
</tr>
<tr>
<td>32</td>
<td>Socket-type polyvinyl chloride (PVC) plastic pipe fittings, schedule 80, ASTM D 2467</td>
<td>A X</td>
</tr>
<tr>
<td>33</td>
<td>Threaded polyvinyl chloride (PVC) plastic pipe fittings, schedule 80, ASTM D 2464</td>
<td>A X</td>
</tr>
<tr>
<td>34</td>
<td>Joints for IPS pvs pipe using solvent cement, ASTM D 2672</td>
<td>A X</td>
</tr>
<tr>
<td>35</td>
<td>Filament-wound reinforced thermosetting resin (RTRP) pipe, ASTM D 2996</td>
<td>A X</td>
</tr>
<tr>
<td>36</td>
<td>Steel pipeline flanges, MSS SP-44</td>
<td>A X</td>
</tr>
<tr>
<td>37</td>
<td>Unions: brass or bronze, FS WW-U-516</td>
<td>A X</td>
</tr>
<tr>
<td>38</td>
<td>Carbon steel pipe unions, socket-welding and threaded, MSS SP-83</td>
<td>A X X</td>
</tr>
<tr>
<td>39</td>
<td>Malleable-iron threaded pipe unions, ASME B16.39</td>
<td>A X</td>
</tr>
<tr>
<td>40</td>
<td>Nipples, pipe threaded ASTM A 733</td>
<td>A X X</td>
</tr>
</tbody>
</table>

**Service Codes:**

- **A - Cold Water Aboveground**
- **B - Hot Water 80 degrees F Maximum Aboveground**
- **C - Compressed Air Lubricated**
- **D - Cold Water Service Belowground**
TARGET LAUNCH FACILITIES, PHASE 1, FT WINGATE, NM

Indicated types are minimum wall thicknesses.

** - Type L - Hard

*** - Type K - Hard temper with brazed joints only or type K-soft temper without joints in or under floors

**** - In or under slab floors only brazed joints

-- End of Section --
TARGET LAUNCH FACILITIES; PHASE 1, FT WINGATE, NM

SECTION 15653

AIR-CONDITIONING SYSTEM (UNITARY TYPE)

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.

AIR CONDITIONING AND REFRIGERATION INSTITUTE (ARI)


AIR DIFFUSION COUNCIL (ADC)

ADC 1062:GRD (1984) Test Codes for Grilles, Registers and Diffusers

AIR MOVEMENT AND CONTROL ASSOCIATION (AMCA)

AMCA 500 (1989) Test Methods for Louvers, Dampers and Shutters

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 53 (1993) Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless

ASTM A 307 (1993a) Carbon Steel Bolts and Studs, 60 000 psi Tensile Strength

ASTM A 525 (1993) General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process


ASTM B 280 (1993a) Seamless Copper Tube for Air Conditioning and Refrigeration Field Service

ASTM C 1071 (1991) Thermal and Acoustical Insulation (Glass Fiber, Duct Lining Material)
TARGET LAUNCH FACILITIES, PHASE 1, FT WINGATE, NM


AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS (ASHRAE)


AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME B31.1 (1992; B31.1a; B31.1b) Power Piping

ASME B31.5 (1992; B31.5a) Refrigeration Piping

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

ASME BPV VIII Div 1 (1992; Addenda Dec 1992, Dec 1993) Boiler and Pressure Vessel Code; Section VIII, Pressure Vessels Division 1 - Basic Coverage

ASME BPV IX (1992; Addenda Dec 1992, Dec 1993) Boiler and Pressure Vessel Code; Section IX, Welding and Brazing Qualifications

AMERICAN WELDING SOCIETY (AWS)


AWS D1.1 (1994) Structural Welding Code - Steel

COMMERCIAL ITEM DESCRIPTIONS (CID)

CID A-A-50502 (Basic) Air Conditioner, (Unitary Heat Pump), Air to Air (3,000 to 300,000 BTU)

FEDERAL SPECIFICATIONS (FS)

FS BB-F-1421 (Rev B) Fluorocarbon Refrigerants

FS QQ-B-654 (Rev A; Am 1; Notice 1) Brazing Alloys, Silver

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


SECTION 15653 PAGE 2
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MSS SP-69 (1991) Pipe Hangers and Supports - Selection and Application

MILITARY SPECIFICATIONS (MS)

MS MIL-P-21035 (Rev B) Paint, High Zinc Dust Content, Galvanizing Repair (Metric)

MS MIL-T-27730 (Rev A) Tape, Antiseize, Polytetrafluorethylene, with Dispenser

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA MG 1 (1993) Motors and Generators


NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 90A (1993) Installation of Air Conditioning and Ventilating Systems

SHEET METAL AND AIR CONDITIONING CONTRACTORS NATIONAL ASSOCIATION (SMACNA)

SMACNA-06 (1985) HVAC Duct Construction Standards - Metal and Flexible

SMACNA-10 (1985) HVAC Air Duct Leakage Test Manual

UNDERWRITERS LABORATORIES (UL)


UL-03 (1993; Supple) Electrical Construction Materials Directory

UL 181 (1990; Rev Nov 1990) Factory-Made Air Ducts and Air Connectors

UL 214 (1993) Tests for Flame-Propagation of Fabrics and Films


1.2 SUBMITTALS

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

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TARGET LAUNCH FACILITIES, PHASE 1, FT WINGATE, NM

SD-01 Data

Heat Pump System; GA.

Manufacturer's standard catalog data, prior to the purchase or installation of a particular component, shall be highlighted to show brand name, model number, size, options, performance charts and curves, etc. in sufficient detail to demonstrate compliance with contract requirements. Data shall be submitted for each specified component. Data shall include manufacturer's recommended installation instructions and procedures. If vibration isolation is specified for a unit, vibration isolator literature shall be included containing catalog cuts and certification that the isolation characteristics of the isolators provided meet the manufacturer's recommendations.

Spare Parts Data; FIO.

Spare parts data for each different item of equipment specified, after approval of detail drawings and not later than 1 month prior to the date of beneficial occupancy. The data shall include a complete list of parts and supplies, with current unit prices and source of supply, a recommended spare parts list for 1 year of operation, and a list of the parts recommended by the manufacturer to be replaced on a routine basis.

SD-04 Drawings

Heat Pump System; GA.

Drawings shall provide adequate detail to demonstrate compliance with contract requirements. Drawings shall consist of:

(1) Equipment layouts which identify assembly and installation details.

(2) Piping layouts which identify valves and fittings.

(3) Plans and elevations which identify clearances required for maintenance and operation.

(4) Wiring diagrams which identify each component individually and interconnected or interlocked relationships between components.

(5) Foundation drawings, bolt-setting information, and foundation bolts prior to concrete foundation construction for equipment indicated or required to have concrete foundations.

(6) Details, if piping and equipment are to be supported other than as indicated, which include loadings and type of frames, brackets, stanchions, or other supports.

(7) Automatic temperature control diagrams and control sequences.

(8) Installation details which includes the amount of factory set superheat and corresponding refrigerant pressure/temperature.
SD-06 Instructions

Framed Instructions; FIO.

Framed instructions for posting, at least 2 weeks prior to construction completion.

SD-07 Schedules

Tests; FIO.

A letter, at least 10 working days in advance of each test, advising the Contracting Officer of the test. Individual letters shall be submitted for the condenser water system, refrigerant system, ductwork leak tests, cooling tower tests, condenser water quality tests, and the system performance tests. Each letter shall identify the date, time, and location for each test.

Demonstrations; GA.

A letter, at least 14 working days prior to the date of the proposed training course, which identifies the date, time, and location for the training.

SD-08 Statements

Qualifications; FIO.

A letter listing the qualifying procedures for each welder. The letter shall include supporting data such as test procedures used, what was tested etc., and a list of the names of qualified welders and their identification symbols.

Verification of Dimensions; FIO.

A letter, at least 2 weeks prior to beginning construction, including the date the site was visited, conformation of existing conditions, and any discrepancies found.

SD-09 Reports

Tests; FIO.

Six copies of each test containing the information described below in bound 8-1/2 by 11 inch booklets. Individual reports shall be submitted for the condenser water system, refrigerant system, ductwork leak tests, and the cooling tower tests.

(1) The date the tests were performed.
(2) A list of equipment used, with calibration certifications.
(3) Initial test summaries.
(4) Repairs/adjustments performed.
Final test results.

System Performance Tests; FIO.

Six copies of the report shall be provided in bound 8-1/2 by 11 inch booklets. The report shall document compliance with the specified performance criteria upon completion and testing of the system. The report shall indicate the number of days covered by the tests and any conclusions as to the adequacy of the system. The report shall also include the following information and shall be taken at least three different times at outside dry-bulb temperatures that are at least 5 degrees F apart:

1. Date and outside weather conditions.
2. The load on the system based on the following:
   a. The refrigerant used in the system.
   b. Condensing temperature and pressure.
   c. Suction temperature and pressure.
   d. Ambient, condensing and coolant temperatures
   e. Running current, voltage and proper phase sequence for each phase of all motors.
3. The actual on-site setting of operating and safety controls.
4. Thermostatic expansion valve superheat - value as determined by field test
5. Subcooling
6. High and low refrigerant temperature switch set-points
7. Low oil pressure switch set-point
8. Defrost system timer and thermostat set-points
9. Moisture content
10. Capacity control set-points
11. Field data and adjustments which affect unit performance and energy consumption.
12. Field adjustments and settings which were not permanently marked as an integral part of a device.

Inspections; FIO.

Test report, at the completion of one year of service, in bound 8-1/2 by 11 inch booklets. The report shall identify the condition of the cooling tower and condenser. The report shall also include a comparison of the condition of the cooling tower and condenser with the manufacturer's recommended operating conditions.

SD-13 Certificates

Where the system, components, or equipment are specified to comply with requirements of ARI, ASHRAE, ASME, or UL, proof of such compliance shall be provided. The label or listing of the specified agency shall be acceptable evidence. In lieu of the label or listing, a written certificate from an approved, nationally recognized testing organization equipped to perform such services, stating that the items have been tested and conform to the requirements and testing methods of the specified agency may be submitted. When performance requirements of this project’s drawings and specifications vary from standard ARI rating conditions, computer printouts, catalog, or other application data certified by ARI or a nationally recognized laboratory as described above shall be included. If ARI does not have a current certification program that encompasses such application data, the manufacturer may self certify that his application data complies with project performance requirements in accordance with the specified test standards.

Service Organizations; F10.

A certified list of qualified permanent service organizations for support of the equipment which includes their addresses and qualifications. The service organizations shall be reasonably convenient to the equipment installation and be able to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.

SD-19 Operation and Maintenance Manuals

Operation Manual; F10.

Six complete copies of an operation manual in bound 8-1/2 by 11 inch booklets listing step-by-step procedures required for system startup, operation, and shutdown. The booklets shall include the manufacturer’s name, model number, and parts list. The manuals shall include the manufacturer’s name, model number, service manual, and a brief description of all equipment and their basic operating features.

Maintenance Manual; F10.

Six complete copies of maintenance manual in bound 8-1/2 by 11 inch booklets listing routine maintenance procedures, possible breakdowns and repairs, and a trouble shooting guide. The manuals shall include piping and equipment layouts and simplified wiring and control diagrams of the system as installed.

1.3 QUALIFICATIONS

Piping shall be welded in accordance with the qualified procedures using performance qualified welders and welding operators. Procedures and welders shall be qualified in accordance with ASME BPV IX. Welding procedures qualified by others, and welders and welding operators qualified by another employer may be accepted as permitted by ASME B31.1. The Contracting Officer shall be notified 24 hours in advance of tests and the tests shall be performed at the work site if practical. The welder or
welding operator shall apply his assigned symbol near each weld he makes as a permanent record. Structural members shall be welded in accordance with AWS D1.1.

1.4 DELIVERY, STORAGE, AND HANDLING

Stored items shall be protected from the weather and contamination. Proper protection and care of all material before, during, and after installation shall be the Contractor's responsibility. Any materials found to be damaged shall be replaced at the Contractor's expense. During installation, piping and similar openings shall be capped to keep out dirt and other foreign matter.

1.5 PROJECT/SITE CONDITIONS

1.5.1 Verification of Dimensions

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

1.5.2 Drawings

Because of the small scale of the drawings, it is not possible to indicate all offsets, fittings, and accessories that may be required. The Contractor shall carefully investigate the plumbing, fire protection, electrical, structural and finish conditions that would affect the work to be performed and arrange such work accordingly, furnishing required offsets, fittings, and accessories to meet such conditions. Equipment, ductwork, and piping arrangements shall fit into space allotted and allow adequate acceptable clearances for installation, replacement, entry, servicing, and maintenance.

PART 2 PRODUCTS

2.1 STANDARD PRODUCTS

Materials and equipment shall be standard products of a manufacturer regularly engaged in the manufacturing of such products, which are of a similar material, design and workmanship. The standard products shall have been in satisfactory commercial or industrial use for 2 years prior to bid opening. The 2 year use shall include applications of equipment and materials under similar circumstances and of similar size. The 2 years experience shall be satisfactorily completed by a product which has been sold or is offered for sale on the commercial market through advertisements, manufacturer's catalogs, or brochures. Products having less than a 2 year field service record shall be acceptable if a certified record of satisfactory field operation, for not less than 6000 hours exclusive of the manufacturer's factory tests, can be shown. Products shall be supported by a service organization. System components shall be environmentally suitable for the indicated locations.
2.2 NAMEPLATES

Major equipment including compressors, condensers, receivers, heat exchanges, fans, cooling towers, pumps and motors 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. Plates shall be durable and legible throughout equipment life and made of anodized aluminum. Plates shall be fixed in prominent locations with nonferrous screws or bolts.

2.3 ELECTRICAL WORK

Electrical equipment, motors, motor efficiencies, and wiring shall be in accordance with Section 16415 ELECTRICAL WORK, INTERIOR. Electrical motor driven equipment specified shall be provided complete with motors, motor starters, and controls. Electrical characteristics shall be as shown, and unless otherwise indicated, all motors of 1 horsepower and above with open, dripproof, totally enclosed, or explosion proof fan cooled enclosures, shall be high efficiency type. Field wiring shall be in accordance with manufacturer's instructions. Each motor shall conform to NEMA MG 1 and NEMA MG 2 and be of sufficient size to drive the equipment at the specified capacity without exceeding the nameplate rating of the motor. Motors shall be continuous duty with the enclosure specified. Motor starters shall be provided complete with thermal overload protection and other appurtenances necessary for the motor control indicated. Motors shall be furnished with a magnetic across-the-line or reduced voltage type starter as required by the manufacturer. Motor duty requirements shall allow for maximum frequency start-stop operation and minimum encountered interval between start and stop. Motors shall be sized for the applicable loads. Motor torque shall be capable of accelerating the connected load within 20 seconds with 80 percent of the rated voltage maintained at motor terminals during one starting period. Motor bearings shall be fitted with grease supply fittings and grease relief to outside of enclosure. Manual or automatic control and protective or signal devices required for the operation specified and any control wiring required for controls and devices specified, but not shown, shall be provided.

2.4 MISCELLANEOUS MATERIALS

2.4.1 Gaskets

Gaskets shall conform to ASTM F 104 - classification for compressed sheet with nitrile binder and acrylic fibers for maximum 700 degrees F service.

2.4.2 Bolts and Nuts

Bolts and nuts, except as required for piping applications, shall be in accordance with ASTM A 307. The bolt head shall be marked to identify the manufacturer and the standard with which the bolt complies in accordance with ASTM A 307.
2.4.3 Pipe Hangers, Inserts, and Supports

Pipe hangers, inserts, and supports shall conform to MSS SP-58 and MSS SP-69.

2.4.4 Escutcheons

Escutcheons shall be chromium-plated iron or chromium-plated brass, either one piece or split pattern, held in place by internal spring tension or set screws.

2.4.5 Pressure and Vacuum Gauge

Gauge shall conform to ASME B40.1, Class 1, 2, or 3, Style X, Type I or III as required, 4-1/2 inches in diameter with phenolic or metal case. Each gauge range shall be selected so that at normal operating pressure, the needle is within the middle-third of the range.

2.5 SELF-CONTAINED UNITARY HEAT PUMP

Unit shall be a single, blow-through or draw-through, weatherproof packaged unit or indoor unit with a remote condenser where indicated. Unit shall also be provided with equipment as specified in paragraph "System Components". Evaporator or supply fans shall be double-width, double inlet, forward curved, backward inclined, or airfoil blade, centrifugal scroll type. Motors shall have explosion proof enclosures where indicated. Condenser fans shall be manufacturer's standard for the unit specified and may be either propeller or centrifugal scroll type. Remote unit shall be as specified in Paragraph "REMOTE CONDENSING UNIT."

2.5.1 Heat Pump Unit

Unit shall be in accordance with UL 1995 and CID A-A-50502. Unit with capacities less than 135,000 Btuh shall conform to ARI 210/240 and produce a Seasonal Energy Efficiency Ratio (SEER) of 9.7 for the cooling mode and a Heating Seasonal Performance Factor (HSPF) of 6.6 for the heating mode. Unit with capacities 135,000 Btuh or greater shall conform to ARI 340 and produce an Energy Efficiency Ratio (EER) of 8.9 an Integrated Part Load Valve (IPLV) of 7.5 for the cooling mode and a Coefficient of Performance (COP) of 3.0 for the heating mode.

2.5.2 Integral Air Coils

Evaporator and condenser coils shall have copper or aluminum tubes of 3/8 inch minimum diameter with copper or aluminum fins that are mechanically bonded or soldered to the tubes. Casing shall be galvanized steel or aluminum. Contact of dissimilar metals shall be avoided. Coils shall be tested in accordance with ASHRAE 15 at the factory and be suitable for the working pressure of the installed system. Each coil shall be dehydrated and sealed after testing and prior to evaluation and charging. Each unit shall be provided with a factory operating charge of refrigerant and oil or a holding charge. Unit shipped with a holding charge shall be field charged. Separate expansion devices shall be provided for each compressor circuit.
2.5.3 Integral Compressor

Compressor shall be direct drive, semi-hermetic or hermetic reciprocating, or scroll type capable of operating at partial load conditions. Compressor shall be capable of continuous operation down to the lowest step of unloading as specified. Compressors of 10 tons and larger shall be provided with capacity reduction devices to produce automatic capacity reduction of at least 50 percent. If standard with the manufacturer, two or more compressors may be used in lieu of a single compressor with unloading capabilities, in which case the compressors shall operate in sequence, and each compressor shall have an independent refrigeration circuit through the condenser and evaporator. Compressors shall start in the unloaded position. Each compressor shall be provided with vibration isolators, crankcase heater, thermal overloads, high and low pressure safety cutoffs and protection against short cycling.

2.5.4 Refrigeration Circuit

Refrigerant containing components shall comply with ASHRAE 15 and be factory tested, cleaned, dehydrated, charged, and sealed. Refrigerant charging valves and connections, and pumpdown valves shall be provided for each circuit. Refrigerant flow control devices shall be an adjustable superheat thermostatic expansion valve with external equalizer matched to coil, capillary or thermostatic control, and a pilot solenoid controlled, leak-tight, four-way refrigerant flow reversing valve.

2.5.5 Unit Controls

Unit shall be internally wired with a 24 volt control circuit powered by an internal transformer. Terminal blocks shall be provided for power wiring and external control wiring. Unit shall have cutoffs for high and low pressure, and low oil pressure for compressors with positive displacement oil pumps. Head pressure controls shall sustain unit operation with ambient temperature of 21 degrees F. Adjustable-cycle timers shall prevent short-cycling. Multiple compressors shall be staged by means of a time delay. Unit shall be internally protected by fuses or a circuit breaker in accordance with UL 1995. Low cost cooling shall be made possible by means of a control circuit which will modulate dampers to provide 100 percent outside air while locking out compressors.

2.6 REMOTE CONDENSING UNIT

Each remote condenser coil shall be fitted with a manual isolation valve and an access valve on the coil side. Saturated refrigerant condensing temperature shall not exceed 120 degrees F at 95 degrees F ambient. Unit shall be provided with low ambient condenser controls to ensure proper operation in an ambient temperature of 45 degrees F. Fan and cabinet construction shall be provided as specified in paragraph "System Components". Fan and condenser motors shall have totally enclosed enclosures.

2.6.1 Air-Cooled Condenser

Unit shall be rated in accordance with ARI 460 and conform to the requirements of UL 1995. Unit shall be factory fabricated, tested,
packaged, and self-contained. Unit shall be complete with casing, propeller or centrifugal type fans, heat rejection coils, connecting piping and wiring, and all necessary appurtenances.

2.7 SYSTEM COMPONENTS

2.7.1 Refrigerant and Oil

Refrigerant shall be one of the fluorocarbon gases that is in accordance with FS BB-F-1421 and has an Ozone Depletion Potential (ODP) of less than or equal to 0.05. Contractor shall provide and install a complete charge of refrigerant for the installed system as recommended by the manufacturer. Except for factory sealed units, two complete charges of lubricating oil for each compressor crankcase shall be furnished. One charge shall be used during the system performance testing period. Following the satisfactory completion of the performance testing, the oil shall be drained and replaced with a second charge. Lubricating oil shall be of a type and grade recommended by the manufacturer for each compressor. Where color leak indicator dye is incorporated, charge shall be in accordance with manufacturer’s recommendation.

2.7.2 Fans

Fan wheel shafts shall be supported by either maintenance-accessible lubricated antifriction block-type bearings, or permanently lubricated ball bearings. Unit fans shall be selected to produce the cfm required at the fan total pressure. Motor starters, if applicable, shall be magnetic across-the-line type with a explosion proof enclosure. Thermal overload protection shall be of the manual or automatic-reset type. Fan wheels or propellers shall be constructed of aluminum or galvanized steel. Centrifugal fan wheel housings shall be of galvanized steel, and both centrifugal and propeller fan casings shall be constructed of aluminum or galvanized steel. Steel elements of fans, except fan shafts, shall be hot-dipped galvanized after fabrication or fabricated of mill galvanized steel. Mill-galvanized steel surfaces and edges damaged or cut during fabrication by forming, punching, drilling, welding, or cutting shall be recoated with an approved zinc-rich compound. Fan wheels or propellers shall be statically and dynamically balanced. Direct-drive fan motors shall be of the multiple-speed variety. Belt-driven fans shall have adjustable sheaves. The sheave size shall be selected so that the fan speed at the approximate midpoint of the sheave adjustment will produce the specified air quantity. Centrifugal scroll-type fans shall be provided with streamlined orifice inlet and V-belt drive. Each drive will be independent of any other drive. Propeller fans shall be direct-drive drive type with fixed pitch blades. V-belt driven fans shall be mounted on a corrosion protected drive shaft supported by either maintenance-accessible lubricated antifriction block-type bearings, or permanently lubricated ball bearings. Each drive will be independent of any other drive. Drive bearings shall be protected with water slingers or shields. V-belt drives shall be fitted with guards where exposed to contact by personnel.
2.7.2.1 Extended Surface Pleated Panel Filters

Filters shall be 2 inch depth sectional type of the size indicated and shall have an average efficiency of 25 to 30 percent when tested in accordance with ASHRAE 52.1. Initial resistance at 500 feet per minute will not exceed 0.36 inches water gauge. Filters shall be UL Class 2. Media shall be nonwoven cotton and synthetic fiber mat. A wire support grid bonded to the media shall be attached to a moisture resistant fiberboard frame. Four edges of the filter media shall be bonded to the inside of the frame to prevent air bypass and increase rigidity.

2.7.3 Internal Dampers

Dampers shall be parallel blade type with renewable blade seals and be integral to the unitary unit. Damper provisions shall be provided for each outside air intake, exhaust, economizer, and mixing boxes. Dampers shall be linked together and operate as specified.

2.7.4 Cabinet Construction

Casings for the specified unitary equipment shall be constructed of galvanized steel or aluminum sheet metal and galvanized or aluminum structural members. Minimum thickness of single wall exterior surfaces shall be 18 gauge galvanized steel or .071 inch thick aluminum on units with a capacity above 20 tons and 20 gauge galvanized steel or .064 inch thick aluminum on units with a capacity less than 20 tons. Casing shall be fitted with lifting provisions, access panels or doors, fan vibration isolators, electrical control panel, corrosion-resistant components, structural support members, insulated condensate drip pan and drain, and internal insulation in the cold section of the casing. Where double-wall insulated construction is proposed, minimum exterior galvanized sheet metal thickness shall be 20 gauge. Provisions to permit replacement of major unit components shall be incorporated. Penetrations of cabinet surfaces, including the floor, shall be sealed. Unit shall be fitted with a drain pan which extends under all areas where water may accumulate. Drain pan shall be fabricated from Type 300 stainless steel, galvanized steel with protective coating as required, or an approved plastic material. Pan insulation shall be water impervious. Extent and effectiveness of the insulation of unit air containment surfaces shall prevent, within limits of the specified insulation, heat transfer between the unit exterior and ambient air, heat transfer between the two conditioned air streams, and condensation on surfaces. Insulation shall conform to ASTM C 1071. Paint and finishes shall comply with the requirements specified in paragraph "Factory Coating".

2.7.4.1 Outdoor Cabinet

Outdoor cabinets shall be suitable for outdoor service with a weathertight, insulated and corrosion-protected structure. Cabinets constructed exclusively for indoor service which have been modified for outdoor service are not acceptable.
2.8 INSULATION

2.8.1 Field Installed Insulation

Field installed insulation shall be as specified in Section 15250 THERMAL INSULATION FOR MECHANICAL SYSTEM.

2.8.2 Factory Installed Insulation

Factory applied insulation shall be as specified for the equipment to be insulated except that refrigerant suction lines shall be insulated with unicellular plastic foam. Insulation shall comply with the fire hazard rating specified in Section 15250 THERMAL INSULATION FOR MECHANICAL SYSTEM.

2.9 TEMPERATURE CONTROLS

Temperature controls shall be fully coordinated with and integrated into the existing air-conditioning system.

2.10 DUCTWORK COMPONENTS

2.10.1 Metal Ductwork

Every aspect of metal ductwork construction, including fittings and components, shall comply with SMACNA-06 unless otherwise specified. Elbows shall be radius type with a centerline radius of 1-1/2 times the width or diameter of the duct where space permits. Otherwise, elbows having a minimum radius equal to the width or diameter of the duct or square elbows with factory fabricated turning vanes may be used. Static pressure Class 1/2, 1, and 2 inch w.g. ductwork shall meet the requirements of Seal Class C. Class 3 through 10 inch shall meet the requirements of Seal Class A. Sealants shall conform to fire hazard classification specified in Section 15250 THERMAL INSULATION FOR MECHANICAL SYSTEMS. Pressure sensitive tape shall not be used as a sealant. Spiral lock seam duct, and flat oval shall be made with duct sealant and locked with not less than 3 equally spaced drive screws or other approved methods indicated in SMACNA-06. The sealant shall be applied to the exposed male part of the fitting collar so that the sealer will be on the inside of the joint and fully protected by the metal of the duct fitting. One brush coat of the sealant shall be applied over the outside of the joint to at least 2 inch band width covering all screw heads and joint gap. Dents in the male portion of the slip fitting collar will not be acceptable.

2.10.1.1 Transitions

Diverging air flow transitions shall be made with each side pitched out a maximum of 15 degrees, for an included angle of 30 degrees. Transitions for converging air flow shall be made with each side pitched in a maximum of 30 degrees, for an included angle of 60 degrees, or shall be as indicated. Factory-fabricated reducing fittings for systems using round duct sections when formed to the shape of the ASME short flow nozzle, need not comply with the maximum angles specified.
2.10.1.2 Insulated Nonmetallic Flexible Duct Runouts

Flexible duct runouts shall be used only where indicated. Runouts shall not exceed 10 feet in length, shall be preinsulated, factory fabricated, and comply with NFPA 90A and UL 181. Either field or factory applied vapor barrier shall be provided. Where coil induction or high velocity units are supplied with vertical air inlets, a streamlined and vaned and mitered elbow transition piece shall be provided for connection to the flexible duct or hose. The last elbow to these units, other than the vertical air inlet type, shall be a die-stamped elbow and not a flexible connector. Insulated flexible connectors may be used as runouts. The insulation material surface shall not be exposed to the air stream.

2.10.1.3 General Service Duct Connectors

A flexible duct connector approximately 6 inches in width shall be provided where sheet metal connections are made to fans or where ducts of dissimilar metals are connected. For round/oval ducts, the flexible material shall be secured by stainless steel or zinc-coated, iron clinch-type draw bands. For rectangular ducts, the flexible material locked to metal collars shall be installed using normal duct construction methods. The composite connector system shall comply with UL 214 and be classified as "flame-retarded fabrics" in UL-01.

2.10.2 Ductwork Insulation

Ductwork insulation and related materials shall conform to the requirements of Section 15250 THERMAL INSULATION FOR MECHANICAL SYSTEMS.

2.10.3 Ductwork Accessories

2.10.3.1 Duct Access Doors

Access doors shall be provided in ductwork where indicated and at all air flow measuring devices, automatic dampers, fire dampers, coils, thermostats, and other apparatus requiring service and inspection in the duct system, and unless otherwise shown, shall conform to SMACNA-06. Access doors shall be provided upstream and downstream of air flow measuring primaries and heating and cooling coils. Doors shall be minimum 15 by 18 inches, unless otherwise shown. Where duct size will not accommodate this size door, the doors shall be made as large as practicable. Doors 24 by 24 inches or larger shall be provided with fasteners operable from both sides. Doors in insulated ducts shall be the insulated type.

2.10.3.2 Splitters and Manual Balancing Dampers

Splitters and manual balancing dampers shall be furnished with accessible operating mechanisms. Where operators occur in finished portions of the building, operators shall be chromium plated with all exposed edges rounded. Splitters shall be operated by quadrant operators or 3/16 inch rod brought through the side of the duct with locking setscrew and bushing. Two rods are required on splitters over 8 inches. Manual volume control dampers shall be operated by locking-type quadrant operators. Dampers and splitters shall be 2 gauges heavier than the duct in which installed.
Unless otherwise indicated, multileaf dampers shall be opposed blade type with maximum blade width of 12 inches. Access doors or panels shall be provided for all concealed damper operators and locking setscrews. Unless otherwise indicated, the locking-type quadrant operators for dampers, when installed on ducts to be thermally insulated, shall be provided with stand-off mounting brackets, bases, or adapters to provide clearance between the duct surface and the operator not less than the thickness of the insulation. Stand-off mounting items shall be integral with the operator or standard accessory of the damper manufacturer. Volume dampers shall be provided where indicated.

2.10.3.3 Air Deflectors and Branch Connections

Air deflectors shall be provided at all duct mounted supply outlets, at all takeoff or extension collars to supply outlets, at all duct branch takeoff connections, and at all 90 degree elbows, as well as at all locations as indicated on the drawings or shown in the Sheet Metal and Air Contractors National Association manuals. Air deflectors, except those installed in 90 degree elbows, shall be provided with an approved means of adjustment. Adjustment shall be made from easily accessible means inside the duct or from an adjustment with sturdy lock on the face of the duct. When installed on ducts to be thermally insulated, external adjustments shall be provided with stand-off mounting brackets, integral with the adjustment device, to provide clearance between the duct surface and the adjustment device not less than the thickness of the thermal insulation. Air deflectors shall be factory-fabricated units consisting of curved turning vanes or louver blades designed to provide uniform air distribution and change of direction with minimum turbulence or pressure loss. Air deflectors shall be factory or field assembled. Blade air deflectors, also called blade air extractors, shall be approved factory fabricated units consisting of equalizing grid and adjustable blade and lock. Adjustment shall be easily made from the face of the diffuser or by position adjustment and lock external to the duct. Stand-off brackets shall be provided on insulated ducts and are described herein before. Fixed air deflectors, also called turning vanes, shall be provided in all 90 degree elbows. Turning vanes shall be designed as shown in the Sheet Metal and Air Condition Contractors National Association manuals.

2.10.4 Duct Sleeves, Framed Prepared Openings, Closure Collars

2.10.4.1 Duct Sleeves

Duct sleeves shall be provided for all round ducts 15 inches in diameter or less passing through floors, walls, ceilings, or roof, and installed during construction of the floor, wall, ceiling, or roof. Round ducts larger than 15 inches in diameter and all square, rectangular, and oval ducts passing through floors, walls, ceilings, or roof shall be installed through framed prepared openings. The Contractor shall be responsible for the proper size and location of sleeves and prepared openings. Sleeves and framed openings are also required where grilles, registers, and diffusers are installed at the openings. Framed prepared openings shall be fabricated from 20 gauge galvanized steel, unless otherwise indicated. Where sleeves are installed in bearing walls or partitions, black steel pipe, ASTM A 53, Schedule 20 shall be used. Sleeve shall provide 1 inch clearance between the duct and the sleeve or 1 inch clearance between the insulation and the sleeve for
2.10.4.2 Framed Prepared Openings

Openings shall have 1 inch clearance between the duct and the opening or 1 inch clearance between the insulation and the opening for insulated ducts.

2.10.4.3 Closure Collars

Collars shall be fabricated of galvanized sheet metal not less than 4 inches wide, unless otherwise indicated, and shall be installed on exposed ducts on each side of walls or floors where sleeves or prepared openings are provided. Collars shall be installed tight against surfaces. Collars shall fit snugly around the duct or insulation. Sharp edges of the collar around insulated duct shall be ground smooth to preclude tearing or puncturing the insulation covering or vapor barrier. Collars for round ducts 15 inches in diameter or less shall be fabricated from 20 gauge galvanized steel. Collars for round ducts larger than 15 inches and all square, and rectangular ducts shall be fabricated from 18 gauge galvanized steel. Collars shall be installed with fasteners on maximum 6 inch centers, except that not less than 4 fasteners shall be used.

2.10.5 Diffusers, Registers, and Grilles

Units shall be factory-fabricated of steel, corrosion-resistant steel, or aluminum and shall distribute the specified quantity of air evenly over space intended without causing noticeable drafts, air movement faster than 50 fpm in occupied zone, or dead spots anywhere in the conditioned area. Outlets for diffusion, spread, throw, and noise level shall be as required for specified performance. Performance shall be certified in accordance with ADC 1062:GRD. Inlets and outlets shall be sound rated and certified in accordance with ADC 1062:GRD. Sound power level shall be as indicated. Diffusers and registers shall be provided with volume damper with accessible operator, unless otherwise indicated; or if standard with the manufacturer, an automatically controlled device will be acceptable. Volume dampers shall be opposed blade type for all diffusers and registers, except linear slot diffusers. Linear slot diffusers shall be provided with round or elliptical balancing dampers. Where the inlet and outlet openings are located less than 7 feet above the floor, they shall be protected by a grille or screen in accordance with NFPA 90A.

2.10.5.1 Diffusers

Diffuser types shall be as indicated. Ceiling mounted units shall be furnished with antismudge devices, unless the diffuser unit minimizes ceiling smudging through design features. Diffusers shall be provided with air deflectors of the type indicated. Air handling troffers or combination light and ceiling diffusers shall conform to the requirements of UL-03 for the interchangeable use as cooled or heated air supply diffusers or return air units. Ceiling mounted units shall be installed with rims tight against ceiling. Sponge rubber gaskets shall be provided between ceiling and surface mounted diffusers for air leakage control. Suitable trim shall be provided for flush mounted diffusers. Duct collar connecting the duct to diffuser shall be airtight and shall not interfere with volume
controller. Return or exhaust units shall be similar to supply diffusers.

2.10.5.2 Registers and Grilles

Units shall be four-way directional-control type, except that return and exhaust registers may be fixed horizontal or vertical louver type similar in appearance to the supply register face. Registers shall be provided with sponge-rubber gasket between flanges and wall or ceiling. Wall supply registers shall be installed at least 6 inches below the ceiling unless otherwise indicated. Return and exhaust registers shall be located 6 inches above the floor unless otherwise indicated. Four-way directional control may be achieved by a grille face which can be rotated in 4 positions or by adjustment of horizontal and vertical vanes. Grilles shall be as specified for registers, without volume control damper.

2.10.6 Louvers

Louvers shall be furnished for installation in exterior walls which are directly connected by ductwork to air handling equipment. Louver blades shall be fabricated from anodized aluminum or galvanized steel sheets, and shall be provided with a frame of galvanized steel or aluminum structural shapes. Sheet metal thickness and fabrication shall conform to SMACNA-06. Blades shall be accurately fitted and secured to frames. Edges of louver blades shall be folded or beaded for rigidity and baffled to exclude driving rain. Louver shall be provided with bird screen. Louvers shall bear AMCA Certified Ratings Seal for air performance and water penetration ratings as described in AMCA 500.

2.10.7 Copper Tubing

Copper tubing shall conform to ASTM B 280 annealed or hard drawn as required. Copper tubing shall be soft annealed where bending is required and hard drawn where no bending is required. Soft annealed copper tubing shall not be used in sizes larger than 1-3/8 inches. Joints shall be brazed except that joints on lines 7/8 inch and smaller may be flared.

2.10.8 Joints and Fittings, Copper Tubing

Copper tube joints and fittings shall be flare joint type with short-shank flare, or solder-joint pressure type. Joints and fittings for brazed joint shall be wrought-copper or forged-brass sweat fittings. Cast sweat-type joints and fittings shall not be allowed for brazed joints.

2.10.9 Brazing Materials

Brazing materials for refrigerant piping shall be in accordance with FS QQ-B-654, Classification BCuP-5.

2.11 DRAIN AND MISCELLANEOUS PIPING

Piping, fittings, valves and accessories for drain and miscellaneous services shall be in accordance with Section 15400 PLUMBING, GENERAL PURPOSE.
2.12 FABRICATION

2.12.1 Factory Coating

Unless otherwise specified, equipment and component items, when fabricated from ferrous metal, shall be factory finished with the manufacturer's standard finish, except that items located outside of buildings shall have weather resistant finishes that will withstand 125 hours exposure to the salt spray test specified in ASTM B 117 using a 25 percent sodium chloride solution. Immediately after completion of the test, the specimen shall show no signs of blistering, wrinkling, cracking, or loss of adhesion and no sign of rust creepage beyond 1/8 inch on either side of the scratch mark. Cut edges of galvanized surfaces where hot-dip galvanized sheet steel is used shall be coated with a zinc-rich coating conforming to MS MIL-P-21035.

2.12.2 Field Painting

Painting required for surfaces not otherwise specified, and finish painting of items only primed at the factory are specified in Section 09900 PAINTING, GENERAL.

PART 3 EXECUTION

3.1 INSTALLATION

Work shall be performed in accordance with the manufacturer's published diagrams, recommendations, and equipment warranty requirements. Where equipment is specified to conform to the requirements of ASME BPV VIII Div 1 and ASME BPV IX, the design, fabrication, and installation of the system shall conform to ASME BPV VIII Div 1 and ASME BPV IX.

3.1.1 Equipment

Refrigeration equipment and the installation thereof shall conform to ASHRAE 15. Necessary supports shall be provided for all equipment, appurtenances, and pipe as required, including frames or supports for compressors, pumps, cooling towers, condensers, and similar items. Compressors shall be isolated from the building structure. If mechanical vibration isolators are not provided, vibration absorbing foundations shall be provided. Each foundation shall include isolation units consisting of machine and floor or foundation fastenings, together with intermediate isolation material. Other floor-mounted equipment shall be set on not less than a 6 inch concrete pad doweled in place. Concrete foundations for floor mounted pumps shall have a mass equivalent to three times the weight of the components, pump, base plate, and motor to be supported. In lieu of concrete pad foundation, concrete pedestal block with isolators placed between the pedestal block and the floor may be provided. Concrete pedestal block shall be of mass not less than three times the combined pump, motor, and base weights. Isolators shall be selected and sized based on load-bearing requirements and the lowest frequency of vibration to be isolated. Lines connected to pumps mounted on pedestal blocks shall be provided with flexible connectors. Foundation drawings, bolt-setting information, and foundation bolts shall be furnished prior to concrete
foundation construction for all equipment indicated or required to have concrete foundations. Concrete for foundations shall be as specified in Section 03300 CONCRETE FOR BUILDING CONSTRUCTION. Equipment shall be properly leveled, aligned, and secured in place in accordance with manufacturer’s instructions.

3.1.2 Building Surface Penetrations

Sleeves in nonload bearing surfaces shall be galvanized sheet metal, conforming to ASTM A 525, Coating Class G-90, 20 gauge. Sleeves in load bearing surfaces shall be uncoated carbon steel pipe, conforming to ASTM A 53, Standard weight. Sealants shall be applied to moisture and oil-free surfaces and elastomers to not less than 1/2 inch depth. Sleeves shall not be installed in structural members.

3.1.2.1 General Service Areas

Each sleeve shall extend through its respective wall, floor, or roof, and shall be cut flush with each surface. Pipes passing through concrete or masonry wall or concrete floors or roofs shall be provided with pipe sleeves fitted into place at the time of construction. Sleeves shall be of such size as to provide a minimum of 1/4 inch all-around clearance between bare pipe and sleeves or between jacketed-insulation and sleeves. Except in pipe chases or interior walls, the annular space between pipe and sleeve or between jacket over-insulation and sleeve shall be sealed in accordance with Section 07920 JOINT SEALING.

3.1.2.2 Waterproof Penetrations

Pipes passing through roof or floor waterproofing membrane shall be installed through a 17-ounce copper sleeve, or a 0.032 inch thick aluminum sleeve, each within an integral skirt or flange. Flashing sleeve shall be suitably formed, and skirt or flange shall extend not less than 8 inches from the pipe and be set over the roof or floor membrane in a troweled coating of bituminous cement. The flashing sleeve shall extend up the pipe a minimum of 2 inches above the roof or floor penetration. The annular space between the flashing sleeve and the bare pipe or between the flashing sleeve and the metal-jacket-covered insulation shall be sealed as indicated. Penetrations shall be sealed by either one of the following methods.

a. Waterproofing Clamping Flange: Pipes up to and including 10 inches in diameter passing through roof or floor waterproofing membrane may be installed through a cast iron sleeve with caulking recess, anchor lugs, flashing clamp device, and pressure ring with brass bolts. Waterproofing membrane shall be clamped into place and sealant shall be placed in the caulking recess.

b. Modular Mechanical Type Sealing Assembly: In lieu of a waterproofing clamping flange and caulking and sealing of annular space between pipe and sleeve or conduit and sleeve, a modular mechanical type sealing assembly may be installed. Seals shall consist of interlocking synthetic rubber links shaped to continuously fill the annular space between the pipe/conduit and sleeve with corrosion protected carbon steel bolts, nuts, and pressure plates. Links shall be loosely assembled with
bolts to form a continuous rubber belt around the pipe with a pressure plate under each bolt head and each nut. After the seal assembly is properly positioned in the sleeve, tightening of the bolt shall cause the rubber sealing elements to expand and provide a watertight seal rubber sealing elements to expand and provide a watertight seal between the pipe/conduit seal between the pipe/conduit and the sleeve. Each seal assembly shall be sized as recommended by the manufacturer to fit the pipe/conduit and sleeve involved. The Contractor electing to use the modular mechanical type seals shall provide sleeves of the proper diameters.

3.1.2.3 Escutcheons

Finished surfaces where exposed piping, bare or insulated, pass through floors, walls, or ceilings, except in boiler, utility, or equipment rooms, shall be provided with escutcheons. Where sleeves project slightly from floors, special deep-type escutcheons shall be used. Escutcheon shall be secured to pipe or pipe covering.

3.1.3 Access Panels

Access panels shall be provided for all concealed valves vents, controls, and items requiring inspection or maintenance. Access panels shall be of sufficient size and located so that the concealed items may be serviced and maintained or completely removed and replaced. Access panels shall be as specified in Section 05500 MISCELLANEOUS METALS.

3.1.4 General Piping Installation

3.1.4.1 Brazed Joints

Brazing shall be performed in accordance with AWS BRH, except as modified herein. During brazing, the pipe and fittings shall be filled with a pressure regulated inert gas, such as nitrogen, to prevent the formation of scale. Before brazing copper joints, both the outside of the tube and the inside of the fitting shall be cleaned with a wire fitting brush until the entire joint surface is bright and clean. Brazing flux shall not be used. Surplus brazing material shall be removed at all joints. Steel tubing joints shall be made in accordance with the manufacturer's recommendations. Joints in steel tubing shall be painted with the same material as the baked-on coating within 8 hours after joints are made. Tubing shall be protected against oxidation during brazing by continuous purging of the inside of the piping using nitrogen. Piping shall be supported prior to brazing and not be sprung or forced.

3.1.4.2 Threaded Joints

Threaded joints shall be made with tapered threads and made tight with PTFE tape complying with MS MIL-T-27730 or equivalent thread-joint compound applied to the male threads only. Not more than three threads shall show after the joint is made.
3.1.4.3 Flared Connections

When flared connections are used, a suitable lubricant shall be used between the back of the flare and the nut in order to avoid tearing the flare while tightening the nut.

3.1.5 Refrigeration Piping

Unless otherwise specified, pipe and fittings installation shall conform to requirements of ASME B31.5. Pipe shall be cut accurately to measurement established at the jobsite and worked into place without springing or forcing. Cutting or otherwise weakening of the building structure to facilitate piping installation will not be permitted without written approval. Pipes shall be cut square, shall have burrs removed by reaming, and shall be installed in a manner to permit free expansion and contraction without damage to joints or hangers. Filings, dust, or dirt shall be wiped from interior of pipe before connections are made.

3.1.5.1 Directional Changes

Changes in direction shall be made with fittings, except that bending of pipe 4 inches and smaller will be permitted, provided a pipe bender is used and wide-sweep bends are formed. The centerline radius of bends shall not be less than 6 diameters of the pipe. Bent pipe showing kinks, wrinkles, or other malformations will not be accepted.

3.1.5.2 Functional Requirements

Piping shall be installed 1/2 inch per 10 feet of pipe in the direction of flow to ensure adequate oil drainage. Open ends of refrigerant lines or equipment shall be properly capped or plugged during installation to keep moisture, dirt, or other foreign material out of the system. Piping shall remain capped until installation. Equipment piping shall be in accordance with the equipment manufacturer's recommendations and the contract drawings.

3.1.5.3 Expansion Valves

Expansion valves shall be installed with the thermostatic expansion valve bulb located on top of the suction line when the suction line is less than 2-1/8 inches in diameter and at the 4 o'clock or 8 o'clock position on lines larger than 2-1/8 inches. The bulb shall be securely fastened with two clamps. The bulb shall be insulated. The bulb shall be installed in a horizontal portion of the suction line, if possible, with the pigtail on the bottom. If the bulb must be installed in a vertical line, the bulb tubing shall be facing up.

3.1.6 Thermometers

Thermometers located within 5 feet of floor may be rigid stem type. Where thermal well is located above 5 feet above floor, thermometer shall be universal adjustable angle type or remote element type to 7 feet above floor and remote element type where thermal well is 7 feet or more above floor. Thermometers shall be located in coolant supply and return or waste lines at each heat exchanger, condenser water lines entering and
leaving the condenser, at each automatic temperature control device without an integral thermometer, refrigerant liquid line leaving receiver, refrigerant suction line at each evaporator or liquid cooler, and where indicated or required for proper operation of equipment.

3.1.7 Piping Supports

Refrigerant pipe supports shall be in accordance with ASME B31.5. Hangers used to support piping 2 inches and larger shall be fabricated to permit adequate adjustment after erection while still supporting the load. Pipe guides and anchors shall be installed to keep pipes in accurate alignment, to direct the expansion movement, and to prevent buckling, swaying, and undue strain. Piping subjected to vertical movement, when operating temperatures exceed ambient temperatures, shall be supported by variable spring hangers and supports or by constant support hangers.

3.1.7.1 Structural Attachments

Attachment to building structure concrete and masonry shall be by cast-in concrete inserts, built-in anchors, or masonry anchor devices. Inserts and anchors shall be applied with a safety factor not less than 5. Supports shall not be attached to metal decking. Masonry anchors for overhead applications shall be constructed of ferrous materials only. Material used for support shall be as specified under Section 05120 STRUCTURAL STEEL.

3.1.8 Pipe Hangers, Inserts, and Supports

Pipe hangers, inserts, and supports shall conform to MSS SP-58 and MSS SP-69, except as modified herein. Pipe hanger types 5, 12, and 26 shall not be used.

3.1.8.1 Hangers

Type 3 shall not be used on insulated piping. Type 24 may be used only on trapeze hanger systems or on fabricated frames.

3.1.8.2 Inserts

Type 18 inserts shall be secured to concrete forms before concrete is placed. Continuous inserts which allow more adjustments may be used if they otherwise meet the requirements for Type 18 inserts.

3.1.8.3 C-Clamps

Type 19 and 23 C-clamps shall be torqued per MSS SP-69 and have both locknuts and retaining devices, furnished by the manufacturer. Field-fabricated C-clamp bodies or retaining devices are not acceptable.

3.1.8.4 Angle Attachments

Type 20 attachments used on angles and channels shall be furnished with an added malleable-iron heel plate or adapter.
3.1.8.5 Saddles and Shields

Where Type 39 saddle or Type 40 shield are permitted for a particular pipe attachment application, the Type 39 saddle, connected to the pipe, shall be used on all pipe 4 inches and larger when the temperature of the medium is 60 degrees F or higher. Type 40 shields shall be used on all piping less than 4 inches and all piping 4 inches and larger carrying medium less than 60 degrees F. A high density insulation insert of cellular glass shall be used under the Type 40 shield for piping 2 inches and larger.

3.1.8.6 Horizontal Pipe Supports

Horizontal pipe supports shall be spaced as specified in MSS SP-69 and a support shall be installed not over 1 foot from the pipe fitting joint at each change in direction of the piping. Pipe supports shall be spaced not over 5 feet apart at valves. Pipe hanger loads suspended from steel joist with hanger loads between panel points in excess of 50 pounds shall have the excess hanger loads suspended from panel points.

3.1.8.7 Vertical Pipe Supports

Vertical pipe shall be supported at each floor, except at slab-on-grade, and at intervals of not more than 15 feet, not more than 8 feet from end of risers, and at vent terminations.

3.1.8.8 Multiple Pipe Runs

In the support of multiple pipe runs on a common base member, a clip or clamp shall be used where each pipe crosses the base support member. Spacing of the base support members shall not exceed the hanger and support spacing required for an individual pipe in the multiple pipe run.

3.1.9 Pipe Anchors

Anchors shall be provided wherever necessary or indicated to localize expansion or to prevent undue strain on piping. Anchors shall consist of heavy steel collars with lugs and bolts for clamping and attaching anchor braces, unless otherwise indicated. Anchor braces shall be installed in the most effective manner to secure the desired results using turnbuckles where required. Supports, anchors, or stays shall not be attached where they will injure the structure or adjacent construction during installation or by the weight of expansion of the pipeline. Where pipe and conduit penetrations of vapor barrier sealed surfaces occur, these items shall be anchored immediately adjacent to each penetrated surface, to provide essentially zero movement within penetration seal. Detailed drawings of pipe anchors shall be submitted for approval before installation.

3.1.10 Metal Ductwork

Installation shall be in accordance with SMACNA-06 unless otherwise indicated. Duct supports for sheet metal ductwork shall be in accordance with SMACNA-06, unless otherwise specified. Friction beam clamps indicated in SMACNA-06 will not be used. Risers on high velocity ducts shall be anchored in the center of the vertical run to allow ends of riser to move due to thermal expansion. Supports on the risers shall allow free
vertical movement of the duct. Supports shall be attached only to structural framing members and concrete slabs. Supports shall not be anchored to metal decking unless a means is provided and approved for preventing the anchor from puncturing the metal decking. Where supports are required between structural framing members, suitable intermediate metal framing shall be provided. Where C-clamps are used, retainer clips shall be provided.

3.1.11 Field Applied Insulation

Field applied insulation shall be as specified in Section 15250 THERMAL INSULATION FOR MECHANICAL SYSTEMS.

3.1.12 Factory Applied Insulation

Refrigerant suction lines between an evaporator and compressors shall be insulated with not less than 3/4 inch thick unicellular plastic foam.

3.1.13 Framed Instructions

Framed instructions shall be framed under glass or laminated plastic and be posted where directed. Instructions shall include equipment layout, wiring and control diagrams, piping, valves and control sequences, and typed condensed operation instructions. The condensed operation instructions shall include preventative maintenance procedures, methods of checking the system for normal and safe operation, and procedures for safely starting and stopping the system. The instructions shall be posted before acceptance testing of the system.

3.2 TESTS

Tests shall be conducted in the presence of the Contracting Officer. Utilities for testing shall be provided as specified in the "SPECIAL CLAUSES". Water and electricity required for the tests will be furnished by the Government. The services of a qualified technician shall be provided as required to perform all tests and procedures indicated herein.

3.2.1 Ductwork Leak Tests

Ductwork leak test shall be performed for the entire air distribution system, including fans, coils, filters, etc. Test procedure, apparatus, and report shall conform to SMACNA-10. The maximum allowable leakage rate shall be for seal Class A. Ductwork leak test shall be completed with satisfactory results prior to applying insulation to ductwork exterior.

3.2.2 System Performance Tests

After the foregoing tests have been completed and before each refrigeration system is accepted, tests to demonstrate the general operating characteristics of all equipment shall be conducted by a registered professional engineer or an approved manufacturer's start-up representative experienced in system start-up and testing, at such times as directed. Tests shall cover a period of not less than 48 hours for each system and demonstrate that the entire system is functioning in accordance with the drawings and specifications. Corrections and adjustments shall be made as
necessary and tests shall be re-conducted to demonstrate that the entire
system is functioning as specified. Prior to acceptance, service valve
seal caps and blanks over gauge points shall be installed and tightened.
Any refrigerant lost during the system startup shall be replaced. If tests
do not demonstrate satisfactory system performance, deficiencies shall be
corrected and the system shall be retested.

3.3 INSPECTIONS

At the conclusion of the one year period, cooling towers and condensers
shall be inspected for problems due to corrosion, scale, and biological
growth. If the cooling tower and condenser are found not to conform to the
manufacturers recommended conditions, assuming the water treatment company
recommendations have been followed; the water treatment company shall
provide all chemicals and labor for cleaning or repairing the equipment as
required by the manufacturer's recommendations.

3.4 CLEANING AND ADJUSTING

3.4.1 Piping

Prior to testing, pipes shall be cleaned free of scale and thoroughly
flushed of all foreign matter. A temporary bypass shall be provided for
water coils to prevent flushing water from passing through coils.
Strainers and valves shall be thoroughly cleaned. Prior to testing and
balancing, air shall be removed from each water system through the use of
the air vents. Temporary measures, such as piping the overflow from vents
to a collecting vessel shall be taken to avoid water damage during the
venting process. Air vents shall be plugged or capped after the system has
been vented.

3.4.2 Ductwork

Prior to testing, inside of ducts, plenums, and casing shall be thoroughly
cleaned of all debris and blown free of small particles of rubbish and dust
and then vacuum cleaned before installing outlet faces. Temporary filters
shall be provided for fans that are operated during construction. New
filters shall be installed after all construction dirt has been removed
from the building and the ducts, plenum, casings, and other items specified
have been vacuum cleaned. Fans shall be adjusted to the speed indicated by
the manufacturer to meet specified conditions.

3.4.3 Equipment

Equipment shall be wiped clean, with all traces of oil, dust, dirt, or
paint spots removed. System shall be maintained in this clean condition
until final acceptance. Bearings shall be lubricated with oil or
grease as recommended by the manufacturer. Belts shall be tightened to
proper tension. Control valves and other miscellaneous equipment requiring
adjustment shall be adjusted to setting indicated or directed.

3.5 DEMONSTRATIONS

Contractor shall conduct a training course for the operating staff as
designated by the Contracting Officer. The training period shall consist
of a total 4 hours of normal working time and start after the system is functionally completed but prior to final acceptance tests. The field instructions shall cover all of the items contained in the operation and maintenance manuals as well as demonstrations of routine maintenance operations.

-- End of Section --
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.

AIR CONDITIONING AND REFRIGERATION INSTITUTE (ARI)

ARI Guideline D (1987) Application and Installation of Central Station Air-Handling Units

AIR MOVEMENT AND CONTROL ASSOCIATION (AMCA)

AMCA 210 (1985) Laboratory Methods of Testing Fans for Rating

AMCA 300 (1985; Rev 1987; Errata) Reverberant Room Method for Sound Testing of Fans

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS (ASHRAE)

ASHRAE 52 (1968; R 1976) Air-Cleaning Devices Used in General Ventilation for Removing Particulate Matter

FEDERAL SPECIFICATIONS (FS)

FS RR-W-360 (Rev A) Wire Fabric, Industrial

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA MG 1 (1993) Motors and Generators

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)


SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION (SMACNA)

SMACNA-06 (1985) HVAC Duct Construction Standards - Metal and Flexible

SMACNA-10 (1985) HVAC Air Duct Leakage Test Manual

UNDERWRITERS LABORATORIES (UL)
1.2 COORDINATION OF TRADES

Ductwork, piping offsets, fittings, and accessories shall be furnished as required to provide a complete installation and to eliminate interference with other construction.

1.3 DELIVERY AND STORAGE

Equipment delivered and placed in storage shall be stored with protection from the weather, humidity and temperature variations, dirt and dust, or other contaminants.

1.4 SUBMITTALS

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

SD-01 Data
Components and Equipment Data; GA.

Manufacturer's catalog data shall be included with the detail drawings for the following items. The data shall be highlighted to show model, size, options, etc., that are intended for consideration. Data shall be adequate to demonstrate compliance with contract requirements for the following:

a. Ductwork Components

b. Air Systems Equipment

SD-04 Drawings
Air Supply, Distribution, Ventilation, and Exhaust Equipment; GA.

Drawings shall consist of equipment layout including assembly and installation details and electrical connection diagrams; ductwork layout showing the location of all supports and hangers, typical hanger details, gauge reinforcement, reinforcement spacing rigidity classification, and static pressure and seal classifications; and piping layout showing the location of all guides and anchors, the load imposed on each support or anchor, and typical support details. Drawings shall include any information required to demonstrate that the system has been coordinated and will properly function as a unit and shall show equipment relationship to other parts of the work, including clearances required for operation and maintenance.
TARGET LAUNCH FACILITIES, PHASE 1, FT WINGATE, NM

SD-06 Instructions

Test Procedures; FIO.

Proposed test procedures for piping hydrostatic test, ductwork leak test, and performance tests of systems, at least 2 weeks prior to the start of related testing.

Welding Procedures; FIO.

A copy of qualified welding procedures, at least 2 weeks prior to the start of welding operations.

System Diagrams; GA.

Proposed diagrams, at least 2 weeks prior to start of related testing. System diagrams that show the layout of equipment, piping, and ductwork, and typed condensed operation manuals explaining preventative maintenance procedures, methods of checking the system for normal, safe operation, and procedures for safely starting and stopping the system shall be framed under glass or laminated plastic. After approval, these items shall be posted where directed.

SD-07 Schedules

Test Schedules; FIO.

Proposed test schedules for hydrostatic test of piping, ductwork leak test, and performance tests, at least 2 weeks prior to the start of related testing.

Field Training Schedule; FIO.

Proposed schedule for field training, at least 2 weeks prior to the start of related training.

SD-09 Reports

Test Reports; FIO.

Test reports for the piping hydrostatic test, ductwork leak test, and performance tests in booklet form, upon completion of testing. Reports shall document phases of tests performed including initial test summary, repairs/adjustments made, and final test results.

SD-19 Operation and Maintenance Manuals

Air Supply, Distribution, Ventilation, and Exhaust Manuals; FIO.

Six manuals listing step-by-step procedures required for system startup, operation, shutdown, and routine maintenance, at least 2 weeks prior to field training. The manuals shall include the manufacturer’s name, model number, parts list, list of parts and tools that should be kept in stock by the owner for routine maintenance including the name of a local supplier,
simplified wiring and controls diagrams, troubleshooting guide, and recommended service organization (including address and telephone number) for each item of equipment. Each service organization submitted shall be capable of providing 6 hour onsite response to a service call on an emergency basis.

PART 2 PRODUCTS

2.1 STANDARD PRODUCTS

Components and equipment shall be standard products of a manufacturer regularly engaged in the manufacturing of products that are of a similar material, design and workmanship. The standard products shall have been in satisfactory commercial or industrial use for 2 years before bid opening. The 2-year experience shall include applications of components and equipment under similar circumstances and of similar size. The 2 years must be satisfactorily completed by a product which has been sold or is offered for sale on the commercial market through advertisements, manufacturers' catalogs, or brochures. Products having less than a 2-year field service record will be acceptable if a certified record of satisfactory field operation, for not less than 6000 hours exclusive of the manufacturer's factory tests, can be shown. The equipment items shall be supported by a service organization.

2.2 ASBESTOS PROHIBITION

Asbestos and asbestos-containing products shall not be used.

2.3 NAMEPLATES

Equipment shall have a nameplate that identifies the manufacturer's name, address, type or style, model or serial number, and catalog number.

2.4 EQUIPMENT GUARDS AND ACCESS

Belts, pulleys, chains, gears, couplings, projecting setscrews, keys, and other rotating parts exposed to personnel contact shall be fully enclosed or guarded according to OSHA requirements. High temperature equipment and piping exposed to contact by personnel or where it creates a potential fire hazard shall be properly guarded or covered with insulation of a type specified.

2.5 ELECTRICAL WORK

Electrical motor-driven equipment specified shall be provided complete with motor, motor starter, and controls. Unless otherwise specified, electric equipment, including wiring and motor efficiencies, shall be according to Section 16415 ELECTRICAL WORK, INTERIOR. Electrical characteristics and enclosure type shall be as shown. Unless otherwise indicated, motors of 1 hp and above shall be high efficiency type. Motor starters shall be provided complete with thermal overload protection and other appurtenances necessary. Each motor shall be according to NEMA MG 1 and shall be of sufficient size to drive the equipment at the specified capacity without exceeding the nameplate rating of the motor. Manual or automatic control and protective or signal devices required for the operation specified, and
any control wiring required for controls and devices, but not shown, shall be provided. Where two-speed or variable-speed motors are indicated, solid-state variable-speed controller may be provided to accomplish the same function. Solid-state variable-speed controllers shall be utilized for motors rated 10 hp or less. Adjustable frequency drives shall be used for larger motors.

2.6 DUCTWORK COMPONENTS

2.6.1 Metal Ductwork

As specified under Section 15653 AIR-CONDITIONING (UNITARY TYPE).

2.6.2 Air Vents, Penthouses, and Goosenecks

Air vents, penthouses, and goosenecks shall be fabricated from galvanized steel sheets with galvanized structural shapes. Sheet metal thickness, reinforcement, and fabrication shall conform to SMACNA-06. Louver blades shall be accurately fitted and secured to frames. Edges of louver blades shall be folded or beaded for rigidity and baffled to exclude driving rain. Air vents, penthouses, and goosenecks shall be provided with bird screen.

2.6.3 Bird Screens and Frames

Bird screens shall conform to FS RR-W-360, Type I, Class 1, 2 by 2 mesh, 0.063 inch diameter aluminum wire or 0.031 inch diameter stainless steel wire. Frames shall be removable type or stainless steel or extruded aluminum.

2.7 AIR SYSTEMS EQUIPMENT

2.7.1 Fans

Fans shall be tested and rated according to AMCA 210. Fans may be connected to the motors either directly or indirectly with V-belt drive. V-belt drives shall be designed for not less than 140 percent of the connected driving capacity. Motor sheaves shall be variable pitch for 15 hp and below and fixed pitch as defined by ARI Guideline D. Variable pitch sheaves shall be selected to drive the fan at a speed which will produce the specified capacity when set at the approximate midpoint of the sheave adjustment. When fixed pitch sheaves are furnished, a replaceable sheave shall be provided when needed to achieve system air balance. Motors for V-belt drives shall be provided with adjustable rails or bases. Removable metal guards shall be provided for all exposed V-belt drives, and speed-test openings shall be provided at the center of all rotating shafts.

Fans shall be provided with personnel screens or guards on both suction and supply ends, except that the screens need not be provided, unless otherwise indicated, where ducts are connected to the fan. Fan and motor assemblies shall be provided with vibration-isolation supports or mountings as indicated. Vibration-isolation units shall be standard products with published loading ratings. Each fan shall be selected to produce the capacity required at the fan static pressure indicated. Sound power level shall be as indicated. The sound power level values shall be obtained according to AMCA 300. Standard AMCA arrangement, rotation, and discharge
shall be as indicated.

2.7.1.1 Centrifugal Type Power Roof Ventilators (EF-1, EF-2, EF-3).

Fans shall be direct or V-belt driven with backward inclined, non-overloading wheel. Motor compartment housing shall be hinged or removable and weatherproof, constructed of heavy gauge aluminum. Fans shall be provided with birdscreen, disconnect switch, roof curb, and extended base. Motors shall be spark proof for Class I, Division 2.

2.7.1.2 Ceiling Type Exhaust Fans (EF5 & EF6)

Fans shall be mounted in ceiling with grill on intake and ductwork connection on exhaust. Fans shall be controlled by light switch for room installed in.

2.7.1.3 Panel Type Power Wall Ventilators (EF-4)

Fans shall be propeller type, assembled on a reinforced metal panel with venturi opening spun into panel. Fans with wheels less than 24 inches in diameter shall be direct or V-belt driven and fans with wheels 24 inches in diameter and larger shall be V-belt drive type. Fans shall be furnished with wall mounting collar. Lubricated bearings shall be provided. Fans shall be fitted with wheel and motor side metal or wire guards which have a corrosion-resistant finish. Motor enclosure shall be dripproof type. Gravity backdraft dampers shall be provided where indicated.

2.7.2 Air Filters

Air filters shall be listed according to requirements of UL 900, except high efficiency particulate air filters of 99.97 percent efficiency by the DOP Test method shall be as listed under the Label Service and shall meet the requirements of UL 586.

2.7.2.1 Extended Surface Nonsupported Pocket Filters

Filters shall be 30 inch depth, sectional, replaceable dry media type of the size indicated and shall have an average efficiency of 80 to 85 percent when tested according to ASHRAE 52. Initial resistance at 500 feet per minute shall not exceed 0.45 inches water gauge. Filters shall be UL Class 1. Media shall be fibrous glass, supported in the air stream by a wire or non-woven synthetic backing and secured to a galvanized steel metal header. Pockets shall not sag or flap at anticipated air flows. Each filter shall be installed with an extended surface pleated panel filter as a prefilter in a factory preassembled, side access housing or a factory-made sectional frame as indicated.

2.7.2.2 Extended Surface Pleated Panel Filters

Filters shall be 2 inch depth, sectional, disposable type of the size indicated and shall have an average efficiency of 25 to 30 percent when tested according to ASHRAE 52. Initial resistance at 500 feet per minute shall not exceed 0.36 inches water gauge. Filters shall be UL Class 2. Media shall be nonwoven cotton and synthetic fiber mat. A wire support grid bonded to the media shall be attached to a moisture resistant
fiberboard frame. All four edges of the filter media shall be bonded to the inside of the frame to prevent air bypass and increase rigidity.

2.7.3 Electric Resistance Heaters

Electric resistance heaters shall be of the duct-mounting type consisting of a nickel-chromium resistor mounted on refractory material and a steel or aluminum frame for attachment to ductwork. Electric duct heater shall meet the requirement of Underwriters Laboratories and NFPA 70 for Class 1, Division 2, and shall be provided with a built-in or surface-mounted high-limit thermostat. Electric duct heaters shall be interlocked electrically so that heaters cannot be energized unless the fan is running.

PART 3 EXECUTION

3.1 EQUIPMENT AND INSTALLATION

Frames and supports shall be provided for tanks, compressors, pumps, valves, air handling units, fans, coils, dampers, and other similar items requiring supports. Air handling units shall be floor mounted or ceiling hung, as indicated. The method of anchoring and fastening shall be as detailed. Floor-mounted equipment, unless otherwise indicated, shall be set on not less than 6 inch concrete pads or curbs doweled in place. Concrete foundations for circulating pumps shall be heavy enough to minimize the intensity of the vibrations transmitted to the piping and the surrounding structure, as recommended in writing by the pump manufacturer. In lieu of a concrete pad foundation, a concrete pedestal block with isolators placed between the pedestal block and the floor may be provided. The concrete foundation or concrete pedestal block shall be of a mass not less than three times the weight of the components to be supported. Lines connected to the pump mounted on pedestal blocks shall be provided with flexible connectors. Foundation drawings, bolt-setting information, and foundation bolts shall be furnished prior to concrete foundation construction for all equipment indicated or required to have concrete foundations. Concrete for foundations shall be as specified in Section 03300 CONCRETE FOR BUILDING CONSTRUCTION.

3.1.1 Access Panels

Access panels shall be provided for concealed valves, vents, controls, dampers, and items requiring inspection or maintenance. Access panels shall be of sufficient size and located so that the concealed items may be serviced and maintained or completely removed and replaced. Access panels shall be as specified in Section 05500 MISCELLANEOUS METALS.

3.1.2 Flexible Connectors

Pre-insulated flexible connectors and flexible duct shall be attached to other components in accordance with the latest printed instructions of the manufacturer to ensure a vapor tight joint. Hangers, when required to suspend the connectors, shall be of the type recommended by the connector or duct manufacturer and shall be provided at the intervals recommended.
3.1.3 Metal Ductwork

Installation shall be according to SMACNA-06 unless otherwise indicated. Duct supports for sheet metal ductwork shall be according to SMACNA-06, unless otherwise specified. Friction beam clamps indicated in SMACNA-06 shall not be used. Risers on high velocity ducts shall be anchored in the center of the vertical run to allow ends of riser to move due to thermal expansion. Supports on the risers shall allow free vertical movement of the duct. Supports shall be attached only to structural framing members and concrete slabs. Supports shall not be anchored to metal decking unless a means is provided and approved for preventing the anchor from puncturing the metal decking. Where supports are required between structural framing members, suitable intermediate metal framing shall be provided. Where C-clamps are used, retainer clips shall be provided.

3.1.4 Dust Control

To prevent the accumulation of dust, debris and foreign material during construction, temporary dust control protection shall be provided. The distribution system (supply and return) shall be protected with temporary seal-offs at all inlets and outlets at the end of each day's work. Temporary protection shall remain in place until system is ready for startup.

3.1.5 Insulation

Thickness and application of insulation materials for ductwork, piping, and equipment shall be according to Section 15250 THERMAL INSULATION FOR MECHANICAL SYSTEMS.

3.1.6 Duct Test Holes

Holes with closures or threaded holes with plugs shall be provided in ducts and plenums as indicated or where necessary for the use of pitot tube in balancing the air system. Extensions, complete with cap or plug, shall be provided where the ducts are insulated.

3.1.7 Power Roof Ventilator Mounting

Foamed 1/2 inch thick, closed-cell, flexible elastomer insulation shall cover width of roof curb mounting flange. Where wood nailers are used, holes shall be pre-drilled for fasteners.

3.1.8 Power Transmission Components Adjustment

V-belts and sheaves shall be tested for proper alignment and tension prior to operation and after 72 hours of operation at final speed. Belts on drive side shall be uniformly loaded, not bouncing. Alignment of direct driven couplings shall be to within 50 percent of manufacturer's maximum allowable range of misalignment.
3.2 DUCTWORK LEAK TEST

Ductwork leak test shall be performed for the entire air distribution and exhaust system, including fans, coils, filters, etc., designated as static pressure Class 3 inch water gauge through Class 10 inch water gauge. Test procedure, apparatus, and report shall conform to SMACNA-10. The maximum allowable leakage rate shall be for seal Class A. Ductwork leak test shall be completed with satisfactory results prior to applying insulation to ductwork exterior.

3.3 TESTING, ADJUSTING, AND BALANCING

Testing, adjusting, and balancing shall begin only when the air supply and distribution, including controls, has been completed, with the exception of performance tests.

3.4 PERFORMANCE TESTS

After testing, adjusting, and balancing has been completed as specified, each system shall be tested as a whole to see that all items perform as integral parts of the system and temperatures and conditions are evenly controlled throughout the building. Corrections and adjustments shall be made as necessary to produce the conditions indicated or specified. Capacity tests and general operating tests shall be conducted by an experienced engineer. Tests shall cover a period of not less than 5 days for each system and shall demonstrate that the entire system is functioning according to the specifications. Coincidental chart recordings shall be made at points indicated on the drawings for the duration of the time period and shall record the temperature at space thermostats or sensors, the humidity at space humidistats or space sensors and the ambient temperature and humidity in a shaded and weather protected area.

3.5 FIELD TRAINING

The Contractor shall conduct a training course for operating and maintenance personnel as designated by the Contracting Officer. Training shall be provided for a period of 24 hours of normal working time and shall start after the system is functionally complete but prior to the performance tests. The field instruction shall cover all of the items contained in the approved Operating and Maintenance Instructions.

-- End of Section --
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)**

<table>
<thead>
<tr>
<th>ANSI Code</th>
<th>Description</th>
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<tbody>
<tr>
<td>ANSI C29.2</td>
<td>(1992) Insulators - Wet-Process Porcelain and Toughened Glass - Suspension Type</td>
</tr>
<tr>
<td>ANSI C29.4</td>
<td>(1989) Wet-Process Porcelain Insulators - Strain Type</td>
</tr>
<tr>
<td>ANSI C29.6</td>
<td>(1984) Wet-Process Porcelain Insulators - High-Voltage Pin Type</td>
</tr>
<tr>
<td>ANSI C29.7</td>
<td>(1983; C29.7a) Wet-Process Porcelain Insulators - High-Voltage Line-Post Type</td>
</tr>
<tr>
<td>ANSI C135.1</td>
<td>(1979) Galvanized Steel Bolts and Nuts for Overhead Line Construction</td>
</tr>
<tr>
<td>ANSI C135.4</td>
<td>(1987) Zinc-Coated Ferrous Eyebolts and Nuts for Overhead Line Construction</td>
</tr>
<tr>
<td>ANSI C135.14</td>
<td>(1979) Staples with Rolled or Slash Points for Overhead Line Construction</td>
</tr>
</tbody>
</table>
ANNEX A


ANSI O5.1 (1992) Specifications and Dimensions for Wood Poles

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 123 (1989a) Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

ASTM A 153 (1982; R 1987) Zinc Coating (Hot-Dip) on Iron and Steel Hardware

ASTM A 475 (1989) Zinc-Coated Steel Wire Strand

ASTM A 575 (1989) Steel Bars, Carbon, Merchant Quality, M-Grades

ASTM A 576 (1990b) Steel Bars, Carbon, Hot-Wrought, Special Quality


ASTM B 8 (1993) Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft


AMERICAN WOOD-PRESERVE RS' ASSOCIATION (AWPA)

AWPA C4 (1993) Poles - Preservative Treatment by Pressure Processes

AWPA C25 (1992) Sawn Crossarms - Preservative Treatment by Pressure Processes

AWPA P1/P13 (1991) Standard for Coal Tar Creosote for Land and Fresh Water and Marine (Coastal Water) Use

AWPA P5 (1993) Standards for Waterborne Preservatives

AWPA P8 (1993) Standards for Oil-Borne Preservatives


INSTITUTE OF ELECTRICAL AND ELECTRONIC ENGINEERS (IEEE)


SECTION 16370 PAGE 2


IEEE Std 100 (1992) IEEE Standard Dictionary of Electrical and Electronics Terms

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)


NEMA LA 1 (1992) Surge Arresters

NEMA SG 2 (1993) High Voltage Fuses

NEMA WC 5 (1992) Thermoplastic-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)


RURAL ELECTRIFICATION ADMINISTRATION (REA)


UNDERWRITERS LABORATORIES (UL)

UL 467 (1993) Grounding and Bonding Equipment


SECTION 16370 PAGE 3
1.2 GENERAL REQUIREMENTS

1.2.1 Terminology

Terminology used in this specification is as defined in IEEE Std 100.

1.2.2 Service Conditions

Items provided under this section shall be specifically suitable for the following service conditions.

a. Altitude: 4100 feet above mean sea level.

b. Ambient Temperature: from 0 to 110 degrees F.

c. Frequency: 60 Hertz.

d. Seismic Zone: 2.

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 DESCRIPTIONS:

Manufacturer's Catalog; GA.

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.

SD-04 Drawings

Electrical Distribution System; GA.

Detail drawings consisting of equipment drawings, illustrations, schedules, instructions, diagrams and other information necessary to define the installation and enable the Government to check conformity with the requirements of the contract drawings. Detail drawings shall as a minimum include:

a. Poles.

b. Crossarms.

c. Fused Cut-outs.

d. Conductors.

e. Insulators.

f. Surge arresters.

If departures from the contract drawings are deemed necessary by the
Contractor, complete details of such departures shall be submitted with the detail drawings. Approved departures shall be made at no additional cost to the Government.

Detail drawings shall show how components 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 consist of the following:

a. Detail drawings showing physical arrangement, construction details, connections, finishes, materials used in fabrication, provisions for conduit or busway 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. Optional items shall be clearly identified as included or excluded.

As-Built Drawings; GA.

The as-built drawings shall be a record of the construction as installed. The drawings shall include the information shown on the contract drawings as well as 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 deviations, modifications, and changes. The as-built drawings shall be complete and show the location, dimensions, part identification, and other information. Additional sheets may be added. The as-built drawings shall be jointly inspected for accuracy and completeness by the Contractor’s quality control representative and by the Contracting Officer prior to the submission of each monthly pay estimate. 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-09 Reports

Factory Test; FIO.

Certified factory test reports shall be submitted when the manufacturer performs routine factory tests, including tests required by standards listed in paragraph REFERENCES. Results of factory tests performed shall be certified by the manufacturer, or an approved testing laboratory, and submitted within 7 days following successful completion of the tests specified in applicable publications or in these specifications.

Field Testing; FIO.
A proposed field test plan 20 days prior to testing the installed system. No field test shall be performed until the test plan is approved. The test plan shall consist of complete field test procedures including tests to be performed, test equipment required, and tolerance limits.

Test Reports; GA.

Six copies of the information described below in 8-1/2 by 11 inch binders having a minimum of 5 rings, and including a separate section for each test. Sections shall be separated by heavy plastic dividers with tabs.

a. A list of equipment used, with calibration certifications.

b. A copy of measurements taken.

c. The dates of testing.

d. The equipment and values to be verified.

e. The condition specified for the test.

f. The test results, signed and dated.

g. A description of adjustments made.

SD-13 Certificates

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 Electronic Engineers (IEEE), or the National Electrical Manufacturers Association (NEMA), the Contractor shall submit proof that the items provided under this section of the specifications conform to such requirements. The label of, or listing by, UL will be acceptable as evidence that the items conform thereto. 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 thereto. 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 thereto. 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.

Three additional copies of the instructions manual within 30 calendar days following the approval of the manuals.
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. Oil filled transformers and switches shall be stored in accordance with the manufacturer's requirements. Wood poles held in storage for more than 2 weeks shall be stored in accordance with ANSI 05.1. Handling of wood poles shall be in accordance with ANSI 05.1, except that pointed tools capable of producing indentations more than inch in depth shall not be used. Metal poles shall be handled and stored in accordance with the manufacturer's instructions.

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. Two complete sets of all special tools required for maintenance shall be provided, complete with a suitable tool box. Special tools are those that only the manufacturer provides, for special purposes (to access compartments, or operate, adjust, or maintain special parts).

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

Products shall conform to the following requirements. Items of the same classification shall be identical including equipment, assemblies, parts, and components.

2.2 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.

2.3 NAMEPLATES

2.3.1 General

Each major component 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 transformers, regulators, circuit breakers, capacitors, meters and switches.

2.4 CORROSION PROTECTION

2.4.1 Aluminum Materials

Aluminum shall not be used in contact with earth or concrete. Where aluminum conductors are connected to dissimilar metal, fittings conforming
2.4.2 Ferrous Metal Materials

2.4.2.1 Hardware

Ferrous metal hardware shall be hot-dip galvanized in accordance with ASTM A 153 and ASTM A 123.

2.4.3 Finishing

Painting required for surfaces not otherwise specified and finish painting of items only primed at the factory shall be as specified in Section 09900 PAINTING, GENERAL.

2.5 CONDUCTORS, CONNECTORS, AND SPLICES

2.5.1 Aluminum-Composition Conductors

Aluminum-conductor-steel-reinforced, ACSR, shall comply with ASTM B 232.

2.5.2 Connectors and Splices

Connectors and splices shall be of copper alloys for copper conductors, aluminum alloys for aluminum-composition conductors, and a type designed to minimize galvanic corrosion for copper to aluminum-composition conductors. Aluminum-composition and aluminum-composition to copper shall comply with UL 486B, and copper-to-copper shall comply with UL 486A.

2.5.3 Copper Conductors

Hard-drawn-copper conductors shall comply with ASTM B 1 and ASTM B 8 as appropriate for the conductor size.

2.5.4 Connectors and Splices

Connectors and splices shall be of copper alloys for copper conductors, aluminum alloys for aluminum-composition conductors, and a type designed to minimize galvanic corrosion for copper to aluminum-composition conductors. Aluminum-composition and aluminum-composition to copper shall comply with UL 486B, and copper-to-copper shall comply with UL 486A.

2.6 MEDIUM-VOLTAGE LINES

2.6.1 Bare Medium-Voltage Lines

Bare medium-voltage line conductors shall be aluminum-conductor-steel-reinforced, ACSR. Conductor types shall not be mixed on any project, unless specifically indicated. Conductors larger than No. 2 AWG shall be stranded.
2.7 LOW-VOLTAGE LINES

Low-voltage line conductors shall be of the neutral-supported secondary and service drop type with thermoplastic insulation in accordance with NEMA WC 5. Neutral-supported secondary and service drop conductors shall be insulated aluminum with bare 1350 alloy aluminum or ACSR neutrals.

2.8 POLES AND HARDWARE

Poles shall be of lengths and classes indicated.

2.8.1 Wood Poles

Wood poles shall comply with ANSI 05.1, and shall be pressure treated in accordance with AWPA C4, with creosote conforming to AWPA P1/P13 or with oil-borne preservatives and petroleum conforming to AWPA P8 and AWPA P9, respectively, and waterborne preservatives conforming to AWPA P5. Waterborne preservatives shall be either chromated or ammonical copper arsenate. Any species listed in ANSI 05.1 for which a preservative treatment is not specified in AWPA C4, shall not be used; northern white cedar, if treated as specified for western red cedar, and western fir, if treated as specified for Douglas fir, may be used. Wood poles shall have pole markings located approximately 10 feet from pole butts for poles 50 feet or less in length. Poles shall be machine trimmed by turning smooth full length, and shall be roofed, gained, and bored prior to pressure treatment. Where poles are not provided with factory-cut gains, metal gain plates shall be provided.

2.8.2 Pole Line Hardware

Zinc-coated hardware shall comply with ANSI C135.1, ANSI C135.2, ANSI C135.4, ANSI C135.14, ANSI C135.17, ANSI C135.22, and ANSI C135.33. Steel hardware shall comply with ASTM A 575 and ASTM A 576. Hardware shall be hot-dip galvanized in accordance with ASTM A 153. Pole-line hardware shall be hot-dip galvanized steel, except anchor rods of the copper-molten welded-to-steel type with nonferrous corrosion-resistant fittings shall be used. Washers shall be installed under boltheads and nuts on wood surfaces and elsewhere as required. Washers used on through-bolts and double-arming bolts shall be approximately 2-1/4 inches square and 3/16 inch thick. The diameter of holes in washers shall be the correct standard size for the bolt on which a washer is used. Washers for use under heads of carriage-bolts shall be of the proper size to fit over square shanks of bolts. Eye bolts, bolt eyes, eyenuts, strain-load plates, lag screws, guy clamps, fasteners, hooks, shims, and clevises shall be used wherever required to support and to protect poles, brackets, crossarms, guy wires, and insulators.

2.8.3 Armless Construction

Pole mounting brackets for line-post or pin insulators and eye bolts for suspension insulators shall be as shown. Brackets shall be attached to poles with a minimum of two bolts. Brackets may be either provided integrally as part of an insulator or attached to an insulator with a suitable stud. Bracket mounting surface shall be suitable for the shape of the pole. Brackets for wood poles shall have wood gripping members.
Horizontal offset brackets shall have a 5-degree uplift angle. Pole top brackets shall conform to ANSI C135.22, except for modifications necessary to provide support for a line-post insulator. Brackets shall provide a strength exceeding that of the required insulator strength, but in no case less than a 2800 pound cantilever strength.

2.8.4 Guy Assemblies

Guy assemblies shall be zinc-coated steel in accordance with ASTM A 475. Guy assemblies, including insulators and attachments, shall provide a strength exceeding the required guy strength. Three-eye thimbles shall be provided on anchor rods to permit attachment of individual primary, secondary, and communication down guys. Anchors shall provide adequate strength to support all loads. Guy strand shall be 7 strand. Guy material shall be zinc-coated steel with a minimum breaking strength as shown except where two or more guys are used to provide the required strength. Guy rods shall be not less than 8 feet in length by 5/8 inch in diameter.

2.9 INSULATORS

Insulators shall comply with NEMA H12 for general requirements. Suspension insulators shall be used at corners, angles, dead-ends, other areas where line insulators do not provide adequate strength, and as indicated. Mechanical strength of suspension insulators and hardware shall exceed the rated breaking strength of the attached conductors.

2.9.1 Medium-Voltage Line Insulators

Medium-voltage line insulators shall comply with ANSI C29.2, ANSI C29.5, ANSI C29.6, and ANSI C29.7 as applicable. Ratings shall not be lower than the ANSI classes indicated in Table I. Horizontal line-post insulators shall be used for armless construction and shall have the same mechanical and electrical ratings as vertical line-post insulators for the ANSI class indicated, but shall be modified to be suitable for horizontal installation. Where line-post insulators are used for angles greater than 15 degrees, clamp-top fittings shall be provided as well as for other locations shown. Conductor clamps for use with clamp-top, line-post insulators shall be hot-dip galvanized malleable iron for copper conductors and aluminum alloy for aluminum-composition conductors. Either line-post or pin insulators may be used for crossarm construction. Pin insulators for use on voltages in excess of 6 kV phase-to-phase shall be radio-interference-free or else line-post insulators shall be used.

<table>
<thead>
<tr>
<th>Voltage Level</th>
<th>Line-Post</th>
<th>Pin</th>
<th>Suspension</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 5 kV</td>
<td>57-1 or 11</td>
<td>55-3</td>
<td>One 52-1</td>
</tr>
<tr>
<td></td>
<td>57-1 or 11</td>
<td>55-5</td>
<td>Two 52-1</td>
</tr>
<tr>
<td>6 kV to 15 kV</td>
<td>57-1 or 11</td>
<td>55-5</td>
<td>Two 52-2</td>
</tr>
<tr>
<td></td>
<td>57-2 or 12</td>
<td>56-3</td>
<td>Two 52-3 or 4</td>
</tr>
<tr>
<td>16 kV to 25 kV</td>
<td>57-2 or 12</td>
<td>56-3</td>
<td>Two 52-3 or 4</td>
</tr>
</tbody>
</table>

SECTION 16370 PAGE 10
TABLE I - MINIMUM ANSI RATING OF MEDIUM-VOLTAGE INSULATORS BY CLASS

<table>
<thead>
<tr>
<th>Voltage Level</th>
<th>Line-Post</th>
<th>Pin</th>
<th>Suspension</th>
</tr>
</thead>
<tbody>
<tr>
<td>57-3 or 13</td>
<td>57-3 or 13</td>
<td>56-4</td>
<td>Three 52-3 or 4</td>
</tr>
<tr>
<td>26 kV to 35 kV</td>
<td>57-4 or 14</td>
<td>56-5</td>
<td>Four 52-3 or 4</td>
</tr>
</tbody>
</table>

2.9.2 Strain Insulators for Guy Wires

Strain insulators for use in insulated guy assemblies shall comply with ANSI C29.4 for porcelain or equivalent fiberglass, and shall have a mechanical strength exceeding the rated breaking strength of the attached guy wire. Insulators shall be not smaller than Class 54-1 for lines up to 5 kV.

2.10 CROSSARM ASSEMBLIES

2.10.1 Crossarms

Crossarms shall comply with REA Bulletin 1728H-701 and shall be solid wood, distribution type, except cross-sectional area with pressure treatment conforming to AWPA C25, and a 1/4 inch, 45 degree chamfer on all top edges. Cross-sectional area minimum dimensions shall be 4-1/4 inches in height by 3-1/4 inches in depth in accordance with ANSI C2 for Grade B construction. Crossarms shall be 8 feet in length. Crossarms shall be machined, chamfered, trimmed, and bored for stud and bolt holes before pressure treatment. Factory drilling shall be provided for pole and brace mounting, for four pin or four vertical line-post insulators, and for four suspension insulators, except where otherwise indicated or required. Drilling shall provide required climbing space and wire clearances. Crossarms shall be straight and free of twists to within 1/10 inch per foot of length. Bend or twist shall be in one direction only.

2.10.2 Crossarm Gains

Crossarm gains shall comply with ANSI C135.33.

2.11 FUSES AND SWITCHES, MEDIUM-VOLTAGE

2.11.1 Fused Cutouts

Medium-voltage fuses and cutouts shall comply with NEMA SG 2 and shall be of the loadbreak open type construction rated 15 kV and of the heavy-duty type. Open-link cut-outs are not acceptable. Fuses shall be either indicating or dropout type. Fuse ratings shall be as indicated. Fuse cutouts shall be equipped with mounting brackets suitable for the indicated installations.

2.12 SURGE ARRESTERS

Surge arresters shall comply with NEMA LA 1 and IEEE C62.1, IEEE C62.2, and IEEE C62.11, and shall be provided for protection of
aerial-to-underground transitions, group-operated load-interrupter switches, transformers and other indicated equipment. Arresters shall be distribution class, rated as shown. Arresters for use at elevations in excess of 6000 feet above mean sea level shall be specifically rated for that purpose. Arresters shall be equipped with mounting brackets suitable for the indicated installations. Arresters shall be of the metal-oxide varistor type suitable for outdoor installations.

2.13 GROUNDING AND BONDING

2.13.1 Driven Ground Rods

Ground rods shall be of copper-clad steel conforming to UL 467 not less than 3/4 inch in diameter by 10 feet in length of the sectional type driven full length into the earth.

2.13.2 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 the 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.

2.14 FACTORY TESTS

Factory tests shall be performed, as follows, in accordance with the applicable publications and with other requirements of these specifications. The Contracting Officer shall be notified at least 10 days before the equipment is ready for testing.

a. High-Voltage Fuses: Manufacturer’s standard tests in accordance with IEEE C37.41.

b. Electric Power Insulators: Manufacturer’s standard tests in accordance with ANSI C29.1.

PART 3 EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

Equipment and devices shall be installed and energized in accordance with the manufacturer’s published instructions. Circuits installed in conduits or underground and splices and terminations for medium-voltage cable shall conform to the requirements of Section 16375 ELECTRICAL DISTRIBUTION SYSTEM, UNDERGROUND. Secondary circuits installed in conduit on poles shall conform to the requirements of Section 16415 ELECTRICAL WORK, INTERIOR.

3.1.1 Conformance to Codes

The installation shall comply with the requirements and recommendations of NFPA 70 and ANSI C2 for medium loading districts, Grade B construction. No reduction in clearance shall be made.
3.1.2 Verification of Dimensions

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

3.2 POLE INSTALLATION

Crossarm construction shall be provided for support of equipment except where direct-pole mounting is indicated. Provision for communication services is required on pole-line construction, except where specifically noted otherwise. A vertical pole space of not less than 2 feet shall be reserved at all locations.

3.2.1 Wood Pole Setting

Wood Pole Setting: Wood poles shall be set straight and firm. In normal firm ground, minimum pole-setting depths shall be as listed in Table II. Poles in straight runs shall be in a straight line. Curved poles shall be placed with curvatures in the direction of the pole line. Poles shall be set to maintain as even a grade as practicable. When the average ground run is level, consecutive poles shall not vary more than 5 feet in height. When the ground is uneven, poles differing in length shall be kept to a minimum by locating poles to avoid the highest and lowest ground points. If it becomes necessary to shorten a pole, a piece shall be sawed off the top end and roofed. If any pole is shortened after treatment, the shortened end of the pole shall be given an application of hot preservative. Where poles are set on hilly terrain, along edges of cuts or embankments, or where soil may be washed out, special precautions shall be taken to ensure durable pole foundations, and the setting depth shall be measured from the lower side of the pole. Holes shall be dug large enough to permit proper use of tampers to the full depth of a hole. Earth shall be placed into the hole in 6 inch maximum layers, then thoroughly tamped before the next layer is placed. Surplus earth shall be placed around each pole in a conical shape and packed tightly to drain water away from poles.

<table>
<thead>
<tr>
<th>Length Overall Feet</th>
<th>Straight Lines</th>
<th>Curves, Corners, and Points of Extra Strain</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>5.0</td>
<td>5.0</td>
</tr>
<tr>
<td>25</td>
<td>5.5</td>
<td>5.5</td>
</tr>
<tr>
<td>30</td>
<td>5.5</td>
<td>5.5</td>
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<tr>
<td>35</td>
<td>6.0</td>
<td>6.0</td>
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<tr>
<td>40</td>
<td>6.5</td>
<td>6.5</td>
</tr>
<tr>
<td>45</td>
<td>6.5</td>
<td>7.0</td>
</tr>
<tr>
<td>50</td>
<td>7.0</td>
<td>7.5</td>
</tr>
<tr>
<td>55</td>
<td>7.5</td>
<td>8.0</td>
</tr>
</tbody>
</table>

SECTION 16370 PAGE 13
3.3 CROSSARM MOUNTING

Crossarms shall be bolted to poles with 5/8 inch through-bolts with square washers at each end. Bolts shall extend not less than 1/8 inch nor more than 2 inches beyond nuts. On single crossarm construction, the bolt head shall be installed on the crossarm side of the pole. Fiberglass crossarm braces shall be provided on crossarms. Flat braces may be provided for 8 foot crossarms and shall be 1/4 by 1-1/4 inches, not less than 28 inches in length. Flat braces shall be bolted to arms with 3/8 inch carriage bolts with round or square washers between boltheads and crossarms, and secured to poles with 1/2 by 4 inch lag screws after crossarms are leveled and aligned. Double crossarms shall be securely held in position by means of 5/8 inch double-arming bolts. Each double-arming bolt shall be equipped with four nuts and four square washers.

3.3.1 Line Arms and Buck Arms

Line arms and buck arms shall be set at right angles to lines for straight runs and for angles 45 degrees and greater; and line arms shall bisect angles of turns of less than 45 degrees. Dead-end assemblies shall be used for turns where shown. Buckarms shall be installed, as shown, at corners and junction poles. Double crossarms shall be provided at ends of joint use or conflict sections, at dead-ends, and at angles and corners to provide adequate vertical and longitudinal strength. Double crossarms shall be provided at each line-crossing structure and where lines not attached to the same pole cross each other.

3.3.2 Equipment Arms

Equipment arms shall be set parallel or at right angles to lines as required to provide climbing space. Equipment arms shall be located below line construction to provide necessary wire and equipment clearances.
3.4 GUY INSTALLATION

Guys shall be provided where shown, with loads and strengths as indicated, and wherever conductor tensions are not balanced, such as at angles, corners, and dead-ends. Where a single guy will not provide the required strength, two or more guys shall be provided. Where guys are wrapped around poles, at least two guy hooks shall be provided and pole shims shall be provided where guy tension exceeds 6000 pounds. Guy clamps 6 inches in length with three 5/8 inch bolts, or offset-type guy clamps, or approved guy grips shall be provided at each guy terminal. Guy-strain insulators shall be provided in each guy for wood poles. Multiple-helix screw anchors shall be provided in marshy ground; rock anchors shall be installed in rock at right angles to guys, elsewhere anchors shall be of an expanding type, except that power installed screw anchors of equivalent holding power are acceptable. A half-round yellow polyvinyl, fiberglass, or other suitable plastic guy marker, not less than 8 feet in length, shall be provided at the anchor end of each guy shown, securely clamped to the guy or anchor at the bottom and top of the marker. Holding capacities for down guys shall be based on a lead angle of 45 degrees.

3.5 CONDUCTOR INSTALLATION

3.5.1 Line Conductors

Unless otherwise indicated, conductors shall be installed in accordance with manufacturer's approved tables of sags and tensions. Proper care shall be taken in handling and stringing conductors to avoid abrasions, sharp bends, cuts, kinks, or any possibility of damage to insulation or conductors. Conductors shall be paid out with the free end of conductors fixed and cable reels portable, except where terrain or obstructions make this method unfeasible. Bend radius for any insulated conductor shall not be less than the applicable NEMA specification recommendation. Conductors shall not be drawn over rough or rocky ground, nor around sharp bends. When installed by machine power, conductors shall be drawn from a mounted reel through stringing sheaves in straight lines clear of obstructions. Initial sag and tension shall be checked by the Contractor, in accordance with the manufacturer's approved sag and tension charts, within an elapsed time after installation as recommended by the manufacturer.

3.5.2 Connectors and Splices

Connectors and splices shall be mechanically and electrically secure under tension and shall be of the nonbolted compression type. The tensile strength of any splice shall be not less than the rated breaking strength of the conductor. Splice materials, sleeves, fittings, and connectors shall be noncorrosive and shall not adversely affect conductors. Aluminum-composition conductors shall be wire brushed and an oxide inhibitor applied before making a compression connection. Connectors which are factory-filled with an inhibitor are acceptable. Inhibitors and compression tools shall be of types recommended by the connector manufacturer. Primary line apparatus taps shall be by means of hot line clamps attached to compression type bail clamps (stirrups). Low-voltage connectors for copper conductors shall be of the solderless pressure type. Noninsulated connectors shall be smoothly taped to provide a waterproof
insulation equivalent to the original insulation, when installed on insulated conductors. On overhead connections of aluminum and copper, the aluminum shall be installed above the copper.

3.5.3 Conductor-To-Insulator Attachments

Conductors shall be attached to insulators by means of clamps, shoes or tie wires, in accordance with the type of insulator. For insulators requiring conductor tie-wire attachments, tie-wire sizes shall be as indicated in TABLE II.

**TABLE II - TIE-WIRE REQUIREMENTS**

<table>
<thead>
<tr>
<th>CONDUCTOR</th>
<th>TIE WIRE</th>
</tr>
</thead>
<tbody>
<tr>
<td>AAC, AAAC, or ACSR (AWG)</td>
<td>AAAC OR AAC (AWG)</td>
</tr>
<tr>
<td>Any size</td>
<td>6 or 4</td>
</tr>
</tbody>
</table>

3.5.4 Armor Rods

Armor rods shall be provided for AAC, AAAC, and ACSR conductors. Armor rods shall be installed at supports, except armor rods will not be required at primary dead-end assemblies if aluminum or aluminum-lined zinc-coated steel clamps are used. Lengths and methods of fastening armor rods shall be in accordance with the manufacturer's recommendations. For span lengths of less than 200 feet, flat aluminum armor rods may be used. Flat armor rods, not less than 0.03 by 0.25 inch shall be used on No. 1 AWG AAC and AAAC and smaller conductors and on No. 5 AWG ACSR and smaller conductors. On larger sizes, flat armor rods shall be not less than 0.05 by 0.30 inches. For span lengths of 200 feet or more, preformed round armor rods shall be used.

3.6 CONNECTIONS TO UTILITY LINES

The Contractor shall coordinate the work with the Contracting Officer and shall provide for final connections to the installation electric lines.

3.7 CONNECTIONS BETWEEN AERIAL AND UNDERGROUND SYSTEMS

Connections between aerial and underground systems shall be made as shown. Underground cables shall be extended up poles in conduit to cable terminations. Conduits shall be secured to poles by two-hole galvanized steel pipe straps spaced not more than 10 feet apart and with one support not more than 12 inches from any bend or termination. Cables shall be supported by devices separate from the conduit or guard, near their point of exit from the riser conduit or guard. Cables guards shall be secured in accordance with the manufacturers published procedure. Risers shall be equipped with bushings to protect cables. Capnut potheads shall be used to terminate medium-voltage multiple-conductor cable.
3.8 CONNECTIONS TO BUILDINGS

3.8.1 Underground Services

Connections to buildings shall be made at the point indicated and shall be
terminated at the service entrance equipment terminals. Cable pulling
shall be in accordance with Section 16375, ELECTRICAL DISTRIBUTION
SYSTEM, UNDERGROUND. Service entrance conduits with termination fittings
and conductors within the building shall conform to the requirements of
Section 16415 ELECTRICAL WORK, INTERIOR.

3.9 GROUNDING

Noncurrent-carrying metal parts of equipment and conductor assemblies, such
as luminaires, medium-voltage cable terminations and messengers, metal
poles, operating mechanisms of pole top switches, panel enclosures,
transformers, capacitors, recloser frames (cases) and other
noncurrent-carrying metal items shall be grounded. Additional grounding of
equipment, neutral, and surge arrester grounding systems shall be installed
at poles where indicated.

3.9.1 Grounding Electrodes

Grounding electrodes shall be installed as follows:

a. Driven rod electrodes - Unless otherwise indicated, ground rods
shall be located approximately 3 feet out from base of the pole and shall
be driven into the earth until the tops of the rods are approximately 1
foot below finished grade. Multiple rods shall be evenly spaced at least
10 feet apart and connected together 2 feet below grade with a minimum No.
6 bare copper conductor.

b. Ground Resistance - The maximum resistance of a driven ground
rod shall not exceed 25 ohms under normally dry conditions. Whenever the
required ground resistance is not met, provide additional electrodes
interconnected with grounding conductors, to achieve the specified ground
resistance. The additional electrodes will be up to three, 10 foot rods
spaced a minimum of 10 feet apart. In high ground resistance, UL listed
chemically charged ground rods may be used. If the resultant resistance
exceeds 25 ohms measured not less than 48 hours after rainfall, the
Contracting Officer shall be notified immediately. Connections below grade
shall be fusion welded. Connections above grade shall be fusion welded or
shall use UL 467 approved connectors.

3.9.2 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. Where grounding
conductors are connected to aluminum-composition conductors, specially
treated or lined copper-to-aluminum connectors suitable for this purpose
shall be used.
3.9.3 Grounding Electrode Conductors

On multi-grounded circuits, as defined in ANSI C2, provide a single continuous vertical grounding electrode conductor. Neutrals, surge arresters, and equipment grounding conductors shall be bonded to this conductor. For single grounded or ungrounded systems, provide a grounding conductor for the surge arrester and equipment grounding conductors and a separate grounding conductor for the secondary neutrals. Grounding electrode conductors shall be sized as shown. Secondary system neutral conductors shall be connected directly to the transformer neutral bushings, then connected with a neutral bonding jumper between the transformer neutral bushing and the vertical grounding electrode conductor, as shown. Grounding electrode conductors shall be stapled to wood poles at intervals not exceeding 2 feet. On metal poles, a preformed galvanized steel strap, 5/8 inch wide by 22 gauge minimum by length, secured by a preformed locking method standard with the manufacturer, shall be used to support a grounding electrode conductor installation on the pole and spaced at intervals not exceeding 5 feet with one band not more than 3 inches from each end of the vertical grounding electrode conductor. Bends greater than 45 degrees in grounding electrode conductor are not permitted.

3.10 FIELD TESTING

3.10.1 General

Field testing shall be performed in the presence of the Contracting Officer. The Contractor shall notify the Contracting Officer 20 days prior to conducting tests. The Contractor shall furnish materials, labor, and equipment necessary to conduct field tests. The Contractor shall perform tests and inspections recommended by the manufacturer unless specifically waived by the Contracting Officer. The Contractor shall maintain a written record of tests which includes date, test performed, personnel involved, devices tested, serial number and name of test equipment, and test results. Field reports will be signed and dated by the Contractor.

3.10.2 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.

3.10.3 Ground-Resistance Tests

The resistance of each grounding electrode system shall be measured using the fall-of-potential method defined in IEEE Std 81. Ground resistance measurements shall be made before the electrical distribution system is energized and shall be made in normally dry conditions not less than 48 hours after the last rainfall. Resistance measurements of separate grounding electrode systems shall be made before the systems are bonded together below grade. The combined resistance of separate systems may be used to meet the required resistance, but the specified number of electrodes shall be provided.
3.10.4 Sag and Tension Test

The Contracting Officer shall be given prior notice of the time schedule for stringing conductors or cables serving overhead medium-voltage circuits and reserves the right to witness the procedures used for ascertaining that initial stringing sags and tensions are in compliance with requirements for the applicable loading district and cable weight.

3.10.5 Operating Tests

After the installation is completed, and at such time as the Contracting Officer may direct, the Contractor shall conduct operating tests for approval. The equipment shall be demonstrated to operate in accordance with the specified requirements. An operating test report shall be submitted in accordance with paragraph SUBMITTALS.

3.11 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 --
PART 1  GENERAL

1.1  REFERENCES

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

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)


AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI C12.4  (1984; R 1990) Mechanical Demand Registers
ANSI C12.10  (1987) Electromechanical Watthour Meters
ANSI C12.11  (1987) Instrument Transformers for Revenue Metering, 10 kV BIL through 350 kV (0.6 kV NSV through 69 kV NSV)
ANSI C37.06  (1987; C37.06a) AC High-Voltage Circuit Breakers Rated on a Symmetrical Current Basis-Preferred Ratings and Relate Required Capabilities
ANSI C37.121  (1989) Unit Substations Requirement
TARGET LAUNCH FACILITIES, PHASE 1, FT WINGATE, NM

Liquid-Filled Transformers Used in Unit Installations, Including Unit Substations

ANSI C57.12.21
(1980) Requirements for Pad-Mounted Compartmental-Type, Self-Cooled, Single-Phase Distribution Transformers with High-Voltage Bushings; High-Voltage, 34 500 GrdV/19 920 Volts and Below; Low-Voltage, 240/120 Volts; 167 kVA and Smaller

ANSI C57.12.22
(1989) Transformers - Pad-Mounted, Compartmental-Type, Self-Cooled, Three-Phase Distribution Transformers with High-Voltage Bushings, 2500 kVA and Smaller: High-Voltage, 34 500 GrdV/19 920 Volts and Below; Low Voltage, 480 Volts and Below

ANSI C57.12.27
(1982) Conformance Requirements for Liquid-Filled Distribution Transformers Used in Pad-Mounted Installations, Including Unit Substations

ANSI C78.1352
(1990) 1000-Watt, 250-Volt, S52 Single-Ended High-Pressure Sodium Lamps

ANSI C80.1
(1990) Rigid Steel Conduit - Zinc Coated

ANSI C82.4
(1992) Ballasts for High-Intensity-Discharge and Low-Pressure Sodium Lamps (Multiple-Supply Type)

ANSI C119.1
(1986) Sealed Insulated Underground Connector Systems Rated 600 Volts

ANSI C136.10

ANSI C136.13
(1992) Metal Brackets for Wood Poles

ANSI O5.1
(1992) Specifications and Dimensions for Wood Poles

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 48
(1993a) Gray Iron Castings

ASTM A 123
(1989a) Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

ASTM A 153
(1982; R 1987) Zinc Coating (Hot-Dip) on Iron and Steel Hardware

ASTM B 8
(1993) Concentric-Lay-Stranded Copper
TARGET LAUNCH FACILITIES, PHASE 1, FT WINGATE, NM

ASTM B 117

ASTM B 188
(1988) Seamless Copper Bus Pipe and Tube

ASTM B 317
(1992) Aluminum-Alloy Extruded Bar, Rod, Tube, Pipe, and Structural Shapes for Electrical Purposes (Bus Conductor)

ASTM C 478
(1993) Precast Reinforced Concrete Manhole Sections

ASTM D 923
(1991) Sampling Electrical Insulating Liquids

ASTM D 1654
(1992) Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments

ASTM D 4059
(1991) Analysis of Polychlorinated Biphenyls in Insulating Liquids by Gas Chromatography

ASTM F 883
(1990) Padlocks

AMERICAN WOOD PRESERVERS ASSOCIATION (AWPA)

AWPA C4
(1992) Poles - Preservative Treatment by Pressure Processes

AWPA P1/P13
(1991) Coal Tar Creosote for Land and Fresh Water and Marine (Coastal Water) Use

AWPA P8
(1991) Oil-Borne Preservatives

AWPA P9
(1992) Solvents and Formulations for Organic Preservative Systems

ASSOCIATION OF EDISON ILLUMINATING COMPANIES (AEIC)

AEIC CS5
(1994) Thermoplastic and Crosslinked Polyethylene Insulated Shielded Power Cables Rated 5 Through 35 kV

AEIC CS6

FACTORY MUTUAL ENGINEERING AND RESEARCH (FM)

FM P7825
(1994; Supple I & II) Approval Guide

FEDERAL SPECIFICATIONS (FS)

SECTION 16375 PAGE 3
FS HH-I-595
(Rev C) Insulation Tape, Electrical, Pressure-Sensitive Adhesive, Plastic

FS RR-F-621
(Rev E) Frames, Covers, Gratings, Steps, Sump and Catch Basin, Manhole

FS W-F-1814/GEN
(Rev A; Am 1; Suppl 1; Notice 1) Fuses, Cartridge, High-Interrupting Capacity

FS W-S-610
(Rev E) Splice Connectors

ILLUMINATING ENGINEERING SOCIETY OF NORTH AMERICA (IESNA)

IESNA ARP-8
(1983) Roadway Lighting

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE C37.04
(1979; R 1988) Rating Structure for AC High-Voltage Circuit Breakers Rated on a Symmetrical Current Basis

IEEE C37.2

IEEE C37.20.1
(1993) Metal-Enclosed Low-Voltage Power Circuit-Breaker Switchgear

IEEE C37.20.2
(1993) Metal-Clad and Station-Type Cubicle Switchgear

IEEE C37.20.3
(1987) Metal-Enclosed Interrupter Switchgear

IEEE C37.30
(1992) Definitions and Requirements for High-Voltage Air Switches, Insulators, and Bus Supports

IEEE C37.34
(1971; R 1987; C37.34a; C37.34b; C37.34d; C37.34e) Test Code for High-Voltage Air Switches

IEEE C37.41
(1988; 37.41c) Design Tests for High-Voltage Fuses, Distribution Enclosed Single-Pole Air Switches, Fuse Disconnecting Switches, and Accessories

IEEE C37.90

IEEE C37.90.1

IEEE C37.98
(1987; R 1991) Seismic Testing of Relays
IEEE C57.12.00  

IEEE C57.12.01  
(1989) Dry-Type Distribution and Power Transformers Including Those with Solid Cast and/or Resin - Encapsulated Windings

IEEE C57.12.11  

IEEE C57.13  
(1993) Instrument Transformers

IEEE C57.98  

IEEE C62.1  
(1989) Surge Arresters for AC Power Circuits

IEEE C62.2  

IEEE C62.11  
(1993) IEEE Standard Metal-Oxide Surge Arresters for AC Power Circuits

IEEE Std 48  
(1990) Standard Test Procedures and Requirements for High-Voltage Alternating-Current Cable Terminations

IEEE Std 81  

IEEE Std 100  
(1992) IEEE Standard Dictionary of Electrical and Electronics Terms

IEEE Std 404  
(1993) Cable Joints for Use with Extruded Dielectric Cable Rated 5000 V through 46 000 V and Cable Joints for Use with Laminated Dielectric Cable Rated 2500 V Through 500 000 V

IEEE Std 484  
(1987) Recommended Practice for Installation Design and Installation of Large Lead Storage Batteries for Generating Stations and Substations

IEEE Std 592  
(1990) Exposed Semiconducting Shields on Premolded High Voltage Cable Joints and Separable Insulated Connectors
TARGET LAUNCH FACILITIES, PHASE 1, FT WINGATE, NM

INSTRUMENT SOCIETY OF AMERICA (ISA)

ISA S18.1  (1979; R 1992) Annunciator Sequences and Specifications

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 LA 1  (1992) Surge Arresters

NEMA SG 2  (1993) High-Voltage Fuses

NEMA SG 5  (1990) Power Switchgear Assemblies

NEMA TC 5  (1990) Corrugated Polyolefin Coilable Plastic Utilities Duct

NEMA TC 6  (1990) PVC and ABS Plastic Utilities Duct for Underground Installation

NEMA TC 7  (1990) Smooth-Wall Coilable Polyethylene Electrical Plastic Duct


NEMA WD 1  (1983; R 1989) General Requirements for Wiring Devices

NEMA 250  (1991) Enclosures for Electrical Equipment (1000 Volts Maximum)

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)


UNDERWRITERS LABORATORIES (UL)

UL 6  (1993) Rigid Metal Conduit


SECTION 16375  PAGE 6
1.2 GENERAL REQUIREMENTS

1.2.1 Terminology

Terminology used in this specification is as defined in IEEE Std 100.

1.2.2 Service Conditions

Items provided under this section shall be specifically suitable for the following service conditions:

a. Altitude: 7250 feet above sea level

b. Ambient Temperature: -1 to 89 degrees F

c. Frequency: 60

d. Seismic Zone: 1

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 01300 SUBMITTAL DESCRIPTIONS:

SD-01 Data

Short-Circuit and Protective Devices Coordination Studies; GA.

Studies which demonstrate that the equipment selected and system constructed meet the contract requirements for equipment ratings, coordination, and protection. The studies shall include a complete single-line diagram of the power system covered by this specification; a short circuit study including the maximum and minimum values of short circuit currents at major buses extended down to system buses where currents are equal to 10,000 amperes symmetrical; utility company data including system voltages, fault MVA, system X/R ratio, time-current characteristic curves, current transformer ratios, and relay device numbers and settings; and existing power system data including time-current characteristic curves and protective device ratings and settings; fully coordinated composite time-current characteristic curves including recommended ratings and settings of all protective devices in tabulated form; and associated calculations to demonstrate that the power system protection will be selectively coordinated by the use of devices or equipment submitted. Situations where system coordination is not achievable due to device limitations shall be noted. The studies shall be performed by a registered professional engineer with demonstrated experience in power system coordination in the last three years. The Contractor shall provide a list of references complete with points of contact, addresses and telephone numbers. The selection of the engineer is subject to the approval of the Contracting Officer.

Manufacturer's Catalog Data; GA.

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; 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.

Installation Procedures; GA.

As a minimum, installation procedures for transformers, switchgear, and medium-voltage cable terminations and splices.

Procedures shall include cable pulling plans, diagrams, instructions, and precautions required to install, adjust, calibrate, and test the devices and equipment.

SD-04 Drawings
Electrical Distribution System; GA.

Detail drawings consisting of equipment drawings, illustrations, schedules, instructions, diagrams manufacturers standard installation drawings and other information necessary to define the installation and enable the Government to check conformity with the requirements of the contract drawings.

If departures from the contract drawings are deemed necessary by the Contractor, complete details of such departures shall be included with the detail drawings. Approved departures shall be made at no additional cost to the Government.

Detail drawings shall show how components 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 consist of the following:

a. Detail drawings showing physical arrangement, construction details, connections, finishes, materials used in fabrication, provisions for conduit or busway 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. All optional items shall be clearly identified as included or excluded.

b. Internal wiring diagrams of equipment showing wiring as actually provided for this project. External wiring connections shall be clearly identified.

Detail drawings shall as a minimum depict the installation of the following items:

a. Medium-voltage cables and accessories including cable installation plan.

b. Transformers.

c. Substations.

d. Switchgear.

e. Busways.

f. Surge arresters.

As-Built Drawings; GA.

The as-built drawings shall be a record of the construction as installed. The drawings shall include the information shown on the contract.
drawings as well as deviations, modifications, and changes from the contract drawings, however minor. The as-built drawings shall be a full sized set of prints marked to reflect deviations, modifications, and changes. The as-built drawings shall be complete and show the location, size, dimensions, part identification, and other information. Additional sheets may be added. The as-built drawings shall be jointly inspected for accuracy and completeness by the Contractor's quality control representative and by the Contracting Officer prior to the submission of each monthly pay estimate. Upon completion of the work, the Contractor shall provide 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 10 calendar days from the time the drawings are returned to the Contractor.

SD-09 Reports

Factory Test; FIO.

Certified factory test reports shall be submitted when the manufacturer performs routine factory tests, including tests required by standards listed in paragraph REFERENCES. Results of factory tests performed shall be certified by the manufacturer, or an approved testing laboratory, and submitted within 7 days following successful completion of the tests. The manufacturer's pass-fail criteria for tests specified in paragraph FIELD TESTING shall be included.

Field Testing; GA.

A proposed field test plan, 20 days prior to testing the installed system. No field test shall be performed until the test plan is approved. The test plan shall consist of complete field test procedures including tests to be performed, test equipment required, and tolerance limits.

Test Reports; FIO.

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. A list of equipment used, with calibration certifications.

b. A copy of measurements taken.

c. The dates of testing.

d. The equipment and values to be verified.

e. The condition specified for the test.

f. The test results, signed and dated.

g. A description of adjustments made.
Cable Installation Reports; FIO.

Six copies of the information described below in 8-1/2 by 11 inch binders having a minimum of three rings from which material may readily be removed and replaced, including a separate section for each cable pull. Sections shall be separated by heavy plastic dividers with tabs, with all data sheets signed and dated by the person supervising the pull.

a. Site layout drawing with cable pulls numerically identified.
b. A list of equipment used, with calibration certifications. The manufacturer and quantity of lubricant used on pull.
c. The cable manufacturer and type of cable.
d. The dates of cable pulls, time of day, and ambient temperature.
e. The length of cable pull and calculated cable pulling tensions.
f. The actual cable pulling tensions encountered during pull.

SD-13 Certificates

Materials and Equipment; GA.

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.

Cable Splicer Qualification; GA.

A certification that contains the names and the qualifications of people recommended to perform the splicing and termination of medium-voltage cables approved for installation under this contract. The certification shall indicate that any person recommended to perform actual splicing and terminations has been adequately trained in the proper techniques and have had at least three recent years of experience in splicing and terminating
the same or similar types of cables approved for installation. In addition, any person recommended by the Contractor may be required to perform a practice splice and termination, in the presence of the Contracting Officer, before being approved as a qualified installer of medium-voltage cables. If that additional requirement is imposed, the Contractor shall provide short sections of the approved types of cables along with the approved type of splice and termination kits, and detailed manufacturer's instruction for the proper splicing and termination of the approved cable types.

Cable Installer Qualifications; GA.

The Contractor shall provide at least one onsite person in a supervisory position with a documentable level of competency and experience to supervise all cable pulling operations. A resume shall be provided showing the cable installers' experience in the last three years, including a list of references complete with points of contact, addresses and telephone numbers.

SD-19 Operation and Maintenance Manuals

Electrical Distribution System; FIO.

Six copies of Operation and Maintenance manuals, within 7 calendar days following the completion of tests and including assembly, installation, operation and maintenance instructions, spare parts data which provides supplier name, current cost, catalog order number, and a recommended list of spare parts to be stocked. Manuals shall also include data outlining detailed procedures for system startup and operation, and a troubleshooting guide which lists possible operational problems and corrective action to be taken. A brief description of all equipment, basic operating features, and routine maintenance requirements shall also be included. Documents shall be bound in a binder marked or identified on the spine and front cover. A table of contents page shall be included and marked with pertinent contract information and contents of the manual. Tabs shall be provided to separate different types of documents, such as catalog ordering information, drawings, instructions, and spare parts data. Index sheets shall be provided for each section of the manual when warranted by the quantity of documents included under separate tabs or dividers.

Three additional copies of the instructions manual, within 30 calendar days following the approval of the manuals.

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. Oil filled transformers and switches shall be stored in accordance with the manufacturer's requirements. Wood poles held in storage for more than 2 weeks shall be stored in accordance with ANSI 05.1. Handling of wood poles shall be in accordance with ANSI 05.1, except that pointed tools capable of producing indentations more than 1 inch in depth shall not be used. Metal poles shall be handled and stored in accordance with the
manufacturer's instructions.

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. Two complete sets of all special tools required for maintenance shall be provided, complete with a suitable tool box. Special tools are those that only the manufacturer provides, for special purposes (to access compartments, or operate, adjust, or maintain special parts).

PART 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. Equipment containing liquid dielectrics shall have the type of dielectric on the nameplate. Sectionalizer switch nameplates shall have a schematic with all switch positions shown and labeled. As a minimum, nameplates shall be provided for transformers, circuit breakers, meters, switches, and switchgear.

2.2.2 Liquid-Filled Transformer Nameplates

Nameplates shall indicate percent impedance, voltage, kVA, frequency, number of phases, cooling class, insulation class, temperature rise, the number of gallons and composition of liquid-dielectric, and shall be permanently marked with a statement that the dielectric supplied is non-polychlorinated biphenyl. If transformer nameplate is not so marked, the Contractor shall furnish manufacturer's certification for each transformer that the dielectric is non-PCB classified, with less than 50 ppm PCB content in accordance with paragraph LIQUID DIELECTRICS. Certifications shall be related to serial numbers on transformer nameplates. Transformer dielectric exceeding the 50 ppm PCB content or transformers without certification will be considered as PCB insulated and will not be accepted.

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.

2.3.2.2 Equipment

Equipment and component items, including but not limited to transformer stations and ferrous metal luminaires not hot-dip galvanized or porcelain enamel finished, shall be provided with corrosion-resistant finishes which shall withstand 120 hours of exposure to the salt spray test specified in ASTM B 117 without loss of paint or release of adhesion of the paint primer coat to the metal surface in excess of 1/16 inch from the test mark. The scribed test mark and test evaluation shall be in accordance with ASTM D 1654 with a rating of not less than 7 in accordance with TABLE 1, (procedure A). Cut edges or otherwise damaged surfaces of hot-dip galvanized sheet steel or mill galvanized sheet steel shall be coated with a zinc rich paint conforming to the manufacturer's standard.

2.3.3 Finishing

Painting required for surfaces not otherwise specified and finish painting of items only primed at the factory shall be as specified in Section 09900 PAINTING, GENERAL.

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 conductor material.

2.4.2 Medium-Voltage Cables

2.4.2.1 General

Medium voltage cables shall conform to the requirements of NEMA WC 8 for cables utilizing ethylene-propylene-rubber (EPR) insulation. Cables shall be in accordance with the requirements of NFPA 70.

2.4.2.2 Insulation

Cables shall utilize ethylene-propylene-rubber (EPR) insulation. Cables shall be provided with 133 percent insulation level.

2.4.2.3 Jackets

Cables shall be provided with a nonmetallic jacket. Concentric neutral cables for direct buried applications shall have a moisture-resistant, nonmetallic jacket rated for direct burial.
2.4.2.4 Neutrals

Neutral conductors of grounded neutral systems except for concentric neutral cables shall be of the same insulation material as phase conductors, except that a 600-volt insulation rating is acceptable. Cables employing a concentric neutral shall have full concentric neutral with an insulating jacket over the concentric neutral.

2.4.2.5 Shielding

Cables rated for above 2 kV shall have both conductor and insulation shielding for each phase, except insulation shielding is not required for 5 kV armored or metallic-sheathed cable.

2.4.2.6 Ratings

Medium-voltage cables shall be rated for a circuit voltage 5 kV unless otherwise indicated.

2.4.3 Low-Voltage Cables

Cables shall be rated 600 volts and shall conform to the requirements of NFPA 70. Cables shall utilize ethylene-propylene-rubber (EPR) insulation and shall conform to the requirements of NEMA WC 8.

2.4.3.1 Direct Buried

Service entrance cables shall conform to UL 854 for Type USE service entrance cable. Other direct buried cable applications shall be single-conductor cable, type use, and conforming to NEMA WC 8.

2.4.3.2 In Duct

Cables shall be single-conductor cable, Types RHW, THW, THWN, TW, USE, or XHHW in accordance with NFPA 70. Cables in factory-installed, coilable-plastic-duct assemblies shall conform to NEMA TC 5 or NEMA TC 7.

2.5 CABLE JOINTS, TERMINATIONS, AND CONNECTORS

2.5.1 Medium-Voltage Cable Joints

Medium-voltage cable joints shall comply with IEEE Std 404 and IEEE Std 592. Medium-voltage cable terminations shall comply with IEEE Std 48. Joints shall be the standard products of a manufacturer and shall be either of the factory preformed type or of the kit type containing tapes and other required parts. Joints shall have ratings not less than the ratings of the cables on which they are installed. Splice kits may be of the heat-shrinkable type for voltages up to 15 kV, of the premolded splice and connector type, the conventional taped type, or the resin pressure-filled overcast taped type for voltages up to 35 kV; except that for voltages of 7.5 kV or less a resin pressure-filled type utilizing a plastic-tape mold is acceptable. Joints used in manholes, handholes, vaults and pull boxes shall be certified by the manufacturer for waterproof, submersible applications.
2.5.2 Low-Voltage Cable Splices

Low-voltage cable splices and terminations shall be rated at not less than 600 Volts. Splices in conductors No. 10 AWG and smaller shall be made with an insulated, solderless, pressure type connector, Type I, Class I, Grade B, Style G, or Type II, Class 1 of FS W-S-610 and conforming to the applicable requirements of UL 486A. Splices in conductors No. 8 AWG and larger shall be made with uninsulated, solderless, pressure type connector, Type II, Class 2 of FS W-S-610, conforming to the applicable requirements of UL 486A and UL 486B. Splices shall then be covered with an insulation and jacket material equivalent to the conductor insulation and jacket. Splices below grade or in wet locations shall be sealed type conforming to ANSI C119.1 or shall be waterproofed by a sealant-filled, thick wall, heat shrinkable, thermosetting cubing or by pouring a thermosetting resin into a mold that surrounds the joined conductors.

2.5.3 Terminations

Terminations shall be in accordance with IEEE Std 48, Class 1 or Class 2; of the molded elastomer, wet-process porcelain, prestretched elastomer, heat-shrinkable elastomer, or taped type. Acceptable elastomers are track-resistant silicone rubber or track-resistant ethylene propylene compounds, such as ethylene propylene rubber or ethylene propylene diene monomer. Separable insulated connectors may be used for apparatus terminations, when such apparatus is provided with suitable bushings. Terminations shall be of the outdoor type, except that where installed inside outdoor equipment housings which are sealed against normal infiltration of moisture and outside air, indoor, Class 2 terminations are acceptable. Class 3 terminations are not acceptable. Terminations, where required, shall be provided with mounting brackets suitable for the intended installation and with grounding provisions for the cable shielding, metallic sheath, and armor.

2.5.3.1 Factory Preformed Type

Molded elastomer, wet-process porcelain, prestretched, and heat-shrinkable terminations shall utilize factory preformed components to the maximum extent practicable rather than tape build-up. Terminations shall have basic impulse levels as required for the system voltage level.

2.5.3.2 Taped Terminations

Taped terminations shall use standard termination kits providing terminal connectors, field-fabricated stress cones, and rain hoods. Terminations shall be at least 20 inches long from the end of the tapered cable jacket to the start of the terminal connector, or not less than the kit manufacturer’s recommendations, whichever is greater.

2.6 CONDUIT, DUCTS AND TRAYS

Ducts shall be as specified on the drawings.
2.6.1 Deleted

2.6.2 Nonmetallic Ducts

2.6.2.1 Concrete Encased Ducts

UL 651 Schedule 40 or NEMA TC 6 Type EB.

2.6.2.2 Direct Burial

UL 651 as indicated, or NEMA TC 6 Type DB.

2.6.3 Conduit Sealing Compound

Compounds for sealing ducts and conduit shall have a putty-like consistency workable with the hands at temperatures as low as 35 degrees F, shall neither slump at a temperature of 300 degrees F, nor harden materially when exposed to the air. Compounds shall adhere to clean surfaces of fiber or plastic ducts; metallic conduits or conduit coatings; concrete, masonry, or lead; any cable sheaths, jackets, covers, or insulation materials; and the common metals. Compounds shall form a seal without dissolving, noticeably changing characteristics, or removing any of the ingredients. Compounds shall have no injurious effect upon the hands of workmen or upon materials.

2.6.4 Cable Trays

Cable trays shall form a wireway system, and shall be dimensioned as shown and in nominal 3 foot lengths. Cable trays shall be constructed of steel that has been zinc-coated after fabrication. Trays shall include splice plates and miscellaneous hardware. Edges and hardware shall be finished free from burrs and sharp edges.

2.7 HANDHOLES AND PULLBOXES

Handholes and pullboxes shall be as indicated.

In paved areas, frames and covers in vehicular traffic areas shall be rated for wheel loads in accordance with FS RR-F-621. Cast iron shall comply with ASTM A 48, Class 30B, minimum. Concrete pullboxes shall consist of precast reinforced concrete boxes, extensions, bases, and covers.

2.8 TRANSFORMERS, SUBSTATIONS, AND SWITCHGEAR

Transformers, substations, and switchgear shall be of the outdoor type having the ratings and arrangements indicated. Medium-voltage ratings of cable terminations shall be 15 kV between phases for 133 percent insulation level.
2.8.1 Unit Substation

Unit substations shall comply with ANSI C37.121 and shall be of the radial type with an outgoing section mounted integrally on the transformer. Substations shall be subassembled and coordinated by one manufacturer and shall be shipped in complete sections ready for connection at the site. Complete sections shall include incoming, transformer, and outgoing sections and, where practicable, shall be shipped as one unit.

2.8.1.1 Incoming Section

Metal-enclosed interrupter switchgear of the fused load-interrupter air type shall be provided for protection of incoming circuits. Metal-enclosed interrupter switchgear shall comply with IEEE C37.20.3 and IEEE C37.30 for load-interrupter switches, NEMA SG 2 for power fuses, and shall be of the outdoor no-aisle type that meets or exceeds the requirements of applicable publications listed. Switch construction shall be of the manually-operated, "OPEN-CLOSED," air load interrupter type equipped with a stored energy operator for quick-make quick-break to make operating speeds independent of manual switch operations. Where indicated, suitable bus or lug connections shall be provided to mount field-installed, slip-on, medium-voltage cable terminations for cable entering via conduit from below and a bus throat suitable for connection to the associated metal-enclosed bus. Surge protection shall be provided in accordance with paragraph SURGE ARRESTERS. Switches shall be of the 2-position type, open-closed.

a. Ratings. Fuse continuous current ratings shall be as indicated for the transformer for an incoming line unit and for the line tie unit. Unless otherwise indicated, fuses shall be of the current limiting type. Switch ratings at 60 Hz shall be:

Nominal voltage ......................................................... 13.8 kV
Rated maximum voltage .............................................. 17 kV
Maximum symmetrical interrupting capacity .................... 12,000
Maximum asymmetrical interrupting capacity .................. 19,200
Rated continuous current .......................................... 600A
BIL ........................................................................... 110 kV

b. Basic Requirements. The electrical devices listed below shall be rated for the application and voltage and current indicated. Unless otherwise noted, manufacturer's standard devices shall be provided and shall include the following:

(1) A switch-operating handle with provisions for locking in either the open or closed position.

(2) A switch mechanical position indicator.
2.6.1 Metallic Conduit

Intermediate metal conduit shall comply with UL 1242. 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 PB-1.

2.6.2 Nonmetallic Ducts

2.6.2.1 Concrete Encased Ducts

UL 651 Schedule 40 or NEMA TC 6 Type EB.

2.6.2.2 Direct Burial

UL 651 as indicated, or NEMA TC 6 Type DB.

2.6.3 Conduit Sealing Compound

Compounds for sealing ducts and conduit shall have a putty-like consistency workable with the hands at temperatures as low as 35 degrees F, shall neither slump at a temperature of 300 degrees F, nor harden materially when exposed to the air. Compounds shall adhere to clean surfaces of fiber or plastic ducts; metallic conduits or conduit coatings; concrete, masonry, or lead; any cable sheaths, jackets, covers, or insulation materials; and the common metals. Compounds shall form a seal without dissolving, noticeably changing characteristics, or removing any of the ingredients. Compounds shall have no injurious effect upon the hands of workmen or upon materials.

2.6.4 Cable Trays

Cable trays shall form a wiring system and shall be dimensioned as shown and in nominal 3 foot lengths. Cable trays shall be constructed of steel that has been zinc-coated after fabrication. Trays shall include splice plates and miscellaneous hardware. Edges and hardware shall be finished free from burrs and sharp edges.

2.7 MANHOLES, HANDBOLES, AND PULLBOXES

Manholes, handholes, and pullboxes shall be as indicated. Precast-concrete manholes shall have the required strength established by ASTM C 478. Frames and covers shall be made of gray cast iron and a machine-finished seat shall be provided to ensure a matching joint between frame and cover. In paved areas, frames and covers in vehicular traffic areas shall be rated for wheel loads in accordance with FS RR-F-621. Cast iron shall comply with ASTM A 89, Class 30B, minimum. Concrete pullboxes shall consist of precast reinforced concrete boxes, extensions, boxes, and covers.

2.8 TRANSFORMERS, SUBSTATIONS, AND SWITCHGEAR

Transformers, substations, and switchgear shall be of the outdoor type having the ratings and arrangements indicated. Medium voltage ratings of cable terminations shall be 15 kV between phases for 133 percent insulation level.

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2.8.1 Unit Substation

Unit substations shall comply with ANSI C37.121 and shall be of the radial type with an outgoing section mounted integrally on the transformer. Substations shall be subassembled and coordinated by one manufacturer and shall be shipped in complete sections ready for connection at the site. Complete sections shall include incoming, transformer, and outgoing sections and, where practicable, shall be shipped as one unit.

2.8.1.1 Incoming Section

Metal-enclosed interrupter switchgear of the fused load-interrupter air type shall be provided for protection of incoming circuits. Metal-enclosed interrupter switchgear shall comply with IEEE C37.20.3 and IEEE C37.30 for load-interrupter switches, NEMA SG 2 for power fuses, and shall be of the outdoor no-aisle type that meets or exceeds the requirements of applicable publications listed. Switch construction shall be of the manually-operated, "OPEN-CLOSED," air load interrupter type equipped with a stored energy operator for quick-make quick-break to make operating speeds independent of manual switch operations. Where indicated, suitable bus or lug connections shall be provided to mount field-installed, slip-on, medium-voltage cable terminations for cable entering via conduit from below and a bus throat suitable for connection to the associated metal-enclosed bus. Surge protection shall be provided in accordance with paragraph SURGE ARRESTERS. Switches shall be of the 2-position type, open-closed.

a. Ratings. Fuse continuous current ratings shall be as indicated for the transformer for an incoming line unit and for the line tie unit. Unless otherwise indicated, fuses shall be of the current limiting type. Switch ratings at 60 Hz shall be:

- Nominal voltage .............................................. 13.8 kV
- Rated maximum voltage .................................... 17 kV
- Maximum symmetrical interrupting capacity ............. 12,000 A
- Maximum asymmetrical interrupting capacity ............ 19,200 A
- Rated continuous current .................................. 600 A
- BIL .......................................................... 110 kV

b. Basic Requirements. The electrical devices listed below shall be rated for the application and voltage and current indicated. Unless otherwise noted, manufacturer's standard devices shall be provided and shall include the following:

(1) A switch operating handle with provisions for locking in either the open or closed position.
(2) A switch mechanical position indicator.
(3) A heater continuously energized to prevent condensation over
an ambient temperature range of minus 20 to 104 degrees F and wired in
series with a cabinet door-actuated switch, so the heater is de-energized
when doors are open. High-temperature thermal protection shall be
included.

(4) One-pole or 2-pole thermal-magnetic, molded-case circuit
breakers suitable for the operating voltage for heater circuits.

(5) Safety devices as necessary to ensure that the load
interrupter switch is in the open position whenever unit doors are in the
open position.

(6) An interface terminal block wired for required exterior
connections.

2.8.1.2 Transformer Section

Transformers shall have two separate windings per phase and shall be of the
mineral oil-insulated type. Transformers shall be suitable for outdoor
use. Liquid-insulated transformers shall comply with IEEE C57.12.00,
ANSI C57.12.13, and ANSI C57.12.27, and shall have two 2-1/2
percent full capacity taps above and two 2-1/2 percent full capacity taps
below rated voltage. Transformers shall be of the sealed tank type
construction with welded-on cover. High-voltage terminals shall be
provided for direct connection to the incoming line section. Low-voltage
terminals shall be provided for direct connection to the outgoing
switchgear section. Low-voltage terminals shall be on the right as shown on
the drawings when facing the front, accessory side of the transformer.
Provision shall be made for the future addition of forced air cooling
equipment to give 667 kVA capacity. The transformer bushings, leads, and
other components shall be designed to carry the increased load. A top
liquid thermometer for control of future fans shall be furnished.
Provision for future mounting of fans, conduit, and terminal box shall be
provided. Transformer accessories and ratings at 60 Hz shall be as
follows:

Three-phase capacity, self-cooled...............................................500 kVA
Three-phase capacity, (future) forced-cooled..........................667 kVA
Impedance..........................................................5.75 percent, standard
Temperature rise..........................................................65 degrees C
High-voltage winding....................................................13,800 volts
High-voltage winding connection......................................Delta
Low-voltage winding.....................................................4160 volts
Low-voltage winding connection......................................Wye
Accessories:
   a. drain and filter connection
   b. filling and top filter press connection
   c. pressure-vacuum gauge
   d. dial type thermometer with alarm contacts

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2.8.1.3 Integral Outgoing Section

Integral outgoing section shall be of the metal-enclosed switchgear type. Each circuit breaker and auxiliary compartment shall have a suitable metal or laminated plastic nameplate with white cut letters at least 1/4 inch high on contrasting backgrounds identifying the unit and/or circuit number as shown on the drawings.

a. Metal-Enclosed Switchgear Type:

Metal-enclosed interrupter switchgear shall comply with NEMA SG 5 for switchgear, ANSI C37.32 for load-interrupter switches, NEMA SG 2 for power fuses, and shall be of the outdoor no-aisle type that meets or exceeds the requirements of applicable publications listed. Switch construction shall be of the manually-operated, "OPEN-CLOSED," air load interrupter type equipped with a stored energy operator for quick-make-quick-break to make operating speeds independent of manual switch operations. Where indicated, bus or lug connections to mount field-installed, slip-on, medium-voltage cable terminations for cable entering from below and a flanged throat for direct connection to the associated transformer be three-phase, four-wire.

1) Ratings

Switches shall have an operating life expectancy of at least 20 full-load, close/open operations in accordance with the requirements of IEEE C37.30. Switch ratings at 60 Hz shall be in accordance with IEEE C37.2 and as follows:

Nominal voltage.............................4.16 kV
Rated maximum voltage......................4.8 kV
Maximum symmetrical interrupting capacity..........12,000
Maximum asymmetrical interrupting capacity..........19,200
Rated continuous current.....................600A
BIIL.................................................[_____]
shall be rated for the application and shall be suitable for the
low-voltage alternating current available as shown or specified. Unless
otherwise noted, manufacturer's standard devices for the rating specified
shall be provided and shall include the following:

- A switch-operating handle with provisions for locking in either the
  open or closed position.

- A switch mechanical position indicator.

- A heater continuously energized to prevent condensation over an
  ambient temperature range of minus 20 degrees to 104 degrees F and
  wired in series with a cabinet door-actuated switch, so the heater
  is de-energized when doors are open. High-temperature thermal
  protection shall be included.

- One-pole or two-pole thermal-magnetic, molded-case circuit breakers
  suitable for the operating voltage for heater circuits.

- Safety devices as necessary to ensure that the load interrupter
  switch is in the open position whenever unit doors are in the open
  position.

- A key interlock if indicated.

- An interface terminal block wired for required exterior
  connections.

- Devices specified under specific unit requirements below.

2) Specific Unit Requirements

In addition to basic requirements, switchgear shall be as indicated on the
drawings.

3) Miscellaneous

A fuse puller and one set of any other special tools, as necessary for
servicing, shall be provided.

2.8.1.4 Ground Fault Protection

Ground fault protection shall be provided utilizing sensors of the
zero-sequence type or by the residual connection of phase and neutral
current sensors. Ground fault settings shall be as determined by the
coordination study.

2.8.2 Pad-Mounted Transformers

Pad-mounted transformers shall comply with ANSI C57.12.22 and shall be
of the radial type. Pad-mounted transformer stations shall be assembled
and coordinated by one manufacturer and each transformer station shall be
shipped as a complete unit so that field installation requirements are
limited to mounting each unit on a concrete pad and connecting it to
primary and secondary lines. Stainless steel pins and hinges shall be
provided. Barriers shall be provided between high- and low-voltage compartments. High-voltage compartment doors shall be interlocked with low-voltage compartment doors to prevent access to any high-voltage section unless its associated low-voltage section door has first been opened. Compartments shall be sized to meet the specific dimensional requirements of ANSI C57.12.22. Pentahead locking bolts shall be provided with provisions for a padlock.

2.8.2.1 High-Voltage Compartments

High-voltage compartments shall be dead-front construction. Primary protection shall include loadbreak switching, drawout dry-well-mounted current-limiting fuses, and medium-voltage separable connectors, and surge arresters. Switches shall be of the group-operated type. Switches may be mounted inside transformer tanks with switch operating handles located in high-voltage compartments and equipped with metal loops for hook stick operation. Fuses shall be interlocked with switches so that fuses can be removed only when the associated switch is in the "OFF" position. Adjacent to medium-voltage cable connections, a nameplate or equivalent stencilled inscription shall be provided inscribed "DO NOT OPEN CABLE CONNECTORS UNLESS SWITCH IS OFF." Adjacent to switches, nameplates shall identify switch operating handles and "ON" and "OFF" positions. Surge arresters shall be fully insulated and configured to terminate on the same bushing as the primary cable by means of a loadbreak, feed-through bushing insert.

2.8.2.2 Transformer Tank Sections

Transformers shall comply with IEEE C57.12.60, ANSI C57.12.21, and ANSI C57.12.22 and shall be of the mineral oil-insulated type. Transformers shall be suitable for outdoor use and shall have 2 separate windings per phase. Standard NEMA primary taps shall be provided. Where primary taps are not specified, 4, 2-1/2 percent rated kVA high-voltage taps shall be provided 2 above and 2 below rated, primary voltage. Operating handles for primary tap changers for de-energized operation shall be located within high-voltage compartments, externally to transformer tanks. Adjacent to the tap changer operating handle, a nameplate or equivalent stencilled inscription shall be provided and inscribed "DO NOT OPERATE UNDER LOAD." Transformer ratings at 60 Hz shall be as follows:

Three-phase capacity...........................................225 kVA
Impedance..........................................................standard
Temperature rise..................................................65 degrees C
High-voltage winding...........................................13,800 volts
Low-voltage winding.............................................4,160 volts

2.8.2.3 Low-Voltage Cable Compartments

Neutrals shall be provided with fully-insulated bushings. Clamp type cable terminations, suitable for copper conductors entering from below, shall be provided as necessary.

2.8.2.4 Accessories

High-voltage warning signs shall be permanently attached to each side of transformer stations. Voltage warning signs shall comply with ANSI C2.
Copper-faced steel or stainless steel ground connection pads shall be provided in both the high- and low-voltage compartments. Dial-type thermometer, liquid-level gauge, and drain valve with built-in sampling device shall be provided for each transformer station. Insulated-bushing-type parking stands shall be provided adjacent to each separable load-break elbow to provide for cable isolation during sectionalizing operations.

2.9 METAL-CLAD SWITCHGEAR

Switchgear shall comply with NEMA SG 5 and IEEE C37.20.2 and shall be of the outdoor protected-aisle type consisting of two incoming lines, auxiliary compartments and feeder circuit breaker units. Compartments shall be provided to accommodate specified or indicated auxiliary equipment. The indicated number of active circuit breakers and equipped cubicles shall be provided. The use of two-high circuit breaker units is acceptable. When two-high circuit breaker units are installed, equipped space units shall be provided when necessary to make adjacent sections equal in height. Switchgear shall be vented according to the manufacturer's standard practice. Intake and exhaust openings shall be screened. Switchgear shall have relaying as shown.

2.9.1 Ratings

Main buses shall be three-phase four-wire with a continuous current rating of 1200 amperes rms. Switchgear ratings at 60 Hz shall be in accordance with ANSI C37.06 and as follows:

- Maximum voltage..........................4.16 kV
- Nominal voltage class......................4.8 kV
- BIL........................................60
- Maximum symmetrical interrupting current..............36,000 A
- 3-second short-time current..................36,000 A
- Continuous current..........................1200A

2.9.2 Circuit Breakers

Circuit breakers shall comply with IEEE C37.04 and shall consist of items listed for such units in NEMA SG 5. Where indicated, bus or lug connections to mount field-installed, slip-on, medium-voltage cable terminations for cable entering from below shall be provided. Circuit breakers shall be of the vacuum drawout type having electrically charged, stored-energy mechanisms which are mechanically and electrically trip free. A means for manual charging of each trip mechanism shall be provided. Circuit breakers of the same ampere rating shall be interchangeable, both mechanically and electrically. Each circuit breaker shall have a cell-mounted switch assembly for control and interlocking. Contact surfaces shall be silver-plated. Cell switches may be connected either in parallel or in series with control contacts that are used for interlocking, but either connection shall permit operation of a circuit breaker when it
is in a test position. In addition to any contacts used or shown, each circuit breaker shall be provided with four spare auxiliary and cell contacts, two normally open and two normally closed, wired to interconnection terminals. If auxiliary relays are used to provide additional contacts, such relays shall not be of the latching type. Interconnection terminal blocks shall be wired to permit remote open and close operations of each circuit breaker and for other required exterior connections or connections between switchgear sections.

2.9.2.1 Vacuum Circuit Interrupters

Vacuum interrupters shall be hermetically-sealed in a high vacuum to protect contacts from moisture and contamination. Circuit breakers shall have provisions for maintenance slow closing of contacts and have a readily accessible contact wear indicator. Tripping time shall not exceed five cycles.

2.9.3 Buses

Copper bus shall comply with ASTM B 188. Equivalent aluminum bus shall comply with ASTM B 317. Bolted or pressure joints for main and ground buses, interconnections, and external connections to equipment shall be of the silver-to-silver or the silver-to-tin high-pressure type. Bolted connections shall have a minimum of two bolts, except for the ground bus where one bolt will suffice. Each nut on any bolted connection shall be secured with a belleville washer or other locking means torqued in accordance with manufacturer's recommendations. Bus supporting elements shall be bolted to switchgear enclosures and shall comply with IEEE C37.20.2.

2.9.3.1 Main Buses

Main buses and connections shall have at least the same short-circuit current rating as circuit breakers. Buses may be copper or aluminum, but a combination of both metals is not acceptable unless silver-to-silver or silver-to-tin plating is used wherever aluminum and copper buses are connected.

2.9.3.2 Ground Buses

Uninsulated copper ground buses, not less than 2 inches by 1/4 inch in cross-sectional area, shall be provided for the full length of a switchgear lineup. Ground buses of aluminum are not acceptable. The short-circuit current rating of the ground bus shall be at least equal to the short circuit current rating of the primary bus. Compression indent type cable lugs shall be provided at each end of a ground bus for connection of No. 4/0 AWG copper ground cables.

2.9.3.3 Control Buses

Control buses shall be provided as necessary to supply power to control devices. One CPT shall be connected via fuses to main bus in metal-enclosed switchgear. Each CPT, fuse, transfer device, panelboard, and wiring system shall be sized to handle 125 percent of the total load of both buses. The "Normal" and "Backup" sources shall be as indicated. Upon
the loss of the "Normal" source, transfer to the "Backup" source shall be via manual transfer. Retransfer back to the "Normal" source shall also be a manual operation. Insulated wire buses shall be wired to interface terminal blocks for connection between switchgear units and exterior components. Wire bus shall not be less than [No. 8 AWG] [____], nor less than required to serve the complete switchgear lineup plus 25 percent spare capacity.

2.9.4 Control Power Transformers

Control power transformers shall comply with IEEE C57.12.01, shall be of the ventilated dry type, and shall provide 240/120-volt, single-phase electric power for station ac control power requirements. The transformer primary voltage rating shall be 4.2 kV and the transformer capacity shall be 10 kVA. The BIL rating shall equal or exceed the BIL rating of the switchgear. Transformer current-limiting primary fuses shall be drawout type and shall be interlocked with a secondary molded case circuit breaker provided as a part of the transformer installation. Molded case circuit breakers shall comply with NEMA AB 1. It shall not be possible to open the primary fuse compartment unless this secondary circuit breaker is in the open position. Construction shall be of the drawout type for either the complete assembly or for primary fuses only, according to the manufacturer's standard. Mechanical interlocks shall prevent removal of primary fuses, unless the associated assembly is in a drawout or disconnected position. Transformer compartments shall have hinged doors.

2.9.5 Instrument Transformers

Instrument transformers shall comply with ANSI C12.11 and IEEE C57.13 and shall be of a type suitable for mounting in switchgear and shall have a BIL not less than that of the associated switchgear. Polarity marks on instrument transformers shall be visually evident and shown on drawings.

2.9.5.1 Current Transformers for Metal-Clad Switchgear

Current transformers shall have indicated ratios. Single-ratio units, used for metering and relaying, shall have a metering accuracy class rating of C20 B.0.1. Single-ratio units, used only for relaying, shall have a relaying accuracy class rating of C20 for either a C or T classification. The continuous thermal-current rating factor shall be not less than 1.0. Other thermal and mechanical ratings of current transformers and their primary leads shall be consistent with the switchgear design and shall not be less than the momentary rating of the associated circuit breaker. Unless otherwise indicated, bar, wound, or window-type transformers are acceptable; and except for window-type units installed over insulated buses, transformers shall be insulated for the rated voltage of the associated switchgear or electric power apparatus. Transformer secondaries shall be connected directly to a short-circuiting type terminal block.

2.9.5.2 Voltage Transformers

Voltage transformers shall have indicated ratios. Units shall have an accuracy class rating of 0.3. Voltage transformers shall be of the drawout type having current-limiting fuses in both primary and secondary circuits.
Mechanical interlocks shall prevent removal of fuses, unless the associated voltage transformer is in a drawout position. Voltage transformer compartments shall have hinged doors.

2.9.6 Protective Relays

Electromechanical protective relays shall be provided as shown and shall be of a type specifically designed for use on power switchgear or associated electric power apparatus. Protective relays shall conform to IEEE C37.90. Relays shall be the manufacturer's standard items of equipment with appropriate ranges for time dial, tap, and other settings. Relay device numbers shall correspond to the function names and descriptions of IEEE C37.2.

2.9.6.1 Construction

Relays shall be suitable for operation on the voltage and/or current circuits to which they are shown connected. Relays shall be of the semiflush, rectangular, back-connected, dustproof switchboard type. Cases shall have black finish and window-type removable covers capable of being sealed against tampering. Relays shall be of a type that can be withdrawn, through approved sliding contacts, from fronts of panels or doors without opening current transformer secondary circuits, disturbing external circuits, or requiring disconnection of any relay leads. Necessary test devices shall be incorporated within each relay and shall provide means for testing either from an external source of electric power or from associated instrument transformers. Each relay shall be provided with an operation indicator and an external target reset device. Relays shall have necessary auxiliaries for proper operation. Relays and auxiliaries shall be suitable for operation with the instrument transformer ratios and connections provided.

2.9.6.2 Overcurrent Relays

Overcurrent relays shall be as follows:

a. Phase overcurrent relays for main circuit breakers shall be single-phase, nondirectional, induction type time delay, device 51, current taps [[____] to [____] amperes] [as indicated] with characteristic curves that are [definite time] [moderately inverse] [inverse] [very inverse] [extremely inverse] [as indicated].

b. Ground overcurrent relays for feeder circuit breakers shall be nondirectional, induction type time delay, device 5IN, residually connected, with current taps [[____] to [____] amperes] [as indicated] and with characteristic curves that are [definite time] [moderately inverse] [inverse] [very inverse] [extremely inverse] [as indicated].

c. Phase overcurrent relays for feeder circuit breakers shall be single-phase, nondirectional, induction type time delay, device 50/51, with instantaneous-current pick-up range [[____] to [____] amperes] [as indicated], with time-delay-current taps [[____] to [____] amperes] [as indicated] and with characteristic curves that are [definite time] [moderately inverse] [inverse] [very inverse] [extremely inverse] [as indicated].
2.9.6.3  Bus Differential and Lockout Relays

Bus differential relay, device 87B, shall be of the three-phase or single-phase, high-speed impedance differential type suitable for protection of buses. Lockout relay, device 86B, shall be of a type which, when used in conjunction with the 87B relay, trips and locks out the indicated circuit breaker.

2.9.7  Control and Instrument Switches

Control and instrument switches shall be of the rotary switchboard type rated for alternating-current operation at 600 volts, or direct-current operation at 250 volts for dc circuits, as applicable. Contacts shall be rated for not less than a continuous current of 20 amperes, shall be of the silver-to-silver type, and shall have positive means for maintaining contact. Each switch shall be provided with a black operating handle, and an escutcheon clearly marked to show each operating position. Switch identifications and handle positions shall be engraved on escutcheons or may be provided on separate nameplates. Escutcheon engravings shall be white on a black background or black on a white background. Instrument switches for potential phase selection shall be provided with an oval handle. Ammeter switches for phase selection shall have round, notched, or knurled handles and equipped with short-circuiting type of contacts to prevent open-circuiting of current transformer secondary circuits in any position of the ammeter switches. Switches provided for circuit breaker control and local-remote selector switches shall have a pistol-grip handle and a mechanical target to indicate the last operating position of the switch. Red and green circuit breaker position indication LED lights shall be installed immediately above each circuit breaker switch. Local-remote selector switches shall be provided only when shown or specified. Position indication lights shall be installed immediately above selector switches, with blue LED lights indicating remote control and amber LED lights indicating local control.

2.9.8  Electrical Indicating Instruments

Electrical indicating instrument relays shall comply with ANSI C12.1, ANSI C12.4, ANSI C12.10, and ANSI C39.1. Electrical indicating instruments shall be of the semiflush, back-connected, dustproof, direct-reading, switchboard type, approximately 4-1/4 inches square, with white dials, black markings, black pointers, and scale arcs of approximately 250 degrees. Cases shall have a black finish and shadowproof viewing covers. The accuracy of each instrument shall be within 1 percent of full scale. Moving elements shall be provided with zero adjustments readily accessible from instrument fronts without disassembly. Each instrument shall be accurately calibrated for use with the associated instrument transformers, and shall have the indicated scale or a scale suitable for the application, where a specific scale is not indicated. Except for ammeters and voltmeters or unless otherwise specified or approved, the nominal or full-load values shall appear at the approximate mid-point, or the 12 o'clock position, of the scales.
2.9.9 Test Blocks and Accessories

Test blocks and their associated testing accessories shall be provided for testing of instruments and protective relays that require periodic testing or calibration in-place, but which are not equipped with integral testing features. Test blocks with covers shall be mounted near the base of the switchgear unit beneath the devices to be tested, and shall be provided with a nameplate engraved to identify individual current or potential test blocks, or a combination current/potential test block, as applicable. Combination test blocks shall not exceed 10 poles. Current test blocks shall be the short-circuiting type. Test devices shall be provided for insertion into the associated test block to permit application of the proper current or potential source for testing and calibration. Test devices shall be rated not less than 20 amperes and 125 volts dc.

2.9.10 Specific Unit Requirements

In addition to the basic circuit breaker unit requirement listed in NEMA SC 5, each individual unit or section shall contain other devices as required for the application. The following requirements are not to be considered complete in every detail and miscellaneous equipment and devices necessary for correct operation, as indicated or specified, shall be provided as necessary. Protective relays, meters, instruments, and control and instrument switches, shall be mounted on a unit or compartment door.

2.9.10.1 Auxiliary Compartments

Control and instrument transformers and panelboards shall be provided and housed in compartments, and shall supply control power and instrument voltage to each bus section of the switchgear lineup and remote devices as required. Compartments shall be provided with a hinged door. Any interconnection wiring and conduit needed to connect the switchgear lineup or other devices requiring control power or instrument voltage shall be provided and indicated on the detail drawings. Equipment items shall include the following:

a. Three potential transformers.

b. One control power transformers.

c. One low-voltage alternating-current panelboards and one low-voltage direct-current panelboards with main and branch circuits as shown [\(\text{located in the metal-enclosed switchgear aisle where indicated}\)] [, and with equipment as specified in paragraph AUXILIARY SUBSTATION EQUIPMENT.

2.9.10.2 Feeder Units

Units shall be provided for the protection of outgoing feeder circuits and shall include the following:

a. Six current transformers. One ground sensor current transformer.

b. Three overcurrent relays, device \([50]\) \([51]\).

c. Ground overcurrent relay, device 51N.
d. Three phase secondary potential test blocks with associated test devices, quantity as shown.

e. Three phase secondary current test blocks with associated test devices, quantity as shown.

2.9.11 Miscellaneous Items

2.9.11.1 Space Heating and Ventilation

Continuously-energized space heaters (with high-temperature thermal protection) shall be installed in each switchgear unit and auxiliary compartment in accordance with the manufacturer's standard practice and shall be sized to prevent condensation over an ambient temperature range of minus 20 to 104 degrees F. Aisle ventilation fans shall be provided where indicated and shall be sized to provide at least 10 air changes per hour. Fans shall be wired to three-way switches located at each end of the switchgear aisle and adjacent to aisle lighting switches. In addition, fans shall be thermostatically controlled to turn fans on when interior temperatures exceed 104 degrees F.

2.9.11.2 Aisle Lighting

Fluorescent luminaires shall be a manufacturer's standard fixture equipped with a cold-weather ballast, and installed in the switchgear aisle to provide a maintained lighting intensity level of 50 footcandles at floor level in the aisle and on faces of units and compartments. Luminaires shall be wired to three-way switches located at each end of the switchgear aisle.

2.9.11.3 Duplex Receptacles

Duplex receptacles shall be installed on each end wall of the switchgear aisle and at approximately 6-foot intervals along the exterior wall of the aisle. Receptacles and receptacle plates shall be ivory in color. Receptacles shall be the two-pole, three-wire, grounded type rated at 15 amperes and 125 volts, NEMA WD 1 configuration 5-15R.

2.9.11.4 Lighting and Appliance Branch Circuit Panelboards

Lighting and appliance branch-circuit panelboards for the protection of the indicated low-voltage circuits shall be located as specified or indicated and shall conform to the requirements of Section 16415 ELECTRICAL WORK, INTERIOR. Ratings of panelboard mains shall be compatible with the supply voltage to the panelboard. Circuit breakers in a direct-current panelboard shall be rated for 48 volts dc operation.

2.9.12 Accessories

Accessories identified in NEMA SG 5 shall be provided for the inspection, testing, maintenance, and repair of circuit breakers, and shall include one set of any special tools, as necessary to repair and maintain circuit breakers and major switchgear components. Maintenance and testing accessories shall include, but are not limited to the following:
a. Portable gear motor for electric-power positioning of circuit breakers, if required by the breaker design.

b. Secondary test coupler for testing of drawout circuit breakers in the test position.

c. Hand crank for positioning of circuit breakers.

d. Transfer truck, for movement of circuit breaker units.

e. Test cabinet for closing and tripping of circuit breakers by electrical control operations.

f. Lifting and transfer device for two-high circuit breaker units.

2.9.13 Finish Color

Finish color of the switchgear shall comply with the requirements for cabinets specified in paragraph CABINETS AND ENCLOSURES.

2.9.14 Station Battery

The station battery installation shall include a battery, battery racks, a battery charger, and protective equipment. The station battery installation shall be housed in the metal-enclosed switchgear.

2.9.14.1 Battery

The battery shall consist of the required number of lead-calcium cells interconnected with proper connectors provided by the battery manufacturer to provide a nominal battery rating of 48 volts. Rubber or plastic numerals, of at least 1 inch in height, shall be provided by the battery manufacturer for field attachment to permit proper cell identification. The battery shall have an ampere-hour capacity equal to at least 125 percent of the station’s direct-current requirements including normal continuous loads plus intermittent loads. Normal continuous load capacity shall be adequate for an 8-hour period. Intermittent load capacity shall be adequate so that at least three openings and three closings of each of the station’s associated circuit breakers can occur in an 8-hour period with no more than two circuit breaker units simultaneously operating. Battery circuits shall be ungrounded. Batteries shall have a 20-year minimum life and a 5-year no cost replacement warranty.

2.9.14.2 Battery Racks

Battery racks shall have welded steel frames and rails finished with two coats of paint of a color matching the battery charger enclosure. Racks shall be no more than two tiers high and top tiers shall be low enough to permit maintenance to be done by personnel standing at floor level. Rails shall have a top covering of plastic or rubber at least 1/16-inch thick. Paint, rubber, and plastic shall resist corrosion and action of the electrolyte. The installation shall be provided with a portable hydrometer syringe and thermometer. Where recommended by the manufacturer, the installation shall include a cell lifter.
2.9.14.3 Battery Charger

The battery charger shall comply with UL 1564 and shall be a constant voltage, filtered, voltage-regulated, fully automatic type rated for full-float charging of the associated battery. The battery charger shall be convection cooled and suitable for operation on electric power supplied from the associated low-voltage alternating-current panelboard, shall have adequate capacity to fully recharge the associated depleted battery in not more than 8 hours while supplying normal direct-current loads, and shall have an efficiency of not less than 90 percent. The battery charger shall have input and output circuit breakers which automatically disconnect the battery charger when faults occur. The battery charger shall have an output ammeter and voltmeter, and equalizing-float selector switch, and an equalizing timer with a range of 0 to 24 hours. The battery charger enclosure shall be painted as specified for indoor cabinets in paragraphs CABINETS AND ENCLOSURES and shall be provided with wall mounting brackets or shall be free-standing as required by its size and weight. A relay for sensing loss of alternating-current input, and an adjustable relay for sensing that the battery charger output voltage has fallen to a pre-set level, shall be installed on the battery charger to actuate the associated annunciator circuits. DC ground detector LED lights shall be provided.

2.9.14.4 Calculations

Calculations for the battery and associated charger shall be provided and shall indicate the basis used in defining loads, selecting cell types, and determining the battery ampere-hour capacity and physical size. Calculations shall be provided to determine capacity for the battery charger and be similar to those shown in the Appendix to IEEE Std 485, including explanatory data. Calculations for the battery-charger shall demonstrate that the output voltage and current provided are adequate to comply with the preceding requirements. Calculations shall be submitted in accordance with the detail drawings portion of paragraph SUBMITTALS.

2.9.14.5 Protective Equipment

Protective equipment required by IEEE Std 484 shall be provided and installed in a free-standing cabinet mounted where indicated or directed. The cabinet shall conform to paragraph CABINETS AND ENCLOSURES. Water facilities required shall be of the portable type consisting of one 5-gallon tank and one 1-quart basin. The tank shall have a removable screw top and a spigot. The basin shall be suitable for rinsing eyes or skin in case of acid spillage.

2.9.14.6 Station Audible and Visual Indication

One station horn shall be installed. The station horn shall be weatherproof and shall be of the resonating type having an audible output of not less than 100 dB at 10 feet. Station lights shall be 25-watt incandescent with guards and red globes, shall be UL listed as enclosed and gasketed for use in wet locations, and shall be of a style suitable for the indicated mounting. A horn silencing relay shall be wired in series with the horn so that, after an adjustable time delay of 5 to 15 minutes, the horn shall be silenced. Necessary auxiliary devices provided in
conjunction with the horn shall permit signalling to a remote central point.

2.9.14.7 Operating Modes

The system shall be wired so that when the component being monitored by an annunciator is operating correctly, the associated annunciator relay actuates the normal mode, and when the component malfunctions, the associated annunciator relay actuates the alert mode. During normal mode no part of the system shall be energized by the associated annunciator relay. Upon equipment malfunction, the alert mode shall energize the system flasher which shall turn the associated annunciators lights on and off, and sound the station horn, including turning on the station exterior visual indication lights. Depressing the station pushbutton shall turn off the horn, the station visual indication lights, and the flasher, but shall leave the associated annunciator lights on. Correction of a malfunction shall automatically return the alarm system to the normal mode for the associated annunciator relay. Turning the system pushbutton during a normal mode shall simulate an alert mode for all annunciator relays so that correct operation of annunciator lamps, the station exterior visual indication lights, the system flasher, and the station horn can be checked.

2.9.14.8 Annunciators

Annunciators shall comply with ISA S18.1 and shall be solid-state logic, modular, hermetically sealed, plug-in relays each with two integral long-life lamps for backlighting a white translucent nameplate window of not less than 3 inches by 3 inches. Nameplates shall have black letters at least 1/8-inch in height and the inscription shall match the indicated malfunction description.

2.9.14.9 Other Requirements

The annunciator cabinet shall be suitable for the indicated location and shall conform to requirements specified herein for cabinets. The flasher frequency shall be between 1 and 5 Hz. The system pushbutton shall be provided with a nameplate inscribed "PUSH TO SILENCE" and "TURN TO TEST."

2.10 CABINETS AND ENCLOSURES

Cabinets and enclosures shall comply with NEMA 250 and shall be of galvanized steel, shall be provided with hinged doors, and shall be suitable for indoor or outdoor installation as indicated. Where locations are not indicated, cabinets shall be suitable for outdoor installation. Thickness of metal and outdoor construction shall be in accordance with UL 50. An indoor cabinet exterior shall have one finish coat and an outdoor cabinet exterior shall have two finish coats. Finish colors shall be manufacturer’s standard dark gray or sky gray for outdoor cabinets and light gray for indoor cabinets, unless otherwise specified. The finish color of outdoor equipment shall be the same unless otherwise approved. Finish coats shall be applied over a prepared substrate. Each cabinet shall be a freestanding type or may be supported by attachment to an enclosure fence or a switchgear interior wall where located adjacent thereto. A concrete pad shall be provided to support any outdoor cabinet whose base extends to within three inches of grade level and pads shall
extend at least four inches below grade.

2.11 PROTECTIVE DEVICES

2.11.1 Fuses, Medium-Voltage, Including Current-Limiting

Medium-voltage fuses, including current-limiting, shall comply with NEMA SG 2.

2.11.2 Fuses, Low-Voltage, Current-Limiting

Low-voltage, current-limiting fuses shall comply with FS W-F-1914/GEN for Class L or UL 198E for Class R.

2.12 SURGE ARRESTERS

Surge arresters shall comply with NEMA IA 1, IEEE C62.1, IEEE C62.2, and IEEE C62.11 and shall be provided where indicated. Arresters shall be intermediate class, rated as shown. Arresters for use at elevations in excess of 6000 feet above mean sea level shall be specifically rated for that purpose. Arresters shall be equipped with mounting brackets suitable for the indicated installations. Arresters shall be of the metal-oxide varistor type.

2.13 GROUNDING AND BONDING

2.13.1 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. Sectional type rods may be used.

2.13.2 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.

2.14 CONCRETE AND REINFORCEMENT

Concrete shall be a minimum of 2500 psi at 28 days. All other requirements shall be as specified in Section 03300 CONCRETE FOR BUILDING CONSTRUCTION. Concrete reinforcing shall be as specified in Section 03200 CONCRETE REINFORCEMENT.

2.15 PADLOCKS

Padlocks shall conform to ASTM F 883, Type EPC, size 2.

* 2.16 Deleted
2.16.1 Deleted

2.16.2 Deleted

2.16.3 Deleted

2.17 LIQUID DIELECTRICS

Liquid dielectrics for transformers, capacitors, reclosers, and other liquid-filled electrical equipment shall be non-polychlorinated biphenyl (PCB) mineral-oil or less-flammable liquid as specified. Nonflammable fluids shall not be used. Tetrachloroethylene (perchloroethylene) and 1, 2, 4 trichlorobenzene fluids shall not be used. Liquid dielectrics in retrofitted equipment shall be certified by the manufacturer as having less than 50 parts per million (ppm) PCB content. In lieu of the manufacturer's certification, the Contractor may submit a test sample of the dielectric in accordance with ASTM D 923 and have tests performed per ASTM D 4059 at a testing facility approved by the Contracting Officer. Equipment with test results indicating PCB level exceeding 50 ppm shall be replaced.

2.18 FACTORY TESTS

Factory tests shall be performed, as follows, in accordance with the applicable publications and with other requirements of these specifications. The Contracting Officer shall be notified at least 10 days before the equipment is ready for testing. The Contracting Officer reserves the right to witness the tests.

a. Transformers: Manufacturer's standard routine and design tests in accordance with IEEE C57.12.00.

b. Transformers rated 200 kVA and above: Reduced full-wave, chopped-wave, and full-wave impulse test on each line and neutral terminal, in accordance with IEEE C57.98.
c. High-Voltage Air Switches: Manufacturer's standard tests in accordance with IEEE C37.34 and IEEE C37.41.

d. Protective Relays: Seismic tests in accordance with IEEE C37.98. Surge withstand tests in accordance with IEEE C37.90.1.

e. Relaying Current Transformers: Manufacturer's standard tests in accordance with IEEE C57.13.

f. Instrument Current Transformers: Manufacturer's standard tests in accordance with IEEE C57.13.

g. Factory Prefabricated Terminations: Wet withstand voltage tests in accordance with IEEE Std 48 for the next higher BIL level.

h. Outdoor Switchgear: Manufacturer's standard tests in accordance with IEEE C37.20.1, IEEE C37.20.2, and IEEE C37.20.3.

i. Electrical Power Insulators: Manufacturer's standard tests in accordance with ANSI C29.1.

2.19 AREA LIGHTING

2.19.1 Bracket Arms on Wood Poles

Poles shall be in accordance with ANSI C136.13 provided with galvanized steel pipe bracket arms coordinated for pole attachment. The bracket arm shall be as indicated on the drawings.

2.19.2 Insulated Cable

Cable shall be type USE conforming to UL 854, with copper conductors and type RHW or XHHW insulation conforming to UL 44, and shall include green ground conductor. Cable shall be provided with insulation of a thickness not less than that given in column A of TABLE 15.1 of UL 854. Cable shall be rated 600 volts. Parts of the cable system such as splices and terminations shall be rated not less than 600 volts. The size and number of conductors and the number of cables shall be as indicated. Conductors larger than No. 8 AWG shall be stranded.

2.20 POLES

Poles shall be designed for a wind velocity of 80 mph at the base of the pole, for a wind gust factor of 1.3, and for the height and drag factors recommended by AASHTO LTS-2. The effective projected area of luminaires and other pole-mounted devices shall be taken into account in pole design. Poles shall have grounding provisions. The type of pole shaft material provided shall not be mixed on any project. Grounding connection shall be provided near the bottom of each metal pole and at each concrete pole anchor base. Scratched, stained, chipped, or dented poles shall not be installed.
2.20.1 Wood Poles

Wood poles shall conform to ANSI 05.1. Poles shall be pressure treated in accordance with AWPA C4 with creosote conforming to AWPA P1/P13 and oil-borne preservatives and petroleum conforming to AWPA P8 and AWPA P9. Species listed in ANSI 05.1 for which a preservative treatment is not specified in AWPA C4 shall not be used. Northern white cedar may be used if treated as specified for western red cedar, and western fir may be used if treated as specified for Douglas fir. Pole markings shall be located approximately 10 feet from the butt of the pole or as approved. Poles shall be machine trimmed by turning smooth full length and shall be roofed, gained, and bored before pressure treatment.

2.20.2 Exposed-to-Weather Enclosures

Enclosures to house lighting equipment in an outdoor environment shall meet the requirements of a NEMA 4 enclosure as defined in NEMA 250.

2.21 LAMPS AND BALLASTS, HIGH PRESSURE SODIUM

Lamps shall conform to ANSI C78.1352. Ballasts shall conform to ANSI C82.4, or UL 1029. High-pressure sodium lamps shall be clear.

2.21.1 Photo-Control Devices

Photo-control devices shall conform to ANSI C136.10. Each photo-control element shall be a replaceable, weatherproof, plug-in or twist-lock assembly adjustable operation range of approximately 0.5 to 5.0 foot-candles. Luminaires shall be equipped with weatherproof plug-in or twist-lock receptacle to receive the photo-control element.

2.22 PHOTOMETRIC DISTRIBUTION CLASSIFICATION

Photometrics shall conform to IESNA ARP-8.

2.23 FIXTURES

Standard fixtures shall be as detailed on Standard Detail No. 40-06-04, Sheet No. 52 which accompanies and forms a part of this specification. Special fixtures shall be as indicated on the drawings. Illustrations shown on these sheets or on the drawings are indicative of the general type desired and are not intended to restrict selection to fixtures of any particular manufacturer. Fixtures of similar design, equivalent light distribution and brightness characteristics, equal finish and quality will be acceptable as approved.

2.24 FENCING

Fencing shall conform to the requirements of Section 02831 CHAIN LINK FENCE.

2.25 Primary Cable Terminating/Sectionalizing Enclosures

Cable terminating enclosures shall be hood-stick operable, deadfront construction conforming to the requirements of ANSI/IEEE C37.20.3, Category A. Enclosure shall be a minimum of 12 gage steel and provided with 200 A loadbreak junctions and elbow-type separable loadbreak connectors, cable parking stands, and grounding lugs. The cable terminating equipment shall conform to ANSI/IEEE 386. Ratings at 60 Hz shall be:

- Nominal voltage (kV) .................................................. 12.47
- Rated continuous current (A) .......................................... 200
- Three-second short-time current carrying capacity (kA) sym. .......................... 3
- BIL (kV) ................................................................. 95
extend at least four inches below grade.

2.11 PROTECTIVE DEVICES

2.11.1 Fuses, Medium-Voltage, Including Current-Limiting

Medium-voltage fuses, including current-limiting, shall comply with NEMA SG 2.

2.11.2 Fuses, Low-Voltage, Current-Limiting

Low-voltage, current-limiting fuses shall comply with FS W-F-1114/GEN for Class L or UL 198E for Class R.

2.12 SURGE ARRESTERS

Surge arresters shall comply with NEMA LA 1, IEEE C62.1, IEEE C62.2, and IEEE C62.11 and shall be provided where indicated. Arresters shall be intermediate class, rated as shown. Arresters for use at elevations in excess of 6000 feet above mean sea level shall be specifically rated for that purpose. Arresters shall be equipped with mounting brackets suitable for the indicated installations. Arresters shall be of the metal-oxide varistor type.

2.13 GROUNDING AND BONDING

2.13.1 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. Sectional type rods may be used.

2.13.2 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.

2.14 CONCRETE AND REINFORCEMENT

Concrete shall be a minimum of 2500 psi at 28 days. All other requirements shall be as specified in Section 03300 CONCRETE FOR BUILDING CONSTRUCTION. Concrete reinforcing shall be as specified in Section 03200 CONCRETE REINFORCEMENT.

2.15 PADLOCKS

Padlocks shall conform to ASTM F 883, Type EPC, size 2.

2.16 CABLE FIREPROOFING SYSTEMS

Cable fireproofing systems shall be listed in FM P7825 as a fire-protective coating or tape approved for grouped electrical conductors.
and shall be suitable for application on the type of medium-voltage cables provided. After being fully cured, materials shall be suitable for use where exposed to oil, water, gases, salt water, sewage, and fungus and shall not damage cable jackets or insulation. Asbestos materials are not acceptable.

2.16.1 Fireproof Coating

Cable fireproofing coatings shall be compounded of water-based thermoplastic resins, flame-retardant chemicals, and inorganic noncombustible fibers and shall be suitable for the application methods used. Coatings applied on bundled cables shall have a derating factor of less than 5 percent, and a dielectric strength of 95 volts per mil minimum after curing.

2.16.2 Fireproofing Tape

Fireproofing tape shall be at least 2 inches wide and shall be a flexible, conformable, polymeric, elastomer tape designed specifically for fireproofing cables.

2.16.3 Plastic Tape

Preapplication plastic tape shall be pressure sensitive, 10 mil thick, conforming to FS HH-I-595.

2.17 LIQUID DIELECTRICS

Liquid dielectrics for transformers, capacitors, reclosers, and other liquid-filled electrical equipment shall be non-polychlorinated biphenyl (PCB) mineral-oil or less-flammable liquid as specified. Nonflammable fluids shall not be used. Tetrachloroethylene (perchloroethylene) and 1, 2, 4 trichlorobenzene fluids shall not be used. Liquid dielectrics in retrofitted equipment shall be certified by the manufacturer as having less than 50 parts per million (ppm) PCB content. In lieu of the manufacturer's certification, the Contractor may submit a test sample of the dielectric in accordance with ASTM D 923 and have tests performed per ASTM D 4059 at a testing facility approved by the Contracting Officer. Equipment with test results indicating PCB level exceeding 50 ppm shall be replaced.

2.18 FACTORY TESTS

Factory tests shall be performed, as follows, in accordance with the applicable publications and with other requirements of these specifications. The Contracting Officer shall be notified at least 10 days before the equipment is ready for testing. The Contracting Officer reserves the right to witness the tests.

a. Transformers: Manufacturer's standard routine and design tests in accordance with IEEE C57.12.00.

b. Transformers rated 200 kVA and above: Reduced full-wave, chopped-wave, and full-wave impulse test on each line and neutral terminal, in accordance with IEEE C57.98.
c. High-Voltage Air Switches: Manufacturer's standard tests in accordance with IEEE C37.34 and IEEE C37.41.

d. Protective Relays: Seismic tests in accordance with IEEE C37.98. Surge withstand tests in accordance with IEEE C37.40.1.

e. Relaying Current Transformers: Manufacturer's standard tests in accordance with IEEE C57.13.

f. Instrument Current Transformers: Manufacturer's standard tests in accordance with IEEE C57.13.

g. Factory Prefabricated Terminations: Wet withstand voltage tests in accordance with IEEE Std 48 for the next higher BIL level.

h. Outdoor Switchgear: Manufacturer's standard tests in accordance with IEEE C37.20.1, IEEE C37.20.2, and IEEE C37.20.3.

i. Electrical Power Insulators: Manufacturer's standard tests in accordance with ANSI C29.1.

2.19 AREA LIGHTING

2.19.1 Bracket Arms on Wood Poles

Poles shall be in accordance with ANSI C136.13 provided with galvanized steel pipe bracket arms coordinated for pole attachment. The bracket arm shall be as indicated on the drawings.

2.19.2 Insulated Cable

Cable shall be type USE conforming to UL 854, with copper conductors and type RHW or XHHW insulation conforming to UL 44, and shall include green ground conductor. Cable shall be provided with insulation of a thickness not less than that given in column A of TABLE 15.1 of UL 854. Cable shall be rated 600 volts. Parts of the cable system such as splices and terminations shall be rated not less than 600 volts. The size and number of conductors and the number of cables shall be as indicated. Conductors larger than No. 8 AWG shall be stranded.

2.20 POLES

Poles shall be designed for a wind velocity of 80 mph at the base of the pole, for a wind gust factor of 1.3, and for the height and drag factors recommended by ASHRAE LTS-2. The effective projected area of luminaires and other pole-mounted devices shall be taken into account in pole design. Poles shall have grounding provisions. The type of pole shaft material provided shall not be mixed on any project. Grounding connection shall be provided near the bottom of each metal pole and at each concrete pole anchor base. Scratched, stained, chipped, or dented poles shall not be installed.
2.20.1 Wood Poles

Wood poles shall conform to ANSI 05.1. Poles shall be pressure treated in accordance with AWPA C4 with creosote conforming to AWPA P1/P13 and oil-borne preservatives and petroleum conforming to AWPA P8 and AWPA P9. Species listed in ANSI 05.1 for which a preservative treatment is not specified in AWPA C4 shall not be used. Northern white cedar may be used if treated as specified for western red cedar, and western fir may be used if treated as specified for Douglas fir. Pole markings shall be located approximately 10 feet from the butt of the pole or as approved. Poles shall be machine trimmed by turning smooth full length and shall be roofed, gained, and bored before pressure treatment.

2.20.2 Exposed-to-Weather Enclosures

Enclosures to house lighting equipment in an outdoor environment shall meet the requirements of a NEMA 4 enclosure as defined in NEMA 250.

2.21 LAMPS AND BALLASTS, HIGH PRESSURE SODIUM

Lamps shall conform to ANSI C78.1352. Ballasts shall conform to ANSI C82.4, or UL 1029. High-pressure sodium lamps shall be clear.

2.21.1 Photo-Control Devices

Photo-control devices shall conform to ANSI C136.10. Each photo-control element shall be a replaceable, weatherproof, plug-in or twist-lock assembly adjustable operation range of approximately 0.5 to 5.0 foot-candles. Luminaires shall be equipped with weatherproof plug-in or twist-lock receptacle to receive the photo-control element.

2.22 PHOTOMETRIC DISTRIBUTION CLASSIFICATION

Photometrics shall conform to IESNA ARP-8.

2.23 FIXTURES

Standard fixtures shall be as detailed on Standard Detail No. 40-06-04, Sheet No. 52 which accompanies and forms a part of this specification. Special fixtures shall be as indicated on the drawings. Illustrations shown on these sheets or on the drawings are indicative of the general type desired and are not intended to restrict selection to fixtures of any particular manufacturer. Fixtures of similar design, equivalent light distribution and brightness characteristics, equal finish and quality will be acceptable as approved.

2.24 FENCING

Fencing shall conform to the requirements of Section 08311 CHAIN LINK FENCE.
PART 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. Concrete work shall conform to the requirements of Section 03300A CONCRETE FOR BUILDING CONSTRUCTION.

3.1.1 Conformance to Codes

The installation shall comply with the requirements and recommendations of NFPA 70 and ANSI 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 Disposal of Liquid Dielectrics

PCB-contaminated dielectrics must be marked as PCB and transported to and incinerated by an approved EPA waste disposal facility. The Contractor shall furnish certification of proper disposal. Contaminated dielectrics shall not be diluted to lower the contamination level.

3.2 CABLE AND BUSWAY INSTALLATION

The Contractor shall obtain from the manufacturer an installation manual or set of instructions which addresses such aspects as cable construction, insulation type, cable diameter, bending radius, cable temperature, lubricants, coefficient of friction, conduit cleaning, storage procedures, moisture seals, testing for and purging moisture, etc. The Contractor shall then perform pulling calculations and prepare a pulling plan which shall be submitted along with the manufacturer's instructions in accordance with SUBMITTALS.

3.2.1 Cable Installation Plan and Procedure

Cable shall be installed strictly in accordance with the cable manufacturer's recommendations. Each circuit shall be identified by means of a fiber, laminated plastic, or non-ferrous metal tags, or approved equal, in each manhole, handhole, junction box, and each terminal. Each tag shall contain the following information; cable type, conductor size, circuit number, circuit voltage, cable destination and phase identification.
3.2.1.1 Cable Inspection

The cable reel shall be inspected for correct storage positions, signs of physical damage, and broken end seals. If end seal is broken, moisture shall be removed from cable in accordance with the cable manufacturer's recommendations.

3.2.1.2 Duct Cleaning

Duct shall be cleaned with an assembly that consists of a flexible mandrel (manufacturers standard product in lengths recommended for the specific size and type of duct) that is 1/4 inch less than inside diameter of duct, 2 wire brushes, and a rag. The cleaning assembly shall be pulled through conduit a minimum of 2 times or until less than a volume of 8 cubic inches of debris is expelled from the duct.

3.2.1.3 Duct Lubrication

The cable lubricant shall be compatible with the cable jacket for cable that is being installed. Application of lubricant shall be in accordance with lubricant manufacturer's recommendations.

3.2.1.4 Cable Installation

The Contractor shall provide a cable feeding truck and a cable pulling winch as required. The Contractor shall provide a pulling grip or pulling eye in accordance with cable manufacturer's recommendations. The pulling grip or pulling eye apparatus shall be attached to polypropylene or manilla rope followed by lubricant front end packs and then by power cables. A dynamometer shall be used to monitor pulling tension. Pulling tension shall not exceed cable manufacturer's recommendations. The Contractor shall not allow cables to cross over while cables are being fed into duct. For cable installation in cold weather, cables shall be kept at 50 degrees F temperature for at least 24 hours before installation.

3.2.1.5 Cable Installation Plan

The Contractor shall submit a cable installation plan for all cable pulls in accordance with the detail drawings portion of paragraph SUBMITTALS. Cable installation plan shall include:

a. Site layout drawing with cable pulls identified in numeric order of expected pulling sequence and direction of cable pull.

b. List of cable installation equipment.

c. Lubricant manufacturer's application instructions.

d. Procedure for resealing cable ends to prevent moisture from entering cable.

e. Cable pulling tension calculations of all cable pulls.

f. Cable percentage conduit fill.

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g. Cable sidewall thrust pressure.

h. Cable minimum bend radius and minimum diameter of pulling wheels used.

i. Cable jam ratio.

j. Maximum allowable pulling tension on each different type and size of conductor.

k. Maximum allowable pulling tension on pulling device.

3.2.2 Duct Line

Cables shall be installed in duct lines where indicated. Cable splices in low-voltage cables shall be made in handholes only, except as otherwise noted. Cable joints in medium-voltage cables shall be made in terminating/sectionalizing enclosures or approved pullboxes only. Neutral and grounding conductors shall be installed in the same duct with their associated phase conductors.

3.2.3 Direct-Burial

Low-voltage cables shall be buried directly in the earth as indicated.

3.2.3.1 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.

3.2.3.2 Plowing

Cable plowing is not permitted.

3.2.3.3 Cable Burial

Cables shall be unreeled along the sides of or in trenches and carefully placed on sand or earth bottoms. Pulling cables into direct-burial trenches from a fixed reel position will not be permitted, except as required to pull cables through conduits under paving or railroad tracks. Where cables cross, a separation of at least 3 inches shall be provided, unless each cable circuit is protected by a nonmetallic conduit sleeve at the crossing. Where single-conductor cable is installed, all 3 phases and the neutral shall be installed in the same sleeve. Bend radius of any cable shall be not less than 8 times the diameter of the cable. In no case shall cables be left under longitudinal tension. The first 6 inch layer of backfill shall be of sand. Machine compaction shall not be used within 6 inches of the cable.

3.2.3.4 Other Requirements

Where direct-burial cables cross under roads or other paving exceeding 5 feet in width, such cables shall be installed in concrete-encased ducts.
least 5 feet beyond each edge of any paving. Cables may be pulled into duct from a fixed reel where suitable rollers are provided in the trench. Where direct burial cable transitions to duct-enclosed cable, direct-burial cables shall be centered in duct entrances, and a waterproof nonhardening mastic compound shall be used to facilitate such centering.

Where cuts are made in any paving, the paving and subbase shall be restored to their original condition.

3.2.3.5 Medium-Voltage Cable Joints or Low-Voltage Cable Splices

Cable joints or splices in direct-burial cables are not permitted in runs of 1000 feet or less, nor at intervals of less than 1000 feet in longer runs, except as required for taps. Locations of cable joints or splices in shorter intervals, where required to avoid obstructions or damage to cables, shall be approved. Cable joints or splices in direct burial installations shall be installed in above-ground junction boxes or in cast metal splice boxes suitable for direct burial use. Cable joints or splices in duct banks shall be made only in manholes, handholes, or pullboxes.

3.2.3.6 Cable Markers

Markers shall be located near the ends of cable runs, at each cable joint or splice, at approximately every 500 feet along cable runs, and at changes in direction of cable runs. In addition to markers, a 5 mil, brightly colored plastic tape not less than 3 inches in width and suitably inscribed at not more than 10 feet on centers, or other approved dig-in warning indication, shall be placed approximately 12 inches below finished grade levels of trenches.

3.2.4 Electric Handholes

Cables shall be routed around the interior walls and securely supported from walls on cables racks. Cable routing shall minimize cable crossover, provide access space for maintenance and installation of additional cables, and maintain cable separation in accordance with ANSI C2.

3.3 CABLE JOINTS

Medium-voltage cable joints shall be made by qualified cable splicers only. Qualifications of cable splicers shall be submitted in accordance with paragraph SUBMITTALS. Shields shall be applied as required to continue the shielding system through each entire cable joint. Shields may be integrally molded parts of preformed joints. Shields shall be grounded at each joint or in accordance with manufacturer’s recommended practice. Cable joints shall provide insulation and jacket equivalent to that of the associated cable. Armored cable joints shall be enclosed in compound-filled, cast-iron or alloy, splice boxes equipped with stuffing boxes and armor clamps of a suitable type and size for the cable being
3.4 Deleted

3.4.1 Deleted

3.4.2 Deleted

3.5 DUCT LINES

3.5.1 Requirements

Numbers and sizes of ducts shall be as indicated. Duct lines shall be laid with a minimum slope of 4 inches per 100 feet. Depending on the contour of the finished grade, the high-point may be at a terminal, a handhole, or between termination points. Short-radius manufactured 90-degree duct bends may be used only for pole or equipment risers, unless specifically indicated as acceptable. The minimum manufactured bend radius shall be 18 inches for ducts of less than 3 inch diameter, and 36 inches for ducts 3 inches or greater in diameter. Otherwise, long sweep bends having a minimum radius of 25 feet shall be used for a change of direction of more than 5 degrees, either horizontally or vertically. Both curved and straight sections may be used to form long sweep bends, but the maximum curve used shall be 30 degrees and manufactured bends shall be used. Ducts shall be provided with end bells whenever duct lines terminate.
3.5.2 Treatment

Ducts shall be kept clean of concrete, dirt, or foreign substances during construction. Field cuts requiring tapers shall be made with proper tools and match factory tapers. A coupling recommended by the duct manufacturer shall be used whenever an existing duct is connected to a duct of different material or shape. Ducts shall be stored to avoid warping and deterioration with ends sufficiently plugged to prevent entry of any water or solid substances. Ducts shall be thoroughly cleaned before being laid. Plastic ducts shall be stored on a flat surface and protected from the direct rays of the sun.

3.5.3 Concrete Encasement

Ducts requiring concrete encasements shall comply with NFPA 70, except that electrical duct bank configurations for ducts 6 inches in diameter shall be determined by calculation and as shown on the drawings. The separation between adjacent electric power and communication ducts shall conform to ANSI C2. Duct line encasements shall be monolithic construction. Where a connection is made to a previously poured encasement, the new encasement shall be well bonded or doweled to the existing encasement. The Contractor shall submit proposed bonding method for approval in accordance with the detail drawing portion of paragraph SUBMITTALS. At any point, tops of concrete encasements shall be not less than the cover requirements listed in NFPA 70. Where ducts are jacked under existing pavement, rigid steel conduit will be installed because of its strength. To protect the corrosion-resistant conduit coating, predrilling or installing conduit inside a larger iron pipe sleeve (jack-and-sleeve) is required. Separators or spacing blocks shall be made of steel, concrete, plastic, or a combination of these materials placed not farther apart than 4 feet on centers. Ducts shall be securely anchored to prevent movement during the placement of concrete and joints shall be staggered at least 6 inches vertically.

3.5.4 Nonencased Direct-Burial

Top of duct lines shall be as indicated on the drawings and shall be installed with a minimum of 3 inches of earth around each duct, except that between adjacent electric power and communication ducts, 12 inches of earth is required. Bottoms of trenches shall be graded toward manholes or handholes and shall be smooth and free of stones, soft spots, 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 before installing ducts. Joints in adjacent tiers of duct shall be vertically staggered at least 6 inches. The first 6 inch layer of backfill cover shall be sand compacted as previously specified. The rest of the excavation shall be backfilled and compacted in 3 to 6 inch layers. Duct banks may be held in alignment with earth. However, high-tiered banks shall use a wooden frame or equivalent form to hold ducts in alignment prior to backfilling.
3.5.5 Installation of Couplings

Joints in each type of duct shall be made up in accordance with the manufacturer's recommendations for the particular type of duct and coupling selected and as approved.

3.5.5.1 Plastic Duct

Duct joints shall be made by brushing a plastic solvent cement on insides of plastic coupling fittings and on outsides of duct ends. Each duct and fitting shall then be slipped together with a quick 1/4-turn twist to set the joint tightly.

3.5.6 Duct Line Markers

Duct line markers shall be provided at the ends of long duct line stubouts or for other ducts whose locations are indeterminate because of duct curvature or terminations at completely below-grade structures. In addition to markers, a 5 mil brightly colored plastic tape, not less than 3 inches in width and suitably inscribed at not more than 10 feet on centers with a continuous metallic backing and a corrosion-resistant 1 mil metallic foil core to permit easy location of the duct line, shall be placed approximately 12 inches below finished grade levels of such lines.

3.6 HANDBOLES, AND PULLBOXES

3.6.1 General

Handholes shall be constructed approximately where shown. The exact location of each handhole shall be determined after careful consideration has been given to the location of other utilities, grading, and paving. The location of each handhole shall be approved by the Contracting Officer before construction of the handhole is started.

The Contractor may at his option utilize precast handholes having the required strength and inside dimensions as required by the drawings or specifications. In paved areas, frames and covers for handhole entrances in vehicular traffic areas shall be flush with the finished surface of the paving. In unpaved areas, the top of handhole covers shall be approximately 1/2 inch above the finished grade. Where existing grades that are higher than finished grades are encountered, concrete assemblies designed for the purpose shall be installed to elevate temporarily the manhole cover to existing grade level. Where duct lines enter handholes, the sections of duct may be either cast in concrete or may enter the handhole through a square or rectangular opening of suitable dimensions provided in the handhole walls. Where openings are provided for the entrance of duct lines, the space between ducts and between ducts and handhole walls shall be sealed.
3.6.2 Ground Rods

A ground rod shall be installed at the handholes and pullboxes. Ground rods shall be driven into the earth before the handhole floor is poured so that approximately 4 inches of the ground rod will extend above the floor. When precast concrete handholes are used, the top of the ground rod may be below the handhole floor and a No. 1/0 AWG ground conductor brought into the handhole through a watertight sleeve in the handhole wall.

3.7 PAD-MOUNTED EQUIPMENT INSTALLATION

Pad-mounted equipment, shall be installed on concrete pads in accordance with the manufacturer's published, standard installation drawings and procedures, except that they shall be modified to meet the requirements of this document. Units shall be installed so that they do not damage equipment or scratch painted or coated surfaces. After installation, surfaces shall be inspected and scratches touched up with a paint or coating provided by the manufacturer especially for this purpose. Three-phase transformers shall be installed with the phase sequence, required by the local utility company.

3.7.1 Concrete Pads

3.7.1.1 Construction

Concrete pads for pad-mounted electrical equipment shall be poured-in-place. Pads shall be constructed as indicated, except that exact pad dimensions and mounting details are equipment specific and are the responsibility of the Contractor. Tops of concrete pads shall be level and shall project 4 inches above finished paving or grade and sloped to drain. Edges of concrete pads shall have 3/4 inch chamfer. Conduits for primary, secondary, and grounding conductors shall be set in place prior to placement of concrete pads. Where grounding electrode conductors are installed through concrete pads, PVC conduit sleeves shall be installed through the concrete to provide physical protection. To facilitate cable installation and termination, the concrete pad shall be provided with a rectangular hole below the primary and secondary compartments, sized in accordance with the manufacturer's recommended dimensions. Upon completion of equipment installation the rectangular hole shall be filled with masonry...
grout. Duct bends and ducts entering equipment pads shall be rigid, galvanized steel.

3.7.1.2 Concrete and Reinforcement

Concrete work shall comply with the requirements of Section 03300 CONCRETE FOR BUILDING CONSTRUCTION. Concrete pad reinforcement shall be in accordance with Section 03200 CONCRETE REINFORCEMENT.

3.7.1.3 Sealing

When the installation is complete, the Contractor shall seal all conduit and other entries into the equipment enclosure with an approved sealing compound. Seals shall be of sufficient strength and durability to protect all energized live parts of the equipment from rodents, insects, or other foreign matter.

3.7.2 Padlocks

Padlocks shall be provided for pad-mounted equipment and for each fence gate. Padlocks shall be keyed as directed by the Contracting Officer.

3.7.3 Fencing

Fencing shall conform to the requirement of and be installed in accordance with Section 02831 CHAIN LINK FENCE. Fences shall provide working clearances for operation and maintenance in accordance with ANSI C2. The entire space between fences and concrete pads shall be excavated to a minimum depth of 4 inches below finished gradelines, shall be graded to reasonably level surfaces, and filled with well-compacted clean coarse gravel or crushed stone of 1/2 inch to 1-1/2 inches graded size up to finished gradelines. Space between fences and concrete pads shall be excavated to a minimum depth of 4 inches below finished gradelines, shall be graded to reasonably level surfaces, and filled with well-compacted clean coarse gravel or crushed stone of 1/2 inch to 1-1/2 inches graded size up to finished gradelines.

3.7.4 Surface Treatment

Horizontal spaces between concrete foundations or pads and fences shall be excavated to minimum depth of six inches below finished gradelines, shall be graded to level surfaces, and filled with well-compacted clean coarse gravel or crushed stone of 1/2 to 1-1/2 inches in size up to finished gradelines.

3.7.5 Transformer Stations

Transformer stations shall be installed in accordance with IEEE C57.12.11 and shall be fence-enclosed type and mounted on concrete pads.
3.7.6 Equipment Finishes

Equipment shall be carefully installed so as not to scratch finishes. After installation, finished surfaces shall be inspected and scratches touched up with a finish provided by the manufacturer especially for this purpose.

3.7.7 Supports

Enclosures and enclosure supports shall be installed in accordance with manufacturer's instructions. Supports shall consist of anchored channels leveled and then embedded in the concrete foundation. Channels, anchors, shims, or other leveling items shall be installed in accordance with the recommendations of the equipment manufacturer.

3.7.8 Switchgear Leveling

After leveling items are correctly installed, switchgear lineups shall be out-of-plumb by not more than 1/4 inch for the entire length and width. Insertion or withdrawal of removable elements shall be easily accomplished, and component devices shall operate properly after the switchgear assembly is completely installed.

3.8 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.

3.9 GROUNDING

A ground mat or ring consisting of the indicated configuration of bare copper conductors and driven ground rods shall be installed under or around pad-mounted equipment as shown. Equipment frames of metal-enclosed equipment, and other noncurrent-carrying metal parts, such as cable shields, cable sheaths and armor, and metallic conduit shall be grounded. At least 2 connections shall be provided from a transformer, a switchgear ground bus, and a unit substation to the ground mat. Metallic frames and covers of handholes and pull boxes shall be grounded by use of a braided, copper ground strap with equivalent ampacity of No. 6 AWG.

3.9.1 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.
b. Ground mat - A ground mat shall be installed as shown consisting of bare copper conductors installed 18 inches, plus or minus 3 inches, below the finished top of soil grade. Mat conductors shall be bonded to all rod electrodes, electrolytic electrodes, and to all other intersecting mat conductors. Mat conductors shall be sized as shown on the drawings.

c. Ground ring - A ground ring shall be installed as shown consisting of bare copper conductors installed 18 inches, plus or minus 3 inches, below finished top of soil grade.

d. Additional electrodes - When the required ground resistance is not met, additional electrodes shall be provided interconnected with grounding conductors to achieve the specified ground resistance. The additional electrodes will be up to three, 10 feet rods spaced a minimum of 12 feet apart. In high ground resistance, UL listed chemically charged ground rods may be used. If the resultant resistance exceeds 25 ohms measured not less than 48 hours after rainfall, the Contracting Officer shall be notified immediately.

3.9.2 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. Where grounding conductors are connected to aluminum-composition conductors, specially treated or lined copper-to-aluminum connectors suitable for this purpose shall be used.

3.9.3 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.

3.9.4 Surge Arrester Grounding

Surge arresters and neutrals shall be bonded directly to the transformer enclosure and then to the grounding electrode system with a bare copper conductor, sized as shown. Lead lengths shall be kept as short as practicable with no kinks or sharp bends.

3.9.5 Grounding at Cable Terminating/Sectionalizing Enclosures, Handhole, or Concrete Pullbox

Ground rods shall be connected to enclosures, cable racks, cable-pulling irons, the cable shielding, metallic sheath, and armor at each cable joint or splice by means of a No. 4 AWG braided copper wire. Connections to metallic
cable sheaths shall be by means of tinned terminals soldered to ground wires and to cable sheaths. Care shall be taken in soldering not to damage metallic cable sheaths or shields. Ground rods shall be protected with a double wrapping of pressure-sensitive plastic tape for a distance of 2 inches above and 6 inches below concrete penetrations. Grounding electrode conductors shall be neatly and firmly attached to manhole walls and the amount of exposed bare wire shall be held to a minimum.

3.9.6 Deleted

3.9.7 Riser Pole Grounding

A single continuous vertical grounding electrode conductor shall be installed on each riser pole and connected directly to the grounding electrodes indicated on the drawings or required by these specifications. All equipment, neutrals, surge arresters, and items required to be grounded shall be connected directly to this vertical conductor. The grounding electrode conductor shall be sized as shown. Grounding electrode conductors shall be stapled to wood poles at intervals not exceeding 2 feet.

3.9.8 Lighting Pole

One ground rod shall be provided at each pole. Bases of metal or concrete lighting poles shall be connected to ground rods by means of No. 8 AWG bare copper wire. Lighting fixture brackets on wood and concrete poles shall be grounded to a No. 6 AWG bare copper grounding conductor connected to the ground rod.

3.10 LIGHTING POLE INSTALLATION

Pole lengths shall provide a luminaire mounting height of 25 feet. Luminaire mounting height may be increased by the height of the transformer base where required. Electrical cabling shall be provided to the light pole as specified in this Section. The mount interfaces shall have ac power connected, and the pole wiring harness shall be connected to the luminaire. Light poles shall not be installed outside the site or inside the perimeter zone. Pole installation shall conform to the manufacturer's recommendations, NFPA 70, and ANSI C2. Poles shall be set straight and plumb.

3.10.1 Pole Brackets

Brackets shall be installed as specified by the manufacturer and as shown on drawings. Mounting hardware shall be sized appropriately to secure the mount, luminaire, and housing with wind and ice loading normally encountered at the site. Where indicated on drawings, adjustable heads shall be installed on the brackets to position the luminaires. Identical brackets shall be used with one type of luminaire.
3.2.3.1 Low-voltage cables shall be buried directly in the earth in the trench. 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 shall be compacted to approximate consistencies of surrounding fill soil.

3.2.3.2 Direct-burial cables shall be installed in ducts where indicated. Cable splices in low-voltage cables shall be made in manholes or approved pullboxes only. Manholes or approved pullboxes shall be installed in the same duct with their associated phase conductors.

3.2.3.3 Cable burial is not permitted when cables are to be installed in concrete-encased ducts.
cable sheaths shall be by means of tinned terminals soldered to ground wires and to cable sheaths. Care shall be taken in soldering not to damage metallic cable sheaths or shields. Ground rods shall be protected with a double wrapping of pressure-sensitive plastic tape for a distance of 2 inches above and 6 inches below concrete penetrations. Grounding electrode conductors shall be neatly and firmly attached to manhole walls and the amount of exposed bare wire shall be held to a minimum.

3.9.6 Metal Splice Case Grounding

Metal splice cases for medium-voltage direct-burial cable shall be grounded by connection to a driven ground rod located within 2 feet of each splice box using a grounding electrode conductor having a current-carrying capacity of at least 70 percent of the individual phase conductors in the associated splice box, but not less than No. 6 AWG.

3.9.7 Riser Pole Grounding

A single continuous vertical grounding electrode conductor shall be installed on each riser pole and connected directly to the grounding electrodes indicated on the drawings or required by these specifications. All equipment, neutrals, surge arresters, and items required to be grounded shall be connected directly to this vertical conductor. The grounding electrode conductor shall be sized as shown. Grounding electrode conductors shall be stapled to wood poles at intervals not exceeding 2 feet.

3.9.8 Lighting Pole

One ground rod shall be provided at each pole. Bases of metal or concrete lighting poles shall be connected to ground rods by means of No. 8 AWG bare copper wire. Lighting fixture brackets on wood and concrete poles shall be grounded to a No. 6 AWG bare copper grounding conductor connected to the ground rod.

3.10 LIGHTING POLE INSTALLATION

Pole lengths shall provide a luminaire mounting height of 25 feet. Luminaire mounting height may be increased by the height of the transformer base where required. Electrical cabling shall be provided to the light pole as specified in this Section. The mount interfaces shall have ac power connected, and the pole wiring harness shall be connected to the luminaire. Light poles shall not be installed outside the site or inside the perimeter zone. Pole installation shall conform to the manufacturer’s recommendations, NFPA 70, and ANSI C2. Poles shall be set straight and plumb.

3.10.1 Pole Brackets

Brackets shall be installed as specified by the manufacturer and as shown on drawings. Mounting hardware shall be sized appropriately to secure the mount, luminaire, and housing with wind and ice loading normally encountered at the site. Where indicated on drawings, adjustable heads shall be installed on the brackets to position the luminaires. Identical brackets shall be used with one type of luminaire.
3.10.2 Rigid Steel Conduit Els

Rigid steel conduit els shall be provided for all wood poles, where required. Rigid steel conduit shall be connected to the els and shall extend to a minimum height of 10 feet above grade. Conduit els shall be provided at all poles.

3.10.3 Wood Pole Installation

Wood poles shall be set straight and firm. In normal firm ground, minimum pole-setting depths shall be as listed in Table II. In rocky or swampy ground, pole-setting depths shall be decreased or increased as shown respectively in accordance with the local utility's published standards and as approved. In swampy or soft ground, a bog shoe shall be used where support for a pole is required. Poles in straight runs shall be in a straight line. Curved poles shall be placed with curvatures in the direction of the pole line. Poles shall be set to maintain as even a grade as practicable. When the average ground run is level, consecutive poles shall not vary more than 5 feet in height. When the ground is uneven, poles differing in length shall be kept to minimum by locating poles to avoid the highest and lowest ground points. If it becomes necessary to shorten a pole, a piece shall be sawed off the top end and roofed. If any pole is shortened after treatment, the shortened end of the pole shall be given an application of hot preservative. Where poles are set on hilly terrain, along edges of cuts or embankments, or where soil may be washed out, special precautions shall be taken to ensure durable pole foundations, and the setting depth shall be measured from the lower side of the pole. Holes shall be dug large enough to permit proper use of tampers to the full depth of a hole. Earth shall be placed into a hole in 6 inch maximum layers, then thoroughly tamped before the next layer is placed. Surplus earth shall be placed around a pole in a cone and packed tightly to drain water from poles.

TABLE I - MINIMUM POLE-SETTING DEPTH
(Feet and Inches)

<table>
<thead>
<tr>
<th>Length Overall Feet</th>
<th>Straight Lines</th>
<th>Curves, Corners, and Points of Extra Strain</th>
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<tr>
<td>60</td>
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</table>
3.11 LIGHTING AND LIGHTING CONTROLS

3.11.1 Lamps

Lamps of the proper type, wattage, and voltage rating shall be delivered to the project in the original containers and installed in the fixtures just before completion of the project.

3.11.2 Fixture Installation

Standard fixtures shall be installed as detailed on Standard Detail No. 04-06-04, Sheet No. 52, which accompanies and forms a part of this specification. Special fixtures shall be as indicated on drawings. Illustrations shown on these sheets or on the drawings are indicative of the general type desired and are not intended to restrict selection of fixtures to any particular manufacturer. Fixtures of similar design, equivalent light-distribution and brightness characteristics, and equal finish and quality will be acceptable as approved.

3.11.2.1 Accessories

Accessories such as straps, mounting plates, nipples, or brackets shall be installed as required for proper installation.

3.11.2.2 In-Line Fuses

An in-line fuse shall be provided for each fixture.

3.11.3 Photo-Control

Lighting luminaires shall be individually controlled by photo-control elements mounted on the heads of the luminaires.

3.12 FIELD TESTING

3.12.1 General

Field testing shall be performed in the presence of the Contracting Officer. The Contractor shall notify the Contracting Officer 10 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.

3.12.2 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.
3.12.3 Ground-Resistance Tests

The resistance of each grounding electrode system, ground mat, or ground ring shall be measured using the fall-of-potential method defined in IEEE Std 81. Ground resistance measurements shall be made before the electrical distribution system is energized and shall be made in normally dry conditions not less than 48 hours after the last rainfall. Resistance measurements of separate grounding electrode systems shall be made before the systems are bonded together below grade. The combined resistance of separate systems may be used to meet the required resistance, but the specified number of electrodes must still be provided.

a. Ground mat - 25 ohms.

b. Ground ring - 25 ohms ohms.

3.12.4 Ground-Mat Connection Inspection

All below-grade ground-mat connections will be visually inspected by the Contracting Officer before backfilling. The Contractor shall notify the Contracting Officer 48 hours before the site is ready for inspection.

3.12.5 Medium-Voltage Cable Test

After installation and before the operating test or connection to an existing system, the medium-voltage cable system shall be given a high potential test. Direct-current voltage shall be applied on each phase conductor of the system by connecting conductors as one terminal and connecting grounds or metallic shieldings or sheaths of the cable as the other terminal for each test. Prior to making the test, the cables shall be isolated by opening applicable protective devices and disconnecting equipment. The test shall be conducted with all splices, connectors, and terminations in place. The method, voltage, length of time, and other characteristics of the test for initial installation shall be in accordance with NEMA WC 7 or NEMA WC 8 for the particular type of cable installed, except that 28 kV and 35 kV insulation test voltages shall be in accordance with either AEIC CS5 or AEIC CS6 as applicable, and shall not exceed the recommendations of IEEE Std 404 for cable joints and IEEE Std 48 for cable terminations unless the cable and accessory manufacturers indicate higher voltages are acceptable for testing. Should any cable fail due to a weakness of conductor insulation or due to defects or injuries incidental to the installation or because of improper installation of cable, cable joints, terminations, or other connections, the Contractor shall make necessary repairs or replace cables as directed. Repaired or replaced cables shall be retested.

3.12.6 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 cable grounded. 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 system shall be retested until failures have been eliminated.

3.12.7 Liquid-Filled Transformer Tests

The following field tests shall be performed on all liquid-filled transformers. Pass-fail criteria shall be in accordance with transformer manufacturer’s specifications.

a. Insulation resistance test phase-to-ground.

b. Turns ratio test.

c. Correct phase sequence.

d. Correct operation of tap changer.

3.12.8 Circuit Breaker Tests

The following field tests shall be performed on circuit breakers. Pass-fail criteria shall be in accordance with the circuit breaker manufacturer’s specifications.

a. Insulation resistance test phase-to-phase.

b. Insulation resistance test phase-to-ground.

c. Closed breaker contact resistance test.

d. Power factor test.

e. High-potential test.

f. Manual and electrical operation of the breaker.

3.12.9 Protective Relays

Protective relays shall be visually and mechanically inspected, adjusted, tested, and calibrated in accordance with the manufacturer’s published instructions. Tests shall include pick-up, timing, contact action, restraint, and other aspects necessary to ensure proper calibration and operation. Relay settings shall be implemented in accordance with the coordination study. Relay contacts shall be manually or electrically operated to verify that the proper breakers and alarms initiate. Relaying current transformers shall be field tested in accordance with IEEE C57.13.

3.12.10 Pre-Energization Services

Calibration, testing, adjustment, and placing into service of the installation shall be accomplished by a manufacturer’s product field
service engineer or independent testing company with a minimum of 2 years of current product experience. The following services shall be performed on the equipment listed below. These services shall be performed subsequent to testing but prior to the initial energization. The equipment shall be inspected to ensure that installation is in compliance with the recommendations of the manufacturer and as shown on the detail drawings. Terminations of conductors at major equipment shall be inspected to ensure the adequacy of connections. Bare and insulated conductors between such terminations shall be inspected to detect possible damage during installation. If factory tests were not performed on completed assemblies, tests shall be performed after the installation of completed assemblies. Components shall be inspected for damage caused during installation or shipment to ensure packaging materials have been removed. Components capable of being both manually and electrically operated shall be operated manually prior to the first electrical operation. Components capable of being calibrated, adjusted, and tested shall be calibrated, adjusted, and tested in accordance with the instructions of the equipment manufacturer. Items for which such services shall be provided, but are not limited to, are the following:

a. Unit substation

b. Pad-mounted transformers

c. Metal-clad switchgear

d. Switches

e. Battery station

f. Metal-enclosed switchgear

3.12.11 Operating Tests

After the installation is completed, and at such times as the Contracting Officer may direct, the Contractor shall conduct operating tests for approval. The equipment shall be demonstrated to operate in accordance with the requirements herein. An operating test report shall be submitted in accordance with paragraph SUBMITTALS.

3.13 MANUFACTURER'S FIELD SERVICE

3.13.1 Onsite Training

The Contractor shall conduct a training course for the operating staff as designated by the Contracting Officer. The training period shall consist of a total of 24 hours of normal working time and shall start after the system is functionally completed but prior to final acceptance tests. The course instruction shall cover pertinent points involved in operating, starting, stopping, and servicing the equipment, as well as all major elements of the operation and maintenance manuals. Additionally, the course instructions shall demonstrate all routine maintenance operations. A VHS format video tape of the entire training session shall be submitted.
3.13.2 Installation Engineer

After delivery of the equipment, the Contractor shall furnish one or more field engineers, regularly employed by the equipment manufacturer to supervise the installation of the equipment, assist in the performance of the onsite tests, initial operation, and instruct personnel as to the operational and maintenance features of the equipment.

3.14 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 --
**TYPE 402**

Enclosed, Heavy Duty, Integrally Ballasted, High Intensity Discharge Roadway Lighting Fixture

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<th>Second Suffix</th>
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<td>Rated for mercury lamp</td>
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<tr>
<td>B</td>
<td></td>
<td>Rated for metal halide lamp</td>
</tr>
<tr>
<td>C</td>
<td>1</td>
<td>Rated for high pressure sodium lamp</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>IES type I medium light distribution</td>
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<tr>
<td></td>
<td>3</td>
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<td>IES type IV medium light distribution</td>
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<tr>
<td></td>
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<td>IES type V medium light distribution</td>
</tr>
</tbody>
</table>

Fixture shall conform to UL 1572, and ANSI C136.10 as specified below. Fixture housing shall be of die-cast aluminum with the bottom plate hinged to the top housing. The bottom plate shall be held in place by hinge and spring latch and shall have a continuous, weather-tight gasket that filters air entering or leaving the optical and power compartment. The housing finish shall be baked enamel. The fixture shall have an integral slip-fitter to accept a 1-1/2-inch to 2-inch mast arm. The reflector shall be aluminum of the manufacturer’s standard commercial product finish suitable for the type and rating of the lamp. The lens shall be tempered prismatic glass and shall be held securely in the bottom plate. The fixture shall be provided with the locking-type mounting receptacle for photoelectric control in accordance with ANSI C136.10. Photocell shall be provided on top of fixture. Ballast shall be of the high power factor type. Ballast shall be of the constant wattage autotransformer type for mercury vapor lamps, the leadpeak regulated type for metal halide lamps, and the regulated type for high pressure sodium lamps. Ballast shall be capable of starting the lamp at ambient temperatures ranging from minus 20 degrees F to 105 degrees F. The fixture shall be prewired, and shall have a mogul base glazed porcelain lampholder.

Fixture type indicated on this sheet shall also conform to requirements specified and indicated in the contract documents.
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 C12.11  (1987) Instrument Transformers for Revenue Metering, 10 kV BIL through 350 kV (0.6 kV NSV through 69 kV NSV)


ANSI C57.12.10  (1988) Transformers - 230 kV and Below 833/958 through 8333/10 417 kVA, Single-Phase, and 750/862 through 60 000/80 000/100 000 kVA, Three-Phase without Load Tap Changing; and 3750/4687 through 60 000/80 000/100 000 kVA with Load Tap Changing - Safety Requirements

ANSI C57.12.50  (1981; R 1989) Ventilated Dry-Type Distribution Transformers, 1 to 500 kVA, Single-Phase, and 15 to 500 kVA, Three-Phase, with High-Voltage 601 to 34 500 Volts, Low-Voltage 120 to 600 Volts

ANSI C80.5  (1990) Rigid Aluminum Conduit

ANSI C82.1  (1985; C82.1a; C82.1b; C82.1c) Ballasts for Fluorescent Lamps

ANSI C82.4  (1985; C82.4a) Ballasts for High-Intensity-Discharge and Low-Pressure Sodium Lamps (Multiple-Supply Type)

CODE OF FEDERAL REGULATIONS (CFR)

47 CFR 18  Rules and Regulations: Industrial, Scientific, and Medical Equipment

FEDERAL SPECIFICATIONS (FS)

FS L-C-530  (Rev C) Coating, Pipe, Thermoplastic Resin
INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE C57.12.01 (1989) Dry-Type Distribution and Power Transformers Including Those With Solid Cast and/or Resin - Encapsulated Windings

IEEE C57.12.80 (1978; R 1992) Terminology for Power and Distribution Transformers

IEEE C57.12.91 (1979) Test Code for Dry Type Distribution and Power Transformers

IEEE C57.13 (1993) Instrument Transformers

IEEE C57.94 (1982; R 1987) Installation, Application, Operation and Maintenance of Dry-Type General Purpose Distribution and Power Transformers


IEEE C57.105 (1978; R 1987) Transformers Connections in Three Phase Distribution Systems


NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA 250 (1991) Enclosures for Electrical Equipment (1000 Volts Maximum)

NEMA AB 1 (1986; Rev 1) Molded Case Circuit Breakers and Molded Case Switches

NEMA FU 1 (1986) Low Voltage Cartridge Fuses

NEMA ICS 1 (1988; Rev 1, 2 & 3) Industrial Controls and Systems

NEMA ICS 2 (1988; Rev 1) Industrial Control Devices, Controllers and Assemblies

NEMA ICS 3 (1988; Rev 1) Industrial Systems

NEMA ICS 6 (1988; Rev 1) Enclosures for Industrial Control and Systems

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<tr>
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<tbody>
<tr>
<td>NEMA MG 1</td>
<td>(1993) Motors and Generators</td>
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<tr>
<td>NEMA OS 1</td>
<td>(1989) Sheet Steel Outlet Boxes, Device Boxes, Covers, and Box Supports</td>
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<tr>
<td>NEMA OS 2</td>
<td>(1986; Errata 1986; R 1991) Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports</td>
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<tr>
<td>NEMA PB 1</td>
<td>(1990) Panelboards</td>
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<td>NEMA PB 2</td>
<td>(1989) Deadfront Distribution Switchboards</td>
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<tr>
<td>NEMA RN 1</td>
<td>(1989) Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit</td>
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<td>NEMA ST 20</td>
<td>(1992) Dry-Type Transformers for General Applications</td>
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<td>NEMA TC 2</td>
<td>(1990) Electrical Polyvinyl Chloride (PVC) Tubing (EPT) and Conduit (EPC-40 and EPC-80)</td>
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<tr>
<td>NEMA TC 13</td>
<td>(1986) Electrical Nonmetallic Tubing (ENT)</td>
</tr>
<tr>
<td>NEMA WD 1</td>
<td>(1983; R 1989) General Requirements for Wiring Devices</td>
</tr>
<tr>
<td>NEMA WD 6</td>
<td>(1988) Wiring Devices - Dimensional Requirements</td>
</tr>
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</table>

**NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)**

<table>
<thead>
<tr>
<th>Code</th>
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**UNDERWRITERS LABORATORIES (UL)**

<table>
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<tr>
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<tbody>
<tr>
<td>UL-03</td>
<td>(1993; Supple) Electrical Construction Materials Directory</td>
</tr>
<tr>
<td>UL 1</td>
<td>(1985; Rev thru Aug 1993) Flexible Metal Conduit</td>
</tr>
<tr>
<td>UL 5</td>
<td>(1985; Rev thru Sep 1990) Surface Metal Raceways and Fittings</td>
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</table>
UL 6  (1993) Rigid Metal Conduit
UL 50  (1992; Rev thru Feb 1994) Enclosures for Electrical Equipment
UL 67  (1988; Rev thru Feb 1993) Panelboards
UL 83  (1991; Rev thru Jul 1993) Thermoplastic-Insulated Wires and Cables
UL 98  (1987; Rev thru Apr 1990) Enclosed and Dead-Front Switches
UL 198B (1988; Rev Jan 1988) Class H Fuses
UL 198C (1986; Rev thru Jun 1993) High-Interrupting-Capacity Fuses, Current-Limiting Types
UL 198F (1988) Plug Fuses
UL 198G (1988; Rev May 1988) Fuses for Supplementary Overcurrent Protection
UL 198H (1988; Rev thru Nov 1993) Class T Fuses
UL 360 (1986; Rev thru Jan 1993) Liquid-Tight Flexible Steel Conduit
UL 467 (1984; Rev thru Nov 1986) Grounding and Bonding Equipment
UL 486C (1991; Rev thru Sep 1992) Splicing Wire Connectors
UL 506  (1989; Rev Sep 1993) Specialty Transformers
UL 508  (1993) Industrial Control Equipment
UL 510  (1986; Rev Oct 1986) Insulating Tape
UL 512  (1993) Fuseholders
UL 514A (1991) Metallic Outlet Boxes
UL 514B (1992; Rev thru Mar 1993) Fittings for Conduit and Outlet Boxes
UL 651  (1989; Rev thru Dec 1989) Schedule 40 and 80 Rigid PVC Conduit
UL 651A (1989; Rev thru Dec 1989) Type EB and A Rigid PVC Conduit and HDPE Conduit
UL 674  (1989) Electric Motors and Generators for Use in Hazardous (Classified) Locations
UL 698  (1991; Rev thru May 1993) Industrial Control Equipment for Use in Hazardous (Classified) Locations
UL 719  (1985; Rev thru Apr 1993) Nonmetallic-Sheathed Cables
UL 797  (1993) Electrical Metallic Tubing
UL 844  (1990; Rev thru Dec 1993) Electric Lighting Fixtures for Use in Hazardous (Classified) Locations
UL 877  (1993) Circuit Breakers and Circuit-Breaker Enclosures for Use in

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Hazardous (Classified) Locations

UL 886  (1994; Rev thru Feb 1994) Outlet Boxes and Fittings for Use in Hazardous (Classified) Locations

UL 891  (1994) Dead-Front Switchboards


UL 935  (1993; Rev Feb 1993) Fluorescent-Lamp Ballasts

UL 943  (1993) Ground-Fault Circuit Interrupters

UL 1004 (1989; Rev thru Mar 1993) Electric Motors

UL 1010 (1991; Rev thru Feb 1994) Receptical-Plug Combinations for Use in Hazardous (Classified) Locations

UL 1029 (1986; Rev thru Jul 1993) High-Intensity-Discharge Lamp Ballasts

UL 1242 (1983; Rev thru Jul 1993) Intermediate Metal Conduit

UL 1561 (1986; Rev thru Jul 1992) Dry-Type General Purpose and Power Transformers

UL 1570 (1988; Rev thru Mar 1994) Fluorescent Lighting Fixtures

UL 1571 (1991; Rev thru Mar 1994) Incandescent Lighting Fixtures

UL 1572 (1991; Rev thru Mar 1994) High Intensity Discharge Lighting Fixtures

UL 1660 (1987) Liquid-Tight Flexible Nonmetallic Conduit

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 herein 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 Electrical Contractor shall coordinate the electrical work with HVAC and electrical drawings and provide all power related wiring even if they are not shown on electrical drawings.

1.2.3 Hazardous Locations

Wiring in locations indicated shall conform to the NFPA 70 for Class 1, Division 2 hazardous locations. Equipment shall be suitable for Groups C & D.

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 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. Designation of motors shall coincide with their designation in the motor control center or panel. Unless otherwise specified, all identification nameplates shall be made of laminated plastic in accordance with FS L-P-387 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, motor control center, switchgear, and switchboard 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
Panelboards
Starters
Safety Switches
Motor Control Centers
Transformers
Equipment Enclosures
Switchgear
Switchboards
Motors

Minimum 1/8 inch High Letters
Control Power Transformers
Control Devices
Instrument Transformers

Each panel, section, or unit in motor control centers, switchgear or similar assemblies shall be provided with a nameplate in addition to nameplates listed above, which shall be provided for individual compartments in the respective assembly, including nameplates which identify "future," "spare," and "dedicated" or "equipped spaces."

1.2.6 As Built Drawings

Following the project completion or turnover, within 30 days the Contractor shall furnish two 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 01300 SUBMITTAL DESCRIPTIONS:

SD-04 Drawings

Electrical Work; GA.

Detail drawings for all materials and equipment specified. Detail drawings shall consist of a complete list of equipment and materials, including manufacturer's descriptive and technical data; catalog cuts; and any special installation instructions that may be required. Drawings shall show applicable schematic diagrams; equipment layout and anchorage; and conduit and cable tray runs, anchorage, and support. Power system coordination study, short-circuit analysis or study, fault-impedance diagrams, and load flow analysis or study shall be included and shall be in accordance with paragraph COORDINATED POWER SYSTEM PROTECTION. Telephone system drawings showing actual layout, including locations, type any gauge of cables, and terminal assignment of wiring, after installation.

SD-09 Reports

Materials and Equipment; GA.

The label or listing of the Underwriters Laboratories, Inc., shall 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. However, materials and equipment installed in hazardous locations must bear the UL label unless the data submitted from other testing agency is specifically approved in writing by the Contracting Officer. Materials and equipment shall 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 Federal Specification, or standard of the American Society for Testing and Materials, National Electrical Manufacturers Association, or other commercial standard, is acceptable.

SD-13 Certificates

Telephone Installer; GA.

Qualifications of the telephone installer.

1.4 WORKMANSHIP

Materials and equipment shall be installed in accordance with recommendations of the manufacturer and as shown.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

Materials and equipment 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.

2.1.1 Cables and Wires

Conductors in cables shall be annealed copper, except that AA-8000 series aluminum conductors may be used as an equivalent for copper conductors of No. 6 AWG or larger. Intermixing of copper and aluminum conductors in these sizes is not permitted. Design is based on copper conductors and aluminum conductors shall have an ampacity not less than that of the indicated copper conductors. Cables shall be single-conductor type, unless otherwise indicated. Cables and wires shall conform to UL 44 for rubber-insulated type; UL 83 for the thermoplastic-insulated type; and UL 719 for the nonmetallic-sheathed cables.

2.1.1.1 Service Entrance Cable

Type [SE] [USE].
2.1.1.2 Grounding Cables

Grounding cables shall be bare or shall have green low-voltage insulation.

2.1.1.3 Cord Sets and Power-Supply Cords

UL 817.

2.1.2 Cable Trays

Cable trays shall form a wireway system, and shall be of nominal [3] [4] [6] inch depth. Cable trays shall be constructed of [aluminum] [copper-free aluminum] [steel that has been zinc-coated after fabrication]. Trays shall include splice and end plates, dropouts, and miscellaneous hardware. Edges, fittings, and hardware shall be finished free from burrs and sharp edges. Fittings shall have not less than the load-carrying ability of straight tray sections and shall have manufacturer’s minimum standard radius unless otherwise indicated. [Radius of bends shall be [12] [24] [36] inches.] [Radius of bends shall be as shown.]

2.1.2.1 Trough

Trough-type cable trays shall be of a nominal [6] [12] [18] [24] inch width as indicated.

2.1.2.2 Ladder


2.1.2.3 Channel

Channel-type cable trays shall be of [3] [4] inch width as indicated. Trays shall be one-piece construction having slots spaced not more than 4-1/2 inches on centers.

2.1.2.4 Cantilever

Cantilever-type, center-hung cable trays may be provided at the Contractor’s option in lieu of other cable tray types specified. Connector blocks shall be type 66 equipped with punch down clips.

2.1.3 Telephone Backboards

Backboards shall be 3/4 inch plywood having a two-coat insulating varnish finish.

2.1.4 Circuit Breakers

Circuit breakers shall have voltage, current and interrupting ratings as indicated. Fully rated circuit breakers shall be provided to obtain the specified interrupting rating.
2.1.4.1 Molded-Case and Insulated-Case Circuit Breakers

NEMA AB 1 and UL 489 for circuit breakers, and UL 877 for circuit breakers and circuit breaker enclosures in hazardous (classified) locations.

a. Molded-Case Circuit Breakers: Single-pole breakers shall be full module size; two poles shall not be installed in a single module. Multipole breakers shall be of the common-trip type having a single operating handle, but for sizes of 100 amperes or less may consist of single-pole breakers permanently factory assembled into a multipole unit having an internal, mechanical, nontamperable common-trip mechanism and external handle ties. Breakers coordinated with current-limiting fuses shall have a combined interrupting capacity of 100,000 symmetrical amperes. All poles of associated breakers shall open if any fuse blows.

2.1.4.2 Ground Fault Circuit Interrupters

UL 943. Breakers equipped with ground fault interrupters shall have ground fault class, interrupting capacity, and voltage and current ratings as indicated.

2.1.5 Conduit and Tubing

2.1.5.1 Electrical, Zinc-Coated Steel Metallic Tubing (EMT)

UL 797.

2.1.5.2 Electrical Nonmetallic Tubing (ENT)

NEMA TC 13.

2.1.5.3 Electrical Plastic Tubing and Conduit

NEMA TC 2.

2.1.5.4 Flexible Conduit, Steel and Plastic

General-purpose type, UL 1; liquid tight, UL 360, and UL 1660

2.1.5.5 Intermediate Metal Conduit

UL 1242.

2.1.5.6 PVC Coated Rigid Steel Conduit

NEMA RN 1.

2.1.5.7 Rigid Aluminum Conduit

ANSI C80.5 and UL 6.
2.1.5.8 Rigid Metal Conduit
   UL 6.

2.1.5.9 Rigid Plastic
   NEMA TC 2, UL 651 and UL 651A.

2.1.5.10 Surface Metal Electrical Raceways and Fittings
   UL 5.

2.1.6 Conduit and Device Boxes and Fittings

2.1.6.1 Boxes, Metallic Outlet
   NEMA OS 1 and UL 514A.

2.1.6.2 Boxes, Nonmetallic, Outlet and Flush-Device Boxes and Covers
   NEMA OS 2 and UL 514C.

2.1.6.3 Boxes, Outlet for Use in Hazardous (Classified) Locations
   UL 886.

2.1.6.4 Boxes, Switch (Enclosed), Surface-Mounted
   UL 98.

2.1.6.5 Fittings for Conduit and Outlet Boxes
   UL 514B.

2.1.6.6 Fittings for Use in Hazardous (Classified) Locations
   UL 886.

2.1.6.7 Fittings, PVC, for Use with Rigid PVC Conduit and Tubing
   UL 514B.

2.1.7 Conduit Coatings Plastic Resin System
   FS L-C-530 or NEMA RN 1, Type A-40.

2.1.8 Connectors, Wire Pressure

2.1.8.1 Copper Conductors
   UL 486A.
2.1.8.2 Aluminum Conductors

UL 486B.

2.1.9 Electrical Grounding and Bonding Equipment

UL 467.

2.1.9.1 Ground Rods

Ground rods shall be of copper-clad steel conforming to UL 467 not less than 3/4 inch in diameter by 10 feet in length of the sectional type driven full length into the earth.

2.1.9.2 Ground Bus

The ground bus shall be bare conductor or flat copper in one piece, if practicable.

2.1.10 Enclosures

NEMA ICS 6 or NEMA 250 or UL 698 for use in hazardous (classified) locations, unless otherwise specified.

2.1.10.1 Cabinets and Boxes

UL 50.

2.1.10.2 Circuit Breaker

UL 489.

2.1.10.3 Circuit Breaker for Use in Hazardous (Classified) Locations

UL 877.

2.1.11 Fixtures, Lighting and Fixture Accessories/Components

Standard Drawing 40-06-04 sheets referenced hereinafter and enclosed as an integral part of these specifications, additional fixtures shown on contract drawings, if any and UL 844 for fixtures to be installed in hazardous (classified) locations. Fixtures, accessories and components, including ballasts, lampholders, lamps, starters and starter holders, shall conform to industry standards specified below.

2.1.11.1 Fixture, Auxiliary or Emergency

UL 924.

2.1.11.2 Incandescent Fixture

NEMA LE 4 for ceiling compatibility of recessed fixtures and UL 1571.
TARGET LAUNCH FACILITIES, PHASE 1, FT WINGATE, NM

2.1.11.3 Fluorescent

a. Fixture: NEMA LE 4 for ceiling compatibility of recessed fixtures and UL 1570. Fixtures shall be plainly marked for proper lamp and ballast type to identify lamp diameter, wattage, color and start type. Marking shall be readily visible to service personnel, but not visible from normal viewing angles.

b. Ballasts:

(1) Magnetic Ballast, Energy-Saving, High Power Factor, Class P, Automatic-Resetting Type, approved for the application by the Certified Ballast Manufacturers: ANSI C82.1 and UL 935. Two-lamp ballasts shall be used for each pair of lamps within a fixture or within continuous mounted fixtures. Single-lamp ballasts shall be used for individually mounted single-lamp fixtures and where an odd single-lamp fixture occurs at the end of a continuous group. Magnetic fluorescent lamp ballasts shall have a Ballast Efficacy Factor (BEF) not less than shown in the following table:

<table>
<thead>
<tr>
<th>NUMBER OF LAMPS</th>
<th>LAMP TYPE</th>
<th>NOMINAL OPERATIONAL INPUT VOLTAGE</th>
<th>MAX. LAMP OPERATING CURRENT</th>
<th>MIN. BALLAST EFFICACY FACTOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4 ft rapid start</td>
<td>120 or 277</td>
<td>less than 1000 m amp</td>
<td>1.805</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>4 ft rapid start</td>
<td>120</td>
<td>less than 1000 m amp</td>
<td>1.060</td>
</tr>
<tr>
<td>2</td>
<td>4 ft rapid start</td>
<td>277</td>
<td>less than 1000 m amp</td>
<td>1.050</td>
</tr>
<tr>
<td>2</td>
<td>8 ft slim-line</td>
<td>120 - 277</td>
<td>less than 1000 m amp</td>
<td>0.570</td>
</tr>
<tr>
<td>2</td>
<td>8 ft high output, rapid start</td>
<td>120 - 277</td>
<td>less than 1000 m amp</td>
<td>0.390</td>
</tr>
</tbody>
</table>

* For ballasts not specifically designed for use with dimming controls
The BEF is calculated using the formula:

\[ \text{BEF} = \frac{\text{Ballast Factor, (in percent)}}{\text{Power Input}} \]

Where Power Input = Total Wattage of Combined Lamps and Ballasts.

(2) Electronic Ballast. Electronic ballasts shall consist of a rectifier, high frequency inverter, and power control and regulation circuitry. The ballasts shall be UL listed, Class P, with a Class A sound rating and shall contain no PCBs. Ballasts shall meet 47 CFR 18 for electromagnetic interference and shall not interfere with the operation of other electrical equipment. Design shall withstand line transients per IEEE C62.41, Category A. Unless otherwise indicated, the minimum number of ballasts shall be used to serve each individual fixture, using one, two, three or four lamp ballasts. A single ballast may be used to serve multiple fixtures if they are continuous mounted, factory manufactured for that installation with an integral wireway and are identically controlled.

(a) Light output regulation shall be +/- 10%.
(b) Voltage input regulation shall be +/- 10%.
(c) Lamp current crest factor shall be no more than 1.7.
(d) Ballast factor shall not be less than 85% nor more than 100%, unless otherwise indicated.
(e) A 60 Hz filter shall be provided. Flicker shall be no more than 15% with any lamp suitable for the ballast.
(f) Ballast case temperature shall not exceed 25 degree celsius rise above 40 degree celsius ambient, when tested in accordance with UL 935.
(g) Input current to third harmonic shall not exceed 32 percent total harmonic distortion or 27.5 percent of the third triplens.
(h) Power factor shall not be less than 0.9.
(i) Ballasts shall operate at a frequency of 20 KHz or more.
(j) Operating filament voltage shall be 2.5 to 4.5 volts.
(k) Warranty. Three year full warranty including a $10 labor allowance.

(1) Ballast Efficacy Factor (BEF) shall be in accordance with the following table. Ballasts and lamps shall be matching rapid start or instant start as indicated on the following table. If 32W-F32-T8 lamps and ballasts are used, they must be either all rapid start or all instant start.

<table>
<thead>
<tr>
<th>LAMP TYPE</th>
<th>TYPE OF STARTER &amp; LAMP</th>
<th>NOMINAL OPERATIONAL INPUT VOLTAGE</th>
<th>NUMBER OF LAMPS</th>
<th>MIN. BALLAST EFFICIENCY FACTOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>40W F40 T12</td>
<td>rapid start</td>
<td>120 or 277 V</td>
<td>1</td>
<td>2.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>1.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td>0.8</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4</td>
<td>0.6</td>
</tr>
<tr>
<td>34W F40 T12</td>
<td>rapid start</td>
<td>120 or 277 V</td>
<td>1</td>
<td>2.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>1.3</td>
</tr>
</tbody>
</table>
### ELECTRONIC FLUORESCENT BALLAST EFFICACY FACTORS

<table>
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<th>LAMP TYPE</th>
<th>TYPE OF STARTER &amp; LAMP</th>
<th>NOMINAL OPERATIONAL INPUT VOLTAGE</th>
<th>NUMBER OF LAMPS</th>
<th>MIN. BALLAST EFFICACY FACTOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>40W F40 T10</td>
<td>rapid start</td>
<td>120 or 277 V</td>
<td>1</td>
<td>2.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>1.1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td>0.8</td>
</tr>
<tr>
<td>32W F32 T8</td>
<td>rapid or instant start</td>
<td>120 or 277 V</td>
<td>1</td>
<td>2.4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>1.4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td>1.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4</td>
<td>0.8</td>
</tr>
</tbody>
</table>

*For ballasts not specifically designed for use with dimming controls

The BEF is calculated using the formula:

\[
\text{BEF} = \frac{\text{Ballast Factor (in percent)}}{\text{Power Input}}
\]

Where Power Input = Total Wattage of Combined Lamps and Ballasts.

a. Lampholders, Starters, and Starter Holders: UL 542.

2.1.11.4 High-Intensity-Discharge

a. Fixture: NEMA LE 4 for ceiling compatibility of recessed fixtures and UL 1572.

b. Ballasts: ANSI C82.4 for multiple supply types and UL 1029.

2.1.12 Fuses and Fuseholders

2.1.12.1 Fuses, Low Voltage Cartridge Type

NEMA FU 1.

2.1.12.2 Fuses, High-Interrupting-Capacity, Current-Limiting Type

UL 198C.

2.1.12.3 Fuses, Class K, High-Interrupting-Capacity Type

UL 198D.
2.1.12.4  Fuses, Class H
          UL 198B.

2.1.12.5  Fuses, Class R
          UL 198E.

2.1.12.6  Fuses, Class T
          UL 198H.

2.1.12.7  Fuses, Plug Type
          UL 198F.

2.1.12.8  Fuses for Supplementary Overcurrent Protection
          UL 198G.

2.1.12.9  Fuseholders
          UL 512.

2.1.13   Instruments, Electrical Indicating
          ANSI C39.1.

2.1.14   Motors, ac, Fractional and Integral Horsepower

          Motors, ac, fractional and integral horsepower, 500 hp and smaller shall
          conform to NEMA MG 1 and UL 1004 for motors; NEMA MG 10 for energy
          management selection of polyphase motors; and UL 674 for use of motors in
          hazardous (classified) locations.

2.1.14.1  Horsepower Rating

          The horsepower rating of motors should be limited to no more than 125
          percent of the maximum load being served unless a NEMA standard size does
          not fall within this range. In this case, the next larger NEMA standard
          motor size should be used.

2.1.14.2  Motor Efficiencies

          All permanently wired polyphase motors of 1 hp or more shall meet the
          minimum full-load efficiencies as indicated in the following table, and as
          specified in this specification. Motors of 1 hp or more with open,
          dripproof or totally enclosed fan cooled enclosures shall be high
          efficiency type, unless otherwise indicated. Motors provided as an
          integral part of motor driven equipment are excluded from this requirement
          if a minimum seasonal or overall efficiency requirement is indicated for
          that equipment by the provisions of another section.
### Minimum Motor Efficiencies

<table>
<thead>
<tr>
<th>HP</th>
<th>Std. Efficiency</th>
<th>High Efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>77.0</td>
<td>85.5</td>
</tr>
<tr>
<td>1.5</td>
<td>78.5</td>
<td>85.5</td>
</tr>
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<td>2</td>
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#### 2.1.15 Motor Controls and Motor Control Centers

**NEMA ICS 1, NEMA ICS 2, NEMA ICS 3 and NEMA ICS 6, and UL 508 and UL 845.**

#### 2.1.16 Panelboards

Dead-front construction, NEMA PB 1 and UL 67.

#### 2.1.17 Receptacles

##### 2.1.17.1 General Grade

**NEMA WD 1.**

##### 2.1.17.2 Standard Grade

**UL 498.**

##### 2.1.17.3 Ground Fault Interrupters

**UL 943, Class A or B.**
2.1.17.4 Hazardous (Classified) Locations

UL 1010.

2.1.18 Service Equipment

UL 869A.

2.1.19 Splice, Conductor

UL 486C.

2.1.20 Switchboard, Dead Front Distribution

NEMA PB 2 and UL 891.

2.1.21 Tapes

2.1.21.1 Plastic Tape

UL 510.

2.1.21.2 Rubber Tape

UL 510.

2.1.22 Transformers

2.1.22.1 Conventional Dry-Type

IEEE C57.12.01, ANSI C57.12.10, IEEE C57.12.80, IEEE C57.12.91, IEEE C57.94, IEEE C57.98, IEEE C57.105 and UL 1561 in addition to the specific standards referenced below.

a. Distribution: Ventilated, 1 to 500 kVA, single-phase, and 15 to 500 kVA, three-phase with high-voltage 601 to 34500 volts, low-voltage 120-600 volts: ANSI C57.12.50.

b. Specialty or General Applications: NEMA ST 20 and UL 506 unless otherwise shown or specified.

c. Instrument: ANSI C12.11 and IEEE C57.13 with current ratio or voltage ratings shown or specified.

2.1.23 Wiring Devices

NEMA WD 1 for general-purpose 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, Section 16670, LIGHTNING PROTECTION SYSTEM, and the following specifications.

3.1.1 Ground Bus

Ground bus shall be provided in the electrical equipment rooms as indicated. Non-current-carrying metal parts of transformer neutrals and other electrical equipment shall be effectively grounded by bonding to the 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

A green ground wire shall be furnished regardless of the type of conduit. 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

3.2.1 General Requirements

Unless otherwise indicated, wiring shall consist of insulated conductors installed in rigid aluminum or rigid zinc-coated steel conduit, rigid plastic conduit, electrical metallic and/or nonmetallic tubing, or intermediate metal conduit. Nonmetallic-sheathed cables or metallic-armored cables may be installed in areas permitted by NFPA 70.

3.2.2 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. Nonmetallic conduit and tubing may be used in damp, wet or corrosive locations when permitted by NFPA 70 and the conduit or tubing system is provided with appropriate boxes, covers, clamps, screws or other appropriate type of fittings. Electrical metallic tubing may be installed only within buildings. Electrical metallic tubing may be
installed in concrete and grout in dry locations. Electrical metallic tubing 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. Aluminum conduit may be used only where installed exposed in dry locations. Nonaluminum sleeves shall be used where aluminum conduit passes through concrete floors and firewalls. Penetrations of above grade floor slabs, time-rated partitions and fire walls shall be firestopped in accordance with Section 07270 FIRESTOPPING. 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. Raceways crossing structural expansion joints shall be provided with suitable expansion fittings or other suitable means to compensate for the building expansion and contraction and to provide for continuity of grounding. Wiring installed in [underfloor duct system] [underfloor raceway system] shall be suitable for installation in wet locations.

3.2.2.1 Below Slab-on-Grade or in the Ground

Electrical wiring below slab-on-grade shall be protected by a conduit system. Conduit passing vertically through slabs-on-grade shall be rigid steel or IMC. Rigid steel or IMC conduits installed below slab-on-grade or in the earth shall be field wrapped with 0.010 inch thick pipe-wrapping plastic tape applied with a 50 percent overlay, or shall have a factory-applied polyvinyl chloride, plastic resin, or epoxy coating system.

3.2.2.2 Installing in Slabs Including Slabs on Grade

Conduits shall be installed as close to the middle of concrete slabs as practicable without disturbing the reinforcement. Outside diameter shall not exceed 1/3 of the slab thickness and conduits shall be spaced not closer than 3 diameters on centers except at cabinet locations where the slab thickness shall be increased as approved by the Contracting Officer.

3.2.2.3 Exposed Raceways

Exposed raceways shall be installed parallel or perpendicular to walls, structural members, or intersections of vertical planes and ceilings. Raceways under raised floors and above accessible ceilings shall be considered as exposed installations in accordance with NFPA 70 definitions.

3.2.2.4 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. Care shall be taken to prevent the lodgment of plaster, dirt, or trash in raceways, boxes, fittings and equipment during the course of construction. Clogged raceways shall be entirely freed of obstructions or shall be replaced.

3.2.2.5 Supports

Metallic conduits and tubing shall be securely and rigidly fastened in place at intervals of not more than 10 feet and within 3 feet of boxes, cabinets, and fittings, with approved pipe straps, wall brackets, conduit clamps, conduit hangers, threaded C-clamps, or ceiling trapeze. C-clamps or beam clamps shall have strap or rod-type retainers. Rigid plastic conduits (if permitted as a wiring method) shall be supported as indicated above, except that they will be supported at intervals as indicated in NFPA 70. Loads and supports shall be coordinated with supporting structure to prevent damage or deformation to the structures, but no load shall be applied to joist bridging. Fastenings shall be by wood screws or screw-type nails to wood; by toggle bolts on hollow masonry units; by expansion bolts on concrete or brick; by machine screws, welded threaded studs, heat-treated or spring-steel-tension clamps on steel work. Nail-type nylon anchors or threaded studs driven in by a powder charge and provided with lock washers and nuts may be used in lieu of expansion bolts or machine screws. Raceways or pipe straps shall not be welded to steel structures. Holes cut to a depth of more than 1-1/2 inches in reinforced concrete beams or to a depth of more than 3/4 inch in concrete joists shall avoid cutting the main reinforcing bars. Holes not used shall be filled. In partitions of light steel construction, sheet-metal screws may be used. Conduit shall not be supported using wire or nylon ties. Raceways shall be installed as a complete system and be independently supported from the structure. Upper raceways shall not be the support of lower raceways. Supporting means will not be shared between electrical raceways and mechanical piping or ducts and shall not be fastened to hung ceiling supports. Conduits shall be fastened to all sheet-metal boxes and cabinets with two locknuts where required by the 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. A pull wire shall be inserted in each empty raceway in which wiring is to be installed by others 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 pound per square inch tensile strength. Not less than 10 inches of slack shall be left at each end of the pull wire. Additional support for horizontal runs is not required when EMT rests on steel stud cutouts.

3.2.2.6 Exposed Risers

Exposed risers in wire shafts of multistory buildings shall be supported by U-clamp hangers at each floor level, and at intervals not to exceed 10 feet.
Communications raceways indicated shall be installed in accordance with the previous requirements for conduit and tubing and with the additional requirements that no length of run shall exceed 50 feet for 1/2 inch and 3/4 inch sizes, and 100 feet for 1 inch or larger sizes, and shall not contain more than two 90-degree bends or the equivalent. Additional pull or junction boxes shall be installed to comply with these limitations whether or not indicated. Inside radii of bends in conduits of 1 inch size or larger shall be not less than ten times the nominal diameter.

3.2.3 Cable Systems

Cables shall be installed concealed behind ceiling or wall finish where practicable. Cables shall be threaded through holes bored on the approximate centerline of wood members; notching of surfaces will not be permitted. Sleeves shall be provided through bond beams of masonry-block walls for threading cables through hollow spaces. Exposed cables shall be installed parallel or at right angles to walls or structural members. In rooms or areas not provided with ceiling or wall finish, cables and outlets shall be installed so that a room finish may be applied in the future without disturbing the cables or resetting the boxes. Exposed nonmetallic-sheathed cables less than 4 feet above floors shall be protected from mechanical injury by installation in conduit or tubing.

3.2.4 Mineral-Insulated Cable Systems

Mineral-insulated, metal-sheathed cable system, Type MI may be used in lieu of exposed conduit and wiring. Conductor sizes shall be not less than those indicated for the conduit installation. Cables shall be fastened within 12 inches of each turn or offset and at intervals of not more than 6 feet. Cable terminations shall be made in accordance with manufacturer's recommendations immediately upon stripping of sheath. Single-conductor cables of a circuit having capacities of more than 50 amperes shall terminate in a single box or cabinet opening. Individual conductors in all outlets and cabinets shall be color coded.

3.2.5 Cable Trays

Cable trays shall be supported in accordance with the recommendations of the manufacturer but at no more than 6 foot intervals. Contact surfaces of aluminum connections shall be coated with an antioxidant compound prior to assembly. Adjacent cable tray sections shall be bonded together by connector plates of an identical type as the cable tray sections. The Contractor shall submit the manufacturer's certification that the cable tray system meets all requirements of Article 318 of NFPA 70. The cable tray shall be installed and grounded in accordance with the provisions of Article 318 of NFPA 70. Data submitted by the Contractor shall demonstrate that the completed cable tray systems will comply with the specified requirements. Cable trays shall terminate 10 inches from both sides of smoke and fire partitions. Conductors run through smoke and fire partitions shall be installed in 4 inch rigid steel conduits with grounding bushings, extending 12 inches beyond each side of the partitions. The installation shall be sealed to preserve the smoke and fire rating of the partitions. Penetrations shall be firestopped in accordance with Section
3.2.6 Cables and Conductors

Aluminum conductors shall have amperacity of not less than the copper conductors. Wire connectors of insulating material or solderless pressure connectors properly taped shall be utilized for all splices. Pressure connectors for aluminum conductors shall have tinned aluminum bodies. Aluminum contact surfaces of conductors and connectors shall be cleaned and covered with antioxidant compound prior to making of connections.

3.2.6.1 Sizes

All sizes are based on copper conductors, unless otherwise 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 and of 277 volts more than 230 feet long, from panel to load center, shall be no smaller than No. 10 AWG. Class 1 remote control and signal circuit conductors shall be not less than No. 14 AWG. Class 2 remote control and signal circuit conductors shall be not less than No. 16 AWG.

The conductor sizes are based on the use of TW insulation for conductors smaller than No. 1/0 AWG and THW insulation for conductors No. 1/0 and larger, except where otherwise indicated.

Higher temperature rated conductors will be permitted to be used, if the UL tested temperature ratings for which the equipment in the circuit is marked are not exceeded.

Conductor sizes for nonlinear loads shall be based on the use of minimum 75 degrees C insulated conductors for branch circuits and feeders.

3.2.6.2 Power Conductor Identification

Phase conductors shall be identified by color coding. The color of the insulation on phases A, B, and C respectively (for three phase) or phases A and B respectively (for single phase) of different voltage systems shall be as follows:

- 120/208 volt, 3-phase: Black, red, and blue.
- 277/480 volt, 3-phase: Brown, orange, and yellow.
- 120/240 volt, single/phase: Black and red.

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 3 inches of length near the end, or other method as submitted by the Contractor and approved by the Contracting Officer. Conductor identification shall be provided within each enclosure where a tap, splice, or termination is made. Phase identification by a
particular color shall be maintained continuously for the length of a circuit, including junctions.

3.2.6.3 Control Conductor Identification

Control circuit conductor identification shall be made by color-coded insulated conductors, plastic-coated self-sticking printed markers, permanently attached stamped metal foil markers, or equivalent means as approved. 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 wherever required for pulling of wires, making connections, and mounting of devices or fixtures. Boxes for metallic raceways, 4 inch 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, or when located in hazardous areas. Large size boxes shall be NEMA 4 or as shown. Boxes in other locations shall be sheet steel except that aluminum boxes may be used with aluminum conduit, and nonmetallic boxes may be used with nonmetallic conduit and tubing or nonmetallic sheathed cable system, when permitted by NFPA 70. In partitions of light steel construction bar hangers with 1 inch long studs, mounted between metal wall studs or metal stud "C" brackets snapped on and tab-locked to metal wall studs, shall be used to secure boxes to the building structure. When "C" brackets are used, additional box support shall be provided on the side of the box opposite the brackets. The edges of boxes for electrical devices shall be flush with the finished surfaces in gypsum and plasterboard installations.

Boxes for mounting lighting fixtures shall be not less than 4 inches square except smaller boxes may be installed as required by fixture configuration, as approved. Boxes installed for concealed wiring shall be provided with suitable extension rings or plaster covers, as required. The bottom of boxes installed in masonry-block walls for concealed wiring shall be flush with the top of a block to minimize cutting of blocks, and boxes shall be located horizontally to avoid cutting webs of block. Indicated elevations are approximate, except where minimum mounting heights for hazardous areas are required by NFPA 70. Unless otherwise indicated, boxes for wall switches shall be mounted 48 inches above finished floors. Switch and outlet boxes on opposite sides of fire rated walls shall be separated by a minimum horizontal distance of 24 inches. Cast-metal boxes installed in wet locations and boxes installed flush with the outside of exterior surfaces shall be gasketed. 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. 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 screws or welded studs on steel work. Threaded studs driven in by powder charge and provided with lockwashers and nuts, or nail-type nylon anchors may be used in lieu of expansion shields, or machine screws. In open overhead spaces, cast-metal boxes threaded to raceways need not be separately supported except where used for fixture support; cast-metal boxes having threadless
connectors and sheet metal boxes shall be supported directly from the building structure or by bar hangers. Hangers shall not be fastened to or supported from joist bridging. Cast-metal boxes with 3/32 inch wall thickness are acceptable. 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. 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.

3.3.1 Boxes for Use with Raceway Systems

Boxes for use with raceway systems shall be not less than 1-1/2 inches deep except where shallower boxes required by structural conditions are approved. Sheetmetal boxes for other than lighting fixtures shall be not less than 4 inches square except that 4 by 2 inch boxes may be used where only one raceway enters the outlet. Contractor shall size the telephone outlet boxes as required by the number, size and type of outlets specified and as required by the outlets furnished by the Contractor.

3.3.2 Boxes for Use with Cable Systems

Boxes for use with cable systems shall be not less than 3 by 2 inch sectional boxes, 2 inches deep.

3.3.3 Pull Boxes

Pull boxes of not less than the minimum size required by NFPA 70 shall be constructed of aluminum or galvanized sheet steel, except where cast-metal boxes are required in locations specified above. Boxes shall be furnished with screw-fastened covers. 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.

3.3.4 Conduit Stub-Ups

Conduits stubbed up through concrete floors for connections to freestanding equipment shall be provided with a short elbow and an adjustable top or coupling threaded inside for plugs, set flush with the finished floor. Wiring shall be extended in rigid threaded conduit to equipment, except that where required, flexible conduit may be used 6 inches above the floor. Screwdriver-operated threaded flush plugs shall be installed in conduits from which no equipment connections are made to suit the devices installed.

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 satin finish corrosion resistant steel or satin finish chromium plated brass. 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 Single and Duplex

Single and duplex receptacles shall be rated 20 amperes, 125 volts, two-pole, three-wire, grounding type with polarized parallel slots. Bodies shall be of brown or ivory 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

Weatherproof receptacles shown shall be mounted in a box with a gasketed, weatherproof, cast-metal cover plate and gasketed cap over each receptacle opening. The cap shall be provided with a spring-hinged flap.

3.5.3 Receptacles, 20-Ampere, 250-Volt

Receptacles, single, 20-ampere, 250-volt, shall be molded plastic, two-pole, three-wire or three-pole, four-wire, grounding type complete with appropriate mating cord-grip plug.

3.5.4 Special-Purpose or Heavy-Duty Receptacles

Special-purpose or heavy-duty receptacles shall be of the type and of ratings and number of poles indicated or required for the anticipated purpose. Contact surfaces may be either round or rectangular. One appropriate straight or angle-type plug shall be furnished with each receptacle. Locking of receptacles, indicated to be the locking type, shall be accomplished by the rotation of the plug.

3.6 WALL SWITCHES

Wall switches shall be of the totally enclosed tumbler type. The wall switch handle and switch plate color shall harmonize with the color of the respective wall. Wiring terminals shall be of the screw type or of the solderless pressure type having suitable conductor-release arrangement. Not more than one switch shall be installed in a single-gang position. Switches shall be rated 20-ampere 277-volt for use on alternating current.
only. Pilot lights indicated shall consist of yoke-mounted candelabra-base sockets rated at 75 watts, 125 volts, and fitted with glass or plastic jewels. A clear 6-watt lamp shall be furnished and installed in each pilot switch. Jewels for use with switches controlling motors shall be green, and jewels for other purposes shall be red. Dimming switches shall be solid-state flush mounted, sized for the loads.

3.7 SERVICE EQUIPMENT

Service-disconnecting means shall be of the enclosed molded-case circuit breaker type as indicated with external handle for manual operation. 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, and not in sight of the motor and the driven machinery location, 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 or aluminum.

3.8.1 Loadcenters

Loadcenters shall be circuit breaker equipped.

3.8.2 Panelboards

Panelboards shall be circuit breaker switch equipped as indicated on the drawings.

3.9 UNDERGROUND-SERVICE CONDUITS

Empty conduits for underground electric-service cable shall be installed as indicated. Except where otherwise indicated, conduits shall terminate approximately 5 feet beyond the building wall and 2 feet below finished grade, with the outside ends bushed and plugged or capped.

3.10 MOTORS

Motors shall be as specified in paragraph Motors, ac, Fractional and Integral Horsepower, whether or not motors are separately provided or included in equipment assemblies specified in other sections of these specifications. Each motor shall conform to the hp and voltage ratings indicated, and shall have a service factor and other characteristics that are essential to the proper application and performance of the motors under conditions shown or specified. Three-phase motors for use on 3-phase 208-volt systems shall have a nameplate rating of 200 volts. Unless otherwise specified, all motors shall have open frames, and continuous-duty classification based on a 40 degree C ambient temperature reference. Polyphase motors shall be squirrel-cage type, having normal-starting-torque and low-starting-current characteristics, unless other characteristics are
specified in other sections of these specifications or shown on contract drawings. The Contractor shall be responsible for selecting the actual horsepower ratings and other motor requirements necessary for the applications indicated. When electrically driven equipment furnished under other sections of these specifications materially differs from the design, the Contractor shall make the necessary adjustments to the wiring, disconnect devices and branch-circuit protection to accommodate the equipment actually installed.

3.11 MOTOR CONTROL

Each motor or group of motors requiring a single control shall be provided under other sections of these specifications with a suitable controller and devices that will perform the functions as specified for the respective motors. Each motor of 1/8 hp or larger shall be provided with thermal-overload protection. Polyphase motors shall have overload protection in each ungrounded conductor. The overload-protection device shall be provided either integral with the motor or controller, or shall be mounted in a separate enclosure. Unless otherwise specified, the protective device shall be of the manually reset type. Single or double pole tumbler switches specifically designed for alternating-current operation only may be used as manual controllers for single-phase motors having a current rating not in excess of 80 percent of the switch rating. Automatic control devices such as thermostats, float or pressure switches may control the starting and stopping of motors directly, provided the devices used are designed for that purpose and have an adequate horsepower rating. When the automatic-control device does not have such a rating, a magnetic starter shall be used, with the automatic-control device actuating the pilot-control circuit. When combination manual and automatic control is specified and the automatic-control device operates the motor directly, a double-throw, three-position tumbler or rotary switch shall be provided for the manual control; when the automatic-control device actuates the pilot control circuit of a magnetic starter, the latter shall be provided with a three-position selector switch marked MANUAL-OFF-AUTOMATIC.

Connections to the selector switch shall be such that only the normal automatic regulatory control devices will be bypassed when the switch is in the Manual position; all safety control devices, such as low- or high-pressure cutouts, high-temperature cutouts, and motor-overload protective devices, shall be connected in the motor-control circuit in both the Manual and the Automatic positions of the selector switch. Control circuit connections to any MANUAL-OFF-AUTOMATIC switch or to more than one automatic regulatory control device shall be made in accordance with wiring diagram approved by the Contracting Officer unless such diagram is included on the drawings. All controls shall be 120 volts or less unless otherwise indicated.

3.12 MOTOR-DISCONNECT MEANS

Each motor shall be provided with a disconnecting means when required by NFPA 70 even though not indicated. For single-phase motors, a single or double pole toggle switch, rated only for alternating current, will be acceptable for capacities less than 30 amperes, provided the ampere rating of the switch is at least 125 percent of the motor rating. Switches shall disconnect all ungrounded conductors.
3.13 TRANSFORMERS

Only single- and three-phase transformers having two windings per phase will be approved. Full-capacity standard NEMA taps shall be provided in the primary windings of transformers having a primary rating in excess of 600 volts. Three-phase transformers shall be connected only in a delta-wye or wye-delta configuration, as indicated except isolation transformers having a one-to-one turns ratio. "T" connections may be used for transformers rated at 15 kVA or below. The insulation on transformer windings may be the manufacturer's standard for transformers rated for operation in a 40-degree Celsius ambient temperature unless a higher-temperature insulation is shown, specified or required by the application indicated. Single kVA ratings shown are based on self-cooled operation. The basic impulse level (BIL) of individual transformers shall be as stated in the following paragraphs. The conventional dry-type transformer shown located within 5 feet of the exterior wall shall be provided in a weatherproof enclosure. Transformers to be located within the building may be provided in the manufacturer's standard, ventilated indoor enclosure designed for use in a 40-degree Celsius ambient temperature, unless otherwise specified or shown. The average sound level in decibels (dB) of transformers shall not exceed the following dB level for the applicable kVA rating range listed:

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3.13.1 Conventional Dry-Type Transformers

Transformers having the primary or higher-voltage winding rated at 600 volts or less and a secondary or lower-voltage winding rated at 240 volts or less may be manufacturer's standard ventilated or enclosed, self-cooled type of transformer unless otherwise shown, specified or required for proper and safe application. Transformers shown with primary ratings in excess of 600 volts shall have the NEMA 220 degree C insulation and shall be rated for a temperature rise of 80 degrees C above ambient. Similarly, transformers having primary windings rated at 480 volts or less and a kVA rating of 150 or larger shall have Class H insulation and be suitable for an 80 degree C temperature rise above ambient. The percent voltage impedance for the transformer shown to supply all facility power demands shall be 5.75 as required to limit the available fault current to less than the ampere-interrupting-capacity of the equipment supplied through the power supply transformer shown. These distribution transformers shall have a basic impulse level (BIL) rating not less than the ANSI standard BIL rating for the mineral-oil insulated type of transformer having the same voltage classification or rating as the dry-type of transformer proposed for installation.
3.14 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.

3.14.1 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.

3.14.1.1 Incandescent

Incandescent lamps shall be for 125-volt operation unless otherwise indicated.

3.14.1.2 Fluorescent

Fluorescent lamps for magnetic ballasts shall have standard cool-white color characteristics and shall be of a type that will not require starter switches. Lamps shall be of the rapid-start type unless otherwise shown or approved. Fluorescent lamps for electronic ballasts shall be as indicated.

3.14.1.3 High-Intensity-Discharge

High-intensity-discharge lamps shall be the high-pressure sodium type unless otherwise indicated, shown, or approved.

3.14.2 Fixtures

Fixtures shall be as shown and shall conform to the following specifications and shall be as detailed on the drawings and on Standard Drawing No. 40-06-04, Sheet Nos. 2, 20, 36, 38, 57, 67, 71 and 74, which accompany and form a part of this specification for the types indicated. Illustrations shown on these sheets are indicative of the general type desired and are not intended to restrict selection to fixtures of any particular manufacturer. Fixtures of similar designs and equivalent energy efficiency, light distribution and brightness characteristics, and of equal finish and quality will be acceptable if approved. In suspended acoustical ceilings with fluorescent fixtures, the fluorescent emergency light fixtures shall be furnished with self-contained battery packs.

3.14.2.1 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.

3.14.2.2 Suspended Fixtures

Suspended fixtures shall be provided with swivel hangers in order to ensure a plumb installation. Pendants, rods, or chains 4 feet or longer excluding fixture, shall be braced to limit swinging. Bracing shall be 3
directional, 120 degrees apart. Single unit suspended fluorescent fixtures shall have twin-stem hangers. Multiple unit or continuous-row fluorescent units shall have a tubing or stem for wiring at one point, and a tubing or rod suspension provided for each length of chassis including one at each end. Maximum distance between adjacent tubing or stems shall be 10 feet. Rods shall be of not less than 3/16 inch diameter. Flexible raceway shall be installed to each fixture from an overhead junction box. Fixture to fixture wiring installation is allowed only when fixtures are installed end to end in a continuous run.

3.14.2.3 Ceiling Fixtures

Ceiling fixtures shall be coordinated with and suitable for installation in, on, or from the suspended ceiling provided under other sections of these specifications. Installation and support of fixtures shall be in accordance with the NFPA 70 and manufacturer's recommendations. Where seismic requirements are specified herein, fixtures shall be supported as shown or specified. Recessed fixtures shall have adjustable fittings to permit alignment with ceiling panels. Recessed fixtures installed in fire-resistive type of suspended ceiling construction shall have the same fire rating as the ceiling or shall be provided with fireproofing boxes having materials of the same fire rating as the ceiling panels, in conformance with UL-03. Surface-mounted fixtures shall be suitable for fastening to the structural support for ceiling panels.

3.14.2.4 Sockets

Sockets of industrial, strip, and other open type fluorescent fixtures shall be of the type requiring a forced movement along the longitudinal axis of the lamp for insertion and removal of the lamp.

3.14.3 Emergency Light Sets

Emergency light sets shall conform to UL 924 with the number of heads as indicated. Sets shall be permanently connected to the wiring system by conductors installed in short lengths of flexible conduit.

3.15 EQUIPMENT CONNECTIONS

All 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.

3.15.1 Motors and Motor Control

Control equipment furnished under this section of the specifications, and shown on the drawings, shall be connected under this section of the specifications unless shown or specified otherwise. Except as otherwise specifically noted, automatic-control wiring, signaling, and protective
devices are not included in this section of the specifications, but shall be furnished and installed under other sections of the specifications. Control wiring not shown on the drawings shall be furnished under the other sections of the specifications.

3.15.2 Installation of Government-Furnished Equipment

Wiring shall be extended to the equipment, and proper connections made thereto.

3.15.3 Food Service Equipment Provided Under Other Sections

Wiring shall be extended to the equipment and proper connections made thereto.

3.16 COORDINATED POWER SYSTEM PROTECTION

A fault-impedance diagram, a load flow analysis or study, a short-circuit analysis or study, and a power system coordination study shall be prepared to demonstrate that protective system after devices have been properly calibrated, adjusted, set and tested. These data, including complete descriptive and technical data of all protective devices, diagrams, and studies as required to ensure complete coordination, shall be prepared in conformance with industry practices, standards, or with other technical data approved by the Contracting Officer, and shall be submitted for approval of the Contracting Officer in accordance with submittal SD-04, Drawings.

3.16.1 Determination of Facts

The Contractor shall coordinate with the commercial power company for short circuit current availability at the site.

3.16.2 Fault-Impedance Diagram

The diagram shall be prepared to reflect the system impedance of power sources available to supply the building or facility, and the impedance of the new power system components for the facility.

3.16.3 Fault Locations and Short-Circuit Current Availability (SCCA)

The fault-impedance diagram shall, as a minimum, show fault locations for each voltage transformation and at each power distribution bus. The SCCA available at each fault location shall be shown in tabular form on the diagram for a bolted line-to-line fault and a line-to-ground fault.

3.16.4 Protective Devices

The time-current characteristics, features, and nameplate data for each existing protective device, including fuses, circuit breakers, and protective relays shall be determined and documented when necessary to ensure coordination between existing and new protective devices. New protective devices proposed, including devices with fixed or adjustable time-current characteristics and features, shall demonstrate proper coordination with existing devices and new and related devices required to:
a. Minimize the extent of power outages by the operation of the primary protective device nearest the load-side fault location.

b. Provide back-up protection on the supply-side of the primary protective device if the primary protective device fails to operate.

c. To ensure a minimum of a 0.2-second delay between the operation of the primary and the back-up, or secondary, protective device unless otherwise approved to prevent nuisance tripping.

3.16.5 Power System Coordination Study

The study shall include all data related to existing and new protective devices proposed as such data relates to the nameplate data, time-current characteristics, and the fixed or adjustable features of the existing or new protective devices. These data shall include:

a. The time-current characteristic curves published by the manufacturer of the protective devices or equipment having adjustable time-current characteristics.

b. Data published by the manufacturer of circuit breakers or protective relays which contain installation, operation and maintenance instructions for calibration, adjustment, setting, and testing of the specific protective device.

c. Composite time-current characteristic curves for primary, secondary and other related devices, as required to ensure coordinated power system protection between existing and new protective devices or equipment.

3.16.6 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.

3.16.7 Telephone Backboards

Telephone backboards shall be installed at locations shown on the drawings. The backboards shall be 3/4 inch plywood having a two-coat insulating varnish finish and shall be sized as shown on the drawings.

3.17 PAINTING AND FINISHING

Field-applied paint on exposed surfaces shall be provided under Section 09900 PAINTING, GENERAL.

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 TESTS

After the interior-wiring-system installation is completed, and at such time as the Contracting Officer may direct, the Contractor shall conduct an operating test for approval. The equipment shall be demonstrated to operate in accordance with the requirements of this specification. Continuity test shall be conducted on the telephone wiring system. The test shall be performed in the presence of the Contracting Officer. The Contractor shall furnish all instruments and personnel required for the tests, and the Government will furnish the necessary electric power. No part of the electrical distribution system shall be energized prior to the resistance testing of that system's ground rods and submission of test results to the Contracting Officer. Test reports shall indicate the location of the rod and the resistance and the soil conditions at the time the test was performed.

3.20 ONE-LINE DIAGRAM

A one-line diagram with main transformer, building disconnect means, and feeder breakers/switches to building panels located at the building disconnect shall be provided. Diagram shall be mounted under glass or shall be plastic laminated. The breaker/switch identification on the diagram shall match nameplate on the installed equipment.

-- End of Section --
Fixtures shall conform to UL 1571. Reflector shall have a reflection factor of not less than 0.83, and shall be the porcelain enameled steel type unless a fiberglass reinforced polyester or polished aluminum reflector is the manufacturer's standard commercial product. If a porcelain enameled steel type is proposed, the minimum steel thickness after fabrication shall be not less than the thickness recorded in the tabulation below. Other standard commercial product types shall have equivalent strength and rigidity as provided by porcelain enameled steel type listed below for the respective type and wattage size. The wire guard shall be of welded, rust-resistant-steel wire provided with a bright tin finish after welding. Pendant mounted fixtures shall be provided with self-aligning hanger and canopy.

<table>
<thead>
<tr>
<th>Type</th>
<th>Fixture Rated for Lamp Wattages</th>
<th>Reflector Thickness (inch)</th>
</tr>
</thead>
<tbody>
<tr>
<td>103</td>
<td>100, 150, 200, 300, 500, 1,000</td>
<td>0.019, 0.024</td>
</tr>
<tr>
<td>104</td>
<td>100, 150, 200, 300, 500, 1,000</td>
<td>0.019, 0.024</td>
</tr>
<tr>
<td>105</td>
<td>100, 150, 200, 300, 500, 1,000</td>
<td>0.019, 0.024</td>
</tr>
</tbody>
</table>

Fixture types indicated on this sheet shall also conform to requirements specified and indicated in the contract documents.
Type 206
Static Troffer

Type 207
Air Handling Troffer

Recessed Fluorescent Fixture, 2-foot by 4-foot

<table>
<thead>
<tr>
<th>First Suffix</th>
<th>Second Suffix</th>
<th>Third Suffix</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td></td>
<td></td>
<td>Two lamps</td>
</tr>
<tr>
<td>B</td>
<td></td>
<td></td>
<td>Three lamps</td>
</tr>
<tr>
<td>C</td>
<td>1</td>
<td></td>
<td>Four lamps</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td></td>
<td>Prismatic acrylic lens</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>A</td>
<td>1/2- by 1/2- by 1/2-inch cube louver</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1/2- by 1/2- by 1/2-inch polystyrene cube louver</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Type 200 emergency unit</td>
</tr>
</tbody>
</table>

Fixture shall conform to UL 1570. Housing shall be complete with integral side trim flanges and shall be suitable for mounting in continuous rows. Housing and trim flanges shall be cold-rolled steel. The lens or louver shall be installed in a manner that will prevent it from coming loose due to vibration. The ballasts and wiring shall be enclosed in a wireway that is continuous throughout the length of the fixture and which forms a wireway for circuits through the fixture. All metal parts shall receive a rust inhibitive coating before application of the finish coat. The finish coat shall be baked enamel. Lenses and acrylic cube louvers shall be 100 percent virgin acrylic plastic. The lens or louver shall be four feet in length. Acrylic lens shall be flat, 0.125 inch nominal thickness, low brightness, with smooth top surface and a lower surface having a regular array of prismatic elements. Two-lamp ballasts shall be used for individually mounted two-lamp fixtures. Standard ballast(s) shall be the Class P, high power factor type which has been approved for the application by the Certified Ballast Manufacturers. Fixture shall be prewired.

Fixture types indicated on this sheet shall also conform to requirements specified and indicated in the contract documents.
TYPE 230
Suspension Mounted, Industrial,
Open Type Fluorescent Fixture, 4-Foot

<table>
<thead>
<tr>
<th>First-Suffix</th>
<th>Second-Suffix</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td></td>
<td>Two lamps</td>
</tr>
<tr>
<td>B</td>
<td>1</td>
<td>Three lamps</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>8 to 15 percent upright</td>
</tr>
<tr>
<td></td>
<td></td>
<td>18 to 25 percent upright</td>
</tr>
</tbody>
</table>

Fixture shall conform to UL 1570. Standard ballast(s) shall be the Class P, high power factor type approved for the application by the Certified Ballast Manufacturers. Channel housing, end fittings, and reflector shall be constructed with die-formed, cold-rolled steel. Reflector finish shall be porcelain enamel, baked white enamel or aluminum oxide. Sockets shall be of the type requiring a forced movement along the longitudinal axis of the lamp for insertion and removal of the lamp. Fixture shall be prewired. Fluorescent tubes shall be protected by a virgin acrylic protective sleeve and clear plastic vented end caps.

Fixture type indicated on this sheet shall also conform to requirements specified and indicated in the contract documents.

FEBRUARY 1991  STD. DET. NO. 40-06-04  SHEET 36
TYPE 232
4-Foot Fixture Length

TYPE 233
8-Foot Fixture Length

Enclosed and Gasketed, Vapor-Tight Fluorescent Fixture
For Surface or Pendant Mounting

Fixture shall conform to UL 1570 and shall be vapor-tight and suitable for use in wet locations. Fixture shall have one-piece housing of molded high-impact plastic or reinforced fiberglass. Housing body shall have an internal, die-formed, cold-rolled steel channel with cover to provide fixture rigidity and to contain electric components. The metal channel and cover shall receive a rust inhibitive coating before application of the finish coat, which shall consist of baked white enamel or porcelain enamel. The lens shall be one piece, of high-impact-resistant acrylic, and shall have smooth exterior surface and stippled or pebbled interior surface. The lens shall be secured to the housing with captive molded plastic or stainless steel spring latches. A continuous gasket shall be provided to form a vapor seal between the lens and the fixture body. All openings in the housing for mounting, conduit, etc., shall be capable of forming a vapor-tight seal. Ballast(s) shall be cold weather type for starting temperatures down to minus 20 degrees F. Standard ballast(s) shall be the Class P, high power factor type approved for the application by the Certified Ballast Manufacturers. Fixture shall be prewired, and provided with lamps that are properly mated to the ballast operating characteristics.

Fixture types indicated on this sheet shall also conform to requirements specified and indicated in the contract documents.

FEBRUARY 1991       STD. DET. NO. 40-06-04       SHEET 38
TYPE 503
High Intensity Discharge Fixture for Exterior Wall Mounting, High Output

<table>
<thead>
<tr>
<th>Suffix</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Rated for:</td>
</tr>
<tr>
<td>A</td>
<td>250 watt mercury vapor lamp</td>
</tr>
<tr>
<td>B</td>
<td>400 watt mercury vapor lamp</td>
</tr>
<tr>
<td>C</td>
<td>250 watt high pressure sodium lamp</td>
</tr>
<tr>
<td>D</td>
<td>400 watt high pressure sodium lamp</td>
</tr>
</tbody>
</table>

Fixture shall conform to UL 1572 and shall be rated for use in wet locations. The fixture housing, door assembly, and backplate shall be die-cast aluminum. The door assembly shall have integral cast aluminum hinges. The door assembly shall be held securely to the fixture housing with a stainless steel safety strap when the door is in the open position. The door assembly shall be held firmly against a sealing gasket between the fixture door and housing by stainless steel latches or with stainless steel or brass captive screws when the fixture door is closed. The refractor shall be prismatic borosilicate glass or polycarbonate resin. The refractor shall be gasketed and securely held in the door frame, but shall be easily removed for replacement using a common tool. The reflector shall be aluminum with the manufacturer's standard commercial product finish suitable for light source provided. The fixture shall have the manufacturers standard protective coating. Cast knockouts shall be provided in the backplate for recessed outlet box mounting. A 3/4-inch threaded and plugged conduit entry shall be provided on each side. Ballast shall be of the constant wattage autotransformer type for mercury vapor lamps and the regulating type for high pressure sodium lamps. The ballast shall be capable of starting and operating the lamp at ambient temperatures ranging from minus 20 degrees F to 105 degrees F. The fixture shall be prewired, and shall have a field adjustable, mogul base glazed porcelain lampholder.

Fixture type indicated on this sheet shall also conform to requirements specified and indicated in the contract documents

FEBRUARY 1991  STD. DET. NO. 40-06-04  SHEET 57
Incandescent fixtures shall conform to UL 924, UL 1571, and NFPA 101. Fluorescent fixture shall conform to UL 924, UL 1570, and NFPA 101. Unit shall conform to UL 924, and shall meet or exceed the NFPA 70 time and voltage requirements. The unit shall be dual-rated for use on either 120-Volt or 277-Volt alternating current power supplies. Following sustained loss of the normal power supply, the unit shall be capable of automatically and instantaneously illuminating the two 6-Volt lighting fixtures for a period of not less than 90 minutes at a battery voltage in excess of 87.5 percent of the nominal voltage rating. The battery shall be the nickel-cadmium, pocket plate type designed to be maintenance free during the expected battery life, and shall be warranted for not less than 3 years from the date of the purchase of the unit, and shall be field replaceable without requiring removal of other components. The battery charger shall be the solid-state type and shall provide a continuous, variable, current limited, filtered and regulated charge rate. The battery and charger shall be contained in a steel cabinet not less than 18 gauge thickness with an enamel finish, unless otherwise approved, which shall be equipped with a push-to-test switch and a meter to indicate battery voltage when the switch is closed. Mounting brackets or shelf shall be provided, complete with all mounting hardware, all with a finish to match the finish or color of the cabinet. Fixture shall be prewired, with wiring concealed in the illuminated portion of the fixture housing.

<table>
<thead>
<tr>
<th>First Suffix</th>
<th>Second Suffix</th>
<th>Third Suffix</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td></td>
<td></td>
<td>Single face</td>
</tr>
<tr>
<td>B</td>
<td></td>
<td></td>
<td>Double face</td>
</tr>
<tr>
<td>1</td>
<td></td>
<td></td>
<td>Incandescent</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td>Fluorescent</td>
</tr>
<tr>
<td>A</td>
<td></td>
<td></td>
<td>End mounted</td>
</tr>
<tr>
<td>B</td>
<td></td>
<td></td>
<td>Top mounted</td>
</tr>
<tr>
<td>C</td>
<td></td>
<td></td>
<td>Back mounted</td>
</tr>
<tr>
<td>D</td>
<td></td>
<td></td>
<td>Stem mounted</td>
</tr>
</tbody>
</table>

Fixture type indicated on this sheet shall also conform to requirements specified and indicated in the contract documents.

FEBRUARY 1991

STD. DET. NO. 40-06-04

SHEET 67
Four-Foot Industrial Lighting Fixture for use in Class I, Div. 1 and 2, Groups C and D; Class II, Div. 1 and 2, Groups E, F, and G, and Class III Locations.

<table>
<thead>
<tr>
<th>First Suffix</th>
<th>Description</th>
<th>Second Suffix</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Two Lamps</td>
<td>1</td>
<td>Rated for rapid start 40 watt, 430 mA lamps</td>
</tr>
<tr>
<td>B</td>
<td>Four Lamps</td>
<td>2</td>
<td>Rated for 60 watt, 800 mA lamps</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
<td>Rated for 110 watt, 1500 mA lamps</td>
</tr>
</tbody>
</table>

Fixture shall conform to UL 595 and 844. Fixture shall be suitable for locations where hazardous fumes, gases, or dust are present, and for wet locations if specified in other contract documents. Fixture, excluding reflectors, shall be constructed of copper-free aluminum and shall be provided with lamps, tempered, heat and impact resistant lamp tubes. Reflectors shall be heavy gauge extruded aluminum which shall have a high gloss reflective finish. Fixture shall be capable of being relamped from either end and shall be provided with lamp guides at each end for ease of relamping. Lamp access covers shall be interchangeable, screw type, with neoprene, "0-ring" seals. Sockets on both ends shall be spring loaded for maximum shock and vibration protection, and shall be the T-12 medium Bi-pin type for the 40 watt lamps and the T-12 recessed type for the 60 and 110 watt lamps unless otherwise approved. Ballast shall be Class P thermally protected. Replacement of ballast shall be feasible with fixture in place. Fixture shall be factory sealed and shall be suitable for vertical or horizontal mounting with 360° rotation permissible. Fixture shall have 90° and 45° mounting provisions as standard.

Fixture type indicated on this sheet shall also conform to requirements specified and indicated in the contract documents.
**Type HA**

**CORPS OF ENGINEERS**

**DEPARTMENT OF THE ARMY**

**TYPE 714**  
Without Reflector

**TYPE 715**  
With Standard Dome Reflector

**TYPE 716**  
With 30 Degree Angle Dome Reflector

High Intensity Discharge, Mogul Base, Industrial Lighting Fixture  
For Use In NEC Class I, Division 2, Groups C, D and Class II,  
Divisions 1 and 2, Groups E, F, and G and Class III Locations

<table>
<thead>
<tr>
<th>First Suffix</th>
<th>Second Suffix</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td></td>
<td>175 watt metal halide lamp</td>
</tr>
<tr>
<td>B</td>
<td></td>
<td>250 watt metal halide lamp</td>
</tr>
<tr>
<td>C</td>
<td></td>
<td>50 watt high pressure sodium</td>
</tr>
<tr>
<td>D</td>
<td></td>
<td>70 watt high pressure sodium</td>
</tr>
<tr>
<td>E</td>
<td></td>
<td>100 watt high pressure sodium</td>
</tr>
<tr>
<td>F</td>
<td></td>
<td>150 watt high pressure sodium</td>
</tr>
<tr>
<td>G</td>
<td>1</td>
<td>250 watt high pressure sodium</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Pendant mounted</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Ceiling mounted</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>Bracket mounted</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Stanchion mounted</td>
</tr>
</tbody>
</table>

Fixture shall conform to UL 844 and UL 1572. The fixture shall be integrally ballasted. The housing and guard shall be cast aluminum with the manufacturer's standard commercial product protective finish. The globe shall be heat and impact resistant glass and shall be fluted, ribbed or patterned. The finished reflector shall be the manufacturer's standard commercial product. Lampholder shall be the mogul base glazed porcelain type. Fixture shall be provided with the type mounting specified or indicated. Ballast shall be of the high power factor type. The fixture ballast shall be of the lead-peak regulating type for metal halide lamps, and regulating type for high pressure sodium lamps. Ballast shall be capable of starting and operating the lamp at ambient temperatures ranging from minus 20°F. to 105°F. Fixture shall be prewired.

Fixture types indicated on this sheet shall also conform to requirements specified and indicated in the contract documents.

FEBRUARY 1991      STD. DET. NO. 40-06-04      SHEET 74
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 C135.30 (1988) Zinc-Coated Ferrous Ground Rods for Overhead or Underground Line Construction

FEDERAL SPECIFICATION (FS)

FS W-S-610 (Rev E) Splice Connectors

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (1990) National Electrical Code


UNDERWRITERS LABORATORIES (UL)


UL 96 (1985; Rev thru Dec 1988) Lightning Protection Components

UL 96A (1982; Rev thru Jul 1990) Installation Requirements for Lightning Protection Systems

UL 467 (1984; Rev thru Nov 1986) Grounding and Bonding Equipment

1.2  GENERAL REQUIREMENTS

1.2.1  Verification of Dimensions

The Contractor shall become familiar with all details of the work, verify all dimensions in the field, and shall advise the Contracting Officer of any discrepancy before performing the work. No departures shall be made without the prior approval of the Contracting Officer.

1.2.2  System Requirements

The system furnished under this specification shall consist of the standard products of a manufacturer regularly engaged in the production of lightning
TARGET LAUNCH FACILITIES, PHASE 1, FT WINGATE, NM

protection systems and shall be the manufacturer's latest UL approved design. The lightning protection system shall conform to NFPA 70 and NFPA 780, UL 96 and UL 96A, except where requirements in excess thereof are specified herein.

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 DESCRIPTIONS:

SD-04 Drawings

Lightning Protection System; GA.

Detail drawings consisting of a complete list of material, including manufacturer's descriptive and technical literature, catalog cuts, drawings, and installation instructions. Detail drawings shall demonstrate that the system has been coordinated and will function as a unit. Drawings shall show proposed layout and mounting and relationship to other parts of the work.

SD-13 Certificates

Materials and Equipment; GA.

Where material or equipment is specified to comply with requirements of UL, proof of such compliance. The label of or listing in UL-03 will be acceptable evidence. In lieu of the label or listing, a written certificate from an approved nationally recognized testing organization equipped to perform such services, stating that the items have been tested and conform to the requirements and testing methods of Underwriters Laboratories may be submitted. A letter of findings shall be submitted certifying UL inspection of lightning protection systems provided on the following facilities: Missile Assembly Building, Launch Pad, and Launch Operations Trailer Shelter.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 General Requirements

No combination of materials shall be used that form an electrolytic couple of such nature that corrosion is accelerated in the presence of moisture unless moisture is permanently excluded from the junction of such metals. Where unusual conditions exist which would cause corrosion of conductors, conductors with protective coatings or oversize conductors shall be used. Where a mechanical hazard is involved, the conductor size shall be increased to compensate for the hazard or the conductors shall be protected by covering them with molding or tubing made of wood or nonmagnetic material. When metallic conduit or tubing is used, the conductor shall be electrically connected at the upper and lower ends.
2.1.2 Main and Secondary Conductors

Conductors shall be in accordance with NFPA 780 and UL 96 for Class I, Class II, or Class II modified materials as applicable.

2.1.2.1 Copper

Counterpoise shall be copper conductors not smaller than No. 1/0 AWG.

2.1.2.2 Aluminum

Aluminum shall not contact the earth nor shall it be used in any other manner that will contribute to rapid deterioration of the metal. Appropriate precautions shall be observed at connections with dissimilar metals. Aluminum conductors for bonding and interconnecting metallic bodies to the main cable shall be at least equivalent to strength and cross-sectional area of a No. 4 AWG aluminum wire. If perforated strips are used, the strips shall be as much wider than solid strips, as the diameter of the perforations. Aluminum strip for connecting exposed water pipes shall be not less than No. 12 AWG in thickness and at least 1-1/2 inches wide.

2.1.3 Air Terminals

Terminals shall be in accordance with UL 96 and NFPA 780. The tip of air terminals on buildings used for manufacturing, processing, handling, or storing explosives, ammunition, or explosive ingredients shall be a minimum of 2 feet above the ridge parapet, ventilator or perimeter. Air terminals more than 24 inches in length shall be supported by a suitable brace, with guides, not less than one-half the height of the terminal.

2.1.4 Ground Rods

Rods made of copper-clad steel shall conform to UL 467 and galvanized ferrous rods shall conform to ANSI C135.30. Ground rods shall be not less than 3/4 inch in diameter and 10 feet in length. Ground rods of copper-clad steel, stainless steel, galvanized ferrous, and solid copper shall not be mixed on the job.

2.1.5 Clamp-Type Connectors

Connectors for splicing conductors shall conform to UL 96, class as applicable, and FS W-S-610, Class 2, style and size as required for the installation.

2.1.6 Lightning Protection Components

Lightning protection components, such as bonding plates, air terminal supports, chimney bands, clips, and fasteners shall conform to UL 96, classes as applicable.
PART 3 EXECUTION

3.1 INTEGRAL SYSTEM: LAUNCH EQUIPMENT BUILDING AND LAUNCH OPERATIONS TRAILER SHELTER

3.1.1 General Requirements

The lightning protection system shall consist of air terminals, roof conductors, down conductors, ground connections, and grounds, electrically interconnected to form the shortest distance to ground. All conductors on the structures shall be exposed except where conductors are in protective sleeves exposed on the outside walls. Secondary conductors shall interconnect with grounded metallic parts within the building. Interconnections made within side-flash distances shall be at or above the level of the grounded metallic parts.

3.1.1.1 Air Terminals

Air terminal design and support shall be in accordance with NFPA 780. Terminals shall be rigidly connected to, and made electrically continuous with, roof conductors by means of pressure connectors or crimped joints of T-shaped malleable metal and connected to the air terminal by a dowel or threaded fitting. Air terminals at the ends of the structure shall be set not more than 2 feet from the ends of the ridge or edges and corners of roofs. Spacing of air terminals 2 feet in height on ridges, parapets, and around the perimeter of buildings with flat roofs shall not exceed 25 feet. In specific instances where it is necessary to exceed this spacing, the specified height of air terminals shall be increased not less than 2 inches for each foot of increase over 25 feet. On large, flat or gently sloping roofs, as defined in NFPA 780, air terminals shall be placed at points of the intersection of imaginary lines dividing the surface into rectangles having sides not exceeding 50 feet in length. Air terminals shall be secured against overturning either by attachment to the object to be protected or by means of a substantial tripod or other braces permanently and rigidly attached to the building or structure. Metal projections and metal parts of buildings, smokestacks, and other metal objects that do not contain hazardous materials and that may be struck but not appreciably damaged by lightning, need not be provided with air terminals. However, these metal objects shall be bonded to the lightning conductor through a metal conductor of the same unit weight per length as the main conductor. [Where metal ventilators are installed, air terminals shall be mounted thereon, where practicable. Any air terminal erected by necessity adjacent to a metal ventilator shall be bonded to the ventilator near the top and bottom thereof.] Where nonmetallic spires, steeples, or ventilators are present, air terminals shall be mounted thereon or to the side. In addition, where spires or steeples project more than 10 feet above the building, the conductor between the air terminal [and metal roof] shall be continued to the nearest down conductor and securely connected thereto.

3.1.1.2 Roof Conductors

Roof conductors shall be connected directly to the roof or ridge roll. Sharp bends or turns in conductors shall be avoided. Necessary turns shall have a radius of not less than 8 inches. Conductors shall preserve a

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downward or horizontal course and shall be rigidly fastened every 3 feet along the roof and down the building to ground. Metal ventilators shall be rigidly connected to the roof conductor at three places. All connections shall be electrically continuous. Roof conductors shall be coursed along the contours of flat roofs, ridges, parapets, and edges; and where necessary, over flat surfaces, in such a way as to join each air terminal to all the rest. Roof conductors surrounding tank tops, decks, flat surfaces, and flat roofs shall be connected to form a closed loop.

3.1.1.3 Down Conductors

Down conductors shall be electrically continuous from air terminals and roof conductors to grounding electrodes. Down conductors shall be coursed over extreme outer portions of the building, such as corners, with consideration given to the location of ground connections and air terminals. Each building or structure shall have not less than two down conductors located as widely separated as practicable, at diagonally opposite corners. On rectangular structures having gable, hip, or gambrel roofs more than 110 feet long, there shall be at least one additional down conductor for each additional 50 feet of length or fraction thereof. On rectangular structures having French, flat, or sawtooth roofs exceeding 250 feet in perimeter, there shall be at least one additional down conductor for each 100 feet of perimeter or fraction thereof. On an L- or T-shaped structure, there shall be at least one additional down conductor; on an H-shaped structure, at least two additional down conductors; and on a wing-built structure, at least one additional down conductor for each wing. On irregularly shaped structures, the total number of down conductors shall be sufficient to make the average distance between them along the perimeter not greater than 100 feet. On structures exceeding 50 feet in height, there shall be at least one additional down conductor for each additional 60 feet of height or fraction thereof, except that this application will not cause down conductors to be placed about the perimeter of the structure at intervals of less than 50 feet. Additional down conductors shall be installed when necessary to avoid "dead ends" or branch conductors ending at air terminals, except where the air terminal is on a roof below the main protected level and the "dead end" or branch conductor is less than 16 feet in length and maintains a horizontal or downward coursing. Down conductors shall be equally and symmetrically spaced about the perimeter of the structure. Down conductors shall be protected where necessary, to prevent mechanical injury to the conductor.

3.1.1.4 Interconnection of Metallic Parts

Metal doors, windows, and gutters shall be connected directly to the grounds or down conductors using not smaller than No. 6 copper conductor, or equivalent. Conductors placed where there is probability of unusual wear, mechanical injury, or corrosion shall be of greater electrical capacity than would normally be used, or shall be protected. The ground connection to metal doors and windows shall be by means of mechanical ties under pressure, or equivalent.

3.1.1.5 Ground Connections

Ground connections comprising continuations of down conductors from the structure to the grounding electrode shall securely connect the down
conductor and ground in a manner to ensure electrical continuity between the two. All connections shall be of the clamp type. There shall be a ground connection for each down conductor. Metal water pipes and other large underground metallic objects shall be bonded together with all grounding mediums. Ground connections shall be protected from mechanical injury. In making ground connections, advantage shall be taken of all permanently moist places where practicable, although such places shall be avoided if the area is wet with waste water that contains chemical substances, especially those corrosive to metal.

3.1.1.6 Grounding Electrodes

A grounding electrode shall be provided for each down conductor located as shown. A driven ground shall extend into the earth for a distance of not less than 10 feet. Ground rods shall be set not less than 3 feet, nor more than 8 feet, from the structures foundation. The complete installation shall have a total resistance to ground of not more than 5 ohms. Ground rods shall be tested individually prior to connection to the system and the system as a whole shall be tested not less than 48 hours after rainfall. When the resistance of the complete installation exceeds the specified value, the Contracting Officer will be notified immediately. A counterpoise, where required, shall be of No. 1/0 copper cable or equivalent material having suitable resistance to corrosion and shall be laid around the perimeter of the structure in a trench not less than 2 feet deep at a distance not less than 3 feet nor more than 8 feet from the nearest point of the structure. All connections between ground connectors and grounds or counterpoise, and between counterpoise and grounds shall be electrically continuous. Where so indicated on the drawings, an alternate method for grounding electrodes in shallow soil shall be provided by digging trenches radially from the building. The lower ends of the down conductors [or their equivalent in the form of metal strips or wires] are then buried in the trenches.

3.2 INTERCONNECTION OF METAL BODIES

Metal bodies of conductance shall be protected if not within the zone of protection of an air terminal. All metal bodies of conductance having an area of 400 square inches or greater or a volume of 1000 cubic inches or greater shall be bonded to the lightning protection system using main size conductors and a bonding plate having a surface contact area of not less than 3 square inches. Provisions shall be made to guard against the corrosive effect of bonding dissimilar metals. Metal bodies of inductance shall be bonded at their closest point to the lightning protection system using secondary bonding conductors and fittings. A metal body that exceeds 5 feet in any dimension, that is situated wholly within a building, and that does not at any point come within 6 feet of a lightning conductor or metal connected thereto shall be independently grounded.

3.3 FENCES

Except as indicated below, metal fences that are electrically continuous with metal posts extending at least 2 feet into the ground require no additional grounding. Other fences shall be grounded on each side of every gate. Fences shall be grounded by means of ground rods every 1000 to 1500 feet of length when fences are located in isolated places, and every 500 to
750 feet when in proximity (100 feet or less) to public roads, highways, and buildings. [Where the fence consists of wooden posts and horizontal metal strands only, down conductors consisting of No. 8 copper wire or equivalent shall be run from the ground rod the full height of the fence and fastened to each wire, so as to be electrically continuous.] The connection to ground shall be made from the post where it is of metal and is electrically continuous with the fencing. All metal fences shall be grounded at or near points crossed by overhead lines in excess of 600 volts and at distances not exceeding 150 feet on each side of line crossings.

3.4 SEPARATELY MOUNTED SHIELDING SYSTEM, OVERHEAD GROUND-WIRE TYPE: MISSILE ASSEMBLY BUILDING

This type of protection shall consist of two or more poles electrically connected to each other by overhead conductors. Where the poles are made of a nonconducing material an air terminal shall be mounted to the top of each pole and shall extend not less than 2 nor more than 5 feet above the top of the pole. Down conductors shall be run down the side of the pole, or a guy wire may be used as a conductor. When the guy wire is used, the guy wire and the overhead ground wire shall be dead-ended at the pole. The overhead ground wire and the guy wire shall then be connected to each other by a separate cable using standard cable clamps in such manner that the discharge will not be reversed at any point. Guy wires used as down conductors shall be grounded by means of separate ground rods with cable connections clamped to the lower end of guy wire. Resistance to ground shall not exceed 5 ohms. Where the resistance to ground exceeds 5 ohms, additional grounding shall be provided and the ground connection shall be fastened to the metal pole and the ground. The height of the poles shall be sufficient to provide a clearance of not less than 6 feet between the overhead ground wire and the highest projection of the building. When the ground cable runs across and is used to protect stacks or vents that emit explosive dusts, vapors, or gases under forced draft, the cable shall have at least 15 feet clearance above the stack or vent. When grounding is required, a ground rod shall be driven approximately 6 feet from the base of each pole. When the combined measured resistance to ground of the pole and ground rod exceeds 5 ohms, the Contracting Officer will be notified immediately.

3.5 INSPECTION

The lightning protection system will be inspected by the Contracting Officer to determine conformance with the requirements of this specification. No part of the system shall be concealed until so authorized by the Contracting Officer.

-- End of Section --
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.

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)


NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 90A  (1993) Installation of Air Conditioning and Ventilating Systems

UNDERWRITERS LABORATORIES (UL)

UL 6  (1993) Rigid Metal Conduit
UL 464  (1990) Audible Signal Appliances
UL 797  (1993) Electrical Metallic Tubing
UL 864  (1991; Rev thru May 1994) Control Units for Fire-Protective Signaling Systems
UL 1242  (1983; Rev thru Jul 1993) Intermediate Metal Conduit
1.2 GENERAL REQUIREMENTS

1.2.1 Standard Products

Material and equipment shall be the standard products of a manufacturer regularly engaged in the manufacture of the products and shall be items that have been in satisfactory use for at least 2 years prior to bid opening. Equipment shall be supported by a service organization that can provide service within 24 hours.

1.2.2 Nameplates

Major components of equipment shall have the manufacturer's name, address, type or style, voltage and current rating, and catalog number on a noncorrosive and nonheat-sensitive plate which is securely attached to the equipment.

1.2.3 Keys and Locks

Locks shall be keyed alike.

1.2.4 Tags

Tags with stamped identification number shall be furnished for keys and locks.

1.2.5 Verification of Dimensions

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

1.2.6 Compliance

The fire detection and internal alarm system and the central reporting system shall be configured in accordance with NFPA 72. The equipment furnished shall be compatible and be UL listed or FM approved or approved or listed by a nationally recognized testing laboratory in accordance with the applicable NFPA standards.

1.2.7 Manufacturer's Services

Services of a manufacturer's representative who is experienced in the installation, adjustment, testing, and operation of the equipment specified shall be provided. The representative shall supervise the installation, adjustment, and testing of the equipment.

1.3 SYSTEM DESIGN

1.3.1 Operation

The fire alarm and detection system shall be a complete, supervised fire alarm system. The system shall be activated into the alarm mode by actuation of any alarm initiating device. The system shall remain in the alarm mode until initiating device is reset and the fire alarm control
panel is reset and restored to normal. Alarm initiating devices shall be connected to signal line circuits (SLC), Style 6, in accordance with NFPA 72. Alarm indicating appliances shall be connected to indicating appliance circuits (IAC), Style Z in accordance with NFPA 72. A two-loop conduit system shall be provided so that if any one conduit and all conductors contained in that conduit are severed all IDC, IAC, or SLC on that circuit shall remain functional. A two-loop system is not applicable to the central fire alarm communication center from the local panels. All textual, audible, and visual appliances and systems shall comply with NFPA 72.

1.3.2 Operational Features

The system shall have the following operating features:

a. Electrical supervision of alarm SLC and IAC.

b. Electrical supervision of the primary power (ac) supply, battery voltage, placement of alarm zone module (card, PC board) within the control panel, and transmitter tripping circuit integrity.

c. Trouble buzzer and trouble lamp (light emitting diode or neon light) to activate upon a single break, open, or ground fault condition which prevents the required normal operation of the system. The trouble signal shall also operate upon loss of primary power (ac) supply, low battery voltage, removal of alarm zone module (card, PC board), and disconnection of the circuit used for transmitting alarm signals off-premises. A trouble alarm silence switch shall be provided which will silence the trouble buzzer, but will not extinguish the trouble indicator lamp. After the system returns to normal operating conditions, the trouble buzzer shall again sound until the silencing switch returns to normal position, unless automatic trouble reset is provided.

d. Transmitter disconnect switch to allow testing and maintenance of the system without activating the transmitter but shall provide a trouble signal when disconnected and a restoration signal when reconnected. One person test mode - Activating an initiating device in this mode will activate an alarm for a short period of time, then automatically reset the alarm, without activating the transmitter during the entire process.

e. Evacuation alarm silencing switch or switches which, when activated, will silence alarm devices, but will not affect the zone indicating lamp nor the operation of the transmitter. This switch shall be over-ridden upon activation of a subsequent alarm from an unalarmed zone and the alarm devices will be activated.

f. Electrical supervision of circuits used for supervisory signal services. Supervision shall detect any open, short, or ground.

g. Zones for alarm SLC shall be arranged as indicated on the contract drawings.
1.3.3 Alarm Functions

An alarm condition on a circuit shall automatically initiate the following functions:

a. Transmission of signals over the station telephonic fire reporting system. The signals shall be different for each zone.

b. Visual indications of the alarmed zones on the fire alarm control panel annunciator.

c. Continuous sounding of alarm notification appliances throughout the building.

d. Deactivation of the air handling units in the alarmed zone.

1.3.4 Primary Power

Operating power shall be provided as required by paragraph Power Supply for the System. Transfer from normal to emergency power or restoration from emergency to normal power shall be fully automatic and not cause transmission of a false alarm. Loss of ac power shall not prevent transmission of a signal via the fire reporting system upon operation of any initiating circuit.

1.3.5 Battery Backup Power

Battery backup power shall be through use of rechargeable, sealed-type storage batteries and battery charger.

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-01 Data

Battery; GA.

Substantiating battery calculations for supervisory and alarm power requirements. Ampere-hour requirements for each system component and each panel component, and the battery recharging period shall be included.

Voltage Drop; GA.

Voltage drop calculations for signaling appliance circuits to indicate that sufficient voltage is available for proper appliance operation.

Spare Parts; FIO.

Spare parts data for each different item of material and equipment specified, not later than 2 months prior to the date of beneficial occupancy. Data shall include a complete list of parts and supplies with
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the current unit prices and source of supply and a list of the parts recommended by the manufacturer to be replaced after 1 year of service.

Qualifications; GA.

Qualifications, with verification of experience and license number, of a Registered Professional Engineer with at least 4 years of current experience in the design of the fire protection and detection systems. This engineer must perform the various specification items required by this section to be performed by a registered Professional Engineer.

SD-04 Drawings

Fire Alarm Reporting System; GA.

Detail drawings, signed by the Registered Professional Engineer, consisting of a complete list of equipment and material, including manufacturer’s descriptive and technical literature, catalog cuts, and installation instructions. Note that the contract drawings show layouts based on typical detectors. The contractor shall check the layout based on the actual detectors to be installed and make any necessary revisions in the detail drawings. The detail drawings shall also contain complete wiring and schematic diagrams for the equipment furnished, equipment layout, and any other details required to demonstrate that the system has been coordinated and will properly function as a unit.

Detailed point-to-point wiring diagram, signed by the Registered Professional Engineer, showing all points of connection. Diagram shall include connections between system devices, appliances, control panels, supervised devices, and all equipment that is activated or controlled by the panel.

SD-06 Instructions

Fire Alarm Reporting System; GA.

Six copies of operating instructions outlining step-by-step procedures required for system startup, operation, and shutdown. The instructions shall include the manufacturer’s name, model number, service manual, parts list, and brief description of all equipment and their basic operating features. Six copies of maintenance instructions listing routine maintenance procedures, possible breakdowns and repairs, and troubleshooting guide. The instructions shall include conduit layout, equipment layout and simplified wiring, and control diagrams of the system as installed. Instructions shall be approved prior to training.

Training; GA

Lesson plans and training data, in manual format, for the training courses.

SD-08 Statements

Test Procedures; GA.

Detailed test procedures, signed by the Registered Professional Engineer,
for the fire detection and alarm system 60 days prior to performing system tests.

SD-09 Reports

Testing; FIO.

Test reports in booklet form showing all field tests performed to prove compliance with the specified performance criteria, upon completion and testing of the installed system. Each test report shall document all readings, test results and indicate the final position of controls.

SD-13 Certificates

Equipment; FIO.

Certified copies of current approvals or listings issued by UL, FM or other nationally recognized testing laboratory, showing compliance with specified NFPA standards.

Installer; GA.

The Contractor shall provide documentation demonstrating that its fire detection and alarm system installer has been regularly engaged in the installation of fire detection and alarm systems meeting NFPA standards for a minimum of three years immediately preceding commencement of this contract. Such documentation shall specifically include proof of satisfactory performance on at least three projects similar to that required by these specifications, including the names and telephone numbers of using agency points of contact for each of these projects. Documentation shall indicate the type of each system installed and include a written certificate that each system has performed satisfactorily in the manner specified for a period of not less than 12 months following completion. All such data shall be submitted 30 days prior to commencement of installation for approval of the Contracting Officer. Listing of the installer under "Protective Signaling Services - Local, Auxiliary, Remote Station Proprietary (UUJS)" of UL-04 shall be accepted as equivalent proof of compliance with the foregoing experience requirements.

1.5 DELIVERY AND STORAGE

All equipment delivered and placed in storage shall be stored with protection from the weather, humidity and temperature variation, dirt and dust, and any other contaminants.

PART 2 PRODUCTS

2.1 CONTROL PANEL

Control Panel shall comply with all the applicable requirements of UL 864. Panel shall be modular, installed in a surface mounted steel cabinet with hinged door and cylinder lock. Control panel shall be a clean, uncluttered, and orderly assembled panel containing all components and equipment required to provide the specified operating and supervisory functions of the system. The panel shall have prominent rigid plastic,
phenolic or metal identification plates for all lamps, zones, controls, meters, fuses, and switches. Nameplates for fuses shall also include amperage rating. Separate alarm and trouble lamp shall be provided for each zone alarm located on exterior of cabinet door or be visible through the cabinet door. Control panel switches shall be within the locked cabinet. A suitable means shall be provided for testing the control panel visual indicating devices (meters or lamps). Meters and lamps shall be plainly visible when the cabinet door is closed. Signals shall be provided to indicate by zone any alarm, supervisory or trouble condition on the system. Each SLC initiating circuit shall be powered and supervised so that a signal on one zone does not prevent the receipt of signals from other zones. Loss of power, including any or all batteries, shall not require the reloading of a program. Upon restoration of power, startup shall be automatic, and shall not require any manual operation. The loss of primary power or the sequence of applying primary or emergency power shall not affect the transmission of alarm, supervisory or trouble signals.

Visual annunciators shall be provided for each active zone and spare zone. 2 Spare zones shall be provided. Each lamp shall provide specific identification of the zone by means of a permanently attached rigid plastic, phenolic or metal sign with either raised or engraved letters. Zone identification shall consist of word description of the zone.

Cabinets shall be provided with ample gutter space to allow proper clearance between the cabinet and live parts of the panel equipment. If more than one modular unit is required to form a control panel, the units shall be installed in a single cabinet large enough to accommodate all units.

2.1.1 Remote System Trouble Audible/Visual Appliance

Audible appliance shall have a minimum sound level output rating of 85 dBA at 10 feet and operate in conjunction with the panel’s integral trouble signal. The audible device shall be silenced by the system trouble silence switch. A rigid plastic, phenolic or metal identification sign which reads "Fire Alarm System Trouble" shall be provided at the audible appliance. The visual appliance located with the audible appliance shall not be extinguished until the trouble has been cleared.

2.1.2 Circuit Connections

Circuit conductors entering or leaving the panel shall be connected to screw-type terminals with each terminal marked for identification.

2.2 STORAGE BATTERIES

Storage Batteries shall be provided and shall be the sealed, lead-calcium type requiring no additional water. The batteries shall have ample capacity, with primary power disconnected, to operate the fire alarm system for a period of 48 hours. Following this period of operation via batteries, the batteries shall have ample capacity to operate all components of the system, including all alarm signaling devices in the total alarm mode for a minimum period of 15 minutes. Batteries shall be sized to deliver 50 percent more ampere/hours based on a 48 hour discharged rate than required for the calculated capacities. Battery cabinet shall be
a separate cabinet. Batteries in the control panel shall be located at the
bottom of the panel. Battery shall be provided with overcurrent protection
in accordance with NFPA 72.

2.3 BATTERY CHARGER

Battery charger shall be completely automatic, with high/low charging rate,
capable of restoring the batteries from full discharge to full charge
within 12 hours. A separate ammeter shall be provided for indicating rate
of charge. A separate voltmeter shall be provided to indicate the state of
the battery charge. A pilot light indicating when batteries are manually
placed on a high rate of charge shall be provided as part of the unit
assembly if a high rate switch is provided. Charger shall be located in
control panel or battery cabinet.

2.4 MANUAL FIRE ALARM STATIONS

Manual fire alarm stations shall conform to the applicable requirements of
UL 38. Manual stations shall be connected into alarm-initiating
circuits. Stations shall be installed on surface mounted outlet boxes.
Stations shall be double action type. Stations shall be finished in red,
with raised letter operating instructions of contrasting color. Stations
requiring the breaking of glass or plastic panels for operation are not
acceptable. Stations employing glass rods are not acceptable. The use of
a key or wrench shall be required to reset the station. Gravity or mercury
switches are not acceptable. Switches and contacts shall be rated for the
voltage and current upon which they operate. Stations shall have a
separate screw terminal for each conductor. Surface mounted boxes shall be
painted the same color as the fire alarm manual stations. Addressable pull
stations shall be capable of being field programmed, shall latch upon
operation and remain latched until manually reset.

2.5 FIRE DETECTING DEVICES

Fire detecting devices shall comply with the applicable requirements of
NFPA 72, NFPA 90A, UL 268, and UL 521. The detectors shall
be provided as indicated. Detector base shall have screw terminals for
making connections. No solder connections will be allowed. Detectors
shall be connected into alarm initiating circuits. Installed devices
shall conform to the classification of the area.

2.5.1 Heat Detectors

Heat detectors shall be designed for detection of fire by combination fixed
temperature and rate-of-rise principle. Heat detectors shall be rated for
a minimum of 50 foot spacing (smooth-ceiling rated) in accordance with UL
521. Detectors located in areas subject to moisture, exterior atmospheric
conditions or hazardous locations as defined by NFPA 70, shall be types
approved for such locations.

2.5.1.1 Combination Fixed-Temperature and Rate-of-Rise Detectors

Detectors shall be designed for surface outlet box mounting and supported
independently of wiring connections. Contacts shall be self-resetting
after response to rate-of-rise principle. Under fixed temperature
actuation, the detector shall have a permanent external indication which is readily visible. Detector units located in boiler rooms, showers, or other areas subject to abnormal temperature changes shall operate on fixed temperature principle only. Rating for fixed temperature portion shall be 135 degrees F in temperature conditioned spaces.

2.6 NOTIFICATION APPLIANCES

Audible appliances shall be heavy duty and conform to the applicable requirements of UL 464. Devices shall be connected into alarm indicating circuits. All devices shall have a separate screw terminal for each conductor.

2.6.1 Alarm Bells

Bells shall be surface mounted with the matching mounting back box surface mounted. Bells shall be suitable for use in an electrically supervised circuit. Bells shall be the underdome type producing a minimum output rating of 85 dBA at 10 feet. Bells used in exterior locations shall be specifically listed or approved for outdoor use and be provided with metal housing and protective grilles. Single stroke, electrically operated, supervised, solenoid bells shall be used for coded applications.

2.6.2 Visual Notification Appliances

Visual notification appliances shall have high intensity optic lens and flash tubes. Strobes shall flash at approximately 1 flash per second and a minimum of 1 candela (8,000 peak candle power). Strobe shall be surface mounted.

2.6.3 Combination Audible/Visual Notification Appliances

Combination audible/visual notification appliances shall provide the same requirements as individual units except they shall mount as a unit in standard backboxes. All units shall be factory assembled. Any other audible indicating appliance employed in the fire alarm systems shall be approved by the authority having jurisdiction.

2.6.4 Telephone Dialer

The telephone dialer shall be compatible with and be activated by the fire alarm control panel to provide at least a 30 second message to the Gallup City Fire Department. The telephone number shall be programmed in and operation shall be automatic once contacts in the fire alarm control panel have closed. The number to be programmed in is 722-2231. The dialer shall automatically reset itself after sending its message. The dialer shall be housed in a lockable cabinet, with a test speaker, an abort switch, a pilot lamp and battery pack.

2.7 FIRE DETECTION AND ALARM SYSTEM PERIPHERAL EQUIPMENT

2.7.1 Conduit

Conduit and fittings shall comply with UL 6, UL 1242 and UL 797.

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2.7.2 Wiring

Wiring for 120V ac power shall be No. 12 AWG minimum. Wiring for low voltage dc circuits shall be No. 14 AWG minimum. Power wiring (over 28 volts) and control wiring shall be isolated. All wiring shall conform to NFPA 70. System field wiring shall be solid copper and installed in metallic conduit or electrical metallic tubing, except rigid plastic conduit may be used under slab-on-grade. All conductors shall be color coded. Conductors used for the same functions shall be similarly color coded. Wiring code color shall remain uniform throughout the circuit. Pigtail or T-tap connections to alarm initiating, supervisory circuits, and alarm indicating circuits are prohibited.

2.7.3 Special Tools and Spare Parts

Special tools necessary for the maintenance of the equipment shall be furnished. Two spare fuses of each type and size required and five spare lamps and LED's of each type shall be furnished. Two percent of the total number of each different type of detector, but no less than two each, shall be furnished. Fuses and lamps shall be mounted in the fire alarm panel.

PART 3 EXECUTION

3.1 INSTALLATION

All work shall be installed as shown and in accordance with the manufacturer's diagrams and recommendations, unless otherwise specified.

3.1.1 Power Supply for the System

A single dedicated circuit connection for supplying power to each building fire alarm system shall be provided. The primary power shall be supplied as shown on the drawings. The power supply shall be equipped with a locking mechanism and marked "FIRE ALARM CIRCUIT CONTROL".

3.1.2 Wiring

Conduit size for wiring shall be in accordance with NFPA 70. Wiring for the fire alarm system shall not be installed in conduits, junction boxes, or outlet boxes with conductors of lighting and power systems. No more than one conductor shall be installed under any screw terminal. All circuit conductors entering or leaving any mounting box, outlet box enclosure or cabinet shall be connected to screw terminals with each terminal marked in accordance with the wiring diagram. Connections and splices shall be made using screw terminal blocks. The use of wire nut type connectors are prohibited in the system. Wiring within any control equipment shall be readily accessible without removing any component parts. The fire alarm equipment manufacturer's representative shall be present for the connection of wiring to the control panel.

3.1.3 Control Panel

The control panel and its assorted components shall be mounted so that no part of the enclosing cabinet is less than 12 inches nor more than 78
inches above the finished floor. All manually operable controls shall be between 36 inches to 42 inches above the finished floor. Panel shall be installed to comply with the requirements of UL 864.

3.1.4 Detectors

Detectors shall be installed in accordance with NFPA 72. Detectors shall be at least 12 inches from any part of any lighting fixture. Detectors shall be located at least 3 feet from diffusers of air handling systems. Each detector shall be provided with appropriate mounting hardware as required by its mounting location. Detectors which mount in free space shall be mounted directly to the end of the stubbed down rigid conduit drop. Conduit drops shall be firmly secured to minimize detector sway. Where length of conduit drop from ceiling or wall surface exceeds 3 feet, sway bracing shall be provided.

3.1.5 Notification Appliances

Notification appliances shall be mounted a minimum of 8 feet above the finished floor unless limited by ceiling height or otherwise indicated.

3.1.6 Annunciator Equipment

Annunciator equipment provided shall be mounted where indicated.

3.2 OVERVOLTAGE AND SURGE PROTECTION

All equipment connected to alternating current circuits shall be protected from surges per IEEE C62.41 and NFPA 70. All cables and conductors which serve as communications links, except fiber optics, shall have surge protection circuits installed at each end. Fuses shall not be used for surge protection.

3.3 GROUNDING

Grounding shall be provided to building ground or ground rods shall be driven. Maximum impedance to ground shall be 25 ohms. Ground rods shall not protrude more than 6 inches above grade.

3.4 TESTING

The Contractor shall notify the Contracting Officer 30 days before the preliminary and acceptance tests are to be conducted. The tests shall be performed in accordance with the approved test procedures in the presence of the Contracting Officer. The control panel manufacturer’s representative shall be present to supervise all tests. The Contractor shall furnish all instruments and personnel required for the tests.

3.4.1 Preliminary Tests

Upon completion of the installation, the system shall be subjected to functional and operational performance tests including tests of each installed initiating and notification appliance. Tests shall include the meggering of all system conductors to determine that the system is free from grounded, shorted, or open circuits. The megger test shall be
conducted prior to the installation of fire alarm equipment. If
deficiencies are found, corrections shall be made and the system shall be
retested to assure that it is functional.

3.4.2 Acceptance Test

Testing shall be in accordance with NFPA 72. The recommended tests in
NFPA 72 shall be considered mandatory and shall verify that all
previous deficiencies have been corrected. The test shall include the
following:

a. Test of each function of the control panel.
b. Test of each circuit in both trouble and normal modes.
c. Tests of alarm initiating devices in both normal and trouble
   conditions.
d. Tests of each control circuit and device.
e. Tests of each alarm notification appliance.
f. Tests of the battery charger and batteries.
g. Complete operational tests under emergency power supply.
h. Visual inspection of all wiring connections.
i. Opening the circuit at each alarm initiating device and
   notification appliance to test the wiring supervisory feature.
j. Ground fault
k. Short circuit faults
l. Stray voltage
m. Loop resistance

3.5 TRAINING

Training course shall be provided for the operations and maintenance staff.
The course shall be conducted in the building where the system is installed
or as designated by the Contracting Officer. The training period shall
consist of 3 training days (8 hours per day) and shall start after the
system is functionally completed but prior to final acceptance tests. The
instructions shall cover all of the items contained in the operating and
maintenance instructions.

-- End of Section --
TARGET LAUNCH FACILITIES, PHASE 1, FT WINGATE, NM

SECTION 16770

RADIO AND PUBLIC ADDRESS SYSTEMS

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.

ELECTRONIC INDUSTRIES ASSOCIATION (EIA)

EIA 310-C (1977; R 1982) Racks, Panels and Associated Equipment

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)


1.2  SYSTEM DESCRIPTION

The radio and public address system shall consist of an audio distribution network to include amplifiers, microphones, speakers, cabling, and any ancillary components required to meet the required system configuration and operation.

1.2.1  Single Channel System

The system shall control and amplify an audio input from microphone and telephone for distribution within the site. Components of the system shall include a mixer-amplifier microphone speaker system, telephone input, cabling, and other associated hardware.

1.2.2  System Performance

The system shall provide even sound distribution throughout the designated area, plus or minus 3 dB for the 1-octave band centered at 4000 Hz. The system shall provide uniform frequency response throughout the designated area, plus or minus 3 dB as measured with 1/3-octave bands of pink noise at locations across the designated area selected by the Contracting Officer. The system shall be capable of delivering 75 dB average program level with additional 10 dB peaking margin sound pressure level (SPL) to any location in the area at an acoustic distortion level below 5 percent total harmonic distortion (THD). Unless otherwise specified the sound pressure reference level is 20 micro Pascal (0.00002 Newtons per square meter).

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:

SECTION 16770  PAGE 1
SD-01 Data

Spare Parts; FIO.

Spare parts data for each different item of material and equipment specified, after approval of the detail drawings and not later than one month prior to the date of beneficial occupancy. The data shall include a complete list of parts and supplies, with current unit prices and source of supply.

SD-04 Drawings

Radio and Public Address System; GA.

Detail drawings consisting of a complete list of equipment and material, including manufacturer's descriptive and technical literature, performance charts and curves, catalog cuts, and installation instructions. Detail drawings shall also contain complete wiring and schematic diagrams and any other details required to demonstrate that the system has been coordinated and will properly function as a unit. Drawings shall show proposed layout of equipment and appurtenances, and equipment relationship to other parts of the work including clearances for maintenance and operation.

SD-09 Reports

Test Plan; GA.

Test plan and test procedures for the acceptance tests. The test plan and test procedures shall explain in detail, step-by-step actions and expected results to demonstrate compliance with the requirements specified. The procedure shall also explain methods for simulating the necessary conditions of operation to demonstrate system performance.

Acceptance Tests; GA.

Test reports in booklet form showing all field tests performed to adjust each component and to prove compliance with the specified performance criteria, upon completion and testing of the installed system. The reports shall include the manufacturer, model number, and serial number of test equipment used in each test. Each report shall indicate the final position of controls and operating mode of the system.

SD-19 Operation and Maintenance Manuals

Radio and Public Address System; FIO.

Six copies of the operation manual outlining the step-by-step procedures required for system start up, operation, and shutdown. The manual shall include equipment layout and schematics of simplified wiring and control diagrams of the system as installed, the manufacturer's name, model number, and brief description of all equipment and their basic operating features. Six copies of maintenance manual listing routine maintenance procedures, possible breakdowns and repairs, and troubleshooting guides. The manual shall include equipment layout and
1.4 DELIVERY AND STORAGE

Equipment placed in storage until installation time shall be stored with protection from the weather, humidity and temperature variations, dirt and dust, and other contaminants.

1.5 VERIFICATION OF DIMENSIONS

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

PART 2 PRODUCTS

2.1 STANDARD PRODUCTS

Material and equipment to be provided shall be the standard products of a manufacturer regularly engaged in the manufacture of such products, and shall essentially duplicate material and equipment that have been in satisfactory use at least 2 years. All components used in the system shall be commercial designs that comply with the requirements specified. Equipment shall be supported by a service organization that is, in the opinion of the Contracting Officer, reasonably convenient to the site.

2.1.1 Identical Items

Items of the same classification shall be identical. This requirement includes equipment, modules, assemblies, parts, and components.

2.1.2 Nameplates

Each major component of equipment shall have the manufacturer's name, address, model and catalog number, and serial number on a plate secured to the equipment.

2.2 MIXER AMPLIFIER

Mixer amplifier shall as a minimum conform to the following specifications:
Rated Power Output: 35 watts RMS

Frequency Response: Plus or Minus 2 dB, 60-13,000 Hz

Distortion: Less than 1 percent at RPO, 60 - 13,000 Hz

Inputs: 2 microphones (high impedance or low-impedance unbalanced
2 Aux. (high-impedance)

Output Impedance: Balanced 4, 8, and 16 ohms

Output Voltage: 25 and 70 volts

Power Requirement: 110-125 Vac 60 Hz

2.3 MICROPHONES

Microphones shall as a minimum conform to the following specifications:

Application: Desk

Element: Dynamic

Frequency Response: 50 - 12,000 Hz

Impedance: 250 ohms (nominal)

Front-to-back Ratio: 20 dB

2.3.1 Microphone Jack

Each outlet for microphones shall consist of a standard outlet box, flush-mounted, and fitted with a three-pole, polarized, locking-type, female microphone jack and a corrosion resistant-steel device plate.

2.4 LOUDSPEAKERS

2.4.1 Horn Speaker

The horn speaker shall as a minimum conform to the following specifications:
2.5 PRIORITY RELAYS AND CONTROLS

Priority relays and controls required to accomplish operations specified shall be provided. Relays shall be completely enclosed with a plastic dust cover for maximum protection against foreign matter, and shall be plug-in type. Relays shall be provided with a diode wired across the relay coil for transient suppression and shall be installed utilizing factory-rewired, rack-mounted receptacle strips. Coil shall be maximum 24 volts dc.

2.6 EQUIPMENT RACKS

Equipment shall be mounted on 19-inch racks in accordance with EIA 310-C and located as shown on drawings. Ventilated rear panels, solid side panels, and solid top panels shall be provided. Perforations or louvers may be provided in front panels to ensure adequate ventilation of equipment. The racks and panels shall be factory finished with a uniform baked enamel over rust inhibiting primer.

2.7 SPEAKER AND MICROPHONE CABLE

Cables shall be of the gauge required depending upon the cable run length. In no case shall any cable be used which is smaller than 20 AWG. Insulation on the conductors shall be polyvinyl chloride (PVC) or an equivalent synthetic thermoplastic not less than .009 inch. Cables shall be shielded with a 34-gauge tinned soft copper strand formed into a braid. Cables shall be jacketed with a PVC or Fluoropolymer compound. The jacket thickness shall be 0.0200 inch minimum.

2.8 POWER SURGE PROTECTION

Major components of the system such as power amplifiers, mixer-preamplifiers, phonographs, and tuners, shall have a device, whether internal or external, which provides protection against voltage spikes and current surges originating from commercial power sources.

2.9 SIGNAL SURGE PROTECTION

Major components of the system shall have internal protection circuits which protects the component from mismatched loads, direct current, and shorted output lines.
PART 3  EXECUTION

3.1  INSTALLATION

All equipment shall be installed as indicated and specified, and in accordance with the manufacturer's recommendations except where otherwise indicated. Equipment mounted out-of-doors or subject to inclement conditions shall be weatherproofed.

3.1.1  Wiring

Wiring shall be installed in rigid conduit, intermediate metal conduit, cable trays, or electric metallic tubing as specified in Section 16415 ELECTRICAL WORK, INTERIOR. Wiring for microphone, grounding, line level, video, speaker and power cables shall be isolated from each other by physical isolation and metallic shielding. Shielding shall be terminated at only one end.

3.2  GROUNDING

All grounding practices shall comply with NFPA 70. The antenna mast shall be separately grounded. The system shall utilize a multiple-point signal grounding scheme where conductive path connections are required between each piece of equipment and the reference ground point. An isolated ground bar for power shall be provided for the connection of the main system components. The ground bar shall be connected to the main service ground utilizing a No. 6 conductor.

3.3  ACCEPTANCE TESTS

After installation has been completed, the Contractor shall conduct acceptance tests, utilizing the approved test procedures, to demonstrate that equipment operates in accordance with specification requirements. The Contractor shall notify the Contracting Officer 14 days prior to the performance of tests. In no case shall notice be given until after the Contractor has received written Contracting Officer approval of the test plans as specified. The acceptance tests shall include originating and receiving messages at specified stations, at proper volume levels, without cross talk or noise from other links or nondesignated units.

3.4  TRAINING

The Contractor shall conduct a training course for 3 members of the operating and maintenance staff as designated by the Contracting Officer. The training course will be given at the installation during normal working hours for a total of 8 hours and shall start after the system is functionally complete but prior to final acceptance tests. The field instructions shall cover all of the items contained in the approved operating and maintenance manuals, as well as demonstrations of routine maintenance operations. The Contracting Officer shall be notified at least 14 days prior to the start of the training course.

END OF SPECIFICATIONS