AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

1. CONTRACT ID CODE	Page 1 of Pages 72

2. AMENDMENT/~~MODIFICATION~~ NO.	3. EFFECTIVE DATE	4. REQUISITION/PURCHASE REQ. NO.	5. PROJECT NO. (If applicable)
001	August 24, 1998		

6. ISSUED BY CODE LC-3114

Bureau of Reclamation
Lower Colorado Region
P.O. Box 61470
Boulder City NV 89006-1470
http://www.lc.usbr.gov/~g3100/

7. ADMINISTERED BY *(If other than Item 6)* CODE

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

CODE FACILITY CODE

(✓)	9A. AMENDMENT OF SOLICITATION NO.
✓	**98-SI-30-12400**
	9B. DATED (SEE ITEM 11) **August 18, 1998**
	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.

Offerors 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 copy 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 and return _____ copies to the issuing office.

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

Project Title: Pre-Engineered Carpentry/Sandblast Shop, Boulder Canyon Project, Hoover Dam, Arizona - Nevada

Purpose of Amendment: The purpose of this amendment is to make revisions and/or corrections to (1) Section B, (2) Section H, (3) Section J, (4) and the Specifications and Drawing Nos. 2/45-301-6574 and 6/45-301-6578 located behind Attachment No. 1; (5) incorporate Drawing No. 5/45-301-6577 which was inadvertently omitted from the solicitation; (6) provide better quality copies of the remaining drawings; and (7) incorporate the applicable DOL Wage Rate Determination.

Receipt of Bids: The date and time for receipt of bids remains September 17, 1998 at 2 p.m., local time. The place for receipt of bids remains the Bureau of Reclamation, Lower Colorado Regional Office, Annex Building, Room AA-123, Nevada Hwy and Park Street, Boulder City, Nevada.

Acknowledgment: See block 11 above regarding how to acknowledge this amendment. The acknowledgment must be received at the place designated for receipt of offers (see block 8 of the "Solicitation, Offer, and Award," Standard Form 1442).

Bid Modification: See block 11 above if you have submitted your bid and now desire to modify it or withdraw it.

(Continued on following page)

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 _____ (Signature of person authorized to sign)	15C. DATE SIGNED	16B. UNITED STATES OF AMERICA BY_____ (Signature of Contracting Officer)	16C. DATE SIGNED

Description of Changes:

1. The estimated quantity in Item 2. of paragraph B.2 is revised to 120 cubic yards, from 75 cubic yards.

Instructions: In Section B, remove pages B-1 and B-2 and replace with the attached revised pages B-1 and B-2.

2. Reclamation clause WBR 1452.211-81 Effective Dates of Referenced Specifications and Standards is revised to incorporate the replacement ASTM specifications and standards referenced in the new paragraph.

Instructions: In Section H, remove pages H-9 and H-10 and replace with the attached revised pages H-9 and H-10.

3. The number of pages of the DOL Wage Determinations(s) and Drawings, listed in Section J, are revised.

Instructions: In Section J, remove page J-1 and replace with the attached revised page J-1.

3. Revisions and/or corrections are made to the specifications on the pages mentioned below.

Filing Instructions:

Remove Pages	Insert Pages
1-7 and 1-8	1-7 and 1-8
4-3 thru 4-6	4-3 thru 4-6
5-3 and 5-4	5-3 and 5-4
5-9 thru 5-20	5-9 thru 5-20a
5-25 thru 5-27	5-25 thru 5-27
9-3	9-3

4. The applicable U.S. Department of Labor (DOL) Wage Rate Determination is incorporated.

Instructions: In Attachment No. 2, U.S. Department of Labor Wage Rate Determination(s), remove Heavy Highway, General Decision No. NV980005, dated 02/13/1998, Modification No. 1, dated 07/24/1998, in its entirety (28 pages), and replace with the attached Building, General Decision Number NV980009 (17 pages), dated 08/14/1998.

5. Drawing No. 5/45-301-6577 inadvertently omitted from the solicitation is hereby incorporated. Drawing Nos. 2/45-301-6574 and 6/45-301-6578 are revised. All other remaining drawings are replaced for the purpose of incorporating better quality copies.

Instructions: In Attachment No. 5, Drawings, remove the drawings in its entirety and replace with the attached set of drawings.

SECTION B - SUPPLIES OR SERVICES AND PRICES

B.1 WBR 1452.214-908 THE REQUIREMENTS--BUREAU OF RECLAMATION--LOWER COLORADO REGION (NOV 1996)

(a) The Contractor shall furnish the items identified in this Section, in accordance with the terms, conditions, and specifications contained in the contract.

(b) Bidders are cautioned to carefully review the bid submission requirements contained in Section L. Failure to comply with these requirements may result in a bid being declared nonresponsive.

(c) Bids will be considered for award on the total of the schedule in paragraph B.2, but no bid will be considered for award for only a part of the schedule. Bids for only a part of the schedule will be considered nonresponsive and will be rejected.

(d) The Section H clause entitled "Payment for Mobilization and Preparatory Work" applies to schedule item(s) for Mobilization and Preparatory Work.

(e) Bidders are advised to carefully read paragraph (d) of the FAR clause 52.214-19, entitled "Contract Award–Sealed Bidding–Construction," regarding materially unbalancing of bids.

B.2 THE SCHEDULE

SCHEDULE

Item	Work or Material	Quantity	Unit	Unit Price	Amount
1.	Mobilization and preparatory work.	1	LS	$	$
% 2.	Excavation.	~~75~~ **120**	CY	$	$
3.	Placing and compacting aggregate base.	45	CY	$	$
4.	Furnishing and placing reinforced concrete.	90	CY	$	$
5.	Furnishing and erecting pre-engineered metal building.	1	LS	$	$
6.	Furnishing and installing electrical system.	1	LS	$	$
7.	Furnishing and installing air compressor.	1	LS	$	$
8.	Furnishing and installing power cable and transformers.	1	LS	$	$
9.	Assembling, installing, painting, and testing Government-furnished pulse filter system.	1	LS	$	$
10.	Furnishing, installing, and testing grounding system.	1	LS	$	$
TOTAL FOR SCHEDULE					$

B.3 WBR 1452.214-906 BIDDING SCHEDULE COMPLETION INSTRUCTIONS--BUREAU OF RECLAMATION--LOWER COLORADO REGION (NOV 1996)

NOTE OF CAUTION TO BIDDERS: When completing the bid schedule, the price entered in the "Amount" column shall be the mathematical product of the quantity multiplied by the unit price. Rounding up or down is not permitted. If a price entered in the "Amount" column has been rounded, the Contracting Officer will correct such amount, pursuant to the bid preparation provision(s) in Section L for the purposes of determining the apparent low bidder, and any such corrections will appear on the contract award document.

NO. 12	BRAND NAME SPECIFIED	Mfr: Munters Evaporative Cooling Division Make/Model/Catalog #: CELdek - Media (Humidifying Elements) Paragraph: 6.3.c.(7)
	EQUAL PRODUCT OFFERED	Mfr: _____ Address: _____ Product Name (if any): _____ Make/Model/Catalog # _____

NO. 13	BRAND NAME SPECIFIED	Mfr: Pass & Seymour Make/Model/Catalog #: Exhaust Fan Switch Paragraph: 6.4.c.(5)(a)
	EQUAL PRODUCT OFFERED	Mfr: _____ Address: _____ Product Name (if any): _____ Make/Model/Catalog # _____

H.5 WBR 1452.211-81 EFFECTIVE DATES OF REFERENCED SPECIFICATIONS AND STANDARDS--BUREAU OF RECLAMATION (SEP 1997)

Materials, contractor design, construction work, and other requirements which are specified by reference to Federal Specifications, Federal Standards, or other standards, specifications, or codes shall be in compliance with the edition or revision date cited below.

REFERENCED SPECIFICATION OR STANDARD	TITLE	EDITION OR REVISION EFFECTIVE DATE
AASHTO M17	Mineral Filler for Bituminous Paving Mixtures	1988
AISC S335	Specification for Structural Steel Buildings Allowable Stress Design, Plastic Design	1989
A.I.S.I.	Design and Fabrication of Cold-Formed Steel Structures SG503-76	1976
AMCA	Air Movement Control Association	1996
ANSI/ASME B1.1	Unified Inch Screw Threads	1989
ANSI/ASME B1.20.1	Pipe Threads, General Purpose	1983 (Revised 1992)
ANSI C37.32	High-Voltage Air Disconnect Switches Interrupter Switches, Fault Initiating Switches, Grounding Switches, Bus supports and Accessories Control Voltage Ranges - Schedule of Preferred Ratings, Construction Guidelines and Specifications	1990 (Revised 1996)

REFERENCED SPECIFICATION OR STANDARD	TITLE	EDITION OR REVISION EFFECTIVE DATE
ANSI/IEEE C57 Collection	Collection of C57 Standards	1995
ANSI/IEEE C57.12.00	General Requirements for Liquid-Immersed Distribution, Power and Regulating Transformers	1993
ANSI C57.12.50	Distribution Transformers 1 to 500 kVA, Single-Phase; and 15 to 500 kVA, Three-Phase with High-Voltage 601-34 500 Volts, Low Voltage 120-600 Volt, Ventilated Dry-Type	1981
ANSI/IEEE C57.12.70	Terminal Markings and Connections for Distribution and Power Transformers	1978 (Revised 1993)
ANSI/IEEE C57.12.80	Terminology for Power and Distribution Transformers	1978 (Revised 1992)
ANSI/IEEE C57.12.90	Test Code for Liquid-Immersed Distribution, Power and Regulating Transformers and Guide for Short-Circuit Testing of Distribution and Power Transformers	1993
ASTM A 36	Carbon Structural Steel	1996
ASTM A-106	Seamless Carbon Steel Pipe for High-Temperature Service	1996
ASTM A-497	Steel Welded Wire Fabric, Deformed, for Concrete Reinforcement	1997
ASTM A-501	Hot-Formed Welded and Seamless Carbon Steel Structural Tubing	1993
% ASTM ~~A-525~~ **A924** % %	**General Requirements for Steel Sheets Metallic Coated by the Hot-Dip Process**	~~1991~~ **1997A**
% ASTM ~~A-526~~ **A653** % %	**Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron-Alloy Coated (Galvannealed) by the Hot-Dip Process**	~~1990~~ **1998**
ASTM A-529	High-Strength Carbon-Manganese Steel of Structural Quality	1994
ASTM A-570	Steel, Sheet and Strip, Carbon, Hot-Rolled, Structural Quality	1995
ASTM A-572	High-Strength Low-Alloy Columbium-Vanadium Structural Steel	1994

SECTION J - LIST OF ATTACHMENTS

J.1 WBR 1452.214-906 LIST OF CONTRACT DOCUMENTS--BUREAU OF RECLAMATION-- LOWER COLORADO REGION (NOV 1996)

	Attachment No.	Title	No. of Pages
	1	Specifications	137
%	2	U.S. Department of Labor Wage Determination(s)	~~28~~ **17**
	3	Bid Guarantee Form (SF-24)	2
	4	Release of Claims Form (DI-137)	1
%	5	Drawings	~~22~~ **23**

J.2 WBR 1452.214-905 APPLICABILITY OF DOCUMENTS--BUREAU OF RECLAMATION-- LOWER COLORADO REGION (NOV 1996)

The documents, exhibits, and other attachments which are identified in this Section J, apply to and are a part of this contract. In the event that any document is missing in whole or in part from this document when received, the Contracting Officer shall be notified immediately.

	RSN	Item	Reference paragraph or clause	Respon-sible code	Submittals required	No. of sets to be mailed to:*		Due date or delivery time
						CO	CE	
	C18	Pre-engineered metal building	4.1.3	CE	a. Shop drawings	0	4	Not more than 30 days following Notice to Proceed
					b. Certification of compliance	1	2	
					c. Foundation design and anchor bolt plan	0	4	
	C19	Pre-engineered metal building	4.1.3	CE	Final erection drawings and instructions	0	3	Not less than 20 days prior to beginning of erection
	C20	Air compressor	6.1.1.	CE	Manufacturer's data	0	3	Not less than 20 days prior to purchase
	C21	Rolling doors	4.1.7	CE	a, Shop drawings b. Product data c. Instalation data d. Maintenance data	0	3	Not less than 30 days prior to shipment
	C22	Evaporative coolers	6.3	CE	a. Approval drawings and data b. Final material	0	3	Not less than 20 days prior to purchase
	C23	Propeller fans	6.4	CE	a. Approval drawings and data b. Final material	0	3	Not less than 20 days prior to purchase
	C24	Packaged air-conditioning unit	6.5	CE	a. Approval drawings and data b. Final material	0	3	Not less than 20 days prior to purchase
	E1	Grounding system	5.2	CE	Test report	0	3	Not less than 15 days after completion of testing
% % %	E2	**Manually operated load-break** disconnect switch **assembly**	~~5.1.6~~ **5.3.3**	CE	Approval drawings and data	0	3	Not less than 20 days prior to purchase
% % %	E3	**Manually operated load-break** disconnect switch **assembly**	~~5.1.6~~ **5.3.3**	CE	Operation and maintenance manual and bill of materials	0	3	30 Days before start of installation of equipment
% %	E4	Load-break **fused** disconnect switch assembly	~~5.1.5~~ **5.3.2**	CE	Approval drawings and data	0	3	Not less than 20 days prior to purchase
% %	E5	Load-break **fused** disconnect switch assembly	~~5.1.5~~ **5.3.2**	CE	Operation and maintenance manual and bill of materials	0	3	30 Days before start of installation of equipment
% %	E6	**Dry-type** transformer	5.3.1	CE	Drawings, ~~and~~ data **and bills of material**	0	3	Not less than 20 days prior to purchase
%	E7	**Dry-type** transformer	5.3.1	CE	**Factory** test results	0	3	Not less than 15 days after completion of testing
% % % %	E8	Distribution panelboard**s**	5.1.4	CE	~~Drawings and data~~ **Catalog cut-sheets and manufacturer's data**	0	3	Not less than 20 days prior to purchase

	RSN	Item	Reference paragraph or clause	Respon-sible code	Submittals required	No. of sets to be mailed to:*		Due date or delivery time
						CO	CE	
% % % %	E9	Lighting panelboard	5.1.5	CE	~~Drawings and data~~ **Catalog cut-sheets and manufacturer's data**	0	3	Not less than 20 days prior to purchase
	E10	Insulated conductors	5.1.2	CE	Manufacturer's data	0	3	Not less than 20 days prior to purchase
%	E11	Insulated conductors	5.1.2	CE	~~Manufacturer's data~~ **Meggar test reports**	0	3	Not less than 15 days after completion of testing
	E12	Lighting systems	5.1.3	CE	Manufacturer's data	0	3	Not less than 20 days prior to purchase
% % % % %	**E13**	**Power Cable**	**5.4**	**CE**	**Manufacturer's data and meggar test reports**	**0**	**2**	**Within 15 days after tests are completed**
	P1	Paint	8.1.1	CE	Color samples	0	2	Not less than 20 days prior to application

*CO indicates Contracting Officer, and CE indicates Construction Engineer. For mailing addresses, see subparagraph entitled "Addresses" of paragraph entitled "Submittal Requirements."

SECTION 1.2 - MATERIALS

1.2.1. MATERIALS TO BE FURNISHED BY THE CONTRACTOR

a. General.--The Contractor shall furnish all materials required for completion of the work.

The words "material" or "materials" as used in these specifications to denote items furnished by the Contractor shall be construed to mean equipment, machinery, product, component, or any other item required to be incorporated in the work.

When a separate item which includes the furnishing of any material is provided in the schedule, the cost of furnishing, hauling, storing, and handling shall be included in the price offered for that item. When a separate item is not provided in the schedule for furnishing any material required to be furnished by the Contractor, the cost of furnishing, hauling, storing, and handling shall be included in the price offered for the work for which the material is required.

Materials furnished by the Contractor shall be of the type and quality described in these specifications. The Contractor shall make diligent effort to procure the specified materials from any and all sources, but where because of Government priorities or other causes, materials required by these specifications become unavailable, substitute materials may be used: Provided, That no substitute materials shall be used without prior written approval of the Contracting Officer, said written approval to state the amount of the adjustment, if any, to be made in favor of the Government. The Contracting Officer's determination as to whether substitution shall be permitted and as to what substitute materials may be used shall be final and conclusive. If the substitute materials approved are of less value to the Government or involve less cost to the Contractor than the materials specified, an adjustment shall be made in

Any fabrication or procurement of materials by the Contractor before approval of the drawings and data will be at the Contractor's risk.

The Government shall have the right to require the Contractor to make any changes which may be necessary in the opinion of the Government to make the finished construction conform to the requirements of these specifications without additional cost to the Government.

Approval by the Government of the Contractor's drawings and data shall not relieve the Contractor of any part of the Contractor's obligations to meet the requirements of these specifications or of the responsibility for the correctness of the Contractor's drawings and data.

One set of the drawings and data will be returned to the Contractor either approved, not approved, or conditionally approved, and also marked to indicate changes if required. Drawings and data shall be resubmitted for approval if directed.

C. Final erection drawings and instructions--At least 20 days before beginning erection of the building, the Contractor shall submit the building manufacturer's erection drawings and instructions in accordance with Paragraph 1.1.4. (Submittal Requirements) and Table 1A (List of Submittals).

4.1.4. MATERIALS

a. General.--Materials and accessories for the metal building shall be in accordance with the applicable requirements of sections 7 and 8, respectively, of the "Recommended Guide Specifications for Metal Building Systems," as contained in the MBMA "Metal Building Systems Manual" and as specified below.

b. Primary members.--Steel for hot-rolled mill shapes, plates, and bars shall be in accordance with ASTM A 36.

Hot-rolled steel sheet, plate, and strip of welded assemblies shall conform to ASTM A 529, Grade 42.

Steel tubing shall conform to ASTM A 501, Grade B.

Diagonal-rod bracing steel shall be in accordance with ASTM A 572, Grade 60. Threads shall be rolled or cut. Nuts shall be semi-finished hex-head.

Anchor bolts shall be uncoated, carbon steel in accordance with ASTM A 36.

c. Secondary members.--Members shall conform to ASTM A 570, Grade 50. Shop prime paint shall be the final finish. Minimum thickness of members shall be 16 gauge. Members shall be pre-punched for bolted field assembly.

d. Roofing and siding.--Factory insulated roof and wall panels shall be units having a modular cover width of 40" and a maximum "U" factor of 0.055 BTU/HR/SF/°E.

The wall panels shall consist of color-coated galvanized steel facings and a rigid urethane foam insulation, such that the core and facings act compositely to form a single structural unit. The "U" factor shall be determined by test in accordance with ASTM Specification C-236 with an outside temperature of 13° F and an inside temperature of 78° F. Under these conditions the minimum inside surface temperature shall be 70° F.

Galvanized steel for the exterior face of wall panels shall conform to ASTM Specification A-446 Grade A (33,000 psi yield) G-90 coating class.

Galvanized steel for the interior face of wall panels shall conform to ASTM Specification A-446 Grade A (33,000 psi yield) G-60 coating class.

The insulating core for roof and wall panels shall be closed-cell rigid polyurethane foam having a nominal density of 2 pounds per cubic foot. The foam shall have a minimum continuous service temperature of 200° F and shall exhibit a maximum volume change of 6 percent when aged for a period of 21 days at 1400E and 90% relative humidity.

Roof panels shall conform to ASTM A 446, Grade D, not less than 24-gauge thick, before
% coating. Zinc coating shall conform to ASTM ~~A 525~~ **A924**, G90.

Roofing sheets shall be of sufficient length to bridge at least 3 purlin spans plus the required end lap. Siding sheets shall extend full height as shown on the contract drawings, without horizontal joints. Roofing sheets shall extend full width from ridge to eave of the building. Roofing and siding sheets shall have concealed, semi-concealed, or exposed fasteners on exterior. Exposed fasteners shall be colored to match the roof and wall sheeting.

Panel to structural and panel to panel fasteners shall be No. 12 x 1" selfdrilling, self-tapping, hex head, steel screws with formed steel washer and an elastomeric sealing washer. Roof and wall fasteners shall be zinc plated with a clear chromatic dip post treatment. Wall fasteners shall be colored to match the wall color.

e. Mastic.--Standard mastic shall be preformed bead type meeting or exceeding Federal Specification TT-C-1796, Type II, Grade B.

4.1.5. ERECTION AND INSTALLATION

The pre-engineered metal building shall be erected according to the specifications requirements and the final approved erection drawings and instructions. The building shall be erected under the supervision of a representative of the building manufacturer. Damaged or defective materials shall not be installed. The repair of damage which is due to the operations of the Contractor shall be made by the Contractor without additional cost to the Government.

Primary and secondary framing shall be bolted-up using A325 high-strength bolts.

At roof side laps, a permanently pliable 1/4" bead of mastic shall be placed in the mastic grove of the under lapping rib in a bead of constant cross section to ensure continuous contact of

mastic with the upper and lower panels. At roof end laps, one or two beads, 1/4" each, permanently pliable mastic shall be applied.

Fasteners for roof panels shall be installed in the flat of the panel at a spacing of 1 foot on center except at end laps and terminal ends, where the spacing shall be a nominal 6 inches on center. Fasteners for wall panels shall be installed in the flat of the panel at a spacing of 1 foot on center.

Damaged or defective areas of paint or galvanizing shall be cleaned and repaired in accordance with recommendations of the building manufacturer.

Care shall be taken to ensure that all parts are installed in correct position and alinement. The building anchor bolts shall be located accurately and shall be held in correct position and alinement during placing and setting of the concrete.

Baseplates shall be leveled or aligned carefully, adjusted to correct alinement and grade with steel shims as necessary and rigidly secured in place. Spaces under the baseplates shall be filled completely with grouting mortar according to Paragraph 3.4.2. (Grouting Mortar).

The ridge, eaves, corners, and panel joints shall be closed and sealed watertight.

4.1.6. HINGED DOORS

a. General.--The Contractor shall furnish and install standard hinged doors at the locations shown on the specification drawings or approved submittal drawings. The doors shall be 3'-0" x 7'-0" *x* 1-3/4", single swing, flush panel metal doors.

b. Door and Frame.--The 3-foot 0-inch by 7-foot 0-inch hollow core steel doors shall meet the requirements of SDI-100 published by the Steel Door Institute. The door shall be grade III, model 3, galvanized steel, with flush end closure treatment at top and internal construction of polyurethane core, polystyrene core, or steel vertical stiffeners and fiberglass insulation. The frame shall be a hollow steel frame constructed of 14-gauge, minimum, galvanized steel. The doors and frames shall be bonderized and furnished with one finish coat of oven baked rust inhibiting alkyd white enamel paint meeting the manufacturer's specifications.

All door hardware shall be of standard commercial quality and the design and finish shall be subject to the approval of the Contracting Officer. Hinges shall be full mortise.

Each door shall be provided with an aluminum threshold and a prepainted white drip. The junction of the door frame and wall panels shall be made weathertight by the use of a trim and sealant. The cross section of the trim shall be subject to approval of the Contracting Officer.

c. Cost.--The cost for furnishing and installing hinged doors, including all labor and materials, shall be included in the lump sum price offered in the schedule for furnishing and erecting the pre-engineered metal building.

4.1.7. INSULATED STEEL ROLLING DOORS

a. General. -- The Contractor shall provide manually-operated insulated steel rolling doors with weatherstripping for the shop building as shown on the drawing. The insulated steel rolling doors shall be complete with hood, barrel, door curtain, guides, counterbalance assembly, manual operator assembly, weather seals, and all accessory material required for complete installation.

The steel rolling doors shall be a product of a manufacturer regularly engaged in the manufacture of insulated steel rolling doors of the type specified. The door curtain shall be inside mounted between jambs with outside face flat in appearance.

The insulated steel rolling doors shall be designed to minimize the infiltration of wind, water, sand and dust and shall be designed for a wind pressure of not less than 25 pounds per square foot. The door shall be mounted on the interior face of the wall.

b. Submittals. -- Submittals shall be in accordance with this paragraph and paragraph 1.4.3. (Submittal Requirements).

(1) Shop drawings. -- At least 30 days before shipment to the jobsite, submit shop drawings and data covering details of the insulated steel rolling doors and hardware. Show size and location of door framing and reinforcement; gages of steel, thickness and type of insulation, “R” factor of door curtain, details and location of manual operator and door hardware, details of guides and brackets, details of weatherstripping, and other details covering fabrication and installation of the doors and frames.

(2) Product data. -- Include manufacturer's catalog sheets, specifications, color charts, and information showing that material and equipment are in accordance with these specifications.

(3) Installation data. -- Submit manufacturer’s installation data.

(4) Maintenance data. -- Submit manufacturer’s maintenance data.

c. Materials. -- The insulated steel rolling doors shall be the 625 Series "Stormtite" insulated rolling door manufactured by Overhead Door Company, P.O. Box 809046, Dallas TX 75380-9046; or the “Thermal-Door” insulated rolling door manufactured by Atlas Door Corporation, 116 Truman Drive, Edison NJ 08818; or equal, having the following salient characteristics:

(1) Structural steel. -- ASTM A 36.

% (2) Sheet steel. -- ASTM ~~A 526~~ **A653** with not less than G-90 zinc coating. General
% requirements shall be In accordance with ASTM ~~A 525~~ **A924**.

The ends of conduits terminating at all boxes and panelboards shall be sealed with a sealing material or with sealing bushings to prevent air circulation and entrance of rodents through the conduits into the boxes or panelboards.

Conduit terminated at horizontal and vertical surfaces shall be stubbed two inches above the finished floor level or wall surface and shall be terminated with a coupling and a plug. The two-inch stubout and approximately 1 foot of the embedded conduit shall be wrapped with corrosion tape. The plug shall be replaced with a bushing or a Chase-type nipple before installing cable.

Unless shown otherwise, conduit to be embedded in concrete shall be rigid steel conduit. Conduit and conduit fittings to be embedded in concrete shall be held securely in position while the concrete is being placed. The ends of conduit shall be protected to prevent the entrance of concrete, sand, or other foreign material. The ends of embedded conduit shall be terminated with couplings and pipe plugs or with insulating bushings and caps.

Within 24 hours after removal of forms, conduit runs shall be swabbed with clean dry rags until thoroughly cleaned and dried. The threads of the removed plugs shall be greased, and the plugs shall be replaced and shall be left in place to prevent entrance of water or foreign material until the insulated conductors are installed. Conduit boxes shall be sealed with a rubber gasketed blank cover.

Wall penetration seals shall be furnished and installed for conduits entering the structure below grade. The seals shall be installed in accordance with the manufacturer's instructions.

Exposed conduit runs shall be straight and shall be parallel with each other and with the centerline of the room or structure. Exposed conduit shall be rigidly supported from the wall or ceiling within 3 feet of each outlet box, junction box, cabinet, or fitting and at intervals of not more than 5 feet. Installation of exposed conduit shall include, where required, drilling holes in the bottom, side, or top enclosures or plates of other electrical equipment. Exposed conduit shall be tightened securely and shall be supported rigidly in place, and connections to outdoor boxes shall be watertight. Metal conduit shall not be welded to structural steel or conduit supports.

Metal conduit buried directly in earth shall be plastic-coated conduit. Joints shall be watertight and shall be coated or covered in accordance with manufacturer's instructions. Plastic-coated conduit shall be securely tightened with a plumbers-type strap wrench. Damaged portions of the protective coat shall be repaired or covered in accordance with the manufacturer's instructions. Where buried conduit is to connect to embedded conduit or is to extend above ground, the bonded covering shall extend at least 3 inches into concrete or above the ground surface. Solvent shall be used when installing fittings and couplings to permanently bond the sleeves to the plastic coating of the conduit.

Bending of plastic-coated conduit shall be in accordance with the manufacturer's recommendations. If the manufacturer warns of possible damage to the conduit or the plastic coating when bending larger sizes, factory bends shall be used.

Buried electrical conduit shall be buried at a depth of 24 inches. All buried electrical conduit shall have 2 inches of sand or fine earth placed around each conduit. The remaining portions of the trenches shall be backfilled and compacted as required to protect the conduit.

d. Cost.--Cost for furnishing and installing the various types and sizes of electrical conduit shall be included in the lump sum price offered in the schedule for furnishing and installing the electrical system.

5.1.2. INSULATED CONDUCTORS, 600 VOLTS OR LESS

a. General.--The Contractor shall furnish and install insulated conductors, 600 volts or less, in accordance with this paragraph and as shown on the drawings.

(1) Exceptions.--The insulated conductors, 600 volts or less, paragraph does not include the material requirements for the following cable and wire, which are provided for elsewhere in these specifications as indicated; however, the wire and cable listed below shall be installed in accordance with the applicable requirements of this paragraph.

(a) Luminaire wire.--Paragraph 5.1.3.c.(6).

(2) Definitions.--For the purposes of this paragraph, the following definitions shall apply:

(a) Cable.--Cable, cables, wire, or wires of one or more insulated conductors.

(b) Power cable.--Cable that is used for power loads including receptacle outlets; motors; alternating- and direct-current distribution circuits; heating, ventilating, air-conditioning and lighting circuits; and cable that is used for controlling heating, ventilating, air-conditioning, and lighting equipment.

(c) Indoor cable.--Cable with its entire length indoors.

b. Submittals.--Submittals shall be in accordance with this subparagraph, and paragraph 1.1.4. (Submittal Requirements).

The Contractor shall submit the data listed below.

(1) Manufacturer's data.

% (2) Meggar test reports. **Refer to Section 5.4.f.**

(cc) Voltage rating.--The voltage rating shall be 120/277 volts, alternating current.

(dd) Current rating.--The current rating shall be 20 amperes.

(9) 120 volt indoor and outdoor convience receptacles.--

(a) Manufacturer.--The receptacles shall be as manufactured by Pass & Seymour, Syracuse NY 13221; Hubbell Inc., Bridgeport CT 06605; Challenger Circle F Inc., PO Box 591, Trenton NJ 08604; or equal, having the following salient characteristics:

(aa) Description.--The receptacles shall be NEMA WD 1, heavy-duty, general use, duplex receptacles.

(bb) Wiring terminals.--The terminals for wiring shall be of the screw type only for No. 10 wire maximum.

(cc) Device body.--The body shall be of the ivory, impact resistant, plastic type.

(dd) Configuration.--The configuration shall be NEMA WD 6 type as specified and as shown on the drawings.

(ee) Convenience receptacle.--The convenience receptacle shall be a duplex, NEMA Type 5-20R.

(10) 240 volt receptacles.--

(a) Manufacturer.--The receptacles shall be as manufactured by Pass & Seymour, Syracuse NY 13221; Hubbell Inc., Bridgeport CT 06605; Challenger Circle F, Inc., P.O. Box 591, Trenton NJ 08604; or equal, having the following salient characteristics:

(aa) Description.--The receptacles shall be straight-blade type, heavy-duty, general use, duplex receptacles.

(bb) Wiring terminals.--The terminals for wiring shall be of the screw type only for No. 6 wire maximum.

(cc) Device body.--The body shall be of the ivory, impact resistant, plastic type.

(dd) Configuration.--The configuration shall be NEMA 6 type as specified and as shown on the drawings.

(ee) Convenience receptacle.--The convenience receptacle shall be a duplex, NEMA Type 6-20, 6-30, and 6-50.

(11) Coverplates.--

(a) Manufacturer.--The coverplates shall be as manufactured by Pass & Seymour, Syracuse NY 13221; Hubbell Inc., Bridgeport CT 06605; Challenger Circle Inc., P.O. Box 591, Trenton NJ 08604; or equal, having the following salient characteristics for each type required:

(aa) Single-gang coverplates.--The single-gang coverplates shall be stainless steel, type 302 and shall be 0.040 inch thick with satin finish.

(bb) Weatherproof duplex receptacle coverplates.--The weatherproof duplex receptacle coverplates shall be specification grade cast aluminum coverplates. The coverplate shall have two single spring-loaded covers, each of which close when the plug is removed. The coverplate shall be mounted in the vertical position and still maintain its weatherproof capability.

(12) Miscellaneous materials.--For materials shown on the drawings but not covered herein by detailed specifications, the Contractor shall furnish standard commercial grades of materials that are satisfactory to the Contracting Officer.

d. Installation.--The lighting systems shall be installed in accordance with this subparagraph, the applicable requirements of paragraph 5.1.1, Electrical conduit Systems, and in the locations shown on the drawings.

e. Cost.--Cost for furnishing and installing the lighting system and making electrical connections to the lighting systems will be made at the lump sum price for furnishing and installing electrical system in the schedule, which price shall include the cost of all labor and materials required by this paragraph, except grounding.

% 5.1.4. DISTRIBUTION PANELBOARD**S (L4 and L6)**

% a. General. - The Contractor shall furnish and install ~~a~~ **two** 480-volt distribution panelboard**s** in
% the location shown on drawing No. 3 (45-301-6575) **and drawing No. 2 (45-301-6574)**.

% The panelboard**s** shall be in accordance with NEMA publication No. PB1, Federal Specification W-P-115A, and as specified.

% The panelboard**s** shall be factory assembled and completely installed, connected, and made
% ready for normal operation. The panelboard**s** shall be rigid, self-supporting, dead-front, indoor, dustproof type for surface mounting.

% The panelboard**s** shall be the air circuit breaker type with incoming main circuit breakers.

% The panelboard**s** shall be of the sectional type with interchangeable units, permitting the substitution of breakers of larger rating.

% The panelboard**s** will be complete with enclosures, air circuit breakers (bolt-on), terminal blocks, nameplates, mounting materials, and all other required accessories.

Except where indicated on the drawings, the Contractor shall determine the rating of the air circuit breaker thermal protective devices in accordance with equipment requirements and the requirements of NEC, 1996. Also, the Government reserves the right to change the ampere ratings of the thermal protective devices, within the same price group for any breaker, at the time the drawings are submitted for information. Breaker frame sizes shall be as shown on the drawings. Spare breakers shall be furnished as shown on the drawings.

Panelboard schematic diagrams are shown on drawings No. 6 (45-301-6578).

b. Materials. -

% (1) Enclosures. - The enclosure**s** shall have welded joints and shall be galvanized after
% fabrication. The steel construction of the enclosure**s** shall meet one of the following requirements:

(a) Enclosures with a maximum dimension less than 20 inches shall be constructed of sheet steel not lighter than No. 16 United States Standard gauge.

(b) Enclosures with a maximum dimension more than 20 inches shall be constructed of sheet steel not lighter than No. 20 United States Standard gauge.

Enclosed doors shall be furnished with latch and lock. The locks shall be keyed alike, and two keys shall be furnished for each door.

(2) Air circuit breakers (bolt-on). - The circuit breakers shall be in accordance with NEMA publication No. AB1 and Federal Specification WC-375A.

Each air circuit breaker shall be trip free and shall be furnished with thermal instantaneous overload trip devices. The circuit breakers for 480-volt service shall have an interrupting rating of not less than 18,000 symmetrical amperes minimum.

The circuit breakers shall be single, 2, or 3 pole, as required, and shall be furnished to supply power for the services as indicated on drawing No. 5 (45-301-6577) and drawing No. 6 (45-301-6578).

(3) Terminal blocks. -

(a) Heavy-duty terminal blocks with barriers shall be furnished and installed for external supply cables.

(b) Terminal blocks for control wiring shall be rated at least 600 volts and 25 amperes, shall be suitable for use with No. 8 AWG wire, shall be molded-block type to accommodate ring lugs 1/2 inch wide (outer diameter) at the terminal screws, shall be furnished with binding-head or washer-head screws having serrated or grooved contact surfaces or having lockwashers, and shall be furnished with molded insulating barriers between terminals. Each terminal block shall have a removable marking strip and cover.

Examples of terminal blocks meeting the above requirements are:

Buchanan catalog No. B104T through B112T Marathon catalog Nos. 1604116 through 1612116 General Electric Co., type EB-25.

(c) Terminal block arrangement and location shall be such that coming and outgoing cables can be supported. Adjacent rows of terminal blocks shall be separated at least 6 inches edge to edge and at least 6 inches from sides, top, or bottom of the cabinet.

(d) Approximately 25 percent spare terminals shall be provided on each terminal block for terminating spare conductors in each control cable and for possible future use.

(e) Marking strips shall be provided for terminal blocks with conductor designations engraved or printed with a permanent marking fluid. One spare blank marking strip shall be furnished with each terminal block.

(4) Accessory options. --

(a) Interior busbar shall be copper bus with required rating for this 480 volt distribution panel board.

(b) Equipment ground shall be copper, box bonded.

(5) Conductor identifying markers. - Conductors shall be tagged near each terminal to identify them with their respective studs or terminals, and the identifying markers shall be W. H. Brady Co., No. B-500 vinyl-cloth with a silicone plastic overcoating; or equal.

(6) Nameplates. - A nameplate shall be mounted on the front of each panelboard. The nameplate material, type B, and engraving shall be in accordance with drawing No. 18 (40-D-6234). The nameplate shall read: “Panel L4 480 VAC distribution.”

% c. Installation. - The Contractor shall install the panelboard**s** at the location**s** indicated on the drawings. Electrical equipment shall be installed in proper position and shall be completely
% wired and ready for operation. All cables shall enter the panelboard**s** through conduits.

% d. Painting. - The panelboard**s** shall be painted in accordance with Division 8 (Painting).

e. Submittals. - Submittals shall be in accordance with this paragraph and paragraph 1.1.4 (Submittal Requirements). The Contractor shall submit the following documentation:

% (1) Catalog cut-sheets for the 480 VAC distribution panelboard**s** and corresponding
% breaker**s**.

(2) Data which includes wiring diagrams, details on internal components (rating, interrupting capability, panel amps, and voltage), and dimensions of each device

% f. Cost.--Cost for furnishing and installing panelboard**s** shall be included in the lump sum price offered in the schedule for furnishing and installing the electrical system.

5.1.5. LIGHTING PANELBOARD

a. General. - The Contractor shall furnish and install a 120/240-volt lighting panelboard in the location shown on drawing No. 3 (45-301-6575).

The panelboard shall be in accordance with NEMA publication No. PB1, Federal Specification W-P-115A, and as specified.

The panelboard shall be factory assembled and completely installed, connected, and made ready for normal operation. The panelboard shall be rigid, self-supporting, indoor, dustproof type for surface mounting.

The panelboard shall be the air circuit breaker type with incoming main lugs.

The panelboard shall be of the sectional type with interchangeable units permitting the substitution of breakers of larger ratings.

The panelboard will be complete with enclosures, air circuit breakers (bolt-on), terminal blocks, nameplates, mounting materials, and all other required accessories.

Except where indicated on the drawings, the Contractor shall determine the rating of the air circuit breaker thermal protective devices in accordance with equipment requirements and the requirements of NEC, 1996. Also, the Government reserves the right to change the ampere ratings of the thermal protective devices, within the same price group for any breaker, at the time the drawings are submitted for information. Breaker frame sizes shall be as shown on the drawings. Spare breakers shall be furnished as shown on the drawings.

Panelboard schematic diagrams are shown on drawing No. 6 (45-301-6578).

b. Materials. -

(1) Enclosures. - The enclosure shall have welded joints and shall be galvanized after fabrication. The steel construction of the enclosure shall meet one of the following requirements:

(a) Enclosures with a maximum dimension less than 20 inches shall be constructed of sheet steel not lighter than No. 16 United States Standard gauge.

(b) Enclosures with a maximum dimension more than 20 inches shall be constructed of sheet steel not lighter than No. 20 United States Standard gauge.

Enclosed doors shall be furnished with latch and lock. The locks shall be keyed alike, and two keys shall be furnished for each door.

(2) Air circuit breakers (bolt-on). - The circuit breakers shall be in accordance with NEMA publication No. AB1 and Federal Specification WC-375A.

Each air circuit breaker shall be trip free and shall be furnished with thermal instantaneous overload trip devices. The circuit breakers for 120 - and 240 -volt service shall have an interrupting rating of not less than 10,000 symmetrical amperes.

The circuit breakers shall be single or 2-pole as required, and shall be furnished to supply power for the services as indicated on drawing No. 5 (45-301-6577) and drawing No. 6 (45-301-6578).

(3) Terminal blocks. -

(a) Heavy-duty terminal blocks with barriers shall be furnished and installed for external supply cables.

(b) Terminal blocks for control wiring shall be rated at least 600 volts and 25 amperes, shall be suitable for use with No. 8 AWG wire, shall be molded-block type to accommodate ring lugs 1/2 inch wide (outer diameter) at the terminal screws, shall be furnished with binding-head or washer-head screws having serrated or grooved contact surfaces or having lockwashers, and shall be furnished with molded insulating barriers between terminals. Each terminal block shall have a removable marking strip and cover.

Examples of terminal blocks meeting the above requirements are:

Buchanan catalog No. B104T through B112T Marathon catalog Nos. 1604116 through 1612116 General Electric Co., type EB-25.

(c) Terminal block arrangement and location shall be such that coming and outgoing cables can be supported. Adjacent rows of terminal blocks shall be

separated at least 6 inches edge to edge and at least 6 inches from sides, top, or bottom of the cabinet.

(d) Approximately 25 percent spare terminals shall be provided on each terminal block for terminating spare conductors in each control cable and for possible future use.

(e) Marking strips shall be provided for terminal blocks with conductor designations engraved or printed with a permanent marking fluid. One spare blank marking strip shall be furnished with each terminal block.

(4) Accessory options. --

(a) One interior busbar shall be copper bus 1000 amperes psi.

(b) Equipment ground shall be copper, box bonded.

(5) Conductor identifying markers. - Conductors shall be tagged near each terminal to identify them with their respective studs or terminals, and the identifying markers shall be W. H. Brady Co., No. B-500 vinyl-cloth with a silicone plastic overcoating; or equal, having the following salient characteristics:

(a) Identifying wire markers shall be self-adhesive, vinyl-coated cloth.

(6) Nameplates. - A nameplate shall be mounted on the front of each panelboard. The nameplate material, type B, and engraving shall be in accordance with drawing No. 18 (40-D-6234). The name plate shall read: “Panel L5 120/240 VAC Distribution.”

c. Installation. - The Contractor shall install the panelboard at the location indicated on the drawings. Electrical equipment shall be installed in proper position and shall be completely wired and ready for operation. All cables shall enter the panelboard through conduits.

d. Painting. - The panelboard shall be painted in accordance with Division 8 (Painting).

e. Submittals. - Submittals shall be in accordance with this paragraph and paragraph 1.1.4 (Submittal Requirements). The Contractor shall submit the following documentation:

(1) Catalog cut-sheets for the lighting panelboard and corresponding breaker.

(2) Data which includes wiring diagrams, details on internal components (rating, interrupting capability, panel amps, and voltage), and dimensions of each device.

% f. Cost.--Cost for furnishing and installing panelboard**s** shall be included in the lump sum price offered in the schedule for furnishing and installing the electrical system.

5.1.6. PAYMENT

Payment for furnishing and installing the electrical system shall be made at the lump sum price offered therefor in the schedule, which price shall include the cost of all labor, materials, equipment and incidentals, required for complete installation of the electrical system as shown on the drawings and herein specified.

SECTION 5.2 - GROUNDING SYSTEM

a. General. - The Contractor shall furnish and install all materials required for the complete % grounding system for the **new** carpentry/sandblast shop**, existing long-term storage building** % **- transformer (T6) foundation** and to connect to the existing grounding system in accordance with NEC, 1996, this paragraph, and the drawings.

b. Submittals. - Submittals shall be in accordance with this paragraph and paragraph 1.1.4 (Submittal Requirements). The Contractor shall submit the following documentation:

(1) Test reports shall be submitted within 15 days after completion of the testing required % by subparagraph ~~G~~ **g**. below.

c. Materials. -

(1) Ground cables. -

(a) Copper cables. - The copper cables shall be annealed bare-copper cable, concentric stranded, in accordance with ASTM B 8, class B. The solid wires used in forming the copper cables shall be in accordance with ASTM B 3.

(b) Copper-covered steel cable. - The copper-covered steel cable shall be in accordance with ASTM B 228, 9/16 inch (seven No. 5 AWG), grade 40 HS.

(2) Cable connectors. - Cable connectors shall be of the welded, bolted solderless, or compression type and shall have a current-carrying capacity equal to the cable with which they are to be used. All connectors for ground cables, including fittings, lugs, bolts, nuts, and washers, shall be a copper alloy containing not more than 4 percent zinc. All bolted solderless or compression-type connectors shall meet the requirements of IEEE standard No. 837. Ground connectors that will be buried underground or embedded in concrete shall be listed for direct burial use in accordance with the requirements of UL standard No. 467.

(3) Welding. - All welding shall be performed using Cadweld, Thermoweld, or an equivalent exothermic process. All molds and weld metal shall be from fresh stock and shall be from the same manufacturer. The weld metal and starting material shall contain no significant quantities of hazardous ingredients.

d. Installation. - All equipment, metal conduit, steel structures, shall be connected to the % grounding system as shown on drawings No. 5 (45-301-6577) **and No. 2 (45-301-6574)**.

Equipment and/or miscellaneous metalwork that is required to be grounded, but is not shown on the drawings, shall be connected to the grounding system with a No. 4 AWG ground cable.

e. Connections. -- The Contractor shall make all ground connections between the equipment and the miscellaneous metalwork, and the ground plates of the grounding system whether or not such grounding connections are shown on the drawings. The number of grounding connections for equipment shall be one. Paint, enamel, scale, oil, grease, or other foreign nonconductive material shall be removed from the point of contact on metal surfaces before ground connections are made. After the connections are made, paint or galvanizing on the metal finishes that is damaged or removed as a result of the connections, shall be repaired in accordance with Division 8 (Painting).

Connections of ground cable risers to above-ground equipment shall be fastened above the base plates. The ground cable risers shall be secured to the structures as shown on the drawings.

Ground connections that will be buried underground or embedded in concrete shall be made utilizing an exothermic process. All connections shall be performed in accordance with manufacturer's instructions.

f. Damaged ground cable. - Existing ground cables, shown on drawing No. 2 (45-301-6574) are shown only in approximate location, and caution should be used in excavating near existing ground cables. The Contractor shall repair all ground cable damaged during construction to the satisfaction of the Contracting Officer at no additional cost to the Government.

g. Testing. - The resistance of the interconnected carpentry/sandblast shop, transformer T5, % **transformer T6** and the existing warehouse area ground mat to ground shall be measured no sooner than 30 days after completion of the substructure concrete pouring. The resistance shall be measured by the Contractor using the fall of potential method described in section 8.2.1.5 of IEEE standard No. 81, dated May 1983, using a Megger Ground Tester of the heavy-duty, low-resistance type with direct-reading, direct-current ohmmeter as described in bulletin No. 25 and any one of bulletins Nos. 25J, 25J-2, and 25T, all by James G. Biddle Co.; or equal.

When performing the test, the initial distance between the remote current electrode and the ground mat under test shall be a distance of at least six times the longest diagonal dimension of the ground mat being measured, and the distance between the potential electrode and the mat shall be a distance of at least four times the longest diagonal dimension of the mat. These distances should provide a starting point outside the area of influence of the ground mat to begin taking test measurements. The potential electrode shall be located as nearly as possible in an opposite direction from the current electrode during testing. The exact locations of the electrodes for subsequent measurements shall be determined by the Contractor in order to obtain results that reflect the actual resistance of the ground mat. The Contractor shall notify the Contracting Officer at least 24 hours in advance of the time the test is to be performed in order that the test may be witnessed by a representative of the Contracting Officer.

g. Payment. -- Payment for the complete electrical ground system will be made at the lump-sum price offered therefor in the schedule, which price shall include the cost of furnishing and installing all materials and testing.

SECTION 5.3 - TRANSFORMERS

5.3.1. DRY-TYPE TRANSFORMERS

a. General. - The Contractor shall furnish and install one 3 phase, 500 kilovolt ampere, 2400/480 volt dry-type pad-mounted transformers (designated T5) and one single phase 100 kilovolt ampere, 120/240 volt dry-type pad-mounted transformer (designated T4) in accordance with this paragraph and where shown on the drawings.

Except as specified, characteristics, definitions, terminology, voltage designations, and tests shall be in accordance with the following ANSI Requirements, Terminology, and Test Code for Distribution, Power, and Regulating Transformers:

(1) General Requirements, C57.12.00.

(2) Terminal Markings and Connections, C57.12.70.

(3) Terminology, C57.12.80.

(4) Test Code, C57.12.90.

b. Submittals. - Submittals shall be in accordance with this paragraph, paragraph 1.1.4 (Submittal Requirements). The Contractor shall be responsible for the accuracy of all submittals.

The Contractor shall submit, for approval:

(1) Equipment layout drawings, manufacturer's data, and bills of material for each item or component of equipment.

(2) Results of factory testing required by subparagraph e. below.

c. Materials. -

(1) Transformer T5 shall have the following ratings and features:

Type.....3 phase, 60 hertz
outdoor, dry-type

Capacity.....500 kVA

High-voltage rating.....2400 volt delta connected

Low-voltage rating.....480/277 volts grounded wye

Basic impulse insulation level.....30 kilovolts (high side)
1.2 Kv (low side)

Taps, rated kilovolt ampere capacity.. ±2 1/2 %, ±5%, -7 1/2%, -10%

Impedance.....6.5 percent

Temperature rise..... 150°C

The transformers shall be capable of operating at specified loading and temperature rises when installed in the following ambient temperatures:

Average ambient temperature for 24 hours .....185°C insulation class

(2) Transformer T4 shall have the following ratings and features:

Type.....1 phase, 60 hertz
outdoor, dry-type

Capacity.....100 kVA

High-voltage rating.....240/480 volt

Low-voltage rating.....120/240

Basic impulse insulation level.....1.2 kilovolts (high side)

Taps, rated kilovolt ampere capacity.. ±2 1/2 %, ±5%, -7 1/2%, -10%

Impedance.....5.2 percent

Temperature rise.....150°C

The transformer shall be capable of operating at specified loading and temperature rises when installed in the following ambient temperatures:

Average ambient temperature for 24 hours 185 °C insulation class

(3) The transformers shall be provided with those accessories specified in ANSI C57.12.01 and C57.12.50.

(4) Transformer T5 shall consist of high and low-voltage cable terminating compartments. There shall be no exposed screws, bolts, or other fastening devices which are externally removable, nor shall there be openings through which foreign objects such as sticks, rods, or wires might contact live parts. Compartment doors shall be provided with means of padlocking. Construction shall limit entry of water (other than floodwater) into compartment to prevent impairment of operation of transformer. The enclosure shall be dry-type, NEMA dR outdoor, general purpose, pad-mounted.

(5) Transformer T5 shall have Incoming and outgoing terminal compartments with hinged doors with provisions for latching in open position and shall be located side by side separated by steel barrier with incoming compartment on the left. High-voltage (incoming) compartment shall be accessible only after door to low-voltage (outgoing) compartment has been opened. To facilitate making connections and permit cable pulling, doors and compartment hood shall be removable. Removable doorsill on compartments shall be provided to permit rolling or skidding of unit into place over conduit studs in foundation.

(6) Transformer T5 primary load-break fused disconnect switch assembly. -- Paragraph 5.3.2.

(7) Transformer T5 secondary manually operated load-break disconnect switch. -- Paragraph 5.3.3.

(8) Grounding. - Grounding shall be in accordance with Section 5.2 (Grounding), and as shown on the drawings. There shall be provisions for grounding in both high- and
% low-voltage compartments in transformer T5 as well as in transformer**s** T4 **and T6**. The contractor shall provide solderless, clamp-type lugs or terminals for connecting to ground cables.

(9) Special tools and accessories required for installation, normal operation, and maintenance of equipment shall be furnished by the Contractor.

(10) Nameplates. - A nameplate shall be mounted on the front of each transformer. The nameplate material, type B, and engraving shall be in accordance with drawing No. 18 (40-D-6234).

% **(11) Transformer T6 shall have the following ratings and features:**
%
% **Type.....1 phase, 60 hertz**
% **outdoor, dry-type**
%
% **Capacity.....50 kVA**
%
% **High-voltage rating.....480 volt**

% **Low-voltage rating.....120/240**
%
% **Basic impulse insulation level.....1.2 kilovolts (high side)**
%
% **Taps, rated kilovolt ampere capacity.. ±2 1/2 %, ±5%, -7 1/2%, -10%**
%
% **Impedance.....5.2 percent**
%
% **Temperature rise..... 150°C**
%
% **The transformer shall be capable of operating at specified loading and**
% **temperature rises when installed in the following ambient temperatures:**
%
% **Average ambient temperature for 24 hours 185 °C insulation class**

d. Installation. - The transformers shall be installed in the locations shown on the drawings.

e. Testing. - The transformers shall receive factory tests described in ANSI C57.12.90, except no-load-loss and exciting-current tests will not be required.

f. Painting. - The transformers shall be painted in accordance with Section 8.1 (Painting).

g. Cost. - Cost for furnishing and installing two dry-type pad-mounted transformers shall be included in the lump-sum price offered therefor in the schedule for furnishing and installing power cable and transformers.

SECTION 5.4 - FURNISHING AND INSTALLING POWER CABLE

5.4.1. FURNISHING AND INSTALLING POWER CABLE

a. General. -- The Contractor shall furnish all materials and equipment necessary for
% installing power cable between the **new** carpentry/sandblast shop**, existing long-term storage**
% **building** and the switchyard relay house in accordance with these paragraphs and as shown on the drawings.

This work includes:

% (1) Furnishing and installing power cable, in 4" conduit, between **480 v panelboard L4,**
% **480V panelboard L6** ~~transformer T4~~ and transformer T5.

(2) Modifying the existing conduit in the warehouse yard as shown on drawing No. 2 (45-301-6574).

(2) Furnishing and installing power cable in the existing conduit between transformer T5 and the switchyard relay house.

(3) Core drilling one hole in the wall of the existing relay house.

% (4) Making final connections of the power cable **and corresponding conduit** to **the**
% **480V panelboard L4, transformer T4, 120/240V panelboard L5, 480V panelboard L6,**
% **transformer T6, existing 120/240V panelboard and** transformer~~s T4 and~~ T5, shown on drawing No. 2 (45-301-6574) and drawing No. 3 (45-301-6575), to the bus bar in the existing switchyard relay house, shown on drawing No. 12 (45-D-8494) and to the 480-volt distribution panel.

b. Materials. -- The materials for installing power cable shall conform to the following requirements:

% (1) Power cable. -- Transformer **T4** to 120/240 volt distribution panel **L5,** ~~and~~ 480 volt
% distribution panel **L4 to** Transformer T5 **and 480 volt distribution panel L6 to**
% **Transformer T5**:

(a) Single-conductor, nonshielded type, minimum conductor size shall be 350 MCM copper.

(b) UL listed and shall bear the UL-type label on the outer surface in accordance with NEC, 1996.

% (2) Power cable. -- 480 volt distribution panel **L4** to Transformer T4:

(a) Single-conductor, nonshielded type, minimum conductor size shall be 2/0 AWG copper.

(b) UL listed and shall bear the UL-type label on the outer surface in accordance with NEC, 1996.

(3) Power cable. -- Transformer T5 to relay house

(a) Single- conductor, nonshielded type, minimum conductor size shall be 3/0 AWG copper with concentric ground, 15 kv insulated.

(b) UL listed and shall bear the UL-type label on the outer surface per NEC, 1996.

(4) Conduit. -- Paragraph 5.1.1.

(5) Dry-type transformers. -- Paragraph 5.3.1.

% **(6) Power cable. -- 480 volt distribution panel L6 to Transformer T6:**
%
% **(a) Single-conductor, nonshielded type, minimum conductor size shall be**
% **3 AWG copper.**
%
% **(b) UL listed and shall bear the UL-type label on the outer surface in**
% **accordance with NEC, 1996.**
%
% **(7) Power cable. -- Existing 120/240 volt distribution panel to Transformer T6:**
%
% **(a) Single-conductor, nonshielded type, minimum conductor size shall be**
% **3 AWG copper.**
%
% **(b) UL listed and shall bear the UL-type label on the outer surface in**
% **accordance with NEC, 1996.**

c. Installation. -- The power cable shall be installed as shown on the drawings and in accordance with the applicable requirements of the NEC, 1996 and NFPA-101, 1997.

Making electrical connections shall include furnishing all materials to make the connections and shall be made in accordance with the following:

(1) Clean the contact surfaces immediately prior to making the connection to remove dirt deposits and any old joint compound.

(a) Prepare tinned contact surfaces by rubbing with fine steel wool.

(b) Prepare untinned contact surfaces by cleaning to bright metal with emery cloth. Remove nicks and ridges by filling. Wipe off all copper particles.

(2) Coat the contact surfaces with a “nongrit” joint compound such as NO-OX-ID “A-Special.”

(3) Do not abrade the copper contact surfaces through the joint compound.

(4) Bolt the bus connection in accordance with the following:

(a) Lubricate bolts with a nongrit joint compound such as NO-OX-ID or Alcoa No. 2 EJC.

(b) Torque all bolts in accordance with manufacturer's instruction.

(c) Remove excess joint compound expect a small bead around the joint to prevent entrance of moisture and dirt.

d. Core Drilling.-- The contractor shall core drill one hole in the existing reinforced concrete wall of the relay house as indicated on specification drawing No. 11 (45-D-8494). The core hole shall be larger in diameter than the outside diameter of the 4" conduit to be installed. Core drilling shall be the only acceptable method for cutting through the wall for installation of conduit. Upon completion of the hole, the Contractor shall thoroughly clean up all cuttings or other waste materials resulting from the core drilling operations in accordance Paragraph 1.5.6 (Cleanup and Disposal of Waste Materials). If drilling water is used, surfaces of concrete to remain exposed shall be cleaned immediately so as to prevent discoloration of the concrete by the drilling water and cuttings. The Contractor shall take all necessary precautions required to contain drilling fluids and prevent them from leaking to lower floors or otherwise becoming a nuisance or hazard

e. Fire Retardant Sealant.-- Where the conduit is installed through the existing concrete wall, the Contractor shall seal the annular space between the conduit and the perimeter of the core hole with fire retardant sealant. The sealant shall be placed in accordance with manufacturer's instructions.

% **f. Testing. -- The Contractor shall perform megger tests on each power cable**
% **conductor per Section 5.4.b, insulated conductors in section 5.1.2 and specification**
% **drawing number No. 6 (45-301-6578).**
%
% **g. Submittals. -- Submittals shall be in accordance with this subparagraph, and**
% **paragraph 1.1.4. (Submittal Requirements).**
%
% **The Contractor shall submit the data listed below.**
%
% **(1) Manufacturer's data for each type/size power cable and fire retardant sealant.**
%
% **(2) Meggar test reports.**

% ~~g~~ **h**. Cost. -- The cost for furnishing all materials, installing cable, core drilling, installing sealant, and making all power connections for the power cable will be made at the applicable lump sum price for furnishing and installing power cable and transformers.

5.4.2. PAYMENT

Payment for furnishing and installing power cable and transformers shall be included in the lump sum price offered therefor in the schedule, which price shall include the cost of all labor, materials, equipment and incidentals, required for complete installation of the power cable and transformers, as shown on the drawings and herein specified.

Sheet No.	Drawing No.	Drawing Title
10	45-D-8417	Boulder Switchyard - Concrete Structure City of Los Angeles Relay House Equipment Arrangement - Conduit Installation
11	45-D-8494	Hoover Switchyard - Electrical Installation City of Los Angeles Relay House Section Showing Conduit Installation in Basement
12	45-D-10135	Hoover Switchyard - Electrical Installation 2300 volt Wiring Diagram
13	40-D-6263	General Notes and Minimum Requirements for Detailing Reinforcement
14	40-D-4334	Electrical Installation Typical Grounding Details
15	40-D-4335	Electrical Installation Typical Grounding Details
16	40-D-5370	Buried Insulated Cables Typical Details
17	40-D-4753	Electrical Installation Grounding Details
18	40-D-2567	Standard Nameplates
19	001	As built of Underground Facility
20	002	As built of Underground Facility
21	Details of 001	As built of Underground Facility
22	Details of 002	As built of Underground Facility
23	**DC94-1260-1 (Rev. B)**	**General Arrangement of Ducon Standard Uni-Pulse Filter**