FILE FOLDER

DESCRIPTION ON TAB:

Heat'g Plant 1700

☒ **Outside/inside of actual folder did not contain hand written information**

☐ **Outside/inside of actual folder did contain hand written information**
***Scanned as next image**

Confidential Records Management, Inc.
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ELK ELECTRIC, INC.

ELECTRICAL CONTRACTORS, INDUSTRIAL AND COMMERCIAL
SPECIALIZING IN
POWER, CONTROL AND AUTOMATION

RALEIGH, N.C.

TELEPHONE
AREA CODE 919
787-3933

P.O. BOX 6501
RALEIGH, N.C.
27628

July 24, 1980

Mr. Ken Bearnes
Design Division
P. W. Department
Building 1005
Camp Lejeune, N. C.

Ref: Building 1700
1942 Control Drawings
My letter to you July 15, 1980

Dear Mr. Bearnes,

I am delightful to have stumbled on to the 1942 prints I told you I thought we had.

Attached is a photostat of each sheet. Also a sketch of the low water cut off typical for each of 4 boilers.

Best wishes,

Joe Ellen

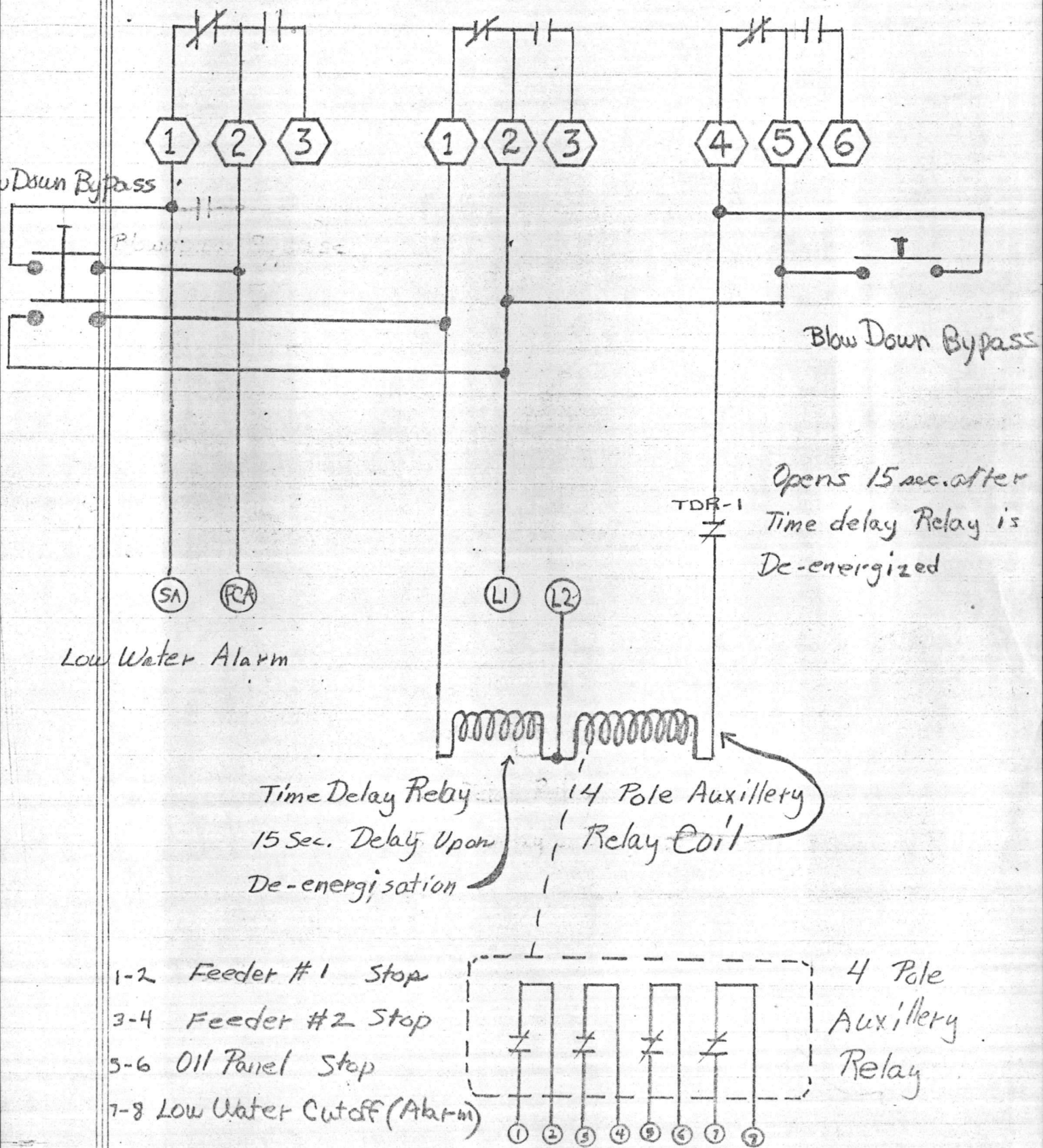
Joe R. Ellen Jr.
Elk Electric, Inc.

JRE/db

BUILDING 1700, CAMP LEJEUNE, NC. APR 24, 73

TYPICAL FOR EACH BOILER

Low Water Cutoff Circuit



505A720-SH1

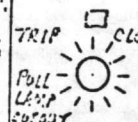
SUB	11 EP17534 SH1 REDRAWN 9-15-66 WERE REDRAWN W/O FOREIGN W.O. 6-2-67 additions	12 EP17707 SH1? WAS NOT ON 8-31-67 additions	13 EP17833 SH20 WAS NOT ON 3-28-68 additions	14 EP18189 SH15 ITEM 141 SUB WAS 505A720G01 7-14-70 additions	15 EP19491 SH1 WAS NOT ON 10-72 additions	16 EP20555 SH22 WAS NOT ON 2-72 additions

WESTINGHOUSE ELECTRIC CORPORATION | SWITCHGEAR | EAST PITTSBURGH PA, U

DWG. 505A720-SH1 SUB 12 N 13 N 15 16 | TYPE W-2 SWITCH

S# 505A720G01 = ASS'D ITEMS 1 to 3-6 | S# 505A720A01 = ITS. 3-6

CIRCUIT BREAKER CONTROL

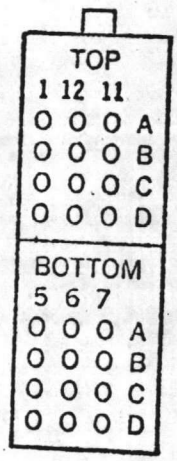


NP MAY VARY WITH APPLICATION (FOR 505A720 G01, EMI - K60 505A720-1 FOR STOCK P/

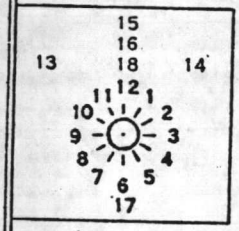
STAGE: 2 HANDLE SHAPE: Pistol
CONTACTS: MOMENTARY - MAINTAINED
HANDLE TYPE: FIXED - REMOVABLE KEY
MOUNTING: 1/8 - 1/4 - 3/8
TARGET: YES - NO
STAGE CONTACTS: 6-12
OUTLINE: 677C776 Line2-11Fig2

ASSD ITEM	DESCRIPTION	STORE ROOM	STYLE NO.	QUAN. 1 UNIT	ROUTING	DUE	LC
X 1	SWITCH EMIK55		505A620G01	1			
2	HANDLE	632	310C624H02	1			
Y 3	NAMEPLATE	632	677C525H03	1			
4	CONNECTOR						
5							
6	PRINT OF DWG.		505A720-SH1	1			
	.164-32 HEX B. NUT (FIN. 24AA00)						

CONTACT	SWITCH POSITION TABULATION							
	Pull	T	aft	C				
A11-B11	X	X						
A12-B12			X					
A1 - B1				X				
A5 - B5	X	X						
A6 - B6			X					
A7 - B7				X				
C12-C1	X							
D12-D1		X	X	X				
C6-C7	X							
D6-D7		X	X	X				



X - PUT STOP PINS ON LOCATION NOS _____, _____.
Y - STAMP N.P. AS FOLLOWS:



1= _____ 10= _____
2= _____ 11= _____
3= _____ 12= _____
4= _____ 13= _____
5= _____ 14= _____
6= _____ 15= _____
7= _____ 16= _____
8= _____ 17= _____
9= _____ 18= _____

NOTE: SPRING RETURN TO OFF (CENTER) POSITION.
MAINTAINED IN PULL OUT AT TRIP POSITION.

FD FAW

FOR _____ G _____
PUT CONNECTORS ON SW. TERMINALS AS FOLLOWS:

CONN. IT.	BETWEEN TERM.	TERM.	CONN. IT.	BETWEEN TERM.	TERM.	CONN. IT.	BETWEEN TERM.	TE

PAGE 1 FINAL/~~CONTINUED~~

SHEET 1 OF 22

ENG. CODE: A323A1AB

505A720-SH1

ATE CODE: 6,,2,,0,002,1,301,1,0,0,0

WESTINGHOUSE ELECTRIC & MFG. CO., EAST PITTSBURGH, PA., U. S. A.

CONTRACTORS CONTRACT NO-Y-4750 U.S.-MARINE BARRACKS NEW RIVER N.C.

BOILER CONTROL PANEL - - # - -. FOR HEATING PLANT - BLDG.

WIRING DIAGRAM

Dwg. No. 8-B-1822 Sub. No. 12

781A291G02

TO UNIT #2 OR #6 DWG. 12-A-4632.

2PCO 1PCO

TO SAFETY EQUIPMENT DWG. AT-5141

TO "P2" P.B. THIS DWG.

TO REL. PNL. UNIT #3 OR #5 DWG. 12-A-4632

"FD" FAN 0-400A — F.D. AM. — FCO FCI

"ID" FAN 0-600A — I.D. AM. — ICO ICI

PULV #2 0-400A — P2 AM. — 2SC 2PCI

PULV. #1 0-400A — P1 AM. — 1SC 1PCI

IT.304 IT.305

(P.B.) SCALE NO.1

CONTACTOR 1 — MS — M — SC — X — SI — SC — ST — MF1 — Y — SL — MF1

S# 1033371

(P.B.) SCALE NO.2 — CONTR 1 — S1

WIRE SAME AS (P.B.) SCALE NO.1 & CONTACTOR

(P.B.) FDR. NO.1

CONTACTOR 2 — MF — M — C — X — T — IP4 — Y — L — MF1 — IP2 — IP4 — MF1

TO UNIT NO.6 - 12-A-4632 DWG.

(P.B.) FDR. NO.2 — CONTR 2 — F2

WIRE SAME AS (P.B.) FDR. NO.1 & CONTACTOR

(P.B.) PUL. NO.1 — P1 — START — PIC2 — S# 1033093 — STOP — PIT — PIC1 — SAFE RUN — S# 1039621

(P.B.) PUL. NO.2 — P2

WIRE SAME AS (P.B.) PUL. NO.1

PIC1 — TO UNIT NO.2 OR 6 DWG. 12-A-4632

208 V DC 208 V DC

208 V.D.C. SUPPLY

TO "S-2" P.B. THIS DWG. — TO "F-2" P.B. THIS DWG. — TO "F-D" P.B. THIS DWG. — TO UNIT #2 OR #6 DWG. 12-A-4632 — TO "I-D" P.B. THIS DWG. — TO "P-1" P.B. THIS DWG. — TO UNIT #2 OR #6 DWG. 12-A-4632 — 125 V.D.C. SUPPLY — TO "F-1" P.B. THIS DWG. — TO "S-1" P.B. THIS DWG.

IND. DRAFT FAN SELECTOR SW. N.P.-F.V. — NORMAL — FAN NOT RUNNING

POS. TABULATION. FOR IT.306

CONTACT	POSITION NORMAL	POSITION F.N.R.
1-2	X	
3-4		X
5-6		X
7-8	X	
9-10	X	
11-12	X	
13-14		X
15-16		X
17-18		X
19-20		X

CONTACTOR CONTROL SW. N.P.-F.V. — OFF

POSITION TABULATION — IT.305

CONTACT	POSITION TRIP	OFF	CLOSE
1-2			X
3-4		X	X
5-6	X	X	X

505A722G04

CIR. BKR. CONT. SW. — OFF

POSITION TABULATION — IT.304

CONTACT	POSITION PULL-OUT	TRIP	OFF	CLOSE
1-2				X
3-4	X	X		
5-6		X	X	X

505A720G01

(P.B.) F.D. — S# 1033371 — START — (SAFE) SEL. SW. — RUN — STOP — FT — FC1 FC2 — TO CONT. PNL. THIS DWG. (5)

(P.B.) I.D. — IG1 IG2 — 1T — TO CONT. PNL. THIS DWG. (4)

"CB-3" — V1 C11 C1 V2 C12 C2 V0 V3 C13 C3 C0 — REMOTE MTD. WHM (R.V.)

TO DWG. AT-5116E (W) — FROM UNIT 3 OR 5 DWG. 12-A-4632 (M3)

ENG. DEP'T. REF.

WIRING DIAG. (UNITS # 1 TO 6 DWG. 12-A-4632.

SCHEMATIC - - - - - - - - - - - - DWG. 8-B-8711.

ASSEMBLY - - - - - - - - - - - - DWG. AT-5116A

WIRING DIAG. (L.V. AUX. SWGR.) DWG. AT-5116E

" " BOILER SAFETY EQUIT. DWG. AT-5141

NOTE TO CUSTOMER

Material supplied by Westinghouse Electric & Manufacturing Company is according to contract and not modified by anything shown on this diagram.

Location of apparatus, wires or cables must not be determined from diagram.

Panel connections shown as viewed from rear. Apparatus perpendicular to panel shown with part nearest panel as top of symbol. Apparatus shown in deenergized position. Auxiliary switches shown for de-energized position of the main device.

Current and potential transformer symbols show terminals of the same instantaneous polarity as indicated at the right.

ϕ -250 Volt Instrument Fuse, 6A.

* -600 Volt Instrument Fuse.

All connections made with ..... wire, except as indicated.

Tool Reference Dwg. No.

8B1822

Item	Change	By	Date
1			8-1-1942
2	S.O. 72-Y-34 Sub #1 was not recorded. P.B. for pul. #1 & 2 was different. CB3-WHM was non-con. pos. tab. for IT. 304 was not con. term. blks were arranged differ. M.R.S. 10-20-42. Changes 10-23-42		

Drawn M.R. Soltis 8-1-1942 — Checked — Design Approved — Installation Approved — Welding Approved — Mechanical Engineer

ENGINEERING DEPT. FORM 14764-E

PITTSBURGH PENCIL TRACING CLOTH

~~NEMA~~ NEW DISCONNECT DEVICE FOR 75 HP MOTOR (PULVERIZER) & TWO 30 AMPS CIRCUIT BREAKERS IN SOME NEMA 1 ENCLOSURE.

3 - #3/0 THW & 1 #6 TW IN EXISTING CONDUIT.

Re
Cons

WELLS. at AE - 190 & 191.
AS 125 - THW 1256.
~~ELEC. DRAWINGS~~

C80.3 - 1966
CR 1971 ELECTRICAL METALLIC TUBING, ZINC COATED.

1430
16,160
910
1920
200

20,620
2,062
22,732
340
23,073
2307
25,380

.05%

25,380

NAVFAC 11013/7 (1-78)
Supersedes NAVDOCKS 2417 and 2417A

COST ESTIMATE

DATE PREPARED: 2-27-81

SHEET 1 OF 1

ACTIVITY AND LOCATION: MCB, CLNC

PROJECT TITLE: REPLACE ELECT. SERV. TRANSF. S.G. BLDG 1700

CONSTRUCTION CONTRACT NO.: CHANGE ORDER, 05-79-4471

ESTIMATED BY: D.D. WEAVER

STATUS OF DESIGN: ☐ PED ☐ 30% ☐ 100% ☐ FINAL ☐ Other (*Specify*) _____

IDENTIFICATION NUMBER

CATEGORY CODE NUMBER

JOB ORDER NUMBER

ITEM DESCRIPTION	QUANTITY		MATERIAL COST		LABOR COST		ENGINEERING ESTIMATE	
	NUMBER	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
*HIGH PRESSURE SODIUM								
LGT. FIXTURES	16	EA	180	2,880	15	240	195	3120
*INCANDESCENT LIGHT								
FIXTURES	6	EA	150	900	15	90	165	990
SUBTOTAL				3,780		330		4110
OVERHEAD 15%								616
TAXES, INS., S.S. 12% OF LABOR								40
SUBTOTAL								4,766
PROFIT 10%								476
SUBTOTAL								5,242
BOND 1.5%								78
TOTAL ESTIMATED COST								5,320
*LIGHT FIXTURES TO REPLACE								
EXISTING FIXTURES AT LOCATIONS								
SHOWN ON PLAN								

S/N 0105-LF-010-1335

☆U.S. Government Printing Office: 1980—603-189/7847 2-1

| | | |

PWO

PWO N719 PAGE 01

10 04 408 404 LDN JUL 10 394

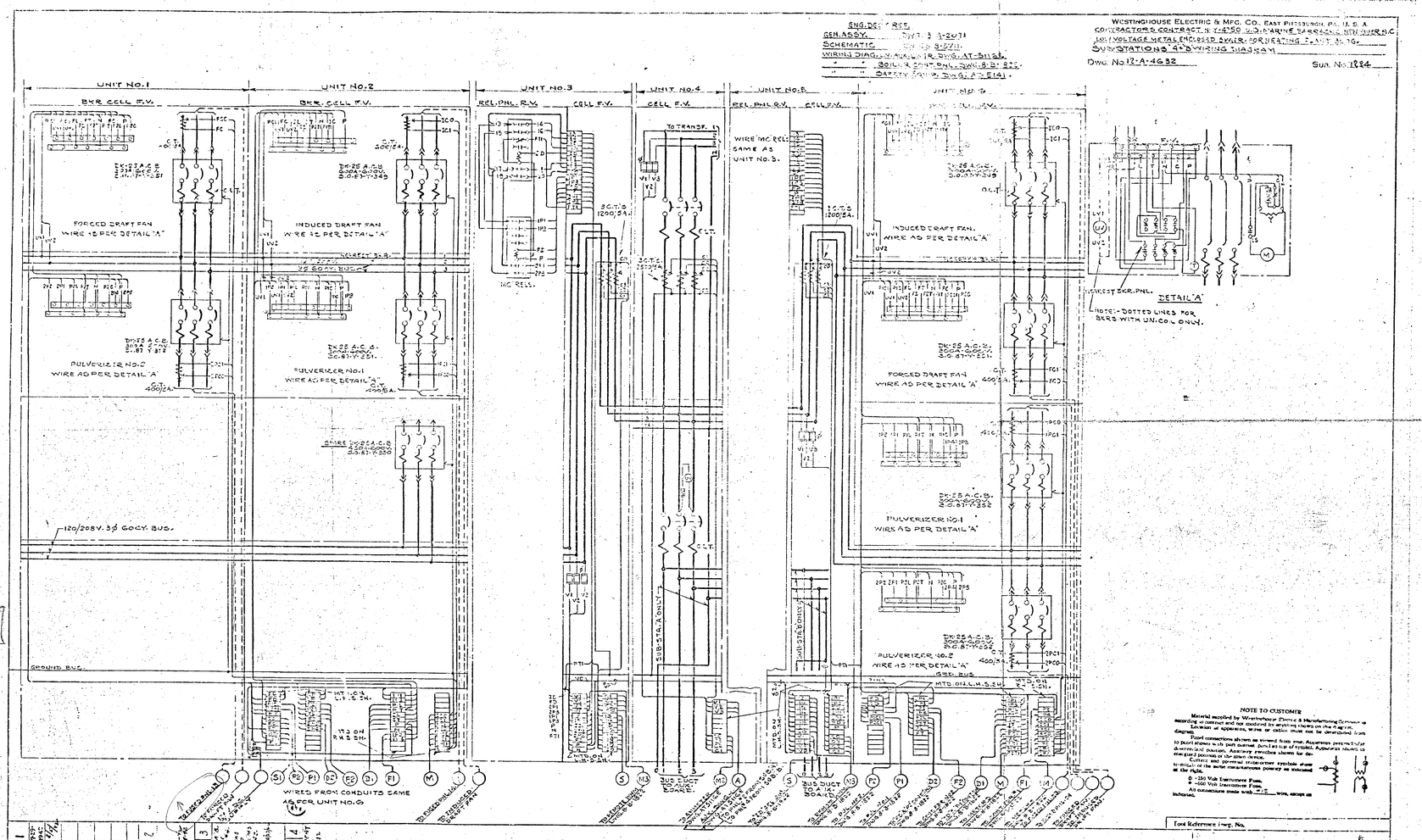
ROUTINE **********
* U N C L A S S I F I E D *
****
PT 00310 188/1927Z

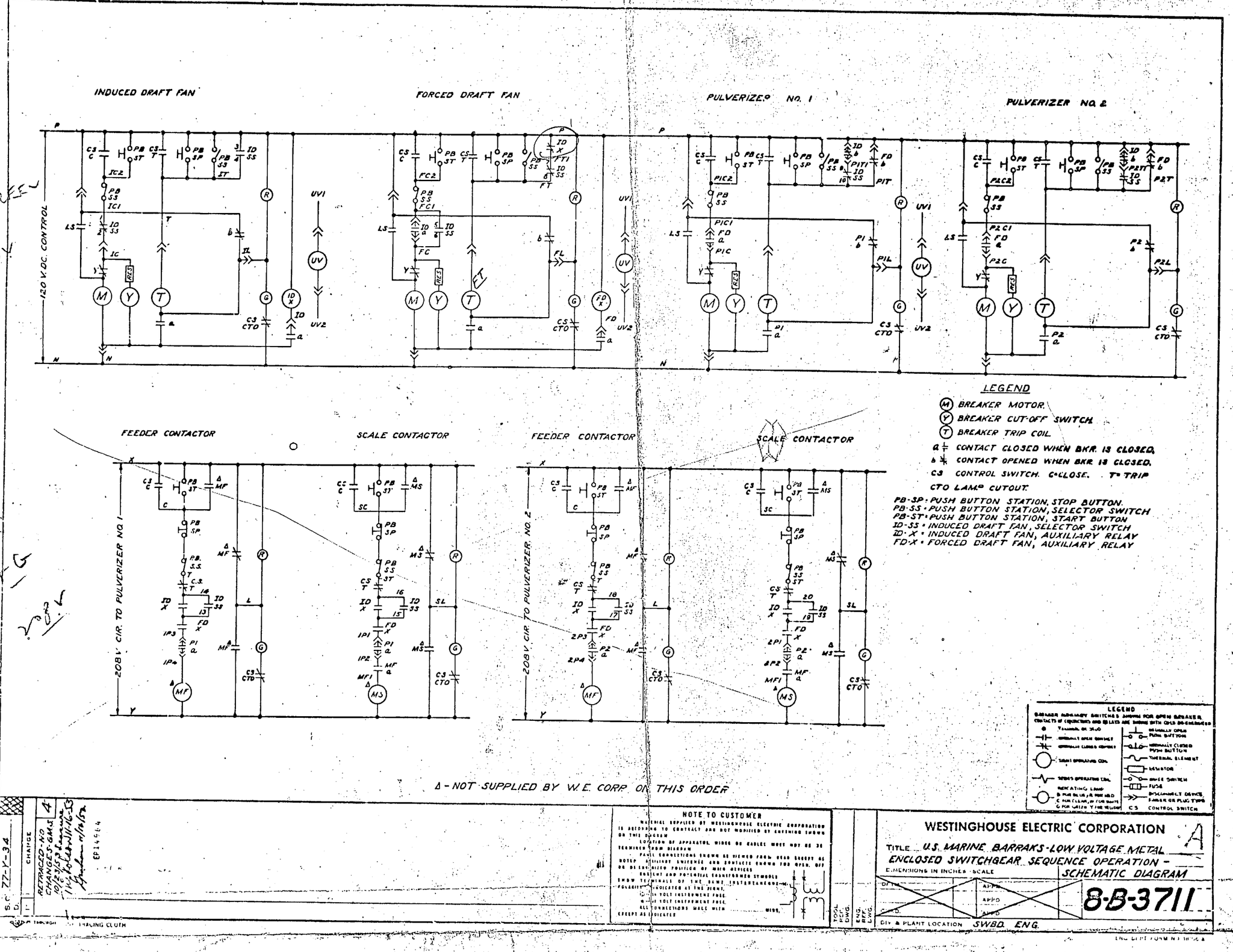
RTTUZYUW RUEACMC5862 1881927-UUUU--RUEBDOA.
ZNR UUUUU
R 061426Z JUL 79
FM CMC WASHINGTON DC
TO RUEBDOA/CG MCB CAMP LEJEUNE NC
INFO RUEBNMA/MCAS H NEW RIVER NC
BT
UNCLAS //N11019//
FY80 FACS PROJS PROG: HQMC PROJ NOS. LE001M-LE029M, AND NR001M-NR006M (CMC CODE LFF-2)
A. CG MCB CAMP LEJEUNE LTR PWO:408:EGJ:MMM OVER 11000 DTD 22 JUN 79
1. PROJS SUBMITTED BY THE REF ARE TECHNICALLY ACCURATE AND REASONABLE IN SCOPE WITH THE FOL EXCEPTIONS/COMMENTS:
A. RPL ELECTRIC SERVICE/TRANSFORMERS AND SWITCHING EQUIP, BLDG 1700 (LE008M) - BUS DUCT AND FLOURESCENT FIXTURE REPLACEMENT WAS NOT CONSIDERED AS A PART OF THE PROJ REQUIREMENT IN THE VALIDATION. THE MISC WIRING REQUIREMENT REQS ADDITIONAL INFO AS TO THE QUANTITY OF AND NECESSITY FOR THE WIRING. REQ RESUBMISSION OF THIS PROJ.
B. RPR AND PAINTING, BLDGS 1212 ANC 1500 (LE009M) - THE ROOF WORK ON BLDG 1500 (LAUNDRY) WAS CONSIDERED AS A PROJECTED DEFICIENCY DURING THE VALIDATION AND SHOULD BE DELETED FROM THIS PROJ SUBMITTAL. REQ RESUBMISSION.

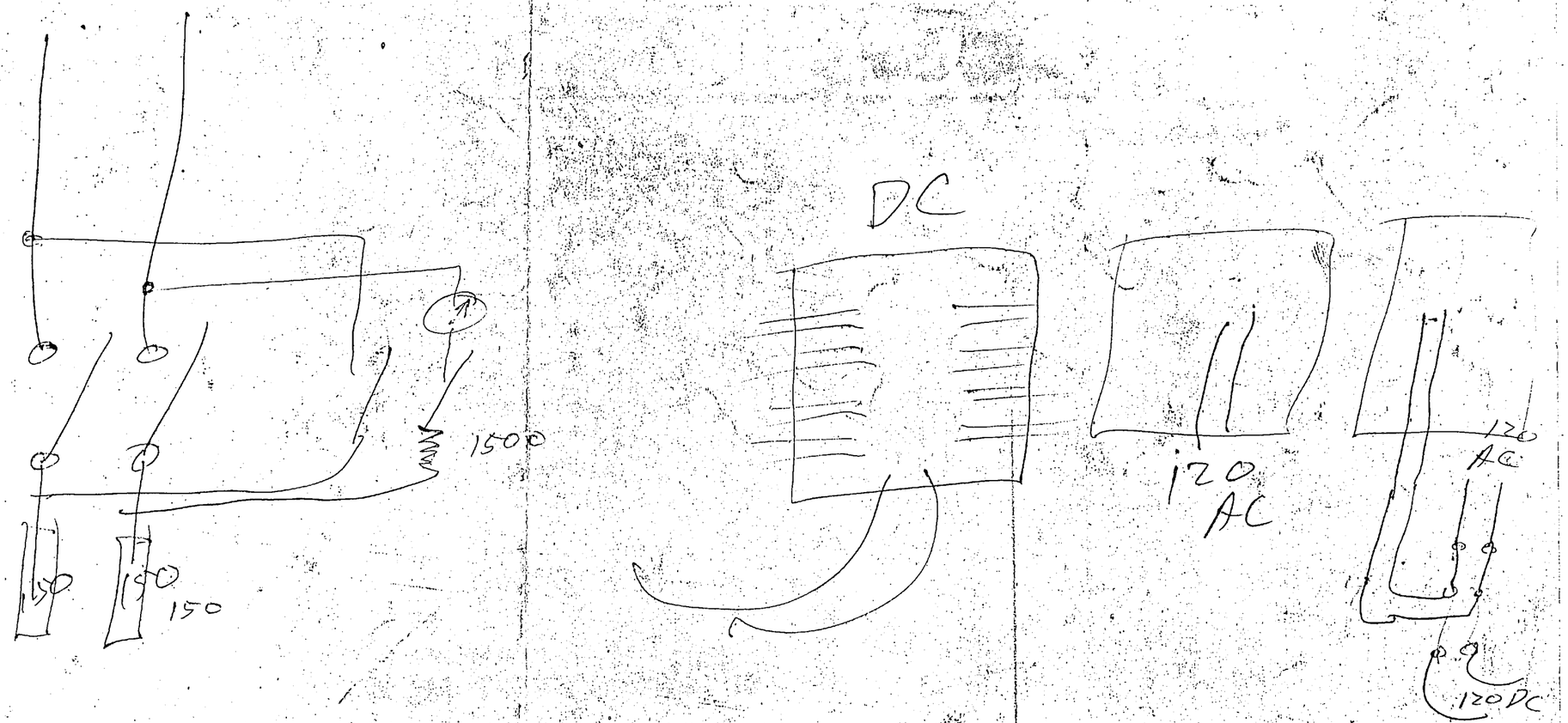
PAGE 2 RUEACMC5862 UNCLAS //N11019//
C. REROOF, MISC RPRS, PAINT, BLDG BR-45 (LE025M) - INTERIOR AND EXTERIOR PAINTING ARE CONSIDERED MAINT WHEN NOT PERFORMED AS A RESULT OF STRUCTURAL RPRS. SINCE ONLY STRUCTURAL RPRS RELATED TO THE ROOF WERE VALIDATED ON THIS PROJ ONLY THE PORTION OF THE PAINTING RELATED TO THE ROOF WOULD BE CONSIDERED A VALID PROJ REQUIREMENT. REQ RESUBMISSION.
D. ARCHITECT, ELEC, MECH RPRS, BLDG 1300 (LE029M) - ELECTRICAL WORK WAS NOT CONSIDERED AS A VALID PORTION OF THE WORK IN THE VALIDATION. REQ RESUBMISSION DELETING THIS PORTION OF THE WORK.
E. REROOF, ARCHITECTURAL, MECHANICAL RPRS. BLDGS AS-516 (NR001M) WORK OTHER THAN ROOF AND RELATED CEILING RPR WAS NOT VALIDATED. DELETE FROM PROJ SCOPE AND RESUBMIT.
F. RPRS TO BLDGS AS-202 (NR002M) - INTERIOR AND EXTERIOR PAINTING CONSIDERED MAINT. DELETE THIS FROM PROJ SCOPE AND RESUBMIT.
G. RPRS TO TAXIWAYS MCAS (H), NEW RIVER (NR004M) - AREAS DESCRIBED IN PROJ SUBMITTAL SHOW AN ABANDONED PORTION OF TAXIWAY WHICH SHOULD BE DELETED FROM THE PROJ SCOPE. ALSO VALIDATION WAS BASED ON SEAL COATING RATHER THAN OVERLAY EXCEPT FOR COMPASS ROSE AREA. REQ RESUBMISSION.
BT
#5862

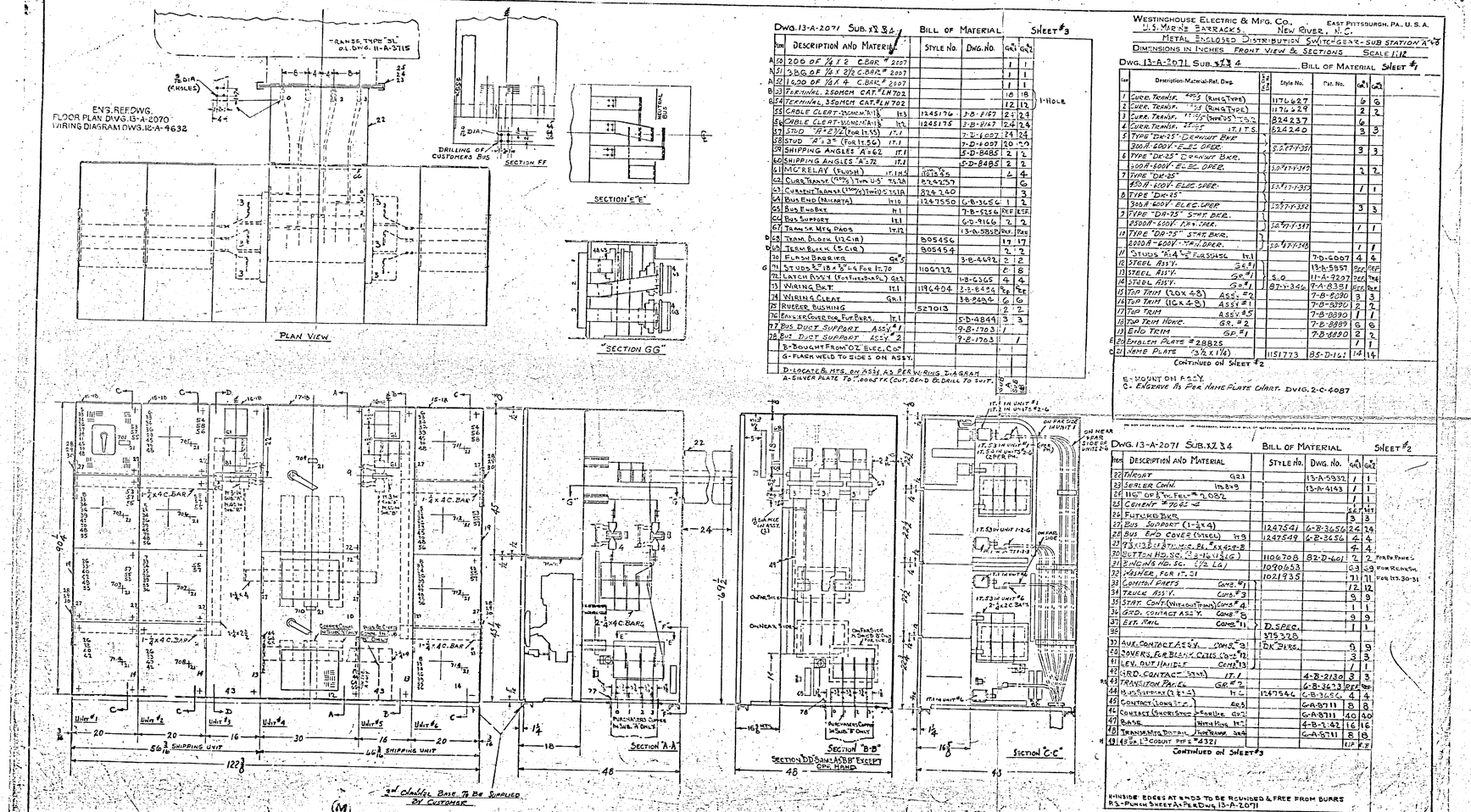
NNNN

ACT: FAC
INFO: COMP, PWO /45


ENG. DEPT. RES.
GEN. ASSY. DWG. A-2071
SCHEMATIC DWG. A-2071
WIRING DIAG. W. WALL TR. DWG. AT-3115
" SGHT. & CONT. PNL. DWG. B-3
" SAFETY PANEL DWG. A-E141
WESTINGHOUSE ELECTRIC & MFG. CO. EAST PITTSBURGH, PA. U.S.A.
CONTRACTOR'S CONTRACT X-4750 U.S. MARINE BARRACKS, NEW YORK, N.Y.
Dwg. No. 12-A-4632
Sub. No. 1824
UNIT NO. 1
UNIT NO. 2
UNIT NO. 3
UNIT NO. 4
UNIT NO. 5
UNIT NO. 6
BKR. CELL F.V.
REL. PNL. R.V.
CELL F.V.
FORCED DRAFT FAN WIRE AS PER DETAIL 'A'
INDUCED DRAFT FAN WIRE AS PER DETAIL 'A'
PULVERIZER NO. 2 WIRE AS PER DETAIL 'A'
PULVERIZER NO. 1 WIRE AS PER DETAIL 'A'
120/208V. 3ϕ 60CY. BUS.
GROUND BUS.
WIRE MC REL. SAME AS UNIT NO. 5.
DETAIL 'A'
NOTE:- DOTTED LINES FOR BKRS WITH UV. COIL ONLY.
NOTE TO CUSTOMER
Material supplied by Westinghouse Electric & Manufacturing Company in accordance with contract and not obtained by scaling checks on the engraving. Dimension of apparatus, wires or cables must not be determined from diagrams.
Panel connections shown as entered from rear. Apparatus connections shown as viewed from front. Symbol key for interpretation of symbols. Apparatus shown in energized positions or the safest instance.
Current and potential transformer symbols shown to indicate the same instantaneous polarity as indicated at the right.
○ -250 Volt Instrument Fuse.
● -600 Volt Instrument Fuse.
All conductors made with ____ wire, except as indicated.
Test Reference Dwg. No.
12A4632
A


INDUCED DRAFT FAN
FORCED DRAFT FAN
PULVERIZER NO. 1
PULVERIZER NO. 2
120 V.D.C. CONTROL
UV1
UV2
FEEDER CONTACTOR
SCALE CONTACTOR
FEEDER CONTACTOR
SCALE CONTACTOR
208 V. CIR. TO PULVERIZER NO. 1
208 V. CIR. TO PULVERIZER NO. 2
LEGEND
(M) BREAKER MOTOR
(Y) BREAKER CUT-OFF SWITCH
(T) BREAKER TRIP COIL
a & a' CONTACT CLOSED WHEN BKR. IS CLOSED.
b & b' CONTACT OPENED WHEN BKR. IS CLOSED.
CS CONTROL SWITCH. C-CLOSE. T-TRIP
CTO LAMP CUTOUT
PB-SP-PUSH BUTTON STATION, STOP BUTTON
PB-SS-PUSH BUTTON STATION, SELECTOR SWITCH
PB-ST-PUSH BUTTON STATION, START BUTTON
ID-SS-INDUCED DRAFT FAN, SELECTOR SWITCH
ID-A-INDUCED DRAFT FAN, AUXILIARY RELAY
FD-X-FORCED DRAFT FAN, AUXILIARY RELAY
Δ - NOT SUPPLIED BY W.E. CORP. ON THIS ORDER
NOTE TO CUSTOMER
WESTINGHOUSE ELECTRIC CORPORATION
TITLE U.S. MARINE BARRACKS-LOW VOLTAGE METAL ENCLOSED SWITCHGEAR SEQUENCE OPERATION - SCHEMATIC DIAGRAM
8-B-3711
SWBD. ENG.


150
150
150
DC
120 AC
120 AC
120 DC



DWG. 13-A-2071 SUB. XX & 4 — BILL OF MATERIAL — SHEET #3

Item	Description and Material	Style No.	Dwg. No.	Gr1	Gr2
A	206 OF 1/4 X 2 C.BAR # 2207			1	1
A	386 OF 1/4 X 2 1/2 C.BAR # 2207			1	1
A	1420 OF 1/4 X 4 C.BAR # 2207			1	1
B	TERMINAL, 250MCM CAT. # LN702			10	10
C	TERMINAL, 350MCM CAT. # LN702			12	12
55	CABLE CLEAT-350MCM "A" TYPE	1245176	3-B-2167	24	24
56	CABLE CLEAT-500MCM "A" TYPE	1245175	3-B-2167	24	24
57	STUD "A" 2 3/4" (FOR 11-55)		7-D-6007	24	24
58	STUD "A" 3" (FOR 11-56)		7-D-6007	20	20
59	SHIPPING ANGLES A-462		5-D-8485	2	2
60	SHIPPING ANGLES "A"-72		5-D-8485	2	2
61	MC RELAY (FLUSH)	1012 X 6		4	4
62	CURR. TRANSF. (1200/5) TYPE U-5	824257			6
63	CURRENT TRANSF. (1200/5) TYPE O-5	824240			3
64	BUS END (MALGAMATE)	1247550	6-B-3656	1	1
65	BUS END BRT.		7-B-5256	REF.	REF.
66	BUS SUPPORT		6-D-9166	2	2
67	TRANSF. MTG. PADS		13-A-5858	REF.	REF.
68	TRANS. BLOCK (12 CIR.)	805456		17	17
69	TERMINAL (5 CIR.)	805454		2	2
70	FLASH BARRIER GR. # 5		3-B-4492	2	2
71	STUDS 3/8" - 18 X 3" - 4 FOR 11-70	1109732		6	18
72	LATCH ASS'Y (FOR HINGED DOOR) GR. 3		1-B-6365	4	4
73	WIRING BRT.	1194404	2-S-8494	REF.	REF.
74	WIRING CLEAT GR. 1		3B-8494	6	6
75	RUBBER BUSHING	527013		2	2
76	ENCLOSURE CUT OUT FOR BUS. 11-1		5-D-4844	3	3
77	BUS DUCT SUPPORT ASS'Y # 1		9-B-1703	1	
78	BUS DUCT SUPPORT ASS'Y # 2		9-B-1703		1

B-BOUGHT FROM "O" ELEC. CO.
G-FLASH WELD TO SIDES ON ASS'Y.
D-LOCATE & MTG. ON ASS'Y AS PER WIRING DIAGRAM
A-SILVER PLATE TO 1.0005 FK CUT, GRND & DRILL TO SUIT.

WESTINGHOUSE ELECTRIC & MFG. CO. EAST PITTSBURGH, PA., U. S. A.
U. S. MARINE BARRACKS NEW RIVER, N. C.
METAL ENCLOSED DISTRIBUTION SWITCHGEAR - SUB STATION "A"
DIMENSIONS IN INCHES FRONT VIEW & SECTIONS SCALE 1:12

DWG. 13-A-2071 SUB. XX & 4 — BILL OF MATERIAL — SHEET #1

Item	Description-Material-Ref. Dwg.	Style No.	Pat. No.	Gr1	Gr2
1	CURR. TRANSF. 400/5 (RING TYPE)	1176627		6	6
2	CURR. TRANSF. 1200/5 (RING TYPE)	1176629		2	2
3	CURR. TRANSF. 1200/5 (THROUGH TYPE)	824237		6	
4	CURR. TRANSF. 2000/5	824240		3	3
5	TYPE "DK-25" DRAWOUT BKR. 300 A. 600 V. E.O. OPER.	5-D-7719-351		3	3
6	TYPE "DK-35" DRAWOUT BKR. 1000 A. 600 V. E.O. OPER.	5-D-7719-349		2	2
7	TYPE "DK-35" 450 A. 600 V. ELEC. OPER.	5-D-7719-350		1	1
8	TYPE "DK-25" 300 A. 600 V. ELEC. OPER.	5-D-7719-352		3	3
9	TYPE "DA-75" STAT BKR. 1200 A. 600 V. MAN. OPER.	5-D-7717-347		1	1
10	TYPE "DA-75" STAT BKR. 2000 A. 600 V. MAN. OPER.	5-D-7717-348		1	1
11	STUDS "A" 4 1/2" FOR 5HASE		7-D-6007	4	4
12	STEEL ASS'Y. GR. # 1		13-B-5957	REF.	REF.
13	STEEL ASS'Y. GR. # 1	S.O. 87-Y-346	11-A-9207	REF.	REF.
14	STEEL ASS'Y. GR. # 1		9-A-8351	REF.	REF.
15	TOP TRIM (10 X 48) ASS'Y # 1		7-B-8390	3	3
16	TOP TRIM (16 X 48) ASS'Y # 1		7-B-8390	2	2
17	TOP TRIM ASS'Y # 5		7-B-8390	1	1
18	TOP TRIM HOWE. GR. # 2		7-B-8389	6	6
19	END TRIM GR. # 1		7-B-8890	2	2
20	EMBLEM PLATE # 28825			1	
21	NAME PLATE (3 1/2 X 1 1/4)	1151773	85-D-161	14	14

CONTINUED ON SHEET #2

E-MOUNT ON ASS'Y.
C-ENGRAVE AS PER NAME PLATE CHART. DWG. 2-C-4087

DWG. 13-A-2071 SUB. XX & 4 — BILL OF MATERIAL — SHEET #2

Item	Description and Material	Style No.	Dwg. No.	Gr1	Gr2	
22	THROAT GR. 1		13-A-5932	1	1	
23	SEALER COMP. 1 LB. CAN		13-A-4143	1	1	
24	110 OF 1" INS. FELT # 2052			1	1	
25	CEMENT # 7042 - C			1	1	
26	FUTURES BKR.			24	24	
27	BUS SUPPORT (1-1/2 X 4)	1247541	6-B-3656	24	24	
28	BUS END COVER (STEEL)	1247549	6-B-3656	4	4	
29	13 1/8 X 23 1/2" W. SL. BL. 3/16 X 2-8			4	4	
30	BUTTON HD. SOC. 1/2-13 X 1 1/2 (LG.)	1106708	82-D-601	2	2	FOR 8 PHASE
31	2 INCH S HD. SC. 1/2 LG.	1090653		63	63	FOR 8 PHASE
32	WASHER, FOR 11-31	1021935		71	71	FOR 8 PHASE
33	CONTROL PARTS CONT. # 1			12	12	
34	TRUCK ASS'Y. CONT. # 3			9	9	
35	STAT. CONT. (WITHOUT TRIPPING) CONT. # 4			1	1	
36	GRD. CONTACT ASS'Y. CONT. # 5			9	9	
37	EXT. RAIL CONT. # 11	D. SPEC.		1	1	
38		375325				
39	AUX. CONTACT ASS'Y. CON. # 3	DK PARTS		9	9	
40	COVERS, FOR BLANK CELLS CONT. # 12			3	3	
41	LEVEL OUT HANDLE CONT. 13			1	1	
42	GRD. CONTACT (STAT.) 17.1		4-B-2130	3	3	
43	TRANSITION PARTS GR. # 2		6-B-3633	REF.	REF.	
44	4 1/2" SPACE (2 1/2 - 4) 11 C	1247546	6-B-3656	4	4	
45	CONTACT (LONG S.C.) GR. 5		G-A-8711	8	8	
46	CONTACT (SHORT STUD) CONTACT GR. 2		G-A-8711	40	40	
47	BASE WITH KING 11-2		4-B-1.42	16	16	
48	TRANSFORMER DETAIL TRANSFORMER SEE #		G-A-8711	8	8	
49	4 3/8" L. COUNT PIECE # 4321			4 OF	4 F	

CONTINUED ON SHEET #3

H-INSIDE EDGES AT ENDS TO BE ROUNDED & FREE FROM BURRS
R3-PUNCH SHEET AS PER DWG. 13-A-2071

Tool Reference Or E. No.

13A 2071

505A720-SH1

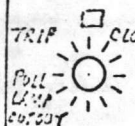
SUB					
	11 EP1753 4 SH1 752-9 TO 15 WERE REDRAWN. AP FORCED WAS 6-2-67	12 EP17707 SH19 WAS ADD. 8-31-67	13 EP17833 SH20 WAS ADD. 10-3-67	14 EP18189 SH15 ITEM 141 SW WAS SUBSTITUTED 7-14-70	15 EP20555 SH22 WAS ADD 12-12-72

WESTINGHOUSE ELECTRIC CORPORATION | SWITCHGEAR | EAST PITTSBURGH PA, U

DWG. 505A720-SH1 SUB 10 N 12 13 N 15 16 | TYPE W-2 SWITCH

S# 505A720G01 = ASS'D ITEMS 1 to 3-6 | S# 505A720A01 = ITS. 3-6

CIRCUIT BREAKER CONTROL



NP MAY VARY WITH APPLICATION (FOR 505A720 G01, EMI - K60 505A720-1 FOR STOCK P/

STAGE: 2 HANDLE SHAPE: Pistol
CONTACTS: MOMENTARY - MAINTAINED
HANDLE TYPE: FIXED - REMOVABLE KEY
MOUNTING: 1/8 - 1/4 - 3/8
TARGET: YES - NO
STAGE CONTACTS: 6-12
OUTLINE: 677C776 Line2-11Fig2

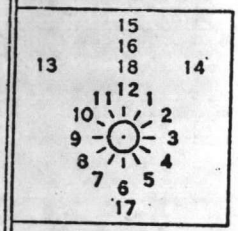
ASSD ITEM	DESCRIPTION	STORE ROOM	STYLE NO.	QUAN. 1 UNIT	ROUTING	DUE	LO
X 1	SWITCH EMI K55		505A620G01	1			
2	HANDLE	632	310C624H02	1			
Y 3	NAMEPLATE	632	677C525H03	1			
4	CONNECTOR						
5							
6	PRINT OF DWG.		505A720-SH1	1			
	.164-32 HEX B. NUT (FIN. 24AA00)						

CONTACT	SWITCH POSITION TABULATION								
	PULL	T	OFF	C					
A11-B11	X	X							
A12-B12			X						
A1 - B1				X					
A5 - B5	X	X							
A6 - B6			X						
A7 - B7				X					
C12-C1	X								
D12-D1		X	X	X					
C6-C7	X								
D6-D7		X	X	X					

TOP
1 12 11
O O O A
O O O B
O O O C
O O O D

BOTTOM
5 6 7
O O O A
O O O B
O O O C
O O O D

X - PUT STOP PINS ON LOCATION NOS _____, _____.
Y - STAMP N.P. AS FOLLOWS:



1= _____ 10= _____
2= _____ 11= _____
3= _____ 12= _____
4= _____ 13= _____
5= _____ 14= _____
6= _____ 15= _____
7= _____ 16= _____
8= _____ 17= _____
9= _____ 18= _____

NOTE: SPRING RETURN TO OFF (CENTER) POSITION.
MAINTAINED IN PULL OUT AT TRIP POSITION.

ID FAN

FOR _____ G _____
PUT CONNECTORS ON SW. TERMINALS AS FOLLOWS:

CONN. IT.	BETWEEN TERM.	TERM.	CONN. IT.	BETWEEN TERM.	TERM.	CONN. IT.	BETWEEN TERM.	TE

6,2,0,002,1,301,100,000,000,000,000,000

PAGE 1 FINAL/~~CONTINUED~~

SHEET 1 OF 22

ENG. CODE: A323A1AB

505A720-SH1.

ID FAN
INT BY-PASS

505A722-SH4

SUB				
			Westinghouse	M1-7
			3-17-64	E-2

EP 19491 | EP 17706 | 7-13-70 | 22 | EP 19953 | 6-2-67 | 15

WESTINGHOUSE ELECTRIC CORPORATION | SWITCHGEAR | EAST PITTSBURGH PA, L

DWG. 505A722-SH4 SUB SEE SHEET 1 | RATE CODE | TYPE W-2 SWITCH

STYLE NO. 505A722G04 = ASS'D ITEMS 31-32-33-36 | S# 505A722A04 = ITS 33-36

CONTROL CUTOUT

NP MAY VARY WITH APPLICATION (FOR 505A722 G 04, EMI - K60 505A722-4 FOR STOCK P

STAGE: 2 HANDLE SHAPE: PIST. GRIP
CONTACTS: ~~MOMENTARY~~ - MAINTAINED
HANDLE TYPE: FIXED - ~~REMOVABLE KEY~~
MOUNTING: 1/8 - 1/4 - ~~3/5~~ 4
TARGET: ~~YES~~ - NO
STAGE CONTACTS: 6-~~12~~ Y
OUTLINE: 677C775 LINES 2-11 FIG 2

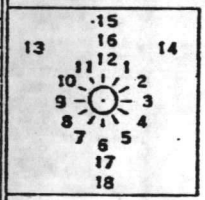
ASSD ITEM	DESCRIPTION	STORE ROOM	STYLE NO.	QUAN. / UNIT	ROUTING	DUE
31	SWITCH EMI	K55	505A622G01	1		
32	HANDLE	632	310C624H02	1		
33	NAMEPLATE	632	502A054H04	1		
34	CONNECTOR					
35						
36	PRINT OF DWG		505A722-SH4	1		

SWITCH POSITION TABULATION

CONTACT	OFF	ON
A11-B11		X
A12-B12	X	
A1-B1		X
A5-B5		X
A6-B6	X	
A7-B7		X
C11-D11		X
C12-D12	X	
C1-D1		X
C5-D5		X
C6-D6	X	
C7-D7		X

X - PUT STOP PINS ON LOCATION NOS _____ . _____ .

Y - TYPE N.P. AS FOLLOWS:



1= ON
2= _____
3= _____
4= _____
5= _____
6= _____
7= _____
8= _____
9= _____
10= _____
11= _____
12= OFF
13= _____
14= _____
15= CONTROL CU
16= _____
17= _____
18= _____

FOR _____ G _____

PUT CONNECTORS ON SW. TERMINALS AS FOLLOWS:

CONN. IT.	BETWEEN TERM.	TERM.	CONN. IT.	BETWEEN TERM.	TERM.	CONN. IT.	BETWEEN TERM.

N.P.

PAGE 1 FINAL/~~CONFORMED~~ | SHEET 4 OF ~~SEE SHEET~~

ENG. CODE: A22.1A0AB | 505A722-SH4

FORM 33938 A

6

FEEDER #1

781A291SH2

SUB				
2			1-12-67 [illegible]	
3	7-31-67			
4	2-18-68			

EP 18100 | EP 7786 | 7.92

WESTINGHOUSE ELECTRIC CORPORATION | SWITCHGEAR | EAST PITTSBURGH PA, U.S.A.

TYPE W-2 SWITCH

DWG. 781A291-SH2 SUB SEE SHEET 3

S# 781A291G02 = ASS'D ITEMS 11 TO 14-16-17

S# 781A291A02 = ITS. 13-17-16

NP MAY VARY WITH APPLICATION (FOR 781A291G02, EMI - K-655 781A291-2 FOR STOCK PARTS)

CIRCUIT BREAKER CONTROL

TRIP CLOSE

PULL OUT

STAGE: 2 HANDLE SHAPE: PIST. GRIP
CONTACTS: MOMENTARY - ~~MAINTAINED~~
HANDLE TYPE: FIXED - REMOV~~ABLE~~ KEY
MOUNTING: 1/8 - 1/4 - ~~3/8~~ _____
TARGET: YES - ~~NO~~
STAGE CONTACTS: 6-~~12~~
OUTLINE: 677C776 LINES 2-11 FIG 2

ASSD ITEM	DESCRIPTION	STORE ROOM	STYLE NO.	QUAN. 1 UNIT	ROUTING	DUE	LOC.	FAC. COST
11	SWITCH EMI	655	781A171G01	1				
12	HANDLE	632	310C624H03	1				
13	NAMEPLATE	632	677C525H02	1				
14	CONNECTOR 75	632	677C519H08	2				
15								
16	PRINT OF DWG. 781A291-SH2			1				
17	.164-32 HEX B. NUT (FIN. 24AA00)			4				

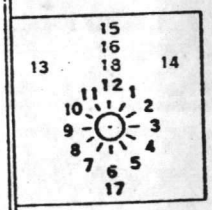
SWITCH POSITION TABULATION

CONTACT	Pull T	T	-	N	-	C		
A11-B11	X	X						
A12-B12				X				
A1 - B1						X		
A5 - B5	X	X	X					X
A6 - B6			X	X	X			
A7 - B7					X	X		
C12-C1	X							
D12-D1		X	X	X	X	X		
C6-C7	X							
D6-D7		X	X	X	X	X		

NOTE: SPRING RETURN TO NEUTRAL. MAINTAINED IN PULL OUT AT TRIP POSITION.

X - PUT STOP PINS ON LOCATION NOS _____ . _____ .

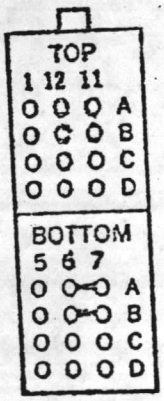
Y - STAMP N.P. AS FOLLOWS:



1= _____ 10= _____
2= _____ 11= _____
3= _____ 12= _____
4= _____ 13= _____
5= _____ 14= _____
6= _____ 15= _____
7= _____ 16= _____
8= _____ 17= _____
9= _____ 18= _____

TABULATION OF SW WITH JUMPERS ADDED:

CONT.	Pull T	T	-	N	-	C
A11-B11	X	X				
A12-B12				X		
A1-B1						X
A5-B5	X	X	X			
A7-B7			X	X	X	X
C12-C1	X					
D12-D1		X	X	X	X	X
C6-C7	X					
D6-D7		X	X	X	X	X



NOTE:
ADJACENT OVERLAP CONTACTS ARE ELECTRICALLY CONNECTED TOGETHER DURING TRANSFER

FOR 781A291 G 02

PUT CONNECTORS ON SW. TERMINALS AS FOLLOWS:

CONN. IT.	BETWEEN TERM.	TERM.	CONN. IT.	BETWEEN TERM.	TERM.	CONN. IT.	BETWEEN TERM.	TERM.
14	(A6	A7)						
14	(B6	B7)						

PAGE 1 FINAL/~~CONTINUED~~

SHEET 2 OF SEE SHEET 3

781A291-SH2 CODE 6151

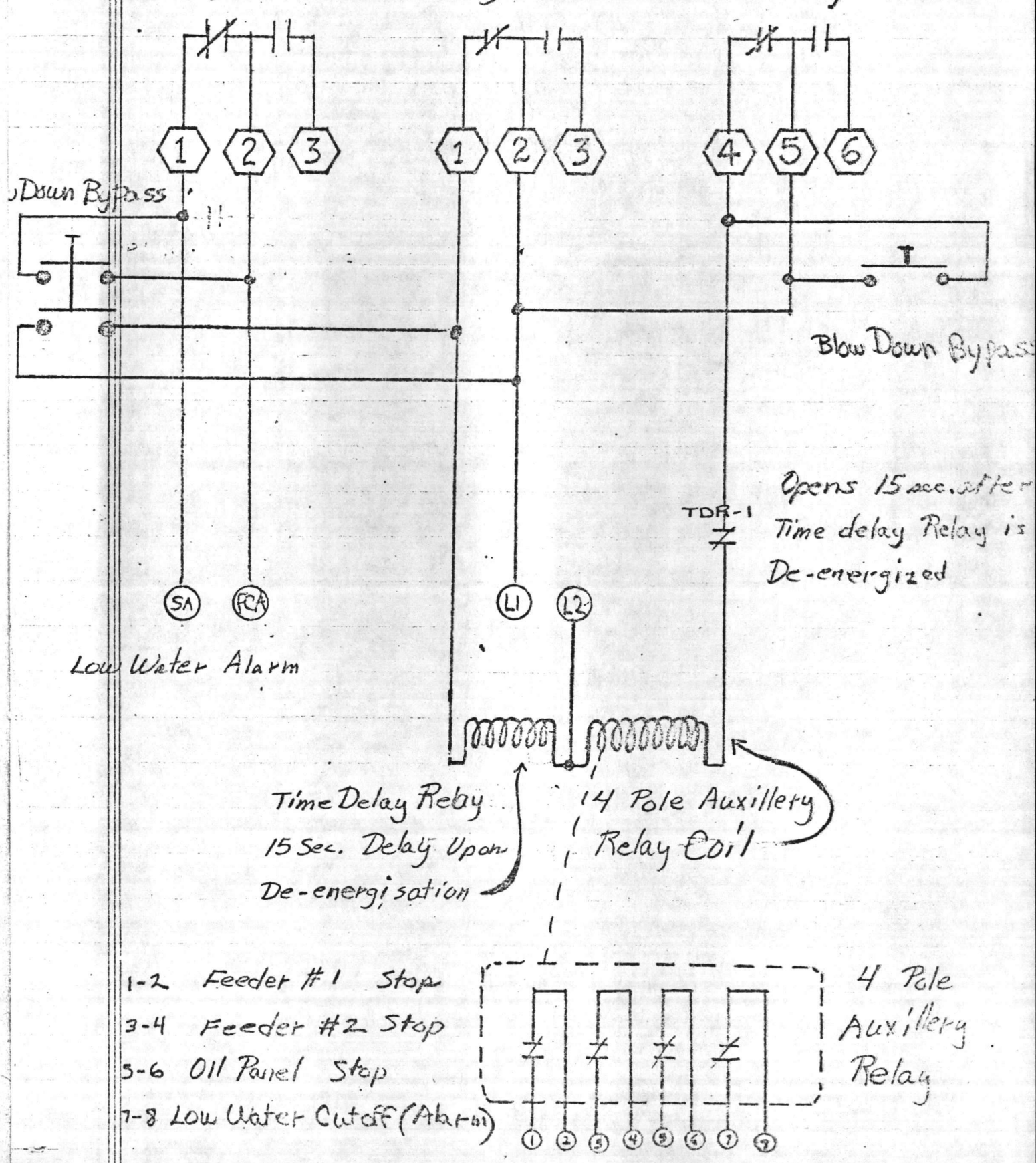
ENG. CODE: A323A1AC

FORM 33958 B

BUILDING 1700, CAMP LEJEUNE, N.C. APR 24, 73

TYPICAL FOR EACH BOILER

Low Water Cutoff Circuit



505A720-SH1

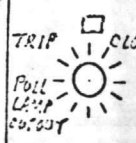
11	EP17534 SH1 REVISED 9 TO 15 WERE REDRAWN. NP FOLDER 4.43 6-2-67 w/drawing	
12	EP17707 SH19 WAS NOT ON 8-31-67 w/drawing	
13	EP17835 SH20 WAS NOT ON 10-6-67 w/drawing	
14	EP18189 SH15 ITEM 141 SO WAS SUPERSEDED. 7-14-70 w/drawing	
15	EP19491 SH19 WAS NOT ON 10-6-72 w/drawing	
16	EP20555 SH22 WAS NOT ON 2-2-72 w/drawing	

WESTINGHOUSE ELECTRIC CORPORATION | SWITCHGEAR | EAST PITTSBURGH PA, U

DWG. 505A720-SH1 SUB ~~10~~ ~~11~~ ~~12~~ ~~13~~ ~~14~~ ~~15~~ 16 | TYPE W-2 SWITCH

S# 505A720G01 = ASS'D ITEMS 1 to 3-6 | S# 505A720A01 = ITS. 3-6

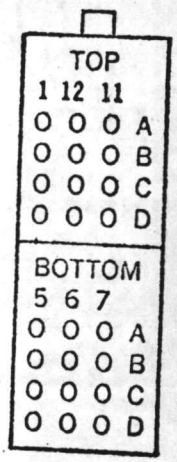
CIRCUIT BREAKER CONTROL



NP MAY VARY WITH APPLICATION (FOR 505A720 G01, EMI - K60 505A720-1 FOR STOCK P/

STAGE: 2 HANDLE SHAPE: Pistol
CONTACTS: MOMENTARY - MAINTAINED
HANDLE TYPE: FIXED - REMOVABLE KEY
MOUNTING: 1/8 - 1/4 - 3/8
TARGET: YES - NO
STAGE CONTACTS: 6-12
OUTLINE: 677C776 Line2-11Fig2

CONTACT	SWITCH POSITION TABULATION								
	PULL	T	OFF	C					
A11-B11	X	X							
A12-B12			X						
A1 - B1				X					
A5 - B5	X	X							
A6 - B6			X						
A7 - B7				X					
C12-C1	X								
D12-D1		X	X	X					
C6-C7	X								
D6-D7		X	X	X					

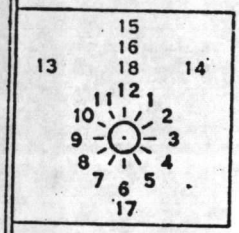


NOTE: SPRING RETURN TO OFF (CENTER) POSITION.
MAINTAINED IN PULL OUT AT TRIP POSITION.

Pulo. #1

ASSD ITEM	DESCRIPTION	STORE ROOM	STYLE NO.	QUAN. 1 UNIT	ROUTING	DUE	LO
X 1	SWITCH EMI K55	632	505A620G01	1			
2	HANDLE	632	310C624H02	1			
Y 3	NAMEPLATE	632	677C525H03	1			
4	CONNECTOR						
5							
6	PRINT OF DWG.		505A720-SH1	1			
	.164-32 HEX B. NUT (FIN. 24AA00)						

X - PUT STOP PINS ON LOCATION NOS _____, _____.
Y - STAMP N.P. AS FOLLOWS:



1= _____ 10= _____
2= _____ 11= _____
3= _____ 12= _____
4= _____ 13= _____
5= _____ 14= _____
6= _____ 15= _____
7= _____ 16= _____
8= _____ 17= _____
9= _____ 18= _____

FOR _____ G _____
PUT CONNECTORS ON SW. TERMINALS AS FOLLOWS:

CONN. IT.	BETWEEN TERM.	TERM.	CONN. IT.	BETWEEN TERM.	TERM.	CONN. IT.	BETWEEN TERM.	TE

PAGE 1 FINAL/~~CONTINUED~~

SHEET 1 OF 22

ENG. CODE: A323A1AB

505A720-SH1

CO 61

ATE CODE: 6.2.0.002,1,301,1.0.0.0

N.P. Tr. No. on F.V.	B. of Mat. Tr. No.	ENGRAVING FIRST LINE	LET. NO.	SECOND LINE	LET. NO.	FIG. No.	REQ.
751	22	COAL HANDLING	6	CONTROL PANEL	6	2	1
752	22	COAL STORAGE	6	EQUIPMENT	6	2	1
753	22	ASH UNLOADING	6	CONTROL PANEL #6	6	2	1
754	22	LIGHTING PANEL	6			1	1
755	22	CONTROL PANEL #5	6			1	1
756	22	AIR COMPRESSOR	6			1	1
757	22	SPARE (BLANK)					1
758	22	SPARE (BLANK)					1
759	307	INDUCED	6	DRAFT FAN	6	2	4
760	307	FORCED	6	DRAFT FAN	6	2	4
761	307	PULVERIZER #1	6			1	4
762	307	PULVERIZER #2	6			1	4
763	307	INDUCED	6	DRAFT FAN	6	2	4
764	307	INDUCED	6	DRAFT FAN LOCK	6	2	4
765	307	FORCED	6	DRAFT FAN	6	2	4
766	307	PULVERIZER #1	6			1	4
767	307	PULVERIZER #2	6			1	4
768	307	FEEDER #1	6			1	4
769	307	FEEDER #2	6			1	4
770	307	SCALE #1	6			1	4
771	307	SCALE #2	6			1	4
772							
773							
774							

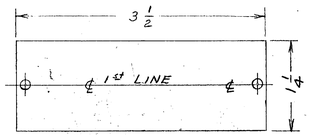


FIG. 1

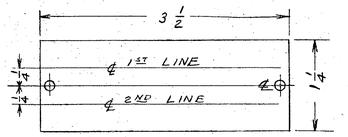
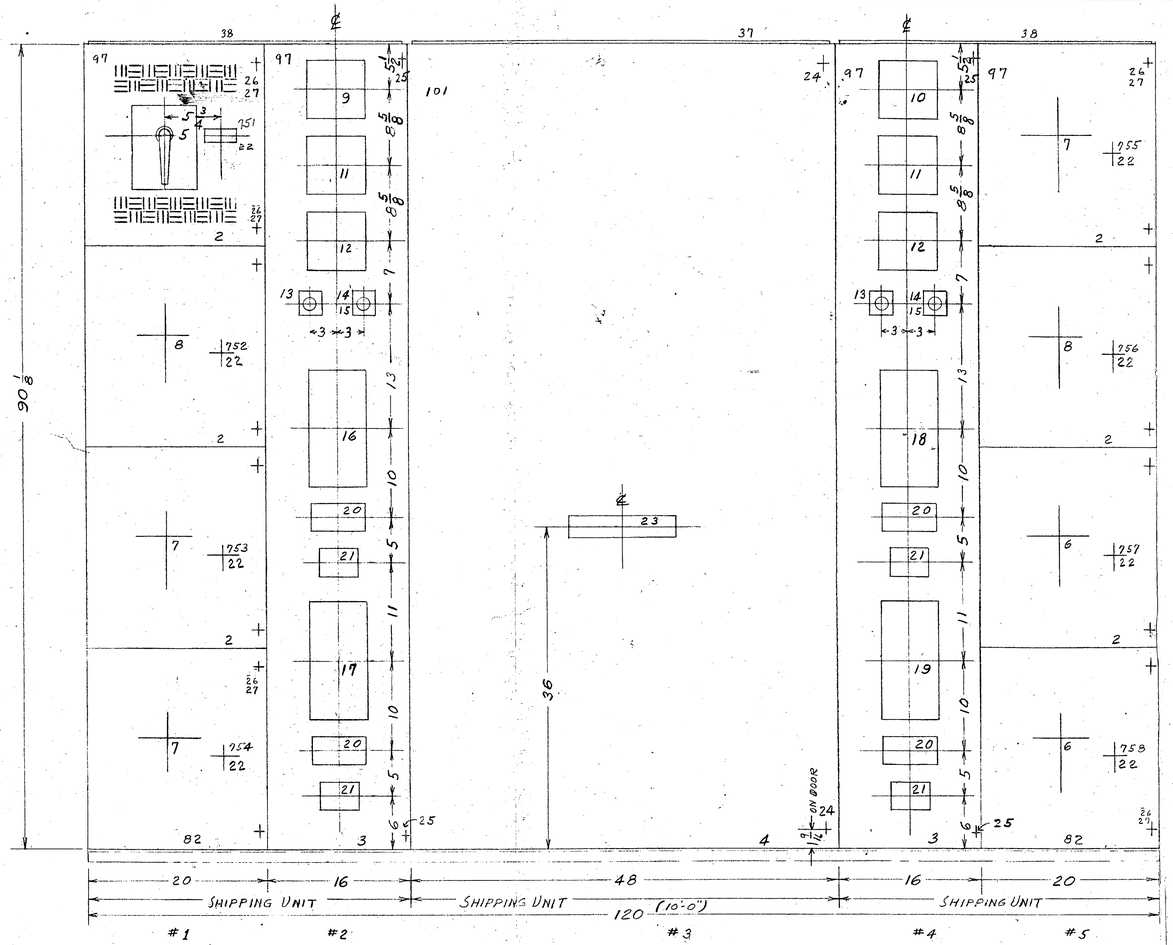


FIG. 2.

EP	37	FINISH ASSEMBLY - GROUP 2		
		DWG. 1-A-333, CONNECTING DIA.	22	
		HINGES		1173215
		HINGE TUBES		1190034
		HINGE PINS		1190033
	98			
	99	BINDING HD. SCREW (FOR REAR SHEETS)		1090653
	100	WASHERS (FOR IT. 99)		1021935
	101	CONCEALED HINGE FROM 4"x3" ANGLE	3	
	102	MICARTA CABLE CLAMPS	10	AT-5116-C
		EXTRA MATERIAL		
ST	201	FUSE 250V. 5A.	6	25005
OFFICE	202	SET OF BLUE PRINTS	1	
ST	203	"M" TEST PLUG (4 POLE)	1	694760
ST	204	"M" TEST PLUG (6 POLE)	1	715514
	205			

EP	26	LATCH DETAIL - GROUP 2			
——		DWG. 1-B-6365 (KNOBS & BLOCK)	16		
EP	27	LATCH DETAIL IT. 10, DWG. 1-B-6245	16	1196427	
	28				
SHOP	29	SIDE SHEET FIG. 7B	1	AT-5116-D	
"	30	" " " 8	2	"	
"	31	" " FIGS. 10 & 10A	1	"	
"	32	" " FIG. 9	1	"	
"	33	" " FIGS. 7 & 7A	1	"	
"	34	REAR COVER FIG. 11	1	"	
"	35	" " A = 15 1/2" " 12	2	"	
"	36	" " A = 19 1/2" " 12	2	"	
"	37	TOP COVER " 17	1	"	
"	38	" " " 18	2	"	
"	39	CROSS MEMBER A = 13" " 19	4	AT-5116-D	
"	40	" " A = 17" " 19	4	"	
"	41	VERTICAL MEMBER " 20	3	"	
"	42	2"x2"x1/4" ANGLE IRON A = 15 1/2" " 4	2	"	
"	43	" " " A = 19 1/2" " 4	2	"	
"	44	BARRIER " 23	6	"	
"	45	" " 16	2	"	
"	46	BUS SUPPORT DET. MM	16	AT-5130-J	
"	47	" " " NN	4	AT-5130-J	
"	48	" " FIG. 24	12	AT-5116-D	
"	49	" " " 25	1	"	
"	50	" " " 26	2	"	
⊗	51	" " COVER DET. 00	4	AT-5130-J	
"	52	" " " FIG. 28	2	AT-5116-D	
"	53	MICARTA FILLER (1/8 x 5 3/8 x 11 3/8)	4		
"	54	" " (1/8 x 3 1/8 x 6 3/8)	2		
"	55	BARRIER FIG. 22	1	AT-5116-D	
	56				
	57				
	58				
SHOP	59	VERTICAL MEMBER FIG. 21	1	AT-5116-D	
K	60	"U-5" CUR. TRANS. 1200/5A.	3	824237	
"	61	"W-5" " " 500/5A.	3	986929	
"	62	" " " 100/5A.	3	986922	
"	63	" " " 25/5A.	3	986916	
STK	64	1/4" x 4" COPPER BAR 9'-11 3/4" LONG	1		
"	65	1/4 x 4 " " FABR. FT.	41	#2007	
"	66	1/4 x 3 " STRAP, FABR. FT.	111		
"	67	1/4 x 2 " " "	34		
"	68	1/4" x 1 " " "	35		
"	69	ULS-DI TERMINAL, UNDRILLED	9	250MCM	
"	70	ULS-BI " "	10	#2	
"	71	ULS-A2 " "	6	#4	
SHOP	72	CLIP 1" OF 5/8" x 1" x 1" x	6		
"	73				
"	74	BUS SUPPORT FIG 27	1	AT-5116-D	
"	75	WIRING GUTTER " 2	1	"	
"	76	" " COVER " 3	1	"	
"	77	REAR COVER " 13	1	"	
"	78	REAR COVER A = 15 1/2" FIG 14	2	"	
"	79	" " A = 19 1/2" " 14	2	"	
"	80	SPACER A = 13 " 5	2	"	
"	81	" A = 17 " 5	2	"	
"	82	"DK-25" BKR. DOOR ITEM 2 OF			
——		AT-SK-2325 EXCEPT 22 1/4" HIGH			
——		AND 6 5/8" DIM. = 6 1/2" AND 2" DIM = 1 9/16"	2		
ST	83	TERMINAL BLOCK 5 PT.	6	805430	
"	84	" " 8 "	9	805431	
"	85				
"	86	MARKING STRIP 5 PT.	6	846292	
"	87	" " 8 "	9	846293	
"	88				
SH	89	ANGLE SPACER A = 4 1/2" FIG. 19	2	AT-5116-D	
"	90	CROSS MEMBER A = 15 1/2" " 6	2	"	
"	91	" " A = 19 1/2" " 6	2	"	
ST	92	FUSE BLOCK 250V. 3P.	2	822311	
"	93	FUSE 250 V. 5A.	6	25005	
SH	94	SPACER A = 13 FIG. 5A	2	AT-5116-D	
"	95	SPACER A = 17 " 5A	2	"	
"	96	END TRIM, ITEM 2.	2	DWG. 738890	



FRONT VIEW

WESTINGHOUSE ELECTRIC & MFG. CO., ATLANTA, GA.
CONTRACTORS CONTRACT NOY-4750
U.S. MARINE BARRACKS, NEW RIVER, N.C.
LOW VOLTAGE AUX. SWGR. FRONT VIEW
DIMENSIONS IN INCHES UNLESS NOTED
DWG. NO. AT-5116-B SUB. NO. X & 3

BILL OF MATERIAL

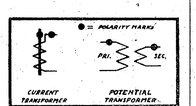
	ITEM	DESCRIPTION AND MATERIAL	REQ.	STYLE NO.
SHOP	1	ANGLE IRON FRAME 90 1/8" HIGH,		
——		48" WIDE, 44 7/8" DEEP OF 4"x2"x3/8"	1	PER DETAIL
SHOP	2	"DK-25" BKR. DOOR, IT. 2, EXCEPT 2" DIM. = 1 9/16	6	AT-SK-2325
"	3	TRANSITION UNIT HINGED FRONT PNL.	2	FIG. 15 AT-5116-D
EP	4	HINGED PNL. 47 3/8" x 89 3/4" x 3/32" 3" GUT.	1	SIM. TO 715483
EP	5	"DK-25" AIR CIRCUIT BREAKER		
——		600 AMP. 600V. 60 CYC. 3P.S.T.		
——		WITH 3-225A. DUAL OIL SUCTION		
——		MAGNETIC OVERLOAD TRIP COILS	1	S.O. 61Y554
EP	6	DITTO EXCEPT WITH 3-200A. TRIP COILS	2	S.O. 61Y555
"	7	" " " 3-125A. " "	3	S.O. 61Y556
"	8	" " " 3-90A. " "	2	S.O. 61Y557
N	9	"HY" WATTMETER, FLUSH MTG.		
——		THREE CUR. COILS, 2-120V. VOLT.		
——		COILS, SIM. TO S# 1156628, 2000-0-2000		
——		KW. SCALE, CAL. FOR USE WITH 2 SETS OF		
——		3-2500/5A. C.T.'S (2 SECON-		
——		DARIES IN PARALLEL PER CUR.		
——		COIL) FOR TOTALIZING TWO		
——		120/208V. 3PH. 4W. 60 CYC. CIR'S.	1	
N	10	"HY" WATTMETER, FLUSH MTG.		
——		THREE CUR. COILS, 2-120V. VOLTAGE		
——		COILS, SIM. TO S# 1156628, 0-2000		
——		KW. SCALE, CAL. FOR USE WITH		
——		5 SETS OF 3-1200/5A. C.T.'S		
——		AND 3-25/5A. AUX. C.T.'S		
——		(5-1200/5A. SEC. & 1-25/5A.		
——		PRIMARY IN PARALLEL PER		
——		CUR. COIL) FOR TOTALIZING 5		
——		120/208V. 3PH. 4W. 60 CYC. CIR'S.	1	
N	11	"HA" AMMETER, FLUSH MTG.		
——		0-2500A. SCALE CAL. FOR USE		
——		WITH 2500/5A. C.T.	2	931776
N	12	"HA" VOLTMETER, 0-300V. SCALE		
——		FLUSH MTG.	2	931781
EP	13	"W" AMMETER SW. 3 CIRCUIT WITH		SIM. TO
——		MODERNISTIC HANDLE	2	1151877
STK.	14	"W" VOLTMETER SW. 3φ	2	1040750
EP	15	" " " KEY	2	1151536
N	16	"CB-3" WATTHOUR METER 3EL.		
——		5A. 120V. COILS FOR USE WITH		
——		2 SETS OF 3-2500/5A. C.T.'S		
——		FOR TOTALIZING 2-120/208V.		
——		3 PH. 4 W. 60 CYC. CIRCUIT'S	1	
N	17	DITTO EXCEPT FOR USE WITH		
——		3-500/5A. C.T.'S ON A 120/208V.		
——		3 PH. 4W. 60 CYC. CIRCUIT.	1	
N	18	DITTO EXCEPT FOR USE WITH		
——		5 SETS OF 3-1200/5A. C.T.'S		
——		AND 3-25/5A. AUX. C.T.'S FOR		
——		TOTALIZING 5-120/208V.		
——		3 PH. 4 W. 60 CYC. CIRCUITS	1	
N	19	DITTO EXCEPT FOR USE WITH		
——		3-100/5A. C.T.'S ON A 120/208V.		
——		3 PH. 4 W. 60 CYC. CIRCUIT	1	
STK.	20	"M" TEST SW. 6P. FLUSH MTG.	4	1019658
STK.	21	" " " 4P. " "	4	1019656
EP	22	NAMEPLATE (3 3/4" x 1 1/4") ENGRAVED		
——		PER SCHEDULE, IN ATLANTA SHOP	8	1151773
EP	23	EMBLEM PLATE	1	#28825
STK.	24	LATCH ASS'Y. #2 DWG. 72-A-957	2	
STK.	25	" " #5 " "	4	

✱: WITH 15 MINUTE INTERVAL DEMAND REGISTER
⊗: PER DETAIL '00', EXCEPT FROM 11GA STEEL

SERVICE ORDER	CHZ-36573	SUB	1
DRAWING FINISHED	B.G.P.	8/6/42	10/1/42
CHECKED BY	M. D. Richardson	10/1/42	
APPROVED BY			
	Drawing reperance was not on.	10-12-42 K.F.	
	MINOR SHOP CHANGES	3	WEK 10-24-42

REFERENCE DRAWINGS
AT-5116 — FOUNDATION PLANS
AT-5116-A, CONTROL SW. PANEL, FOR COMBUSTION CONTROL BOARD
AT-5116-C, L.V. AUX. SWGR. - REAR VIEW & SECTIONS
AT-5116-D, L.V. AUX. SWGR. - SECTIONS & DETAILS
AT-5116-E, L.V. AUX. SWGR. WIRING DIAGRAM
8-B-18822, CONTRL. SW. PANEL WIRING DIAGRAM (E. PGH.)
AT-5116-F, L.V. BUS DUCTS - ASSEMBLY
AT-5116-G, H.V. BUS DUCTS - ASSEMBLY

NOTE TO CUSTOMER
THE MATERIAL SUPPLIED BY THE WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY IS ACCORDING TO CONTRACT AND IS NOT MODIFIED BY ANYTHING SHOWN ON THIS DIAGRAM.
TYPICAL MACHINE AND TRANSFORMER CONNECTIONS ARE SHOWN. FOR DETAIL CONNECTIONS SEE DIAGRAM FURNISHED WITH SUCH APPARATUS.
THIS DIAGRAM MUST NOT BE USED TO DETERMINE LOCATION OF APPARATUS, OR CABLES.
SWITCHBOARD CONNECTIONS ARE SHOWN AS VIEWED FROM THE REAR OF BOARD. APPARATUS PERPENDICULAR TO THE PANEL IS SHOWN WITH PART NEAREST TO PANEL AS THE TOP PART OF SYMBOL.
ALL APPARATUS IS SHOWN IN THE DE-ENERGIZED POSITION. AUXILIARY SWITCHES ARE SHOWN FOR THE OPEN POSITION OF THE MAIN DEVICE.
CURRENT AND POTENTIAL TRANSFORMER SYMBOLS ARE SUCH THAT TERMINALS OF THE SAME INSTANTANEOUS POLARITY ARE AS INDICATED AT THE RIGHT.
250 VOLT INSTRUMENT FUSE.
600 VOLT INSTRUMENT FUSE.
2500 VOLT INSTRUMENT FUSE.



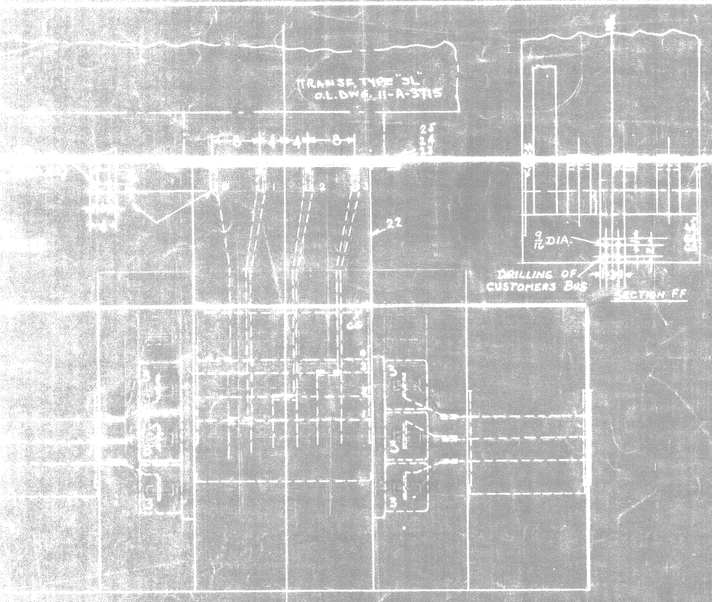
AT-5116-B

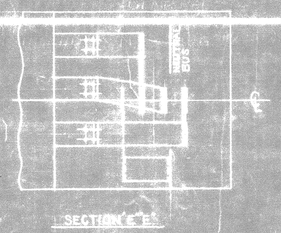
AT-5116-H, PLAN VIEW OF HANGER RODS FOR L.V. BUS DUCTS

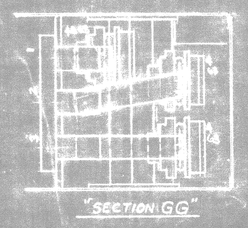
2

AT-5116-B
SUB.# 3

WESTINGHOUSE
LOW VOLTAGE AUX. SWGR.







DWG. 13-A-2077 SUB. 12 BILL OF MATERIAL SHEET #3

	DESCRIPTION AND MATERIAL				
A					
A					
A					
17					

L-8012

East Pittsburgh Works
September 15, 1942

Purchaser- COMTH 07083 CONTRACT NOY-4750; U.S. Marine Barracks

Purchaser's Order-
Westinghouse General Order- GH-36878-K A.O. 77-8-38

Location- New River, N.C.

Apparatus- 1 set of swgr. equipt. consisting of 3 indoor low voltage swgr. units of metal enclosed type.

18-A-8071 Sub 2 - T.W. Sections - Low Voltage Met. Encl. Swgr.
1-C-4067 Sub 2 - M.P. Engraving Chart - Low Volt. Met. Encl. Swgr.
18-A-8070 Sub 2 - Floor Plan - Low voltage M.C. Encl. Swgr.

Switchboard Engineering Dept.
A. P. Cannarino

CB:lf

10 Prints, CHARLOTTE SALES, A. . Robertson
2 Prints, ATLANTA, M & R DEPT., L. M. Hitchenbacher
2 Prints, ATLANTA SALES, J. L. Emmons
cc: CAB - H. A. McCoy

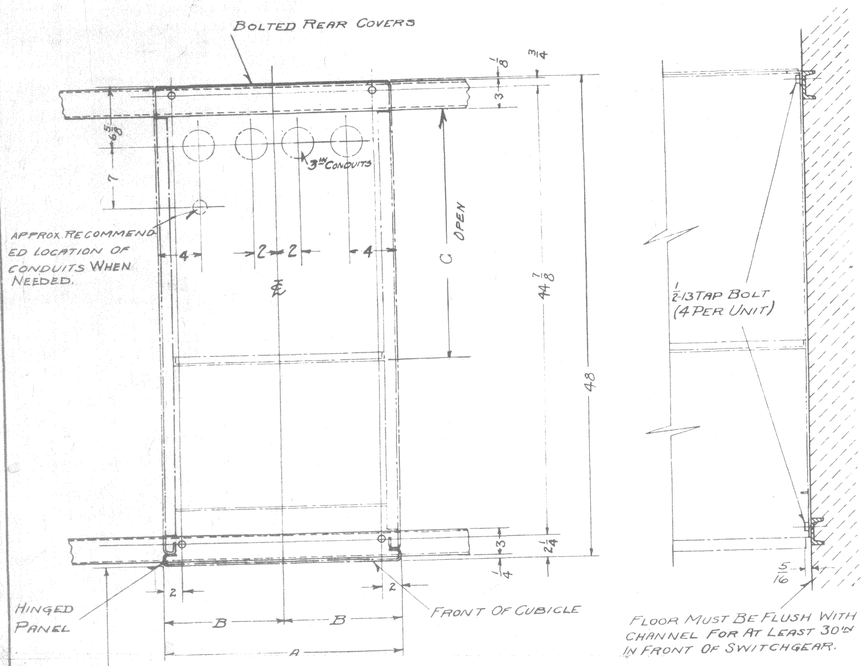
WESTINGHOUSE ELECTRIC & MFG. CO., EAST PITTSBURGH, PA. U. S. A.

U.S. MARINE BARRACKS - NEW RIVER - NORTH CAROLINA

THE LOW VOLTAGE METAL ENCLOSED SWITCHGEAR SUB-STATION "A"

DIMENSIONS IN INCHES FLOOR PLAN SCALE 1:8

DWG. No. 13-A-2070 SUB. No. 123



PLAN VIEW

SIDE VIEW

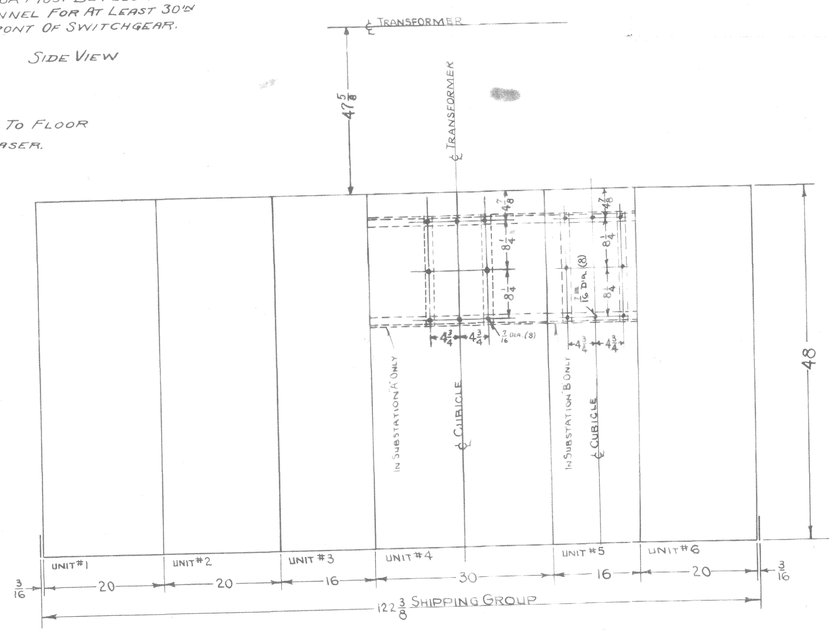
FLOOR MUST BE FLUSH WITH CHANNEL FOR AT LEAST 30" IN FRONT OF SWITCHGEAR.

RECOMMENDED METHOD OF FASTENING CUBICLES TO FLOOR
3" STANDARD CHANNELS SUPPLIED BY PURCHASER.

SPACE REQUIRED AT FRONT OF CUBICLE FOR HANDLING BKR.

DIMENSION TABLE

UNIT No.	A	B	C	
1	20	10	28 1/4	
2	20	10	28 1/4	
3	16	8	28 1/4	
4	30	15	26 7/8	
5	16	8	28 1/4	
6	20	10	28 1/4	



IMPORTANT NOTE TO PURCHASER

WESTINGHOUSE METAL ENCLOSED SWITCHGEAR IS ACCURATELY BUILT ON TRUE AND LEVEL BED PLATES TO INSURE CORRECT ALIGNMENT. THE SAME CARE SHOULD BE TAKEN IN ITS INSTALLATION.
THE FOUNDATION FOR ALL THESE UNITS SHOULD BE CAREFULLY LEVELED IN BOTH DIRECTIONS AND THE SUPPORTING CHANNELS SHOULD BE MAINTAINED IN A LEVEL PLANE UNTIL THE CONCRETE IS SET.
IN EXISTING FLOORS THE CHANNELS ARE NOT ESSENTIAL PROVIDING SUFFICIENT ANCHORAGE CAN BE OBTAINED. HOWEVER, THE EXISTING FLOOR SHOULD BE LEVEL WITHIN 1/16 IN. IN ANY SQUARE YARD.

GENERAL ASSEMBLY DWG. 13-A-2071

Date	7-Y-34	5-26-42	5-28-42					3.0.77-Y-34	2	DETAILS FOR BUS DUCT WAS DIFFERENT IN UNIT 4. 1. MAY 27, 1942. 2. JUNE 1, 1942.
Draftsman	SEKELLIK							3.0.77-Y-34	1	
Checker	CA									
Design Approved										
Installation Approved										
Wiring Approved										
Mechanical Engineer										

S.O. 77-Y-34 Bus Duct Units #5 For Sub. B Was Not On Dwg. 13-A-2070 For Sub. "A" Was Not Necessary SEKELLIK 8-28-42 CA 9-3-42 Changed to 3 W.S. Graham 9/11/42	3	

Tool Reference Dwg. No.

13A2070

ENGINEERING DEPT FORM 1478-E

PITTSBURGH PENCIL TRACING CLOTH

East Pittsburgh Works
September 16, 1942

Purchaser- QUARTERMASTER CONTRACT NOY-4753; U.S. Marine Barracks

Purchaser's Order-
Westinghouse General Order- GR-30975-K S.O. 77-Y-34

Location- New River, N.C.

Apparatus- 1 set of swgr. sculpt. consisting of 2 indoor low voltage swgr. units of metal enclosed type.

13-A-3071 Sub 2 - F.W. Sections - Low Voltage Met. Encl. swgr.
2-C-2087 Sub 2 - N.P. Engraving Chart - Low Volt. Met. Encl. swgr.
13-A-3070 Sub 2 - Floor Plan - Low voltage Met. Encl. Swgr.

Switchboard Engineering Dept.
A. P. Bernardino

CM:f

10 Prints, CHARLOTTE SALES, P. . Robertson
2 Prints, ATLANTA, M & R DEPT., M. F. Richenbacher
1 Print, ATLANTA SALES, . . Emmons
cc: S.S. - M. A. McCoy

7.108-1

REVISION B MAY 19, 1942

REVISION B MAY 19 1942

REVISION C 7-21-42

Revision D Dec 9 1942

REVISION 7-21-42

REVISION B MAY 19 1942

PILING OUT COAL EQUIP

ELEVATION AT TOP OF STRUCTURE

Mount on Bucket Elev. Structure See Mar Dwg No 2444

To Panel No 5

Extend for Lathe

Extend to Drill

Panel No 5

Panel No 6

Coal Handling Control Panel

Control Panel

Vibrator

Rotary Valve

Fuel Pump

Sump Pump

Safety Sw & Mag Starter

Safety Sw & Mag Starter for Fuel Pump Motor

Apron Feeder

Trippers

Pump

Softeners

Compressors

Air Receiver

Motor Driven Steam Valve

Mounted on Ash Unloading Platform See Mar Dwg No 2434

Ash Unloader

Note

Conduit laid in floor

Conduits shown to be neatly grouped and adequately supported by trapeze hangers from ground floor ceiling

Ground Floor Plan

Scale 1/4" = 1'-0"

REVISION	DATE	BRIEF	R.D. IN CHARGE	BY.
D	1-9-42	Motor Clr Added to Lathe & Drill		JGT
C	7-21-42	Added 4 Push Button Stations Relocated 3 Compressors, 2 Circ. pumps	V.C.J.L.A.	ROD
B	5-19-42	Added 2-7½ HP Compressors, Changed Locations of Steam Rector. Valve and Compr. Motors. Relocated Control for Ash.	V.C.J.L.	C.J.D.
B	5-19-42	Coal Handling Equipment Added Motor, Mer. Switch, Changed Size of Crossarc Type Motors		C.J.D.
A By Form	4/15/42	Specification No. Changed from 808 to 824		STFH

DRAWN BY C.J. DUNN
TRACED BY S.W. MITCHELL
CHECKED BY J.G.T.
CHIEF D'MN. V.C.J.L.
IN CHARGE J.T. Mac
DATE 3/9/42
SCALE As Shown
Y.& D. DRAWING NO.

ARCHITECT-ENGINEERS SPECIFICATION No. 824

CARR & J. E. GREINER CO.—ARCHITECT-ENGINEERS
DURHAM, N. C. BALTIMORE, MD.

MARINE BARRACKS—NEW RIVER, N. C.
BUREAU OF YARDS AND DOCKS — U. S. NAVY

Central Heating Plant

Power Wiring Layout

Ground — Floor

APPROVED April 13 1942
BY J. T. Mac Chief Civil Engineer, Bureau of Yards and Docks

SHEET: 2 OF 2

N.R. PROJ. NO. 102.1

N.R. DWG. NO. 2776

PHOTO BRUNNER CO., INC., LONG ISLAND CITY, N.Y.

41

2716 CARR + J.E. GREINER
POWER WIRING LAYOUT -
GROUND FLOOR -

REVISION B
MAY 19, 1942

REVISION
JULY 21, 1942

REVISION
JULY 21, 1942

REVISION B
MAY 19, 1942

REVISION B
MAY 19, 1942

USE 17 REVERSE BEARING FOR 24 PANEL & SEE PACK CONNECTIVE

"RISER DIAGRAM"
"AUXILIARY LOW VOLTAGE"
"SWITCHGEAR SECTION"

"NOTE"

☐ — COMB. MAGNETIC LINE STARTER OR TYPE A SAFETY SW. & MAGNETIC LINE STARTER

"RISER DIAGRAM"
"AUXILIARY HIGH VOLTAGE"
"SWITCHGEAR SECTION"

Note:
SEE SPECIFICATION PARAGRAPH 8(H) 3(A)
FOR DESCRIPTION OF CONTROL SYSTEM
TO BE FURNISHED

BY OTHERS

⊠ — COALIMIT SWITCHES LOCATED IN COAL SCALE DISCHARGE HOPPER

⊠ — FLOW METER BODY OUTLET

☐ — JUNCTION BOX

"B"	5-11-42	ADDED FLOW METER & COMBUSTION CONTROL WIRING		C.J.D.
"B"	5-11-42	CHANGED LOCATION OF STEAM EJECTION VALVE INCREASED SIZE OF BOX MOTORS & CONDENSATE PUMPS		C.J.D.
"B"	5-11-42	ADDED 2-7½ HP COMPRESSORS ADDED METERING W.R.S. TO 4TH PANEL		C.J.D.
A "B" FORM	4/15/42	Specification No. Changed From 8476-824		STEJ.
REVISION	DATE	BRIEF	R.O. IN CHARGE	BY

C — 5-11-42 — ADDED FLOW METER AND STEAM VALVE CONTROL CIRCUIT SIDE OF 2 AIR COMPRESSORS — C.J.D.

DRAWN BY C.A. DUNN
TRACED BY JOHN MITCHELL
CHECKED BY A.F.L.
CHIEF DFMN. A.F.L.
IN CHARGE T.T.B.
DATE 3/3/42
SCALE NOT TO SCALE
Y. & D. DRAWING NO.
ARCHITECT-ENGINEERS SPECIFICATION NO. 824

CARR & J. E. GREINER CO.—ARCHITECT-ENGINEERS
DURHAM, N. C. BALTIMORE, MD.
MARINE BARRACKS—NEW RIVER, N. C.
BUREAU OF YARDS AND DOCKS — U. S. NAVY

"CENTRAL HEATING PLANT"
"POWER WIRING LAYOUT"
"RISER DIAGRAMS"

APPROVED April 20 1942
BY [illegible]
RESIDENT OFFICER IN CHARGE

SHEET 3 OF —

N.E. PROJ. NO. 108-7
N.E. DWG. NO. 2717

EUGENE DIETZGEN CO. INC. CHICAGO NEW YORK

2742 CARR & J.E. GREINER
POWER WIRING LAYOUT
RISER DIAGRAMS

JUL 29 1942

WESTINGHOUSE ELECTRIC & MFG. CO., ATLANTA, GA.

CONTRACTORS CONTRACT NOY-4750

U.S. MARINE BARRACKS, NEW RIVER, N.C.

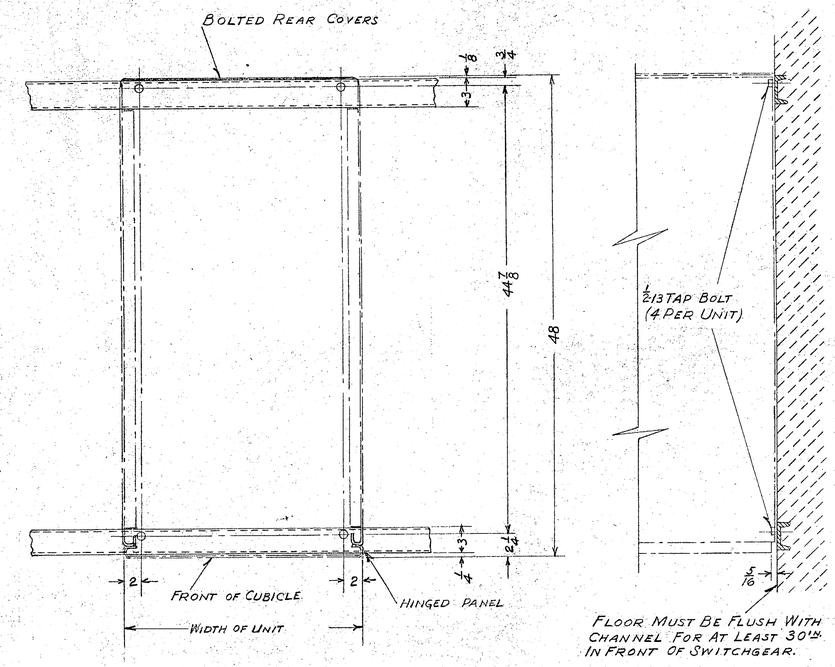
AUXILIARY SWITCHGEAR, FOUNDATION PLAN.

DIMENSIONS IN INCHES UNLESS NOTED 12:1

DWG. No. AT-5116 SUB. No. 1234

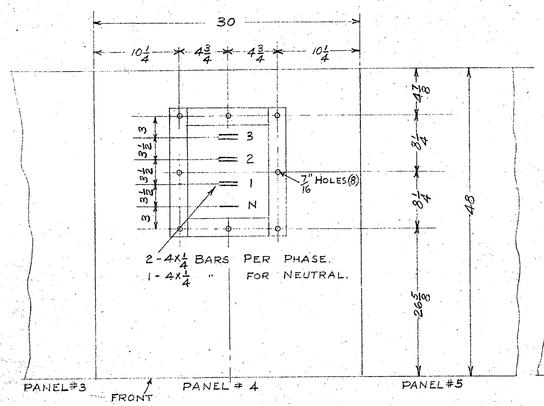
BILL OF MATERIAL

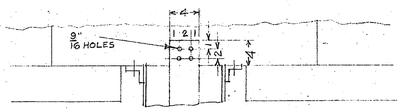
ITEM	DESCRIPTION AND MATERIAL	REQ.	STYLE NO.



PLAN VIEW

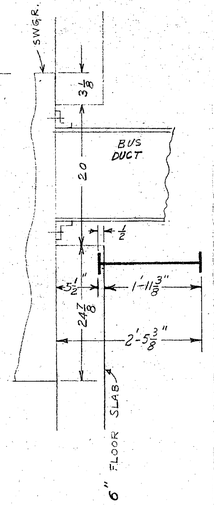
SIDE VIEW



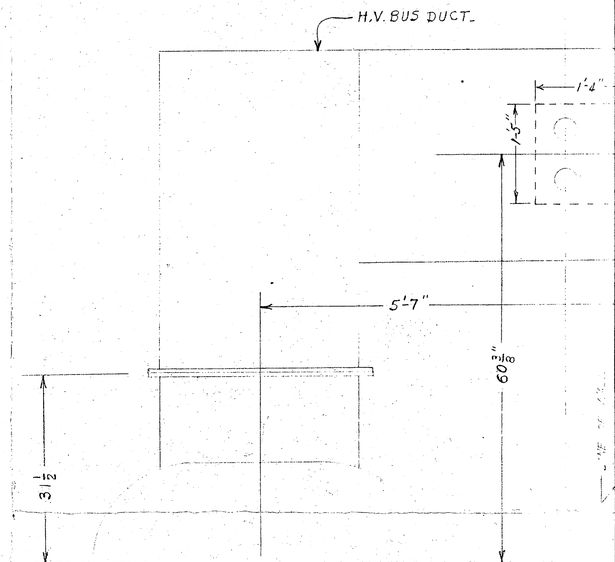


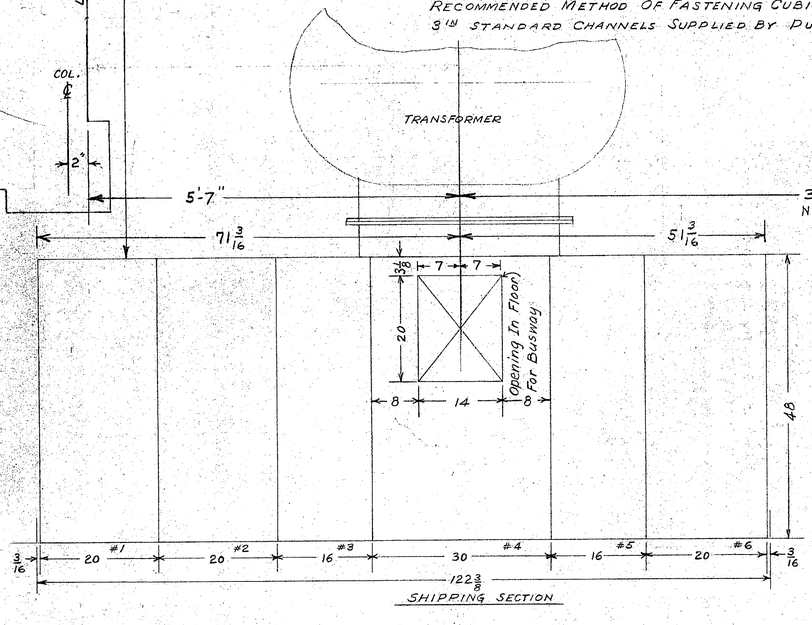
DRILLING PLAN OF BUS DUCT FLANGE, & COPPER BUS.

UNIT SUB-STATION A OR B



CIRCUIT DESIGNATION for CONDUITS IN AUXILIARY UNIT			
A	COAL HANDLING EQUIPMENT	2 1/2" CONDUIT.	
B	COAL STORAGE "	1 1/2"	"
C	ASH HANDLING "	1 1/2"	"
D	LIGHTING	1 1/2"	"
E	MISC. POWER (CONT. PANEL #5)	1 1/2"	"
F	AIR COMPRESSOR	1 1/2"	"
G	SPARE		
H	SPARE		

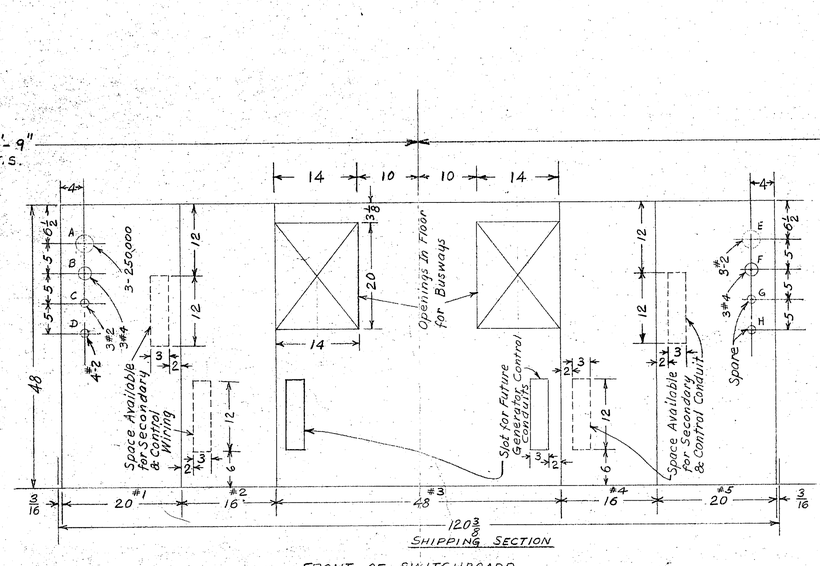




SUBSTATION "A"
SEE DWG. 13A 2070

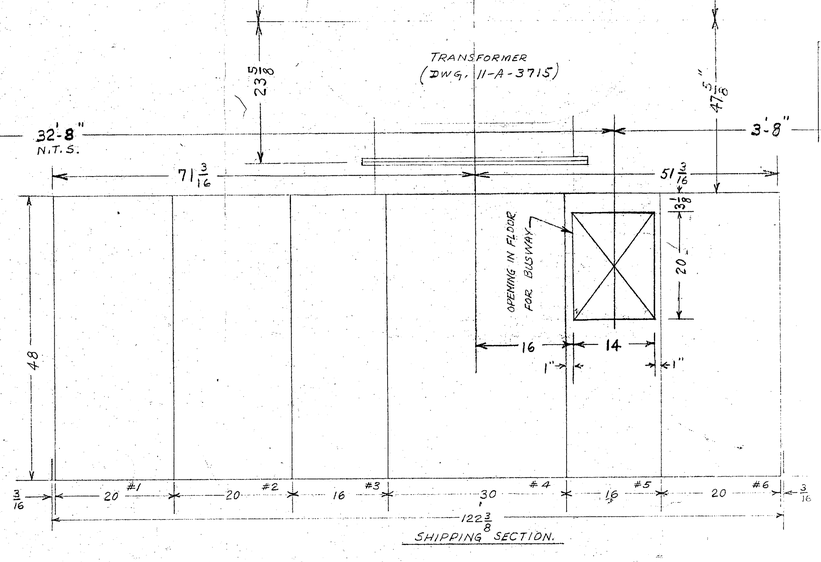
TYPICAL UNIT

RECOMMENDED METHOD OF FASTENING CUBICLES TO FLOOR.
3" STANDARD CHANNELS SUPPLIED BY PURCHASER.



FRONT OF SWITCHBOARD

AUXILIARY UNIT



SUBSTATION "B"
SEE DWG. 13A 2070

230182-692

SUB	SERVICE ORDER	DRAWING FINISHED	CHECKED BY	APPROVED BY	
1	CHZ-36573	HW HAMMOND 6/18/42	M.P. Richardson 9/4/42		VARIOUS DIMENSIONS AND VIEWS WERE NOT ON.
2			M.P.R. 7/24/42		DIMENSIONS WERE CHANGED TO AGREE WITH CUSTOMERS LAYOUT.
3			W.C.S. 8/10/42		3'-8" DIM. WAS 4'-1" (DISTANCE FROM ℄ BUS DUCT SUB. B TO R.H. WALL)
4			M.F.R. 9/25/42		

~NOTE~

FOR FOUNDATION PLAN OF SUB-STATION "A" & "B" SWITCHGEAR, SEE DWG. 13A-2070.

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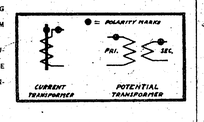
250 VOLT INSTRUMENT FUSE.
600 VOLT INSTRUMENT FUSE.
2500 VOLT INSTRUMENT FUSE.



AT-5116.

IDENTIFICATION LABEL

WESTINGHOUSE
ELECTRIC & MANUFACTURING COMPANY

ATLANTA WORKS

DRAWING AT-5116-A SUB. 1 DATE 10-8-42

PURCHASER Contractor's Contract, NOY-4750

ULTIMATE CUSTOMER U. S. Marine Barracks

GEN. ORDER CHZ-36573 STYLE OR S. O.

PURCHASE ORDER

LOCATION OR STATION New River, N. C.

APPLICATION

APPARATUS

L. V. Auxiliary Switchgear for
Heating Plant

Switchboard DIVISION M.F. Richenbaker ENGR.

NOTICE TO PURCHASER: MANUFACTURE IS PROCEEDING. ANY CHANGES REQUIRED IN THE APPARATUS CONSTRUCTION WILL DELAY SHIPMENT.

FORM 10526 L

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N.P. IT. NO. ON F.V.	B of MAT. IT. NO.	ENGRAVING FIRST LINE	LET. NO.	SECOND LINE	LET. NO.	FIG. No.	REQ.
751	22	COAL HANDLING	6	CONTROL PANEL	6	2	1
752	22	COAL STORAGE	6	EQUIPMENT	6	2	1
753	22	ASH UNLOADING	6	CONTROL PANEL #6	6	2	1
754	22	LIGHTING PANEL	6			1	1
755	22	CONTROL PANEL #5	6			1	1
756	22	AIR COMPRESSOR	6			1	1
757	22	SPARE (BLANK)					1
758	22	SPARE (BLANK)					1
759	307	INDUCED	6	DRAFT FAN	6	2	4
760	307	FORCED	6	DRAFT FAN	6	2	4
761	307	PULVERIZER #1	6			1	4
762	307	PULVERIZER #2	6			1	4
763	307	INDUCED	6	DRAFT FAN	6	2	4
764	307	INDUCED	6	DRAFT FAN LOCK	6	2	4
765	307	FORCED	6	DRAFT FAN	6	2	4
766	307	PULVERIZER #1	6			1	4
767	307	PULVERIZER #2	6			1	4
768	307	FEEDER #1	6			1	4
769	307	FEEDER #2	6			1	4
770	307	SCALE #1	6			1	4
771	307	SCALE #2	6			1	4
772							
773							
774							

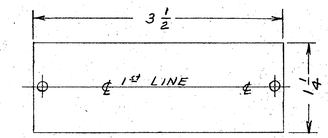


FIG. 1.

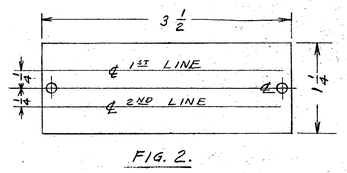
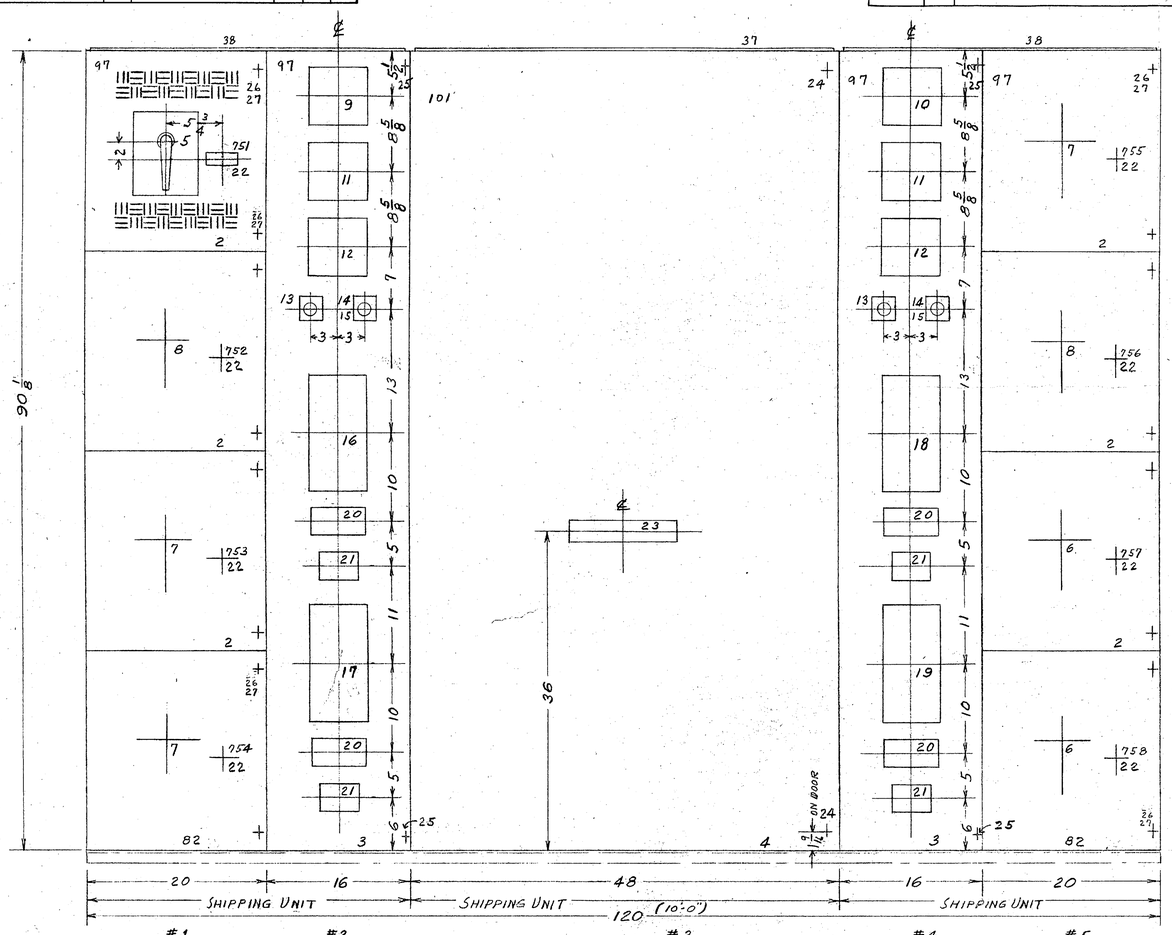


FIG. 2.

EP	97	HINGE ASSEMBLY - GROUP 2		
		DWG. 6-A-1699, - CONSISTING OF:	22	
		HINGES		1173215
		HINGE TUBES		1190034
		HINGE PINS		1190033
	98			
	99	BINDING H.D. SCREW (FOR REAR SHEETS)		1090653
	100	WASHERS (FOR IT. 99)		1021835
	101	CONCEALED HINGE FRONT & ANGLE	3	
	102	MICARTA CABLE CLAMPS		AT-5116-C
		EXTRA MATERIAL		
ST	201	FUSE 250V. 5A.	6	25005
OFFICE	202	SET OF BLUE PRINTS	1	
ST	203	"M" TEST PLUG (4 POLE)	1	694760
ST	204	"M" TEST PLUG (6 POLE)	1	715514
	205			

EP	26	LATCH DETAILS GROUP 2			
——		DWG. 1-B-6365 (KNOB & BLOCK)	16		
EP	27	LATCH DETAIL IT. 10, DWG. 1-B-6365	16		1196427
	28				
SHOP	29	SIDE SHEET FIG. 7B	1		AT-5116-D
"	30	" " " B	2		"
"	31	" " FIGS. 10B & 10A	1		"
"	32	" " FIG. 9	1		"
"	33	" " FIGS. 7 & 7A	1		"
"	34	REAR COVER FIG. 11	1		"
"	35	" " A = 15 1/2" " 12	2		"
"	36	" " A = 19 1/2" " 12	2		"
"	37	TOP COVER " 17	1		"
"	38	" " " 18	2		"
"	39	CROSS MEMBER A = 13" " 19	4		AT-5116-D
"	40	" " A = 17" " 19	4		"
"	41	VERTICAL MEMBER " 20	3		"
"	42	2" x 2" x 1/4" ANGLE IRON A = 15 5/8" " 4	2		"
"	43	" " " A = 19 5/8" " 4	2		"
"	44	BARRIER " 23	6		"
"	45	" " 16	2		"
"	46	BUS SUPPORT DET. MM	16		AT-5130-J
"	47	" " " NN	4		AT-5130-J
"	48	" " FIG. 24	12		AT-5116-D
"	49	" " " 25	1		"
"	50	" " " 26	2		"
"	51	" " COVER DET. 00	4		AT-5130-J
"	52	" " " FIG. 28	2		AT-5116-D
"	53	MICARTA FILLER (5/8 x 5 7/8 x 11 7/8)	4		
"	54	" " (5/8 x 3 5/8 x 6 5/8)	2		
"	55	BARRIER FIG. 22	1		AT-5116-D
	56				
	57				
	58				
SHOP	59	VERTICAL MEMBER FIG. 21	1		AT-5116-D
K	60	"U-5" CUR. TRANS. 1200/5A.	3		824237
"	61	"W-5" " " 500/5A.	3		986929
"	62	" " " 100/5A.	3		986922
"	63	" " " 25/5A.	3		986916
STK	64	1/4" x 4" COPPER BAR 9'-11 3/4" LONG	1		
"	65	1/4" x 4" " FABR. FT.	41		#2007
"	66	1/8" x 3" STRAP, FABR. FT.	111		
"	67	1/4" x 2" " " "	34		
"	68	1/4" x 1" " " "	35		
"	69	ULS-D1 TERMINAL, UNDRILLED	9		250 MCM
"	70	ULS-B1 " "	10		#2
"	71	ULS-A2 " "	6		#4
SHOP	72	CLIP 1" OF 3/8" x 1" x 1/4"	6		
"	73	GRD. BUS SUPPORT OF 1/4" x 4" x 6" EB. ASB.	1		
"	74	BUS SUPPORT FIG 27	1		AT-5116-D
"	75	WIRING GUTTER " 2	1		"
"	76	" " COVER " 3	1		"
"	77	REAR COVER " 13	1		"
"	78	REAR COVER A = 15 1/2" FIG 14	2		"
"	79	" " A = 19 1/2" " 14	2		"
"	80	SPACER A = 13 " 5	2		"
"	81	" A = 17 " 5	2		"
"	82	"DK-25" BKR. DOOR ITEM 2 OF			
——		AT-SK-2325 EXCEPT 22 1/4" HIGH			
——		AND 6 5/8" DIM. = 6 1/2" AND 2" DIM = 1 3/16"	2		
ST	83	TERMINAL BLOCK 5 PT.	8		805430
"	84	" " 8 "	4		805431
"	85	" " 12 "	7		805432
"	86	MARKING STRIP 5 PT.	8		846292
"	87	" " 8 "	4		846293
"	88	" " 12 "	7		846294
SH	89	ANGLE SPACER A = 4 1/2" FIG. 19	2		AT-5116-D
"	90	CROSS MEMBER A = 15 5/8" " 6	2		"
"	91	" " A = 19 1/2" " 6	2		"
ST	92	FUSE BLOCK 250V. 3P.	2		822311
"	93	FUSE 250 V. 5A.	6		25005
SH	94	SPACER A = 13 FIG. 5A	2		AT-5116-D
"	95	SPACER A = 17 " 5A	2		"
"	96	END TRIM, ITEM 2.	2		DWG. 788890



FRONT VIEW

WESTINGHOUSE ELECTRIC & MFG. CO., ATLANTA, GA.
CONTRACTORS CONTRACT NOY-4750
U.S. MARINE BARRACKS, NEW RIVER, N.C.
LOW VOLTAGE AUX. SWGR. FRONT VIEW
DIMENSIONS IN INCHES UNLESS NOTED
DWG. NO. AT-5116-B SUB. NO. 1

BILL OF MATERIAL

	ITEM	DESCRIPTION AND MATERIAL	REQ.	STYLE NO.
SHOP	1	ANGLE IRON FRAME 90 1/8" HIGH,		
——		48" WIDE, 44 7/8" DEEP OF 1 1/2" x 1 1/2" x 3/4"	1	PER DETAIL
SHOP	2	"DK-25" BKR. DOOR, IT. 2, EXCEPT 2" DIM. = 1 9/16"	6	AT-SK-2325
"	3	TRANSITION UNIT HINGED FRONT PNL.	2	FIG. 15 AT-5116-D
EP	4	HINGED PNL. 47 7/8" x 89 3/4" x 5/32" 3" GUT.	1	SIM. TO 715483
EP	5	"DK-25" AIR CIRCUIT BREAKER		
——		600 AMP. 600V. 60 CYC. 3P.S.T.		
——		WITH 3 - 225A. DUAL OIL SUCTION		
——		MAGNETIC OVERLOAD TRIP COILS	1	S.O. 61Y554
EP	6	DITTO EXCEPT WITH 3-200A. TRIP COILS	2	S.O. 61Y555
"	7	" " " 3-125A. " "	3	S.O. 61Y556
"	8	" " " 3-90A. " "	2	S.O. 61Y557
N	9	"HY" WATTMETER, FLUSH MTG.		
——		THREE CUR. COILS, 2-120V. VOLT.		
——		COILS, SIM. TO S# 1156628, 2000-0-2000		
——		KW. SCALE, CAL. FOR USE WITH 2 SETS OF		
——		3-2500/5A. C.T.'S (2 SECON-		
——		DARIES IN PARALLEL PER CUR.		
——		COIL) FOR TOTALIZING TWO		
——		120/208V. 3PH. 4W. 60CYC. CIR'S.	1	
N	10	"HY" WATTMETER, FLUSH MTG.		
——		THREE CUR. COILS, 2-120V. VOLTAGE		
——		COILS, SIM. TO S# 1156628, 0-2000		
——		KW. SCALE, CAL. FOR USE WITH		
——		5 SETS OF 3-1200/5A. C.T.'S		
——		AND 3-25/5A. AUX. C.T.'S		
——		(5-1200/5A. SEC. & 1-25/5A.		
——		PRIMARY IN PARALLEL PER		
——		CUR. COIL) FOR TOTALIZING 5		
——		120/208V. 3PH. 4W. 60CYC. CIR'S.	1	
N	11	"HA" AMMETER, FLUSH MTG.		
——		0-2500A. SCALE CAL. FOR USE		
——		WITH 2500/5A. C.T.	2	931776
N	12	"HA" VOLTMETER, 0-300V. SCALE		
——		FLUSH MTG.	2	931781
EP	13	"W" AMMETER SW. 3 CIRCUIT WITH		SIM. TO
——		MODERNISTIC HANDLE	2	1151877
STK.	14	"W" VOLTMETER SW. 3φ	2	1040950
EP	15	" " " KEY	2	1151536
N	16	"CB-3" WATTHOUR METER 3EL.		
——		5A. 120V. COILS FOR USE WITH		
——		2 SETS OF 3-2500/5A. C.T.'S		
——		FOR TOTALIZING 2-120/208V.		
——		3 PH. 4W. 60CYC. CIRCUITS	1	
N	17	DITTO EXCEPT FOR USE WITH		
——		3-500/5A. C.T.'S ON A 120/208V.		
——		3 PH. 4W. 60CYC. CIRCUIT.	1	
N	18	DITTO EXCEPT FOR USE WITH		
——		5 SETS OF 3-1200/5A. C.T.'S		
——		AND 3-25/5A. AUX. C.T.'S FOR		
——		TOTALIZING 5-120/208V.		
——		3 PH. 4W. 60CYC. CIRCUITS	1	
N	19	DITTO EXCEPT FOR USE WITH		
——		3-100/5A. C.T.'S ON A 120/208V.		
——		3 PH. 4W. 60 CYC. CIRCUIT	1	
STK.	20	"M" TEST SW. 6P. FLUSH MTG.	4	1019652
STK.	21	" " " 4P. " "	4	1019656
EP	22	NAMEPLATE (3 1/2" x 1 1/4") ENGRAVED		
——		PER SCHEDULE, IN ATLANTA SHOP	8	1151773
EP	23	EMBLEM PLATE	1	#28825
STK.	24	LATCH ASS'Y. #2 DWG. 72-A-957	2	
STK.	25	" " #5 " "	4	

*: WITH 15 MINUTE INTERVAL DEMAND REGISTER.
⊗: PER DET. "00" EXCEPT FROM 11GA STEEL.

SERVICE ORDER CH2-36573 SUB 1 — 9/25/42
DRAWING FINISHED 13.G.P. — 10/12/42
CHECKED BY M. B. Richardson
APPROVED BY

REFERENCE DRAWINGS
AT-5116 — FOUNDATION PLANS
AT-5116-A, CONTROL SW. PANEL, FOR COMBUSTION CONTROL BOARD
AT-5116-C, L.V. AUX. SWGR. - REAR VIEW & SECTIONS
AT-5116-D, L.V. AUX. SWGR. SECTIONS & DETAILS
AT-5116-E, L.V. AUX. SWGR. WIRING DIAGRAM
8-B-1882, CONTROL SW. PANEL WIRING DIAGRAM (E.PGH.)
AT-5116-F, L.V. BUS DUCTS - ASSEMBLY
AT-5116-G, H.V. BUS DUCTS - ASSEMBLY

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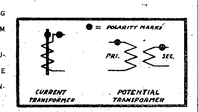

AT-5116-B
230182-694

P108-9

IDENTIFICATION LABEL

WESTINGHOUSE
ELECTRIC & MANUFACTURING COMPANY

ATLANTA WORKS

DRAWING AT-5116 SUB. 4 DATE 10-8-42

PURCHASER Contractor's Contract, NOY-4750

ULTIMATE CUSTOMER U. S. Marine Barracks

GEN. ORDER CHZ-36573 STYLE OR S. O.

PURCHASE ORDER

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FORM 10826 L

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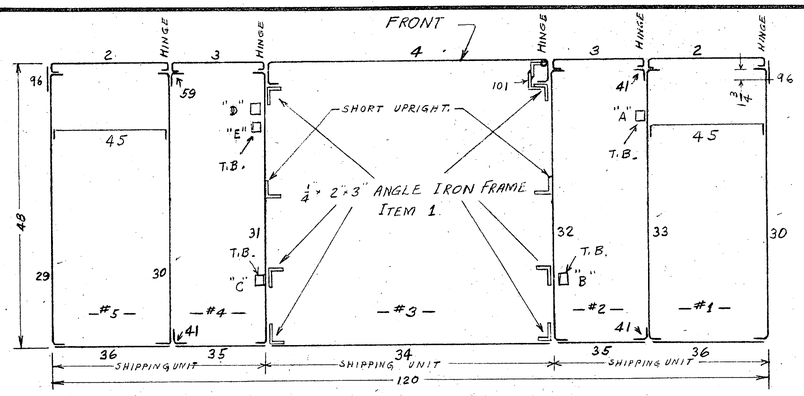
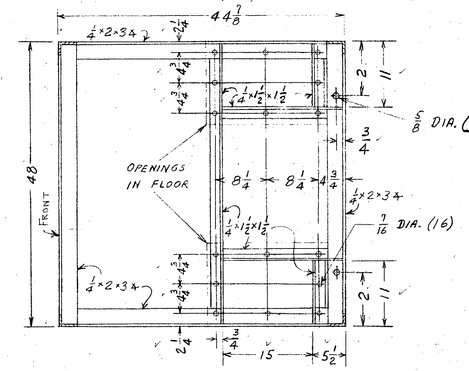
CONTRACTORS CONTRACT NOY-4750
U.S. MARINE BARRACKS NEW RIVER, N.C.
LOW VOLTAGE AUX. SWGR., REAR VIEW & SECT.
DIMENSIONS IN INCHES UNLESS NOTED
DWG. NO. AT-5116-C SUB. NO. 1

BILL OF MATERIAL

ITEM	DESCRIPTION AND MATERIAL	REQ.	STYLE NO.

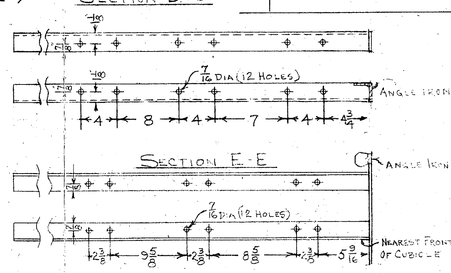


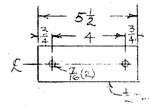
PLAN SECTION OF STEEL



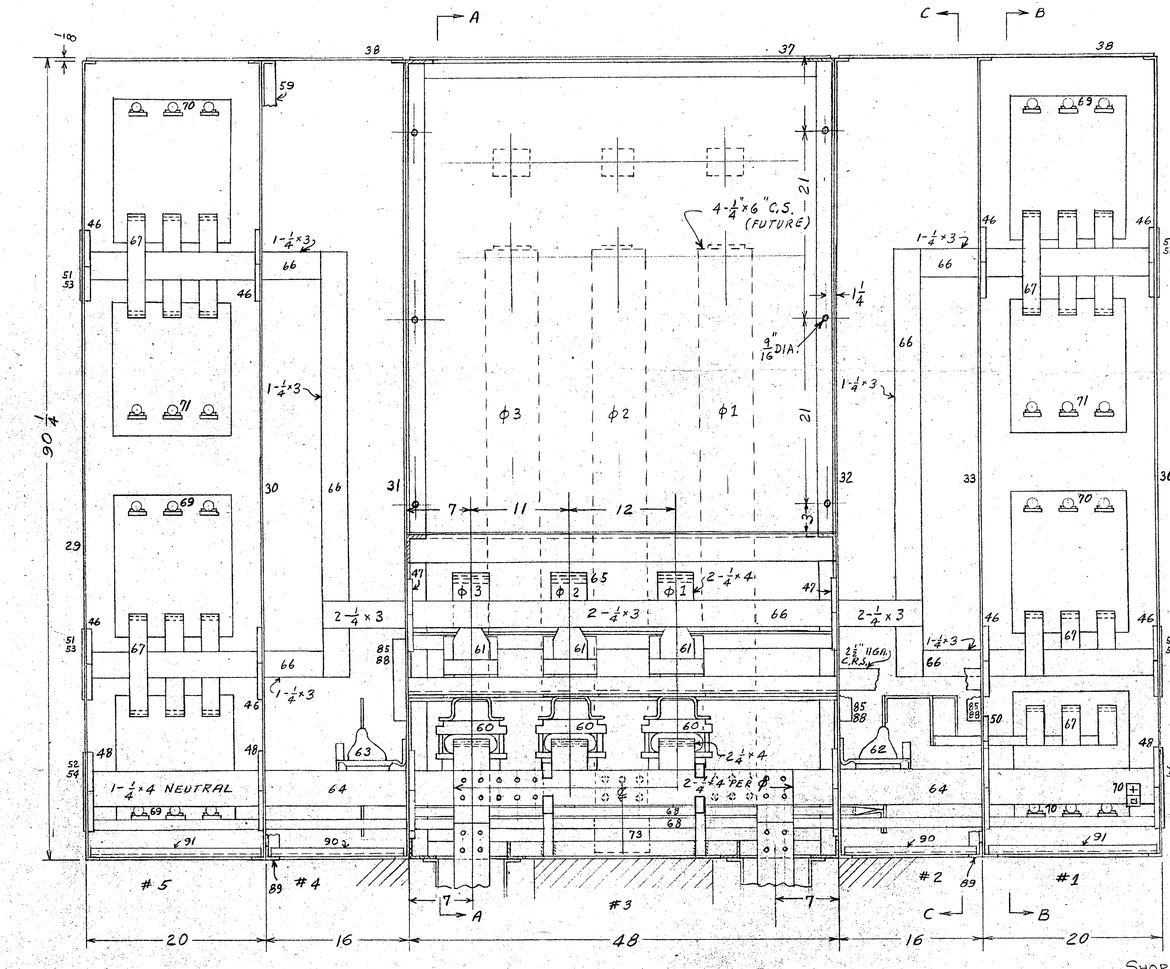
FOUNDATION PLAN
INCOMING LINE UNIT #3

SECTION D-D

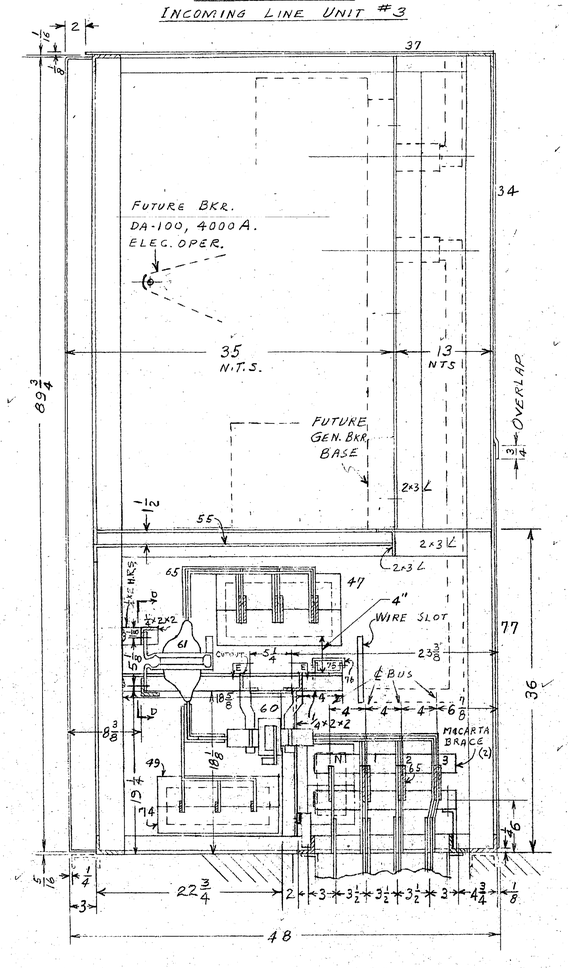




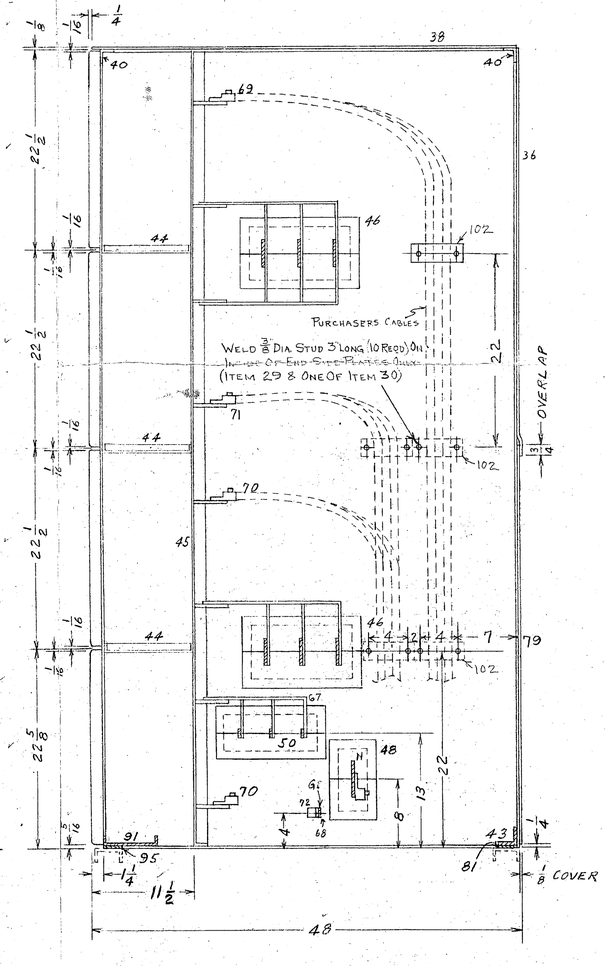
ITEM 102, 10 REQD



REAR VIEW SECTION



SECTION "A-A"



SECTION "B-B"

SHOP NOTE
1. ALL BOLTED COPPER CONNECTION ARE TO BE SILVER PLATED
2. PROVIDE LIFTING ANGLES FOR SHIPMENT

SEE DWG. AT-5116B FOR REFERENCE DWG. SCHEDULE.

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CURRENT AND POTENTIAL TRANSFORMER SYMBOLS ARE SUCH THAT TERMINALS OF THE SAME INSTANTANEOUS POLARITY ARE AS INDICATED AT THE RIGHT.
250 VOLT INSTRUMENT FUSE.
600 VOLT INSTRUMENT FUSE.
2500 VOLT INSTRUMENT FUSE.

● = POLARITY MARKS
PRI. SEC.
CURRENT TRANSFORMER
POTENTIAL TRANSFORMER

SERVICE ORDER	SUB
CHZ-36573	1
DRAWING FINISHED	9/18/42
B.G.P.	
CHECKED BY	10/6/42
M.M.Robinson	
APPROVED BY	

230182-695
AT-5116-C

P-108-7

IDENTIFICATION LABEL

WESTINGHOUSE

ELECTRIC & MANUFACTURING COMPANY

Atlanta WORKS

DRAWING AT-5141 SUB. 2 DATE 10-8-42

PURCHASER Contractor's Contract, NOY-4750

ULTIMATE CUSTOMER U. S. Marine Barracks

GEN. ORDER CHZ-36573 STYLE OR S. O.

PURCHASE ORDER

LOCATION OR STATION New River, N. C.

APPLICATION

APPARATUS

L. V. Auxiliary Switchgear for Heating Plant

Switchboard DIVISION M. F. Richenbaker ENGR.

NOTICE TO PURCHASER: MANUFACTURE IS PROCEEDING. ANY CHANGES REQUIRED IN THE APPARATUS CONSTRUCTION WILL DELAY SHIPMENT.

FORM 10626 L

THIS DRAWING IS THE PROPERTY OF THE WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY, SUBJECT TO RECALL BY THEM AT ANY TIME.

PRINTED U.S.A.

WESTINGHOUSE ELECTRIC & MFG. CO., ATLANTA, GA.

CONTRACTORS CONTRACT NOY-4750

U.S. MARINE BARRACKS, NEW RIVER, N.C.

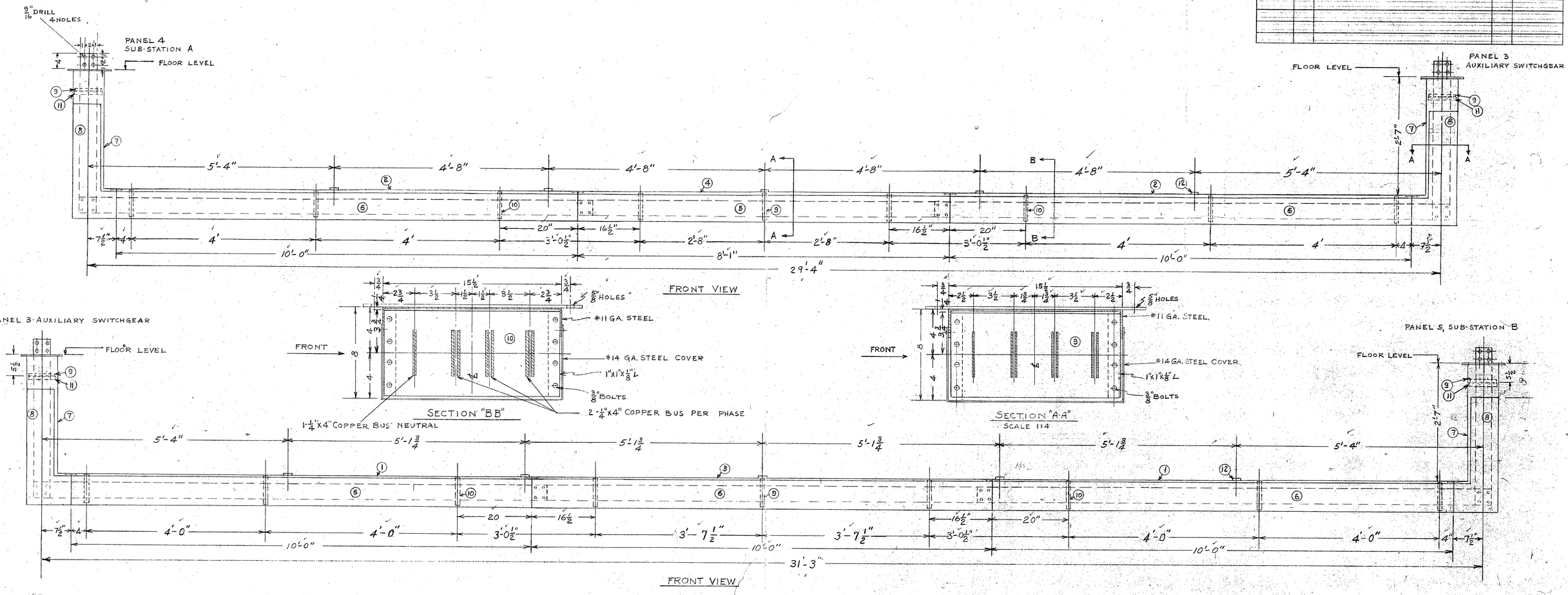
208-VOLT BUS DUCT- ASSEMBLY & DETAILS.

DIMENSIONS IN INCHES UNLESS NOTED

Dwg. No. AT-5116-F Sub. No.1

BILL OF MATERIAL

	ITEM	DESCRIPTION AND MATERIAL	REQ.	STYLE NO.
SHOP	1	BASE	2	Per Detail Dwg AT-5116-J.
"	2	"	2	"
"	3	"	1	"
"	4	"	1	"
"	5	COVER	1	"
"	6	"	5	"
"	7	BASE	4	"
"	8	COVER	4	"
"	9	MICARTA BUS SUPPORT	10	"
"	10	" " "	12	"
"	11	$\frac{1}{8}$"X1"X1" FORMED ANGLE $7\frac{1}{2}$" LONG	44	"
"	12	HANGER IRON $\frac{1}{2}$"X$1\frac{3}{8}$"X19" LG.	10	"
"	13	$\frac{1}{4}$"X4" C.S. BUS (FABRICATED) FT.	500	



~NOTE TO SHOP~

1. INCLUDE BOLTS FOR END CONNECTIONS.
2. SHIP WITH COPPER BUS BARS ASSEMBLED IN BUS DUCT SECTIONS.
3. USE DULL BLACK FINISH.
4. SILVER-PLATE COPPER AT ALL BOLTED JOINTS.

~REFERENCE~

DWG.-AT-5116-J - STEEL DETAILS.

NOTE TO CUSTOMER

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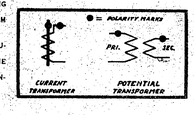
600 VOLT INSTRUMENT FUSE.
2500 VOLT INSTRUMENT FUSE.



SERVICE ORDER	CHZ-36573	SUB	1
DRAWING FINISHED	11/3/42		
CHECKED BY	M.P. Richardson 11/4/42		
APPROVED BY	M.P. Richardson 11/4/42		

230182-697

AT-5116-F

2118-7 M.D.P. 8

IDENTIFICATION LABEL

WESTINGHOUSE

ELECTRIC & MANUFACTURING COMPANY

Atlanta WORKS

DRAWING AT-5116-H SUB. 1 DATE 11-4-42

PURCHASER Contractors Contract NOY-4750

ULTIMATE CUSTOMER

GEN. ORDER CHZ-36573 STYLE OR S. O.

PURCHASE ORDER

LOCATION OR STATION U.S.Marine Barracks, New River, N.C.

APPLICATION

APPARATUS Heating Plant Switchgear

Switchgear DIVISION M.F. Richenbaker ENGR.

NOTICE TO PURCHASER: MANUFACTURE IS PROCEEDING. ANY CHANGES REQUIRED IN THE APPARATUS CONSTRUCTION WILL DELAY SHIPMENT.

FORM 10020 L

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WESTINGHOUSE ELECTRIC & MFG. CO., ATLANTA, GA.
CONTRACTORS CONTRACT NOY-4750
U. S. MARINE BARRACKS NEW RIVER, N.C.
LOW VOLTAGE AUX. SWGR.
DIMENSIONS IN INCHES UNLESS NOTED
DWG. NO. AT-5116-D SUB. NO. 1

BILL OF MATERIAL

ITEM	DESCRIPTION AND MATERIAL	REQ.	STYLE NO.

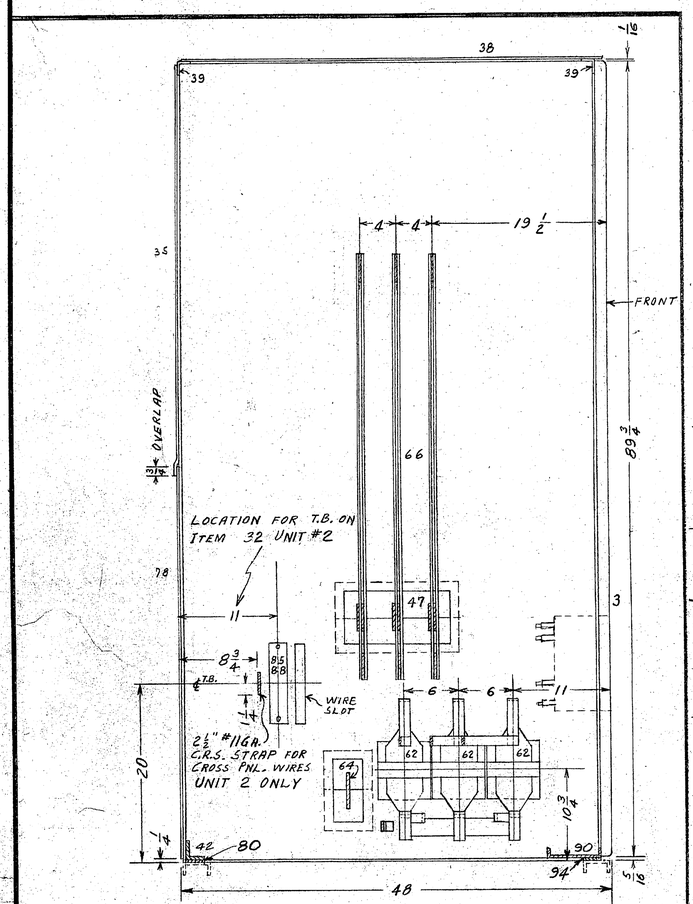
FIG. 1
SCALE: TWICE FULL SIZE

FIG. 2 ~ A = 47 11/16", B = 3", DRILL & TAP FOR #10-32 (6)
FIG. 3 ~ A = 44, B = 3 1/4", DRILL 1/4" (6 HOLES)

FIG. 4 1/4" x 2" x 2" ANGLE

FIG. 5 ~ B = 5/8" ~ 11GA. C.R.S.
FIG. 5A ~ B = 1" ~ 11GA. C.R.S.

FIG. 6 ~ 11GA. C.R.S.



SECTION "C-C"

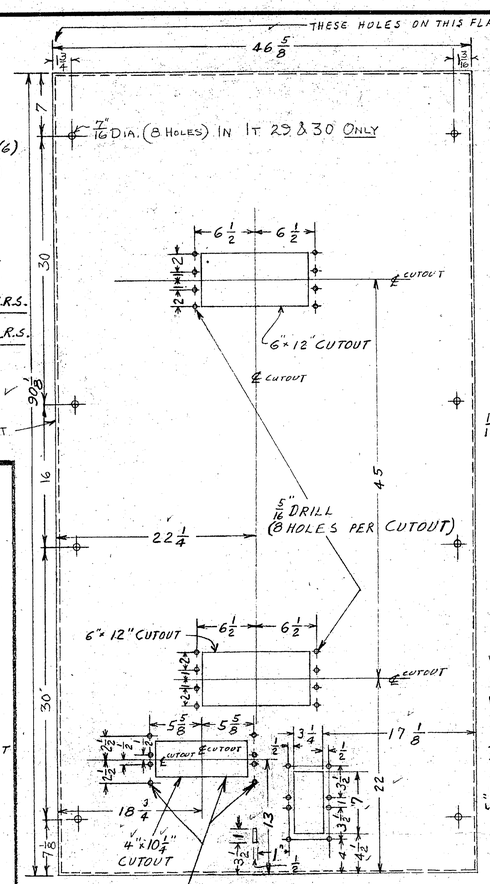


FIG 7 AS SHOWN ~ (11GA. C.R.S.)
FIG. 8 MAKE OPP. HAND & OMIT FLANGE DRLG. & 4 x 10 1/4 CUTOUT & HOLES.
FIG. 7B AS SHOWN EXCEPT OMIT 4 x 10 1/4 CUTOUT & HOLES.

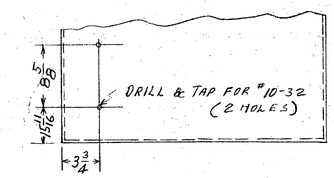


FIG. 7A ~ DRILLING FOR T.B. ON IT. 33

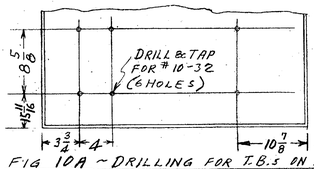


FIG 10A ~ DRILLING FOR T.B.S ON IT. 31

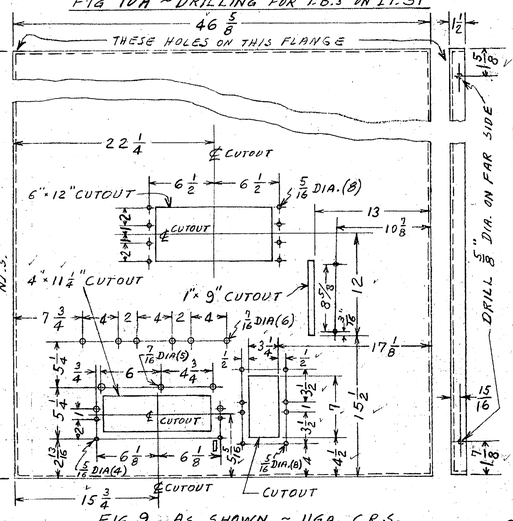


FIG 9 AS SHOWN ~ 11GA. C.R.S.
FIG. 10 OPP. HAND & OMIT FLANGE DRILLING & 4 x 11 3/4 CUTOUT & HOLES.

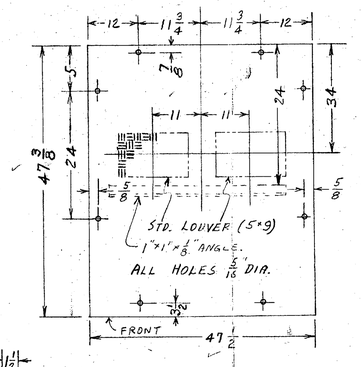


FIG. 17 ~ 11GA. C.R.S.

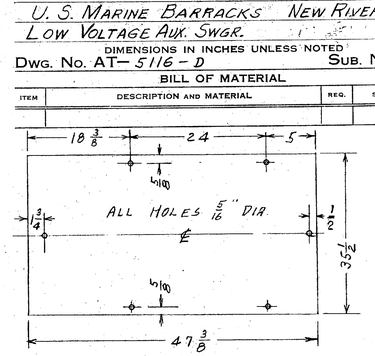


FIG. 18 ~ 11GA. C.R.S.

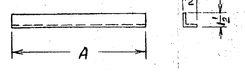


FIG. 19 ~ 11GA. C.R.S.

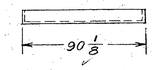


FIG. 20 ~ 11GA. C.R.S.

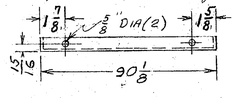
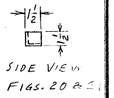


FIG. 21 ~ 11GA. C.R.S.



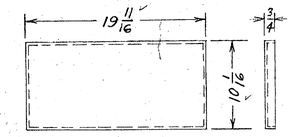


FIG. 23 ~ 11GA. C.R.S.

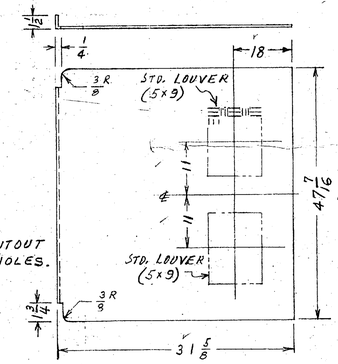


FIG. 22 ~ 11GA. C.R.S.

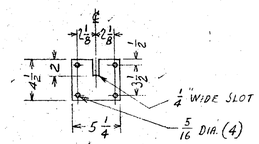


FIG. 24 ~ 1/2" MICARTA

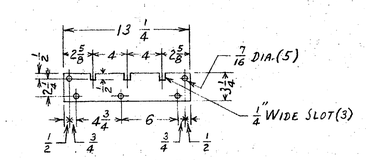


FIG. 25 ~ 1/2" MICARTA

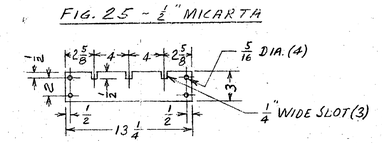


FIG. 27 ~ 1/2" MICARTA

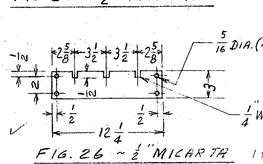


FIG. 26 ~ 1/2" MICARTA

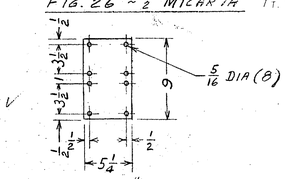


FIG. 28 ~ #11GA. STEEL.

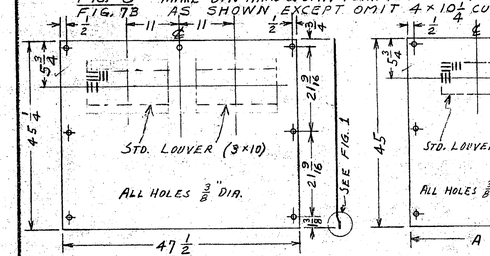


FIG. 11 ~ 11GA. C.R.S.

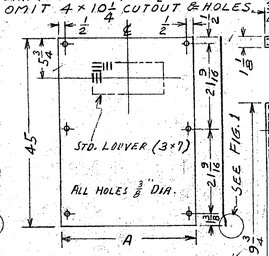


FIG. 12 ~ 11GA. C.R.S.

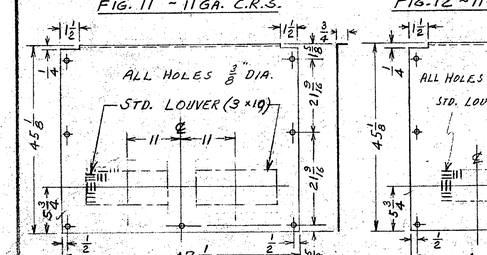


FIG. 13 ~ 11GA. C.R.S.

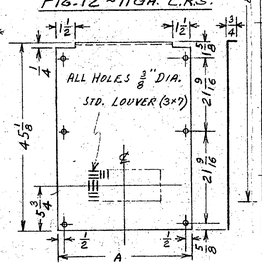


FIG. 14 ~ 11GA. C.R.S.

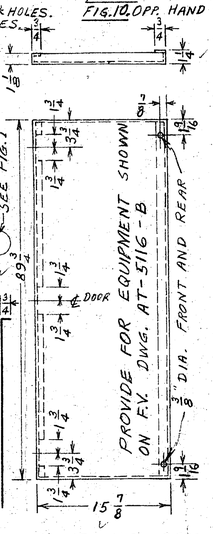


FIG. 15 ~ 11GA. C.R.S.

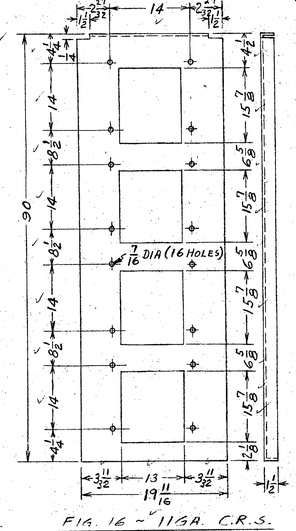


FIG. 16 ~ 11GA. C.R.S.

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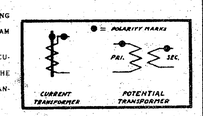

SERVICE ORDER	SUB 1
CHZ-36573	
DRAWING FINISHED	9/25/42
B.G.P.	
CHECKED BY	10/19/42
M.A. Richardson	
APPROVED BY	

230182-696
AT-5116-D

P-108-7

IDENTIFICATION LABEL

WESTINGHOUSE

ELECTRIC & MANUFACTURING COMPANY

ATLANTA WORKS

DRAWING AT-5116-C SUB. 1 DATE 10-8-42

PURCHASER Contractor's Contract, NOY-4750

ULTIMATE CUSTOMER U. S. Marine Barracks

GEN. ORDER OH4-36573 STYLE OR S. O.

PURCHASE ORDER

LOCATION OR STATION New River, N. C.

APPLICATION

APPARATUS

L.V. Auxiliary Switchgear for Heating Plant

Switchboard DIVISION M.F. Richenbaker ENGR.

NOTICE TO PURCHASER: MANUFACTURE IS PROCEEDING. ANY CHANGES REQUIRED IN THE APPARATUS CONSTRUCTION WILL DELAY SHIPMENT.

FORM 10826 L

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WESTINGHOUSE ELECTRIC & MFG. CO., ATLANTA, GA.

CONTRACTORS CONTRACT NOY-4750

U.S. MARINE BARRACKS, NEW RIVER, N.C.

LOW VOLTAGE AUX. SWGR. WIRING DIAGRAM

DIMENSIONS IN INCHES UNLESS NOTED

DWG. NO. AT- 5116-E SUB. NO. 1

BILL OF MATERIAL

ITEM	DESCRIPTION AND MATERIAL	REQ.	STYLE NO.

P.10

UNIT NO. 1 — CELL F.V.

"DK-25" A.C.B. 225A. 600V. S.O. 61-Y-554
O.L.T.
NEAREST BKR.
"DK-25" A.C.B. 90A. 600V S.O. 61-Y-557
"DK-25" A.C.B. 125A. 600V. S.O. 61-Y-556
NEAREST BKR.
"DK-25" A.C.B. 125A. 600V. S.O. 61-Y-556
O.L.T.
3-250 MCM
3-#4
3-#2
4-#2
N

UNIT NO. 2 — PANEL R.V. — CELL F.V.

"HY" WATTMETER
"HA" AM.
"HA" VM.
"W" VM. SW.
"W" AM. SW.
1-1/4 X 3 C.S.
"CB-3" W.H.M.
TEST SW.
"CB-3" W.H.M.
TEST SW.
TEST SW.
"A"
"B"
N

48" WIDE HINGED PANEL FOR FUTURE METERS

UNIT NO. 3 — PANEL R.V. — CELL F.V.

FROM FUTURE GEN.
FUTURE "DA-100" A.C.B. 4000 A. ELECT. OPER.
FUTURE CONN.
BUS NEAREST REAR
1-1/4 X 4 C.S.
"W-S" 500/5A. C.T.'s #5
2-1-1/4 X 4 C.S.
"W-S" 100/5A. C.T.'s #6
"V-S" 1200/5A. C.T.'s #9
BUS NEAREST REAR
GRD. BUS
WIRE GUTTER
N 1 2 3
N 1 2 3
BUS DUCT TO SUB STA. A
BUS DUCT TO SUB STA. B

UNIT NO. 4 — PANEL R.V. — CELL F.V.

"HY" WATTMETER
"HA" AM.
"HA" VM.
"W" VM. SW.
"W" AM. SW.
1-1/4 X 3 C.S.
"CB-3" W.H.M.
TEST SW.
"CB-3" W.H.M.
"W-S" 25/5A. AUX. C.T.'s
TEST SW.
TEST SW.
"C"
"D"
"E"
N

UNIT NO. 5 — CELL F.V.

"DK-25" A.C.B. 125A. 600V. S.O. 61-Y-556
O.L.T.
NEAREST BKR.
"DK-25" A.C.B. 90A. 600V. S.O. 61-Y-557
200 A. SPARE
"DK-25" A.C.B. 200A. 600V. S.O. 61-Y-555
120/208V. 3Φ 60 CYC. BUS
"DK-25" A.C.B. 200A. 600V. S.O. 61-Y-555
COAL SHAICRTC
SPARE 200A.
3-#4
3-#2
N
NEUTRAL BUS
GRD. BUS

TEST CABLE
TEST CABLE
"M" TEST PLUGS (F.V.) FOR W.H.M. TEST SWS.

225A. FDR. CHAR. MAINTENANCE
90A. FDR. COND. - CORAGE
15A. FDR. ASH HANDLING
15A. FDR. LIGHTING
SUB STATION A DWG. 12-A-4632
SUB STATION A DWG. 12-A-4632
SUB STATION B DWG. 12-A-4632
SUB STATION B DWG. 12-A-4632
FROM REMOTE WTD. W.H.M.'s DWG. 8-B-1822
AIR COMPRESSOR 30A. FDR. CONTROL PAN #5
16 SA. FDR.

WIRING DIAGRAM - FRONT VIEW - WITH DOORS OPEN

SERVICE ORDER	CHZ-36573
SUB	1
DRAWING FINISHED	B.G.P. 9/10/42
CHECKED BY	M.P. Richardson 10/31/42
APPROVED BY	M.P. Richardson 11/1/42

SEE DWG. AT-5116B FOR REFERENCE DWG. SCHEDULE
" " AT-5116C (PLAN SECTION) FOR LOCATION OF TERM. BLOCKS.

NOTE TO CUSTOMER

THE MATERIAL SUPPLIED BY THE WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY IS ACCORDING TO CONTRACT AND IS NOT MODIFIED BY ANYTHING SHOWN ON THIS DIAGRAM.

TYPE, MAGNET AND TRANSFORMER CONNECTIONS ARE SHOWN. FOR DETAIL CONNECTIONS SEE DIAGRAM FURNISHED WITH SUCH APPARATUS.

THIS DIAGRAM MUST NOT BE USED TO DETERMINE LOCATION OF APPARATUS, OR CABLES.

SWITCHBOARD CONNECTIONS ARE SHOWN AS VIEWED FROM THE REAR OF BOARD. APPARATUS PERPENDICULAR TO THE PANEL IS SHOWN WITH PART NEAREST TO PANEL AS THE TOP PART OF SYMBOL.

ALL APPARATUS IS SHOWN IN THE DE-ENERGIZED POSITION. AUXILIARY SWITCHES ARE SHOWN FOR THE OPEN POSITION OF THE MAIN DEVICE.

CURRENT AND POTENTIAL TRANSFORMER SYMBOLS ARE SUCH THAT TERMINALS OF THE SAME INSTANTANEOUS POLARITY ARE AS INDICATED AT THE RIGHT.

Φ 250 VOLT INSTRUMENT FUSE 5A.
600 VOLT INSTRUMENT FUSE
2500 VOLT INSTRUMENT FUSE

= POLARITY MARKS

CURRENT TRANSFORMER — POTENTIAL TRANSFORMER

AT-5116-E
230182-701

IDENTIFICATION LABEL

WESTINGHOUSE

ELECTRIC & MANUFACTURING COMPANY

ATLANTA

WORKS

DRAWING AT-5116-B SUB. 1 DATE 10-8-42

PURCHASER Contractor's Contract, NOY-4750

ULTIMATE CUSTOMER U. S. Marine Barracks

GEN. ORDER CHZ-36573

PURCHASE ORDER STYLE OR S. O.

LOCATION OR STATION New River, N. C.

APPLICATION

APPARATUS

L. V. Auxilliary Switchgear for Heating Plant

Switchboard DIVISION M.F.Richenbaker ENGR.

NOTICE TO PURCHASER: MANUFACTURE IS PROCEEDING. ANY CHANGES REQUIRED IN THE APPARATUS CONSTRUCTION WILL DELAY SHIPMENT.

FORM 5965 L

THIS DRAWING IS THE PROPERTY OF THE WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY, SUBJECT TO RECALL BY THEM AT ANY TIME.

WESTINGHOUSE ELECTRIC & MFG. CO., ATLANTA, GA.

CONTRACTORS CONTRACT NOY-4750

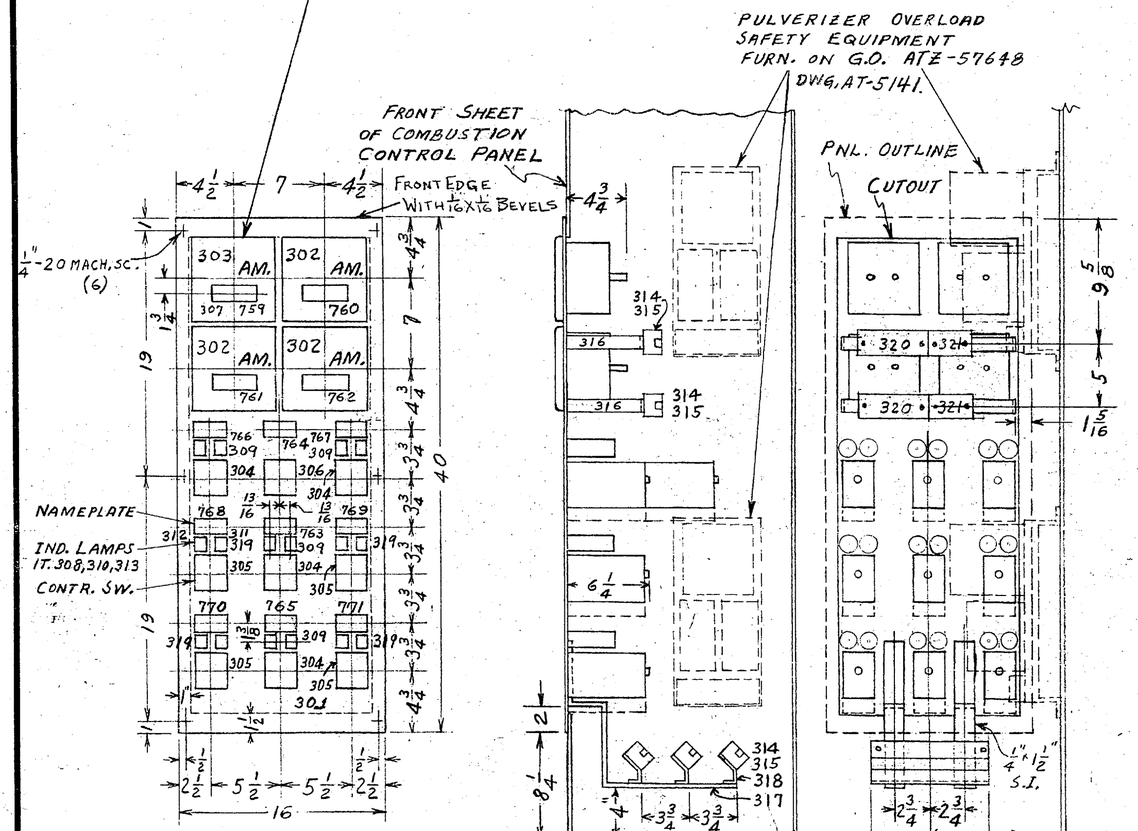
U. S. MARINE BARRACKS, NEW RIVER, N.C.

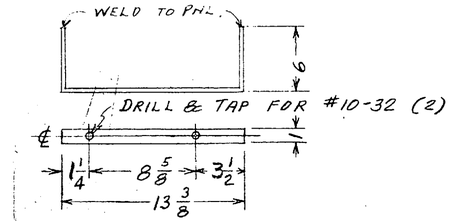
CONTROL SW. PANEL FOR COMBUSTION CONTROL PANEL

DIMENSIONS IN INCHES UNLESS NOTED SCALE - 1:8

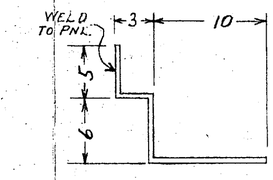
DWG. NO. AT-5116-A SUB. NO. X2

NOTE: 4 UNITS REQ. ON THIS ORDER.

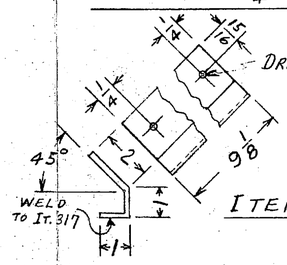




ITEM 316 ~ 1/8" X 1" S.I.



ITEM 317 ~ 1/4" X 1 1/2" S.I.



ITEM 318 ~ 16 GA. C.R.S.

BILL OF MATERIAL

FROM	ITEM	DESCRIPTION AND MATERIAL	REQ.	STYLE NO.
SH	301	1/8" X 16" X 40" FLAT STEEL PANEL WITH 1/16" X 1/16" BEVELS	4	PER DET.
N	302	"HA" AMMETER 5A. COIL 0-400A.		
—		SCALE, FLUSH MTG.	12	931763
N	303	DITTO EXCEPT 0-600 A. SCALE	4	931765
EP	304	"W" CONTROL SW.	16	1124195
EP	305	" " "	16	SIM. TO 1124195
LAB	306	" " " (SPECIAL 10 CIR.)	4	
EP	307	NAMEPLATE BLANK (3 1/2 X 1 1/4")	52	1151773
ST	308	RECEPTACLE	64	1124141
"	309	RESISTOR	32	1124145
"	310	HARDWARE	64	1124139
"	311	RED LENS	32	1124150
"	312	GREEN LENS	32	1124151
"	313	BULB	64	1124156
"	314	TERMINAL BLOCK 12 P.	12	805432
"	315	MARKING STRIP 12 P.	12	846294
SH	316	BRACKET	8	PER DET.
"	317	"	8	" "
"	318	"	12	" "
ST	319	RESISTOR,	32	1124147
"	320	TERM. BLOCK 8 P. & MRKS. STRIP.	8	
"	321	" " 5 P. & " "	8	
		EXTRA MATERIAL		
ST	401	LAMP BULBS	12	1124156
E.P.	402	TYPE HD PUSHBUTTON STATION SURFACE MTG. WITH CAST IRON DUST-TIGHT ENCLOSURE DIAGRAM SYMBOL A-2 "START-STOP"	8	1033993
E.P.	403	TYPE "HD" PUSHBUTTON STATION SURFACE MTG. WITH CAST IRON DUST-TIGHT ENCLOSURE DIAGRAM SYMBOL D-1, SIM. TO S# 1039621 EXCEPT NAMEPLATES TO READ "SAFE" & "RUN" FROM LEFT TO RIGHT	8	S.O. 9-C-3426
E.P.	404	TYPE CB-3 WATTHOUR METER 3 ELEMENT 5 AMP. 120 VOLT COILS WIT. 15 MIN. INTERVAL DEMAND REGISTER SUITABLE FOR USE WITH THREE 1200/5 AMP C.T.S ON 120/208 V. 3 PH. 4 WIRE 60 CY. CIR.	4	
E P	405	TYPE "HD" PUSHBUTTON STATIONS SURFACE MOUNTING SIM. TO S# 1033311 EXCEPT NAMEPLATES TO READ "START-SAFE, RUN-STOP" DIAGRAM D-3	24	S.O. 9-C-1704

* SAME AS IT. 304, EXCEPT SPECIAL NAMEPLATE & DEVELOPMENT.

※ ENGRAVED PER SCHEDULE, DWG. AT-5116-B, BY ATLANTA

SERVICE ORDER	CHZ-36573			
DRAWING FINISHED	13. G. P.	8/25/42	10/18/42	
CHECKED BY	M.M.Pashenkov			
APPROVED BY				
SUB	1			2
				ITEM 319 WAS NOT ON, ITEM 309 WAS 64 REQ. MINOR SHOP CHANGES. M.&K. 11/2/42

SEE DWG. AT-5116-B FOR REFERENCE DWG. SCHEDULE

NOTE TO CUSTOMER

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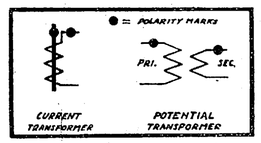
250 VOLT INSTRUMENT FUSE.
600 VOLT INSTRUMENT FUSE.
2500 VOLT INSTRUMENT FUSE.



AT-5116-A

6

AT-5116-A
SUB #. 2

WESTINGHOUSE
CONTROL SW. PANEL
FOR COMBUSTION
CONTROL PANEL.

To: Barbra Briley

For: Ken Beamer, Design Div., P.W. Department, Bldg 1005

Contents: 1942 Control & Power drawings of
Building 1700 - Boiler Plant

FROM Joe ELLEN
ELH ELECTRIC, INC
P.O. Box 6501
RALEIGH, N.C. 27628
919/787-3933

No. 90 CLASP
9 x 12

STANDARD FORM 30, JULY 1966
GENERAL SERVICES ADMINISTRATION
FED PROC REG (41 CFR) 1-16.1

AMENDMENT OF SOLICITATION

PAGE 1 OF 3

1 AMENDMENT	2 EFFECTIVE DATE	3 REQUISITION/PURCHASE REQUEST NO	4 PROJECT NO (If applicable)
NO. 3	15 Jan 1981		Spec. No. 05-79-4471

5 ISSUED BY — CODE: 406

Officer in Charge of Construction
Jacksonville, North Carolina Area
Building 1005, Marine Corps Base
Camp Lejeune, North Carolina 28542

6 ADMINISTERED BY (If other than block 5) — CODE

7 CONTRACTOR — CODE — FACILITY CODE
NAME AND ADDRESS
(Street, city, county, state, and ZIP Code)

8. [XX] AMENDMENT OF SOLICITATION NO. N62470-79-B-4471;
DATED 4 Dec 1980 (See block 9)

[ ] MODIFICATION OF CONTRACT/ORDER NO _____
DATED _____ (See block 11)

9 THIS BLOCK APPLIES ONLY TO AMENDMENTS OF SOLICITATIONS

[X] The above numbered solicitation is amended as set forth in block 12. 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 signing and returning ____ copies of this 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 ACKNOWLEDGEMENT TO BE RECEIVED AT THE ISSUING OFFICE 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 such telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

10 ACCOUNTING AND APPROPRIATION DATA (If required)

11 THIS BLOCK APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS

(a) [ ] This Change Order is issued pursuant to _____
The Changes set forth in block 12 are made to the above numbered contract/order.

(b) [ ] The above numbered contract/order is modified to reflect the administrative changes (such as changes in paying office, appropriation data, etc.) set forth in block 12.

(c) [ ] This Supplemental Agreement is entered into pursuant to authority of _____
It modifies the above numbered contract as set forth in block 12.

12 DESCRIPTION OF AMENDMENT.

REPAIR ELECTRIC SERVICE, TRANSFORMERS, AND SWITCHGEAR
BUILDING 1700
at the
MARINE CORPS BASE, CAMP LEJEUNE, NORTH CAROLINA

SEE ATTACHED PAGES 2 and 3

Except as provided herein, all terms and conditions of the document referenced in block 8, as heretofore changed, remain unchanged and in full force and effect

13. [ ] CONTRACTOR/OFFEROR IS NOT REQUIRED TO SIGN THIS DOCUMENT [ ] CONTRACTOR/OFFEROR IS REQUIRED TO SIGN THIS DOCUMENT AND RETURN _____ COPIES TO ISSUING OFFICE

14 NAME OF CONTRACTOR/OFFEROR	17. UNITED STATES OF AMERICA
BY _____ (Signature of person authorized to sign)	BY M. L. ENNETT By direction (Signature of Contracting Officer)
15 NAME AND TITLE OF SIGNER (Type or print)	16 DATE SIGNED
	18. NAME OF CONTRACTING OFFICER (Type or print): R. E. CARLSON, CDR, CEC, USN for COMNAVFACENGCOM
	19. DATE SIGNED

30-101

U.S. GOVERNMENT PRINTING OFFICE: 1974 O—554-534

DRAWINGS

NAVFAC DWG. NO. 4049583:

Top Right Corner: Delete (10/2) and the related rectangle symbolizing a handhole. Continue dotted underground cable symbol through to the transformers.

Top Center Right: Delete all six details and plan views above "STANDARD ELECTRIC HANDHOLES" and their titles in their entirety. There are now no handholes in this contract.

NAVFAC DWG. NO. 4049584:

Top Right Corner: Remove the handhole and show the ductbank and conduit running all the way to their respective locations at the slab.

Section Detail (7/3) Delete the words "spare conduits" but retain six conduits in the ductbank.

Typical Elevation Detail (16/3) Delete "(A/8)". There is no Breaker A8, but there is a breaker B8.

Switchgear Breaker Table: Add the following lines:

SWITCHGEAR BREAKER DATA

Breaker	Pole & Ampere	Interrupting Class Rating	Type of Breaker	Breaker	C.T. Size	Remarks
B-3	3/300	24a	Feeder	Drawout		
C-7	3/225	24a	Feeder	Drawout		

NAVFAC DWG. NO. 4049586:

Lighting Legend: [A] Delete the word "fluorescent"

(A) Change the text to read "See Detail (A/4-5)"

(C) Delete the symbol and associated text

Top Left: New Light Fixture Detail (A/4-5) Line 3 of caption: Change "250 watt" to read "75 watt"

70W

SPECIFICATION

SECTION 01011. GENERAL PARAGRAPHS

10.6 The normal....After this paragraph add:

"10.7 Coordination with other contractors and Government forces working within the Boiler Plant will be required under this contract. One particular significant situation will be Contract N62470-79-C-4487 (Replace Steam Flow Recorders) which will require that the "Existing Auxiliary Switchgear" shall be periodically de-energized so that the steam flow recorders Contractor can accomplish certain work wihin the panel also existing houses steam flow apparatus to be relocated under the steam flow recorders contract."

SECTION 02110. DEMOLITION AND REMOVAL

6.1.5 The concrete curb...Line 3. Retain the word "oil" and delete "and completely flushed and ready for removal".

7.3 Property of Government...Add at the end of the paragraph: "No askarel movement will be over state roads."

SECTION 16402. INTERIOR WIRING SYSTEM

7. BUSDUCT: Add to this paragraph: "The rating shall be 208-volt, 2,500 amperes, 3 phase, 60 Hertz, with five copper bus bars, one copper bar per phase, one neutral bar, and one internal ground bar. Channel type hangers shall be used for horizontal positions, and spring suspension type hangers for vertical position at 10-feet maximum or less."

Add the following subparagraphs:

'7.1 External busduct shall be unventilated, weatherproof, and totally enclosed type, voltage, capacity, and phase characteristics indicated. The housing shall be 16-gauge galvanized steel, and have drain holes. All seams shall be sealed with sealing compound. The covers shall be gasketed with drain plugs to cover joint bolts. The duct housing shall be bonderized inside and outside.

7.2 Internal busduct shall be a NEMA Type 1 housing, 16-gauge steel. Housing shall be bonderized inside and outside."

SECTION 16475. INTERIOR SWITCHGEAR

6.5 Foundation for...After this paragraph add:

"6.6 Rearrangement of compartments within both switchgear A and B shall be accomplished to arrive at a final arrangement in which all circuit breakers can be removed without interference from existing structural steel columns."

STANDARD FORM 30, JULY 1966
GENERAL SERVICES ADMINISTRATION
FED. PROC. REG. (41 CFR) 1-16.101

AMENDMENT OF SOLICITATION

PAGE 1 OF 1

1. AMENDMENT	2. EFFECTIVE DATE	3. REQUISITION/PURCHASE REQUEST NO.	4. PROJECT NO. (If applicable)
NO. 2	23 Dec 1980		Spec. No. 05-79-4471

5. ISSUED BY	CODE	6. ADMINISTERED BY (If other than block 5)	CODE
Officer in Charge of Construction Jacksonville, North Carolina Area Building 1005, Marine Corps Base Camp Lejeune, North Carolina 28542	406		

7. CONTRACTOR NAME AND ADDRESS — CODE — FACILITY CODE

(Street, city, county, state, and ZIP Code)

8.
[X] AMENDMENT OF SOLICITATION NO. N62470-79-B-4471
DATED 4 Dec 1980 (See block 9)
[ ] MODIFICATION OF CONTRACT/ORDER NO. _____
DATED _____ (See block 11)

9. THIS BLOCK APPLIES ONLY TO AMENDMENTS OF SOLICITATIONS

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10	Appropriation and Subhead	Obj. Cl.	Bureau Cont. No.	Sub-Allot.	Authorization Acct'g Act'y	Trans. Type	Property Acct'g Act'y	Country	Cost Code	Amount

11. THIS BLOCK APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS

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12. DESCRIPTION OF AMENDMENT/

REPAIR ELECTRIC SERVICE, TRANSFORMERS, AND SWITCHGEAR
BUILDING 1700

at the

MARINE CORPS BASE, CAMP LEJEUNE, NORTH CAROLINA

BID OPENING IS POSTPONED TO 29 JANUARY 1981 at 2:00 P.M.

Except as provided herein, all terms and conditions of the document referenced in block 8, as heretofore changed, remain unchanged and in full force and effect.

13. [ ] CONTRACTOR/OFFEROR IS NOT REQUIRED TO SIGN THIS DOCUMENT [ ] CONTRACTOR/OFFEROR IS REQUIRED TO SIGN THIS DOCUMENT AND RETURN _____ COPIES TO ISSUING OFFICE

14. NAME OF CONTRACTOR/OFFEROR	17. UNITED STATES OF AMERICA
BY _____ (Signature of person authorized to sign)	BY M. L. ENNETT By direction (Signature of Contracting Officer)
15. NAME AND TITLE OF SIGNER (Type or print)	16. DATE SIGNED
	18. NAME OF CONTRACTING OFFICER (Type or print): V. PODBIELSKI, CAPT, CEC, USN for COMNAVFACENGCOM
	19. DATE SIGNED: 12/23/80

S/N 0109-200-2804

STANDARD FORM 30, JULY 1966
GENERAL SERVICES ADMINISTRATION
FED. PROC. REG. (41 CFR) 1-16.101

AMENDMENT OF SOLICITATION

PAGE 1 OF 2

1. AMENDMENT/MODIFICATION NO.	2. EFFECTIVE DATE	3. REQUISITION/PURCHASE REQUEST NO.	4. PROJECT NO. (If applicable)
NO. 1	7 Nov 80		Spec. No. 05-79-4471

5. ISSUED BY CODE 406

Officer in Charge of Construction
Jacksonville, North Carolina Area
Building 1005, Marine Corps Base
Camp Lejeune, North Carolina 28542

6. ADMINISTERED BY (If other than block 5) CODE

7. CONTRACTOR NAME AND ADDRESS CODE FACILITY CODE

(Street, city, county, state, and ZIP Code)

8. [X] AMENDMENT OF SOLICITATION NO. N62470-79-B-4471,
DATED NOT YET ISSUED (See block 9)

[ ] MODIFICATION OF CONTRACT/ORDER NO. _____
DATED _____ (See block 11)

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12. DESCRIPTION OF AMENDMENT/MODIFICATION

REPAIR ELECTRIC SERVICE, TRANSFORMERS, AND SWITCHGEAR
BUILDING 1700
at the
Marine Corps Base, Camp Lejeune, North Carolina

DIVISION 1. GENERAL REQUIREMENTS

SECTION 01507. ENVIRONMENTAL PROTECTION

5.2.3 Askarel contained in.....First Line: Change "75-KVA" to read "750-KVA"

DIVISION 16. ELECTRICAL

SECTION 16300. ELECTRICAL DISTRIBUTION, EXTERIOR

6.2 Calking Compound: Third Line: After "temperature as" insert "low"

6.6 Wires and Cables: First Line: Change "Wair" to read "Wire"
Fifth Line: Change "collper" to read "copper"

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14. NAME OF CONTRACTOR/OFFEROR	17. UNITED STATES OF AMERICA
BY _____ (Signature of person authorized to sign)	BY M. L. Ennett M. L. ENNETT By direction (Signature of Contracting Officer)
15. NAME AND TITLE OF SIGNER (Type or print)	16. DATE SIGNED
	18. NAME OF CONTRACTING OFFICER (Type or print) V. PODBIELSKI, CAPTAIN, CEC, USN for COMNAVFACENGCOM
	19. DATE SIGNED 7 Nov 80

U.S. GOVERNMENT PRINTING OFFICE: 1974 O—554-534

SECTION 16300. ELECTRICAL DISTRIBUTION, EXTERIOR

6.6.3 Underground Cabling and.....

c. Seventh Line: Change "k5 kv" to read "15 Kv"

Eighth Line: Change "polyviny" to read "polyvinyl"

7.4.1 Splices in Insulated.....

c. Second Line: Change "compount" to read "compound"

7.4.3 Grounding of Shields....Second Line: Change "shuelded" to read "shielded"

7.6.1 Ground Rods: First Line: Change "braxed" to read "brazed"

7.6.3 Ground Cable Crossing....Fifth Line: Change "jumer" to read "jumper"

SECTION 16301. UNDERGROUND ELECTRICAL WORK

4.3.3 High Voltage Cable Terminations: Tenth Line: After "IEEE 48" delete "except that the requirements of design tightness test need not be met. However,"; Change "the" to read "The"

5.6 Connections to Existing Ducts: Fifth Line: Change "colair" to read "collar"

5.8.1 Cast-type splice.....Third Line: Change "shwihc" to read "which"

5.9 Splices in high.....Second Line: After "submersion" delete "i" and the associated arrow

6.2.1 Ground Rods: Second Line: Change "protable" to read "portable"

SECTION 16402. INTERIOR WIRING SYSTEM

12.1 Buses for Panelboard: Third Line: Change "ground bus" to read "grounding bus"

Fourth Line: Change "ground conductors" to read "grounding conductors"

SECTION 16475. INTERIOR SWITCHGEAR

5.6 Instruments...Second Line: Change "ratin" to read "rating"

SECTION 16510. LIGHTING WORK

2.1 Shop Drawings: Fourth Line: Delete "aiming diagram and"

NOTICE:

Bids to be opened at 2:00 P.M.
at the office of
Officer in Charge of Construction
Jacksonville, North Carolina Area
Building 1005, Marine Corps Base
Camp Lejeune, North Carolina

NAVFAC SPECIFICATION
NO. 05-79-4471

REPAIR ELECTRIC SERVICE, TRANSFORMERS, AND SWITCHGEAR BUILDING 1700

at the

Marine Corps Base, Camp Lejeune, North Carolina

DESIGN BY: Design Division, Public Works Department
Marine Corps Base, Camp Lejeune, North Carolina

SPECIFICATION
PREPARED BY: K. L. Bearnes, Electrical Engineering Technician
J. H. Fitch, P.E., Manager, Specifications and Estimates Branch

APPROVED BY: T. R. Adkins, P.E., Director
Design Division

V. Podbielski, Captain, CEC, U. S. Navy
for Commander, Naval Facilities Engineering Command

CONTENTS

SECTION 00101. Bidding Information

DIVISION
1. GENERAL REQUIREMENTS
   SECTION
   01011. General Paragraphs
   01012. Additional General Paragraphs
   01401. Quality Control
   01507. Environmental Protection
2. SITE WORK
   SECTION
   02100. Cutting and Patching
   02110. Demolition and Removal
   02200. Earthwork and Removal
   02444. Chain Link Fencing
   02600. Asphaltic Concrete
3. CONCRETE
   SECTION
   03300. Cast-in-Place Concrete
4. NOT USED
5. METALS
   SECTION
   05500. Miscellaneious Metals
6 THROUGH 15 NOT USED
16. ELECTRICAL
   SECTION
   16011. General Requirements, Electrical
   16300. Electrical Distribution, Exterior
   16301. Underground Electrical Work
   16401. Interior Wiring System
   16462. Pad Mounted Transformer
   16475. Interior Switchgear
   16510. Lighting Work

SECTION 00101. BIDDING INFORMATION

1. CONTENTS: This Invitation for Bids, IFB N62470-79-B-4471, consists of the following documents:

(a) Bid Instruction Documents

(i) Invitation for Bids (Standard Form 20, Jan 1961 Ed.)
(ii) Bidding Information
(iii) Instructions to Bidders, dated March 1979

(b) Bid Submittal Documents

(i) Bid Form (Standard Form 21, December 1965 Ed.)
(ii) Representations and Certifications (Standard Form 19-B, June 1976 Ed.), including Appendix "A" dated July 1979
(iii) Bid Guaranty (Standard Form 24, June 1964 Ed.) (See Instructions to Bidders)

(c) Contract Documents

(i) Construction Contract (Standard Form 23, Jan 1961 Ed.)
(ii) Performance Bond (Standard Form 25, June 1967 Ed.)
(iii) Payment Bond (Standard Form 25A, June 1964 Ed.)
(iv) Labor Standards Provisions, dated November 1979
(v) General Provisions dated Nov 1979 (Rev. 2-80)
(vi) NAVFAC Specification No. 05-79-4471
(vii) Drawings identified in Section 01011, Division 1 of the specifications
(viii) Wage Determination Decision

2. BIDS:

2.1 Instruction to Bidders: Instructions to Bidders and Invitation for Bids, Standard Form 20, January 1961 edition, shall be observed in the preparation of bids. Bidders shall affix their names and return addresses in the upper left corner of bid envelope. Envelopes containing bids must be sealed.

2.2 Bid Guaranty: A bid guaranty will be required as stipulated in the Instructions to Bidders.

2.3 Items of Bids: Bids shall be submitted, in duplicate, on Standard Form 21, Bid Form, and shall be accompanied by Standard Form 19B, Representations and Certifications, including Appendix "A" thereto, and by Bid Guaranty, all in accordance with the Bid Instruction Documents listed in paragraph 1(a) hereinbefore upon the following item(s):

BASE BID.	Price for the entire work, complete in accordance with the drawings and Specifications, but excluding all work included in Additive Item.
ADDITIVE ITEM NO.1	Additional price for adding the Lighting and related wiring, complete in accordance with the drawings and Specification.

NOTE: Evaluation of Bids. The funds available for this project, known as the control amount, will be recorded prior to bid opening and announced at bid opening. The low bidder for purposes of award shall be determined in accordance with the provisions of this solicitation entitled "Additive or Deductive Items, Clause 21 of the Instruction to Bidders".

2.4 TELEGRAPHIC MODIFICATIONS OF BIDS in accordance with the instructions to Bidders may be made. Two signed copies of the telegram in a sealed envelope marked "Copies of telegraphic modification of bid for REPAIR ELECTRIC SERVICE, TRANSFORMERS, AND SWITCHGEAR, BUILDING 1700 Specification No. 05-79-4471" should be forwarded immediately to the office to which the written bids were submitted.

2.5 TELEGRAPHIC MODIFICATIONS OR WITHDRAWAL OF BIDS will be considered as specified herein. TELEPHONIC RECEIPT OF TELEGRAPHIC MODIFICATIONS OR WITHDRAWAL OF BIDS WILL NOT QUALIFY THE TELEGRAM AS TIMELY. The telegram must be received at the place specified for receipt of bids prior to the exact time set for receipt of bids.

2.6 HAND DELIVERED BIDS: All hand delivered bids must be deposited with personnel in the office of the Officer in Charge of Construction, Jacksonville, North Carolina Area, Building 1005, Marine Corps Base, Camp Lejeune, North Carolina 28542, prior to the time and date set for bid opening. Any bids submitted by hand after the time set for receipt will not be accepted.

3. PRE-BID SITE VISITATION: To inspect the site of the work prior to bid opening, prior appointment must be made with the Officer in Charge of Construction, Jacksonville, North Carolina Area, telephone 919-451-2581. Bidders are urged and expected to inspect the site where services are to be performed and to satisfy themselves as to all general and local conditions that may affect the cost of performance of the contract to the extent such information is reasonably obtainable. In no event will a failure to inspect the site constitute grounds for withdrawal of a bid after opening or for a claim after award of the contract.

4. CONTROLLED MATERIALS DATA: The Contracting Officer will issue a DO-C2 priority rating for procurement of critical materials. See General Provision 46, "PRIORITIES, ALLOCATIONS AND ALLOTMENTS".

5. INQUIRIES: All questions concerning the bidding shall be presented to OICC-ROICC Contract Division, Building 1005, Marine Corps Base, Camp Lejeune, North Carolina, telephone 919-451-2581. Questions regarding any other phase of the plans and specifications occurring prior to bid opening shall be presented to the Design Division, Public Works Department, Building 1005, Marine Corps Base, Camp Lejeune, North Carolina 28542, telephone 919-451-5507. Questions requiring interpretation of drawings and specifications must be submitted at least 10 days before bid opening. Interpretations or modifications to specifications made as a result of questions will be made by amendment only, and unless so done, all bidders should base their bids on the plans and specifications as issued.

6. AVAILABILITY OF SPECIFICATIONS, STANDARDS AND DESCRIPTIONS (1977 JUN): Specifications, standards and descriptions cited in this solicitation are available as indicated below:

a. Unclassified Federal, Military and Other Specifications and Standards (Excluding Commercial), and Data Item Descriptions. Submit request on DD Form 1425 (Specifications and Standards Requisition) to:

Commanding Officer
U. S. Naval Publications and Forms Center
5801 Tabor Avenue, Philadelphia, Pennsylvania 19120

The Acquisition Management Systems and Data Requirements Control List. DOD Directive 5000.19L, Volume II, may be ordered on the DD Form 1425. The Department of Defense Index of Specifications and Standards (DODISS) may be purchased from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402. When requesting a specification or standard, the request shall indicate the title, number, date and any applicable amendment thereto by number and date. When requesting a data item description, the request shall cite the solicitation. When DD Form 1425 is not available, the request may be submitted in letter form, giving the same information as listed above, and the solicitation or contract number involved. Such request may also be made to the activity by TELEX No. 834295, Western Union No. 710-670-1685, or telephone 215-697-3321 in case of urgency.

b. Commercial Specifications, Standards and Description. These specifications, standards and descriptions are not available from Government sources. They may be obtained from the publishers.

c. Availability for Examination of Specifications, Standards, Plans, Drawings, and Other Pertinent Documents. The specifications, standards, plans, drawings, and other pertinent documents cited in this solicitation may be examined at the following location:

Public Works Department
Design Division
Building 1005, Marine Corps Base
Camp Lejeune, North Carolina

7. REFERENCE TO AMENDMENTS: Each bidder shall refer in his bid to all amendments to this specification; failure to do so may constitute an informality in the bid.

8. CERTIFICATE OF CURRENT COST OR PRICING DATA: (This paragraph applies to negotiated contracts of $100,000 or more, except where the price is based on adequate competition, and to change orders of $100,000 or more, to any contract.) The Contractor shall submit to the Contracting Officer a certificate in the form set forth below as soon as practicable after agreement is reached on the contract price:

This is to certify that, to the best of my knowledge and belief, cost or pricing data as defined in DAR 3-807.1(a)(1) submitted, either actually or by specific identification in writing (see DAR 3-807.3(a)) to the Contracting Officer or his representative in support of _____* are accurate, complete, and current as of _____**
day month year

This certification includes the cost or pricing data supporting any advance agreement(s) and forward pricing rate agreements between the offeror and the Government which are part of the proposal.

Firm _____
Name _____
Title _____

_____***
Date of Execution

*Describe the proposal, quotation, request for price adjustment or other submission involved, giving appropriate identifying number (e.g. RFP No. _____).

**The effective date shall be the date when price negotiations were concluded and the contract price was agreed to. The responsibility of the Contractor is not limited by the personal knowledge of the Contractor's negotiator if the Contractor had information reasonably available at the time of agreement, showing that the negotiated price is not based on accurate, complete and current data.

***This date whould be as close as practicable to the date when the price negotiations were concluded and the contract price was agreed to.

DIVISION 1. GENERAL REQUIREMENTS

SECTION 01011. GENERAL PARAGRAPHS

1. GENERAL INTENTION: It is the declared and acknowledged intention and meaning to provide and secure the electrical service replacement, two 750 KVA transformers; two 2,500-ampere switchgears, related electrical equipment, and lighting fixtures, complete and ready for use.

2. GENERAL DESCRIPTION: The work includes new unit transformers, switchgears, busduct, overhead line work, duct bank, miscellaneious wiring components, reconnecting of existing circuits to existing panelboards, new panelboards, switchgears, and new lighting fixtures, the removal of two 750 KVA (askarel-filled) transformers, and incidental related work.

3. LOCATION: The work shall be located at the Marine Corps Base Camp Lejeune, North Carolina, approximately as shown. The exact location will be indicated by the Contracting Officer. "Officer in Charge of Construction (OICC)" and "Contracting Officer" are used interchangeably in this specification and have the same meaning.

4. COMMENCEMENT, PROSECUTION AND COMPLETION OF WORK: The Contractor will be required to commence work under the contract 15 calendar days after the date of receipt of Notice of Award, to prosecute said work diligently, and to complete the entire work ready for use within 480 calendar days. The time stated for completion shall include final cleanup of the premises. The contract completion date will be computed starting 15 calendar days after the date of the Notice of Award. This 15-day period is to allow for mailing of the Notice of Award and the Contractor's submission of required bonds.

5. LIQUIDATED DAMAGES: In case of failure on the part of the Contractor to complete the work within the time fixed in the contract or any extensions thereof, the Contractor shall pay to the Government as liquidated damages pursuant to Clause 5, "Termination for Default - Damages for Delay - Time Extensions", and Clause 80, "Damages for Delay - Defense Materials System and Priorities" of the General Provisions the sum of $75 for each day of delay.

6. DRAWINGS ACCOMPANYING SPECIFICATION: The following drawings accompany this specification and are a part thereof. Drawings are the property of the Government and shall not be used for any purpose other than that contemplated by the specification.

NAVFAC DWG. NO.	TITLE
4049582	Switchgear and Equipment Operating Floor
4049583	Switchgear and Equipment Details
4049584	Switchgear and Equipment Details
4049585	Switchgear and Equipment Lighting Floor Plans and Details
4049586	Switchgear and Equipment Lighting Details

7. FACTORY INSPECTION: (See Clause 10 of the General Provisions). Factory inspection of material and equipment for which tests at the place of manufacture are required in referenced specifications will be waived if notarized copies of factory reports are furnished that show compliance with the specification requirement. Factory inspection will be required only where specified herein or in the technical sections of this specification. The Government reserves the right to charge to the Contractor any additional cost of Government inspection and tests when materials and equipment are not ready at the time inspection and tests are requested by the Contractor.

8. MINIMUM WAGE RATES AND OTHER LABOR STANDARDS: The Contractor shall pay mechanics and laborers employed or working directly upon the site of the work, wage rates not less than those contained in the attached wage determination decision of the Secretary of Labor. Rates for Building Construction shall apply to all work in this contract. The wage rates are attached to the back of this specification.

9. NORTH CAROLINA SALES AND USE TAX IS REQUIRED. (See also section entitled "Additional General Paragraphs")

10. SCHEDULING THE WORK: Notwithstanding the requirements of Clause 62 of the General Provisions, immediately after award, the Contractor shall meet with the Contracting Officer and present a schedule of work, prepared in accordance with Clause 62, for review by the Contracting Officer. The schedule will be reviewed at this meeting and will be retained by the Contracting Officer for final review and approval.

10.1 The building is the main boiler plant which will remain in operation during the entire construction period. During the period of 15 October to 15 April, all boilers will remain in service and no work will be permitted which will require a shutdown of any boiler. During the period of 16 April to 14 October the combination of either Boilers 1 and 2 or Boilers 3 and 4 shall be in operation at all times. The Contractor shall conduct his operations so as to cause the least possible interference with the normal operations of the activity, except one outage will be allowed as specified hereinafter. Panelboards will be complete and ready for operation as approved by the Contracting Officer before any work is started in connection with interior circuits that may interfere with normal operation. Permission to interrupt any utility service shall be requested in writing a minimum of 30 days in advance, and approval of the Contracting Officer shall be received before any service is interrupted.

10.2 Interruptions of utility services will be allowed only when they will cause no interference with the operations of the activity. All utility cutovers shall be made after receiving written permission, after normal working hours. Anticipated costs shall be included in the bid.

10.3 The existing building and its contents shall be kept secure at all times and the Contractor shall provide all temporary closures as required to maintain security as directed by the Contracting Officer.

10.4 The Contractor shall remove all debris from all spaces being used by the activity at the end of each shift or more frequently if required to keep the space useable.

10.5 Dust covers or protective enclosures shall be provided to protect existing work to remain and Government materials located in the involved area during the construction period.

10.6 The normal working hours of Contracting Officer personnel are from 7:45 A.M. to 4:00 P.M., Monday through Friday. The Boiler Plant operation schedule is 24 hours per day, seven days per week.

11. SAFETY PROGRAM: The Contractor shall implement a safety program conforming to the requirements of Federal, State and Local laws, rules and regulations. The program shall include, but is not limited to, the following:

a. "Occupational Safety and Health Standards", which can be examined at the office of the Contracting Officer or be ordered from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402.

b. Department of the Army, Corps of Engineers, "General Safety Requirements", which may be examined at the office where bids are being received or may be purchased from the Superintendent of Documents, U. S. Government Printing Office, Stock No. 008-022-00106-9.

c. General Provisions, Clause 45.

12. TECHNICAL PUBLICATIONS: The Contractor shall furnish to the Contracting Officer three copies each of installation, operation maintenance manuals and parts list for all Contractor-furnished mechanical and electrical equipment.

12.1 Operating instructions for the principal plant mechanical and electrical components, for use by operating personnel, shall be provided. They shall be laminated between thermoplastic sheets and affixed where directed. The instructions shall describe the function of the equipment, its most economical operation, start-up and shut-down procedures, procedures to follow in the event of failure, normal maintenance practices, and caution and warning notices.

12.2 Maintenance and operation manual shall be furnished to the Contracting Officer for approval. The manual shall be mounted in flexible binders with oil-resistant covers and shall contain, but not be limited to, installation and operating instructions, maintenance procedures, illustrations, drawings, detailed descriptions, tests, adjustments, safety precautions, and parts list.

12.3 Parts list, giving part numbers and prices for the equipment furnished, shall be submitted to the Contracting Officer as soon as practicable after the award of the contract, but not later than 90 days after notice of award has been received.

13. TRAILER OR STORAGE BUILDINGS will be permitted on the job site, where space is available, subject to the approval of the Contracting Officer. The trailers or buildings shall be suitably painted and kept in a good state of repair. Failure of the Contractor to maintain his trailers or storage buildings in good condition will be considered sufficient reason to require their removal from the job site.

14. SCHEDULE OF PRICES: The original and seven copies of the Schedule of Prices shall be submitted to the Contracting Officer for approval in accordance with the General Provisions. Pursuant to Clause 7 of the General Provisions, payments will not be made until the Schedule of Prices has been submitted and approved.

15. CONTRACTOR'S INVOICE AND CONTRACT PERFORMANCE STATEMENT: Requests for payment in accordance with the terms of the contract shall consist of:

a. Contractor's Invoice on Form NAVFAC 10-7300/30 (4-68), which shall show, in summary form, the basis for arriving at the amount of the invoice

b. Contractor's Monthly Estimate for Voucher (5ND GEN 5265/1)

c. Affidavit to Accompany Invoice (5ND LANTDIV 4-4235/4) (Rev 1/68)

Forms will be furnished by the Contracting Officer. Monthly invoices and supporting forms for work performed through the 15th of the month shall be submitted to the Officer in Charge of Construction by the 20th of the month in the following quantities:

a. Contractor's Invoice - Original and five copies

b. Contractor's Monthly Estimate for Voucher - Original and two copies

c. Affidavit - Original

16. GOVERNMENT-FURNISHED UTILITIES: The Government will furnish water, steam, and electricity free of charge for pursuance of the work under this contract.

17. WRITTEN GUARANTEES AND GUARANTOR'S LOCAL REPRESENTATIVE: Prior to completion of the contract, the Contractor shall obtain and furnish to the Contracting Officer's designated representative, written guarantees for all equipment and/or appliances furnished under the contract. The Contractor shall furnish with each guarantee the name, address, and telephone number of the guarantor's representative nearest to the location where the equipment and/or appliances are installed, who, upon request of the using service's representative, will honor the guarantee during the guaranty period and will provide the services prescribed by the terms of the guarantee. At the time of installation, the Contractor shall tag each item of warranted equipment with a durable oil and water resistant tag approved by the Contracting Officer. Leave the date of acceptance and inspector's signature blank until the project is accepted for beneficial occupancy. The tag shall show the following information:

EQUIPMENT WARRANTY TAG

Type of Equipment _____

Accepted Date _____

Warranted Until _____

Under Contract No. _____

Inspector's Signature _____

STATION PERSONNEL TO PERFORM ONLY OPERATIONAL MAINTENANCE

SECTION 01012. ADDITIONAL GENERAL PARAGRAPHS

1. APPROVAL OF SAMPLES, CUTS, AND DRAWINGS: Matter submitted for approval shall be accompanied by complete information concerning the material, articles, and/or design proposed for use in sufficient detail to show compliance with the specification, and shall be approved before incorporation into the work. Approval thereof will not be construed as relieving the Contractor of compliance with the specification, even if such approval is made in writing, unless the attention of the Contracting Officer is called to the noncomplying features by letter accompanying the submitted matter. Partial submittals or submittals of less than the whole of any system made up of interdependent components, will not be considered. Approval of drawings, cuts, and samples by the Contracting Officer shall not be construed as a complete check or approval of the detailed dimensions, weights, gauges and similar details of the proposed articles. The conformance of such details with the contract requirements, together with the necessary coordination of dimensions and details between the various elements of the work and between the various subcontractors and suppliers, shall be solely the responsibility of the Contractor, approval of submitted matter notwithstanding.

2. OPERATION OF STATION UTILITIES: The Contractor shall not operate nor disturb the setting of any control devices in the station utilities system, including water, sewer, electrical and steam services. The Government will operate the control devices as required for normal conduct of the work. The Contractor shall notify the Contracting Officer giving reasonable advance notice when such operation is required.

3. CHANGED CONDITIONS: Wherever changed conditions as defined in Clause 4 of the General Provisions are encountered, and wherever conditions exposed during the course of the work necessitate a change from quantities indicated or specified as either estimated quantities or as a basis for bids, whether or not provision for a change in price for such variation is specified, the Contracting Officer must be notified in writing and written directions to do so must be obtained before quantities stated in the contract documents are exceeded.

4. SUBCONTRACTORS AND PERSONNEL: Promptly after the award of the contract, the Contractor shall submit to the Contracting Officer in triplicate, a list of his subcontractors and the work each is to perform. On this form shall appear the names of the key personnel of the Contractor and subcontractors, together with their home addresses and telephone numbers, for use in event of any emergency. From time to time as changes occur and additional information becomes available, the Contractor shall amplify, correct, and change the information contained in previous lists.

5. AS-BUILT DRAWINGS: On completion of the work, one full-size print of each of the drawings accompanying this specification shall be neatly and clearly marked in red to show all variations between the construction actually provided and that indicated or specified in the contract documents, and delivered to the Contracting Officer. The Contractor shall also mark the drawings to indicate the exact location of any underground utility lines discovered in the course of the work. Where a choice of materials and/or methods is permitted herein, and where variations in the scope or character of the work indicated or specified are permitted either by award on bidding items specified for that purpose or by subsequent change to the contract, the as-built drawings shall define the construction actually provided. The representation of such variations shall conform to standard drafting practice and shall include such supplementary notes, legends, and details as may be necessary for legibility and clear portrayal of the as-built construction; the marked prints shall be subject to approval of the Contracting Officer before acceptance.

6. PRINTS FURNISHED TO CONTRACTOR: Six copies of the project specification, and six sets of the drawings accompanying the specification, will be furnished the Contractor. Additional sets of the specifications and drawings can be obtained, if required, by application to the Contracting Officer, providing that the need therefor is justified to the satisfaction of the Contracting Officer.

7. LOCATION OF UNDERGROUND UTILITIES: Where existing piping, utilities, and underground obstructions of any type are indicated in locations to be traversed by new piping, ducts, and other work provided hereunder, and are not indicated or specified to be removed, the elevations of the existing utilities and obstructions shall be determined before the new work is laid closer than the nearest manhole or other structure at which an adjustment in grade could be made. For any additional work required by reason of conflict between the new and existing work, an adjustment in contract price will be made in accordance with Clause 4 of the General Provisions. The Base Telephone Officer, phone 451-2531, will show the Contractor approximate locations of all buried telephone cables after receiving 10 days' notice. The locations of underground utilities shown is only approximate and the information is incomplete.

8. QUARANTINE FOR IMPORTED FIRE ANT (7/76). All of Onslow, Jones and Carteret Counties and portions of Duplin and Craven Counties have been declared a generally infested area by the United States Department of Agriculture for the imported fire ant. Compliance with the quarantine regulations established by this authority as set forth in USDA Quarantine No. 81 dated 9 October 1970, and USDA Publication 301.81-2A of 23 July 1976, is required for operations hereunder. Pertinent requirements of the quarantine for materials, originating on the Camp Lejeune reservation and the Marine Corps Air Station (Helicopter), New River, which are to be

transported outside the Onslow County or adjacent suppression areas include the following:

(a) Certification is required for the following articles, and they shall not be moved from the reservation to any point outside the Onslow County and adjacent designated areas unless accompanied by a valid inspection certificate issured by an authorized imported fire ant inspector:

(1) Bulk soil,

(2) Used mechanized soil-moving equipment.

(3) Any other products, articles, or means of conveyance if it is determined by an inspector that they present a hazard of spread of the imported fire ant and the person in possession thereof has been so notified.

(b) Authorization for movement of equipment shall be obtained from the Officer in Charge of Construction (OICC), and requests for inspection shall be made sufficiently in advance of the date of movement to permit arrangements for the services of authorized inspectors. The equipment shall be prepared and assembled so that it may be readily inspected. All soil on or attached to equipment, supplies and materials shall be removed by washing with water and/or such other means as necessary to accomplish complete removal. Resulting spoil shall be wasted as directed.

9. EMERGENCY MEDICAL CARE. Only emergency medical care is available by Government facilities at Marine Corps Base, Camp Lejeune to Contractor employees who suffer on-the-job injury or disease. Emergency care will be rendered at the prevailing rates established in BUMEDINST 6320.4 series. Reimbursement will be made by the Contractor to the Naval Regional Medical Center Collection Agent upon receipt of a monthly statement.

10. NORTH CAROLINA SALES AND USE TAX.

(a) As used throughtout this clause, the term "materials" means building materials, supplies, fixtures and equipment which become a part of or are annexed to any building or structure erected, altered, or repaired under this contract.

(b) If this is a fixed-price type contract as defined in the Armed Services Procurement Regulation, the contract price includes North Carolina sales and use taxes to be paid with respect to materials, notwithstanding any other provision of this contract. If this is a cost-reimbursement type contract as defined in such regulation, any North Carolina sales and use taxes paid by the Contractor with respect to materials shall constitute an allowable cost under this contract.

(c) At the time specified in paragraph (d) below:

(i) The Contractor shall furnish the Contracting Officer a certified statement setting forth the cost of the materials purchased from each vendor and the amount of North Carolian sales and use taxes

paid thereon. In the event the Contractor makes several purchases from the same vendor, such certified statement shall indicate the invoice numbers, the inclusive dates of the invoices, the total amount of the invoices, and the North Carolina sales and use taxes paid thereon. Such statement shall also include the cost of any tangible personal property withdrawn from the Contractor's warehouse stock and the amount of North Carolina sales or use tax paid thereon by the Contractor. The Contractor shall furnish such additional information as the Commissioner of Revenue of the State of North Carolina may require to substantiate a refund claim for sales or use taxes.

(ii) The Contractor shall obtain and furnish to the Contracting Officer similar certified statements by its subcontractors.

(d) If this contract is completed before the next October 1, the certified statements to be furnished pursuant to paragraph (c) above shall be submitted within 60 days after completion. If this contract is not completed before the next October 1, such certified statements shall be submitted on or before the 30th day of November of each year and shall cover taxes paid during the twelve-month period which ended the preceding September 30.

(e) The certified statement to be furnished pursuant to paragraph (c) above shall be in the following form:

I hereby certify that during the period _____ to _____, (name of Contractor or subcontractor) paid North Carolina sales and use taxes aggregating $_____ with respect to building materials, supplies, fixtures and equipment which have become a part of or annexed to a building or structure erected, altered or repaired by (name of Contractor) for the United States of America, and that the vendors from whom the property was purchased, the dates and numbers of invoices covering the purchases, the total amount of the invoices of each vendor, the North Carolina sales and use taxes paid thereon, and the cost of property withdrawn from warehouse stock and North Carolina sales or use taxes paid thereon are as set forth in the attachments hereto.

SECTION 01401. QUALITY CONTROL

1. APPLICABLE PUBLICATION: The following publication of the issue listed below, but referred to thereafter by basic designation only, forms a part of this specification to the extent indicated by the references thereto:

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM):

ASTM E329-72 Inspection and Testing Agencies for Concrete, Steel, and Bituminous Materials as Used in Construction

2. QUALITY CONTROL of this contract will be administered under the General Provisions Clause entitled "Contractor Inspection System".

3. DEFINITIONS:

3.1 Factory Tests: Tests made on various products and component parts prior to shipment to the job site, including but not limited to such items as transformers, boilers, air conditioning equipment, electrical equipment, and precast concrete.

3.2 Field Tests: Tests or analyses made at, or in the vicinity of, the job site in connection with the actual construction.

3.3 Product: The term "product" includes the plural thereof and means a type or a category of manufactured goods, construction, installations and natural and processed materials or those associated services whose characterization, classification or functional performance determination is specified by standards.

3.4 Person: The term "person" means associations, companies, corporations, educational institutions, firms, government agencies at the Federal, State and Local level, partnerships, and societies, as well as divisions thereof, and individuals.

3.5 Testing Laboratory: The term "testing laboratory" means any "person", as defined above, whose functions include testing, analyzing, or inspecting "products", as defined above, and/or evaluating the designs or specifications of such "products" according to the requirements of applicable standards.

3.6 Certified Test Reports: Reports of tests signed by a qualified professional attesting that the test results reported are accurate and that items tested either meet or fail to meet the stated minimum requirements. These test reports include those performed by Factory Mutual, Underwriters' Laboratories, Inc., and others.

3.7 Certified Inspection Reports: Reports signed by approved inspectors attesting that the items inspected meet the specification requirements other than any exceptions included in the report.

3.8 Manufacturer's Certificate of Conformance or Compliance: A certificate signed by an authorized manufacturer's official attesting that the material or equipment delivered meets the specification requirements.

4. SUBMITTALS shall be prepared in accordance with this specification and the General Provisions and submitted to the Contracting Officer for approval. Each submittal shall be accompanied with a cover letter signed by the Contractor. Each item proposed to be incorporated into the contract shall be clearly marked and identified in the submittals, and shall be cross-referenced to the contract drawings and specifications so as to identify clearly the use for which it is intended. Each sheet of submittal shall be stamped with the Contractor's certification stamp. Data submitted in a bound volume or on one sheet printed on two sides, may be stamped on the front of the first sheet only. The Contractor's certification stamp shall be worded as follows:

"It is hereby certified that the (equipment)(materials) shown and marked in this submittal is that proposed to be incorporated into Contract Number _____, is in compliance with the contract drawings and specifications, can be installed in the allocated spaces, and is submitted for Government approval. Certified by _____ Date _____"

The person signing the certification shall be one designated in writing by the Contractor as having that authority. The signature shall be in original ink. Stamped signatures are not acceptable.

4.1 Submittal Status Logs: The Contractor shall maintain at the job site an up-to-date submittal status log showing the status of all submittals required by the contract. A sample format of an acceptable log is attached at the end of this section. While the use of this sample format is not required, any other format must contain the same information as shown on the sample.

4.2 Samples, shop drawings, manufacturer's data, certifications and data required of the Contractor: Specification MIL-D-1000 shall be used as a guide and its use is encouraged, for all drawings and data submitted by the Contractor. Conformance to the provisions of Specification MIL-D-1000 is not mandatory for maps, sketches, presentation drawings, perspectives, renderings, and all other drawings not requiring Naval Facilities Engineering Command drawing numbers. Before starting the fabrication or installation of any of this work, the Contractor shall submit to the Contracting Officer for, and receive approval of, in accordance with the General Provisions, such drawings as may be required, including all items specified in the applicable paragraphs of the technical sections of this specification. Seven copies of all submittals to be approved by the Contracting Officer shall be forwarded.

4.3 Identification: All catalog cuts, shop drawings, samples and other data submitted for approval shall specifically identify the specification paragraph or contract drawing by number where each item submitted is required to be provided. All submittals shall be clearly marked in

ink to indicate the specific item(s) submitted for approval. Samples shall be clearly labeled with strong tags, firmly affixed, or indelible markings to identify the contract number, contractor, manufacturer, and item name.

4.4 Certified Test Reports: Before delivery of materials and equipment, four certified copies of the reports of all tests listed in the technical sections and referenced publications shall be submitted and approved. The testing shall have been performed in a laboratory meeting the requirements specified herein. The tests shall have been performed within three years of submittal of the reports for approval. Test reports shall be accompanied by certificates from the manufacturer certifying that the material and equipment proposed to be supplied is of the same type, quality, manufacture, and make as that tested.

4.5 Manufacturer's Certificates of Conformance or Compliance: Manufacturer's certification furnished by the Contractor on items of materials and equipment incorporated into the work will be accepted only when this method will assure full compliance with the provisions of the contract, as determined by the Contracting Officer. Preprinted certifications will not be acceptable. All certifications shall be in the original. The original of all manufacturer's certifications shall name the appropriate item of equipment or material, specification, standard, or other document specified as controlling the quality of that item and shall have attached thereto certified copies of test reports upon which the certifications are based. All certificates shall be signed by the manufacturer's official authorized to sign certificates of conformance or compliance.

4.6 Laboratory Reports shall cite the contract requirements, the test or analysis procedures used, the actual test results, and include a statement that the item tested or analyzed conforms or fails to conform to the specification requirements. Each report shall be conspicuously stamped on the cover sheet in large red letters "CONFORMS" or "DOES NOT CONFORM" to the specification requirements as the case may be. All test reports shall be signed by the representative of the testing laboratory authorized to sign certified test reports. The Contractor shall arrange for immediate and direct delivery of the signed original of all reports, certifications, and other documentation to the Contracting Officer.

4.7 Tabulation of Tests: In addition to the General Provisions requiremtns for CQC test reports, prior to final payment the Contractor shall obtain from each laboratory a tabulation of all tests it has performed in connection with the construction contract, including conforming or nonconforming, and repeated test results. The tabulation(s) shall be certified as complete, and signed by the authorized representative of the laboratory, and shall be delivered to the Contracting Officer.

5. QUALITY CONTROL REQUIREMENTS: In accordance with the General Provisions Clause entitled "Contractor Inspection System", the Contractor shall inspect and test all work under the contract and maintain records of the inspections and tests. Approvals, except those required for field

installations, field applications, and field tests, shall be obtained before delivery of materials and equipment to the project site. Surveillance of the inspection system will be performed by the Contracting Officer.

5.1 Factory Tests: Unless otherwise specified, the Contractor will arrange for factory tests when they are required under the contract.

5.2 Factory Inspection: Unless otherwise specified, the Contractor will arrange for factory inspection when required under the contract.

5.3 Field Inspections and Tests by the Contractor: The Contractor shall furnish all equipment, instruments, qualified personnel, and facilities necessary to inspect all work and perform all tests required by the contract. All inspections and tests performed and test results received each day shall be included in the Daily Report to Inspector.

5.5 Approval of Testing Laboratories: All laboratory work under this contract shall be performed by a laboratory approved by the Government, whether the laboratory is employed by the Contractor, or is owned and operated by the Contractor. The basis of approval includes the following:

a. Testing laboratories performing work in connection with concrete, steel, and bituminous materials shall comply with ASTM E329, except that the Contracting Officer will perform the function of paragraphs 3.4 and 3.5 therein in the absence of other Government approval.

b. Testing laboratories performing work not in connection with concrete, steel, or bituminous materials shall comply with sections 3 and 4 of ASTM E329, except that the Contracting Officer will perform the functions of paragraphs 3.4 and 3.5 therein in the absence of other Government approval.

5.6 Repeated Tests and Inspections: The Contractor shall repeat tests and inspections after each correction made to nonconforming materials and workmanship until tests and inspections indicate the materials, equipment, and workmanship conform to the contract requirements. The retesting and reinspections shall be performed at no additional cost to the Government.

5.7 Daily Report to Inspector: The Daily Report to the Inspector Form NAVFAC 4330/34 shall be submitted to the Contracting Officer by 10:00 A.M. on the working day following the day the work was performed.

SUBMITTAL STATUS LOG

"SEE INSTRUCTIONS ON REVERSE BEFORE FILLING IN"

PAGE_____ CF_____

CONTRACT NUMBER	SHORT TITLE	LOCATION	CONTRACTOR

SUBMIT'L/ TRANSMIT'L NO.	DESCRIPTION OF ITEMS	SPECIFICATION SECTION REQUIRING SUBMITTAL	SUBMITTAL REQUIRES					CONTRACTOR APPV'D	GOV'T APPROVED	CONTRACTOR ACTION		DATE FORWARDED FROM ROICC	ROICC ACTION		DATE			REMARKS
			SHOP DWGS.	CATALOG DATA	SAMPLE	CERTIFI-CATION	TEST DATA			INSERT ACTION CODE	DATE OF ACTION		INSERT ACTION CODE	DATE OF ACTION	RECEIVED FROM ROICC	MAT'L/EQUIP RECEIVED ON SITE	APPROVED BY CONTRACTOR	
(a)	(b)	(c)	(d)					(e)		(f)		(g)	(h)		(i)	(j)	(k)	

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INSTRUCTIONS

1. This form may be used by the contractor for listing all material submittals that require action by either the contractor or the government.

2. Colums (a) through (e) should be completed by the contractor and must include all submissions that are required by the specifications.

3. As submittals are received and processed, the remaining columns are to be completed by the contractor.

4. In those instances where the contractor has approved the submittal under his contract responsibility, there may be a dual Action Code under column (f); e.g., "A/E", indicating approved as submitted and forwarded to the ROICC for record purposes.

5. In column (f) for those items requiring ROICC action (Action Code "D"), the reason for forwarding to the ROICC should be entered in the column (l), the Remarks column; e.g., gov't approval required; waiver requested because of variance, substitution, etc.

6. Where no government action is required, (for contractor review/approval items), there need be no entry in columns (h) and (i).

7. Column (j) is completed when material or equipment is delivered to the project. Column (k) is completed only after verification that the delivered item is that represented by the approved submittal.

ACTION CODE: To be used when completing columns (f) and (h)

A - Approved as submitted

B - Approved as noted

C - Disapproved

D - Forwarded to ROICC for action

E - Forwarded to ROICC for record purposes

SECTION 01507. ENVIRONMENTAL PROTECTION

1. ENVIRONMENTAL PROTECTION PLAN: The Contractor may be responsible for the preparation and submission of an Environmental Protection Plan.

1.1 Meeting: After the contract is awarded, but prior to the commencement of the work, the Contractor shall meet with the Contracting Officer, or his representative, and discuss the proposed Environmental Protection Plan. The meeting shall develop mutual understanding relative to details of environmental protection, including required reports and measures to be taken should the Contractor fail to provide adequate protection in an adequate and timely manner.

1.2 Submission: Not more than 14 days after award, the Contractor shall submit for approval his proposed Environmental Protection Plan including:

a. A PCB spill control and countermeasure plan prior to decanting or moving either of the PCB filled transformers.

b. Measures for protection of personnel to prevent contact with PCB's and for first aid decontamination in event of splash or spill.

1.3 Review and approval meeting will be held within 28 days after receipt of the plan. The submitted plan will be discussed and comments relative to approval/revision provided.

2. GENERAL REQUIREMENTS: The Contractor shall provide and maintain environmental protection during the life of the contract as defined herein. The Contractor's operations shall comply with all Federal, State and Local regulations pertaining to water, air, solid waste, and noise pollution.

3. DEFINITION OF POLLUTANTS:

3.1 Non-Hazardous Wastes: Solid or liquid substances that are to be discarded by the Contractor and that normally do not constitute a hazard to man or to the environment. This incudes, but is not limited to, paper, metal (other than toxic metals such as lead and mercury), masonry, wood, brick, stone, asphaltic concrete, plastics, rubber, rubbish and concrete.

3.2 Hazardous Wastes: Solid and liquid substances that are to be discarded by the Contractor and that constitute a significant active or potential hazard to man and/or to the remainder of the environment. This includes, but is not limited to, asbestos, glass, lead, mercury, pesticides, herbicides, other toxic chemicals and waste, liquid petroleum products, human excrement, PCB's, askarel, garbage, sediment and radioactive materials.

4. PROTECTION OF NATURAL RESOURCES: It is intended that the natural resources within the limits of permanent work performed under this contract be preserved in their existing condition or be restored to an equivalent or improved condition upon completion of the work. The Contractor shall confine his construction activities to areas defined by the work schedule, plans, and specifications.

materials.

5. CONTROL AND DISPOSAL OF HAZARDOUS AND NON-HAZARDOUS WASTES:

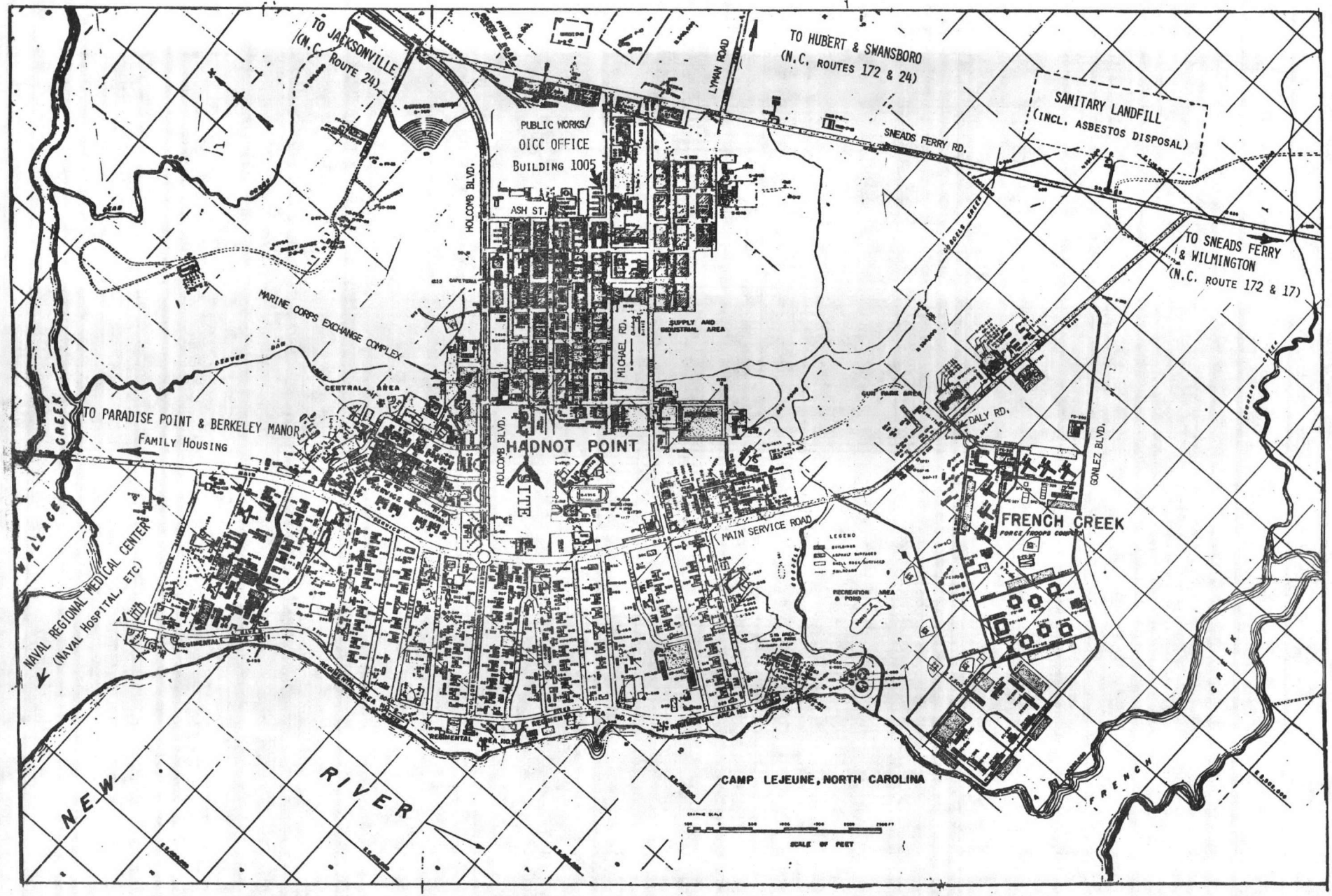
5.1 Non-hazardous wastes, except rubble, shall be picked up and disposed of daily or placed in containers which are emptied on a weekly schedule. All handling and disposal shall be so conducted as to prevent contamination of the site and any other areas. The Contractor shall transport all such waste and dispose of it in the Base Sanitary Landfill, unless otherwise approved. If transporting any material off Government property, the Contractor shall provide the Contracting Officer a copy of State and/or local permit which reflects the responsible agency's approval of the disposal area and proposed waste disposal methods. Rubble such as masonry, stone, concrete without reinforcing steel, and brick shall be deposited as directed. Upon completion, the work and disposal areas shall be left clean and natural looking. All signs of temporary construction and activities incidental to construction of the required permanent work in place shall be obliterated.

5.2 Hazardous Wastes:

5.2.1 Garbage Disposal: The Contractor shall transport his garbage to the Base Sanitary Landfill. However, the preparation, cooking and disposing of food are strictly prohibited on the project site.

5.2.2 Liquid wastes shall be stored in corrosionresistant containers, removed from the project site, and disposed of not less frequently than monthly unless directed otherwise. Disposal of liquid waste shall be in accordance with Federal, State and Local regulations. Fueling and lubricating of equipment and motor vehicles shall be conducted in a manner that affords the maximum protection against spills and evaporation. For oil and hazardous material spills which may be large enough to violate Federal, State and Local regulations, the Contracting Officer shall be notified immediately.

5.2.3 Askarel contained in the two 75-KVA transformers is a PCB, one of the toxic substances controlled by the Federal Toxic Substance Control Act (TSCA). Handling of the PCB or any toxic substance listed in the TSCA shall comply with all features of the TSCA.



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DIVISION 2. SITE WORK

SECTION 02100. CUTTING AND PATCHING

1. CUTTING shall be done by sawing along straight lines. The amount cut out shall be the minimum necessary to accommodate the new work. No flame cutting will be permitted.

2. HOLES shall be rotary drilled. The size shall be the minimum necessary to accommodate the new work.

3. PATCHING shall be done with material which matches the existing in quality and surface texture when finished, unless otherwise specified.

4. PAVEMENT REMOVAL AND REPLACEMENT: Where it is necessary to cut existing pavement, curbs, and gutters, the Contractor shall make cuts with neat, parallel, straight lines. Cuts shall be made at least one foot wider than trench width on each side of the trench. Pavement, curbs, and gutters shall be replaced to same cross-section as the original, using materials specified.

SECTION 02110. DEMOLITION AND REMOVAL

1. SUBMITTALS: The procedures proposed for the accomplishment of removal work shall be submitted to the Contracting Officer and approved before work is started. The procedures shall provide for careful removal and disposition of materials specified to be salvaged, coordination with other work in progress and a disconnection schedule of utility services. The procedures shall include a detailed description of the methods and equipment to be used for each operation and the sequence of operations.

2. GENERAL REQUIREMENTS: The work includes the removal of two 750 KVA, askaril-filled, transformers and two 2,500-ampere switchgears and related equipment, as indicated or specified. All materials resulting from the removal work, except as indicated or specified otherwise, shall become the property of the Contractor and shall be removed from the limits of Government property. Material to remain property of the Government shall be disposed of in accordance with instructions of the Contracting Officer.

3. DUST CONTROL: Dust resulting from removal work shall be controlled to prevent the spread of dust to occupied portions of the building and to avoid creation of a nuisance in the surrounding area. Use of water will not be permitted when it will result in, or create, hazardous or objectionable conditions such as ice, flooding and pollution.

4. PROTECTION:

4.1 Protection from the Weather: The interior of the building and all materials and equipment shall be protected from the weather at all times. Where removal of existing windows is necessary to accomplish work, materials and workmen necessary to provide adequate and approved temporary covering of exposed areas shall be kept in readiness at all times. Temporary coverings shall be attended as necessary to insure their effectiveness and prevent displacement.

4.2 Protection of Personnel: Where the safety of personnel is endangered in the area of removal work, barricades shall be used and advance notice shall be given to the Contracting Officer prior to beginning of any such work.

5. USE OF EXPLOSIVES will not be permitted.

6. EXISTING FACILITIES TO BE REMOVED:

6.1 Removal of Equipment:

6.1.1 Removal of the two 750 KVA askaril-filled transformers, and two 2,500-ampere switchgears as indicated shall terminate in a manner and at a time satisfactory to the Contracting Officer. The two 750 KVA askaril-filled transformers shall be drained into storage drums, removed, and delivered to a location on the Base in accordance with instructions of the Contracting Officer and regulations of EPA. When utility lines are encountered that are not indicated, they shall be disposed of in accordance with instructions of the Contracting Officer and disposal

shall be covered by differing site conditions in accordance with the General Provisions.

6.1.2 Each transformer shall be carefully and fully drained of the askarel oil.

6.1.3 Transformer No. 1 and Switchgear "A" shall be the first substation to be removed. The other substation shall be removed only after Transformer No. 1 and Switchgear "A" have been replaced and in operation.

6.1.4 The suggested route for the removed transformers is indicated.

6.1.5 The concrete curb around the existing two transformers shall not be removed until the respective transformer has been drained of the askaril oil and completely flushed and ready for removal.

7. DISPOSITION OF MATERIAL:

7.1 Title to Materials: Title to all materials and equipment to be removed, except as specified otherwise, is vested in the Contractor upon receipt of notice to proceed. The Government will not be responsible for the condition, loss or damage of such property after notice to proceed.

7.2 Reuse of Materials and Equipment: Materials and equipment to be reused or relocated shall be carefully removed and stored to prevent damage, and reinstalled as the work progresses.

7.3 Property of the Government: The two 750 KVA askaril-filled transformers specified shall remain the property of the Government, and shall be carefully removed and delivered by the Contractor to a storage site as directed within 10 miles of the work site. Askarel oil, to remain property of the Government, shall be placed in steel drums meeting the strength and durability requirements of DOT Specifications 5, 5B, 17C or 17E and delivered to storage site like the tranformers. Items shall be removed in a manner to prevent damage.

7.4 Material for Contractor Salvage shall be stored as directed by the Contracting Officer. Salvage materials shall be removed from Government property before completion of the contract. Material for salvage shall not be sold on the site.

8. CLEAN-UP:

8.1 Debris and Rubbish Control: Debris and rubbish shall be removed and transported in a manner that will prevent spillage on streets and adjacent areas.

8.2 Regulations: Federal, State and local regulations regarding hauling and disposal shall be complied with.

SECTION 02200. EARTHWORK AND REMOVAL

1. GENERAL: Bids shall be based on the following:

a. That the surface elevations are as indicated.

b. That no pipes or other artificial obstructions, except those indicated, will be encountered.

c. That hard material will not be encountered

In case the actual conditions differ substantially from those stated or shown, or both, the provisions of the contract respecting an adjustment for changed conditions shall apply, subject to the requirement of notification thereunder being given. Hard material shall be definied as solid ledge rock, firmly cemented unstratified masses or congolomerate deposits possessing the characteristics of solid rock not ordinarily removed without systematic drilling and blasting, and any boulder, masonry, or concrete except pavement, exceeding 1/2-cubic yard in volume.

2. PROTECTION OF VEGETATION, TREES AND SHRUBS shall be adequate to prevent damage to them from the Contractor's operations. Upon completion, existing vegetation, trees and shrubs shall remain in the same condition as they were before the Contractor was allowed to proceed with construction on site.

3. GRADING: The Contractor shall perform all grading in the areas disturbed by construction. Surfaces which are to receive shellrock shall be depressed as required to receive the shellrock. Existing grades which are to remain and which are disturbed by the Contractor's operations shall be graded to provide surfaces suitable for the proper use of mowing machines.

4. DISPOSITION OF SURPLUS MATERIAL: Surplus soil material, rock not required, and bituminous material removed shall be delivered to a location as directed within eight miles of the site.

5. PROTECTION OF UTILITY LINES: Existing utility lines that are indicated or the locations of which are made known to the Contractor prior to excavating and tenching and that are to be retained, as well as utility lines constructed during excavating and trenching operations, shall be protected from damage during excavating, trenching and backfilling, and if damaged shall be repaired as directed by the Contracting Officer at the Contractor's expense. When utility lines that are to be removed are encountered within the area of operations, the Contractor shall issue written notification 10 hours in advance to the Contracting Officer stating the necessary measures to be taken to prevent interruption of the service.

6. ELECTRICAL DUCTS OR CABLES: Trenches for cables or ducts shall be of a depth that will provide not less than 18 inches of cover from finished grade for cables under 600 volts and 24 inches of cables above 600 volts. Trenches for cables shall be cut to an over-depth of not less than bedding and 3 inches. Granular material shall be used for not less than 3 inches bedding and 3 inches backfill over the cable.

7. EXCAVATING FOR APPURTENANCES: Excavating for manholes and similar structures shall be sufficient to leave at least 12 inches in the clear between their outer surfaces and the embankment or shoring which may be used. Whenever unstable soil is encountered that is incapable of supporting the structure in the bottom of the excavation, such soil shall be removed to the depth necessary to obtain design bearing. Unauthorized over-depths or over-depths in wet or otherwise unstable soil shall be filled with satisfactory backfill material or concrete, as directed, at the expense of the Contractor.

SECTION 02444. CHAIN LINK FENCING

1. APPLICABLE PUBLICATIONS: The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the references thereto:

FEDERAL SPECIFICATIONS:

RR-F-191/GEN	Fencing Wire and Post Metal (and Gates, Chain Link Fabric, and Accessories).
RR-F-191/1A	Fencing, Wire and Post, Metal (Chain Link Fence Fabric).
RR-F-191/2A	Fencing, Wire and Post, Metal (Chain Link Fence Gates).
RR-F-191/3A	Fencing, Wire and Post, Metal (Chain Link Fence Posts, Top Rails and Braces).
RR-F-191/4A	Fence, Wire and Post, Metal (Chain Link Fence Accessories).

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM):

ASTM C94-78A Ready-Mixed Concrete.

2. MATERIALS:

2.1 Chain Link Fencing, Fabric, Gates, Posts, Top Rails and Braces, and Accessories: RR-F-191/GEN and detailed specifications as referenced herein.

2.1.1 Chain Link Fencing Fabric: RR-F-191/1A, Type I, zinc-coated steel, 9 gage coated wire size. Mesh sixe shall be 2 inches. Minimum weight of zinc for zinc-coated steel shall be 1.2 ounces per square foot of uncoated wire. Selvage shall be knuckled at one selvage and twisted and barbed at the other.

2.1.2 Chain Link Fencing Gates: RR-F-191/2A, Type I. Shape and size of the gate frame shall be as indicated. Framing and bracing members shall be round steel. Finish for steel shall be zinc-coated. Gate fabric shall be as specified herein for chain link fencing fabric. Coating on steel latches, stops, hinges, keepers, and accessories shall be zinc-coated steel having weight of zinc-coating not less than 1.2 ounces per square foot. Gate fabric shall be attached to the gate frame by methods standard with the manufacturer except that welding will not be permitted. Latches shall be arranged for padlocking so that padlock will be accessible from both sides of the gate, regardless of latching arrangement.

2.3 Chain Link Fencing, Post, Top Rails and Braces: RR-F-191/3A; post type I, class 1, steel pipe; top rails type II, class 1, steel pipe. Materials shall be zinc-coated steel; weight of zinc-coating shall be 1.6 ounces per square foot on base metal surface.

2.1.4 Chain Link Fencing Accessories: RR-F-191/4A.

3. CONCRETE: ASTM C94, using 3/4-inch maximum size aggregate, and having minimum compressive strength of 3,000 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.

4. INSTALLATION:

4.1 General: The fence shall be installed on previously prepared surfaces to line and grade as indicated. Fence installation shall be in accordance with the fence manufacturer's printed installation instructions except as modified herein.

4.2 Excavation for concrete-embedded items shall be 8 inches by 8 inches by 12 inches except in bedrock. If bedrock is encountered before reaching the required depth, the excavation shall be continued to the depth indicated or 18 inches into the bedrock, whichever is less, and shall be a minimum of 2 inches larger than the outside diameter of the post. Post holes shall be cleared of loose material. Waste material shall be spread where directed by the Contracting Officer within one mile of the site.

4.3 Post Setting: Posts shall be set plumb and in alignment. Posts shall be set in concrete bases of 8 inches by 8 inches by 12 inches except in bedrock. Concrete shall be thoroughly compacted so as to be free of voids and finished in a dome. Straight runs between braced posts shall not exceed 500 feet. In bedrock, posts shall be set with a minimum of one inch or grout around each post. Grout shall be thoroughly worked into the hole so as to be free of voids and finished in a dome. Concrete and grout shall be cured a minimum of 72 hours before any further work is done on the posts.

4.4 Post Caps shall be of the design as required to accommodate the top rail. Post caps shall be installed as recommended by the manufacturer.

4.5 Top Rail shall be installed before installing chain link fabric and shall pass through intermediate post caps. The top rail shall have expansion coupling spaced as indicated.

4.6 Bottom Reinforcing Wire shall be installed before installing chain link fabric and shall be pulled taut. Distance from bottom edge for installation of reinforcing wire shall be two inches.

4.7 Fabric shall be pulled taut and secured to the top rail and bottom wire close to both sides of each post and at intervals of not more than 24 inches on centers. Fabric shall be secured to posts using stretcher bars and ties or clips or by integrally weaving to integral fastening loops of end, corner, pull, and gate posts for the full length of each post. Fabric shall be installed on the opposite side of posts from the area being secured. Installation of fabric shall be such that bottom of fabric is at two inches above ground level.

4.8 Swinging Gates shall be hinged to allow 180-degree swing in direction as indicated and 90-degree swing in opposite direction.

SECTION 02600. ASPHALTIC CONCRETE

1. APPLICABLE PUBLICATIONS: The following publication of the issue listed below, but referred to thereafter by basic designation only, forms a part of this specification to the extent indicated by references thereto.

North Carolina Department of Transportation (NCDOT):

Standard Specifications for Roads and Structures, July 1978

2. GENERAL REQUIREMENTS: All "Section" references refer to NCDOT "Standard Specifications for Roads and Structures". In all references:

a. The articles entitled "Method of Measurement", "Basis of Payment" and "Acceptance of Bituminous Materials" will not apply.

b. All references to "Engineer" shall mean "Contracting Officer".

3. PRIME COAT: Work and materials shall be Grade MC-30 or RC-30 conforming to Section 600.

4. TACK COAT: Work and materials shall conform to Section 605.

5. ASPHALTIC CONCRETE SURFACE COURSE, also specified as "Bituminous Concrete", shall be Type I-1, conforming to Section 645.

6. CRUSHED STONE: Work and materials shall conform to Section 520.

7. CONSTRUCTION EQUIPMENT:

7.1 Mixing Plant shall conform to the requirements of Section 610-5.

7.2 Spreading and Finishing Equipment shall be the electronic-screed type and shall be capable of spreading the bituminous mixtures to a uniform density, striking a smooth surface true to cross- section and producing a finish surface of the specified eveness. Electronic-screed type equipment will not be required on stone base course overlaying.

7.3 Compacting Equipment shall include a tandem roller.

8. CONSTRUCTION METHODS: Work shall conform to the sections referenced hereinbefore and to the following:

8.1 Before Commencing the operations on any portion of the work, the surface of the existing pavement and any new base course shall be thoroughly cleaned of all foreign matter, including grass, by mechanical means, if feasible.

8.2 Patchwork: All asphalt surfacing and loose stone base course shall be removed. Stone base course materials removed shall be replaced with a new stone base course and asphaltic concrete mixture. The tackwork shall be accomplished in advance of placing the surface course, and the surface course placed continuously over the entire area.

8.3 Placing of the Asphaltic Concrete shall be as nearly continuous as possible. The rollers shall pass over the unprotected end of the mixture only when laying is discontinued for sufficient time to permit the mixture to cool, in which case, a joint shall be made by cutting back the surface course to expose a granular surface for its full depth to bond with the fresh mixture. When laying is resumed, the exposed edge shall be coated with hot asphaltic cement and the fresh mixture raked against the joint, thoroughly tamped with hot tamps and rolled.

8.4 Finished Surfaces shall be uniform in texture and appearance and free from cracks and creases. The finished surface shall vary not more than 1/8-inch when the test for smoothness is performed with a 10-foot straightedge. The finished thickness shall be not less than the specified thickness minus 1/8-inch. Where the irregularities of the surface or the deficiency in depth is more than the specified tolerances, the defective work shall be removed and replaced with new material, as directed, without additional cost to the Government.

8.5 Bituminous Materials and/or Mixture shall not be produced or placed when weather is rainy or foggy, or when the air temperature is less than 40 degrees Fahrenheit in the shade away from artificial heat.

8.6 Protection of Pavement: After final rolling, no vehicular traffic of any kind shall be permitted on the pavement until it has cooled and hardened.

END

DIVISION 3. CONCRETE

SECTION 03300. CAST-IN-PLACE CONCRETE

1. APPLICABLE PUBLICATIONS: The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the references thereto:

AMERICAN CONCRETE INSTITUTE (ACI):

ACI 211.1-74	Recommended Practice for Selecting Proportions for Normal Weight Concrete
ACI 308-71	Curing Concrete.
ACI 315-74	Manual of Standard Practice for Detailing Reinforced Concrete Structures.
ACI 318-77	Building Code Requirements for Reinforced Concrete.
ACI 347-78	Recommended Practice for Concrete Formwork.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM):

C150-78	Portland Cement.

2. MATERIALS shall conform to the requirements and reference documents listed.

2.1 Concrete shall be ready-mixed concrete meeting design requirements of ACI 211, made with cement conforming to ASTM C150.

2.2 Reinforcement shall be in accordance with AC 315.

2.3 Formwork shall conform to ACI 347.

2.4 Curing concrete shall be in accordance with ACI 308.

3. WORKMANSHIP: All work shall meet requirements of ACI 318. The surface immediately under concrete installed on grade shall be wetted as directed immediately before the concrete is placed. Reinforcing shall be placed prior to beginning concrete pour. Where concrete abuts, adjoins, or overlays existing concrete, approved expansion joints, bonding agents, or surface preparations shall be used.

4. CONCRETE FINISHES: All interior concrete slabs shall receive a steel trowel finish level within 1/8-inch in 10 feet. Exterior concrete shall be in a direction transverse to that of traffic or at right angles to the slope of the slab. Floated finishes may be used on foundations, footings, and related concrete with approved by the Contracting Officer.

DIVISION 5. METALS

SECTION 05500. MISCELLANEOUS METALS

1. APPLICABLE PUBLICATIONS: The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the references thereto.

American Society for Testing and Materials (ASTM):

A153-78 Zinc-Coating (Hot-Dip) on Iron and Steel Hardware.
A525-78 Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.

2. ZINC-COATING shall be applied to all ferrous metals. Zinc-coating shall conform to ASTM A153 or ASTM A525, coating G-90.

3. NON-FERROUS METALS shall be protected from corrosion by a coating according to manufacturer's recommendation.

4. DISSIMILAR METALS shall be protected by having contact surfaces coated with a heavy coat of bituminous paint. Aluminum surfaces to be embedded in plaster or mortar shall be protected with a heavy coat of bituminous paint or clear non-staining or non-yellowing colorless coating.

5. FASTENERS, ANCHORS, ANCHOR BOLTS and similar items necessary for installation of the work shall be provided. Sizes, types, and spacing of anchors and bolts not indicated or specified otherwise shall be as necessary for their purposes. Anchors and bolts in contact with ferrous metal shall be zinc-coated steel and those adjacent to non-ferrous metal shall be of the same or approved metals compatible with the materials which they adjoin.

6. INSERTS AND SLEEVES: Inserts of suitable and approved types shall be provided where required for the support or anchorage of equipment and finish construction. Inserts shall be gray or malleable iron castings or of galvanized steel unless indicated or specified otherwise.

7. FINISHING: All surfaces of ferrous metal not zinc-coated or encased in concrete shall be shop painted in colors to match existing adjacent surfaces.

END

DIVISION 16. ELECTRICAL

SECTION 16011. GENERAL REQUIREMENTS, ELECTRICAL

1. APPLICABLE PUBLICATIONS: The publications listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the references thereto. Where a number in parenthesis is suffixed to the specification number, it denotes the effective amendment to the specification.

FEDERAL SPECIFICATIONS:

TT-E-496B(2)	Enamel, Heat-Resisting (400 Degrees Fahrenheit), Black.
TT-P-28E	Paint, Aluminum, Heat Resisting (1200 Degrees Fahrenheit).

MILITARY SPECIFICATIONS:

MIL-T-152B(2)	Treatment, Moisture-Fungus Resistance of Communications, Electronic and Associated Equipment).
MIL-I-24092B	Insulating Varnish, Electrical Impregnating.

2. APPLICATION: This section applies to all sections of Division 16 of this project, except as specified otherwise in the individual sections.

3. SUBMITTALS REQUIRED: Shop drawings, manufacturers' data and certificates for equipment, materials, finish and pertinent details for each system shall be submitted and approved before procurement, fabrication or delivery of such items to the job site. Partial submissions are not acceptable and such submittals will be returned without review. Descriptive data shall be annotated to show the specific model, type and size of each item the Contractor proposes to furnish.

3.1 Shop Drawings: The drawings shall be a minimum of 8½ inches by 11 inches in size, except as specified otherwise, and shall include plans, elevations, and sections of equipment and control spaces identifying and indicating proposed location, layout and arrangement of items of equipment, control panels, accessories, elementary diagrams, wiring diagrams, and any other items that must be shown to assure a coordinated installation. Wiring diagrams shall have their terminal identified and shall indicate the internal wiring for each item of equipment and the interconnection between the items. Drawings also shall indicate adequate clearance for operation, maintenance and replacement of operating equipment devices. If any equipment is disapproved, drawings shall be revised to show acceptable equipment resubmitted.

3.2 Manufacturer's Data: Information shall be submitted for all material and equipment as specified in the individual sections that the Contractor proposes to furnish for accomplishment of the contract work. Submittals for each manufactured item shall be manufacturer's descriptive literature, diagrams, performance and characteristic curves, and catalog cuts, and shall include manufacturer's name, trade name, catalog model or number, nameplate data, size, layout dimensions, capacity, specification reference, applicable Federal and military specification references, and all other information necessary to establish contract compliance.

3.3 Listings and Labels of Compliance: Where equipment or materials are specified to conform to requirements of the standards of organizations such as Underwriters' Laboratories (UL), that use a label or listing as method of indicating compliance, proof of such conformance shall be submitted and approved. The label or listing of the specified organization will be acceptable evidence. In lieu of the label or listing, the Contractor shall submit a certificate from an independent testing organization adequately equipped and competent to perform such services, and approved by the Contracting Officer, stating that the item has been tested in accordance with the specified organization's test methods and that the item conforms to the specified organization's standard.

3.4 Certified Test Reports: Where specified in the individual sections and before delivery of materials and equipment, certified copies of the reports of all tests required in referenced publications shall be submitted for approval.

4. POSTED OPERATING INSTRUCTIONS: Operating instructions approved by the Contracting Officer shall be provided for each system and each principal piece of equipment for use of operation and maintenance personnel. The operating instructions shall include wiring and control diagrams, showing the complete layout of the entire system, including equipment, devices, and control sequence and shall be framed under glass or in approved laminated plastic and posted where directed by the Contracting Officer. Printed or engraved operating instructions for each principal piece of equipment, including startup, proper adjustment, operating, lubrication, shutdown, safety precautions, procedure to followin the event of equipment failure, and any other necessary items of instruction as recommended by the manufacturer of the unit shall be attached to or posted adjacent to the piece of equipment. Operating instructions exposed to the weather shall be made of weatherresisting materials or shall be suitably enclosed to be weather protected. Operating instructions shall not fade when exposed to sunlight and shall be secured to prevent easy removal or peeling.

5. DELIVERY AND STORAGE: Equipment and materials shall be properly stored, adequately protected, and carefully handled to prevent damage before and during installation. Equipment and materials shall be handled, stored, and protected in accordance with the manufacturer's recommendations and as approved by the Contracting Officer. Electrical conduit shall be stored to provide protection from the weather and accidental damage. Plastic conduit shall be stored on even supports and in locations not subject to direct sun rays or excessive heat. Cables shall be sealed, stored and handled carefully to avoid damage to the outer covering or insulation and damage from moisture and weather. Damaged or defective items, in the opinion of the Contracting Officer, shall be replaced at no cost to the Government.

6. CATALOGED PRODUCTS: Materials and equipment shall be essentially the cataloged products of manufacturers regularly engaged in production of such materials or equipment and shall be manufacturer's latest design that complies with the specification requirements. Materials and equipment shall essentially duplicate items that have been in satisfactory commercial or industrial use at least two years prior to bid opening. Where two units of the same class of equipment are required, those units shall be products of a single manufacturer. However, the component parts

of the system need not be the product of the same manufacturer. Each item of equipment shall have the manufacturer's name and address, and the model and serial number on the nameplate securely affixed in a conspicuous place. The nameplate of the distributing agent will not be acceptable. Nameplates for electrical apparatus shall conform to NEMA standards.

7. FUNGUS CONTROL: Electrical equipment shall be treated to resist fungus and moisture.

7.1 Electrical components such as switches, fuses and contacts, shall not be treated. Other materials and components which are inherently fungus resistant or are protected by hermetic sealing need not be treated.

7.2 Circuit elements, not covered above and which have a temperature rise of not more than 75 degrees Fahrenheit when operating at full load, shall be coated with a fungus resistant varnish conforming to MIL-V-173. The method of treatment shall be in accordance with MIL-T-152. Circuit elements include, but are not limited to, cable, wire, switchboards, panelboards, terminal and junction blocks, junction boxes, capacitors, and coils.

7.3 Circuit elements such as motor coils, generator and dry type transformer windings, and similar electrical components, which have a temperature rise exceeding 75 degrees Fahrenheit when operating at full load, shall not be coated with a fungitoxic compound. Instead, such components shall be given two coats of varnish conforming to Type M, Class 130 and one sealer coat conforming to Type M, Class 130 of MIL-I-24092. The coats shall be applied by the vacuum-pressure, immersion, centrifugal, pulsating-pressure or built-up method so as to fill all interstices in the coils and preclude the entrapment of air or moisture. The sealer coat may also be applied by brushing or spraying.

8. MANUFACTURER'S RECOMMENDATIONS: Where installation procedures or any part thereof are required to be in accordance with the recommendations of the manufacturer of the material being installed, printed copies of these recommendations shall be furnished to the Contracting Officer prior to installation. Installation of the item will not be allowed to proceed until the recommendations are received. Failure to furnish these recommendations can be cause for rejection of the material.

9. MECHANICAL REQUIREMENTS: The interconnecting power wiring and conduit; control wiring rated over 120 volts and conduit; the motor control equipment forming a part of motor control centers, of switchgear assemblies, and the electrical power circuits are included under this division. The electrical components of mechanical equipment such as motors, motor starters, control or push-button station, float or pressure switches, solenoid valves, electrical disconnecting (isolating) means and other devices functioning to control associated mechanical equipment are specified in the appropriate sections covering such work. Interconnecting wiring for components of packaged equipment shall be provided as an integral part of the equipment as specified elsewhere in the appropriate sections covering such work.

10. COORDINATION: Electrical work shall be coordinated with other trades involved in the construction project. All work shall be carefully laid out in advance, coordinating architectural, structural, mechanical and electrical features of construction.

11. PAINTING OF EQUIPMENT: Equipment painting, both shop and field applied, shall be as specified herein, and provided under Section 09910. It is desirable that all paint be shop applied; however, if the manufacturer's standard shop painting system does not meet these requirements, field painting shall be provided.

11.1 Optional Paint Systems: Manufacturer's standard equipment painting systems may be provided in lieu of the systems specified herein before, provided the Contractor submits certification that the painting system applied will withstand 125 hours in a salt-spray fog test, except that equipment located outdoors shall withstand 500 hours in a salt-spray fog test. Salt-spray fog test shall be in accordance with ASTM B117 using a 20 percent sodium chloride solution. Immediately after completion of the test, the paint shall show no signs of blistering, wrinkling or cracking; no loss of adhesion, and the specimen shall show no signs of rust creepage beyond 0.125-inch on either side of the scratch mark. The film thickness of the factory paint system applied on the equipment shall not be less than the film thickness used on the test specimen. If manufacturer's standard painting system is being proposed for use in lieu of specified systems using TT-E-496 or TT-P-28, certifications that the manufacturer's standard system will conform to the heat resistance requirements of TT-E-496 or TT-P-28 as applicable, shall be submitted in addition to other certifications.

SECTION 16300. ELECTRICAL DISTRIBUTION, EXTERIOR

1. APPLICABLE PUBLICATIONS: The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by references thereto. Where a number in parenthesis is suffixed to the specification number, it denotes the effective amendment to the specification.

FEDERAL SPECIFICATIONS:

J-C-30A	Cable and Wire, Electrical (Power Fixed Installation).
J-C-145B(1)	Cable, Power, Electrical and Wire, Electrical (Weather-Resistant).
QQ-W-343D	Wire, Electrical (Uninsulated).
RR-F-621B	Frame, Cover, Grating, and Step, Manhole.
SS-S210A(1)	Sealing Compound, Preformed Plastic, for Expansion Joints and Pipe Joints.
TT-E-489F(1)	Enamel; Alkyd, Gloss (for Exterior and Interior Surfaces).
TT-P-645	Primer, Paint, Zinc-Chromate, Alkyd Type.

MILITARY SPECIFICATIONS:

MIL-B-7883B	Brazing of Steels, Copper, Copper Alloys, Nickel Alloys, Aluminum and Aluminum Alloys.
MIL-C-18480A(3)	Coating Compound, Bituminous Solvent, Coal Tar Base
MIL-I-15126F(2)	Insulation Tape, Electrical, Pressure Sensitive Adhesive and Pressure Sensitive Thermosetting Adhesive.
MIL-H-55053B	Hardware, Pole LIne, With Supplement 1A.
MIL-P-15328C(1)	Primer, Pretreatment (Formula No. 117 for Metals).

ASSOCIATION OF EDISON ILLUMINATING COMPANIES (AEIC):

5-74	Specification for Polyethylene and Cross-Linked Polyethylene Insulated Shielded Power Cables Rated 5 through 69 KV; Fourth Edition.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM):

B231-74	Concentric-Lay-Stranded Aluminum Conductors.
B397-74	Concentric-Lay-Stranded 5005-H19 Aluminum Alloy Conductors.
B399-74	Concentric-Lay-Stranded, 6201-T81 Aluminum Alloy Conductors.
C309-74	Liquid Membrane Forming Compounds for Curing Concrete.
C32-73	Sewer and Manhole Brick (made from clay or shale).

INSITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE):

48-1975	High-Voltage Alternating Current Cable Terminations, Standard Test Procedures and Requirements.

INSULATED POWER CABLE ENGINEERS ASSOCIATION (IPCEA):

S-19-81-1969 (R Jun 76)	Rubber Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.
S-61-402-1973 (R Aug 74)	Thermoplastic Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.
S-66-524-1971 (R Jun 76)	Cross Linked Thermosetting Polyethylene Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy,
S-68-516-1976	Ethylene-Propylene-Rubber-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA):

LA 1-1976	Lightning Arrester.
SG 2-1975	High Voltage Fuses.
SG 13-1977	Automatic Circuit Reclosers, Automatic Line Sectionalizers, and Oil-Filled Capacitor Switches.
TC 8-1974	Extra Strength Plastic Utilities Duct for Underground Installation.

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA):

70-1978	National Electrical Code.

UNDERWRITERS' LABORATORIES, INC. (UL):

1-1973 (R 76)	Flexible Steel Conduit.
467-1972 (R 76)	Grounding and Bonding Equipment.
510-1976	Insulating Tape
514-1974 (R 77)	Outlet Boxes and Fittings.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI):

C2-1973	National Electrical Safety Code.
C29.1 to C29.7-1961	Wet Process Porcelain Insulators.
C80.1-1966 (R 1971)	Rigid Steel Conduit, Zinc Coated.

AMERICAN CONCRETE INSTITUTE (ACI):

318-71 (1974 SUP)	Building Code Requirement for Reinforced Concrete.

2. QUALITY CONTROL: All field tests to determine conformance with the specified requirements shall be performed in the presence of the Contracting Officer.

3. SUBMITTALS:

3.1 Shop Drawings (SD) and Catalog Data (CD) for the following items shall be submitted to and approved by the Contracting Officer:

High voltage cable (CD)
Handholes (CD)
Potheads (CD)
Lightning Arresters (CD)
Conduit, galvanized coated steel (CD)
Terminators (CD)
Fuses (CD)
Splices (CD)
Pole Top Switches (CD)
Fence (CD)

3.2 Manufacturer's Certifications shall be submitted to the Contracting Officer for the following items:

Condut, metal flexible
Conduit fittings
Wires and cable, 600-volt and less
Pole, hardware
Insulator
Overhead conductor
Tapes
Ground rods

4. GENERAL REQUIREMENTS include those specified in Section 16011 and as specified herein. Prevention of corrosion: Metallic materials shall be protected against corrosion. Outdoor equipment shall be given a rust inhibiting treatment and standard finish by the manufacturer. Aluminum shall not be used in contact with the earth, and where connected to dissimilar metal, shall be protected by approved fittings and treatment. Steel conduits installed underground shall be coated with an approved asphaltic paint, plastic coating, or shall be wrapped with a single layer of a pressure sensitive plastic tape, half lapped.

5. SERVICE:

5.1 Underground Service into building shall terminate at a point five feet outside the building and projections thereof. Connections of the underground service to the service switch, panelboard or load center is included in other sections of Division 16. Ends of the underground conduit shall be protected by threaded metal caps until connections are made.

5.2 Electrical Characteristics for this project shall be 12470 Delta volts primary, three phase, three wire, 60 Hertz and 208/120 Y volts secondary, three phase.

6. MATERIALS, EQUIPLMENT AND ASSEMBLIES:

6.1 Electrical Tapes: Tapes used for electrical insulation and other purposes in wire and cable splices, terminations, repairs and miscellaneous purposes shall conform to UL 510 and shall be UL approved for the specific application.

6.2 Calking Compound: Compound for the sealing of conduits, ducts, pipes, and sleeves shall be of a puttylike consistency workable with the hands at temperatures as as 35 degrees Fahrenheit, shall not slump at a temperature of 300 degrees Fahrenheit, and shall not harden materially when exposed to air. The compound shall readily clak or adhere to clean surfaces of the materials with which it is designed to be used. The compound shall have no injurious effects upon the hands of workmen or upon the materials.

6.3 Pothead, Porcelain Insulator for all Types of Cable: Except as indicated or specified otherwise, potheads as specified herein shall be provided for all terminations of single and multiconductor power and lighting cables for service above 600 volts. The pothead shall be the product of one manufacturer, and shall conform to the requirements of IEEE Standard No. 48 for class 1 terminations. The manufacturer shall

furnish all components including complete instructions which shall be followed for assembly and installation, suitable for the type and materials of the cable terminated. The pothead shall consist of a porcelain insulator or insulators, cable connector-hoodnut assembly and aerial lug as required, metal body and supporting bracket, sealed cable entrance and support and insulating compound as necessary. Pothead installations shall include stress relief for shielded cables. Potheads for use with lead-sheathed cable shall be the wiped joint type, and those for mounting on conduit shall be the stuffing box type with conduit coupling and means for securing and sealing the cable. Means for securing and grounding armor of metallic armored cable shall be included as necessary. Separate parts of copper or copper alloy shall not be used in contact with aluminum or aluminum alloy parts in the construction and installation of potheads.

6.4 Metal Conduit, Fittings and Accessories:

6.4.1 Rigid Metal Conduit: Unless indicated or specified otherwise, rigid metal conduit shall be zinc coated rigid steel. Rigid steel conduit shall conform to ANSI C80.1. Aluminum conduit shall not be installed underground or encased in concrete and shall not be used with brass or bronze boxes or fittings. Except where indicated or specified otherwise, rigid metal conduit installed underground shall be encased in concrete as specified for underground duct lines. Bushings shall be provided on each end of conduit sleeves which pass through cable vault walls and roofs.

6.4.2 Flexible Metal Conduit shall conform to UL-1.

6.4.3 Fittings, Boxes, covers and Outlets: Fittings and accessories for rigid metallic conduit and flexible steel conduit shall conform to UL 467 and UL 514, as applicable and shall meet the following requirements: Fittings, boxes, covers and outlets for use in outdoor work and in exposed indoor work, shall be cast or alleable iron or cast aluminum, and shall have threaded hubs. Where used with aluminum conduit in wet locations, they shall be of aluminum alloy containing less than one percent copper. Iron or steel fittings, except bar hangers, shall be cadmium or zinc coated. Junction boxes shall conform to UL 514. Each box shall have the volume required by the National Electrical Code for the number of conductors enclosed in the box and shall meet the requirements of the National Electrical Code for installation of boxes and fittings. Cast metal conduit outlets and entrance caps shall conform to UL 514 and shall be cadmium or zinc coated if of ferrous metal.

6.4.4.Exposed Conduits, including poles risers and elbows for stub ups shall be hot dipped galvanized rigid steel conduit.

6.5 Plastic Condut shall be polyvinyl chloride (PVC) and conform to NEMA TC-8. Use and installation shall be in accordance with the National Electrical Code requirements for the installation of nonmetallic rigid conduit. PVC conduit fo concrete encasement shall be type EB. Couplings shall provide a watertight joint and shall be of the same material as the conduit.

6.6 Wires and Cables: Conductor sizes are expressed in American Wair Gage (AWG) or in circular mils. Unless otherwise noted, conductor and conduit sizes indicated are for copper conductors. Overhead power transmission and primary distribution line conductors shall be as hereinafter specified. Insulated aluminum or collper clad aluminum conductors may be used in lieu of insulated copper conductors on conductors rated over 600 volts. All conductors No. 6 AWG and smaller shall be copper. All grounding conductors shall be copper. If aluminum or copper clad aluminum conductors are used, the conductors shall have equivalent copper conductor current carrying capacity and the conduit sizes shall be increased to provide the maximum conduit fill in accordance with the National Electrical Code. If aluminum conductors are used, Contractor shall use particular care in making up joints and terminations. Surface oxides shall be removed by cleaning with a wire brush or emery cloth. Joint compound shall be used for connecting aluminum to aluminum.

6.6.1 Connectors and Terminals shall be designed and approved for use with the associated conductor material, and shall provide a uniform compression over the entire contact surface. Solderless terminal lugs shall be used on all stranded conductors. For connecting aluminum to copper, connectors shall be the circumferentially compressed, metallurgically bonded tyep.

6.6.2 Overhead Power Transmission and Primary Distribution Line Conductors: Conductors shall be of the type indicated or specified. Unless specified otherwise, the line conductors shall be bare and comply with the following specifications:

a. Copper conductors, hard drawn and medium hard drawn, shall conform to QQ-W-343.

b. Aluminum conductors shall conform to ASTM B-231.

c. Aluminum alloy conductors shall conform to ASTM B-397 or B-399.

6.6.3 Underground cabling and equipment shall conform to the respective specifications and other requirements specified herein:

a. Grounding conductors shall be No. 6 AWG copper for grounding cable sheathes, cable shields, conduit, and equipment, and No. 4 AWG copper for grounding lightning arresters to ground rods for ground systems as shown.

b. Neutral conductors shall have type TW insulation.

c. Cable for 12.47 KV distribution system shall be cross linked thermosetting polyethylene insulated cable conforming to IPCEA S-66-524, as applicable and AEIC No. 5-74. Cable shall be single conductor, employing concentric, Class B stranded copper conductor. Cable shall have conductor and insulation shielding. Insulation shielding shall be metal wire type consisting of a concentric serving of wires according to IPCEA S-66-524. Cable shall be rated k5 kv with insulation and jacket thickness of .080 and 41740 area mils, respectively. Cable shall have a polyviny chloride jacket. Contractor shall be responsible for determining the cable cutting lengths. Lengths shown on the drawings are for estimating purposes only. Conductor size shall be as indicated.

d. All circuits 600 volts and less, including service entrances, shall be sefved by type USE cable, rated 600 volts, unless otherwise indicated or specified. Conductors shall be copper or aluminum or copper clad aluminum of equivalent ampacity. Conductor size and number of conductors in each cable shall be as indicated. Cable shall be color coded. Conductor identification shall be provided within each enclosure where a tap, splice or termination is made. Conductor identification shall be by color coded insulated conductors, plastic coated self-sticking printed markers, colored nylon cable ties and plates or heat shrink type sleeves. Control circuit terminations shall be properly identified.

Colors to be used in coding shall be:

208 Volt System

Nautral - White
Phase A - Black
Phase B - Red
Phase C - Blue
Grounding Conductor - Green

6.6.4 Bare copper wire for grounding, bonding and other uses when not specified otherwise shall conform to QQ-W-343.

6.6.5 Secondary line and service wires and cables of the weather resistant, insulator supported type shall be polyethylene covered and shall conform to J-C-145. Service entrance cables shall conform to J-C-30.

6.6 Wires and cables for locations and uses not specified above shall be suitable for the purpose and in accordance with the National Electrical Code.

6.7 Wood Poles, Cross Arms and Hardware:

6.7.1 Hardware shall be of standard type manufactured for pole line construction. Miscellaneous steel hardware, including bolts, washers, locknuts, eyenuts, guy attachments, guy clamps, etc., shall conform to MIL-H-55053, shall be hot dip galvanized.

6.7.2 Metal pins shall be zinc coated forged steel with lead thread height to suit the insulator provided, but not less than 4½ inches high by 5/8-inch diameter. Shoulder shall be not less than 2-inch diameter, designed to distribute load uniformly to the crossarm. Shank shall be not less than 5/8-inch diameter by 5-3/4-inch length, equipped with 2-inch square washer, nut, and locknut, and shall project not less than 1/8-inch nor more than 2 inches beyond locknut. Zinc coated, broad base corner pins shall be used where indicated.

6.7.3 Insulators for line wires having a potential of 600 volts or less shall be of porcelain or glass; those for wires having a higher potential shall be of porcelain. Porcelain line insulators shall conform to ANSI C29.2 to C29.7 inclusive, and shall be the type that will not cause interference to radio receiving equipment. Mechanical strength of suspension insulators shall exceed the ultimate strength of the conductor attached thereto. Insulators for various uses shall have ratings not lower than the classes indicated in the following table:

MINIMUM RATING OF INSULATORS IN TERMS OF CLASS

Service	Pin	Line Post	Suspension
5,000 V and below	55-3	-	52-2
5,001-15,000	55-5	57-1L or 1S	2 x 52-2
25,001-35,000	56-5	57-5L or 5S	3 x 52-4

6.8 Ground Rods:

6.8.1 Copper Clad Steel Ground Rods: Rods shall be rolled to a commercially round shape from a welded copper clad steel manufactured by the molten-welding process or by the electro-formed process molecularly bonded. They shall have an ultimate tensile strength of 75,000 pounds per square inch and an elastic limit of 49,000 psi. The rods shall be not less than 3/4-inch in diameter by 10 feet in length and shall have a hard, clean, smooth, continuous copper surface and the proprtion of copper shall be uniform throughout the length of the rod. The copper shall have a minimum wall thickness of 0.013-inch at any point on the rod. Each ground rod shall be die-stamped near the top with the name or trademark of the manufacturer and the length of the rod in feet.

6.9 Lightning Arresters: Distribution valve type 9 kv arresters shall conform to NEMA LA-1, shall be designed for outdoor service, and shall be equipped with suitable mounting brackets for the applicable method of mounting.

6.10 Materials for Manholes and Handholes:

6.10.1 Concrete shall be as specified in section entitled "Cast-in-Place Concrete".

6.10.2 Brick used where indicated shall be sewer and manhole brick conforming to ASTM C32, grade MS.

6.10.3 Mortar shall be mixed in proportions of 1 part Portland cement, 1/4 part hydrated lime and between 2¼ and 3 parts sand by volume.

6.10.4 Metal Frames, Covers and Gratings, except as indicated or specified otherwise, shall conform to RR-F-621 and shall be of cast iron. Frames and covers of steel shall be welded by qualified welders in accordance with standard commercial practice. Steel covers shall be rolled steel floor plate having an approved antislip surface. Steel gratings shall be of welded construction and conform to the applicable requirements of RR-G-661, type I. Hinges shall be of wrought steel, 5 by 5 inches by approximately 3/16-inch thick, without screw holes, and shall be for full surface application by fillet welding. Hinges shall have fast pins and five knuckles. The surfaces of plates under hinges shall be true after the removal, by grinding or other approved method, of raised lugs.

6.10.5 Pulling-in Irons shall be steel bars bent in the form indicated, and cast in the walls and floors. In the floor they shall be centered under the manhole cover, and in walls they shall be not less than 6 inches above or below, and opposite the conduits entering the manhole. Pullin-in irons shall project into the manhole approximately 4 inches. Irons shall be zinc-coated after fabrication.

6.10.6 Cable racks, including cable rack arms and insulators, shall be sufficient to accommodate the cables. Racks shall be spaced not more than three feet apart and each manhole wall shall be provided with a minimum of two racks. The wall bracket shall be 4 inches by approximately 1½ inch by 3/16-inch by 48 inches long (minimum) channel steel. Slots for mounting cable rack arms shall be spaced at 8-inch intervals. The cable rack arms shall be of steel or malleable iron and shall be of the removable type. Insulators shall be dry-process glazed porcelain. The metal portion of racks shall be zinc-coated after fabrication.

6.11 Transformers and switchgear shall be as specified in Sections 16462 and 16475.

7. INSTALLATION:

7.1 General Requirements: Electrical installations shall conform to the National Electrical Safety Code, the National Electrical Code, and to the requirements specified herein.

For installation of underground systems refer to Section 16301.

7.2 Construction of Handholes:

7.2.1 Workmanship: Handholes shall be poured in place or may be of precast construction as specified hereinafter. Horizontal concrete surfaces of floors shall have a smooth trowel finish. Concrete shall be cured by applying two coats of white pigmented membrane forming-curing compound in strict accordance with the manufacturer's printed instructions, except that precast concrete may be steam cured. Curing compound shall conform to ASTM C309. Handholes shall be standard type 2 as indicated. Duct entrances shall be located near the corners of handholes to facilitate cable racking. Covers shall fit the frames without undue play. Steel and iron shall be formed to shape and size with sharp lines and angles. Castings shall be free from warp and blow holes that may impair their strengh or appearance. Exposed metal shall have a smooth finish and sharp lines and arrises. Provide all necessary lugs, rabbets and brackets. Set pulling-in irons and other built-in items in place before depositing concrete.

7.2.1.1 Optional Precast Concrete Construction: In lieu of poured-in-place concrete manholes and handholes, the Contractor may, at his option, provide precast concrete structures, subject to the requirements specified below. Precast units shall be the product of a manufacturer regularly engaged in the manufacture of precast concrete products, including precast manholes.

a. General: Precast concrete handholes shall have the same accessories and facilities as required for pured-in-place manholes and handholes. Likewise, they shall have plan area and clear heights not less than those of poured-in-place handholes. Concrete materials and methods of construction shall be the same as for pured-in-place concrete construction, as modified herein. Concrete for precast work shall have an ultimate 28-day compressive strength of not less than 4000 pounds per square inch. Handholes may be precast to the design and details shown for poured-in-place construction, precast mololithically and placed as a unit; or, they may be assembled sections, designed and produced by the manufacturer in accordance with the requirements specified. All structures shall be identified with the manufacturer's name embedded in, or otherwise permanently attached to, an interior wall face.

b. Design for Assembled Units: Precast structures shall be designed in accordance with the AASHTO "Standard Specifications for Highway Bridges"; concrete and reinforcing shall be designed in accordance with ACI Code 318. Tops and walls of structures shall be designed for AASHTO standard H20 highway loading, with 30 percent loading added for impact, and with design load being that which produces maximum shear and moment. All dead and live loads, as well as impact loading, shall be considered in design. Walls shall be designed to withstand all soil pressures, taking into consideration the soil to be encountered and ground water level present at the site, and assuming that the H20 design vehicle will operate on surfaces adjacent to the structure. Ground water level shall be assumed to be three feet below ground surface unless a higher water table is indicated in the boring logs. Design shall also take into consideration stresses induced in handling units. Lifting devices shall be provided for properly handling units. Calculations and shop drawings shall be submitted covering the design and manufacture of precast units, and shall bear the seal of a registered professional engineer.

c. Joints: Mating edges of precast components shall be provided with tongue and grooved joints. Joints shall be designed to firmly interlock adjoining components and to provide waterproof junctions. Joints shall be sealed watertight using preformed plastic strip conforming to SS-S-210. Sealing material shall be installed in strict accordance with the sealant manufacturer's printed instructions. Provisions shall be made for waterproofing cable entrances into structures, and at manhole covers in the top slab.

d. Installation: Assembly and installation of precast components shall follow the printed instructions and recommendations of the manufacturer of the units. Precast manholes and handholes shall be installed on a level bed of well-compacted gravel or crushed stone, well-graded from the one-inch sieve to the No. 4 sieve. Drain sumps shall be provided for precast structures as required for poured-in-place structures.

7.2.1.2 Methods of Anchoring of Cable Racks shall be as follows:

a. Method "A": Provide a 5/8-inch diameter by 5-inch long anchor bolt with 3-inch foot cast in manhole wall with 2-inch protrusion of threaded portion of bolt into manhole. Provide 5/8-inch steel square head nut on each anchor bolt. Coat threads of anchor bolts with whit lead immediately prior to installing nuts.

b. Method "B": Provide concrete channel insert with a minimum load rating of 800 pounds per foot. Insert channel shall be steel of the same length as "vertical rack channel"; channel insert shall be cast flush in manhole wall. Provide 5/8-inch steel nuts in channel insert to receive 5/8-inch diameter by 3-inch long steel, square head anchor bolts.

c. Method "C": Provide concrete "spot insert" at each anchor bolt location, dast flush in manhole wall. Each insert shall have minimum 800-pound load rating. Provide 5/8-inch diameter by 3-inch long steel, square head anchor bolt at each anchor point. Coat threads of anchor bolts with whit lead immediately prior to installing bolts.

7.2.1.3 Earthwork: Excavation for manholes and handholes shall be depths indicated and of whatever substance encountered. Excavated materials not required or suitable for backfill shall be wasted on the project site as directed. Provide sheeting and shoring as necessary for protection of work and safety of personnel. Remove water from excavation by pumping or other approved method. Backfilling around structures shall consist of earth, loam, sand-clay, or sand and gravel, free from large clods of earth or stones over one inch in size. Approved backfill materials shall be placed symmetrically on all sides in loose layers not more than 9 inches deep. Each layer shall be moistened, if necessary, and compacted with mechanical or hand tampers.

7.2.1.4 Field Painting: After installation, cast-steel frames, covers and gratings not buried in masonry shallbe cleaned to the bare metal of mortar, rust, grease, dirt andother deleterious materials and given a coat of bituminous paint. Steel frames not buried in masonry and steel covers shall be cleaned of mortar, dirt and grease by an approved blasting process. Surfaces that cannot be cleaned satisfactorily by blasting shall be cleaned to bare metal by wire brushing or other mechanical means. Surfaces contaminated with rust, dirt, oil, grease, or other contaminants shall be washed with solvents until thoroughly clean. Immediately after cleaning, surfaces shall be coated with a coat of pretreatment coating conforming to MILP-15328. As soon as practicable after the pretreatment coating has dried, treated surfaces shall be primed with a coat of zinc chromate primer conforming to TT-P-645 and one coat of synthetic gloss enamel conforming to TT-E-489.

7.2.2 Identification Slabs (markers) shall be provided over the ends of ducts or conduits which are installed under paved areas and roadways. Indentification slabs shall be of concrete approximately 20 inches square by 6 inches thick and shall be set flat in the ground so that the top surfaces projects not less than 3/4-inch, nor more than 1¼ inches above ground. The concrete shall have a compressive strength of not less than 3000 psi as hereinbefore specified and have a smooth troweled finish on exposed surface. An identifying legend such as "cable", "duct", "splice", or other applicable designation shall be inscribed on the top surface before the concrete hardens. Circuit identification symbols shall also be inscribed on identification slabs as directed. The letters and/or figures shall be approximately two inches high and the grooves shall be approximately 1/4-inch in width and depth. The identification slabs shall be installed so that the nearest side is 12 inches, horizontally, from the splice, conduit, or duct; the inscription on the top shall include an arrow indicating the nearest side.

7.2.3 Reconditioning of Surface: The surface disturbed during the installation of duct or cable shall be restored to its original elevation and condition. Sod or topsoil shall be preserved carefully and replaced after the backfilling is completed. Sod that is damaged shall be replaced by sod of a quality equal to that removed. Where the surface is disturbed in a newly seeded area, the restored surface shall be reseeded with the same quantity and formula of seed as that used in the original seeding.

7.2.4 Special Conditions: During the construction of all duct lines, handholes located in streets, the strees must be kept open to traffic. The Contractor shall plan and execute his work to meet this condition.

7.3 Installation of Overhead Systems:

7.3.1 Circuit Protective Apparatus: Pole-type lightning arresters and fuses shall be provided on primary lines at all aerial-to-underground connections, dead ends, reclosers, sectionalizing switches and tranformers, and at other locations where indicated. The devices shall be coordinated with the system to which they are connected. Automatic circuit reclosers and automatic line sectionalizers shall be provided where indicated.

7.3.2 Cable Risers on Poles, other than grounding conductors, shall be installed in conduit. The conduit for cable risers shall be encased in concrete to a point six inches above finished grade. The conduit shall be of the rigid metal type as hereinbefore specified. Conduit shall be secured to the pole by means of suitable clamps or straps spaced not over four feet apart.

7.4 Splices in Wires and Cables:

7.4.1 Splices in Insulated Power and Lighting Wires and Cables Without Metallic Sheath: Conductors shall be joined securely both mechanically and electrically by one of the following methods: (1) twisting the conductors together and soldering, (2) twisting the conductors and forming a "Western Union" joint, (3) exothermic weld process, or (4) by the use of solderless connectors. Insulating tapes, hotmolded composition covers, or other approved equivalent, having an insulation value equivalent to the conductor insulation may be used for splices in cables rated 600 volts and below. Splices in rubber or cross-linked polyethylene-insulated, neoprene or cross-linked polyethylene-jacketed wires and cables shall be the cast type, watertight taped type, tape-overcast type, vulcanized type, or other approved type as indicated or specified. The work shall be in accordance with the recommendations of the manufacturer of the wires, cables, and/or splicing materials. All splices shall be suitable for the rated insulation level of the cable.

a. Expoxy cast-type splice: The insulation shall be provided by means of a molded casting process employing a thermosetting epoxy resin insulating material. The resin material shall be applied by a gravity poured method or by a pressure injected method. The component materials of the resin insulation shall be in a packaged form ready for convenient mixing without removing from the package. The gravity poured method shall not be used for splices in shielded cable.

b. EPR cast-type splice: The insulation shall be provided by means of a molded casting process employing an ethylene propylene rubber (EPR) splicing compound which results in an inseparable bond between the splicing material and the cable insulation. The molding process shall include injection of the molding material into the mold so as to insure void-free splice.

c. Watertight taped-type splice: The splice shall consist of an approved connector, self-fusing tape (splicing compound), self-bonding semiconducting tape, tinned copper shielding tape or braid, and plastic tape.

d. Tape-Overcast type splice: This splice shall be as specified hereinbefore for the watertight taped type, overcast with an epoxy resin construction as specified hereinbefore for the cast type, pressure method. This splice shall be suitable for the rated voltage of the cable, to a limit of 15 kv.

e. Vulcanized type splice: The vulcanizing process shall be a heat-pressure process of an approved type and employing materials and equipment suitable for the type and voltage of cables for which it is used. Materials used in the splicing process shall be fully and permanently compatible with materials in the cables. This splice shall be suitable for the rated voltage of the cable, to a limit of 5 kv.

7.4.2 Splices in Overhead Line Conductors shall be made with twist sleeve or compression type connectors. Splices in insulated conductors shall be covered with an insulation equivalent to that of the conductors and an approved weatherproof take overall.

7.4.3 Grounding of Shields in Splices of Power Cables: In handholes, the splicing of shuelded power cables shall include the grounding of the shielding tape. Wires connecting the shields to the ground rod shall be trained toward the sides in such manner as not to be in the way of maintenance personnel.

7.4.4 Termination of Insulated Power and Lighting Cables: All insulated power and lighting cables shall be properly terminated. Terminations shall be made by adequately trained personnel, using methods and materials suitable for the work as necessary and as specified hereinafter, and in accordance with the recommendations of the manufacturer of the cable and/or terminating materials or kit. Such recommendations, accompanied by suitable detail drawings, shall be submitted to the Contracting Officer for approval. Terminations of cable for service exceeding 600 volts shall be made by personnel having not less than three years experience as a licensed electrician, including adequate experience in the splicing or terminating of high-voltage insulated cable. The experience shall be certified and approved by the Contracting Officer. Terminations and/or terminating devices shall be capable of withstanding the tests specified for the cable installations, and for service exceeding 600 volts, shall be rated in accordance with, and be capable of withstanding test voltages in accordance with IEEE Standard No. 48, as applicable. Terminations of single and multiconductor cables shall include the securing and sealing of the sheath and insulation of the cable conductors, stress relief and grounding of cable shields of shielded cable, and grounding of neutral conductors, metallic sheaths, and armor. Cables and cable terminations shall be adequately supported so as to avoid any excessive strain on the termination and the conductor connection.

7.5 Protection of Wire and Cable Ends: The ends of wires and cables in handholes and in other wet locations as defined by the National Electrical Code that are not to be spliced or connected to equipment shall be protected from moisture and other damage by line end caps suitable for the rated insulation level of the cable.

7.6 Grounding shall be in accordance wth the National Electrical Code and the National Electrical Safety Code except that grounds and grounding systems shall have a resistance to solid earth ground not exceeding the following values:

a. For grounding pad mounted transformers without protective fences	5 ohms
b. For grounds in manholes, handholes and vaults	10 ohms
c. For grounding other metal enclosures of primary voltage electrical and electrically operated equipment	10 ohms
d. For lightning arrester grounds on pole line distribution systems	10 ohms

e. For grounding secondary distribution systems (neutral) 25 ohms
non-current carrying metal parts associated with distribution systems
f. For grounds not covered above 25 ohms

When work in addition to that indicated and specified is directed, in order to obtain the specified resistance to ground, the provisions of the contract respecting an adjustment for changed conditions shall apply.

7.6.1 Ground Rods: Approved copper-alloy clamp shall be braxed to the upper end of ground rods, and ground wires shall be securely attached thereto by means of a bolted connection. Ground rods shall be driven to a depth of not less than 11 feet and shall have diameters sufficient to permit driving to necessary depth without being damaged, but in no case shall the diameter be less than hereinbefore specified.

7.6.2 Welded or Brazed Connections: Joints in grounding conductors and mats shall be welded or brazed. The welding or brazing processes shall not in any way cause the parts joined to be damaged or weakend and shall join all strands. The welding process shall be an exothermic type, and the completed connection or joint shall be equal or larger in size than the conductors joined. The brazing process shall be in accordance with MUL-B-7883.

7.6.3 Ground Cable Crossing Expansion Joints or similar separations in structures and pavements shall be protected from damage by means of suitable approved devices or methods of installation which will provide the necessary slack in the cable across the joint to permit movement. Stranded or other approved flexible copper cable run or jumer shall be used across such separations.

7.6.4 Grounding and Bonding Equipment, except as indicated or specified otherwise, shall conform to UL 467.

7.6.5 Installation of Transformers and Switchgear shall be as indicated and specified in Sections 16475 and 16462.

8. FIELD TESTS: The Contractor shall provide all labor, equipment and incidentals required for testing, except that the Government will provide electric power required for the tests. All defective material and workmanship disclosed as the result of the tests given herein shall be corrected by the Contractor at no cost to the Government. The Contractor shall show by demonstration in service that all circuits and devices are in good operating condition. Tests shall be such that each item of control equipment will function not less than five times.

8.1 Insulation Resistance Test for Systems 600 Volts and Less: After all wiring is completed and connected ready for operation, but prior to placing systems in service and before any branch circuit breakers are closed, insulation resistance tests shall be made in all feeder and subfeeder circuits. The insulation resistance between conductors and between each conductor and ground shall be measured. Measurements shall be made with an instrument capable of making measurements at an applied potential of 5000 volts. Readings shall be taken after the voltage has been applied for a minimum of one minute. The minimum insulation resistance for circuits of No. 12 AWG conductors shall be 1,000,000 ohms. For circuits of No. 10 AWG or larger conductors, a resistance based on the allowable ampacity of the conductor as fixed by NFPA 70 shall be as follows:

25 through 50 amperes	250,000 ohms
51 through 100 amperes	100,000 ohms
101 through 200 amperes	50,000 ohms
201 through 400 amperes	25,000 ohms
401 through 800 amperes	12,000 ohms
Over 800 amperes	5,000 ohms

8.2 Arc-proofing Test: The capability of fireproofing (arc-proofing) of withstanding a 200-ampere arc for 30 seconds shall be determined by tests made on a sample assembly consisting of a 3-inch diameter lead tube fireproofed (arc-proofed) as specified hereinbefore. The lead tube shall have a wall thickness of 1/8-inch. The sample assembly shall be tested at three different points. At each point the testing shall consist of an arc current magnetically blown against the test assembly until melting occurs at the point of arc contact. The arc shall be struck between two 7/8-inch electrodes located one inch from the sample assembly. (Note: The electrodes must be squared off after each test run. Failure to do this will result in a weak arc which will extinguish easily.) The arc current shall be between 195 and 210 amperes at 40 volts DC. For each of the three tests, the fireproofing (arc-proofing) shall prevent the arc current from melting the lead tub for at least 25 seconds at any one point and for an average of 30 seconds for the three points. In lieu of the tests specified herein, manufacturer's certification that his product will successfully meet the requirements of the specifiecation may be submitted to the Contracting Officer for approval.

8.3 Ground Resistance Tests: Grounding system shall be tested to assure continuity and compliance with the requirement that ground resistance not exceed the values hereinbefore specified. Ground resistance measurements of each ground rod shall be taken and certified by the Contractor. Upon completion of the work, the Contractor shall submit in writing to the Contracting Officer, the measured ground resistance of each ground rod and grounding system, indicating the location of the rod and grounding system, as well as the resistance and soil conditions at the time the measurements were made. Ground resistance measurements shall be made in normally dry weather, not less than 48 hours after rainfall, and with the ground electrode udner test isolated from other grounds. Ground resistance shall also be measured for each piece of equipment to the ground electrode.

SECTION 16301. UNDERGROUND ELECTRICAL WORK

1. APPLICABLE PUBLICATIONS: The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by references thereto.

FEDERAL SPECIFICATION:

J-C-30A(1)	Cable and Wire, Electrical.
RR-G-661C	Grating, Metal, Bar Type (Floor, Except for Naval Vessels).

UNDERWRITERS' LABORATORIES, INC. (UL):

83-1975(R76)	Thermoplastic Insulated Wires.
510-1976	Insulating Tape.

INSTITURE OF ELECTRICAL AND ELECTRONIC ENGINEERS (IEEE):

48-1975	Standard Test Procedures and Requirements for High Voltage Alternating Current Cable Terminators.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI):

C2-1977	National Electrical Safety Code (NESC).

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA):

70-1978	National Electrical Code (NEC).

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM):

D1556-77A	Density of Soil in Place by the Sand Cone Method

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA):

TC6-1974	ABS and PVC Utilities Duct for Underground Installation.
TC8-1974	Extra Strength Plastic Utilities Duct for Underground Installation.
TC3-1967	PVC Fittings for Use with Rigid Conduit

2. GENERAL REQUIREMENTS: Section 16011, General Requirements, Electrical apply to this section.

3. SUBMITTALS: The following information shall be submitted for approval:

3.1 Catalog Information: Conduit; Junction and Cover; Insulating Tape; Terminator; Cable Lubricants.

3.2 Manufacturer's Instructions: Manufacturer's directions for use of ground megger with proposed method indicated; and terminator manufacturer's installation instructions.

3.3 Certificates:

3.3.1 Material and Equipment: Provide manufacturer's statement certifying that the product supplied meets or exceeds contract requirements.

3.3.2 Workmen's Competency: Submit cable splicer's certificate of competency.

4. MATERIALS AND EQUIPMENT: Provide materials and equipment listed by UL or approved by Factory Mutual (FM) System, when such equipment category is listed or approved.

4.1 Conduit conforming to UL6 shall be rigid galvanized steel or polyvinyl chloride (PVC) conforming to NEMA TC-6.

4.2 Tape: Plastic insulating tape shall conform to the requirements of UL 510.

4.3 Power Wire and Cables shall conform to J-C-30 unless otherwise specified.

4.3.1 Wire and cable conductor sizes are designated by American Wire Gauge (AWG). Conductors shall be copper for conductors No. 6 AWG and smaller. Conductors larger than No. 6 AWG may be copper, aluminum, or copper-encased aluminum. Insulated conductors shall bear the date of manufacturer imprinted on the wire insulation with other identification. Wire and cable manufactured more than six months before delivery to the job site shall not be used.

4.3.2 Provide wire conforming to UL 83. Wires with "W" in the type designation and cable with XLP insulation shall be used in wet or damp locations.

4.3.3 High Voltage Cable Terminations: Except as otherwise indicated, terminators for solid insulation nonmetallic jacketed cables shall be provided up to a maximum of 15.kV. Terminators shall be applied to single conductor cables or to each conductor of multiple conductor cables, which are exposed to the weather. The terminator and all components shall be the product of one manufacturer and finished in a package or kit form compatible with the insulation and conductor material. The kit shall include complete assembly and installation instructions. Contractor shall supply one complete copy of all manufacturer's instructions and information. The terminator shall comply with all requirements of IEEE 48 except that the requirements of design tightness test need not be met. However, the terminator shall not exude any filler compound under either test or service. The terminator shall have a wet process procelain insulator for outside weather service.

4.4 Metal Frames, Covers, and Gratings: Provide steel frames, covers and gratings conforming to RR-G-661.

5. INSTALLATION: Underground cable installation shall conform to ANSI C2 and NFPA 70 except as otherwise specified or indicated.

5.1 Contractor Damage: The Contractor shall promptly repair any indicated utility lines or systems damaged by his operations. Damages to lnes or systems not indicated, which are caused by his operations, shall be treated as "CHANGES" under the terms of the General Provisions. If the Contractor is advised in writing of the location of a non-indicated line or system, such notice shall provide that portion of the line or system with "indicated" status in determining liability for damages. In any event, the Contractor shall immediately notify the Contracting Officer of any such damage.

5.2 Underground Duct with Concrete Encasement: Underground duct lines shall be constructed of individual conduits encased in concrete. Except where rigid galvanized steel conduit is indicated or specified, the conduit shall be of PVC type EB. The kind of conduit used shall not be mixed in any one duct bank. Ducts shall not be smaller than 4 inches in diameter unless otherwise indicated. The concrete encasement surrounding the bank shall be rectangular in cross-section and shall provide at least 3 inches of concrete cover for ducts. Conduit shall be separated by a minimum concrete thickness of 2 inches, except that light and power conduits shall be separated from control, signal, and telephone conduits by a minimum concrete thickness of 3 inches.

5.2.1 The top of the concrete envelope shall not be less than 18 inches below grade except that under roads and pavement it shall be not less than 24 inches below grade.

5.2.2. Except at conduit risers, changes in direction of runs exceeding a total of 10 degrees, either vertical or horizontal, shall be accomplished by long sweep bends having a minimum radius of curvature of 25 feet, sweep bends may be made up of one or more curved or straight sections or combinations thereof. Manufactured bends shall have a minimum radius of 18 inches for use with conduits of less than 3 inches in diameter and a minimum radius of 36 inches for ducts of 3 inches in diameter and larger.

5.2.3 The joints of the conduits shall be staggered by rows and layers so as to provide a duct line having the maximum strength. During construction, partially completed duct lines shall be protected from the entrance of debris such as mud, sand and dirt by means of suitable conduit plugs. As each section of duct line is completed a testing mandrel not less than 12 inches long with a diameter of 1/4-inch less than the size of the conduit shall be drawn through each conduit, after which a brush having the diameter of the duct, and having stiff bristles shall be drawn through until the conduit is clear of all prarticles of earth, sand, and/or gravel; conduit plugs shall then be immediately installed. Provide a plastic pull rope having 3 feet of spare at each end in spare ducts.

5.3 Reconditioning of Surfaces:

5.3.1 Unpaved surfaces disturbed during the installation of duct or direct burial cable shall be restored to their original elevation and condition. Sod or topsoil shall be preserved carefully and replaced after the backfilling is completed. Sod that is damaged shall be replaced by sod of quality equal to that removed. Where the surface is disturbed in a newly seeded area, the restored surface shall be reseeded with the same quantity and fourmula of seed as that used in the original seeding.

5.3.2 The Contractor shall patch pavement, sidewalks, curbs and gutters where existing sufraces are removed for construction. Cut pavement edges shall be sawn. Graded aggregate base course shall have a maximum aggregate size of 1½ inches. Sidewalk thickness and curb and gutter cross-sections shall match the existing.

5.3.3 Paving repairs shall be made as specified in Division 2 of this specification.

5.4 Cable Pulling: Existing duct lines shall be tested with a mandrel and thoroughly swabbed out to remove foreign material before the pulling of cables. Cables shall be pulled down grade with the feed-in point at the manhole or buildings of the highest elevation. Flexible cable feeds shall be used to convey cables through the manhole operning and into the duct runs. Cable lubricants shall be soapstone, graphite or talc for rubber or plastic jacketed cables.

5.4.1 Lubricants for assisting in the pulling of PVC, neoprene and polyethylene jacketed cables shall be those specifically recommended by the cable manufacturer.

5.4.2 Cable pulling tension shall not exceed the maximum pulling tension recommended by the cable manufacturer.

5.4.3 Secondary cable runns, 600 volts and less, in plastic or fiber duct conduit shall, although not indicated, include an insulated copper equipment grounding conductor sized as required by the rating of the overcurrent device supplying the phase conductors.

5.5 Fireproofing (Arc Proofing) of Cables in splice box which will carry current at 2200 volts or more shall be fireproof. Strips of fire-proofing tape approximately 1/16-inch thick by 3 inches wide shall be wrapped tightly around each cable spirally in half-lapped wrapping, or in two butt joined wrappings with the second wrapping covering the joints in the firts. The tape shall be applied with the coated side toward the cable and shall extend one inch into the ducts. To prevent unraveling, the fireproofing tape shall be random wrapped the entire length of the fireproofing with pressure sensitive glass cloth tape. The fireproofing tape shall consist of a flexible, conformable fabric having one side coated with flame retardant, flexible, polymeric coating and/or a chlorinated elastomer not less than 0.050-inch thick and shall weigh not less than 2.5 pounds per square yard. The tape shall be noncorrosive to cable sheath, shall be self-extinguishing, and shall not support combustion The tape shall not deteriorate when subjected to oil, water, gases, saltwater, sewage and fungus.

5.5.1 Metal frames, covers and grating shall be made of steel. Frames and covers of steel shall be welded by qualified welders in accordance with standard commercial practice. Steel covers shall be rolled steel floor plate having an approved antislip surface. Steel grating shall be of welded construction and conform to requirements of RR-G-661, Type 1.

5.6 Connections to Existing Ducts: Where connections to existing duct lines are indicated, excavate the lines to the maximum depth necessary. The lines shall be cut off and loose concrete removed from the conduits before new concrete encased ducts are installed. A reinforced concrete colalr, poured monolithically with the new duct line shall be provided to take the shear at the joint of the duct lines.

5.7 Cable Termination: Terminations of insulated power and lighting cables shall be protected from accidental contact, deterioration of covering and moisture by the use of teminating devices and materials. Terminations shall be made using materials and methods as indicated or specified herein or as designated by the written instructions of the cable manufacturer and terminal kit manufacturer. Termination for high voltage cables shall be rated, and be capable of withstanding test voltages, in accordance with IEEE 48.

5.8 Splices for 600-volt Class Cables: Splices in underground systems shall be made only in accessible locations such as monholes and handholes, using a compression connector on the conductor and by insulating and waterproofing by one of the following methods suitable for continuous submersion in water.

5.8.1 Cast-type splice insulation shall be provided by means of a molded casting process employing a thermosetting epoxy resin insulating material shwihc shall be applied by a gravity poured method or by a pressure injected method. The component materials of the resin insulation shall be in a packaged form ready for convenient mixing without removing from the package. Do not allow the cables to be moved until after the splicing material has completely set.

5.8.2 Gravity poured method shall employ materials and equipment contained in an approved commercial splicing kit which includes a mold suitable for the cables to be spliced. When the mold is in place around the joined conductors, the resin mix shall be prepared and poured into the mold. Do not allow cables to be moved until after the splicing materials have completely set.

5.9 Splices in high voltage cables shall be made only in accessible locations in handholes and shall be suitable for continuous submersion i→ in water.

5.9.1 High voltage cable splicer/terminator certification of competency and experience shall be submitted 30 days before splices or terminations are made in high voltage cables. Splicer terminator experience during the immediate past three years shall include performance in splicing and terminating cables of the type and classification being provided under this contract.

5.9.2 High voltage splices shall be made using a "kit" which shall be the product of one manufacturer and shall have the approval in writing of the manufacturer of the cable which is to be spliced. The Contractor shall provide the inspector with a copy of the manufacturer's instructions before splicing is started. Splices shall be made only in manholes and handholes.

5.10 Grounding: Noncurrent carrying metallic parts associated with electrical equipment shall have a maximum resistance to solid "earth" ground not exceeding the following values:

TYPE	RESISTANCE
Unit substation	3 ohms
Grounding other metal enclosures of primary voltage electrical and electrically operated equipment	10 ohms
Grounded secondary distribution system neutral and noncurrent carrying metal parts associated with distribution systems and grounds not otherwise covered	25 ohms

When work in addition to that indicated or specified is directed in order to obtain the specified ground resistance, the provisions of the contract covering "Changes" shall apply.

5.10.1 Grounding electrodes shall be cone pointed driven ground rods driven full depth plus 6 inches, installed whern indicated to provide an earth ground of the value before stated for the particular equipment being grounded.

5.10.2 Grounding connections which are buried or otherwise normally inaccessible, and excepting specifically those connections for which access for periodic testing is required, shall be made by exothermic weld or by using a compatible mechanical connection and brazing over. Exothermic welds shall be made strictly in accordance with the weld manufacturer's written recommendations. Welds which have "puffed up" or which show convex surfaces, indicating improper cleaning, are not acceptable. No mechanical connector is required at exothermic weldments.

5.10.3 Grounding conductors shall be bare soft-drawn copper wire No. 4 AWG minimum unless otherwise indicated.

6. FIELD TESTS: As an exception to requirements that may be stated elsewhere in the contract, the Contracting Officer shall be given five working days notice prior to each test.

6.1 Distribution Conductors 600 Volt Class: Test all 600-volt class conductors to verify that no short circuits or accidental ground exist. Tests shall be made using an instrument which applies a voltage of approximately 500 volts to provide a direct reading of resistance.

6.2 High Voltage Cables: Test the high voltage cables after installation in accordance with the requirements of the appropriate (IPCEA-NEMA "Voltage Tests after Installation") paragraph in the particular specification for the cable involved. The Contractor shall furnish the Contracting Officer with three copies of the results of the tests.

6.2.1 Ground Rods: Test ground rods for ground resistance value before any wire is connected. A protable ground testing megger shall be used to test each ground or group of grounds. The instrument shall be equipped with a meter reading directly in ohms or fractions thereof to indicate the gorund value of the ground electrode under test. Provide one copy of the megger manufacturer's directions for use of the ground megger indicating the method to be used.

6.3 Compaction: Backfill shall be tested in accordance with ASTM D1556.

6.4 Test Report:

600-volt cables (identify each cable and test result)
High voltage cables (identify each cable and test result)
Grounding electrodes and systems (identify electrodes and system, each test).

SECTION 16402. INTERIOR WIRING SYSTEM

1. APPLICABLE PUBLICATIONS: The following publications of the isues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by references thereto. Where a number in parenthesis is suffixed to the specification number, it denotes the effective amendment to the specification.

FEDERAL SPECIFICATIONS

J-C-30A(1)	Cable and Wire, Electrical.
W-C-586B(1)	Conduit Outlet Boxes, Bodies, and Entrance Caps, Electrical; Cast Metal.
W-C-375B	Circuit Breaker, Molded Case, Branch Circuit and Service.

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA):

MG1-1972	Motors and Generators.
ICS-1977	Industrial Controls and Systems.
BU1-1978	Busways.

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA):

70-78	National Electrical Code (NEC)

UNDERWRITERS LABORATORIES, INC. (UL):

1-73	Conduit, Electrical, Flexible Metal.
6-76	Rigid Metallic Conduit.
50-76	Cabinets and Boxes, Electrical
67-74	Panelboards, Electric.

2. SUBMITTALS: Materials and equipment schedules shall be submitted to the Contracting Officer for approval as soon as practical after notice to proceed. No work shall proceed until approvals have been received from the Contracting Officer. Submit catalog number, cuts, diagrams, and descriptive data as required on the following items:

Conductors	Conduit
Busduct	Panelboard
Circuit Breakers	

All the data for the above materials and equipment shall be submitted at one time. No consideration will be given to partial submittals. Approval of materials and equipment shall be based on manufacturer's published ratings.

3. CONDUIT:

3.1 Rigid steel conduit shall be low carbon, hot dipped galvanized inside and outside for screwed joints. Fittings shall be cast alloy, galvanized, meeting requirements of UL 6-76.

3.2 Flexible conduit shall be galvanized, single strip, with a copper strip interwoven. In areas subject to abnormal moisture, flexible conduit shall have plastic covering. Fittings shall be standard with ground connector. Flexible conduit to meet UL 1-73 requirements.

3.3 Conduit Installation: Conduit shall be installed exposed on side walls and ceilings. Maintain a minimum distance of 6 inches from parallel runs of flues, steam or hot water pipes. For floor mounted equipment, conduit may be run overhead and dropped down, where underfloor installation is not practicable. Conduits entering or leaving outlet, junction or pull boxes, and cabinets shall have insulated bushings. Flexible conduit shall be used for connections to motors and other equipment subject to vibration and for connections to recessed or semi-recessed fixtures. Groups of conduit shall be uniformly spaced, where straight at and at turns. Bends and offsets, where unavoidable, shall be made with a bending machine. Conduit shall be cut with a hacksaw or an approved conduit cutting machine and reamed after threading to remove all burrs. Securely fasten conduit to outlets, junction and pull boxes to effect firm electrical contact. Join conduit with approved couplings. Expansion fittings shall be installed in conduit where it passes through structural expansion joints.

3.4 Conduit Support: Exposed runs of conduit shall be supported every 8 feet and shall be parallel or perpendicular to walls, structural members or intersections of vertical planes and ceilings with right angle turns consisting of fittings or symmetrical bends. Conduits shall be supported within 1 foot of all changes in direction. Supports shall be approved wall brackets, trapeze, strap hangers, or pipe straps secured to hollow masonry with toggle bolts; to brick and concrete with expansion bolts; to metal surfaces with machine screws; and to wood with wood screws. Explosive drive equipment may be used to make connections where the use of this equipment complies with safety regulations. Wood plugs inserted in masonry, and the use of nails as fastening media, are prohibited.

4. WIRE, CABLE AND WIRING:

4.1 Conductors for main feeder circuits out of the main switchboard shall be heat and moisture resistant, flame retarding, thermoplastic insulated type THWN, rated for 600 volts. Circuit wire and cable inside the building shall be moisture resistant, flame retarding, thermoplastic insulated THWN, rated to 600 volts. Thermoplastic insulated type THW rated 600 volts may be used in lieu of THWN at the Contractor's option.

4.2 Conductor sizes shown on the drawings are based on copper and shall be constructed as shown.

4.3 Color Coding: All wire shall be color coded and marked. A different color shall be used for each phase, and the same color shall be used for the same phase throughout for all threephase and feeder circuits. All neutral shall either be white or gray, and service equipment ground conductors shall be green.

4.4 Wire sizes shall be as indicated on the drawings and in general:

a. No wire shall be smaller than No. 12. All wire to conform to J-C-30A.

b. No wire 8 AWG and larger shall be stranded.

c. The minimum size branch circuit shall be 15 amperes.

4.5 Wiring Installation: All wiring shall be in conduit. Connections with wirenut type connectors or approved pressure connectors will be permitted for wires No. 10 and smaller. Mechanical connectors of every kind shall be taped. Flashover or insulation value of joints shall be at least 100 percent in excess of wire insulation. .Multiple conductor control cables may be used for control circuits, at the Contractor's option, in lieu of many single conductors.

4.6 Wiring: Suitable equipment shall be used to pull conductors through conduit, exercising due care to avoid damage to insulation. Wires shall not be pulled through conduits before the conduit system is complete and has been carefully freed from obstruction of any kind. Soapstone or an approved compound may be employed to facilitate pulling wires. Where two or more circuits are housed in one conduit, a common neutral may be used if sized in compliance with NEC.

5. EQUIPMENT CONNECTIONS: All wiring for the connection of motors and control equipment as indicated on the electrical drawings shall be furnished and installed under this section of the specification.

6. OUTLET BOXES:

6.1 General: Outlet boxes shall be sheet steel, zinc-coated or cadmium plated, except for exposed work. Boxes for exposed work shall be cast steel, steel alloy or copper-free aluminum as indicated. Appropriate covers shall be provided. Boxes to conform to W-C-586B.

6.2 Sizing: Boxes shall be sized as follows:

a. Switch and receptacle outlet boxes: not less than four inches square and 1½ inches deep.

b. Fixture outlets in ceilings: 4 inches octagonal, minimum. Where required to accommodate larger conduit or larger number of wires: 4-11/16 inches by 2-1/8 inches deep.

c. Where larger size boxes are required or called for, they shall be similar in all other respects to the types above specified.

6.2 Lighting fixture outlet boxes, where fixtures are to be mounted on the box, shall have suitable studs and supports for carrying the weight of the fixture. Box depth shall be increased, as required, for additional wires and conduit. Exposed boxes in metal building shall be cast aluminum as shown on plans.

6.4 Grounding: All outlet boxes shall be equipped with grounding screws for bonding to green grounding conductor in box.

7. BUSDUCT: All busduct will be bolt-on type as shown and meet all requirements of NEMA BU1-1978.

8. CONDULET BODIES:

8.1 General: Condulet bodies shall be used on exposed conduit work for lighting and power outlets, convenience outlets, or signal outlets, changes in direction of conduit runs, and breaking around beams.

8.2 Covers and gaskets shall be furnished with the condulets, which shall be a design suitable for the purpose intended. In damp areas and outside, condulets shall be made watertight.

8.3 Type: Condulets shall be cast ferrous alloy and galvanized.

8.4 Grounding: All outlet fittings shall be equipped with grounding screws for bonding to green grounding conductor in the outlet.

9. EXPANSION JOINT FITTINGS: Where conduits pass through building expansion joints, approved waterproof telescopic type expansion fittings shall be used. Fittings shall be watertight and permit a movement up to four inches and shall be equipped with approved bonding jumpers around or through each fitting.

10. GROUNDING: The Contractor shall install grounding rods as shown. All exposed non-current carrying metallic parts of electrical equipment, raceway systems, and neutral conductor of the wiring system shall be grounded as shown. Grounding rod size shall be as indicated.

11. COVER AND DEVICE PLATES:

11.1 General: An appropriate device plate shall be provided for each pull box, switch, receptacle or other outlet. Plates on unfinished walls or on fittings shall be cast metal. Device plates shall be of the one-piece type and of suitable shape for devices to be covered. The use of section device plates will not be permitted.

11.2 Outlets and boxes in finished areas shall be complete with flush type covers, stainless steel, satin finish, Trade Series 97000. All screws for fastening shall be stainless steel recessed machine screws.

12. PANELBOARDS: UL 67 and UL 50, as applicable. Lighting and power branch circuit panelboard shall be factory assembled automatic circuit breaker type. The panelboard assembly shall be so designed that any individual breaker can be removed without disturbing adjacent units or without loosening or removing supplemental insulation supplied as a means of obtaining clearances and other requirements of UL. Where "space" is indicated, provisions shall be made for the future installation of a breaker sized as indicated.

12.1 Buses for Panelboard: Provide an insulated neutral bus for each panel for connection of both feeder and branch circuit neutral wires. A separate ground bus, marked with a green strip along its front and bonded to the steel cabinet, shall be provided for connecting all ground conductors. Bus bars shall be copper, shall be securely fastened to bases, and shall be so designed that branch breakers may be changed without additional machining, drilling, or tapping.

13. DISCONNECT SWITCHES shall be heavy duty fusible or non-fusible, quick make-quick break, 2, 3, or 4-pole, 250 or 600-volt as required, NEMA type 1 enclosure unless otherwise indicated. The switch shall have a cover interlock.

14. FUSES: The Contractor shall provide a complete set of fuses for all switches as required. Time-current-tripping characteristics of fuse serving motors or connected in series with circuit breakers shall be coordinated for the proper operation. Fuses shall have a voltage rating not less than the circuit voltage.

15. CIRCUIT BREAKER:

15.1 W-C-375, Type II, ambient compensated thermal magnetic type, and shall have a minimum interrupting capability of 10,000 amperes symmetrical. Breakers shall be designed to accept copper conductors only. Plug-in type circuit breakers are not acceptable.

15.2 Multipole Breakers: Common-trip type having a single operating handle and designed so that any overload in one pole automatically causes all poles to open. Any three adjacent breaker poles shall be connected to phases A, B, and C respectively and that same relationship of phase sequence shall be maintained.

16. SUPPORTING MATERIAL: The Contractor shall provide structural supporting units where required to support conduits, boxes, buscuct, lighting fixtures and other electrical equipment. The system shall be complete with hangers, connectors, bolts, clamps, and necessary accessories to make a complete installation.

17. FIELD TESTS: The Contractor shall perform all field tests and shall provide all labor, equipment and incidentals required for testing, except that the Government will provide electric power required for the tests. All defective material and workmanship disclosed shall be corrected by the Contractor at no cost to the Government. The Contractor shall show by demonstration in service that all circuits and devices are in good operating condition. Tests shall be such that each item of control equipment will function not less than five times.

17.1 Insulation Resistance Test for Systems 600 Volts and Less: After all wiring is completed and connected ready for operation, but prior to placing systems in service and before any branch circuit breakers are closed, insulation resistance tests shall be made in all feeder and sub-feeder circuits. The insulation resistance between conductors and between conductor and ground shall be measured. Measurements shall be made with an instrument capable of making measurements at an applied potential of 500 volts. Readings shall be taken after the voltage has been applied for a minimum of one minute. The minimum insulation resistance for circuits of No. 12 AWG conductors shall be 1,000,000 ohms. For circuits of No. 10 AWG or larger conductors, a resistance based on the allowable ampacity of the conductor shall be as follows:

25 through 50 amperes	250,000 ohms
51 through 100 amperes	100,000 ohms
101 through 200 amperes	50,000 ohms
201 through 400 amperes	25,000 ohms
401 through 800 amperes	12,000 ohms
Over 800 amperes	5,000 ohms

18.2 Grounding System shall be tested to assure continuity and compliance with the requirement that ground resistances not exceed 25 ohms. Ground resistance measurements of each ground rod shall be taken and certified by the Contractor. Upon completion of the work, the Contractor shall submit to the Contracting Officer, the measured ground resistance of each ground rod and grounding system, indicating the location of the rod and grounding system, as well as the resistance and soil conditions at the time the measurements were made. Ground resistance measurements shall be made in normally dry weather, not less than 48 hours after rainfall, and with the ground electrode under test isolated from other grounds. Ground resistance shall also be measured from each piece of equipment to the ground electrode.

17.3 Equipment Ground: All newly installed electrical equipment shall be grounded as required by instructions from the equipment manufacturer.

SECTION 16462. PAD MOUNTED TRANSFORMER

1. APPLICABLE PUBLICATIONS: The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only. Where a number in parenthesis is suffixed to the specification number, it denotes the effective amendment to the specification.

MILITARY SPECIFICATION:

MIL-C-18480A(3)	Coating Compound, Bituminous Solvent, Coal Tar Base.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM):

D117-76	Electric Insulating Oils.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI):

C2-1977	National Electric Safety Code.
C37.44-1969 (R1974	Distribution Oil Cutouts and Fuse Links.
C57.12.22-1969	Pad Mounted Compartmental Type, Self-Cooled, Three-Phase Distribution Transformers, (High Voltage, 16,340 Volts and Below; 2500 KVA and Smaller).
Z35.1-1972	Specifications for Accident Preventions Signs.

INSTITUTE OF ELECTRICAL AND ELECTRONIC ENGINEERS, INC. (IEEE):

48-1975	Standard Test Procedure and Requirements for High Voltage Alternating Current Cable Terminations.

NATONAL ELECTRICAL MANUFACTURER'S ASSOCIATION (NEMA):

LA 1-1976	Surge Arresters.
TR 1-1974 (R1977)	Transformers, Regulators and Reactors

2. GENERAL REQUIREMENTS: The work shall conform to Section 16011.

3. SUBMITTALS: The following information shall be submitted:

3.1 Catalog Information and Shop Drawings: Pad mounted transformer, primary disconnects.

3.2 Certificates: Certificate of transformer manufacturer.

3.3 Manufacturer's Instructions: H.V. cable terminator pothead kit (4 copies).

4. MATERIALS AND EQUIPMENT:

4.1 Distribution Padmount Transformer: The unit shall contain the transformer, primary disconnect, current limiting fusing and separate compartments in a weatherproof, tamperproof enclosure, arranged for padlocking. Transformer shall conform to ANSI C57.12.22 unless otherwise specified. High voltage and low voltage compartments shall

be isolated from each other in a manner to require a separate unlatching or unbolting action to give access to the high voltage compartment. Undercoat the underside of the transformer enclosure, including steel base, with a 30 mil thickness of coal tar coating conforming to MIL-C-18480.

4.1.1 Transformer shall be three-phase, two-winding, 60 Hertz, 65 degree rise, oil insulated, self-cooled type rated 750 kVA capacity, high voltage 12.47 kV delta primary, with two 2½ percent full capacity taps above and below rated primary voltage. Basic insulation level shall be 95 kV. Low voltage shall be 208/120 volts wye. Impedance shall be not less than 5.75 percent. Transformer tank shall be sealed except for bolted handhole access. Provide external tap changing for de-energized operation only. Locate the changer control handle within the high voltage compartment and provide position indicator and method of securing the control handle against unintentional operation.

4.1.2 Mineral oil shall conform to ASTM D3146 tested in accordance with ASTM D117.

4.1.3 Transformer shall be equipped with an externally operable manual tap changer for de-energized operation, and the following accessories:

a. Maintenance Devices:

1. Drain and sampling valves
2. Filter press connections
3. Ground pad
4. Provision for lifting and jacking
5. Top liquid dial type thermometer without alarm contacts
6. Pressure-vacuum gauge
7. Pressure-relief device

b. Tank Construction: Liquid immersed transformers shall have a sealed tank with a welded-on cover.

4.1.4 Surge arrester shall be distribution valve type, rated 15 kV for transformer protection at the primary voltage, mounted inside the high voltage terminal enclosure. Arresters shall conform to NEMA LA-1. External air gap is not permitted.

4.1.5 High voltage oil fused cutouts shall be gang operated load break type and shall have a voltage rating of 15 kV, and a continuous current rating of 200 amperes and symmetrical interrupting rating of 10,000 amperes. Fuse values shall be as indicated. Oil fused cutouts shall comply with ANSI C37.44.

4.1.6 Provide loop feed primary switching and fusing located with the tranformers. Switching must be gang operated for hook stick operation. Minimum switch rating shall be 15 kV, continuous current 200 amperes, and symmetrical interrupting rating 10,000 amperes. Provide current limiting fusing with symmetrical interrupting rating of 50,000 amperes, locate in dry well, air insulated, non-load break fuse holders inserted in the transformer tank. Provide an integral warning notice and safety baffle mechanically interlocked with the high voltage switch to prevent fuse removal unless the transformer is de-energized. Fuse values shall be 150 percent of full load current.

4.1.7 "Weak-link" primary fusing is not acceptable in lieu of current limiting primary fusing.

4.1.8 The low voltage compartment shall provide adequate space and support for secondary terminations, secondary phase and neutral bushings, oil gauge, thermometer, and a drain valve.

4.1.9 Provide adequate space and support within the high voltage and low voltage compartments for forming and terminating cables including specified or indicated high voltage terminaton devices. Provide adequate space to give ready access to low voltage compartments for installation and maintenance tasks.

4.1.10 The enclosure shall be constructed of steel and shall be given the manufacturer's standard finish.

4.1.11 The nameplate shall comply with ANSI C57.12.22 except that the number of gallons of coolant shall be shown.

4.1.12 Manufacturer's test reports, indicating compliance with requirements specified herein will be accepted in lieu of witnessed tests for transformers which have been a standard product of the manufacturer for at least five years when these test reports are certified by competent personnel of the manufacturer's testing division. Transformers which have not been a standard product for five years shall be subjected to the tests witnessed by Government personnel. Tests shall include ratio, load loss, no-load loss, exciting current, resistance, impedance and sound level and shall conform to requirements of NEMA TR1.

4.2 Transformer Pad: Provide concrete slab foundation six inches thick, reinforced by six-inch by six-inch number 10 gage mesh placed uniformly located four inches from the top of the slab. Slab shall be placed on a well compacted gravel subbase so that the top is four inches above grade. All edges shall have a one-half inch chamfer. Pad diemensions shall allow free space on all sides of the equipment as indicated. Cable entrance space and location shall be as required by the equipment to be mounted. Exposed surfaces shall be given a steel trowel finish.

4.3 High Voltage Cable Terminations: Terminations shall be provided for single and multi-conductor cables as indicated conforming to the requirements of IEEE 48 for Class 1 terminations. The manufacturer shall provide all components and insulating compound, and at least two copies of complete directions for assembling, filling, and putting the unit into service, one of which shall be submitted for record. Installation shall include installing cable stress relief cones. Aluminum and copper or copper bearing parts shall not be used in contract with each other in construction or installation of potheads. Potheads shall be designed for use with the specific cable and type of installation required. Contractor shall provide pothead mounting brackets to prevent any strain on terminals.

4.3.1 Terminator and all components shall be the product of one manufacturer and shall be furnished in a package or kit form. The kit shall include complete assembly and installation instructions. Contractor shall supply one complete copy of all manufacturer's instructions and information. The terminator shall comply with all requirements of IEEE 48 Class 1 terminations, except that the requirements of the design tightness test need not be met. However, the terminator shall not exude any filler compound under either test or service. The terminator shall have a wet process porcelain insulator. Termination shall include stress relief cones and shield grounding.

4.4 Ground Rods shall be copper clad steel with diameter adequate to permit driving full length to a depth of at least six inches below finished grade. Rods shall be not less than 3/4-inch in diameter and not less than 10 feet in length.

4.5 Signs: "Danger High Voltage" signs shall conform to ANSI Z35.1.

5. INSTALLATION: Pad mounted transformer installation shall conform to the manufacturer's shop drawings and mounting instructions and shall include securing it to the concrete slab by at least four anchor bolts. Completed installation shall conform to the requirements of ANSI C2.

5.1 Grounding connections which are buried or otherwise normally inaccessible, and excepting specifically those connections for which access for periodic testing is required, shall be made by thermit weld or by using a compatible mechanical connector and brazing completely over. Thermit welds shall be made strictly in accord with the weld manufacturer's written recommendations. Welds which have "puffed up" or which show convex surfaces, indicating improper cleaning, are not acceptable. No mechanical connector is required at thermit weldments.

5.2 Signs: Install "Danger High Voltage" signs with tamperproof screws on each accessible side of pad mounted transformers.

6. FIELD TESTS: After the installation has been completed, and the Contracting Officer has been given five days notice of the proposed test, the Contractor shall conduct an operating test demonstrating that all equipment and devices operate in accordance with the requirements of the drawings and specifications.

6.1 Ground Rods: Test ground rods for ground resistance value before any wire is connected. A portable ground testing megger shall be used to test each ground or group of grounds. The instrument shall be equipped with a meter reading directly in ohms or fractions thereof to indicate the ground value of the electrode under test. Provide one copy of the megger manufacturer's directions for use of the ground megger indicating the method to be used.

6.2 Test Reports:

a. Grounding electrodes and systems (identify each ground and give test value).

b. Operating Test: Energize the tranformer and adjust the output voltage to the specified value. After the transformer has been energized 48 hours, operate each high voltage fused cutout then retest and ajust the output voltage if required.

SECTION 16475. INTERIOR SWITCHGEAR

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

FEDERAL SPECIFICATIONS:

L-P-387A(2) Plastic Sheet, Laminated, Thermosetting (for Deisgnation Plates).

MILITARY SPECIFICATIONS:

MIL-M-14G Molding Plastics and Molded Plastic Parts, Thermosetting.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI):

C2-77 National Electrical Safety Code.
C12-75 Code for Electricity Metering.
C37.13-73 Low-Voltage AC Power Circuit Breakers Used in Enclosures Including Supplement C37.13A-75.
C37.20-74 Switchgear Assemblies (Consolidated Edition).
C37.90-78 Relays and Relay Systems Associated with Electric Power Apparatus, Including Supplement C37.90A-74.
C39.1-72 Electrical Analog Indicating Instruments.
C39.2-64 (R1969) Direct-Acting Electrical Instruments (Switchboard and Portable Types).
C57.13-78 Requirements for Instrument Transformers.
Z55.1-67 (R1973) Gray Finishes for Industrial Apparatus and Equipment.

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA):

EI 20-75 Standards for Watthour Meters.
PB 2-78 Dead-Front Distribution Switchboards.
PB 2.1-77 Safe Handling, Installation, Operation and Maintenance of Switchboards.
ICS 2-78 Industrial Control Devices.

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA):

NFPA 70-1978 National Electrical Code.

UNDERWRITERS LABORATORIES, INC. (UL):

UL 467-1972 (AUG 1978) Grounding and Bonding Equipment.
UL 891-1975 (OCT 1977) Dead-Front Switchboards.

2. FACTORY TESTS: ANSI C37.20 for switchgear. Submit certified copies of design tests, production tests, and conformance tests of the switchgear and await approval before delivering equipment to the project site. In particular, for power circuit breakers, after completion of interrupting test at full rating, there shall be no evidence of any damage to any part except for minor burning of the arcing contact tips. The breaker shall be satisfactory for immediate return to service at full rating without repairs or maintenance of any kind. One breaker of each rating shall be given impulse, momentary and interrupting tests at its full rating, witnessed by the representative of the Contracting Officer. In lieu of the above tests, a report of these tests previously performed on identical units of each rating will be acceptable.

3. SUBMITTALS:

3.1 Manufacturers' Data: Submit manufacturers' data for the following:

Kilowatt Meters	Relays
Switches	Breakers
Busduct	Voltmeter
Ammeters	

3.2 Shop Drawings for switchboards shall indicate, but shall not be limited to, the following:

a. Overall dimensions, front view and section views
b. Bus arrangements including dimensions and ampere ratings of all bus bars
c. Type and spacing of bus supports
d. Maximum short circuit bracing
e. Circuit breaker type, interrupting rating, trip setting
f. Provision for future extension
g. Elementary diagrams and wiring diagrams having their terminals identified, and indicating the internal wiring for each item of equipment and the interconnection between the items
h. One-line diagram

In addition, submit the manufacturer's published time-current curves on full-size logarithmic paper of the internal low voltage secondary circuit breakers and largest feeder breaker at each switchboard location to allow designer to verify that proper protection and coordination has been achieved.

3.3 Spare Parts Data: As soon as practicable after approval of materials and equipment, furnish spare parts data for each different item of equipment listed. Include a complete list of parts and supplies with current unit prices and source of supply. The foregoing shall not relieve the Contractor of any responsibilities under the guaranty.

3.4 Samples: Submit for approval sample of busduct - one right angle turn and more than eight inches from corner in each direction.

3.5 Certificates of Comformance or Compliance: Submit certificates in triplicate for circuit breakers, meters and relays.

3.6 Laboratory Test Reports: Submit certified copies, in triplicate, of the reports of all tests required in referenced publications for circuit breakers, meters and gages.

3.7 Field Tests Reports: Submit certified copies, in triplicate, of the reports of relay settings and dielectric tests as required herein.

3.8 Ground Resistance Tests Reports: Upon completion, and before final acceptance of the work, submit in writing the measured ground resistance of each ground rod and grounding system, indicating the location of the rod and grounding system and soil condition at the time the measurements were taken.

3.9 Operating and Maintenance Instructions: Furnish instructions for operating and maintenance for each entire switchgear assembly.

4. GENERAL REQUIREMENTS include those specified in Section 16011.

4.1 Insulated Phase Barriers shall conform to MIL-M-14, Type MAT-30.

4.2 Nameplates, laminated plastic, shall conform to L-P-387. Provide nameplates for each relay, switch and device to identify its function, and where applicable, its position. Laminated plastic shall be 1/8-inch thick black melamine plastic with white center core, matte finish, and square corners. The lettering shall be accurately aligned and engraved into the white core. Size of nameplates shall be 1 inch by 2½ inches minimum. Lettering shall be minimum 1/4-inch high normal block lettering. Number, location, and letter designation of nameplates shall be as indicated. Fasten nameplates with two sheet metal screws.

5. MATERIALS, EQUIPMENT, AND ASSEMBLIES:

5.1 Switchgear shall conform to ANSI C37.20 and shall consist of low voltage power circuit breaker, 208-volt service. Key-interlocak main secondary breakers with secondary tie circuit breaker to prevent operation of the primary tie breaker, with the main secondary breakers closed. Each steel unit forming part of the switchgear structure shall be a self-contained housing having individual breaker or instrument compartments, and a full height rear compartment for the insulated buses, instrument transformers, and outgoing cable connections. Equip the individual circuit breaker compartments with primary and secondary contacts, rails, disconnecting mechanism parts and a cell interlock which will prevent moving the removable element into or out of the "connected" position while the circuit breaker is closed. Provide a steel door for each individual breaker compartment. Enclose the top, sides, and rear of indoor structures with removable steel sheets. Design the structure so that future additions may be made. Provide an engraved circuit designation plate on each individual circuit breaker compartment door.

5.2 Phase Buses and Connections: Bus structure shall be mounted on insulated supports of high-impact, non-tracking, high-quality insulating material and adequately braced to withstand the mechanical forces exerted during short circuit conditions when connected directly to a source having maximum of 85,000 amperes rms symmetrical available. Bus bars shall be aluminum having silverplated joints. Make bus bar connections from main buses to the incoming circuit breaker studs. Equip the outgoing circuit breaker studs with mechanical clamp-type cable connectors for the size of cables shown.

5.3 Cable supports shall be provided for outgoing cables. Isolate cable compartment from bus compartment. Wire secondary circuits to terminal blocks. Terminal blocks shall be readily accessible for making external connections as required.

5.4 Ground Bus: Provide a copper ground bus secured to each vertical structure and extending the entire length of the switchgear. Include provisions for making the station ground connections.

5.5 Main Circuit Breaker: Electrically operated draw-out type with an interrupting rating not less than 65,000 amperes symmetrical at 600 volts. Equip breaker with magnetic or solid state long time trip device with instantaneous ground fault tripping characteristics so that branch breakers shall normally trip first on overload and at lower fault-current levels and equip breaker with motor-charged stored-energy closing mechanism which will permit rapid and safe closing of the breaker, independent of the operator's strength or effort in closing the handle.

a. Contacts:

(1) Main Contacts: Silver-to-silver, arranged with arc-resistant-alloy arcing contacts, magnetic blowout coils and deionizing arc chutes to control, confine, and interrupt the arc without burning or pitting of the main contacts.

(2) Main Draw-out Contacts: Silver-to-silver, positive, pressure, ball and multifinger, self-aligning type, arranged with steel shutters to enclose the stationary portion when breaker is removed to test position.

(3) Auxiliary and Control Contacts: Multiple-plug bayonet type, silverplated, self-aligning. Auxiliary and control connections shall be automatically made when the breaker is in the "operating" position and provision shall be made for manually engaging them in the "test" position.

b. Test Position: The breaker shall be completely removable from the metal enclosure, and also shall have a test position within the enclosure arranged to permit withdrawal of the breaker from contact with the 1.5 kV bus, connection of the control contacts and test operation of the breaker in the disconnected position with door to the enclosure closed. Provide a reduction-gear device for insertion and removal of the breaker unit.

c. Provision for Maintenance: Provide one complete set of special maintenance tools. Equip the breaker with wheels or provide a castering transport truck to facilitate removal of the breaker from the enclosure. Breaker arc chutes shall be one-pice removable assemblies to permit easy inspection and replacement of contacts. All parts of the breaker shall be accessible when the breaker is removed from the enclosure, without extensive disassembly or removal of other parts.

5.6 Instruments shall conform to ANSI C39.1 for electrical indicating switchboard instruments, accuracy Class 1. The AC ammeters, AC voltmeters, AC wattmeter shall be approximately six inches square, with 250 degree scale. Indicating instruments shall be single-phase with transfer switches for reading 3-phases. Transfer switches shall be flush mounting type.

a. AC Ammeters: Transformer rated, 5-ampere input, for use with a 2,500-to 5-ampere current transformer ratin, 0-to 2,500-ampere scale range, 60 Hertz.

b. AC Voltmeters: Transformer rate, 150-volt input, for use with a 208-to120-volt potential transformer ratin, 0-to 300-volt scale range, 60 Hertz. Provide external dropping resistors if required.

c. AC Wattmeters: Transformer rated for 120-volt input, 60 Hertz, 3-phase, 3-wire, 2-to 3,000-watt scale range for use with 2,500-to 5-ampere current transformer ratio and 208-to 120-volt potential transformer ratio. Furnish resistors, if required.

5.7 Watthour Meters shall conform to NEMA EI 20 with provisions for future pulse initiation. Kilowatthour meters shall be 2-stator, transformer rated, polyphase, 60 Hertz, semiflush mounted switchboard meters for use on a 4-wire, 3-phase system. The meter shall have a 5-dial pointer type register and shall be secondary reading. The kilowatthour meter shall have a cumulative type demand register with 15-minute interval.

5.8 Relays shall conform to NEMA ICS-2. Provide a means to automatically short-circuit the associated current transformer secondaries when removing the relay from its case. The relays shall be for operation on a 120-volt AC control bus.

a. Provide inverse induction time and instantaneous phase overcurrent relays

b. Provide inverse induction time and instantaneous ground overcurrent relay

c. Provide reverse current relays

5.9 Instrument and Control Transformers shall conform to ANSI C57.13 and NEMA ST 20 as applicable for:

a. Current transformers
b. Potential transformers
c. Control power transformer

5.10 Ground Fault Protection: Provide ground fault protective devices consisting of current transformers, fault protection relays with time delay suitable for protecting circuit components against phase to ground faults and system monitor panel. Install the ground sensor (current transformer) in the ground connection to the system neutral. Use special care in grounding the neutral so as not to defeat the proper operation of the ground fault protective devices. The relay shall be of the standard time delay type and have continuously adjustable current pickup and continuously adjustable time delay. It shall provide two independent output contacts each rated 5 amperes continuous and 30 amperes inrush at 120/208-volt AC. The relay shall include a memory function to recognize and initiate tripping on intermittent ground faults. The monitor panel shall indicate relay operation and provide means for testing the system with or without interruption of service and shall not permit the ground fault system to be inadvertently left in an inactive or OFF state.

5.11 Engraved Plastic Terminal Strips: Provide for all external wiring between components and for all internal wiring between removable assemblies. Terminal board identification shall be identical in all similar units. Color code external wiring consistently for all similar terminal boards.

6. INSTALLATION:

6.1 General Requirements: Electrical installations shall conform to ANSI C2, NFPA 70, and to the requirements specified herein. All equipment and materials shall be new unless indicated or specified otherwise.

6.2 Grounding shall be in accordance with the National Electrical Code and the National Electrical Safety Code, except that grounds and grounding systems shall have a resistance to solid earth ground not exceeding 10 ohms for grounding metal enclosures of primary voltage electrical and electrically operated equipment.

6.3 Switchboards shall conform to NEMA PB 2.1.

6.4 Meters and Instrument Transformers shall conform to ANSI C12.

6.5 Foundation for Equipment and Assemblies: Mount switchgear on the existing concrete second floor (operating floor) in the areas where the existing 750 KVA transformers are being removed. They will not be mounted on concrete slabs.

7. FIELD TESTS AND INSPECTIONS:

7.1 Demonstration Tests: Show by demonstration in service that all circuits and devices operate in accordance with manufacturer's specifications. Test the operation of each item of control equipment not less than five times. Submit the request for inspections and tests at least ten working days prior to date inspections and tests are to take place.

7.2 Tests: After installation, perform relay setting and coordination tests and dielectric tests. Furnish certified copies of the relay settings and dielectric tests to the Contracting Officer.

7.3 Equipment and Apparatus Tests: Unless specific factory-witnessed tests are specified, tests normally made by the manufacturer will be acceptable for all equipment and apparatus, and the Contracting Officer will authorize shipment on receipt of satisfactory evidence of such test.

7.4 Ground Resistance Tests: Measure ground resistance of each ground rod. Upon completion and before final acceptance of the work, submit in writing the measured ground resistance of each ground rod and grounding system, indicating the location of the rod and grounding system, as well as the resistance and soil conditions at the time measurements were made. Make ground resistance measurements in normally dry weather, not less than 48 hours after rainfall, and with the ground under test isolated from other grounds. Also, measure ground resistance from each piece of equipment to the ground electrode.

7.5 Retesting: Rectify any deficiencies found and retest work affected by such deficiencies.

SECTION 16510. LIGHTING WORK

1. APPLICABLE PUBLICATIONS: The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the references thereto:

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI):

C82.1-72 w/SUPP C82.1A-73 — Fluorescent Lamp Ballasts.

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA):

70-78 — National Electrical Code (NEC).

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA):

LE-3-74 — Manual for High-Intensity-Discharge Lamps.

UNDERWRITERS LABORATORIES, INC. (UL):

57-1972 (R10/77) — Fixtures, Electrical Lighting.

935-1971 (R11/77) — Ballasts, Fluorescent - Lamp.

2. SUBMITTALS:

2.1 Shop Drawings: Submit shop drawings and data for lighting fixtures. Drawings shall show types, size, accessories, installation details, and other details of construction. Data accompanying shop drawings shall include aiming diagram and computerized foot candle array.

2.2 Manufacturer's Data: Submit manufacturer's data for all fixtures indicating mechanical and electrical construction.

3. GENERAL REQUIREMENTS include those specified in Section 16011 and as specified herein. Lighting fixtures and accessories mounted on the exterior surfaces of building are included in this section..

4. LIGHTING FIXTURES AND ACCESSORIES:

4.1 General: UL 57 and NEMA LE-3. Lighting fixtures shall conform to UL 57. Lighting fixtures shall be provided complete with lamps of the number, type and wattages shown. The details, shapes and dimensions are indicative of the general type desired, but are not intended to restrict selection to fixtures of any particular manufacturer. Fixtures of similar designs and equipment, light distribution and brightness characteristics, and of equal or greater finish and quality will be acceptable as approved. Provide each open-tube fluorescent fixture with spring loaded, telescoping sockets or lamp retainers (two per lamp).

4.2 Suspended Fixtures: Provide with swivel hangers to insure a plumb installation. Hangers shall be cadmium plated steel with swivel-ball tapped for the conduit size indicated. Hangers shall be able to support twice the combined weight of the fixtures to which they are attached. Hangers shall allow fixtures to swing within an angle of 20 degrees. Pendants four feet or longer shall be braced to limit swinging. Single unit suspended fluorescent fixtures shall have twin stem hangers. Multiple unit or continuous row fluorescent fixtures shall have a tubing or stem for wiring at one point, and a tubing or rod suspension provided for each unit length of chassis including one at each end. Rods shall be a minimum of 3/16-inch.

4.3 Ballasts for Fluorescent Fixtures: UL 935, ANSI C82.1, and shall be labeled Certified Ballast Manufacturers (CBM) certified by Electrical Testing Laboratories (ETL). Ballasts shall be high power factor type unless indicated otherwise and shall be designed to operate on the voltage system to which they are connected. Ballasts shall be Class P and have the sound rating "A" unless otherwise noted. Fixtures and ballasts shall be designated and constructed to limit the ballast case temperature to 90 degrees Celcius when installed in a ambient temperature of 78 degrees Fahrenheit.

5. INSTALLATION: Lighting fixtures shall be set plumb, square, level, and in alinement and shall be secured in accordance with manufacturer's directions and approved shop drawings. The installation shall meet with the requirements of NEC. Mounting heights specified or indicated shall be to bottom of fixture. Lighting fixtures shall not be supported from suspended ceilings, but shall be supported from structural members above.

6. FIELD TESTS AND INSPECTIONS:

6.1 General: The Contractor shall show by demonstaration in service that all circuits, fixtures and equipment are in good operating condition. Tests shall be such that each piece of control equipment will function not less than five times. The Contractor shall give the Contracting Officer 14 days advance notice of the dates and times for tests and inspections.

6.2 Tests: Interior installations shall be tested for insulation resistance after all wiring is completed and connected ready for the attachment of fixtures and equipment, and again when fixtures and equipment are connected ready for use. Test shall be as specified in Section 16402. All defective material and workmanship disclosed as the result of the tests given herein shall be corrected at no cost to the Government. The Contractor shall show by demonstaration in service that all circuits and devices are in good operating condition.

SUPERSEDEAS DECISION

STATE: North Carolina **COUNTIES:** See below*
DECISION NUMBER: NC80-1023 (45 FR 1372 Jan 4 1980) **DATE:** 4 January 1980
Supersedes Decision No. NC76-1019 dated January 30, 1976 in 41 FR 4796
DESCRIPTION OF WORK: Building Construction Projects (excluding single family homes and apartments up to and including 4 stories).

*Counties:
Cartaret, Craven, Jones,
Lenoir, Onslow, and Pamlico

		FRINGE BENEFITS PAYMENTS			
	Basic Hourly Rates	H & W	Pensions	Vacation	Education and/or Appr. Tr.
Bricklayers	5.50				
Carpenters	4.50				
Cement masons	4.23				
Electricians	4.56				
Glaziers	3.55				
Ironworkers:					
Structural	4.75				
Reinforcing	4.25				
Laborers:					
Laborers, unskilled	3.10				
Pipelayers	4.35				
Plasterers' tenders	3.50				
Plasterers	6.00				
Plumbers & Steamfitters	5.51				
Sheet metal workers	3.88				
Sprinkler fitters	11.00**	.85	1.20		.08
Soft floor layers	5.10				
Tile setters	6.00				
Truck drivers	3.10				
Welders - rate for craft.					
POWER EQUIPMENT OPERATORS:					
Backhoes	4.50				
Motor graders	4.00				
Rollers	5.00				
PAINTERS	5.00*				
ROOFERS	5.52*				

*Modification No. 1, dated February 29, 1980
**Modification No. 2, dated 17 Oct 1980

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

NYE, MITCHELL, JARVIS & BUGG
ATTORNEYS AND COUNSELORS AT LAW
SUITE 100 LAW BUILDING
120 EAST PARRISH STREET
DURHAM, NORTH CAROLINA 27701

R. ROY MITCHELL, JR.
JERRY L. JARVIS
JOHN E. BUGG
EDMUND D. MILAM, JR.
TELEPHONE
(919) 688-2351

CHARLES B. NYE
TELEPHONE
(919) 682-6191

August 2, 1982

Commander R. E. Carlson
Officer in Charge of Construction
Building 1005, Marine Corps Base
Camp Lejeune, North Carolina 28542

Dear Commander Carlson:

In Re: Contract N62470-79-C-4471, Repair Electric Service, Transformers and Switchgear, Building 1700, MCB, Camp Lejeune, North Carolina

This is to advise that Campbell Electrical Company, Inc. has retained our firm to assist them in resolving the problem referenced in your letter of 23 July 1982 which was received by them on July 28, 1982. It would appear from the record in this matter that little or no purpose would be served by reciting Campbell's position concerning the switchgear problem. To keep the record completely accurate in this matter, however, Campbell did not just assume that motor control was to be accomplished by means other than a switchgear based simply on "standard industry practice." Rather, in preparing and submitting its bid, Campbell had to conclude that the foregoing was the case based on the only reasonable interpretation of the plans and specifications considered in conjunction with the applicable standards of both the National Electrical Code and the Underwriters Laboratories, Inc.

While Campbell has not yet been made privy to the Government's pre-bid estimate for this work, one can only assume that the Government estimator(s) interpreted the plans and specifications the same as did Campbell in arriving at an estimated cost of construction. Regardless of whether or not this was the case, however, it would certainly appear that until the meeting of 22 July 1982, all Government personnel involved with this problem had recognized that Campbell's interpretation of the plans and specifications had been sound and reasonable and its proposed methods of performance with the necessary additional compensation was the only reasonable solution to the problem. Needless to say, the Government's reversal in position first exhibited to Campbell in the hastily called meeting of 22 July 1982 came as a complete shock to Campbell and smacks of bad faith.

At any rate, it is cogently clear that this nonexistence of motor starters or controllers constitutes a "differing site condition" pursuant to 4(a)(2) of the General Provisions of the Contract and that the plans and specifications are inadequate and defective as related to this problem. In addition, your directive of 23 July 1982 clearly constitutes a change in the work - and, a cardinal one at that - for which Campbell shall most assuredly pursue an equitable adjustment if it can and does perform this extra and unanticipated work as ordered by you.

As a result of your letter of 23 July 1982, Campbell has written to its supplier of the switchgear (Westinghouse) to determine if it is possible for the heretofore specified and approved switchgear to be modified as per your directive. If this should prove possible, and if such modification will not void the equipment warranty, then Campbell shall consider proceeding as directed by you. For the record, however, you are reminded that Campbell firmly believes that the method and manner of performance as directed by you is clearly contrary to the National Electrical Code and Underwriters Laboratories, Inc.'s standards and shall pose a considerable safety hazard if accomplished. As a result and rather than having to do this work in this manner even with additional compensation by agreement or adjudication, Campbell would much prefer that the Government terminate its contract pursuant to ¶18 of the General Provisions.

In connection with the foregoing and as I am sure you are aware, Campbell immediately brought this problem to the attention of the Government as soon as it could be discovered on April 21, 1982. Since that date and as a result of the Government's failure to act and make a reasonable decision, Campbell's work has been completely suspended for which it shall be entitled to equitable compensation both in money and time in accordance with ¶17 of the General Provisions even if the control wiring interface can be accomplished as directed by you. You should be further advised, however, that even if this directed change in the work can be accomplished, the additional engineering, modifications, etc. shall most probably preclude boilers no. 1 and 2 from being placed back into service by October 14, 1982. Campbell shall advise of the estimated time requirements as soon as it has the necessary information. (In the meantime, perhaps the Government should realistically consider a substantial increase in its contingency budget for considerably more blankets for the base personnel this coming winter.)

On the other hand, if Campbell should be allowed to proceed immediately to complete this work as heretofore proposed by the use of motor starters, then there would be a relatively good chance that boilers no. 1 and 2 would be operable by winter. If you still feel that Campbell's proposed costs for doing this proposed work are unreasonable and that

the Government can do it more economically as has heretofore been suggested, Campbell's contract should be terminated pursuant to ¶18 of the General Provisions and the work accomplished by the Government or others without further delay.

In summary, the record in this matter shall certainly substantiate that Campbell has acted mostly dilligently, cooperatively, and in the best of good faith in attempting to assist the Government in overcoming the Government's problem. For the last three (3) months, however, it could be said that the Government has acted dilatory at best and in bad faith at worse. In closing, it probably bears reiteration that Campbell is proceeding with all dilligence to ascertain if the work can proceed to be performed in the method you have now directed. Nevertheless, as a result of your letter of 23 July 1982 and in order to protect Campbell's contractual rights in this matter, you should be advised that Campbell does dispute your interpretation and actions in this matter and requests a hearing and a Contracting Officer's decision in accordance with ¶6 of the General Provisions. It might be appropriate, however, to hold the processing of this dispute in abeyance until it can be ascertained whether or not your directed change in the work can be accomplished and, if so, the projected cost of the same.

With kindest regards, I am

Yours very truly,

NYE, MITCHELL, JARVIS & BUGG

By: John E. Bugg
John E. Bugg

JEB/pj

cc: Campbell Electrical Company, Inc.

NAME OF PROJECT: REPAIR ELECTRIC SERVICE, TRANSFORMERS, AND SWITCHGEAR
LOCATION: BUILDING 1700, MARINE CORPS BASE, CAMP LEJEUNE, N. C.
DESIGNED BY: DESIGN DIV., PUBLIC WORKS DEPT., MARINE CORPS BASE CAMP LEJEUNE, N. C.
CONTRACT NO: N62470-79-C-4471

TYPE OF SUBMITTAL: Pole Line Material
LOCATION: Various
GOVERN. SPEC.: #16300, Paragraph 6.7

SUBMITTED BY:

CAMPBELL ELECTRICAL CO., INC.
P. O. BOX 720
WILSON, N. C. 27893

REVIEWED
Date 8-4-81 By

OFFICE OF THE
OFFICER IN CHARGE OF CONSTRUCTION
CAMP LEJEUNE, NORTH CAROLINA

APPROVED

SUBJECT TO CONTRACT REQUIREMENTS

CONTRACT N62470-79-C-4471

DATE 8/11/1981

R. E. CARLSON
CDR, CEC, USN
Officer in Charge
of Construction

CHANCE A. B. CHANCE CO. • 210 NORTH ALLEN ST. • CENTRALIA, MO 65240

CERTIFICATE OF COMPLIANCE

TO: Campbell Electrical Company
Attn: Morris Robinson
P. O. Box 730
Wilson, N. C. 27893

DATE: June 23, 1981

RE: Pole Line Hardware

This is to certify that our Pole Line Hardware will be or has been manufactured or distributed by the Utility Systems Division of the A. B. Chance Company of Centralia, Missouri.

This material does comply with the quality requirements listed to the best of our knowledge and belief.

SPECIFICATIONS:

Applicable A. B. Chance Company drawings and catalog information

Gene McKenzie
Gene McKenzie
Quality Assurance Process Control Analyst

SUBSCRIBED AND SWORN TO BEFORE ME
ON THIS 23RD DAY OF JUNE, 1981.

V. Murray
V. Murray, Notary Public

My Commission expires February 27, 1985.

(314) 682-
TELEX: 447410

Subsidiary of
Emerson Electric Co

NAME OF PROJECT: REPAIR ELECTRIC SERVICE, TRANSFORMERS, AND SWITCHGEAR
LOCATION: BUILDING 1700, MARINE CORPS BASE, CAMP LEJEUNE, N. C.
DESIGNED BY: DESIGN DIV., PUBLIC WORKS DEPT., MARINE CORPS BASE
CAMP LEJEUNE, N. C.
CONTRACT NO: N62470-79-C-4471

TYPE OF SUBMITTAL: Wire
LOCATION: Various
GOVERN. SPEC.: #16402, Para. 4.1

SUBMITTED BY:

CAMPBELL ELECTRICAL CO., INC.
P. O. BOX 730
WILSON, N. C. 27893

REVIEWED
Date 8-4-81 By

OFFICE OF THE
OFFICER IN CHARGE OF CONSTRUCTION
CAMP LEJEUNE, NORTH CAROLINA

APPROVED

SUBJECT TO CONTRACT REQUIREMENTS

CONTRACT N62470-79-C-4471

DATE 8/11/1981

R. E. CARLSON
CDR, CEC, USN
Officer in Charge
of Construction

OFFICE OF THE
OFFICER IN CHARGE OF CONSTRUCTION
CAMP LEJEUNE, NORTH CAROLINA

APPROVED

SUBJECT TO CONTRACT REQUIREMENTS

CONTRACT

DATE

R. E. GARLSON
CDR, CEC, USN
Officer in Charge
of Construction

PC 1949-A (9/80)

Anaconda Ericsson

Power Cable Division
Quality Assurance

Power Cable Quality Assurance

CERTIFICATE OF COMPLIANCE
#2260

EASTERN ELECTRIC SUPPLY CO
P.O. BOX 1160
ROCKY MOUNT,NORTH CAROLINA 27801
ATTN: MARY ALICE WALSTON

Customer's Order No. 77401

Anaconda-Ericsson Order No. 96-00511

The following is a true and accurate description of the material manufactured at our WATKINSVILLE,GA plant, and shipped on the above order:

ITEM NO.	QUANTITY	DESCRIPTION	APPLICABLE SPECIFICATION
01	10,000 ft	#12 Solid TW Green	u/l 83
02	5,000 ft	#12 Solid THHN Red	u/l 83

Signed E M Shockey

E.M. Shockey

Title Supv

SEDC Forest Park,Ga Distribution Center

I hereby certify that the material described above was inspected under my general supervision and found to comply with the requirements of UL 83
as interpreted by Anaconda-Ericsson Quality Control Procedures prior to being placed into stock or released for shipment.

Test records will be kept on file at least one year from date of test, and will be made available for examination by authorized persons upon request.

Signed H. Blake Hardigree

Title Manager - Quality Assurance

Plant Watkinsville

Sworn and subscribed to before me this 29 TH day of May 19 81

Notary Public M S Dine

Notary Public, Clarke County, Georgia
My Commission Expires Dec. 3, 1983

NAME OF PROJECT:	REPAIR ELECTRIC SERVICE, TRANSFORMERS, AND SWITCHGEAR
LOCATION:	BUILDING 1700, MARINE CORPS BASE, CAMP LEJEUNE, N. C.
DESIGNED BY:	DESIGN DIV., PUBLIC WORKS DEPT., MARINE CORPS BASE CAMP LEJEUNE, N. C.
CONTRACT NO:	N62470-79-C-4471

TYPE OF SUBMITTAL:	15 K.V. Termination
LOCATION:	Indoors
GOVERN. SPEC.:	16300 Paragraph 6.3

SUBMITTED BY:

CAMPBELL ELECTRICAL CO., INC.
P. O. BOX 730
WILSON, N. C. 27893

REVIEWED

Date 9-24-81 By MR

OFFICE OF THE
OFFICER IN CHARGE OF CONSTRUCTION
CAMP LEJEUNE, NORTH CAROLINA

APPROVED

SUBJECT TO CONTRACT REQUIREMENTS

CONTRACT N62470-79-C-4471

DATE 9/30/1981

R. E. CARLSON
CDR, CEC, USN
Officer in Charge
of Construction

Scotchcast® 2104
Electrical Insulating and Sealing Compound

2104 Compound in a Unipak Container is a two-part, low-viscosity polyurethane for permanent splice protection. Use it with 72 Series Signal/Control Cable Splices and 85 Series Multi-Mold Splice Kits.

This compound flows well — even at low temperatures. It fills mold bodies completely and eliminates voids. Cure time is about 1 hour at 22°C/72°F and 20 hours at −4°C/20°F. The unique Unipak Container allows fast mixing of premeasured portions that pour cleanly from the container. No tools or containers are needed. Scotchcast 2104 contains no TDI or MOCA.

Product No.	Size	Compound Net Weight (Grams)	Compound Net Weight (Ounces)
2104	D	675	23.8

Packing: 1 Bag per Box; 10 Bags per Carton.

FOR PRICES, SEE PRICE PAGE SECTION D.

Scotchcast® 2114
Re-enterable Electrical Insulating and Sealing Compound

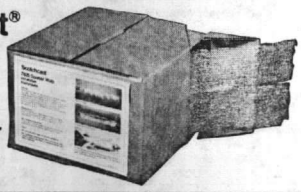
Permanently jelly-like 2114 is a replacement compound for 78 Series Kits. Its tacky urethane formulation adheres well, yet pulls away cleanly for fast, simple splice re-entry.

Yellow when poured, 2114 cures transparent so bundles and connectors are easily located during re-entry. Its Unipak Container allows fast mixing of pre-measured portions and is poured directly from the container. No mess. Cure time is about 20 minutes at 23°C/73°F and 80 minutes at −7°C/20°F. Re-entry can be made at temperatures down to −26°C/−15°F.

Possessing great thermal stability, moisture-resistant 2114 is non-corrosive to copper and does not support fungi or mold. It contains no TDI or MOCA and has no volatile isocyonate problem.

Product No.	Size	Net Wt. Oz./Gr.	Packing Type of Pkg.	Packing Per Ctn.
2114	C	12.3/350	1 Bag/Box	10
			1 Bag/Can	
	D	21.2/600	1 Bag/Box	
			1 Bag/Can	

FOR PRICE, SEE PRICE PAGE SECTION D.



Scotchcast® 7820
Spacer Web Relacement for 78 Series Kits

A loosely-woven polyester, 7820 Spacer Web keeps splice bundle away from mold body wall, providing even compound distribution around splice.

Spacer Web 7820 is included in the 78 Series Re-enterable Splicing Kits, but it may be ordered separately for applications in which splices are to be re-opened for rework.

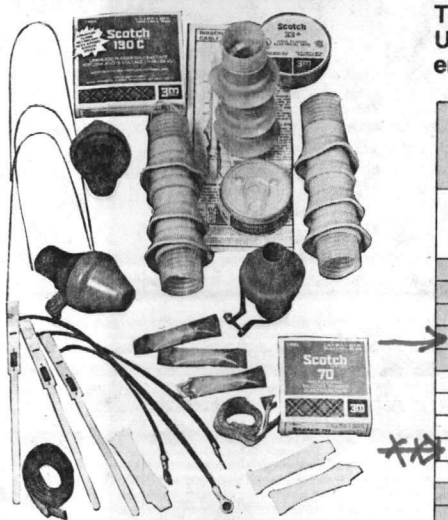
Product No.	Size Per Roll	Packing Roll	Packing Ctn.
7820	3 in. x 20 ft.	2/Box	1 Box

FOR PRICES, SEE PRICE PAGE SECTION D.

Section E

Termination Kits • 5, 8, 15 and 25 KV

Tape • Porcelain • Molded Rubber • Lugs • Brackets



3M 5622-5626; 5633-5636
Quick-Term Molded Rubber Termination Kits

5622-5626 Kits meet requirements of IEEE Standard No. 48-1975, Class 3. 5633-5636 Kits meet requirements of Class 1.

These molded rubber kits terminate a wide range of wire-shielded, ribbon-shielded, UniShield* and URD cables with a rated operating temperature of 90°C/194°F and an emergency overload rating of 130°C/266°F.

Voltage (KV)	Conductor Size Range	Cable** Insulation O.D. Range (inches)	Kit No.
5	2 AWG-3/0	.492-.670	5622 Weather-Protected
5	3/0-250 kcmil	.640-.900	5623 Weather-Protected
8 (100%)	2/0-250 kcmil		
8 (133%)	1/0-4/0		
15 (100%)	2 AWG-3/0		5633 Weather-Exposed
15 (133%)	2 AWG-1/0		
5	350-500 kcmil	.840-1.090	5624 Weather-Protected
8 (100%)	2/0-250 kcmil		
8 (133%)	250-350 kcmil		
15 (100%)	3/0-250 kcmil		5634 Weather-Exposed
15 (133%)	2/0-4/0		
5	600-750 kcmil	1.030-1.330	5625 Weather-Protected
8 (100%)	500-750 kcmil		
8 (133%)	400-600 kcmil		
15 (100%)	350-500 kcmil		5635 Weather-Exposed
15 (133%)	250-350 kcmil		
5	1000-1500 kcmil	1.270-1.650	5626 Weather-Protected
8 (100%)	1000-1250 kcmil		
8 (133%)	750-1000 kcmil		
15 (100%)	600-1000 kcmil		5636 Weather-Exposed
15 (133%)	500-750 kcmil		

*UniShield is a registered trademark of Anaconda Wire and Cable.

**Cable insulation O.D. must be used as final determining factor.

Use Scotchlok Lugs or other standard lugs with these kits which handle copper or aluminum conductors from 2 AWG through 1500 kcmil. Kits 5622 through 5626 are for use in weather-protected areas. (Class III — no contamination or moisture present.) Use 5633 through 5636 Kits in industrial applications which include both weather-exposed and weather-protected areas.

Each kit includes materials to make three terminations. 5620-5626 Kits contain three track-resistant molded rubber stress cones, three mechanical ground straps and accessory items, and an illustrated instruction sheet that shows proper techniques for terminating shielded and concentric neutral cable.

5633-5636 Kits contain these items plus three PST Cold-Shrink Silicone Rubber Skirted Insulators. Less effort and no heat are required to install these terminations and they can be energized immediately upon completion.

Packing: 3 Terminations per Kit; 1 Kit per Carton; 1 Kit per Case.

FOR PRICES, SEE PRICE PAGE SECTION E.

NAME OF PROJECT:	REPAIR ELECTRIC SERVICE, TRANSFORMERS, AND SWITCHGEAR
LOCATION:	BUILDING 1700, MARINE CORPS BASE, CAMP LEJEUNE, N. C.
DESIGNED BY:	DESIGN DIV., PUBLIC WORKS DEPT., MARINE CORPS BASE CAMP LEJEUNE, N. C.
CONTRACT NO:	N62470-79-C-4471

TYPE OF SUBMITTAL:	15 K.V. Termination
LOCATION:	Outdoors
GOVERN. SPEC.:	16300 Paragraph 6.3

SUBMITTED BY:

CAMPBELL ELECTRICAL CO., INC.
P. O. BOX 730
WILSON, N. C. 27893

REVIEWED

Date 9-24-81 By MR

OFFICE OF THE
OFFICER IN CHARGE OF CONSTRUCTION
CAMP LEJEUNE, NORTH CAROLINA

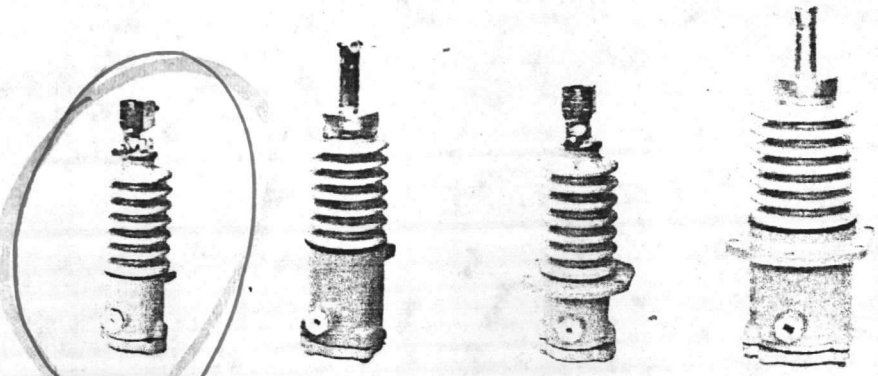
APPROVED "AS NOTED"

SUBJECT TO CONTRACT REQUIREMENTS

CONTRACT N62470-79-C-4471

DATE 9/30/1981

R. E. CARLSON
CDR, CEC, USN
Officer in Charge
of Construction



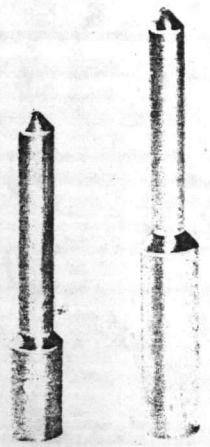
Dimensions

Catalog numbers include pre-filled terminator. Compression connectors must be specified separately. Adapter kits, aerial lugs and mounting brackets must be ordered separately if required.

Catalog No.	Size	Fig.	Dimensions – ins. (mm)						
			A max.	B	C	D	E	F	G
PAT 1701	1	1	12 1/4 (311)	2 5/8 (67)	2 15/32 (63)	2 3/8 (60)	3 1/2 (89)	5/16 (8)	–
PAT 1772	2	2	12 1/16 (306)	3 7/8 (98)	2 15/16 (75)	2 7/8 (73)	4 1/8 (105)	7/16 (11)	–
PAT 1773	3	4	12 7/8 (327)	5 1/8 (130)	7 1/4 (184)	6 1/2 (165)	5 (127)	6 5/8 (168)	7 1/2 (191)
PAT 17/801	1	1	16 (406)	2 5/8 (67)	2 15/32 (63)	2 3/8 (60)	3 1/2 (89)	5/16 (8)	–
PAT 17/802	2	1	17 1/16 (433)	3 7/8 (98)	2 15/16 (75)	3 1/8 (79)	4 1/8 (105)	7/16 (11)	–
PAT 17/872	2	2	15 1/4 (387)	3 7/8 (98)	2 15/16 (75)	2 7/8 (73)	4 1/8 (105)	7/16 (11)	–
PAT 17/873	3	4	16 1/16 (408)	5 1/8 (130)	10 7/16 (265)	6 1/2 (165)	5 (127)	6 5/8 (168)	7 1/2 (191)
PAT 1801	1	1	16 (406)	2 5/8 (67)	2 15/32 (63)	2 5/8 (60)	3 1/2 (89)	5/16 (8)	–
PAT 1802	2	1	17 1/16 (433)	3 7/8 (98)	2 15/16 (75)	3 1/8 (79)	4 1/8 (105)	7/16 (11)	–
PAT 1872	2	2	15 1/4 (387)	3 7/8 (98)	2 15/16 (75)	2 7/8 (73)	4 1/8 (105)	7/16 (11)	–
PAT 1873	3	4	16 1/16 (408)	5 1/8 (130)	10 7/16 (265)	6 1/2 (165)	5 (127)	6 5/8 (168)	7 1/2 (191)
PAT 18/972	2	2	20 1/8 (511)	3 7/8 (98)	2 15/16 (75)	2 7/8 (73)	4 5/8 (117)	7/16 (11)	–
PAT 18/973	3	4	21 (533)	5 1/8 (130)	15 3/8 (391)	6 1/2 (165)	5 3/4 (146)	6 5/8 (168)	7 1/2 (191)
PAT 1972	2	4	20 1/8 (511)	3 7/8 (98)	2 15/16 (75)	2 7/8 (73)	4 5/8 (117)	7/16 (11)	–
PAT 1973	3	4	21 (533)	5 1/8 (130)	15 3/8 (391)	6 1/2 (165)	5 3/4 (146)	6 5/8 (168)	7 1/2 (191)
PAT 19/1073	3	4	27 (686)	5 1/8 (130)	21 3/8 (543)	6 1/2 (165)	5 3/4 (146)	6 5/8 (168)	7 1/2 (191)
PAT 1073	3	4	27 (686)	5 1/8 (130)	21 3/8 (543)	6 1/2 (165)	5 3/4 (146)	6 5/8 (168)	7 1/2 (191)
PAT 18/901	1	1	16 (406)	2 5/8 (67)	2 15/32 (63)	2 3/8 (60)	3 1/2 (89)	5/16 (8)	–
PAT 18/902	2	1	17 1/16 (433)	3 7/8 (98)	2 15/16 (75)	3 1/8 (79)	4 1/8 (105)	7/16 (11)	–
PAT 19/872	2	2	20 1/8 (511)	3 7/8 (98)	2 15/16 (75)	2 7/8 (73)	4 5/8 (117)	7/16 (11)	–
PAT 18/701	1	1	16 (406)	2 5/8 (67)	2 15/32 (63)	2 3/8 (60)	3 1/2 (89)	5/16 (8)	–
PAT 18/702	2	1	17 1/16 (433)	3 7/8 (98)	2 15/16 (75)	3 1/8 (79)	4 1/8 (105)	7/16 (11)	–

Voltage (KV)	BIL (KV)	Catalog No.	Conductor Size (Max) AWG or KCM				Semi-con O.D. Ins. (mm max.)	Creepage Ins. (mm)	Strike Ins. (mm)	Wt. lbs. (kg)
			Copper	mm²	Aluminum	mm²				
15	110	PAT 1701	2/0	67	2/0	67	5/8 – 1 (25.4)	12 1/8 (308)	6 (152)	6 (2.7)
		PAT 1701	250	127	250	127	5/8 – 1 (25.4)	12 1/8 (308)	6 (152)	6 (2.7)
		PAT 1772	500	253	500	253	1 – 1 5/8 (41.3)	12 1/8 (308)	5 3/4 (146)	12 1/2 (5.7)
		PAT 1772	750	380	500	253	1 – 1 5/8 (41.3)	12 1/8 (308)	5 3/4 (146)	12 1/2 (5.7)
		PAT 1773	1000	507	1000	507	1 5/16 – 2 3/16 (55.5)	13 1/4 (336)	6 (152)	14 (6.4)
		PAT 1773	1500	760	1250	633	1 5/16 – 2 3/16 (55.5)	13 1/4 (336)	6 (152)	14 (6.4)
15 Extra Creepage	150	PAT 17/801	2/0	67	2/0	67	5/8 – 1 (25.4)	19 1/2 (495)	10 1/8 (257)	8 1/2 (3.9)
		PAT 17/802	2/0	67	2/0	67	3/4 – 1 1/4 (31.7)	20 (508)	9 5/8 (244)	13 (5.9)
		PAT 17/801	250	127	250	127	5/8 – 1 (25.4)	20 (508)	9 5/8 (244)	8 1/2 (3.9)
		PAT 17/802	250	127	250	127	3/4 – 1 1/4 (31.7)	20 (508)	9 5/8 (244)	13 (5.9)
		PAT 17/872	500	253	500	253	1 – 1 5/8 (41.3)	20 (508)	9 5/8 (244)	15 (6.8)
		PAT 17/872	750	380	500	253	1 – 1 5/8 (41.3)	20 (508)	9 5/8 (244)	15 (6.8)
		PAT 17/873	1000	507	1000	507	1 5/16 – 2 3/16 (55.5)	20 (508)	9 (229)	20 (9.1)
		PAT 17/873	1500	760	1250	633	1 5/16 – 2 3/16 (55.5)	20 (508)	9 (229)	20 (9.1)
25	150	PAT 1801	250	67	250	67	5/8 – 1 (25.4)	19 1/2 (495)	10 1/8 (257)	8 1/2 (3.9)
		PAT 1802	250	127	250	127	3/4 – 1 1/4 (31.7)	20 (508)	9 5/8 (244)	13 (5.9)
		PAT 1872	500	253	500	253	1 – 1 5/8 (41.3)	20 (508)	9 5/8 (244)	15 (6.8)
		PAT 1872	750	380	500	253	1 – 1 5/8 (41.3)	20 (508)	9 5/8 (244)	15 (6.8)
		PAT 1873	1000	507	1000	507	1 5/16 – 2 3/16 (55.5)	20 (508)	9 (229)	20 (9.1)
		PAT 1873	1500	760	1250	633	1 5/16 – 2 3/16 (55.5)	20 (508)	9 (229)	20 (9.1)
25 Extra Creepage	200	PAT 18/972	500	253	500	253	1 – 1 5/8 (41.3)	31 1/4 (794)	13 5/8 (346)	20 (9.1)
		PAT 18/972	500	253	500	253	1 – 1 5/8 (41.3)	31 1/4 (794)	13 5/8 (346)	20 (9.1)
		PAT 18/973	1000	507	1000	507	1 5/16 – 2 3/16 (55.5)	32 1/2 (825)	14 1/2 (368)	30 (13.6)
		PAT 18/973	1500	760	1250	633	1 5/16 – 2 3/16 (55.5)	32 1/2 (825)	14 1/2 (368)	30 (13.6)
34.5	200	PAT 1972	500	253	500	253	1 – 1 5/8 (41.3)	31 1/4 (794)	13 5/8 (346)	20 (9.1)
		PAT 1972	750	380	500	253	1 – 1 5/8 (41.3)	31 1/4 (794)	13 5/8 (346)	20 (9.1)
		PAT 1973	1000	507	1000	507	1 5/16 – 2 3/16 (55.5)	32 1/2 (825)	14 1/2 (368)	30 (13.6)
		PAT 1973	1500	760	1250	633	1 5/16 – 2 3/16 (55.5)	32 1/2 (825)	14 1/2 (368)	30 (13.6)
34.5 Extra Creepage	250	PAT 19/1073	500	253	500	253	1 5/16 – 2 3/16 (55.5)	46 (1168)	20 1/4 (514)	36 (16.3)
		PAT 19/1073	1000	507	1000	507	1 5/16 – 2 3/16 (55.5)	46 (1168)	20 1/4 (514)	36 (16.3)
		PAT 19/1073	1500	760	1250	633	1 5/16 – 2 3/16 (55.5)	46 (1168)	20 1/4 (514)	36 (16.3)
46	250	PAT 1073	1000	507	1000	507	1 5/16 – 2 3/16 (55.5)	46 (1168)	20 1/4 (514)	36 (16.3)
		PAT 1073	1500	760	1250	633	1 5/16 – 2 3/16 (55.5)	46 (1168)	20 1/4 (514)	36 (16.3)
14.4/25	150	PAT 18/701	2/0	67	2/0	67	5/8 – 1 (25.4)	19 1/2 (495)	10 1/8 (257)	8 1/2 (3.9)
		PAT 18/702	2/0	67	2/0	67	3/4 – 1 1/4 (31.7)	20 (508)	9 5/8 (244)	13 (5.9)
		PAT 18/702	250	127	250	127	3/4 – 1 1/4 (31.7)	20 (508)	9 5/8 (244)	13 (5.9)
20/34.5	150	PAT 18/901	2/0	67	2/0	67	5/8 – 1 (25.4)	19 1/2 (495)	10 1/8 (257)	8 1/2 (3.9)
		PAT 18/902	2/0	67	2/0	67	3/4 – 1 1/4 (31.7)	20 (508)	9 5/8 (244)	13 (5.9)
		PAT 18/901	250	127	250	127	5/8 – 1 (25.4)	19 1/2 (495)	10 1/8 (257)	8 1/2 (3.9)
		PAT 18/902	250	127	250	127	3/4 – 1 1/4 (31.7)	20 (508)	9 5/8 (244)	13 (5.9)
20/34.5	200	PAT 19/872	2/0	67	2/0	67	1 – 1 5/8 (41.3)	31 1/4 (794)	13 5/8 (346)	20 (9.1)
		PAT 19/872	750	380	500	253	1 – 1 5/8 (41.3)	31 1/4 (794)	13 5/8 (346)	20 (9.1)

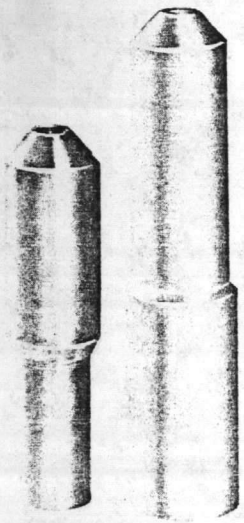
Max. continuous current rating – same as cable.



COPPER ALUMINUM

For use with the following eyebolt style terminators:

PAT(R) 1701
PAT(R) 1801
PAT(R) 1802
PAT(R) 17/801
PAT 17/802
PAT(R) 18/901
PAT(R) 18/902
PAT 18/701
PAT 18/702



COPPER ALUMINUM

For use with the following hood style terminators:

PAT(R) 1772
PAT(R) 1872
PAT(R) 1972
PAT(R) 1773
PAT(R) 1873
PAT(R) 1973
PAT(R) 1073
PAT 17/872
PAT 17/873
PAT 18/972
PAT 18/973
PAT 19/1073
PAT 19/872
PAT 18/772
PAT 18/773

CONNECTORS

Compression connectors are available for both eyebolt and hood style terminators. Copper connectors are made of high conductivity copper and are for use on copper conductor cable only. High conductivity aluminum connectors are tin plated and are for use on aluminum conductors through 1250 kcmil and copper conductors up to 250 kcmil. The aluminum connectors are internally coated with a conductive oxide inhibiting compound for proper connection to aluminum conductors.

Conductor Size* AWG/KCM			Copper		Aluminum	
SC	CR	SD	Part No.	Barrel OD (Inches)	Part No.	Barrel OD (inches)

COMPRESSION CONNECTORS FOR EYEBOLT STYLE TERMINATORS (.370" DIA.)

4	–	–	A5087-22	.34	A5088-22	.65
–	2	2	A5087-117	.38	A5088-230	.65
2	1	1	A5087-23	.41	A5088-23	.65
1	1/0	1/0	A5087-24	.46	A5088-24	.65
1/0	2/0	2/0	A5087-25	.51	A5088-25	.65
2/0	3/0	3/0	A5087-26	.56	A5088-26	.84
3/0	4/0	4/0	A5087-27	.61	A5088-27	.84
4/0	250	–	A5087-28	.69	A5088-28	.84
250	300	–	A5087-29	.75	A5088-29	.94

COMPRESSION CONNECTORS FOR HOOD STYLE TERMINATORS (1" DIA.)

4	–	–	A5087-32	.34	A5088-30	.65
2	1	1	A5087-30	.41	A5088-31	.65
1	1/0	1/0	A5087-33	.46	A5088-32	.65
1/0	2/0	2/0	A5087-31	.51	A5088-33	.65
2/0	3/0	3/0	A5087-21	.56	A5088-34	.84
3/0	4/0	4/0	A5087	.61	A5088	.84
4/0	250	–	A5087-1	.69	A5088-1	.84
250	300	–	A5087-2	.75	A5088-2	.94
–	350	–	A5087-5	.87	A5088-5	1.00
300	–	–	A5087-3	.81	A5088-3	1.00
–	400	–	A5087-7	.95	A5088-7	1.12
350	–	–	A5087-4	.87	A5088-4	1.12
–	450	–	A5087-9	.95	A5088-9	1.19
400	500	–	A5087-6	.95	A5088-6	1.19
450	550	–	A5087-8	1.01	A5088-8	1.31
500	600	–	A5087-10	1.06	A5088-10	1.31
550	650	–	A5087-11	1.12	A5088-11	1.44
600	700	–	A5087-12	1.19	A5088-12	1.44
–	750	–	A5087-16	1.23	A5088-16	1.59
650	800	–	A5087-13	1.23	A5088-13	1.59
700	–	–	A5087-14	1.25	A5088-14	1.59
750	900	–	A5087-15	1.30	A5088-15	1.59
800	–	–	A5087-17	1.35	A5088-17	1.65
–	1000	–	A5087-20	1.50	A5088-20	1.65
900	–	–	A5087-18	1.50	A5088-18	1.65
1000	–	–	A5087-19	1.50	A5088-19	1.84
1250	–	–	A5087-35	1.69	A5088-35	2.12
1500	–	–	A5087-34	1.84		

*SC = Stranded and Compressed, CR = Compact Round, SD = Solid.

Bracket Selector Chart

PAT 1701	PAT 1772	PAT 1801 17/801 18/901	PAT 1802 17/802 18/902	PAT 1872 17/872	PAT 1972 18/972 19/872	PATR 1701	PATR 1772	PAT PATR 1773	PATR 1801 17/801 18/901	PATR 1802 18/902	PATR 1872	PAT PATR 1873 17/873	PATR 1972	PAT PATR 1973 18/973	PAT PATR 1073 19/1073
1, 2, 3	1, 2, 3	1, 2, 3	1, 2, 3	1, 2, 3	1, 2, 3	None	4, 5, 6, 7	4, 5, 6, 7	None	4, 5, 6, 7	4, 5, 6, 7	4, 5, 6, 7	4, 5, 6, 7	4, 5, 6, 7	4, 5, 6, 7

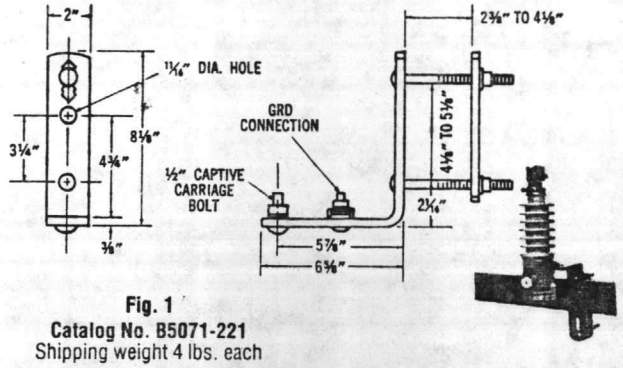


Fig. 1
Catalog No. B5071-221
Shipping weight 4 lbs. each

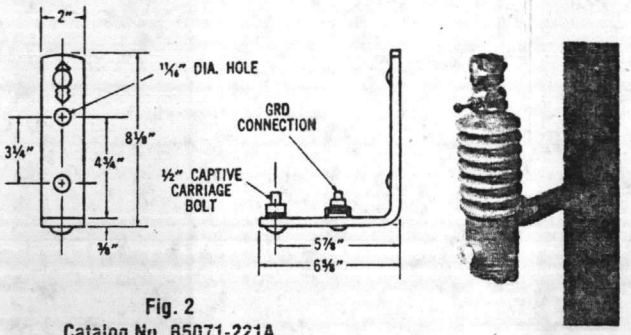


Fig. 2
Catalog No. B5071-221A
Shipping weight 4 lbs. each

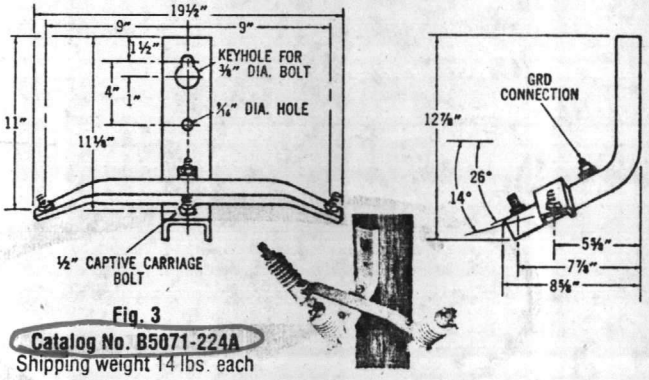


Fig. 3
Catalog No. B5071-224A
Shipping weight 14 lbs. each

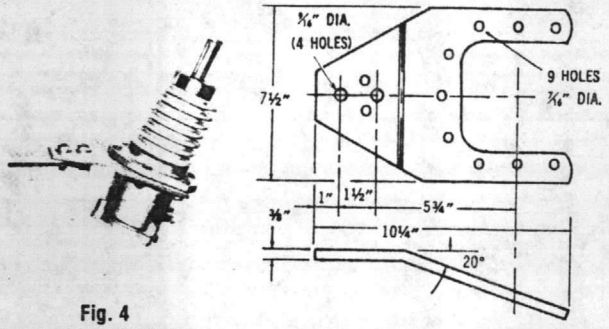
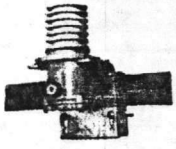


Fig. 4
Catalog No. A3147-686B
Shipping weight 5 lbs. each



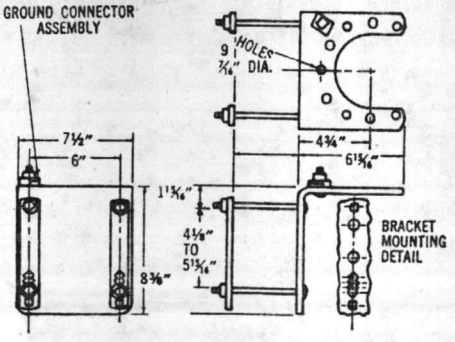
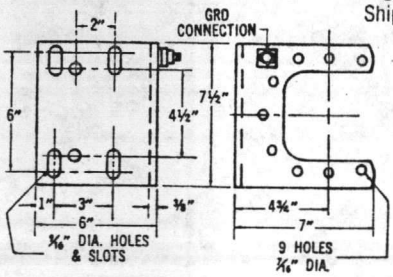
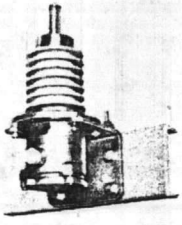


Fig. 5
Catalog No. B5071-273A
Shipping weight 10 lbs. each

Fig. 6
Catalog No. B5071-258A
Shipping weight 7½ lbs. each





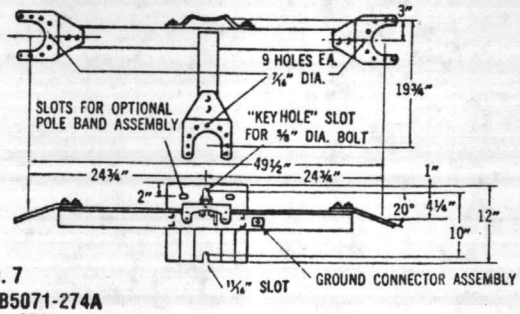
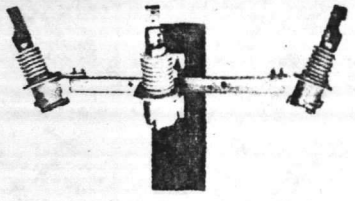


Fig. 7
Catalog No. B5071-274A
Shipping weight 58 lbs. each



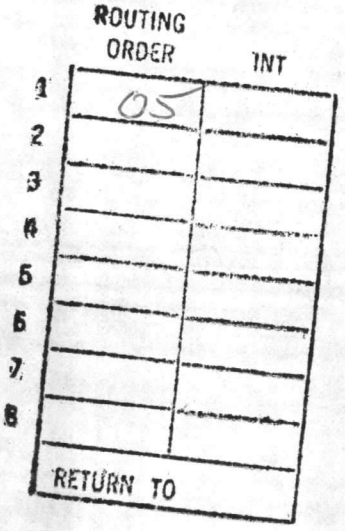
G&W Electric Specialty Company
3500 West 127th Street
Blue Island, Illinois 60406

CAMPBELL ELECTRICAL CO., INC.

ELECTRICAL CONTRACTING

POST OFFICE BOX 1709 • WILSON, NORTH CAROLINA 27893 • TELEPHONE 237-8088

June 1, 1982



Mr. G. N. Sniffin
Officer in Charge of Construction
Building 1005, Marine Corps Base
Camp Lejeune, NC 28542

Dear Mr. Sniffin:

RE: CONTRACT NO. N62470-79-C-4471
REPAIR ELECTRICAL SERVICE, BUILDING 1700
MCB, CAMP LEJEUNE, NC
MODIFICATION NO. 4
OUR JOB NO. 590 - C. O. R. NO. 4

In reply to your letter of request dated May 24, 1982, we offer the following for your consideration.

We will not be submitting a proposal at this time for "Modification No. 4 (a)" to modify the switchgear to accommodate remote control breakers. This would be a violation of the National Electrical Code Section 430-C. Also, note that all warranties on the gear would be voided. If you still desire to entertain this particular solution to the problem in view of the above information, please advise.

Attached is our itemized proposal to perform "Modification No. 4 (b)-add Motor Control Centers to be controlled from Boiler Control Room and interlocking like the existing system." This proposal in the amount of $197,917.00 includes the following:

(1) Motor Control Centers A and B:

Motor Control Center A Consisting of:

Nema 1A Class 2B rating
1 - 2500 A Main C/B
1 - 2500 A Tie C/B
2 - Size 6 FVNR Combo Starters
6 - Size 5 FVNR Combo Starters
3 - 225 A KB C/B Rated 22K
1 - 100 A KB C/B Rated 18K
1 - Ammeter for MCB
1 - Voltmeter for MCB

82 JUN 3 A10:24

1 - KWHD Meter for MCB
Necessary controls and relays for boiler operations with bus duct tie-in and interlocks

Motor Control Center B Consisting of:

Nema 1A Class 2B rating
1 - 2500 A MCB
2 - Size 6 FVNR Combo Starters
6 - Size 5 FVNR Combo Starters
1 - 300 A KB C/B rated 22K
1 - 225 A KB C/B rated 22K
2 - 125 A KB C/B rated 18K
1 - 100 A KB C/B rated 18K
1 - Ammeter for MCB
1 - Voltmeter for MCB
1 - KWHD meter for MCB
Necessary controls and relays for boiler operation with bus duct tie-in and interlocks
Please see attached copy of Westinghouse General Catalog Reference.

(2) Eight new size "0" starters for the Coal Feeder Motors

(3) All control wiring necessary for the proper operation of each of the four boilers

(4) A "RUSH" price for Motor Control Center A, to meet schedules

(5) 420 days time extending the contract time to October 14, 1983

(6) Additional dollars for labor expensed after the initial completion date

Credit for the new switchgear A and B will be issued for the value of credit that Westinghouse gives. We are unable to establish the value at this time.

Due to the time frame of the summer months and the time of delivery of the Motor Control Centers, we must have an approval to release the Motor Control Center A for manufacturing no later than July 15, 1982, in order to have power ready by October 14, 1982.

At the present time we are in a STOP work condition due to this change.

If we can be of any further assistance in this matter, please do not hesitate to contact our office immediately.

Sincerely,

Morris Robinson

Morris Robinson
Project Manager

MR/sb

Enclosure

ESTIMATE FOR CHANGE ORDER

LANTDIV NORVA 4-4330/58 (Rev. 2-81)

DATE

CONTRACT NUMBER	CONTRACT TITLE
N62470-79-C-4471	Repair Electric Service Transformers & Switchgear, Building 1700

CHANGE DESCRIPTION

REMARKS

Add 420 Days To Contract

A. SUB-CONTRACTOR COST

1.	DIRECT LABOR	
2.	INSURANCE & TAXES, ___% OF ITEM 1	
3.	DIRECT MATERIAL	
4.	SALES TAX, ___% OF ITEM 3	
5.	RENTAL EQUIPMENT	
6.	SALES TAX, ___% OF ITEM 5	
7.	MAINT. & MINOR REPAIRS FOR OWNED EQUIP.	
8.	SUBTOTAL	
9.	FIELD OVERHEAD, 10% OF ITEM 8	
10.	SUBTOTAL	
11.	HOME OFFICE OVERHEAD, 3% OF ITEM 10	
12.	OWNED EQUIPMENT COST	
13.	ENGINEERING COST	
14.	SUBTOTAL	
15.	PROFIT, 6% OF ITEM 14	
16.	SUBTOTAL	
17.	BOND, ___% OF ITEM 16	
18.	SUBTOTAL	
19.	LOCAL LICENSE TAX, ___% OF ITEM 18	
20.	SUBCONTRACTOR TOTAL COST	

SUBCONTRACTOR	SIGNATURE & TITLE

B. PRIME CONTRACTORS COST

1.	DIRECT LABOR	4224.00
2.	INSURANCE & TAXES 15 % OF ITEM 1	634.00
3.	DIRECT MATERIAL	149261.00
4.	SALES TAX, 4 % OF ITEM 3	5970.00
5.	RENTAL EQUIPMENT	800.00
6.	SALES TAX, 4 % OF ITEM 5	32.00
7.	MAINT. & MINOR REPAIRS FOR OWNED EQUIP.	250.00
8.	SUBTOTAL	161171.00
9.	FIELD OVERHEAD, 10% OF ITEM 8	16117.00
10.	SUBTOTAL	177288.00
11.	HOME OFFICE OVERHEAD, 3% OF ITEM 10	5319.00
12.	OWNED EQUIPMENT COST	-
13.	ENGINEERING COST	1875.00
14.	SUBCONTRACT COST (FROM "A")	-
15.	OVERHEAD ON SUBCONTRACT, 5% OF ITEM 14	-
16.	SUBTOTAL	184482.00
17.	PROFIT, 6% OF ITEM 16	11069.00
18.	SUBTOTAL	195551.00
19.	BOND 1.21 % OF ITEM 18	2366.00
20.	SUBTOTAL	197917.00
21.	LOCAL LICENSE TAX, ___% OF ITEM 20	
22.	PRIME CONTRACTOR TOTAL COST	

CONTRACTOR	SIGNATURE & TITLE
Campbell Electrical Co., Inc.	Walter D. Cleaton CONSTRUCTION MGR

For Charges Less Than $100,000 Contractor Has Option of Standard Overhead Rates Indicated or Actual Breakdown of Overhead Rates.

BREAKDOWN OF PRIME CONTRACTOR'S LABOR AND MATERIAL COST ONLY

(NO OVERHEAD, PROFITS OR INSURANCE TO BE INCLUDED)

ITEM DESCRIPTION	UNIT	QUANTITY	PRICE OF DELIVERY		PRICE FOR PLACING		TOTAL
			UNIT	TOTAL	UNIT	TOTAL	
MCC A	EA	1	$80,026.	$80,026.	$1,360.	$1,360.	$81,386.00
MCC B	EA	1	66,185.	66,185.	425.	425.	66,610.00
Size "0" Starters	EA	8	331.25	2,650.	42.50	340.	2,990.00
Control Wiring	LS	-	-	400.	-	1,020.	1,420.00
Bus Modification	LS	-	-	-	-	170.	170.00
Addition Labor Rate Due to Time Extension	LS	-	-	-	-	909.	909.00
TOTALS				$149,261.		$4224.	$153,485.00

BREAKDOWN OF PRIME CONTRACTOR'S EQUIPMENT COSTS

EQUIPMENT DESCRIPTION	RATE	HOURS, DAYS, MONTHS	TOTAL
Crane Truck for Changing Swbd A	$1200/Month	1 Week	$400.00
Dump Truck	1200/Month	1 Week	400.00
		TOTAL	$800.00

BREAKDOWN OF SUBCONTRACTOR'S LABOR AND MATERIAL COST ONLY

ITEM DESCRIPTION	UNIT	QUANTITY	PRICE OF DELIVERY		PRICE FOR PLACING		TOTAL
			UNIT	TOTAL	UNIT	TOTAL	
TOTALS							

BREAKDOWN OF SUBCONTRACTOR'S EQUIPMENT COST

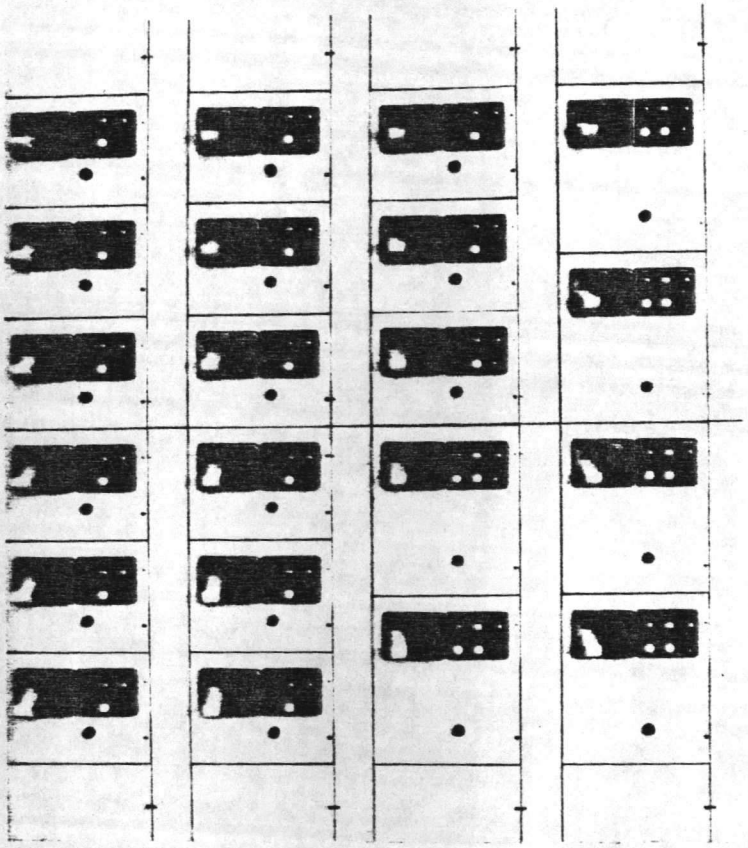
EQUIPMENT DESCRIPTION	RATE	HOURS, DAYS, MONTHS	TOTAL
		TOTAL	

Control Centers
Five Star

Many processes and commercial buildings benefit from the grouping of electrical controls. Industries such as primary metals, paper, petroleum and chemicals typically install electrical controls in centralized locations so that supervision and operation can be performed by a minimum of personnel. To meet this need Westinghouse introduced the Motor Control Center Concept in 1937. This provided a means to mount various motor starter units, feeder tap units and auxiliary controls in a flexible structure arrangement. Since that time the Motor Control Center Concept has been refined to permit greater flexibility, safety and convenience.

The Five Star design begins with components of proven electrical and mechanical integrity; assembles them with strict adherence to the highest engineering practices and with special emphasis on personnel safety and ease of maintenance. The assembly is then wrapped in an enclosure which prevents accidental contact with the enclosed electrical parts.

The Five Star Motor Control Center has been designed and tested to comply with the general standards for industrial controls and the specific standards for motor control centers as set forth by NEMA, UL, IEEE and ANSI. The various state and city codes are generally met by the standard design. However, in those instances where more specific requirements must be met, the Five Star has the design flexibility to meet them.

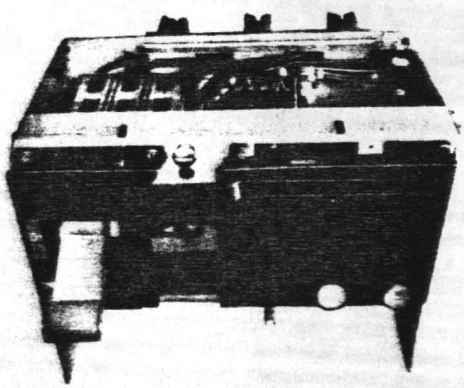


Five Star Motor Control Center
the ultimate in Control Center design

I. Units

Starter Units

Motor starter units are combination type employing a contactor or contactors and a disconnect device of proven capability. The disconnect device can be either a circuit breaker or fusible switch. The Westinghouse Type MCP motor circuit protector breaker is furnished as standard.



The MCP and starter combination has a 22,000 RMS symmetrical ampere interrupting capacity. With the addition of a current limiter the interrupting capacity is increased to 200,000 amperes. Optional circuit breakers for starter units are the Mark 75 and the TriPac with interrupting ratings of 22,000 amperes and 200,000 amperes respectively.

The fusible switch disconnect device is the Type DS. It is a quick-make, quick-break, visible blade switch with fusing facilities for use with current-limiting or dual element, rejection type, NEMA Class "J" or "R" fuses. Facilities for NEMA Class "H" fuses are available.

Both breaker and fuse selection should take into consideration the total short circuit capacity of the system to which the control center is connected.

The starter units are equipped with A200 Contactors for NEMA Sizes one through four and GCA Contactors for NEMA Sizes five and six. These contactors have been successfully applied in thousands of the most demanding industrial applications. Overload protection is provided by a three pole thermal overload relay as standard with ambient compensated also available. The overload relay has adjustable hand or automatic resetting. The hand reset button extends through the unit door. All relays have a "no" stop feature as standard. The location of all control elements contained in each unit has been designed to provide a coordinated control area for easy recognition of functions and maximum operator efficiency.

Typical starter units available include the following:

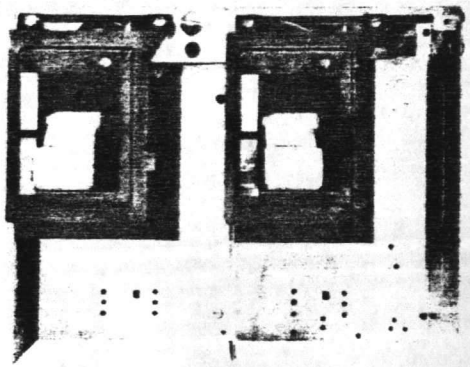
Full Voltage, Non-Reversing
Full Voltage, Reversing
Full Voltage, Non-Reversing, Two Speed, Single Winding
Full Voltage, Non-Reversing, Two Speed, Two Winding

Reduced Voltage, Autotransformer, Closed Transition
Reduced Voltage, Part Winding
Reduced Voltage, Wye-Delta, Closed Transition

All starters through NEMA Size 5 are [illegible] design except Size 5 reduced voltage.

Control Centers
Five Star

Feeder Tap Units

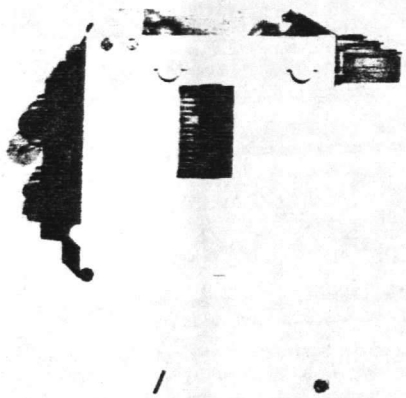


Feeder tap units may contain either circuit breakers or fusible switches. Draw-out breaker units include the fixed trip Type FB, single or dual mounted in ratings through 150 amperes and the interchangeable trip Types KB and LB single mounted through 250 amperes and 400 amperes respectively. Larger circuit breakers are non-draw-out fixed mounted. Adjustable seltronic breaker is standard. Ratings to 2000 amperes are available.

Fusible feeder tap units utilize the Type DS Switch through 200 amperes. Molded case switches and fuses are furnished for 400 amperes and above. These switches are mounted in draw-out units through 400 amperes with the 30 ampere and 60 ampere ratings available in dual mounting. Ratings from 600 amperes through 1200 amperes are fixed mounted.

The DS switches are supplied with fusing facilities for use with current-limiting or dual element rejection type, NEMA Class "J" or "R" fuses. Facilities for NEMA Class "H" fuses can also be supplied.

Terminal Blocks



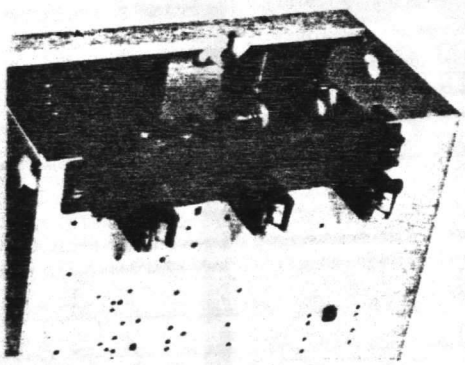
A new side mounted terminal block is standard on units with NEMA Type B or C wiring. These terminal blocks are mounted in knockouts on the wireway side of the unit wrapper. This placement provides greater access to other components within the unit.

The terminal block is available in three types; Standard Pressure Connector, Pressure Pull-Apart, and Pull-Apart for ring or spade type crimp terminations. The smallest starter unit (2X or 12 inches high) can accommodate up to three of the new side mounted terminal blocks providing a maximum of 21 circuits in the standard pressure types and up to 18 circuits in the spade or ring type. Larger starter units can accommodate additional terminal blocks.

As an alternate, terminal blocks may be mounted across the bottom front of the unit.

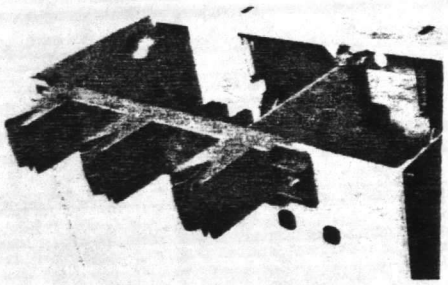
Standard track mounted terminal blocks include the following types: Standard Pressure Connector, Standard Pressure Pull-Apart, Straight Ring or Spade type for crimp terminations, and Pull-Apart Ring or Spade type for crimp terminations. When mounted in this fashion, a maximum of 30 circuits can be provided by the Standard Westinghouse Pressure types and the Ring and Spade types. Wiring within each unit and to the terminal blocks is made with 16 AWG stranded thermoplastic-insulated wire rated 105°C. Power wiring is black and sized to carry the maximum full load current of the unit. AC control wiring is red and DC control wiring is blue. Plug-in type terminal blocks can be supplied for all control wiring and load wiring through size 2 when specified.

Stab Assembly



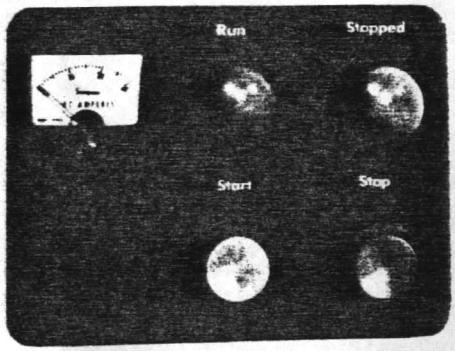
A newly designed two component copper alloy stab incorporates the ultimate in mechanical simplicity to provide precise control of contact pressure on the bus. This assures a positive connection yet permits easy unit insertion and withdrawal. Self aligning Magna-Grip® stabs are mounted in a glass reinforced plastic insulation block which totally shrouds each stab and absolutely ensures positive alignment of the stabs with the vertical bus. The insulation block is also an integral part of the phase to phase isolation system. Power wiring is firmly welded to the stabs and is totally contained within the unit enclosure. This means the vertical bus compartment is completely free of wiring for maximum safety and reliability.

Four stab assembly sizes are used; 60, 150, 300 and 400 amperes to accurately match the electrical requirement of each unit.



I Units, Continued

Device Panel

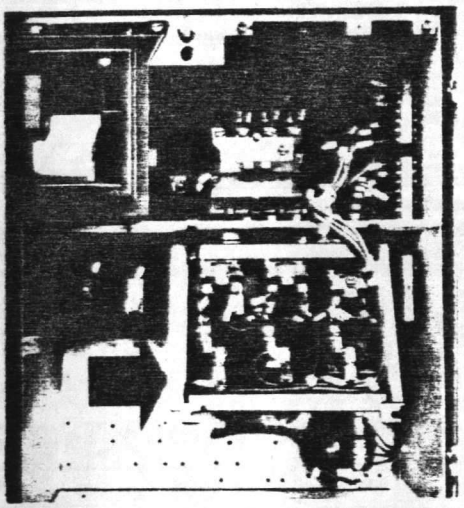


The new device panel can accommodate up to six pilot devices such as oil-tite pushbuttons, indicating lights, selector switches and a new line of miniature meters.

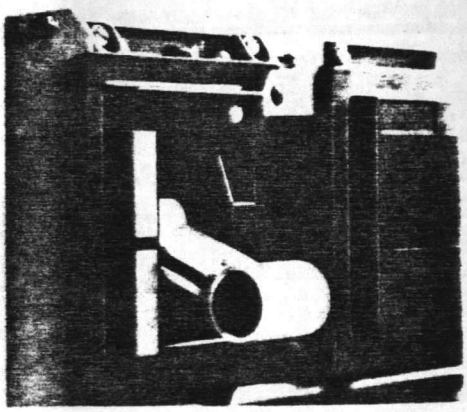
The device panel is hinged on a horizontal rod extending across the front of the unit. With the unit door open, loosening two captive retaining screws at the top of the panel and sliding it ½ inch left, permits it to swing down. This provides ready access to the rear of the panel and increased accessibility to the unit interior.

Molded into the panel is a knock-out for each device location. This facilitates the future addition of devices to the panel.

The panel is molded of a durable, chemically stable plastic material which eliminates corrosion. The textured surface of the panel prevents smearing and fingerprinting to preserve the pleasing appearance of the unit under operating conditions.



Handle Mechanism



The new handle mechanism is designed to provide a high mechanical advantage so that little effort is required to operate any device. Two sizes are used; the smaller mechanism for devices through 400 amperes, and the larger mechanism for devices through 1200 amperes.

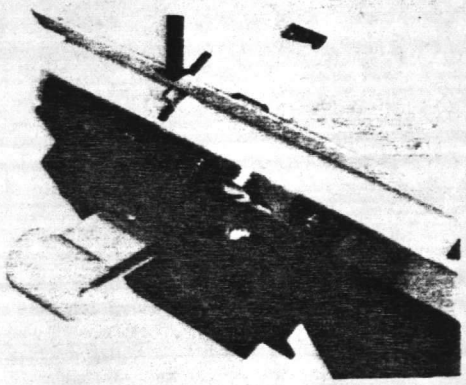
The handle mechanism is a vertical motion type device with three positions; ON, OFF and TRIPPED. It is mounted securely by the wrapper, breaker or fusible switch to eliminate alignment problems and to provide a positive indication of the breaker or switch position, even with the door open.

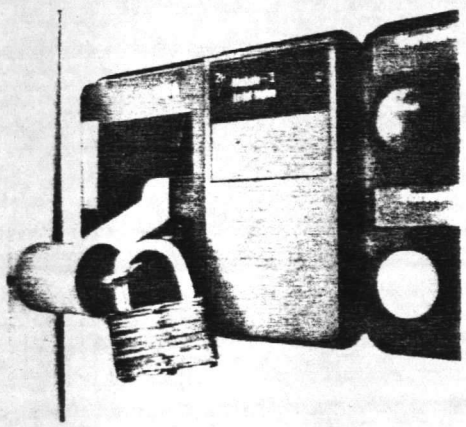
The handle mechanism provides several safety features.

In the "ON" position an interlock prevents the unit door from being opened. However, to enable authorized maintenance personnel to gain access to the units when required, a door interlock defeater screw is located above the handle.

With the unit door open and the operating handle in the "ON" position, an interlock slides into a slot in the divider pan above and prevents removal of the unit. This same interlock prevents insertion of the unit (as shown below) unless the handle mechanism is in the "OFF" position.

To insure that units are not energized accidentally or by unauthorized personnel, the handle mechanism can be padlocked in the "OFF" position. Sufficient space is available for a minimum of three padlocks. Where critical processes are involved and to prevent unauthorized shutdown, the handle mechanism can be modified to enable padlocking in the "ON" position.

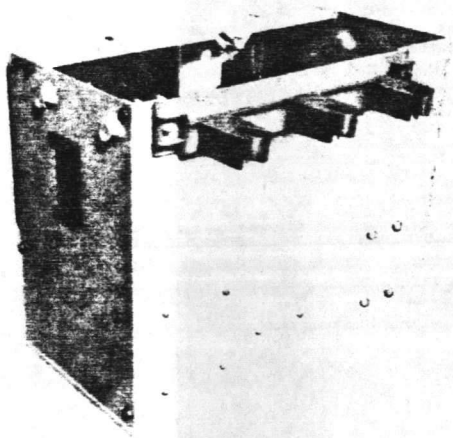




The handle and exterior mounting panel are molded from the same plastic material as the device panel. The mounting panel has a textured surface to preserve appearance. The "ON" position of the mechanism is indicated by a red background; the "OFF" position by a green background. Both positions are highly visible even at a considerable distance. The operating handle is designed for rugged duty and good operator feel. Its color contrasts with the device and mounting panels for easy recognition.

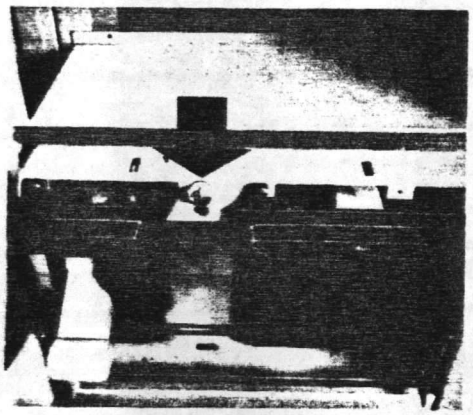
Control Centers
Five Star

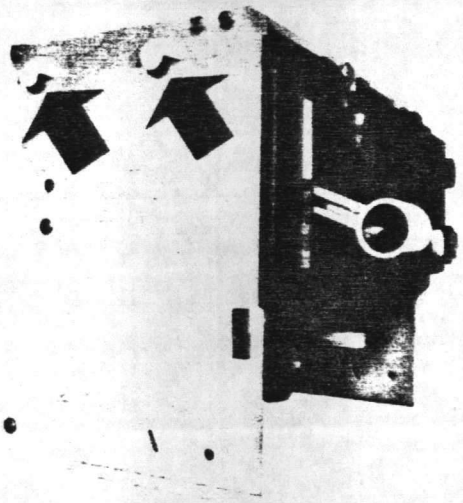
Unit Wrapper



The unit wrapper is designed to provide ample space for cable entry from the wireway to the unit.

The unit wrapper has four mounting points, two on each side, which support the unit in the structure. They engage guide rails located near the top of each unit space. This mounting point guide rail system produces minimum friction and allows units to be inserted and withdrawn easily. The guide rails also give precise alignment to the unit for accurate stabbing on the vertical bus.



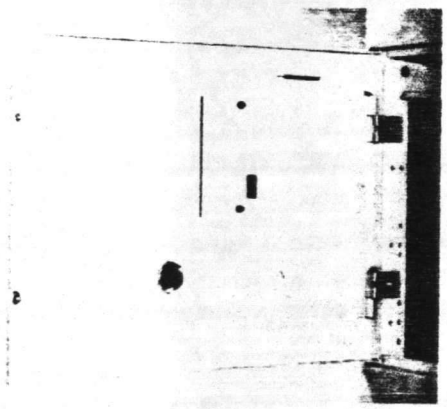


The unit wrapper is fabricated of 16 gauge steel. After fabrication, it is cleaned and given a rust inhibiting phosphatizing treatment. The finish on the unit wrapper is a baked on enamel ASA 70. This is a highly durable enamel, off white in color to increase visibility within the unit and facilitate wiring and maintenance procedures.

The unit wrapper provides three sides of a rugged steel shell and the mounting base for the unit components. The smallest unit measures 13¾ inches wide, 8 inches deep and 12 inches high. Units increase in size in 6 inch increments to a maximum height of 72 inches.

At the top center of the unit wrapper is a quarter turn latch which securely holds the unit in the compartment. The latch can only be engaged when the stabs are fully mated with the vertical bus. Upon release of the latch the unit can be partially withdrawn (as shown above) such that the stabs disengage from the vertical bus. In this position the latch can be re-engaged to prevent the unit from being returned to the fully stabbed position or from being removed from the structure. The latch can be padlocked in this position to ensure the stabs remain disengaged during maintenance.

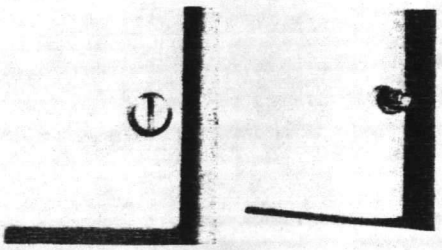
Unit Doors



Unit doors are formed of 14 gauge steel with a ½ inch flange on all four sides. The flange adds rigidity to the door and provides a surface to contain door gasketing when applied. Cutouts are made in the door as required to accommodate the operating handle and device panel. The doors are cleaned, phosphatized and given a finish of off-white, baked on enamel ASA 70.

The doors will open approximately 110° and opposite to wireway doors permitting optimum access to the unit compartment. The doors are mounted on removable pin hinges. This permits quick removal of any door in a vertical structure without disturbing adjacent doors.

Each door is provided with a minimum of two quarter turn indicating type fasteners. They securely hold the door in the closed position, yet allow quick and easy access to the unit when required. The fasteners provide a visual indication of the latched position.



Control Centers
Five Star

I Units, Continued

Nameplates
Unit nameplates are of engraved plastic with ⅛ inch high white lettering on a black background. They are heat and crack resistant to eliminate the need for replacement. Nameplates are mounted with screws.

Modifications
Starter and feeder tap units can be modified to meet a variety of specification requirements. Some typical components which can be added include; control circuit transformers – fused or unfused; control relays, MOR (modular overload) relays, groundgard relays, current transformers, extra electrical interlocks, pushbuttons, selector switches, indicating lights, circuit breaker shunt trip or undervoltage release and auxiliary switches. In most cases, these modifications do not increase starter unit size.

Additional Equipment
In addition to motor starter and feeder units additional equipment can be supplied including the following:

Single phase dry type distribution transformers in ratings of 3, 5, 7.5, 10 and 15 KVA.

Three phase dry type distribution transformers in ratings of 9, 15, 22.5, 30 and 45 KVA.

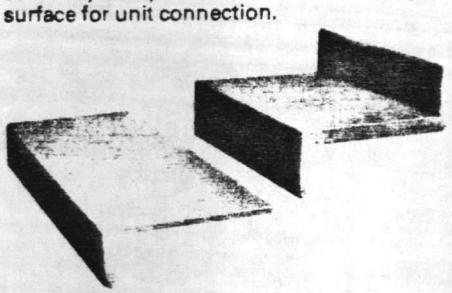
Lighting panelboards with 12, 18, 24, 30, 36, or 42 circuits with either plug-in branch breakers or bolt-on branch breakers.

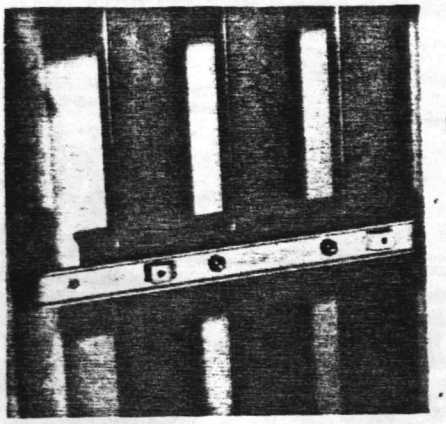
Current limiting reactors with ohmic values of .01, .015, .02 and .025 and amperage ratings of 600, 800, 1000 and 1200.

Metering equipment such as voltmeters, ammeters, wattmeters and power factor meters.

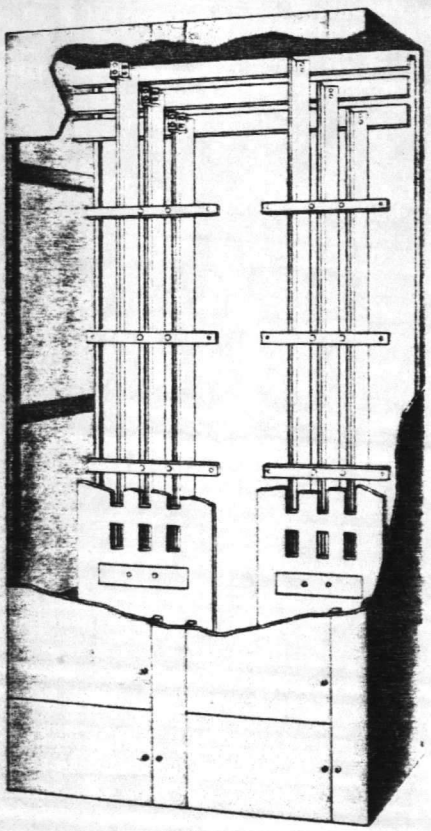
II. Bus System

Vertical Bus
The vertical bus provides three phase power distribution from the main horizontal bus to the vertical compartments. The bus is a unique angular configuration with an "L" shape for front mounted only structures and a "T" shape for back to back mounted structures. These shapes have the inherent mechanical strength to withstand fault stresses. They also provide a smooth stabbing surface for unit connection.



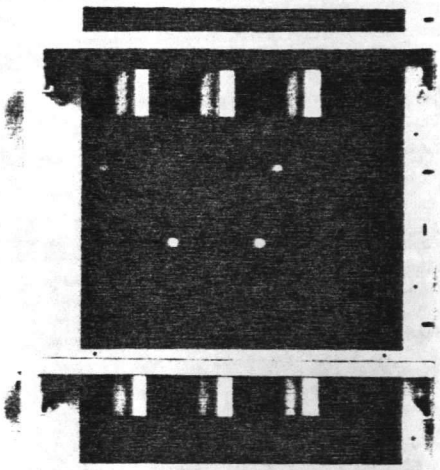


Due to the high strength capability of the bus bars, bus bracing at 42,000 RMS symmetrical amperes is standard. Optional bracing is available at 65,000 and 100,000 RMS. Bus braces are molded from a glass-reinforced polyester material which is non-tracking and impervious to moisture and other adverse atmospheric operating conditions.



Control Centers
Five Star

Vertical Bus, Continued

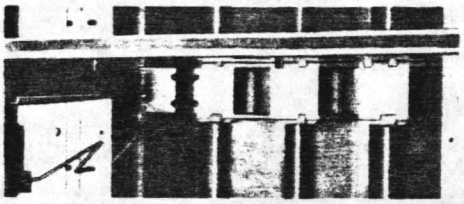


The vertical bus is available in ratings of 300, 600, 800 and 1200 amperes for front mounted only, and 600 and 800 amperes for back to back mounted. Standard vertical bus bars through 600 amperes are tin plated aluminum with the special POLYTET-50 process. Copper bus is available as an option in 300 and 600 amperes and is standard in 800 and 1200 ampere ratings.

The exclusive POLYTET-50 process further improves the corrosion resistant qualities of tin plated aluminum when used in severe environments. It also provides a lubricating effect which prevents stabs from galling and facilitates easy removal and insertion of units.

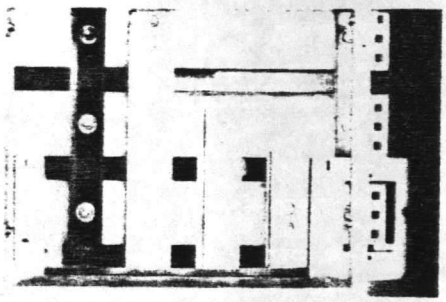
Isolation of the vertical bus compartment from the unit compartments is accomplished by a full height barrier which is provided as standard. This is a single sheet of glass-reinforced polyester with cut-outs to allow the unit stabs to engage the vertical bus. Snap in covers are available for the cutout openings to provide total isolation during maintenance procedures.

When insulation and isolation of the vertical bus is required, a labyrinth design barrier is available. This barrier is molded glass reinforced polyester and forms a labyrinth around the bus bars to restrict fault propagation. This design provides maximum protection against phase to phase insulation breakdown. Thermal efficiency is maintained by a close tolerance fit between the bus bars and the barrier which minimizes air pockets. This insures compliance with NEMA and UL heat rise standards.



An automatic shutter mechanism is included with the labyrinth barrier to provide complete isolation of the vertical bus. The shutter moves automatically to cover the stab openings when a unit is removed. This provides maintenance personnel with maximum protection since the vertical bus is never exposed. As the unit is reinserted in the compartment, the shutter moves sideways to uncover the stab openings in the barrier.

Horizontal Bus



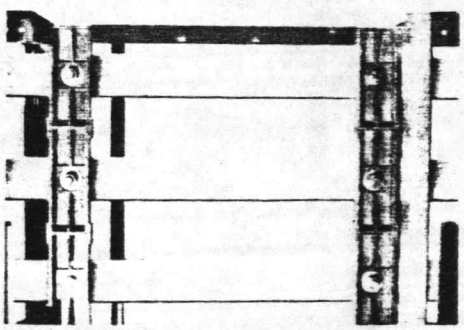
The main horizontal bus provides three phase power distribution from the incoming line or primary disconnect device to each vertical structure in an assembly. The bus bars are mounted in a vertical plane, edge to edge. This mounting produces an exceptionally strong assembly able to withstand high fault current stresses.

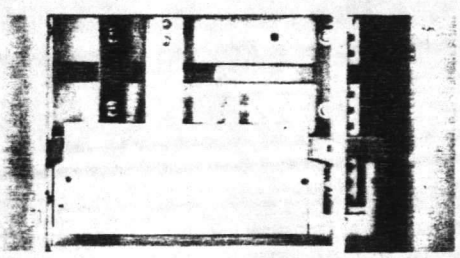
Standard horizontal bus bracing is 42,000 RMS symmetrical amperes. Optional bracing is available at 65,000 and 100,000 RMS. Bus braces are molded from a glass reinforced polyester material with high strength which is non-tracking and impervious to moisture and other adverse atmospheric operating conditions.

The main horizontal bus is rated at 600 amperes as standard with ratings of 800, 1000, 1200, 1400, 1600, 2000 and 2500 amperes optionally available. Tin-plated aluminum bus bars are supplied as standard. Tin-plated aluminum or copper is available for ratings up through 1200 amperes. Above 1200 amperes only copper bus is supplied.

The horizontal bus is rated at 65°C temperature rise in compliance with NEMA standards. A rating of 50°C temperature rise to comply with UL Standards is available as an option.

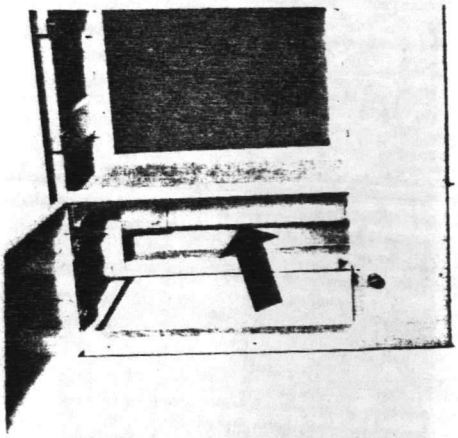
The horizontal main bus is isolated from the top horizontal wireway compartment by an isolation barrier. This two piece steel barrier extends to the full width of each vertical structure. The two piece design allows access to bus connections without the removal of the entire barrier, for added maintenance convenience. The bus bar layout permits front access to all bus connections. This allows maintenance personnel to make splices and check splice bolt torques from the front of the structure.





II Bus System, Continued

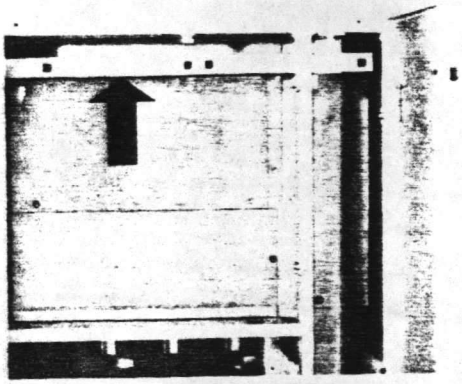
Neutral Bus



Neutral bus can be supplied one half or full rated. The bus bar is mounted on stand-off insulators across the bottom of each vertical compartment when specified.

Tin-plated aluminum or copper bus is also available.

Ground Bus



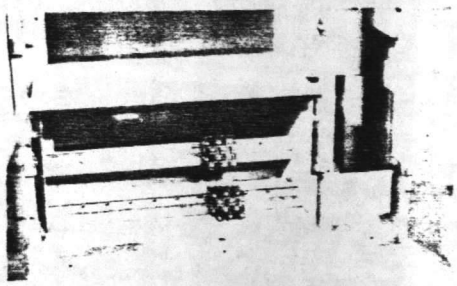
Ground bus is available in ¼ inch by 1 inch tin-plated aluminum or copper. Tin-plated aluminum is standard. Mounting is across the top of each vertical structure in the horizontal wireway when specified. The bus can also be mounted across the bottom when the bottom 6 inches are not occupied by units or master terminal blocks.

Control and Load Terminations

For NEMA Type A wiring each unit is assembled and devices interwired. Terminal blocks are not supplied and control and load wiring is internal to the unit.

For NEMA Type B wiring, control wires are terminated at blocks within the unit. Refer to the discussion of units for types of terminal blocks available.

For NEMA Type C wiring, control and load wires are extended from the unit terminal blocks to master terminal blocks located at the top or bottom of any vertical structure.



The mounting location of the master terminal block in front mounted only structures is in the existing horizontal wireway space at the top or at the bottom as shown above. When mounting is made in an incoming line section, twelve inches of unit space must be used. When mounting is made in the rear of back to back mounted structures, 6 inches of unit space must be used at the bottom and 12 inches at the top.

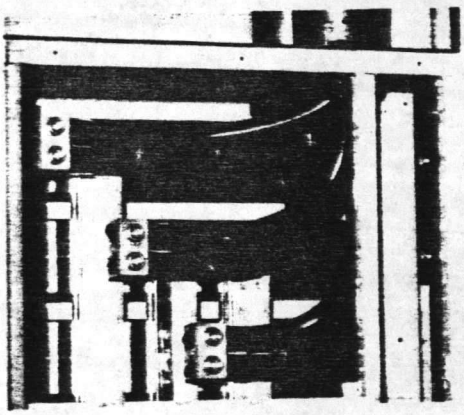
Master terminal blocks can be either fixed or draw-out mounted with draw-out provided as standard. In the draw-out design the terminal blocks are rack mounted to permit removal of the entire assembly for ease of wiring during installation and maintenance.

Incoming Line

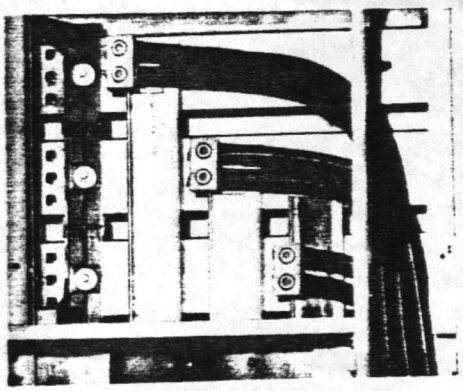
Incoming line cables entering from the top of the control center can be easily terminated on the main horizontal bus or connected to a main breaker. Incoming line (more than one per phase) entering from the bottom of the structure can be easily terminated at the bottom of the vertical bus in that section at ratings through 1200 amperes. Adapters can be provided for up to four cables per phase and for crimp-on lugs. Terminals are suitable for both copper and aluminum cable.

Copper or aluminum cables of #6-350 MCM, two per phase, can be terminated in the incoming line structure utilizing 6 inches of additional space. Copper or aluminum cables of 400-600 MCM, two per phase, can be terminated with the addition of 6 inches for top entry and the addition of 18 inches for bottom entry terminating on vertical bus.

Vertical bus rated same as horizontal bus in incoming line section when incoming line lugs are terminated on vertical bus.



Incoming line entering from the top



Incoming line entering from the bottom

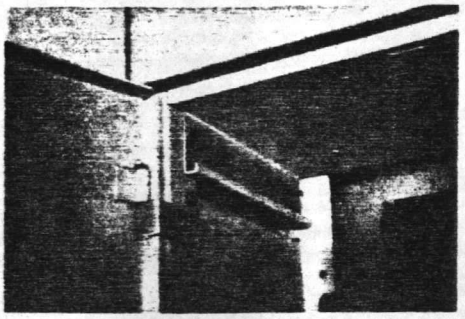
Control Centers
Five Star

III. Structure

Construction
The standard vertical structure is 90 inches high and 20 inches wide. Front mounted only structures can be either **16 inches or 21 inches deep.** Back to back mounted structures are 21 inches deep.

The **structure** framework is made of **12 gauge formed steel channels.** The **sub-frames** for the front and rear of each structure are **welded.** These sub-frames are then **bolted to longitudinal members** to form the complete frame which is rigid and self-supporting. Side, back and roof sheets of **14 gauge steel** are mounted with screw fasteners for quick and easy removal when desired. **All doors are 14 gauge steel with a ½ inch flange to provide a rigid, secure closure for all openings.** Doors mounted on **removable pin hinges** are provided on all unit compartments, vertical wireways, top horizontal wireways, and bottom horizontal wireways.

The unit pan forms the top barrier of each unit space. In conjunction with the unit wrapper this provides **isolation between adjacent units and wireways.** The guide rails are an integral part of this pan and provide **precise alignment of the unit stabs on the vertical bus.**



All structure elements are **thoroughly cleaned after fabrication and given a phosphatizing treatment to inhibit rust and prime the metal for the finish coating.** A baked enamel **ASA 70** off-white is applied to the structure framework, back sheets, doors and units. Charcoal grey is applied to the roof and side sheets.

Standard Structure Arrangements

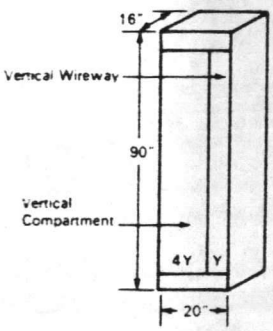


Figure 1
12X space
front mounted only

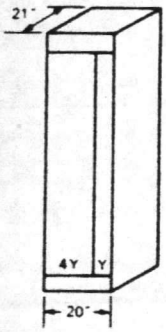


Figure 2
12X space
front mounted only

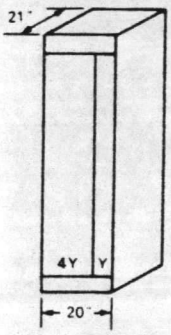


Figure 3
24X space
back to back

Standard structural height is 90 inches with 9 inch spaces available at top and bottom for wiring. The balance of vertical compartments, 72 inches, is available for mounting of control devices. This space can provide up to **twelve 6 inch high (X spaces)** or any combination thereof. Structures containing incoming line sections are limited in their width.

Note: In the rear of **back to back structures** the top horizontal wireway is **15 inches high** and the bottom wireway is **3 inches.**

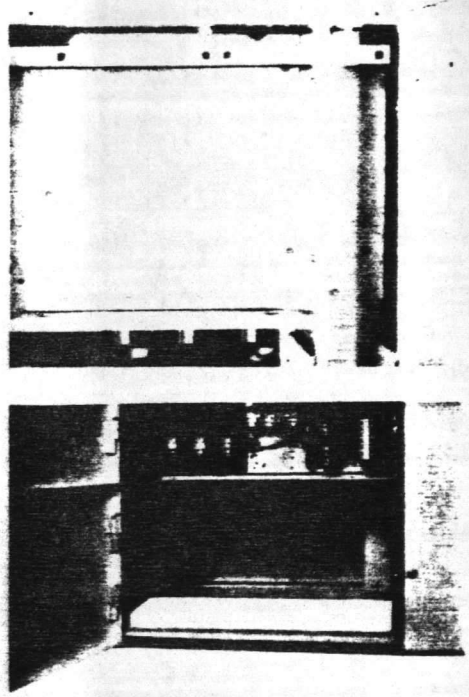
III. Structure

Vertical Wireway

A vertical wireway is provided in each vertical structure. Located on the right side, it extends the full 90 inch height of the structure. The width of the wireway is 4⅝ inches at the rear of the vertical frame members. Overall depth of the wireway is 8 inches providing a cross-sectional area of nearly 35 square inches to easily accommodate control and load wiring. Supports are provided at suitable intervals to secure all wiring and cables.

The wireway opening is covered by two doors, top and bottom, so that the entire wireway need not be exposed to gain access to one section. The doors swing open 110° and opposite to the unit doors for maximum accessibility. The doors are mounted on removable pin hinges for quick detachment and are secured in the closed position by two quarter-turn indicating type fasteners.

Horizontal Wireways



The top horizontal wireway is 9 inches high and 8 inches deep in front mounted only structures and in the front of back to back mounted structures. It extends the full width of each structure and is barriered from the main horizontal bus. The bottom horizontal wireway is 9 inches high and extends the full depth of the structure. This provides unlimited wiring space. The entire floor area under the control center is open for unrestricted conduit entry. For top entry, the top wireway can be increased to 15 inches high, reducing the bottom wireway height to 3 inches.

For back to back mounted structures, the top horizontal wireway at the rear is 15 inches high and 6 inches deep. The bottom wireway is limited to 3 inches high for a depth of 11 inches.

All horizontal wireway openings are covered by doors for increased accessibility. Each door is mounted with removable pin hinges to allow quick detachment and securely closed with a quarter turn indicating type fastener.

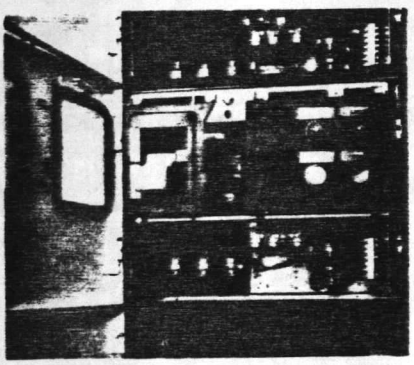
Special Structures

In addition to the standard 20 inch wide structure, extra wide structures are available in 4 inch increments up to 32 inches wide. These structures can be supplied with or without 4⅝ inch wide vertical wireways. They are used for mounting transfer switches, SPCB and DS breakers and other special equipment.

Another special structure is a transition section between Type W and the Five Star. This structure is 10 inches wide to provide for horizontal bus splicing.

Enclosures

The standard enclosure type is the NEMA 1 General Purpose – Indoor. This enclosure is appropriate for installations with normal atmospheric conditions.



The NEMA 1 Gasketed Enclosure has gasketing material around the perimeter of all doors and door cut-outs. It is used to prevent airborne matter from entering the control center.

The NEMA 2 Dripproof – Indoor employs a special roof panel with a drip shield and water channels. This prevents liquid from dripping into the control center.

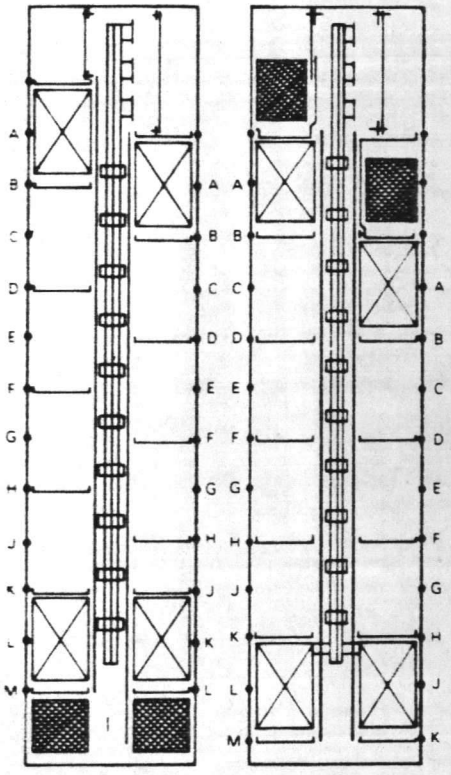
The NEMA 3R Rainproof and Sleet Resistant – Outdoor consists of a NEMA 1 enclosure mounted on a special base with an outdoor house erected around and over it. Both walk-in, non-walk-in aisle and tunnel types are available.

The NEMA 12 Dusttight and Driptight – Indoor has gasketing material around all doors, door cut-outs, cover plates, side, top and back sheets. A gasketed bottom plate is available with this enclosure. This construction provides maximum protection against airborne matter and dripping liquids.

Control Centers
Five Star

Structure Layout
Sketches show the number and location of vertical (x) spaces available with master terminal blocks furnished at the top or bottom of the structure. Each space A to B, and B to C, etc. equals one vertical space equal to 6."

MTB Bottom Location **MTB Top Location**



For layout or devices see number of x spaces required as shown in Tables A thru G.

Table A: NEMA Combination Starters

Max. Horsepower 230 Volts ②	Max. Horsepower 460/575 Volts ②	NEMA Size	Std. Breaker Type	Fuse Clip Size	Full Voltage Starter Function ①	Full Voltage Height, In. Brkr.	Full Voltage Height, In. Fuse ③	Reduced Voltage Starter Function ①	Reduced Voltage Height, In. Brkr.	Reduced Voltage Height, In. Fuse
7½	10	1	MCP㉜	30 60㊵	NR R MM MS	12 18 18 18	12 18 24 18			
15 (10)	25 (15)	2	MCP㉜㉝	60 100㊵	NR R MM㉞ MS	12 18 18 18	18④ 18 24 24	1 PW Res. Auto	18 36 36	24 36 36
30 (25)	50 (40)	3	MCP㉜㉝	100 200㊵	NR R MM㉞ MS	18 24 30 36⑨	24 36 36 48⑨	2 PW Res. Auto	18 36 54	36 36 60
50 (50)	100 (75)	4	MCP㉜㉝	200 400㊵	NR R MS	18 24 36⑨	42㊳ 48㊳ 54⑨㊳	3 PW Res. Auto	24 24⑤ 54	42 48⑤ 72
100 (75)	200 (150)	5	LA㉜	400 600㊵	NR R MS	36⑦ 54 72	54 72 ..	4 PW Res. Auto	30 72⑤ 72⑤	54 .. 72⑤⑥

① Starter Functions: NR, non-reversing; R, reversing; MM, multi-motor; MS, multi-speed; PW, part winding; Auto, auto-transformer; Res., resistor.
② Horsepowers in parenthesis refer to part winding starters only.
③ With provisions for class H, J or R Fuses.
④ With 60 Ampere fuses deduct 6 inches.
⑤ Requires 21" deep vertical compartment.
⑥ Requires extra width vertical compartment.
⑦ Add 6 inches with full capacity transformer.
㊵ With time delay fuses, fuse clips are one size smaller.
⑨ For 2 speed, 2 winding starters, deduct 12 inches.
㊱ For 2 speed, 2 winding starters, deduct 6 inches.
㊲ Dimensions for 2 motor starters only.
㊷ Thermal-magnetic breakers available on request. Add 12" for size 4.
㊸ For MCP plus current limiter, add 6" to height dim.
㊳ With 200 A fuses deduct 6 inches.

Table B: Main Air Circuit Breakers, 600 VAC

Type Breaker	Breaker Rating	No. of Poles	Space Required Width	Space Required Height	Space Required Depth	Fixed or Drawout	Number of Spaces Required
FB	150	2-3	16	12"	10½	D	2X
KB	250	2-3	16	24"	10½	F	4X
LB	400	2-3	16	30"	10½	F	5X
MC	800	2-3	16	30"	16	F	5X
NC	1200	2-3	16	42"	16	F	7X
PC	1600	2-3	16	72"	21	F	12X
PC	2000	2-3	16	72"	21	F	12X
PC	2500	2-3	16	72"	21	F	12X

Table C: Feeder Air Circuit Breakers

Type Breaker	Breaker Rating	No. of Poles	Space Required Width	Space Required Height	Space Required Depth	Fixed or Drawout	Number of Spaces Required
FB①	150	2-3	16	12"	10½	D	2X
KB	250	2-3	16	18"	10½	D	3X
LB	400	2-3	16	24"	10½	D	4X
MC	800	2-3	16	30"	16	F	5X
NC	1200	2-3	16	42"	16	F	7X

① Any two of these units can be mounted in one unit 12" high.

NAME OF PROJECT:	REPAIR ELECTRIC SERVICE, TRANSFORMERS, AND SWITCHGEAR
LOCATION:	BUILDING 1700, MARINE CORPS BASE, CAMP LEJEUNE, N. C.
DESIGNED BY:	DESIGN DIV., PUBLIC WORKS DEPT., MARINE CORPS BASE CAMP LEJEUNE, N. C.
CONTRACT NO:	N62470-79-C-4471

TYPE OF SUBMITTAL:	15 K.V. H.V. Cable
LOCATION:	Outdoors
GOVERN. SPEC.:	16300 Paragraph 6.6.3

SUBMITTED BY:

CAMPBELL ELECTRICAL CO., INC.

WILSON, N. C. 27893

REVIEWED

Date 9-24-81 By mR

OFFICE OF THE
OFFICER IN CHARGE OF CONSTRUCTION
CAMP LEJEUNE, NORTH CAROLINA

APPROVED "AS NOTED"

SUBJECT TO CONTRACT REQUIREMENTS

CONTRACT N62470-79-C-4471

DATE 9/29/1981

R. E. CARLSON
CDR, CEC, USN
Officer in Charge
of Construction

VULKENE® Power Cable

Shielded-FLAMENOL® Jacketed
IPCEA • Type MV-90
SI-58147

Single-conductor | **15 kV Gnd or Ungnd Neutral**

Effective Jan. 15, 1979
Supersedes issue
Oct. 31, 1977

APPLICATION: Where NEC requirements apply, cable is suitable for use in dry or wet locations at conductor temperatures not exceeding 90°C. All sizes may be installed in conduit or duct or for properly supported aerial installations. May be directly buried when conditions of NEC Articles 710-3 (b) and 250-51 are met. Listed by Underwriters's Laboratories, Inc. as Type MV-90. Meets requirements of NEC Article 326.

Where NEC requirements do not apply, cable is also suitable for use in racks and trays. Cable may also be directly buried.

FEATURES: Small diameter, physically tough ozone-resistant cable. Insulation has excellent thermal and electrical properties combined with outstanding moisture and chemical resistance. Jacket provides additional acid, alkali, oil, and sunlight resistance.

CONSTRUCTION: Copper- or aluminum-stranded conductor, semi-conducting tape, (size 600MCM and larger, semi-conducting tape and semi-conducting extrusion), white VULKENE insulation, semi-conducting coating and tape, bare copper concentric wire shield, polyester film tape, FLAMENOL jacket.

MEETS IPEA STANDARD S-66-524
Listed by Underwriters' Laboratories as Type MV-90

CONDUCTOR TEMPERATURE 90°C

Conductor		Thickness		Approx OD in Inches	Ampacity† 40°C Ambient		Minimum Ordering Quantity in Feet	Standard Pack in Feet	Approx Ship Wt in Lb per M Ft Net Wt 1/6 Less	
Size AWG or MCM	No. of Strands	Insulation	Jacket		COPPER Conductors	ALUMINUM Conductors			COPPER Conductors	ALUMINUM Conductors
GROUNDED NEUTRAL (INSULATION LEVEL 100%)										
2★	7	175	80	0.96	150	115	5000	2000	662	493
1†	19	175	80	1.00	170	130	5000	....	755	540
0★	19	175	80	1.04	195	150	5000	2000	868	597
00★	19	175	80	1.09	255	175	5000	2000	1009	667
000	19	175	80	1.14	260	200	5000	....	1171	740
0000★	19	175	80	1.19	295	230	5000	2000	1374	832
250	37	175	80	1.24	330	255	5000	....	1549	902
350★	37	175	80	1.35	395	310	5000	2000	1991	1095
500★	37	175	80	1.48	480	375	5000	2000	2651	1361
750‡	61	175	110	1.85	585	486	5000	....	3726	1783
1000‡	61	175	110	2.00	675	565	3000	....	4901	2312
UNGROUNDED NEUTRAL (INSULATION LEVEL 133%)										
1★	19	220	80	1.08	170	130	5000	2000	847	632
0★	19	220	80	1.12	195	150	5000	2000	964	693
00	19	220	80	1.17	225	175	5000	....	1099	757
000	19	220	80	1.22	260	200	5000	....	1266	835
0000★	19	220	80	1.28	295	230	5000	2000	1472	930
250	37	220	80	1.32	330	255	5000	....	1652	1005
350★	37	220	80	1.43	395	310	5000	2000	2105	1206
500★	37	220	80	1.56	480	385	5000	2000	2771	1480
750 ‡	61	220	110	1.93	585	485	5000	....	3860	1917
1000 ‡	61	220	110	2.09	675	565	3000	....	5053	2465

FACTORY: Bridgeport.
CABLE IDENTIFICATION: Surface ink print giving conductor size, copper or aluminum, voltage, insulation type (XLP) and thickness, TYPE MV-90 (UL), General Electric, point of manufacture, VULKENE, SI-58147, year of manufacture Center strand stamped GE and year of manufacture.
SHIELDING: Lapped bare copper tape shield, available on special order.
SPLICING AND TERMINATING: When terminating or splicing, it is essential that both the semi-conducting coating and semi-conducting tape over the insulation be completely removed.

EXPLANATION OF SYMBOLS:

★ Authorized for stock in copper conductor.

† Based on three insulated conductors or triplexed cable in single isolated conduit in air per 1978 NEC Table 310-43 and 310-44.

‡ This size has extruded strand shield.

® Reg. Trademark of General Electric Company.

DATA SUBJECT TO CHANGE WITHOUT NOTICE

New Information. SI-58802/SI-58803 moved to WCD 110, page 23.

For prices refer to WCP-129, page 4.

GENERAL ELECTRIC

GENERAL ELECTRIC COMPANY, BRIDGEPORT, CONN.
Wire and Cable Department

NAME OF PROJECT: REPAIR ELECTRIC SERVICE, TRANSFORMERS, AND SWITCHGEAR
LOCATION: BUILDING 1700, MARINE CORPS BASE, CAMP LEJEUNE, N. C.
DESIGNED BY: DESIGN DIV., PUBLIC WORKS DEPT., MARINE CORPS BASE CAMP LEJEUNE, N. C.
CONTRACT NO: N62470-79-C-4471

TYPE OF SUBMITTAL: Pole Line Material
LOCATION: Various
GOVERN. SPEC.: #16300, Paragraph 6.7

SUBMITTED BY:

CAMPBELL ELECTRICAL CO., INC.
P. O. BOX 730
WILSON, N. C. 27893

REVIEWED
Date 8-4-81 By

OFFICE OF THE
OFFICER IN CHARGE OF CONSTRUCTION
CAMP LEJEUNE, NORTH CAROLINA

APPROVED

SUBJECT TO CONTRACT REQUIREMENTS
CONTRACT N62470-79-C-4471
DATE 8/11/1981

R. E. CARLSON
CDR, CEC, USN
Officer in Charge
of Construction

OFFICE OF THE
OFFICER IN CHARGE OF CONSTRUCTION
CAMP LEJEUNE, NORTH CAROLINA

APPROVED

SUBJECT TO CONTRACT REQUIREMENTS

CONTRACT

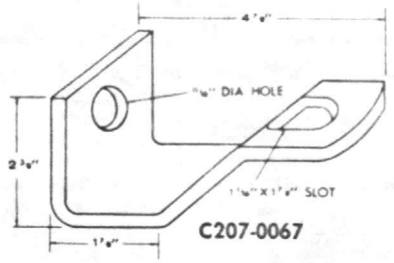
DATE

R. E. CARLSON
CDR, CEC, USN
Officer in Charge
of Construction

TONGUE, DEADEND

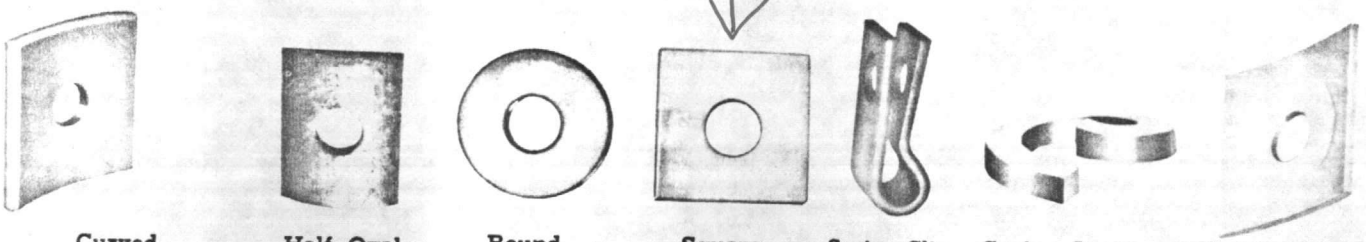
Mounts to wood or metal crossarms for attaching all types of strain insulator clevises. The hook, clevis or eye of porcelain deadend insulators can be attached to slot in tongue. Hot dipped galvanized.

Catalog No.	Stock	Approx. Ship. Wt., Lbs. Per 100 Pcs.
C207-0067	¼" x 2"	350



C207-0067

WASHERS



Curved | Half Oval | Round | Square | Spring Clip | Spring Lock | Saddle

Curved Washers

Catalog No.	Dimensions in Inches			Approx. Ship. Wt., Lbs. Per 100 Pcs.
	Washer Size	Hole Dia.	Bolt Dia.	
*6809½	4 x 4 x ¼	13/16	7/8	120
*6810½	2¼ x 2¼ x 3/16	11/16	5/8	26
6822	2½ x 2½ x 3/16	11/16	5/8	36
*6822½	3 x 3 x ¼	13/16	¾	66
6823	3 x 3 x ¼	7/8	¾	62
*6823½	3 x 3 x ¼	11/16	5/8	68
6825	3¼ x 3⅛ x ¼	11/16	¾	76
*6829	3½ x 3½ x 3/8	7/8	¾	122
6830	3½ x 3½ x 3/8	1⅛	1	129

* E. E. I. Standard

Square Washers

Catalog No.	Dimensions in Inches			Approx. Ship. Wt., Lbs. Per 100 Pcs.
	Washer Size	Hole Dia.	Bolt Dia.	
*6811	2 x 2 x ⅛	9/16	½	13
*6812	2 x 2 x ⅛	11/16	5/8	12
*6813	2¼ x 2¼ x 3/16	11/16	5/8	25
6813½	2¼ x 2¼ x 3/16	13/16	½	26
*6814	2¼ x 2¼ x 3/16	13/16	¾	24
6816	3 x 3 x 3/16	11/16	¾	51
*6817	3 x 3 x ¼	11/16	¾	64
*6817½	3 x 3 x ¼	7/8	¾	64
6818	4 x 4 x 3/16	11/16	¾	87
*6818½	4 x 4 x ¼	7/8	¾	120
*6819	4 x 4 x ¼	11/16	7/8	118
6819½	4 x 4 x ½	11/16	¾	236
6820	4 x 4 x ½	1⅛	1	228

* E. E. I. Standard

Half Oval Washers

Catalog No.	Dimensions In Inches			Approx. Ship. Wt., Lbs. Per 100 Pcs.
	Washer Size	Hole Dia.	Bolt Dia.	
6764	1¾ x 2⅜	11/16	5/8	33

Spring Clip Washers

Catalog No.	Dimensions In Inches		Approx. Ship. Wt. Lbs. Per 100 Pcs.
	Hole Size	Bolt Size	
3539	7/16	½	95
3540	11/16	5/8	97
3541	11/16	¾	96
3542	11/16	7/8	88
C205-0092†	11/16	5/8	62

†3/16" x 1½" Stock

Round Washers

Catalog No.	Dimensions in Inches			Approx. Ship. Wt., Lbs. Per 100 Pcs.
	Washer Size	Hole Dia.	Bolt Dia.	
*6801	1 O. D. x 14 Ga.	7/16	3/8	1.7
*6802	1¼ O. D. x 14 Ga.	7/16	3/8†	2.8
*6803	1⅜ O. D. x 12 Ga.	9/16	½	4.6
*6805	1¾ O. D. x 10 Ga.	11/16	5/8	8.5
*6806	2 O. D. x 9 Ga.	13/16	¾	11.8
6808	2½ O. D. x 8 Ga.	1 1/16	1	19.0

* E. E. I. Standard
†For Carriage Bolt

Spring Lock Washers

Catalog No.	Dimensions in Inches			Approx. Ship. Wt., Lbs. Per 100 Pcs.
	Bolt Size	Hole Dia.	Steel Size	
4034	3/8	7/16	1/8 x 3/16	.6
4035	½	9/16	11/64 x 1/8	1.5
4036	5/8	11/16	13/64 x 3/16	2.5
4037	¾	13/16	¼ x 3/16	4.8

Saddle Washers

Catalog No.	Dimensions in Inches		Approx. Ship. Wt., Lbs. Per 100 Pcs.
	Washer Size	Hole Dia.	
4206	2½ x 2½ x 3/16	11/16	31
4207	2½ x 2½ x 3/16	13/16	31

NUTS

Made to give tight connections. Hot galvanized.

M-F Lock Nuts

Catalog No.	Bolt Size, Inches	Wt., Lbs. Per 100 Pcs.
3510	3/8	1.2
3511	1/2	2.5
3512	5/8	4.4

M-F Lock Nuts

Catalog No.	Bolt Size, Inches	Wt., Lbs. Per 100 Pcs.
3513	3/4	6.0
3514	7/8	8.5
3515	1	13.0

Palnut Lock Nuts

Catalog No.	Dimensions in Inches			Approx. Ship. Wt., Lbs. Per 100 Pieces
	Bolt Size	Width	Height	
3530	3/8	5/8	.160	4
3531	1/2	7/8	.190	9
3532	5/8	1	.224	1.3
3533	3/4	1 1/8	.246	1.7
3534	7/8	1 1/4	.272	3.5

Washer Nuts

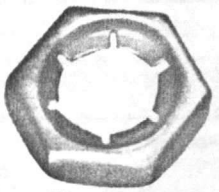
Catalog No.	Dimensions in Inches			Approx. Ship. Wt., Lbs. Per 100 Pieces
	Bolt Size	Washer Dia.	Sq. Size	
3193-W	1/2	1 1/2	1/2	12
3194	5/8	2 1/2	1/2	37
3195	3/4	3	1 1/8	51

For Bolts
Regular Square Nuts

Catalog No.	Bolt Size, Inches	Wt., Lbs. Per 100 Pcs.
55083P	1/2	8
55084P	5/8	13
55085P	3/4	19
55538P	7/8	28
56073P	1	38
8600M	3/8	3

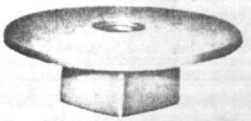
For Rods
Heavy Square Nuts

Catalog No.	Rod Size, Inches	Wt., Lbs. Per 100 Pcs.
55058P	1/2	10
55006P	5/8	15
55312P	3/4	24
55320P	1	53
56001P	1 1/4	105



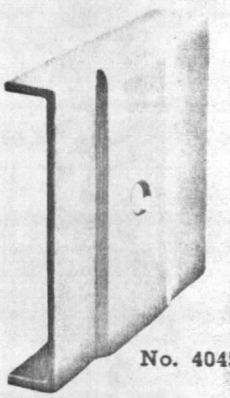
No. 3530

No. 3510

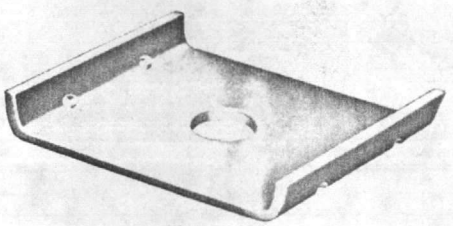


No. 3193-W

No. 55083P



No. 4045



No. 4063

PINS

(See Pages 5-29 Through 5-32)

PLATES, CROSSARM REINFORCING

Reinforcing plates prevent damage to the crossarm from tightened nuts. Nos. 4045 and 4047 have a pressed rib and are normally used on the side of the crossarm to prevent the tightened nut from causing checking or splitting. No. 4063 is used on top or bottom of flat-top crossarms to impede the strain from forged steel pins.

Catalog No.	Dimensions in Inches			Approx. Ship. Wt., Lbs. Per 100 Pieces
	Steel Thickness	Crossarm Size	Hole Dia.	
*4045	1/8	4 x 5	1/2	166
4047	1/4	6 x 8	1/2	206
4063	7 Ga.	3 3/4 x 4 3/4	1/2	103

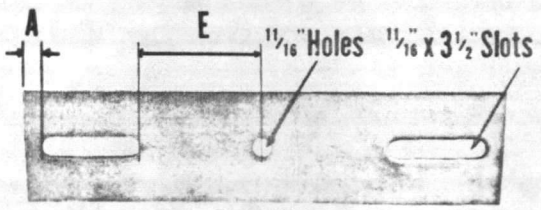
* REA Approved

PLATES, DOUBLE ARMING

Center-Suspension Type

Attached to the crossarm through the slots provided. Suspension attachment is made through center hole. Hot dip galvanized.

Catalog No.	Dimensions in Inches				Approx. Ship. Wt., Lbs. Per 100 Pieces
	Steel Size	Overall Length	A	E	
5819	1/4 x 4	17	5/8	4 3/8	460
C206-0128	1/4 x 4	24	2	8 1/4	1200

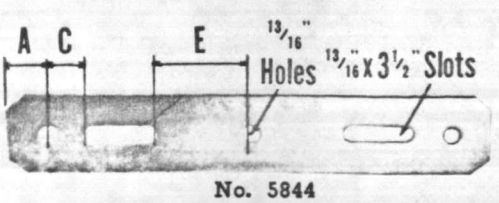


No. 5819

For Clevis Connections

Used with forged steel insulator pins or suspension type insulators on wood or steel crossarms. Used with clevises having 3/4" or smaller bolts. Hot dip galvanized.

Catalog No.	Dimensions in Inches					Approx. Ship. Wt., Lbs. Per 100 Pieces
	Steel Size	Overall Length	A	C	E	
5844	1/2 x 4	24	2	1 7/8	4 5/8	1200



No. 5844

BOLTS, DOUBLE-ARMING, FULL THREAD

These bolts permit ease of replacements in existing double arms and offer added flexibility of use. Cone type point for easy starting . . . driving-out without damage to threads. Open hearth steel, hot galvanized. Furnished with 4 square nuts.

Catalog No.	Length, Inches	Approx. Ship. Wt., Lbs., Per 100 Pcs.
	½-Inch Diameter	
8842	12	101
8844	14	109
8846	16	117
8848	18	125
8850	20	133
	⅝-Inch Diameter	
*8862	12	150
*8864	14	176
*8866	16	182
*8868	18	198
*8870	20	214
*8872	22	230
*8874	24	246
8876	26	250
8877	28	267
8878	30	267
8879	32	280
	¾-Inch Diameter	
8882	12	234
*8884	14	254
*8886	16	274
*8888	18	318
*8890	20	338
*8892	22	348
*8894	24	388
8896	26	358
8897	28	383
8898	30	383
8899	32	404

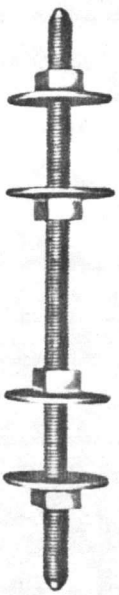
*E. E. I. Standard

No. 8842

BOLTS, DOUBLE-ARMING, WASHER-NUT

Four washer nuts are furnished with each bolt. Bolts are full-threaded. Cone type points for easy starting. Hot galvanized.

Cat. No.	Dim. in Inches: Overall Length	Dim. in Inches: Thread Length	Approx. Shipping Wt., Lbs. Per 100 Pcs.
		⅝-Inch Diameter	
19862	12	12	242
19864	14	14	257
19866	16	16	276
19868	18	18	288
19870	20	20	320
19872	22	22	307
19874	24	24	322

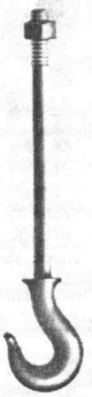


No. 19862

BOLTS, HOOK

Hook bolts are used for attaching suspension insulator strings to crossarms. Drop-forged steel, hot galvanized.

Catalog No.	Dimensions in Inches: Shank Dia.	Dimensions in Inches: Shank Length	Approx. Shipping Wt., Lbs. Per 100 Pcs.
5756	¾	6	182
5759	¾	9	228



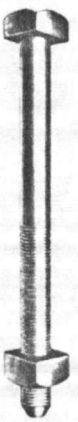
No. 5759

BOLTS, MACHINE

Machine bolts are also called crossarm bolts or through bolts. All bolts have rolled threads and one square nut. Bolts that are six inches or longer in length have cone-type points. Hot galvanized.

Cat. No.	Dim. in Inches: Bolt Length	Dim. in Inches: Thread Length	Approx. Shipping Wt., Lbs. Per 100 Pcs.
		⅜-Inch Diameter	
.8603	3	3	13.0
8603½	3½	3	14.3
*8604	4	3	15.6
*8604½	4½	3	16.9
*8606	6	3	21
*8605	5	3	18.2
8605½	5½	3	19.6
C205-0001	8	4	26.4

*E.E.I. Standard

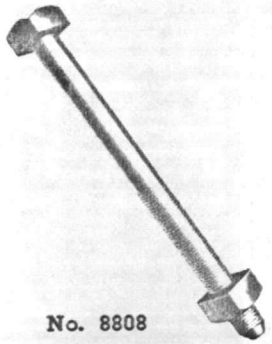


No. 8606

Machine Bolts continued on next page . . .

BOLTS, MACHINE

. . . Continued from preceding page



No. 8808

Catalog No.	Dim. in Inches Bolt Length,	Thread Length	Approx. Shipping Wt., Lbs. Per 100 Pcs.
	½-Inch Diameter		
*8704½	4½	3	33.3
*8705	5	3	35.5
*8706	6	3	40
*8707	7	3	45
*8708	8	4	49.5
8709	9	4	54.8
	⅝-Inch Diameter		
8805	5	3	63
*8806	6	3	67
8807	7	3	75
*8808	8	4	82
*8810	10	4	95
*8812	12	6	108
	¾-Inch Diameter		
*8908	8	4	126
*8910	10	4	162
*8912	12	6	180
*8914	14	6	198
*8916	16	6	216

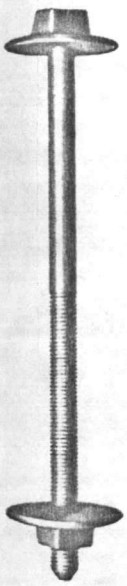
*E. E. I. Standard

Catalog No.	Dim. in Inches Bolt Length	Thread Length	Approx. Shipping Wt., Lbs. Per 100 Pcs.
	½-Inch Diameter		
*8710	10	6	60
*8712	12	6	69
*8714	14	6	79
*8716	16	6	88
*8718	18	6	98
*8720	20	6	107
	⅝-Inch Diameter		
*8814	14	6	124
*8816	16	6	140
*8818	18	6	156
*8820	20	6	172
*8822	22	6	188
*8824	24	6	202
8826	26	6	216
8828	28	6	230
	¾-Inch Diameter		
*8918	18	6	236
8920	20	6	260
*8922	22	6	282
*8924	24	6	304
8926	26	6	328
8928	28	6	352

			⅞-Inch Diameter					
19810	10	4	260		19818	18	6	330
19812	12	6	272		19820	20	6	360
19814	14	6	284		19822	22	6	390
19816	16	6	296		19824	24	6	415

BOLTS, MACHINE, WASHER-HEAD

Head and washer forged into integral unit. Bore holes same diameter as bolts. Use locknut behind washernut. Hot galvanized.



No. 3162

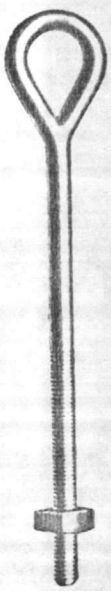
Cat. No.	Dim. in Inches Bolt Length	Head-Nut Dia.	Thread Length	Approx. Ship. Wt. Lbs., Per 100 Pcs.
	½-Inch Diameter			
3162	6	1½	4	57
3163	7	1½	4	61
3164	8	1½	4	69
	⅝-Inch Diameter			
3168	8	1⅞	4	139
3169	10	1⅞	4	164
3170	12	1⅞	6	192
3171½	14	1⅞	6	208
3172	16	1⅞	6	223
	¾-Inch Diameter			
3182	12	2¼	6	277
3183½	14	2¼	6	300
3184	16	2¼	6	323
3185	18	2¼	6	346

Cat. No.	Dim. in Inches Bolt Length	Head-Nut Dia.	Thread Length	Approx. Ship. Wt. Lbs., Per 100 Pcs.
	½-Inch Diameter			
3164½	9	1½	4	74
3165	10	1½	4	78
3166½	12	1½	6	90
	⅝-Inch Diameter			
3173½	18	1⅞	6	238
3174	20	1⅞	6	243
3175	22	1⅞	6	268
3176	24	1⅞	6	283
3178	6	1⅞	4	90
	¾-Inch Diameter			
3186	20	2¼	6	369
3187	22	2¼	6	392
3188	24	2¼	6	415

BOLTS, OVALEYE

Length is measured from directly under eye to last thread at end of bolt. Bolts up through 4" long have 3" of rolled thread; bolts 6" through 9" long have 4" of rolled thread; and bolts 10" long and over have 6" of thread.

Eye dimensions are as follows: Bolts with ½" shanks have 1¼" x 1⅝" ovaleyes; bolts with ⅝" and ¾" shanks have 1½" x 2" ovaleyes. Drop-forged, galvanized steel bolts have cone type points.



No. 29939

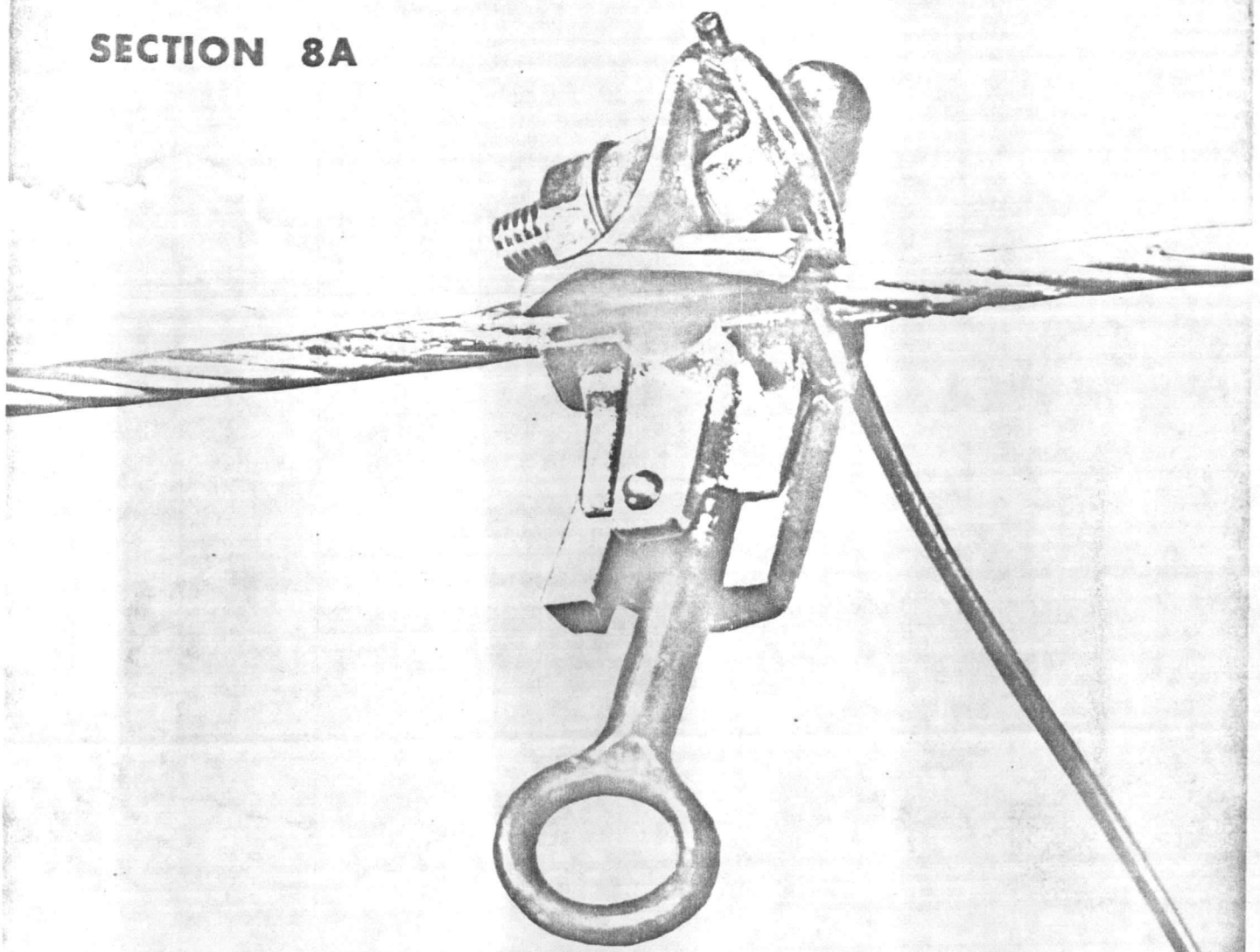
Catalog No.	Length Under Eye Inches	Approx. Ship. Wt., Lbs. Per 100 Pcs.
	½" Shank Dia. — 7/16" Eye Stock Dia.	
29937	6	66
*29939	8	77
*29941	10	88
*29943	12	100

Catalog No.	Length Under Eye Inches	Approx. Ship. Wt., Lbs. Per 100 Pcs.
*29945	14	126
29947	16	139
29949	18	152
29951	20	154

*E.E.I. Standard

Ovaleye Bolts continued on next page . . .

SECTION 8A



A COMPLETE LINE OF HOT LINE CLAMPS

FOR EVERY CONTACT COMBINATION

For more than 30 years A. B. Chance Company has been engaged in the design and development of Hot Line Clamps. While the principle of installing the tap clamp "hot" using a Grip-All Clampstick remains the same, a number of refinements have been made over the years. The most significant of these changes were incorporated into the design of the S1500 Series (Protected Connection) Clamps and are covered in detail on the following pages.

Chance S1500 Series "P.C." Clamps are available in a wide variety of types for every contact combination. The purpose of the Fortified plating (where indicated) is to back up the inhibiting compound in preventing galvanic corrosion and weathering attack.

AA (aluminum to aluminum) clamps have heat-treated aluminum bodies with Fortified plating on the jumper contacts.

AGP (aluminum general purpose) clamps are coated with high density Fortified plating so that they can be used on all connections—aluminum to copper, aluminum to aluminum, copper to aluminum or copper to copper.

AC (aluminum main line and copper tap) clamps have heat-treated aluminum bodies and high strength silicon bronze terminals fitted with aluminum/copper bi-metal washers.

CC (copper to copper) clamps are copper alloy and are recommended for copper to copper connections.

GP (general purpose) clamps are copper alloy with Fortified plating and are used for copper and aluminum combinations.

NAME OF PROJECT: REPAIR ELECTRIC SERVICE, TRANSFORMERS, AND SWITCHGEAR
LOCATION: BUILDING 1700, MARINE CORPS BASE, CAMP LEJEUNE, N. C.
DESIGNED BY: DESIGN DIV., PUBLIC WORKS DEPT., MARINE CORPS BASE CAMP LEJEUNE, N. C.
CONTRACT NO: N62470-79-C-4471

TYPE OF SUBMITTAL: CONDUIT
LOCATION: GENERAL
GOVERN. SPEC.: 16300 Paragraph 6.4.1

SUBMITTED BY:

CAMPBELL ELECTRICAL CO., INC.
P. O. BOX 730
WILSON, N. C. 27893

REVIEWED
Date 7-20-81 By

OFFICE OF THE
OFFICER IN CHARGE OF CONSTRUCTION
CAMP LEJEUNE, NORTH CAROLINA

APPROVED

SUBJECT TO CONTRACT REQUIREMENTS
CONTRACT N62470-79-C-4471
DATE 7/22/81

R. E. CARLSON
CDR, CEC, USN
Officer in Charge
of Construction

Wheatland
TUBE COMPANY

600 HADDON AVENUE, SUITE 500 • P.O. BOX 600 • COLLINGSWOOD, NJ 08108 • (609) 854-5400

June 8, 1981

Campbell Electric Co., Inc.
P.O. Box 730
Wilson, North Carolina 27893

ATTENTION: Morris Robinson

Gentlemen:

This will certify that Wheatland Tube Company's Hot-Dipped Galvanized Rigid Steel Conduit is manufactured in strict accordance with Underwriters Laboratories requirements, A.N.S.I. Standards C80.1-1977 and Federal Specification WWC-581E and amendments.

This will also certify that Wheatland Tube Company's Electrical Metallic Tubing is manufactured in accordance with Underwriters Laboratories Standards, A.N.S.I. Standards C80.3-1977 and Federal Specification WWC-563.

Sincerely,

WHEATLAND TUBE COMPANY

Chuck Whitmore

Chuck Whitmore
Manager, Inside Sales

CW/lk

SWORN AND SUBSCRIBED TO BEFORE ME
THIS 8TH DAY OF JUNE 1981

Francis J. McLaughlin

FRANCIS J. McLAUGHLIN
Notary Public of New Jersey
My Commission Expires Aug. 28, 1985

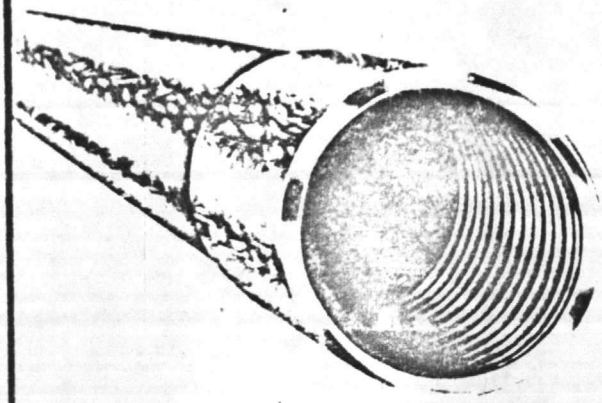
Wheatland products meet or exceed Federal Specifications and U.L. Standards

Wheatland Rigid Steel Conduit conforms to the requirements of Federal Specification WWC-581 and A.N.S.I. Specification C80.1—1966 and is manufactured in strict accordance with Underwriters' Laboratories standards.

Wheatland Electrical Metallic Tubing meets A.N.S.I. Standard C80.3 and Federal Specification WWC-563 and is manufactured in strict accordance with Underwriters' Laboratories standards.

This page may be used or copied as a document of certification. Or, upon request, notarized letters of certification will be provided by Wheatland's general sales office.

Wheatland Rigid Steel Conduit



Dimensions Hot-Dipped Galvanized Conduit

Trade Size (Inches)	Threads per inch	Inside Diameter (Inches)	Outside Diameter (Inches)	Wall Thickness (Inches)	Length without coupling (Feet and Inches)	Underwriters Minimum Wt. per 100 ft. (10 lengths with couplings)
½	14	0.622	0.840	0.109	9-11¼	79
¾	14	0.824	1.050	0.113	9-11¼	105
1	11½	1.049	1.315	0.133	9-11	153
1¼	11½	1.380	1.660	0.140	9-11	201
1½	11½	1.610	1.900	0.145	9-11	249
2	11½	2.067	2.375	0.154	9-11	334
2½	8	2.469	2.875	0.203	9-10½	527
3	8	3.068	3.500	0.216	9-10½	690
3½	8	3.548	4.000	0.226	9-10¼	831
4	8	4.026	4.500	0.237	9-10¼	982
5	8	5.047	5.563	0.258	9-10	1344
6	8	6.065	6.625	0.280	9-10	1770

Packaging

Size (Inches)	N.E.M.A. Color Code Thread Protectors	Pieces per Bundle	Quantity per Crane Lift	Feet per Lift	U.L. Weight per Crane Lift
½	Black	10	25 Bundles	2,500	1,975 Lbs.
¾	Red	5	40 Bundles	2,000	2,100 Lbs.
1	Blue	5	25 Bundles	1,250	1,913 Lbs.
1¼	Red	3	34 Bundles	1,020	2,050 Lbs.
1½	Black	3	34 Bundles	1,020	2,540 Lbs.
2	Blue	—	50 Pieces	500	1,670 Lbs.
2½	Black	—	25 Pieces	250	1,318 Lbs.
3	Blue	—	25 Pieces	250	1,625 Lbs.
3½	Black	—	20 Pieces	200	1,662 Lbs.
4	Blue	—	20 Pieces	200	1,964 Lbs.
5	Blue	—	15 Pieces	150	2,016 Lbs.
6	Blue	—	10 Pieces	100	1,770 Lbs.

NAME OF PROJECT:	REPAIR ELECTRIC SERVICE, TRANSFORMERS, AND SWITCHGEAR
LOCATION:	BUILDING 1700, MARINE CORPS BASE, CAMP LEJEUNE, N. C.
DESIGNED BY:	DESIGN DIV., PUBLIC WORKS DEPT., MARINE CORPS BASE CAMP LEJEUNE, N. C.
CONTRACT NO:	N62470-79-C-4471

TYPE OF SUBMITTAL:	CONDUIT FITTINGS
LOCATION:	GENERAL
GOVERN. SPEC.:	16300 Paragraph 6.4.3

SUBMITTED BY:

CAMPBELL ELECTRICAL CO., INC.
P. O. BOX 730
WILSON, N. C. 27893

REVIEWED

Date 7-20-81 By WR

OFFICE OF THE
OFFICER IN CHARGE OF CONSTRUCTION
CAMP LEJEUNE, NORTH CAROLINA

APPROVED

SUBJECT TO CONTRACT REQUIREMENTS

CONTRACT N62470-79-C-4471

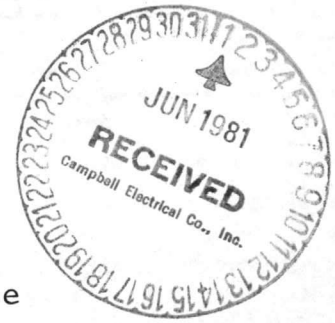
DATE 7/22/81

R. E. CARLSON
CDR, CEC, USN
Officer in Charge
of Construction

Gould Inc., Electrical Components Division
123 Smith Street, East Farmingdale, New York 11735
Telephone (516) 694-5400 Telex 96-1348

GOULD
An Electrical/Electronics Company

May 29, 1981



Campbell Electric Co. Inc.
P.O. Box 730
Wilson, North Carolina 27893

Attention: Mssrs. Morris Robinson and Steve Rose

Subject: LETTER OF CERTIFICATION

To Whom It May Concern:

This is to certify that our product specifications for our 1¼" through 3" Galvanized Rigid Conduit Elbows, namely our Catalog Numbers 1¼-90STD GAL EL through 3-90STD GAL EL inclusive, and our 1¼" through 3" Galvanized Rigid Conduit Couplings, namely our Catalog Numbers 1¼ GAL CPLG through 3 GAL CPLG inclusive, do comply with all the applicable requirements of Federal Specification WW-C-581E, "Conduit, Metal, Rigid, and Intermediate; and Coupling, Elbow, and Nipple, Electrical Conduit: Steel, Zinc Coated"; and our 1¼" and 2" Three-Piece "Erickson" Couplings, namely our Catalog Numbers 168 and 170, our 1¼" through 3" Conduit Locknuts, namely our Catalog Numbers 154 through 158 inclusive, and our 1¼ through 3" 150°C Temperature Rated Insulated Metallic Grounding Bushings with Aluminum and Bronze Cradle-Type Grounding Lugs for Threaded Rigid Conduit, namely our Catalog Numbers 56-125T-4AC through 56-300T-25AC inclusive and our Catalog Numbers 56-125T-4BC through 56-300T-25BC inclusive, do comply with all the applicable requirements of Federal Specification W-F-408c, "Fittings for Conduits, Metal, Rigid (Thick-Wall and Thin-Wall (EMT) Type)".

Subscribed to before me this
29th day of May 1981.
Marie Harrison

MARIE HARRISON
NOTARY PUBLIC, State of New York
No. 52-4518150
Qualified in Suffolk County
Commission Expires March 30, 1982

Very truly yours,

John A. Stokes
QA Engineering Supervisor

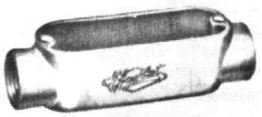
JAS:nfa

EFCORLETS

THREADED FOR RIGID CONDUIT

COPPER FREE ALUMINUM ALLOY

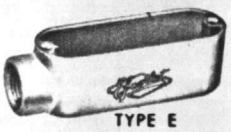
With baked enamel coating
(except sand cast EFCORLETS).



TYPE C

½"-2" DIE CAST 2½"-4" SAND CAST

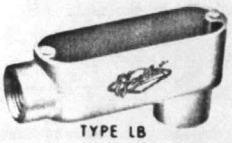
Cat No	Trade Size	Volume (cu. in.)	Approx. Wt Std Pkg	Unit Qty.	Std. Pkg.
10-51	½"	4.0	13	10	50
10-71	¾"	7.0	19	10	50
10-101	1"	11.3	14	5	25
10-121	1¼"	32.0	13	2	10
10-151	1½"	34.3	14	2	10
10-201	2"	71.0	11	—	5
10-251	2½"	△	4	—	1
10-301	3"	△	5	—	1
10-351	3½"	△	5	—	1
10-401	4"	△	8	—	1



TYPE E

½"-2" DIE CAST 2½"-4" SAND CAST

10-52	½"	4.3	12	10	50
10-72	¾"	7.0	18	10	50
10-102	1"	11.5	13	5	25
10-122	1¼"	32.0	12	2	10
10-152	1½"	34.3	13	2	10
10-202	2"	71.8	10	—	5
10-252	2½"	△	4	—	1
10-302	3"	△	4	—	1
10-352	3½"	△	6	—	1
10-402	4"	△	7	—	1



TYPE LB

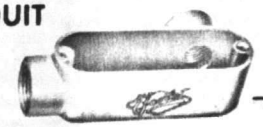
½"-2" DIE CAST 2½"-4" SAND CAST

10-53	½"	4.0	14	10	50
10-73	¾"	7.0	20	10	50
10-103	1"	11.5	12	5	25
10-123	1¼"	32.0	14	2	10
10-153	1½"	34.5	14	2	10
10-203	2"	71.5	11	—	5
10-253	2½"	△	4	—	1
10-303	3"	△	4	—	1
10-353	3½"	△	8	—	1
10-403	4"	△	8	—	1

TYPE LL

½"-2" DIE CAST 2½"-4" SAND CAST

10-54	½"	4.3	14	10	50
10-74	¾"	7.3	21	10	50
10-104	1"	11.5	15	5	25
10-124	1¼"	31.5	14	2	10
10-154	1½"	34.0	14	2	10
10-204	2"	70.5	12	—	5
10-254	2½"	△	4	—	1
10-304	3	△	4	—	1
10-354	3½"	△	8	—	1
10-404	4	△	9	—	1



TYPE LR

E-11579

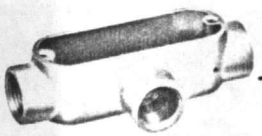
½"-2" DIE CAST 2½"-4" SAND CAST

Cat. No.	Trade Size	Volume (cu. in.)	Approx. Wt Std Pkg.	Unit Qty.	Std Pkg.
10-55	½"	4.0	14	10	50
10-75	¾"	7.3	20	10	50
10-105	1"	11.3	15	5	25
10-125	1¼"	31.8	14	2	10
10-155	1½"	34.0	15	2	10
10-205	2"	71.0	12	—	5
10-255	2½"	△	5	—	1
10-305	3"	△	5	—	1
10-355	3½"	△	8	—	1
10-405	4"	△	9	—	1

TYPE LRL

ALL SAND CAST

10-59	½"	5.3	8	10	50
10-79	¾"	8.8	23	10	50
10-109	1"	13.8	15	5	25
10-129	1¼"	40.0	15	2	10
10-159	1½"	41.0	15	2	10
10-209	2"	86.5	13	—	5



TYPE T

½"-2" DIE CAST 2½"-4" SAND CAST

10-56	½"	4.0	16	10	50
10-76	¾"	6.8	24	10	50
10-106	1"	11.0	16	5	25
10-126	1¼"	31.5	15	2	10
10-156	1½"	34.0	16	2	10
10-206	2"	70.3	12	—	5
10-256	2½"	△	4	—	1
10-306	3"	△	5	—	1
10-356	3½"	△	8	—	1
10-406	4"	△	9	—	1

TYPE X

ALL SAND CAST

10-57	½"	4.3	10	10	50
10-77	¾"	7.3	13	5	25
10-107	1"	11.3	20	5	25
10-127	1¼"	31.8	15	2	10
10-157	1½"	33.5	15	2	10
10-207	2"	70.0	13	—	5

△ Volumetric dimension not available at this printing.

COMPRESSION CONNECTORS

FOR RIGID CONDUIT

MALLEABLE IRON

U.L. listed Concrete Tight

UL E-11575

Cat. No.	Conduit Size	Approx. Weight Std. Pkge.	Unit Qty.	Std. Pkge.
1750	½"	20	25	100
1751	¾"	31	25	100
1752	1"	11	5	25
1753	1¼"	20	5	25
1754	1½"	12	2	10
1755	2"	9	—	5
1756	2½"	14	—	5
1757	3"	19	—	5
1758	3½"	24	—	5
1759	4"	28	—	5
†17595	5"	21	—	2
†17596	6"	15	—	1

WITH INSULATED THROAT

1750B	½"	20	25	100
1751B	¾"	31	25	100
1752B	1"	11	5	25
1753B	1¼"	20	5	25
1754B	1½"	12	2	10
1755B	2"	9	—	5
1756B	2½"	14	—	5
1757B	3"	19	—	5
1758B	3½"	24	—	5
1759B	4"	28	—	5
new †17595B	5"	21	—	2
new †17596B	6"	15	—	1

† Not U.L. listed

COMPRESSION CONNECTORS - 90°

FOR RIGID CONDUIT

MALLEABLE IRON

U.L. listed Concrete Tigh.

1770	½"	16	10	50
1771	¾"	24	10	50
1772	1"	19	5	25
1773	1¼"	14	2	10
1774	1½"	20	2	10
1775	2"	30	2	10

Available in 2½" thru 4" sizes upon special request

WITH INSULATED THROAT

1770B	½"	16	10	50
1771B	¾"	24	10	50
1772B	1"	19	5	25
1773B	1¼"	14	2	10
1774B	1½"	20	2	10
1775B	2"	30	2	10

Available in 2½" thru 4" sizes upon special request

COMPRESSION CONNECTORS - 45°

FOR RIGID CONDUIT

MALLEABLE IRON

U.L. listed Concrete Tight

1780	½"	15	10	50
1781	¾"	18	10	50
1782	1"	20	5	25
1783	1¼"	13	2	10
1784	1½"	19	2	10
1785	2"	29	2	10

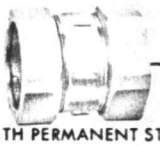
Available in 2½" thru 4" sizes upon special request

COMPRESSION COUPLINGS

FOR RIGID CONDUIT

MALLEABLE IRON

U.L. listed Concrete Tight



WITH PERMANENT STOP

Cat. No.	Conduit Size	Approx. Weight Std. Pkge.	Unit Qty.	Std. Pkge.
1760	½"	28	25	100
1761	¾"	40	25	100
1762	1"	16	5	25
1763	1¼"	31	5	25
1764	1½"	19	2	10
1765	2"	14	—	5
1766	2½"	20	—	5
1767	3"	28	—	5
1768	3½"	33	—	5
1769	4"	38	—	5
new †17695	5"	17	—	1
new †17696	6"	30	—	1

† Not U.L. listed

SLIP-FIT COUPLING

WITH SET SCREW CENTER STOP

(REPLACING PERMANENT SHOULDER STOP)

U.L. listed Concrete Tight

1760S	½"	28	25	100
1761S	¾"	40	25	100
1762S	1"	16	5	25
1763S	1¼"	31	5	25
1764S	1½"	19	2	10
1765S	2"	14	—	5
1766S	2½"	20	—	5
1767S	3"	28	—	5
1768S	3½"	33	—	5
1769S	4"	38	—	5

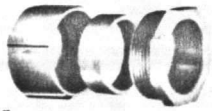
Also available without S.S. center stop upon special request

3-PIECE COUPLINGS

FOR RIGID CONDUIT

MALLEABLE IRON

U.L. listed Concrete Tight



Cat. No.	Conduit Size	Approx. Wt. Std. Pkge.	Unit Qty.	Std. Pkge.
165	½"	25	20	100
166	¾"	38	10	100
167	1"	15	5	25
168	1¼"	23	5	25
169	1½"	28	5	25
170	2"	34	—	20
171	2½"	31	—	10
172	3"	21	—	5
173	3½"	26	—	5
174	4"	14	—	2
1745	5"	20	—	2

Also available in aluminum.

NOTE:
For speedier installations we suggest the use of our Swivel Coupling
(see following page 5)

INSULATED METALLIC GROUNDING BUSHING

E-11577

THREADED FOR RIGID CONDUIT

Size	Cat. No.	Grounding Lug Wire Capacity Min.	Max.	Approx. Wgt. Std. Pkg.	Unit Ctn.	Std. Pkg.
MALLEABLE IRON — HOT DIP GALVANIZED						
½"	56-50-8	14 sol.	#8 str.	66	100	1000
	56-50-4	14 sol.	#4 str.	84	100	1000
¾"	56-75-8	14 sol.	#8 str.	45	50	500
	56-75-4	14 sol.	#4 str.	55	50	500
1"	56-100-8	14 sol.	#8 str.	34	25	250
	56-100-4	14 sol.	#4 str.	38	25	250
1¼"	56-125-8	14 sol.	#8 str	36	20	200
	56-125-4	14 sol.	#4 str.	39	20	200
	56-125-10	6 sol.	1/0 str.	54	20	200
1½"	56-150-8*	14 sol.	#8 str.	43	20	200
	56-150-4	14 sol.	#4 str.	48	20	200
	56-150-10	6 sol.	1/0 str.	57	20	200
2"	56-200-8*	14 sol.	#8 str.	33	10	100
	56-200-4	14 sol.	#4 str.	35	10	100
	56-200-10	6 sol.	1/0 str.	41	10	100
2½"	56-250-4*	14 sol.	#4 str.	5	–	10
	56-250-10	6 sol.	1/0 str.	5	–	10
	56-250-40	1/0 str.	250 MCM	6	–	10
3"	56-300-4*	14 sol.	#4 str.	3.5	–	5
	56-300-10	6 sol.	1/0 str.	4	–	5
	56-300-40	1/0 str.	250 MCM	4.5	–	5
3½"	56-350-4*	14 sol.	#4 str.	4.5	–	5
	56-350-10*	6 sol.	1/0 str.	5	–	5
	56-350-40	1/0 str.	250 MCM	5	–	5
4"	56-400-4*	14 sol.	#4 str.	5.5	–	5
	56-400-10*	6 sol.	1/0 str.	6	–	5
	56-400-40	1/0 str.	250 MCM	6	–	5
5"	56-500-4*	14 sol.	#4 str.	6	–	5
	56-500-10*	6 sol.	1/0 str.	6.5	–	5
	56-500-40	1/0 str.	250 MCM	7	–	5
6"	56-600-4*	14 sol.	#4 str.	7.5	–	5
	56-600-10*	6 sol.	1/0 str.	8	–	5
	56-600-40	1/0 str.	250 MCM	8.5	–	5
EVERDUR BRONZE—WITH BRONZE SCREWS						
½"	56-50-8EV	14 sol.	#8 str.	66	100	1000
	56-50-4EV	14 sol.	#4 str.	84	100	1000
¾"	56-75-8EV	14 sol.	#8 str.	45	50	500
	56-75-4EV	14 sol.	#4 str.	55	50	500
1"	56-100-8EV	14 sol.	#8 str.	34	25	250
	56-100-4EV	14 sol.	#4 str.	38	25	250
1¼"	56-125-8EV	14 sol.	#8 str.	36	20	200
	56-125-4EV	14 sol.	#4 str.	39	20	200
	56-125-10EV	6 sol.	1/0 str.	54	20	200
1½"	56-150-8EV*	14 sol.	#8 str.	43	20	200
	56-150-4EV	14 sol.	#4 str.	48	20	200
	56-150-10EV	6 sol.	1/0 str.	57	20	200
2"	56-200-8EV*	14 sol.	#8 str.	33	10	100
	56-200-4EV	14 sol.	#4 str.	35	10	100
	56-200-10EV	6 sol.	1/0 str.	41	10	100
2½"	56-250-4EV*	14 sol.	#4 str.	5	–	10
	56-250-10EV	6 sol.	1/0 str.	5	–	10
	56-250-40EV	1/0 str.	250 MCM	6	–	10
3"	56-300-4EV*	14 sol.	#4 str.	3.5	–	5
	56-300-10EV	6 sol.	1/0 str.	4	–	5
	56-300-40EV	1/0 str.	250 MCM	4.5	–	5
3½"	56-350-4EV*	14 sol.	#4 str.	4.5	–	5
	56-350-10EV*	6 sol.	1/0 str.	5	–	5
	56-350-40-EV	1/0 str.	250 MCM	5	–	5
4"	56-400-4EV*	14 sol.	#4 str.	5.5	–	5
	56-400-10EV*	6 sol.	1/0 str.	6	–	5
	56-400-40EV	1/0 str.	250 MCM	6	–	5
5"	56-500-4EV*	14 sol.	#4 str.	6	–	5
	56-500-10EV*	6 sol.	1/0 str.	6.5	–	5
	56-500-40EV	1/0 str.	250 MCM	7	–	5
6"	56-600-4EV*	14 sol.	#4 str.	7.5	–	5
	56-600-10EV*	6 sol.	1/0 str.	8	–	5
	56-600-40EV	1/0 str.	250 MCM	8.5	–	5
ALUMINUM						
½"	56-50-8AL	14 sol.	#8 str.	37	100	1000
	56-50-4AL	14 sol.	#4 str.	54	100	1000
¾"	56-75-8AL	14 sol.	#8 str.	25	50	500
	56-75-4AL	14 sol.	#4 str.	33	50	500
1"	56-100-8AL	14 sol.	#8 str.	17	25	250
	56-100-4AL	14 sol.	#4 str.	21	25	250
1¼"	56-125-8AL	14 sol.	#8 str.	17	20	200
	56-125-4AL	14 sol.	#4 str.	20	20	200
	56-125-10AL	6 sol.	1/0 str.	34	20	200
1½"	56-150-8AL*	14 sol.	#8 str.	20	20	200
	56-150-4AL	14 sol.	#4 str.	24	20	200
	56-150-10AL	6 sol.	1/0 str.	38	20	200
2"	56-200-8AL*	14 sol.	#8 str.	14	10	100
	56-200-4AL	14 sol.	#4 str.	16	10	100
	56-200-10AL	6 sol.	1/0 str.	23	10	100
2½"	56-250-4AL*	14 sol.	#4 str.	2	–	10
	56-250-10AL	6 sol.	1/0 str.	3	–	10
	56-250-40AL	1/0 str.	250 MCM	4	–	10
3"	56-300-4AL*	14 sol.	#4 str.	1	–	5
	56-300-10AL	6 sol.	1/0 str.	1	–	5
	56-300-40AL	1/0 str.	250 MCM	2	–	5
3½"	56-350-4AL*	14 sol.	#4 str.	1	–	5
	56-350-10AL*	6 sol.	1/0 str.	2	–	5
	56-350-40AL	1/0 str.	250 MCM	2.5	–	5
4"	56-400-4AL*	14 sol.	#4 str.	2	–	5
	56-400-10AL*	6 sol.	1/0 str.	2.5	–	5
	56-400-40AL	1/0 str.	250 MCM	3	–	5
5"	56-500-4AL*	14 sol.	#4 str.	2	–	5
	56-500-10AL*	6 sol.	1/0 str.	2.5	–	5
	56-500-40AL	1/0 str.	250 MCM	3	–	5
6"	56-600-4AL*	14 sol.	#4 str.	2.5	–	5
	56-600-10AL*	6 sol.	1/0 str.	3	–	5
	56-600-40AL	1/0 str.	250 MCM	3.5	–	5

*LUG SIZE NOT LISTED BY UNDERWRITERS LABORATORIES FOR USE WITH THIS SIZE BUSHING

We reserve the right to substitute "A-35" series AL/CU rated grounding lugs.

LOCKNUTS
FOR RIGID CONDUIT
U.L. File No. E-11575

150-156 STEEL — 157-163 MALLEABLE IRON

Cat. No.	Conduit Size	Approx. Weight Std. Pkge.	Unit Qty.	Std. Pkge.
150	⅜"	27	200	1000
151	½"	34	100	2500
152	¾"	26	100	1000
153	1"	22	50	500
154	1¼"	15	50	250
155	1½"	14	50	200
156	2"	9	—	100
	MALLEABLE IRON			
157	2½"	8	—	30
158	3"	9	—	25
159	3½"	12	—	25
160	4"	15	—	25
162	5"	9	—	10
163	6"	9	—	10

Also available in aluminum.

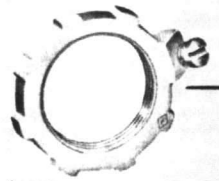
FITTING LOCKNUTS
STEEL

151L	½"	23	100	2500
152L	¾"	17	100	1000
153L	1"	15	50	500
154L	1¼"	11	50	250
155L	1½"	12	50	200
156L	2"	7	—	100
157L	2½"	5	—	30
158L	3"	3	—	25
159L	3½"	6	—	25
160L	4"	7	—	25

FIXTURE NUTS
STEEL

Cat. No	Size	Approx. Weight Std. Pkg	Unit Qty.	Std. Pkge.
148	⅛"	25	1000	5000
149	¼"	35	1000	5000
151S	½"	39	250	1000

BONDING LOCKNUTS
FOR RIGID CONDUIT
MALLEABLE IRON
U.L. File No. E-11577



Cat. No.	Conduit Size	Approx. Weight Std. Pkg.	Std. Pkge.
GL50	½"	3	100
GL75	¾"	4	100
GL100	1"	3	50
GL125	1¼"	3	50
GL150	1½"	5	50
GL200	2"	3	25
GL250	2½"	3	10
GL300	3"	4	10
GL350	3½"	3	5
GL400	4"	3	5
†GL500	5"	5	5
new †GL600	6"	5	5

REDUCING BUSHINGS
FOR RIGID CONDUIT
U.L. File No. E-11575

509-914 STEEL 255-325 MALLEABLE IRON

Cat. No.	Conduit Size	Approx. Weight Std. Pkg.	Unit Qty.	Std. Pkge.
509	½" to ⅜"	30	100	1000
510	¾" to ½"	22	100	500
610	1" to ½"	54	50	500
611	1" to ¾"	34	50	500
710	1¼" to ½"	12	—	50
711	1¼" to ¾"	10	—	50
712	1¼" to 1"	6	—	50
*810	1½" to ½"	21	—	50
811	1½" to ¾"	18	—	50
812	1½" to 1"	14	—	50
*813	1½" to 1¼"	6	—	50
910	2" to ½"	16	—	25
*911	2" to ¾"	22	—	25
912	2" to 1"	18	—	25
913	2" to 1¼"	13	—	25
914	2" to 1½"	9	—	25
	* MALLEABLE IRON			
255	2½" to ½"	9	—	10
257	2½" to ¾"	8	—	10
2510	2½" to 1"	10	—	10
2512	2½" to 1¼"	10	—	10
2515	2½" to 1½"	8	—	10
2520	2½" to 2"	5	—	10
305	3" to ½"	20	—	10
307	3" to ¾"	20	—	10
310	3" to 1"	19	—	10
312	3" to 1¼"	16	—	10
315	3" to 1½"	15	—	10
320	3" to 2"	12	—	10
325	3" to 2½"	11	—	10

† Not U.L. Listed

NAME OF PROJECT: REPAIR ELECTRIC SERVICE, TRANSFORMERS, AND SWITCHGEAR
LOCATION: BUILDING 1700, MARINE CORPS BASE, CAMP LEJEUNE, N. C.
DESIGNED BY: DESIGN DIV., PUBLIC WORKS DEPT., MARINE CORPS BASE CAMP LEJEUNE, N. C.
CONTRACT NO: N62470-79-C-4471

TYPE OF SUBMITTAL: PVC CONDUIT & FITTINGS
LOCATION: DUCT BANKS
GOVERN. SPEC.: 16300 Paragraph 6.5

SUBMITTED BY:

CAMPBELL ELECTRICAL CO., INC.
P. O. BOX 730
WILSON, N. C. 27893

REVIEWED
Date 7-20-81 By

OFFICE OF THE
OFFICER IN CHARGE OF CONSTRUCTION
CAMP LEJEUNE, NORTH CAROLINA

APPROVED

SUBJECT TO CONTRACT REQUIREMENTS
CONTRACT N62470-79-C-4471
DATE 7/22/81

R. E. CARLSON
CDR, CEC, USN
Officer in Charge
of Construction

Carlon
An Indian Head Company

Three Commerce Park Square
23200 Chagrin Boulevard
Cleveland, Ohio 44122
Telephone (216) 831-4000

MAY 1981
RECEIVED
Campbell Electricel Co., Inc.

May 27, 1981

Campbell Electric Co.
P. O. Box 730
Wilson, N. Carolina 27893
Attn: Mr. Morris Robinson

Dear Mr. Robinson:

This is to certify that Carlon's extra strength PVC utilities conduit, EB-35, our Catalog Series 687, meets or exceeds the requirements of EB Duct manufactured to the NEMA TC-8 Standard covering PVC extra strength plastic utilities duct for underground installation.

We trust the above will meet your requirements, but should you have any questions or comments, please do not hesitate to call on us.

Sincerely,

CARLON, AN INDIAN HEAD CO.

Robert O. McAtee

Robert O. McAtee
Assistant Director
Technical Services

STATE OF OHIO
COUNTY OF CUYAHOGA

Sworn to and subscribed before me this 27th day of May, 1981.

Wanda L. Worthington

Wanda L. Worthington, Notary Public

ROM/dmd

WANDA L. WORTHINGTON, Notary Public
STATE OF OHIO
My Commission Expires March 12, 1986

NOTARY PUBLIC
STATE OF OHIO

"Largest Manufacturer of Plastic Conduit & Fittings"

OFFICES:
Cleveland, 23200 Chagrin Blvd., Ohio 44122 (216) 831-4000
Compton, 250 E. Manville, Calif. 90220 (213) 636-0731
High Springs, P. O. Box 886, Fla. 32643 (904) 454-1697
Okla. City, 6500 S. Interpace, Okla. 73115 (405) 672-4531
Nazareth, 635 E. Lawn Rd., Pa. 18064 (215) 759-6760
Woodland, 1776 E. Beamer St., Calif. 95695 (916) 666-1681
Miami, 5000 N.W. 37 Ave., Fla. 33142 (305) 633-1491

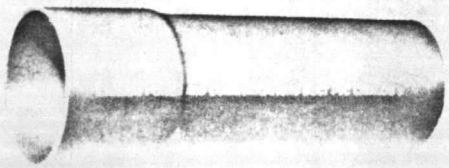
Carlon

An Indian Head Company

Three Commerce Park Square
23200 Chagrin Boulevard
Cleveland, Ohio 44122

Price Sheet 9-143-18
Effective August 1, 1977
Cancels 9-143-17
Dated May 16, 1977

CARLON POWER & COMMUNICATION DUCT*



Carlon Power and Communication Duct is manufactured from Carlon's own C250 PVC Compound.

The compound used in Power and Communication Duct is a high modulus material that offers better load bearing strength and ultra violet protection than conventional plastic duct materials.

Carlon Power and Communication Duct complies with NEMA Standard TC6-1974 and proposed ASTM Standard F-512 for Utilities Duct. Types EB and DB are rated for 90° Conductors.

UL LISTED TYPE EB RATED FOR 90°C CABLE

One Belled End Per Length (for encased burial)

Carlon Type EB Rigid Nonmetallic Conduit is listed by Underwriters Laboratories "Underground — for concrete encasement in outdoor trenches only. Not for use in walls, floors, or ceilings."

Nom. Size	CATALOG NO.	Approx. Wt. Per 100′	O.D.	Min. Wall	Price Per 100 Feet 20′ Lgths.
2″	48711	38	2.375	.060	25.30
3″	48713	56	3.500	.061	34.59
3½″	48714	74	4.000	.072	45.48
4″	48715	93	4.500	.082	57.66
5″	48716	141	5.563	.103	87.13
6″	48717	200	6.625	.125	123.64

25 foot lengths available west of Rockies only. Other lengths available on special order.

TYPE DB RATED FOR 90°C CABLE

One Belled End Per Length (for direct burial)

Nom. Size	CATALOG NO.	Approx. Wt. Per 100′	O.D.	Min. Wall	Price Per 100 Feet 20′ Lgths.
*1½″	48810	31	1.900	.073	19.86
2″	48811	35	2.375	.060	25.30
3″	48813	80	3.500	.092	49.33
3½″	48814	104	4.000	.107	64.06
4″	48815	131	4.500	.121	80.72
5″	48816	200	5.563	.152	123.64
6″	48817	284	6.625	.182	174.89

25 foot lengths available west of Rockies only. Other lengths available on special order.
*Furnished with molded couplings attached. All other sizes belled.

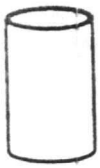
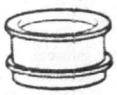
FOR FASTER SERVICE ORDER IN FULL CRATES.

DUCT SIZE	1½″	2″	3″	3½″	4″	5″	6″
20′ Crate Quantity	3160′	3860′	2000′	1480′	960′	760′	440′

Prices subject to change without notice.

P & C DUCT FITTINGS

(USE SAME TYPE FITTINGS FOR TYPE EB AND DB)

Item	PART NO.	Size	Pkg. Qty.	Price Each
COUPLING 	E940H	1½"	25	$ .42
	E940J	2"	30	.60
	E240L	3"	30	.72
	E240M	3½"	25	.94
	E240N	4"	15	1.17
	E240P	5"	20	2.12
	E240R	6"	15	3.25
MALE ADAPTER	E943H	1½"	25	$ .54
	E943J	2"	50	.80
	E943L	3"	45	1.90
	E943M	3½"	30	2.53
	E943N	4"	20	3.28
	E943P	5"	5	6.42
	E943R	6"	10	7.89
FEMALE ADAPTER	E942H	1½"	25	$ .48
	E942J	2"	30	.69
	E942L	3"	25	1.90
	E942M	3½"	20	2.53
	E942N	4"	15	2.82
	E942P	5"	8	7.16
	E942R	6"	6	8.22
BELL END 	E997H	1½"	30	$1.15
	E997J	2"	40	1.74
	E997L	3"	50	1.42
	E997M	3½"	40	1.52
	E997N	4"	30	1.64
	E997P	5"	15	1.76
	E997R	6"	10	2.11
PLUG	P258J	2"	60	$ .30
	P258L	3"	30	.34
	P258M	3½"	45	.46
	P258N	4"	50	.63
	P258P	5"	30	.79
	P258R	6"	30	.99
5° ANGLE COUPLING	E244H	1½"	20	$2.20
	E244J	2"	15	2.45
	E244L	3"	5	3.23
	E244N	4"	15	1.65
	E244P	5"	10	2.20
	E244R	6"	5	3.30

FLEXIBLE ADAPTER COUPLINGS

DIRECTIONS:

A fast, permanent means of coupling a wide variety of dissimilar duct materials. Molded from a PVC flexible compound, this durable fitting resists shear and expansion forces. Stainless setel clamps insure a water tight connection. It will adapt PVC to styrene underground, cast iron pipe, asbestos-cement, fiberduct and any combination of these within the size limitations of the adapter. Other sizes available on special order.

INSTALLATION:

1. Chamfer inside of end of both ducts.
2. Insert ducts so that they extend ½" beyond clamps.
3. Tighten clamps firmly.

PART NO. E946NL Price EACH $9.90

SIZE RANGE

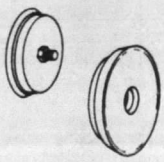
SMALL END — 3.5" to 4.3" O.D.
LARGE END — 4" to 5" O.D.

P & C TERMINATOR

FOR PRECAST OR POURED UTILITY VAULTS

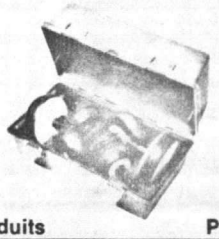
*** Inexpensive * Watertight * Versatile**

Designed to provide an improved termination system. Spacing between ducts may be varied to meet required utility specifications. Locator sets provide the flexibility to handle wall thickness of 4-6 inches. A two-step design entrance will accommodate telephone and P & C Duct dimensions.

	Item	PART NO.	Pkg. Qty.	Price Each
	P&C Terminator	E296N	50	$ .90
	Locator for 4½"	E298NN	7	6.95
	Locator for 5½"	E298NP	4	9.75
	Locator for 6"	E298NR	2	11.25

(Locator sets include rubber sealer, locator pan, and vented bolt assembly).

BENDING PLUGS



(Order with Model F Hotbox Bender)

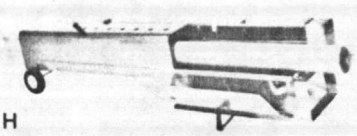
Standard Kit	For Conduits	Price Per Kit
G298JN	2" thru 4"	$92.50

Includes 3 pairs of expanding plugs and two pairs of sleeves in rugged storage box with complete instructions for use.

Large Diameter Kit	For Conduits	Price Per Kit
G298NR	4", 5" and 6"	$119.50

Includes 3 pairs of expanding bending plugs in heavy storage box. Complete instructions included.

MODEL F HOTBOX® BENDER
Model F — PART NO. G290F
For conduits to 6" diameter.
6400 watts, 230V AC
Dimensions: 74" x 11½" x 11½" H
Contractor Price — $495.00



MODEL F BEND GUIDE®
For field bending 2"-6" conduit.
PART NO. G2600
PRICE — $195.00

CARLON RESERVES THE RIGHT TO SHIP TO THE NEAREST PACKAGE QUANTITY

P & C DUCT SWEEPS

Other sweeps available on special order.

Item	PART NO.	Size	Pkg. Qty. Per Bundle	Price Each
90° SWEEP 18″ RADIUS	E7810H	1½″	5	$ 1.63
	E7810J	2″	5	2.05
	E7810L	3″	5	3.29
90° SWEEP 24″ RADIUS	E7820H	1½″	5	1.83
	E7820J	2″	5	2.42
	E7820L	3″	5	3.98
	E7820M	3½″	5	5.60
	E7820N	4″	5	6.40
90° SWEEP 36″ RADIUS	E7840H	1½″	5	2.25
	E7840J	2″	5	3.05
	E7840L	3″	5	5.14
	E7840M	3½″	5	6.50
	E7840N	4″	5	8.30
	E7840P	5″	3	12.54
90° SWEEP 48″ RADIUS	E7850J	2″	5	4.53
	E7850L	3″	5	6.92
	E7850M	3½″	5	8.75
	E7850N	4″	5	11.03
	E7850P	5″	3	16.28
	E7850R	6″	3	20.80
90° SWEEP 60″ RADIUS	E7860M	3½″	5	10.38
	E7860N	4″	5	13.25
	E7860P	5″	3	18.95
	E7860R	6″	3	24.40
45° SWEEP 18″ RADIUS	E7610H	1½″	5	1.13
	E7610J	2″	5	1.48
	E7610L	3″	5	3.24
45° SWEEP 24″ RADIUS	E7620J	2″	5	1.67
	E7620L	3″	5	3.17
	E7620M	3½″	5	4.00
	E7620N	4″	5	4.40
45° SWEEP 36″ RADIUS	E7640H	1½″	5	2.23
	E7640J	2″	5	2.50
	E7640L	3″	5	3.37
	E7640M	3½″	5	4.25
	E7640N	4″	5	5.30
	E7640P	5″	3	8.36
45° SWEEP 48″ RADIUS	E7650L	3″	5	4.53
	E7650N	4″	5	6.29
	E7650P	5″	3	9.52
45° SWEEP 150″ RADIUS	E7690M	3½″	5	12.65
	E7690N	4″	5	16.10
	E7690P	5″	3	23.12
	E7690R	6″	3	29.60
30° SWEEP 18″ RADIUS	E7410J	2″	5	1.44
	E7410L	3″	5	2.71
30° SWEEP 36″ RADIUS	E7440J	2″	5	$ 3.04
	E7440L	3″	5	4.62
	E7440N	4″	5	5.03
30° SWEEP 60″ RADIUS	E7460M	3½″	5	4.89
	E7460N	4″	5	5.69
	E7460P	5″	3	8.12
30° SWEEP 150″ RADIUS	E7490M	3½″	5	11.89
	E7490N	4″	5	12.22
	E7490P	5″	3	13.20
22½° SWEEP 24″ RADIUS	E7220M	3½″	5	4.64
	E7220N	4″	5	6.75
22½° SWEEP 36″ RADIUS	E7240M	3½″	5	5.62
	E7240N	4″	5	6.25
	E7240P	5″	3	6.70
22½° SWEEP 150″ RADIUS	E7290M	3½″	5	7.16
	E7290N	4″	5	10.60
	E7290P	5″	3	14.60
11¼° SWEEP 150″ RADIUS	E6890J	2″	5	5.27
	E6890L	3″	5	5.75
	E6890M	3½″	5	6.21
	E6890N	4″	5	7.65
	E6890P	5″	3	12.46
	E6890R	6″	3	16.50

CABLE PULLING COMPOUND

SLIKUM

A clear, non-staining liquid cable-pulling lubricant. Suitable for all conductor insulations and can be used in all temperatures.

PART NO.	Size	Description	Pkg. Qty.	Price Each
H700	1 Quart	Squeeze Bottle	12	$ 1.95
H710	1 Gallon	Squeeze Bottle	6	4.50
H720	5 Gallon	Plastic Pail	1	19.15

CEMENT

Carlon recommends the use of Carlon cement for proper solvent weld joints. Since this cement is prepared particularly for our product compounds and tolerances, we cannot guarantee joints assembled with other cement materials. All pints and quarter shipped with Carlon's exclusive Zip'licator for fast application.

PART NO.	Size	Pkg. Qty.	Price Each
VC9953	1 Pint - Zip'licator	24	$ 3.35
VC9952	1 Quart - Zip'licator	12	5.50
VC9941	1 Gallon	4	16.50
	CLEAR CEMENT (Quick Set)		
VC9973	Pint - Zip'licator	24	$ 3.35
VC9972	Quart - Zip'licator	12	5.50
VC9981	Gallon	4	16.50

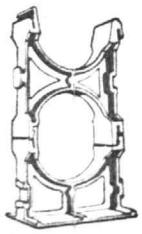
SPRAY COAT (AEROSOL)

FOR COATING STEEL PARTS WITH PVC

PART NO.		Pkg. Qty.	Price Each
VC2934	EQUAL TO 1 PINT	12	$3.10

PLASTIC SPACERS FOR P & C DUCT — Featuring a new unique vertical locking device.

The interlocking device (which snaps intermediate and base spacers together, vertically as well as horizontally, provides greater stability and makes possible the assembly of conduit banks outside of the trenches. This unique design also relieves the conduit of all direct stress.

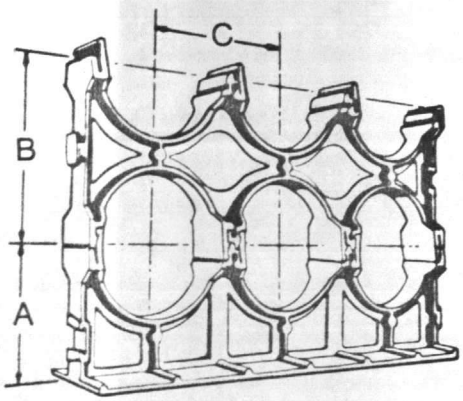


INTERMEDIATE SPACERS

Conduit Size	SEPARATION 1"			1½"			2"			3"		
	PART NO.	Pkg. Qty.	Price Per 100	PART NO.	Pkg. Qty.	Price Per 100	PART NO.	Pkg. Qty.	Price Per 100	PART NO.	Pkg. Qty.	Price Per 100
2"				S289JH	90	$20.00						
3"				S289LH	100	22.10	S289LJ	75	$23.80			
3½ & 4"	S289NF	90	$24.85	S289NH	60	22.30	S289NJ	60	25.00	S289NL	50	$27.40
5"				S289PH	50	25.20	S289PJ	50	27.10	S289PL	50	33.10
6"				S289RH	50	34.75						

BASE SPACERS

Conduit Size	SEPARATION 1"			1½"			2"			3"		
	PART NO.	Pkg. Qty.	Price Per 100	PART NO.	Pkg. Qty.	Price Per 100	PART NO.	Pkg. Qty.	Price Per 100	PART NO.	Pkg. Qty.	Price Per 100
2"				S288JH	100	$24.10						
3"				S288LH	100	27.20	S288LJ	75	$28.90			
3½ & 4"	S288NF	90	$25.90	S288NH	60	29.10	S288NJ	60	30.15	S288NL	50	$33.50
5"				S288PH	50	33.50	S288PJ	50	34.40	S288PL	50	40.40
6"				S288RH	50	42.00						



BASES

Size	Cat. No.	A	C
2x1½	S288JH	4.212	3.875
3x1½	S288LH	4.800	5.000
3x2	S288LJ	4.800	5.500
3½ x4	S288NF	3.950	5.350
4x1½	S288NH	5.300	6.000
4x2	S288NJ	5.300	6.500
4x3	S288NL	5.300	7.500
5x1½	S288PH	5.830	7.060
5x2	S288PJ	5.830	7.560
5x3	S288PL	5.830	8.560
6x1½	S288RH	6.632	8.664

INTERMEDIATES

Size	Cat. No.	B	C
2x1½	S289JH	3.875	3.875
3x1½	S289LH	5.000	5.000
3x2	S289LJ	5.500	5.500
3½ x4	S289NF	5.500	5.350
4x1½	S289NH	6.000	6.000
4x2	S289NJ	6.500	6.500
4x3	S289NL	7.500	7.500
5x1½	S289PH	7.060	7.060
5x2	S289PJ	7.560	7.560
5x3	S289PL	8.560	8.560
6x1½	S289RH	8.664	8.664

SPACERS ARE DESIGNED FOR USE WITH PLASTIC CONDUIT ONLY.

YED # 230170

BUILDING 1700, ELECTRICAL REPAIRS

Replace transformers

Two - 750 KVA, 3Ø 12470 to 120/208 transformers. Should be located outside building with feeders run to new cabinets.

Replace Circuit Breaker Panels

Panel A - 2500 A
Panel B - 2500 A (see attached sketch)
Auxilary Panel

Replace incandescent lighting

Head area	6 fluorescent 4T/4'
Operating floor	60 fluorescent 4T/4'
3d floor	28 fluorescent 4T/4'
4th floor	28 fluorescent 4T/4'
Surge tank room	7 fluorescent 4T/4'
1st floor	86 fluorescent 4T/4'
Battery room	1 explosion proof fixture

Include new circuits.

Cabinet #1 Located in front of boilers # 3 + 4

FD-Fan 75 HP	ID-Fan 150 HP	750-KVA Transformer Switch DK-25 Manually Operated Westinghouse Circuit Breakers	#-4- ID-Fan 150 HP
Pulverizer - 3-B 75- HP	Pulverizer - 3-A 75- HP		#-4- FD Fan 75- HP
Spare	Exhaust Fans	Tie To Aux Switchgear	#-1- Pulverizer 75- HP
Spare	Spare		#-2- Pulverizer 75- HP

Cabinet # B

#-1- FD-Fan
75-HP

#-1- ID Fan
150-HP

750 KVA Transformer
Switch

DK-25-manually Operated
Westinghouse circuit Breaker

#-2- ID Fan
150 HP

#-1-B
Pulverizer - 75 HP

#-1-A
Pulverizer - 75-HP

#-2- FD-Fan
75-HP

Spare

Spare

Tie TO Aux Switchgear

2-A
Pulverizer - 75-HP

Spare

Spare

#2-B
Pulverizer - 75-HP

Center Cabinet (Auxiliary)

Coal Handling Controll Panel

Coal Storage Equipment

Ash Unloading Controll Panel

main Lighting Panel

KW meter

Amps

Volts

DK-25- manually Operated Westinghouse Circuit Breaker

KW-meter

Amps

Volts

Amp switch

volt Switch

totalizing meter

Auxiliaries meter

Aux Power meter

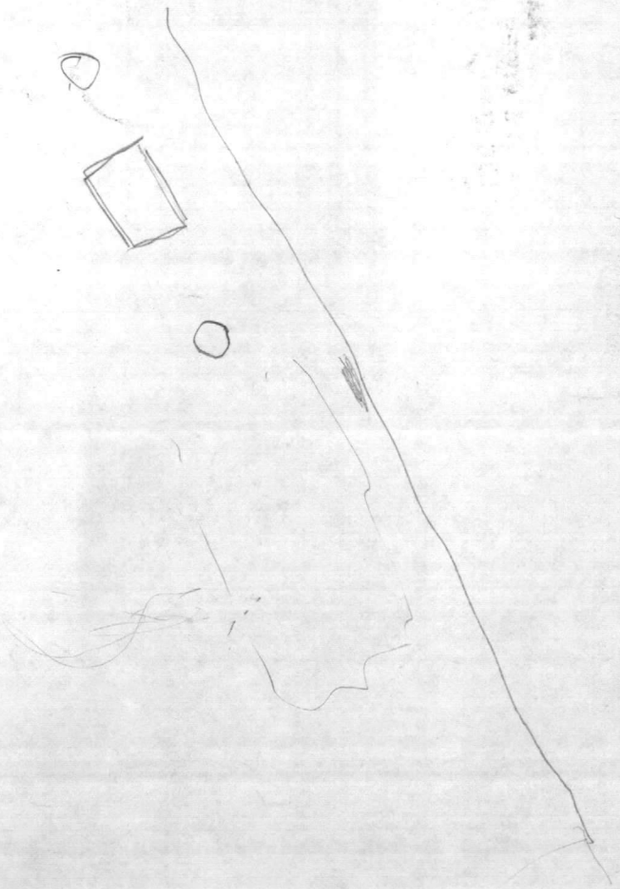
Lighting meter

5- Controll Panel

Air Compressers

Coal Handling Equipment

Coal car Shaker



NAME OF PROJECT: REPAIR ELECTRIC SERVICE, TRANSFORMERS, AND SWITCHGEAR
LOCATION: BUILDING 1700, MARINE CORPS BASE, CAMP LEJEUNE, N. C.
DESIGNED BY: DESIGN DIV., PUBLIC WORKS DEPT., MARINE CORPS BASE CAMP LEJEUNE, N. C.
CONTRACT NO: N62470-79-C-4471

TYPE OF SUBMITTAL: GROUND RODS
LOCATION: TRANSFORMER PAD
GOVERN. SPEC.: 16300 Paragraph 6.8.1

SUBMITTED BY:

CAMPBELL ELECTRICAL CO., INC.
P. O. BOX 730
WILSON, N. C. 27893

REVIEWED
Date 7-20-81 By

OFFICE OF THE
OFFICER IN CHARGE OF CONSTRUCTION
CAMP LEJEUNE, NORTH CAROLINA

APPROVED

SUBJECT TO CONTRACT REQUIREMENTS

CONTRACT N62470-79-C-4471

DATE 7/22/81

R. E. CARLSON
CDR, CEC, USN
Officer in Charge
of Construction

Knight Metalcraft Division
Whittaker Corporation
Longview Drive
Portland, Tennessee 37148
(615) 325-9296 Telex 554314

Knight Metalcraft

Whittaker

JUN 1981
RECEIVED
Campbell Electrical Co. Inc.

June 19, 1981

Campbell Electric Co.
P. O. Box 730
Wilson, N. C. 27893

Attn: Janet Johnson

Gentlemen:

This is to certify that Knight Metalcraft ground rod, catalog no. 1034, meets the requirements of specification 05-79-4471.

Very truly yours,

J. A. Gann
Sales and Marketing Manager

JAG/km

State of Tennessee
County of Sumner

Sworn to and subscribed and acknowledged before me this 19 day of June, 1981.

Notary Public (Seal)

NAME OF PROJECT: REPAIR ELECTRIC SERVICE, TRANSFORMERS, AND SWITCHGEAR
LOCATION: BUILDING 1700, MARINE CORPS BASE, CAMP LEJEUNE, N. C.
DESIGNED BY: DESIGN DIV., PUBLIC WORKS DEPT., MARINE CORPS BASE CAMP LEJEUNE, N. C.
CONTRACT NO: N62470-79-C-4471

TYPE OF SUBMITTAL: FUSES
LOCATION: GENERAL
GOVERN. SPEC.: 16300 Paragraph 14

SUBMITTED BY:

CAMPBELL ELECTRICAL CO., INC.
P. O. BOX 730
WILSON, N. C. 27893

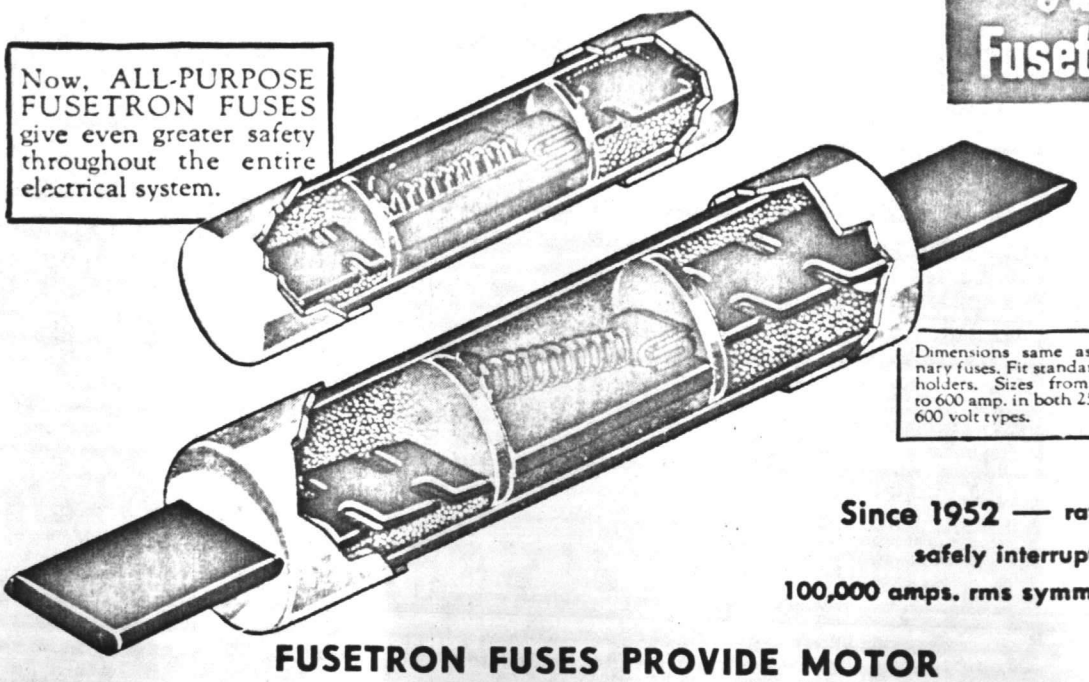
REVIEWED
Date 7-20-81 By

OFFICE OF THE
OFFICER IN CHARGE OF CONSTRUCTION
CAMP LEJEUNE, NORTH CAROLINA

APPROVED
SUBJECT TO CONTRACT REQUIREMENTS
CONTRACT N62470-79-C-4471
DATE 7/22/81

R. E. CARLSON
CDR, CEC, USN
Officer in Charge
of Construction

Now, ALL-PURPOSE FUSETRON FUSES give even greater safety throughout the entire electrical system.



Dimensions same as ordinary fuses. Fit standard fuse holders. Sizes from 1/10 to 600 amp. in both 250 and 600 volt types.

Since 1952 — rated to safely interrupt 100,000 amps. rms symmetrical a. c.

FUSETRON FUSES PROVIDE MOTOR RUNNING PROTECTION AS WELL AS BRANCH CIRCUIT PROTECTION *WHERE AS* . . . . . ORDINARY FUSES AND CIRCUIT BREAKERS CAN ONLY PROVIDE BRANCH CIRCUIT PROTECTION

Fusetron® DUAL-ELEMENT Fuses

Provide 10 Point Protection

1. High interrupting capacity—protect against heavy short-circuits. Have interrupting rating of 100,000 amperes rms symmetrical. See Page 2

2. Protect against needless blows caused by excessive heating — lesser resistance results in cooler operation. See Page 2

3. Protect against needless blows caused by harmless overloads. See Page 2

4. Provide thermal protection — for panels and switches against damage from heating due to poor contact. See Page 3

5. Protect against waste of space and money — permit use of proper size switches and panels. See Page 3

6. Guard motors against burnout from overloads. See Page 4

7. Give DOUBLE burnout protection to large motors — without extra cost. See Page 4

8. Guard motors against burnout due to single phasing. See Page 4

9. Make protection of small motors simple and inexpensive. See Page 4

10. Guard coils, transformers and solenoids against burnout. See Page 5

For size to use see pages 7 and 8. For blowing time charts see pages 9 thru 13. For specifying information see page 14.

1 HIGH INTERRUPTING CAPACITY. Fusetron fuses have an interrupting rating of 100,000 amperes rms symmetrical at rated voltage.

In support of this high rating, Fusetron dual-element fuses from the production line are tested in the BUSS High-Current Test Laboratory. In compliance with the Underwriters' Laboratories, Inc. Standard, the test circuit is set to deliver a current of 100,000 amperes at a short-circuit power factor of not over 20 percent. The open-circuit voltage of the circuit is not less than 250 volts for Fusetron fuses in the 250 volt range and not less than 600 volts for the 600 volt range — at 60 cycles frequency.

In the development work on Fusetron dual-element fuses to increase their interrupting capacity, it was kept in mind that the time-lag characteristics of these fuses must be maintained. Time-lag is of utmost importance in fuses because it permits motors and circuits to be fused down to their normal operating load. This gives maximum protection against any harmful overloading, without fear that fuses will open needlessly on starting currents or other harmless surges. The circuit is not shut down unless a harmful condition exists.

Remarkable results were achieved. Interrupting capacity was greatly increased while the time-lag characteristics were in no way disturbed.

2 Protect against needless blows caused by excessive heating of panels or switches.

Fuses, like all other protective devices, operate from heat created by the current flowing through them. Thus they produce some heat even in normal operation.

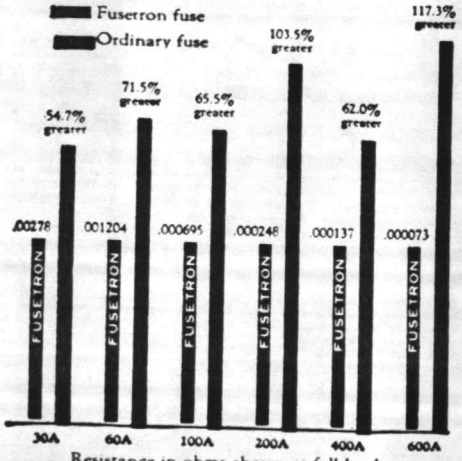
This heat must be dissipated from switches and panels through the air, through metal parts and through the wires connected to such enclosures.

Sometimes the heat is not dissipated fast enough — so it piles up in switches or panels.

This piled up heat over-heats fuses and reduces their carrying capacity. Then fuses often blow even though not loaded to their rated capacity.

To solve the heating problem by putting in larger metal parts or wires to conduct heat away faster is always costly. A more logical answer is to cut down heat at its source by using Fusetron fuses — they produce less heat because they have less electrical resistance than ordinary fuses.

Here's the Resistance of Fusetron fuses compared to ordinary fuses with the lowest resistance.



Resistance in ohms shown at full load.
Chart shows 250 volt sizes. 600 volt sizes show similar results.

Ordinary fuses have 55 to 117% greater resistance than Fusetron fuses in 250 volt sizes, and up to 140% greater resistance in 600 volt sizes.

Since Fusetron fuses generate less heat, switches and panels will operate much cooler. This materially reduces or wipes out entirely useless shutdowns caused by fuses blowing due to overheating of panels and switches.

3 Protect against needless blows caused by harmless overloads.

Fusetron dual-element fuses will hold motor-starting currents or other harmless overloads without opening because they have a tremendous time-lag.

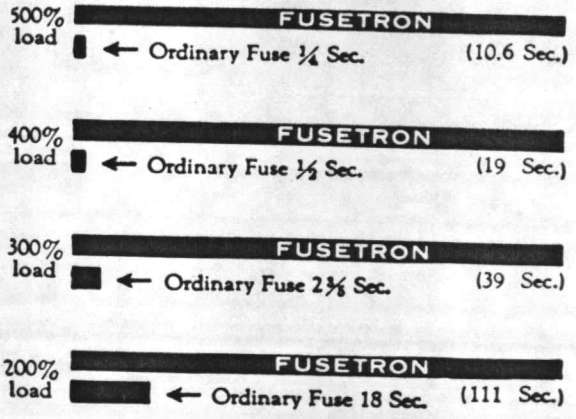
A machine may momentarily stall or be overloaded and Fusetron fuses won't open.

A motor may be started under heavy load — or all the motors on a circuit may be started at once — and Fusetron fuses won't open.

Circuits can be loaded nearer to the capacity of panel-boards and switches without having Fusetron fuses open needlessly.

Here's a comparison of time-lag between Fusetron fuses and ordinary fuses

Notice that even at 500% load a Fusetron fuse will hold on for more than 10 seconds — while an ordinary fuse will open in less than ¼ second. Yet, with all this time-lag, there is no sacrifice of safety.

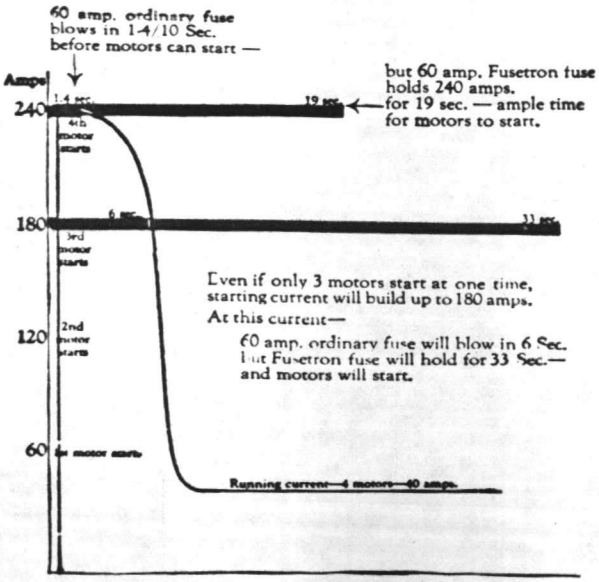


Comparison is based on ordinary fuses with the longest time-lag. Figures apply to 30 amp. 250 volt size. Opening time on larger sizes and on 600 volt sizes is longer.

Here's an example of how Fusetron fuse time-lag works

For example: take four 10 amp. motors on a circuit. 60 amp. ordinary fuses would be used to protect the circuit. BUT see what happens when four motors start at one time. The starting current of each motor is about 60 amps. so the combined starting currents would reach 240 amps.

At this load —



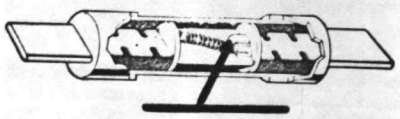
So with Fusetron fuses installed in Mains, Feeders and all Branch circuits — shutdowns caused by needless blowing of fuses are ENTIRELY WIPED OUT.

4 Provide thermal protection — against damage from poor contact — and hazard on short-circuit.

When poor contact develops between fuse and clip — or because of a poorly soldered or loose connection or for any reason — it results in excessive heating.

Such heating chars fibre tubes of ordinary fuses, oxidizes contacts, destroys insulation and finally causes injury or destruction of panel or switch.

Fusetron dual-element fuses protect against such damage



because whenever their thermal cutout reaches 280° F. the solder softens — the cutout opens — and the current is cut off.

Ordinary fuses cannot give this thermal protection. Their fuse link must reach 786° F. before it will melt out. By this time damage is done to clips, panels or switches.

But a Fusetron fuse, regardless of size, will open the circuit long before heat from poor contact can reach damaging temperatures.

They warn that poor contact must be corrected — instead of letting the heat build up and cause a lengthy shutdown while switches or panels are being replaced or repaired.

Fusetron fuses can't become a hazard on short-circuits because fibre tubes never char under any conditions —because the Fusetron fuse will open when the temperature at the Thermal Cutout reaches 280° F. and because the Fusetron fuse never has as high a temperature rise at any load as does an ordinary fuse, the fibre tube on the Fusetron fuse can never be injured — either by its own heating or by heat conducted to it from the outside.

Hence, the fibre tube on a Fusetron fuse will always maintain its original strength, no matter how long it stays in service and will always be ready to function on severe short-circuits or any other conditions without becoming a hazard.

If spring clips have lost their temper they should be replaced or BUSS Clip-Clamps should be used. See BUSS bulletin DCS for full information.

On new installations—

5 Protect against waste of space and money — permit use of PROPER size switches and panels.

Section 430-57 of the National Electrical Code permits this — when Fusetron fuses are used.

To determine PROPER SIZE switch — get ampere rating of motor from tables in Code — then select switch size to have at least 133⅓% capacity based on motor ampere rating. For example a 60 ampere switch should be specified for a 27 ampere motor.

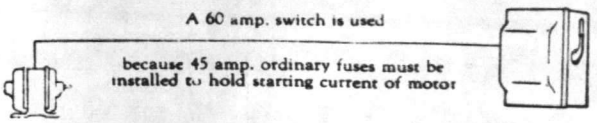
There are at least ten makes of switches available that will have the correct h.p. rating for the motor when selected by the simple method above.

The correct h.p. rating of switches when Fusetron dual-element fuses are used is shown on sticker inside switch cover — or on Laboratories' listing cards.

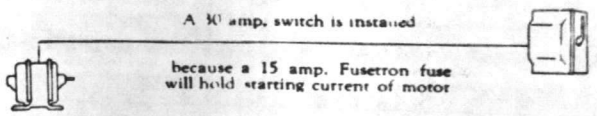
Ordinary fuses require OVERSIZE switches

Since ordinary fuses have relatively little time-lag, oversize fuses have to be used. This means OVERSIZE panels and switches must be installed.

For example: On a 15 amp. Motor



But with Fusetron fuses — on a 15 amp. motor



Again with ordinary fuses a 400 ampere switch is used on a 100 ampere motor — but with Fusetron fuses, a 200 ampere switch can be installed because a 110 ampere Fusetron fuse will hold the motor starting current.

Likewise on other size motors the long time-lag of Fusetron fuses make it possible to install PROPER size fuseholders instead of OVERSIZE.

Panelboards and Main Switches can also be of PROPER SIZE

Of course, with ordinary fuses Panelboards and Main Switches must also be oversize — but with Fusetron fuses, Panelboards and Main Switches can be installed in the PROPER SIZE to handle the load.

Being able to install PROPER SIZE equipment saves money and often helps solve the troublesome problem of finding enough space to have panel or switch installed in a convenient location.

This saving is permitted by the Code, section 430-57, which reads—

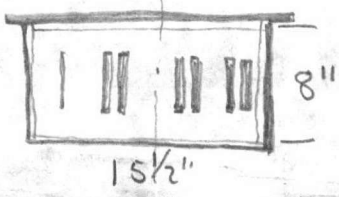
430-56. Size of Fuseholder. Where fuses are used for motor branch-circuit protection, the fuseholders shall not be of a smaller size than required to accommodate the fuses specified in Tables 430-152 and 430-153 except that where fuses having time delay appropriate for the starting characteristics of the motor are used, fuseholders of smaller size than specified in Tables 430-152 and 430-153 may be used.

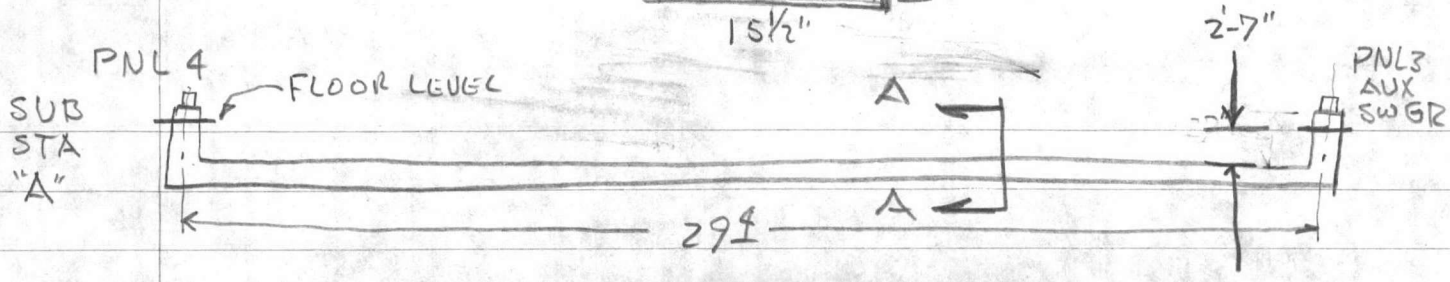
The savinge made possible by using Fusetron fuses under that authorization are shown in the following table:

Type of motor	Size of motor-branch-circuit fuses expressed in percent of full load rating of motor. Specified by Section 430-52 Table 430-153	Permissible with Fusetron fuses on normal installations*
Single phase	300%	100 to 125%
2 or 3 phase, squirrel cage, full voltage start	300%	100 to 125%
2 or 3 phase, auto transformer or high reactance start—		
0 to 30 amp. motor	250%	100 to 125%
over 30 amp. motor	200%	100 to 125%
2 or 3 phase, wound rotor	150%	100 to 125%
Direct current	150%	100 to 125%

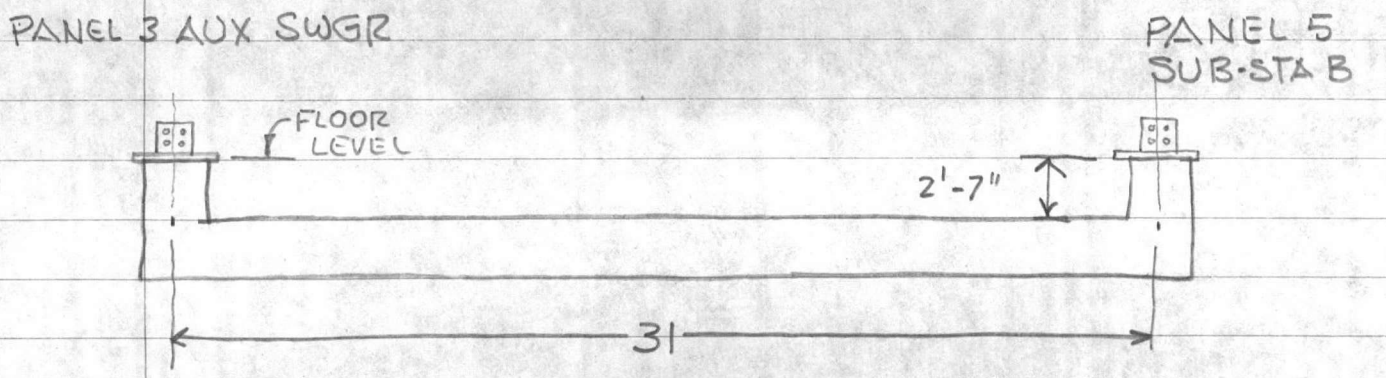
*See page 8 for details.

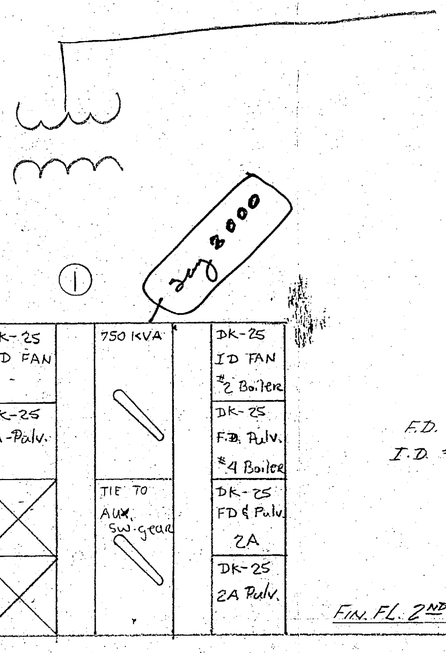
208 VOLT BUS DUCT

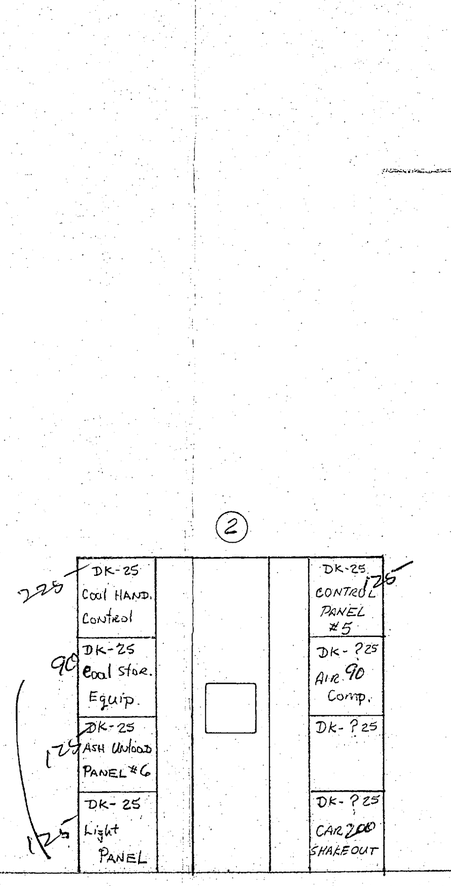


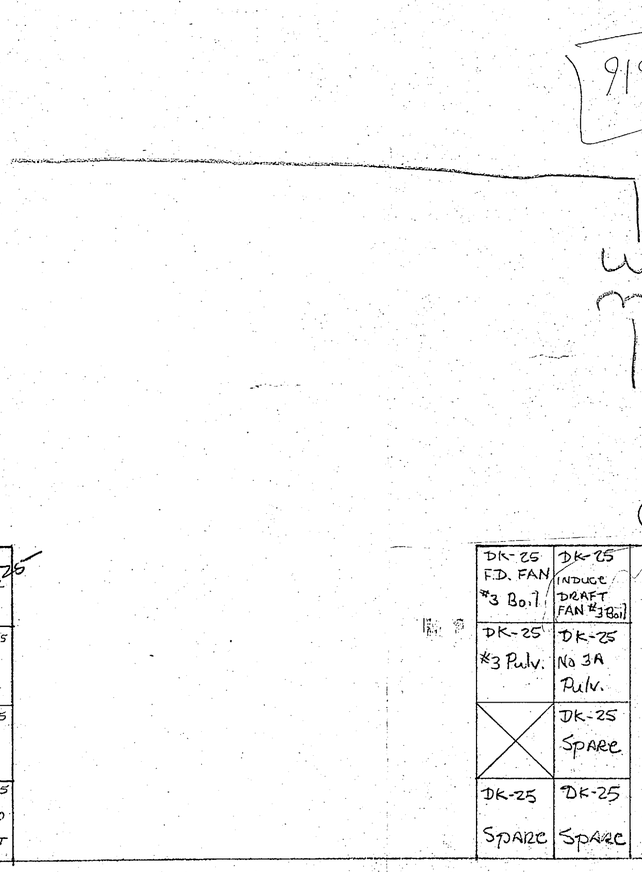


208V BUS DUCT









ELEVATION - SWITCHGEAR & DUCTWORK

BLDG. 1700

N.T.S.

6/14/79 DWG. G.H.

12 JUNE

IT IS IMPOSSIBLE TO PROVIDE AN INTELLEGENT COST ESTIMATE IN JUST A FEW DAYS - THE COST DATA IS NOT READILY AVAILABLE AND MOST COME FROM THE FACTORY - THERE HAS BEEN NO BACK-UP DATA WITH THIS REQUEST. MOST OF THE SHOP DWGS HAVE BEEN LOST & THE DWGS. AVAILABLE ARE NOT ACCURATE. FROM A QUICK FIELD INVESTIGATION ——————, THE FOLLOWING HAS BEEN ASSERTAINED: THE PLANT WAS CONSTRUCTED IN 1943. THE ELECTRICAL SERVICE ~~IS A REDUNDANT~~ SERVICE FOR BUILDRS 1 & 2 2ND SERVICE FOR 2 & 5 SYSTEM IN PRIMARY & SECONDARY USING 2-750 KVA, INERTEEN FILLED TRANSFORMERS WITH 2 SECONDARY SWITCHGEAR SECTIONS CONSISTING OF WESTINGHOUSE DK-25 DRAWOUT CKT BKRS AND A PRIMARY SWITCH & BUS TIE CKT BKRS. THERE HAS BEEN NO MAJOR MAINTENANCE TO THE SWITCH GEAR SENCE ITS INSTALLATION WITH THE EXCEPTION OF MINOR ADJUSTMENTS & REPAIRS. THE SWITCHGEAR IS IN A STATE OF ADVANCED DETERIORATION, ARCHING CONTACTS HAVE CAUSED BUS DAMAGE, SOME CKT BKRS NO LONGER FUNTION AUTOMATIC & MUST BE MANUALLY ~~TRIPED~~ OPERATED, THE BKR MECHANISM IS WORN & SOME OF THE TRIP MOTORS BURNED OUT.

SEE SHEET #2

MCBCL 11014/25

PROJECT LOG

SHEET 2

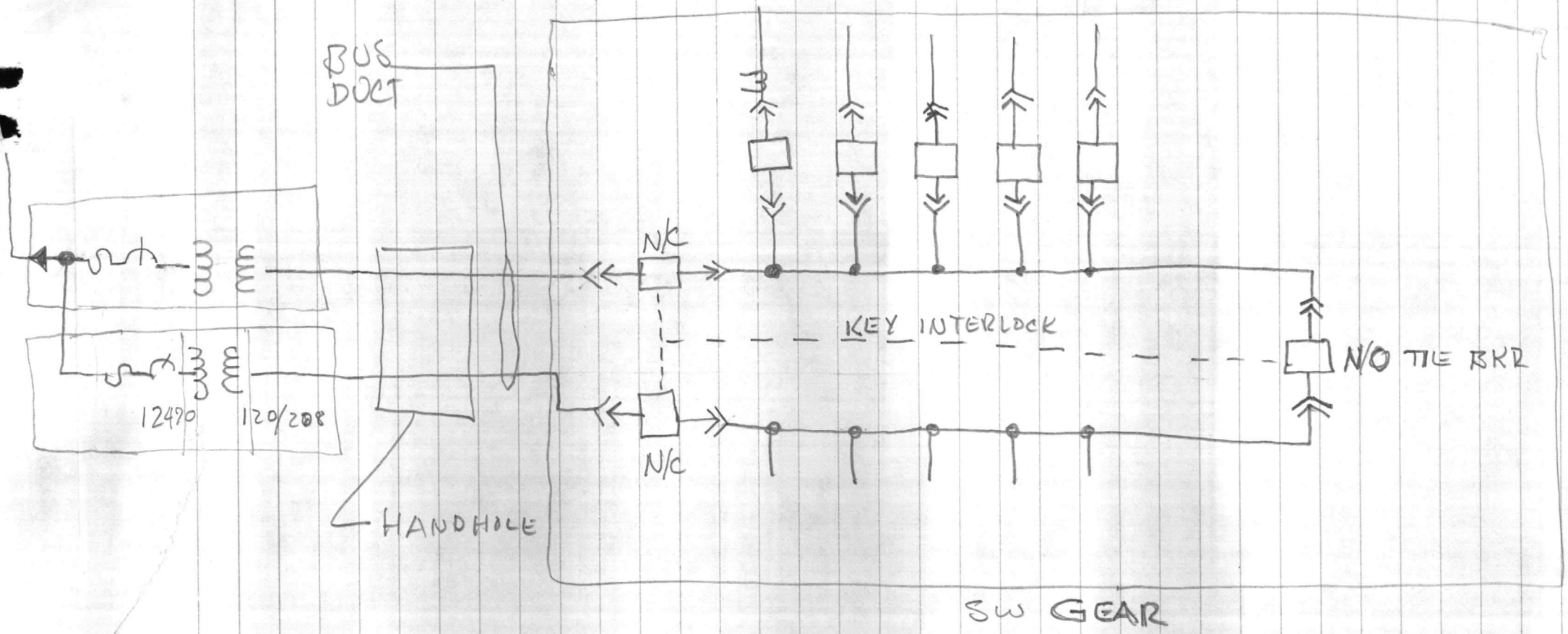
PWD Proj. No. _____

Title: _____

DATE	REMARKS
12 JUNE	IT IS IMPOSSIBLE TO ESTIMATE THE REMAINING LIFE OF THE TRANSFORMERS. THE TRANSFORMERS ARE OVER 35 YEARS OLD. ONE OF THE TRANSFORMERS IS LEAKING OIL ("INTEERTEN" WESTINGHOUSE'S TRADE NAME FOR NON-FLAMMABLE OIL - INERTEEN CONTAINS PCB). BASE MAINTENANCE HAS PROVIDED A TEMPORARY PAN AT THE TRANSFORMER TRANSITION JOINT TO CATCH THE OIL. IT IS PROPOSED TO REPLACE BOTH TRANSFORMERS, THE PRIMARY SWITCHGEAR, SECONDARY SWITCH-GEAR, TIE BREAKERS, BUSDUCT, PRIMARY FEEDERS & TO RECONNECT ALL CKTS. THE NEW TRANSFORMERS WOULD BE INSTALLED ON A PAD @ GROUND LEVEL OUTSIDE OF THE BLDG. THE EXISTING TRANSFORMERS WOULD BE DRAINED & LEFT IN PLACE. NOTE THERE ARE SEVERAL POTENTIAL HAZARDS WHICH IF LEFT UNRESOLVED COULD CAUSE CAUSE PERSONNEL INJURY PLUS A LONG DOWN TIME ON THE PLANT. COAL DUST HAS FILTERED DOWN INTO THE ELECTRICAL CONDUIT & COULD BE IGNITED FROM A SHORT CKT IN THE OLD, DETERIORATED WIRING. "INTERTEEN" THE COOLANT USED IN THE TRANSFORMERS IS LEAKING &

— ON BACK —

AN OPEN PAN HAS BEEN INSTALLED TO CATCH THE LIQUID. IT'S POSIBCE THAT THIS INTERTEEN IS SEAPING FROM SEVERAL OTHER CRACKS - THE TRANSFORMERS ARE COVERED W/ COAL DUST & DIFFICOUT TO EXAMIN FOR A SMALL SEEPING CRACK.


BUS DUCT
N/C
N/C
KEY INTERLOCK
N/O TIE BKR
12490
120/208
HANDHOLE
SW GEAR

FD FAN – 75HP – 300 AMPS
ID " 150HP – 450 AMPS
PULVERIZER 75 HP – 300 AMPS
ID FAN 150 HP – 450 AMPS
* EXHAUST FAN (4) 10 HP – 200 AMP
MAIN CKT BKR – 2500 A
* TIE CKT BKR – 2500A
I.D. FAN 150HP – 450A
F.D. FAN 75HP – 300A
PULVERIZER 75HP – 300A
PULVERIZER 75HP – 300A
FD FAN 75HP – 300A
PULVERIZER 75HP – 300A
ID FAN 150HP – 450A
PULVERIZER

BUREAU OF YARDS AND DOCKS
750 KV A. UNIT SUBSTATIONS
U.S. MARINE BARRACKS
NEW RIVER, N.C.

TRANSFORMER PROPOSAL

The Westinghouse Electric and Manufacturing Company proposes to furnish the following transformers to be in accordance with the attached performance specification # 251813.

ITEM 1.

2 - 750 KV-a., 3 phase, 60 cycle, unit substation transformers.

H.V. - 12,470 volts Delta

L.V. - 120/208 Wye.

230182-720

Transformer Performance Specification

For Marine Barracks New River, N.C.

Neg. No. NOy-4750 SPECIFICATION No. 251813 Date Mar. 16, 1942

RATING

Type	Form	Phase	Cycles	High Voltage	Low Voltage		Service
SL	Core	3	60	12470	208		Outdoor
Distribution Unit Substation				750 Kv-a.	750 Kv-a.	Kv-a.	

ADDITIONAL APPROXIMATE VOLTAGES

High Voltage 12160-11845-11535-11225 F.C. by no load tap changer.

Low Voltage

CONNECTIONS FOR OPERATION

Transformers in Bank	To Transform From	Phase	Connected	To	Phase	Connected
1	12470	3	Delta	208	3	Wye

TEMPERATURE RISE

Load in per Cent of Rated Kv-a.	Hours	Rise in deg. C by resistance not to exceed	Insulating Liquid
100	Until Constant	55	Inerteen

Method of Cooling Self

Cooling water ____ gallons per minute at pressure of ____ lbs. per square inch at the transformer

Ingoing insulating liquid ____ gallons per minute

DIELECTRIC TESTS

APPLIED VOLTAGE TESTS (To other windings and ground)			INDUCED VOLTAGE TESTS
High-Voltage Winding	Low-Voltage Winding		2 Times Normal Voltage
34 Kv.	10 Kv.	Kv.	

LOSSES IN WATTS

				PER CENT REGULATION			
				100% P.F.		80% P.F.	
No-Load Losses	2470						
Total Losses	10250			1.2		4.3	

APPROXIMATE DIMENSIONS AND WEIGHTS (Not for construction purposes)

APPROXIMATE DIMENSIONS IN INCHES

Outline Form No. 25825

Height Overall—A 94

Projected Floor Space (B x C): —B 102, —C 76

Height Over Case—D 94

APPROXIMATE NET WEIGHTS IN POUNDS

Core and Coils 5100

Case and Fittings 4600

T. C. U. L. (Dry)

*Insulating Liquid 5500

Total Weight 15200

*Gallons 440 Inerteen

Terminals, H.V.-DL ____ Fig. ____ L.V.-DL 25766 Fig. 7 ____ V.-DL ____ Fig. ____

230182-720

A Copy of Data Sheet Form 21895 is to be included in contracts with this page.

Page No. 1 of Specification No. 251813 Pages 6 Contract Page ____ Prepared by G.K. K.

Westinghouse Electric & Manufacturing Co.

Transformer Performance Specification

Rating. The voltage ratings are based on the turn ratio and will be subject to the effect of regulation at various loads and power factors. The Kv-a. rating is based on rated secondary voltage maintained by impressing on the primary winding a voltage higher than the primary rating to compensate for the effect of regulation of the transformer. Transformers will be designed to deliver rated Kv-a. at 105% rated voltage.

Temperature Rise. Determined by increase of resistance corrected to instant of shutdown. As it is obviously impossible to obtain resistance readings at the exact instant of shutdown. the observed readings are corrected for the drop in temperature occurring between the instant of shutdown and the time when readings are made.

Temperature rise of all types of transformers is based on rated frequency with the transformer connected to give the maximum losses and upon the conditions listed below applying to the type of transformer covered by this specification.

Water Cooled. Specified quantity of cooling water to be circulated at an ingoing temperature of 25°C.

Forced Oil. Specified quantity of oil to be circulated and oil must be cooled 15°C. Temperature rise is based on 25°C. cooling water or a cooling air temperature not to exceed 40°C. and an altitude of 1000 meters (3300 ft.) or less.

Self Cooled and Self Cooled—Air Blast. Normal conditions of ventilation, a cooling air temperature not to exceed 40°C. and an altitude of 1000 meters (3300 ft.) or less.

Air Blast. Specified quantity of air to be circulated at an ingoing temperature not to exceed 40°C. and an altitude of 1000 meters (3300 ft.) or less. If based on thermometer measurements the permissible temperature rise is 5°C. higher than by resistance.

Water cooled, forced oil cooled and air blast transformers are not designed to be excited or loaded without artificial cooling.

Temperature Tests. Will be made when heating data are not available on duplicate or essentially duplicate transformers. Temperature tests will be made on one transformer furnished in accordance with these specifications, and the results of this test will be considered as determining the temperature rise of all transformers. Testing facilities will not permit power factor consideration in making temperature tests.

Applied Voltage Test. Applied for one minute, sphere gap determination.

Induced Voltage Test. Applied for 7200 cycles at the lowest practicable frequency, except that the duration of test will not exceed 60 seconds.

Impulse Test, Sound Level Test, or Bushing Test. Will be made only when definitely specified.

Efficiency. The efficiency will be established by a statement of the no-load and total losses.

Losses. Based on wattmeter measurements at rated frequency, Kv-a. and voltage at a temperature of 75°C.

The average tested losses of transformers of the same rating on an order will not exceed the specified values. Tested losses for individual single-phase or three-phase transformers on a given order for two or more units will not exceed the guaranteed values by more than 10 per cent for no-load losses or 6 per cent for total losses. If only one single-phase transformer is on an order the above tolerances apply. If only one three-phase transformer is on an order the tested losses will not exceed the guaranteed values.

Per Cent Regulation. At rated Kv-a. voltage and frequency at a temperature of 75°C.

The transformer regulation, computed from impedance volts and impedance watts measured by wattmeter, may exceed the specified regulation at specified power factors by not more than 7½ per cent for two winding transformer, or 10 per cent for three winding and auto transformer.

Method of Making Tests. All tests will be in accordance with the Proposed Standards of American Standards Association except as may be stated otherwise in this specification. The details of test procedure will be in accordance with the testing practice of the Westinghouse Electric & Manufacturing Company.

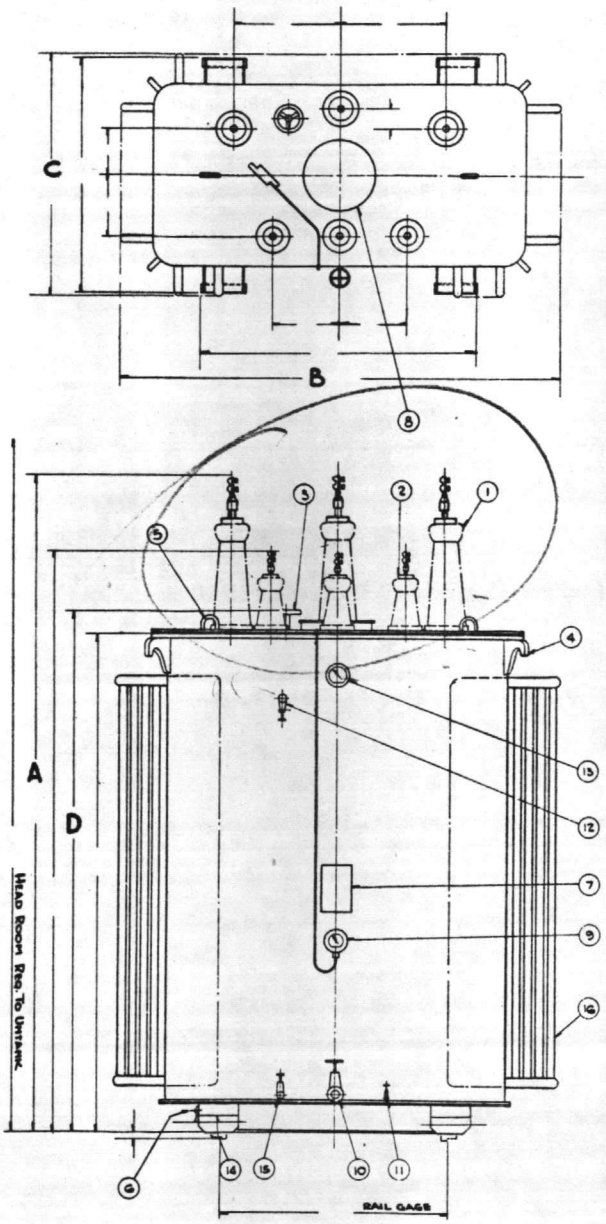
WESTINGHOUSE FORM 21894A
PRINTED IN U.S.A.

OIL-INSULATED, SELF-COOLING TRANSFORMER
3-PHASE
OUTLINE DRAWING

(NOT TO SCALE)

DIMENSIONS IN INCHES

NOTES: This outline is not to be regarded as indicating exact details of construction. When certified the drawing will be properly dimensioned for construction purpose. Transformer is braced inside of tank and may be lifted complete with oil when cover is bolted in place.



ITEM	FITTING and DESCRIPTION
1	3 H.V. Bushing
2	3 L.V. Bushing
3	H.V. Tap Changer Operating Mechanism
4	Lifting Lugs
5	Loops For Lifting Cover Only
6	Ground Terminal
7	Diagram Name Plate
8	Handhole Relief Device Glass Diaphragm Inserted Here For Protection Against Abnormal Pressure
9	Dial Type Thermometer
10	Drain Valve
11	Sampling Valve
12	1" Upper Filter Press Valve
13	Magnetic Oil Gage
14	Jack Lugs
15	1" Lower Filter Press Valve
16	Header Type Cooler

APPROXIMATE NET WEIGHTS

Core and Coils.....Lbs.
Case and Fittings..... "
Oil ..... "
Total.....Lbs.

230182-720

Westinghouse Electric & Manufacturing Company
Sharon, Pa.
1-42 Printed in U.S.A.

1. HIPERSIL, the new high permeability silicon steel, will be used in the core of this transformer.

2. HIGH VOLTAGE TERMINAL CHAMBER - Oil filled and mounted on tank wall and will enclose all connections and live parts external to tank.

   Purchasers cables will enter at bottom of chamber. Detailed cable infomation for final pothead design is to be supplied by Purchaser when order is placed.

3. LOW VOLTAGE THROAT - Mounted on tank wall and will enclose leads for connection to switchgear.

4. NO LOAD TAP CHANGER - Hand operated, for changing connections in high voltage winding from outside of case.

5. IMPULSE STRENGTH - Insulation and bushings coordinated to withstand impulse tests as listed on Form 22028 for power transformers:

12470 Volt Winding	15 Kv. Class.
208 Volt Winding	1.2 Kv. Class.

   Since cable terminals, which are connected to cable systems, are not designed to standard insulation levels, transformers having terminal chambers and for which impulse tests are specified will be tested with terminal chamber disconnected.

6. SEALEDAIRE CONSTRUCTION - Will be provided for oil protection.

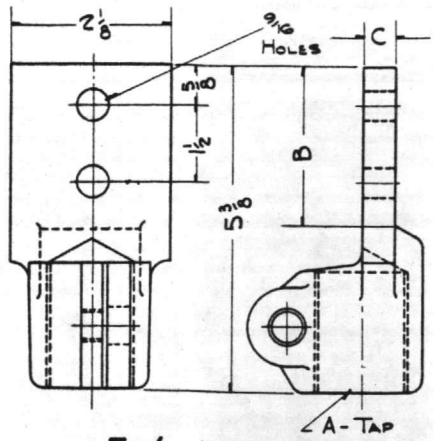
7. BASE - Structural steel and fitted with jack pads.

8. FITTINGS - Will include the following:

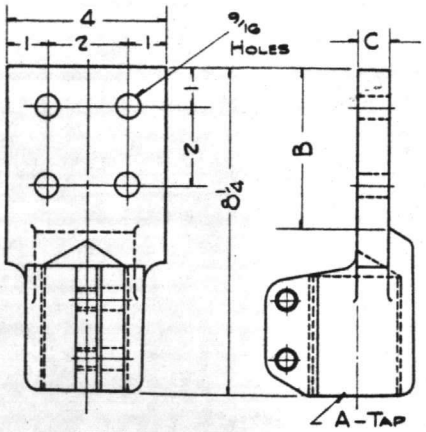
   Drain and sampling valves.
   Upper and lower filter press connections.
   Grounding terminal on tank base.
   Magnetic liquid level gauge.
   Dial type liquid thermometer.

230182-720

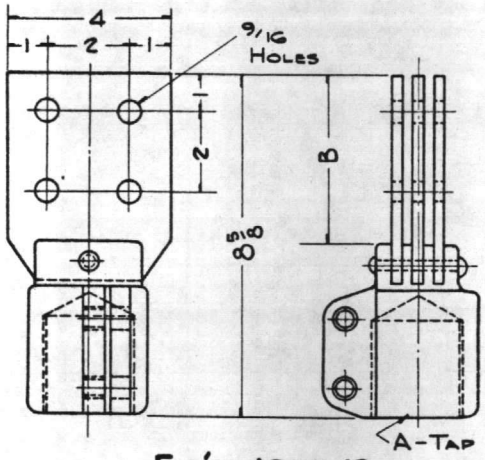
BUSHING TERMINAL ADAPTERS FOR BUS BAR CONNECTIONS



FIG'S 1 TO 5



FIG'S 6 TO 9



FIG'S 10 TO 13

TERMINAL ADAPTERS

FIG.	MAX AMPS	A	B	C	FIG	MAX AMPS	A	B	C
1	220	1/2-13	2 7/8	9/16	8	2900	2-12	4 1/8	3/4
2	450	3/4-16	"	"	9	3300	2 1/4-12	"	"
3	785	1-14	"	"	10	1710	1 1/2-12	4 1/4	
4	1210	1 1/4-12	"	"	11	2280	1 3/4-12	"	
5	1710	1 1/2-12	"	"	12	2900	2-12	"	
6	1710	1 1/2-12	4 1/8	3/4	13	3300	2 1/4-12	"	
7	2280	1 3/4-12	"	"					

230182-720

Westinghouse Electric & Manufacturing Co.
Sharon, Pa.
Printed in U.S.A.

D.L. 25766

DISTRIBUTION AND POWER TRANSFORMER

Impulse Test Values and Bushing Characteristics

IMPULSE TESTS

These transformers will be designed so that impulse test voltages given below may be applied.

BUSHING TESTS

Individual bushings will withstand the test voltages as given below without flashover under standard test conditions.

Transformer Insulation Classification in Kilovolts	—TRANSFORMER IMPULSE TEST VALUES— Full Wave Kv.	Chopped Wave Kv.	Chopped Wave Min. Time to Flashover in MS	Bushing Rating in Kv.	BUSHING CHARACTERISTICS— 60 Cycle Withstand Kv. RMS Dry 1 Min.	Wet 10 Sec.	1½ x 40 MS Impulse Full Wave Withstand Kv. Crest
DISTRIBUTION TRANSFORMERS							
1.2	30	36	1.0	1.2	10	6	30
2.5	45	54	1.25	2.5	15	13	45
5.0	60	69	1.5	5.0	21	20	60
8.66	75	88	1.6	8.66	27	24	75
15.0	95	110	1.8	15.0	35	30	95
POWER TRANSFORMERS							
1.2	45	54	1.5	1.2	15	13	45
5.0	75	88	1.6	5.0	27	24	75
8.66	95	110	1.8	8.66	35	30	95
15.0	110	130	2.0	15.0	50	45	110
DISTRIBUTION AND POWER TRANSFORMERS							
23.0	150	175	3.0	25	70	60	150
34.5	200	230	3.0	34.5	95	80	200
46.0	250	290	3.0	46.0	120	100	250
69.0	350	400	3.0	69.0	175	145	350
92.0	450	520	3.0	92.0	225	190	450
115.0	550	630	3.0	115.0	280	230	550
138.0	650	750	3.0	138.0	335	275	650
161.0	750	865	3.0	161.0	385	315	750
196.0	900	1035	3.0	196.0	465	385	900
230.0	1050	1210	3.0	230.0	545	445	1050

METHOD OF APPLYING IMPULSE TESTS

During tests, the impulse test wave rises to crest value in not less than ½ and not more than 2½ microseconds, and diminishes to ½ crest value in from 40 to 50 microseconds. The transformer will be excited at normal voltage and frequency, and the impulse voltage timed within 30 degrees of the crest of the normal frequency voltage of opposite polarity. Either a positive or a negative wave may be used.

The standard impulse test shall consist of two applications of a specified chopped wave followed by one application of a full wave. Either a positive or a negative wave may be used. The chopped wave may be obtained by flashing over either the bushing or an external rod gap.

1. **Chopped Wave:** For this test, the applied voltage wave shall have a crest voltage and time to flashover as given above.

2. **Full Wave:** For this test, the applied voltage wave shall have a crest value as given above. For this test, bushing gaps may be removed and negative wave can be used.

When protective devices are permanently connected across windings or parts of windings, these protective devices shall be connected during test.

When protective devices are installed from line to ground on the transformer, these protective devices shall be disconnected during test.

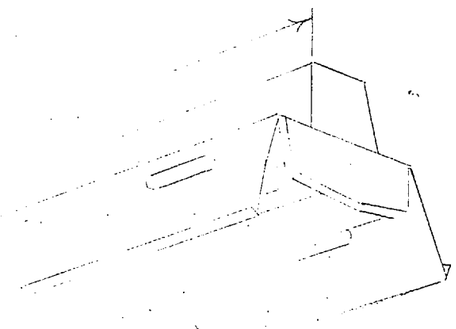
When impulse tests are specified on a multiple connection of series-multiple windings, the tests will correspond to those required for the multiple voltage rating.

STANDARD TEST CONDITIONS FOR BUSHINGS

77°F. temperature. 30 inches Hg. pressure. 0.6085 inch vapor pressure. Water resistance and precipitation, 12000 ohms/Centimeter Cube, 0.1 inch per minute at 45° angle.

This is in accordance with Recommended Practice by the Transformer Section of the National Electrical Manufacturers Association as adopted May 16, 1940 (Reference TR6-50).

230182-720



APERTURED REFLECTOR

REMARKS
NAME PLATE 16-F TYPE

LIGHT FIXTURE DETAIL (A 4-5)

LIGHT FIXTURE

LAMP

DS-206

375A. CONTINUOUS CURRENT RATING.

300 Amp. → 42,000 Amps INTERRUPTING RATING W/INSTANTANEOUS TRIP, @

208V; 60 HZ

375 Amps — AT

300

750 RMS SECONDARY SHUNT CURRENT COMPENT.
IS 36,241 AMPS.

DS 206 — FRAME 800 — 42,000.

DS 420 — 2000Amp. 65,000.

DS 632 — ~~3200~~ Amp. 85,000.

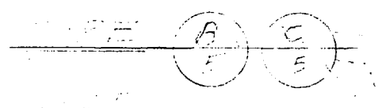
CURRENT TRANSFORMER.

400/5 Ring Type-6

600/5, 2-2

1200/5, 6-6

2500/5 - 4-3-3



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REVISIONS			
SYM	DESCRIPTION	DATE	APPROVED

SPECIAL SWITCHGEAR NOTES

SWITCHGEAR "A"

206 A1 — TO NO. 1 F.D. FAN REPLACE EXISTING 3# 250 MCM CABLE WITH NEW 3#250 MCM, THWN CONDUCTORS IN EXISTING 2½" CONDUIT. 300Amp, 208Volt, 3Ø 75HP,

206 A2 — TO NO. 1 I.D. FAN. REPLACE EXISTING 6#350 MCM CABLE WITH NEW 6#350 MCM, THWN CONDUCTORS IN EXISTING 2½" CONDUIT. 450Amp, 208 Volt, 3Ø, 100HP

206 A3 — TO PULVERIZER NO. 1A AND 1B PANELS. REPLACE EXISTING 3#250 MCM TO EACH PANEL, WITH NEW 3#250 MCM, THWN CONDUCTORS IN EXISTING 2½" CONDUIT. 300Amp. 75HP,

206 A4 — TO NO. 2 F.D FAN. REPLACE EXISTING 3#250 MCM, WITH 3#250 MCM, THWN CONDUCTORS IN EXISTING 2½" CONDUIT. 300Amp. 75HP.

206 A5 — TO NO. 2 I.D. FAN. REPLACE EXISTING 6#350 MCM WITH NEW 6#350 MCM, THWN CONDUCTORS IN EXISTING 4" CONDUIT. 450 Amp. 100HP.

206 A6 — TO PULVERIZER NO. 2A, AND 2B PANELS. REPLACE THE EXISTING 3#250 MCM TO EACH PANEL, WITH NEW 3#250 MCM, THWN CONDUCTORS IN EXISTING 2½" CONDUIT. 300Amp. 75HP EA.

630 A7 — 2500 AMP MAIN BREAKER, 208Volt, 3Ø

420 A8 — 2000 AMP TIE AIR CIRCUIT BREAKER TO AUXILIARY SWITCHGEAR.

SWITCHGEAR "B"

B1 — TO NO. 3 F.D. FAN. REPLACE EXISTING 3#250 MCM WITH NEW 3#250 MCM, THWN CONDUCTORS IN EXISTING 2½" CONDUIT. 300 Amp 75HP,

B2 — TO NO. 3 I.D. FAN. REPLACE EXISTING 6#350 MCM WITH 6#350 MCM, THWN CONDUCTORS IN 4" CONDUIT. 450 Amps. 100HP,

B3 — TO PULVERIZE NO. 3A AND NO. 3B PANELS, WITH NEW 3#250 MCM, THWN CONDUCTORS IN EXISTING 2½" CONDUIT. 300Amps 75HP,

B4 — TO EXHAUST FAN. REPLACE EXISTING CONDUCTORS WITH THE SAME SIZE NEW CONDUCTORS IN EXISTING CONDUIT. (4) 10HP. 208V, 3Ø →

B5 — TO NO. 4 I.D. FAN. REPLACE EXISTING 6#350 MCM WITH 6#350 MCM, THWN CONDUCTORS IN EXISTING 4" CONDUIT. 450Amp. 100HP,

B6 — TO NO. 4 F.D. FAN.. REPLACE EXISTING 3#250 MCM WITH 3#250 MCM, THWN CONDUCTORS IN EXISTING 2½" CONDUIT. 300Amp 75HP,

B7 — TO PULVERIZER NO. 4A AND 4B PANELS. REPLACE EXISTING 3#250 MCM WITH NEW 3#250 MCM, THWN CONDUCTORS IN EXISTING 2½" CONDUIT. 300Amp. 75HP. EA

B8 — NEW 2500 AMP AIR CIRCUIT BREAKER. 208V, 3Ø.

B9 — NEW 2000 AMP TIE AIR CIRCUIT BREAKER TO AUXILIARY SWITCHGEAR.

S A1

S A3

A8/87

A6 A4

A6 A5

T.B.

C3 C1

C4 C2

AUXILIARY SWITCHGEAR

C1 — TO COAL HANDLING CONTROL PANEL. INSTALL NEW 3#250 MCM, THWN CONDUCTORS, USING EXISTING AND NEW 2½" GALV. RIGID METAL CONDUIT. REMOVE EXISTING CONDUCTORS. 225 Amp.

C2 — TO COAL STORAGE DISTRIBUTION CONTROL PANEL. INSTALL NEW 3#4, THWN CONDUCTORS, USING EXISTING AND NEW 1½" CONDUIT. REMOVE EXISTING CONDUCTORS. 90Amp,

C3 — TO ASH UNLOADING CONTROL PANEL. INSTALL NEW 4#2 THWN CONDUCTORS, USING EXISTING AND NEW 1½" GALV. RIGID METAL CONDUIT. REMOVE THE EXISTING CONDUCTORS. 125Amps

C4 — TO NEW LIGHTING PANEL "B". INSTALL NEW 4#2/0 CONDUCTORS, USING EXISTING AND NEW 2" GALV. RIGID METAL CONDUIT. REMOVE THE EXISTING CONDUCTORS. 125 Amp

C5 — TO PANEL NO. 5. INSTALL NEW 3#2 THWN CONDUCTORS, USING EXISTING AND NEW 1¼" GALV. RIGID METAL CONDUIT. 125Amp,

C6 — TO AIR COMPRESSOR. REPLACE EXISTING 3#2 CONDUCTORS WITH NEW 3#2, THWN CONDUCTORS, USING EXISTING AND NEW 1¼" GALV RIGID METAL CONDUIT. 90Amps.

C7 — TO COAL HANDLING EQUIPMENT. REPLACE THE EXISTING CONDUCTORS WITH NEW CONDUCTORS OF THE SAME SIZE AS THE EXISTING CONDUCTORS. USE THE EXISTING AND NEW CONDUIT OF THE SAME SIZE. 200Amps.

C8 — TO COAL CAR SHAKER. REPLACE THE EXISTING CONDUCTORS WITH NEW CONDUCTORS OF THE SAME SIZE, USING THE EXISTING OR EQUAL SIZE GALV. RIGID METAL CONDUIT. 200 Amps.

C9 — NEW KILOWATT METER. → 2500/5A

C10 — NEW AMP METER. → 2500/5A

C11 — NEW VOLT METER. → ~~208~~ 2500 ~~Amp Switch~~.

C12 — NEW TOTALIZING METER. → 2,500/5 Amp.

C13 — NEW AUXILIARY METER. → Volt Switch

C14 — NEW AUXILIARY POWER METER.

C15 — NEW LIGHTING METER.

A9 — AMPERES ~~S.C.~~ SWITCH ~~VOLT~~ ~~AMPS~~

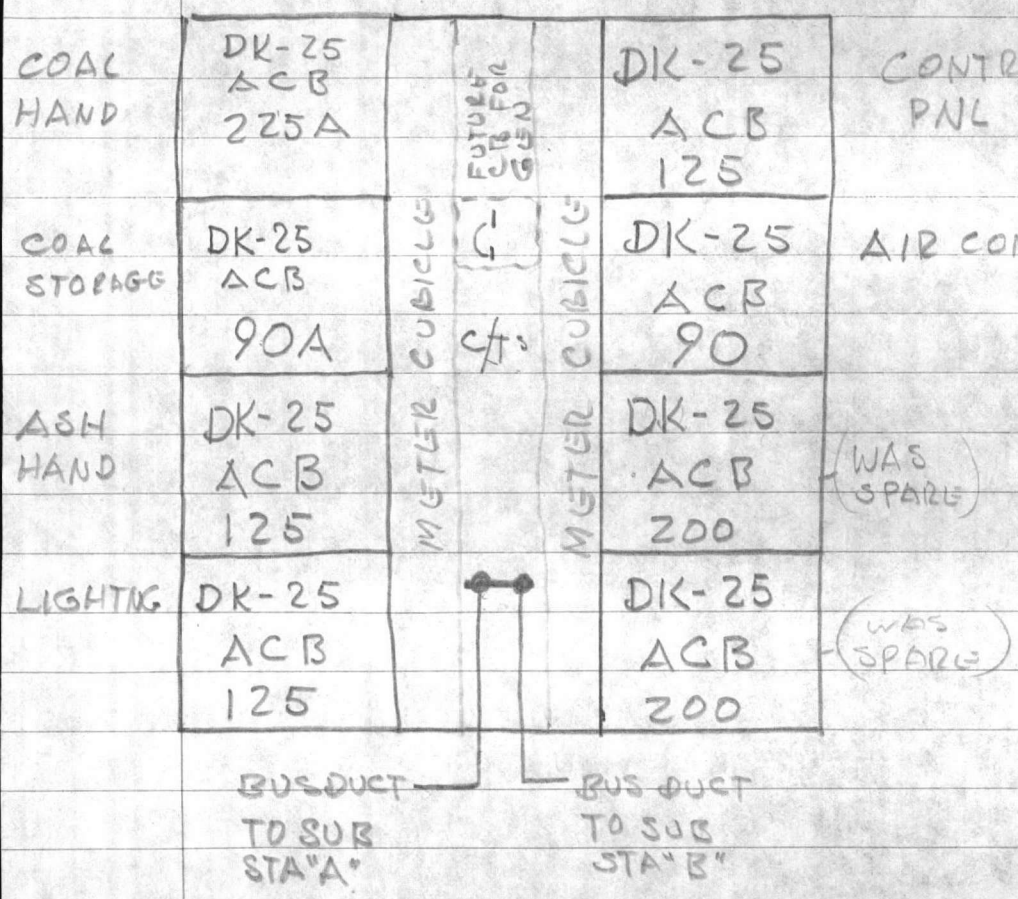
V9 — VOLT SWITCH.

S — SPARE BREAKER SPACE

TB

20,000 / 1,234 × 208 × 35

1- EXIST. LOW VOLTAGE AUX SWGR. AT-5116-E



Sent for information only

Westinghouse Electric Corporation

Box 1399
2001 W Morehead Street
Charlotte North Carolina 28201

February 12, 1979

Mr. B.J. Lanier
Bldg. 1202
Base Maintenance Dept.
Utilities Div.
Camp Lejeune, North Carolina 28542

Reference: Retro-Fit/Repair Of Westinghouse DK-25
Circuit Breakers

Dear Mr. Lanier:

We appreciate the opportunity to provide a quotation on the repair and retrofit of your DK-25 manually operated Westinghouse circuit breakers.

We would propose to replace the existing series magnetic trip devices with modern solid state trip units, disassemble, clean, lubricate, silver plate contact surfaces, reassemble, test and calibrate the breakers.

In view of the amount of work to be performed, it is necessary that the work be done at our service center in Charlotte. We could have our truck pick up and return the breakers at your location.

The price for the above including parts, labor and transportation is $2250.00 per breaker.

This offer is made subject to the terms and conditions listed above and on the reverse side hereof. Notice of objection is hereby given to different or additional terms and conditions.

Again, we appreciate the opportunity to participate in this program to upgrade the operation and reliability of your low voltage switchgear. If we can provide additional assistance or information relative to the above or other areas within your electrical distribution system, please contact us at any time.

Sincerely yours,

K.M. Holder

R.M. HOLDER
ENGINEERING SERVICE
(704) 377-3471

CC: Service Sales -
Bill Herriott

CAMP LEJEUNE

JACKSONVILLE

NORTH CAROLINA

MAINTENANCE TEST REPORT

BLDG.#1700 NO. 1 & 2

BY
WESTINGHOUSE ELECTRIC CORP.
ENGINEERING SERVICE DIV.
CHARLOTTE, N.C.

DECEMBER 1975

Substation #1 and #2

1A	2A	⊠ ⊠	3A	⊠ ⊠	4A
1B	2B				4B
1C	2C		3C		4C
1D	2D				4D

X-MG6 relays

Westinghouse Electric Corporation

CUSTOMER:
LOCATION:
ENGINEERING SERVICE DIVISION
DATE:
ORDER: CMM-349
BY:
PAGE
OF
ENGINEERING REPORT

TRANSFORMER
INSPECTION REPORT

CUSTOMER: Camp LeJeune JOB NO.: CHM 349

SUBSTATION: #1 - Bldg. # 1700 S.O. #: ----

MFG. & TYPE: Westinghouse KVA: 750

VOLTS: 12470 to 120/208 LTC TY

OIL ☐ ASKAREL ☒ DRY TYPE ☐ 3 Ø ☒ 1 Ø ☐

TEST

	XFMR # 1	XFMR # 2	XFMR # 3	XFMR # 4
SERIAL NUMBER	3152943			
INSULATION RESISTANCE				
MEGGER VOLTS 1000 @ °F AMB.	200MΩ to gnd			
DIELECTRIC TEST - TOP	29KV			
BOTTOM				
ACIDITY				
OTHER				

INTERNAL/EXTERNAL INSPECTION

BUSHINGS	OK *			
TANK	OK			
PUMPS AND VALVES	--			
PAINT	Satisfactory			
OIL LEVEL	25oC+			
TEMP. GAUGE	25°C			
INTERNAL CONDITION	--			
NLTC	--			
LTC	--			
TANK PRESSURE	No gauge			
GROUNDING	OK			
FANS	None			

NOTES: * Tank covered with heavy accumulation of coal dust. Small leak by sampling valve and drain valve. Fightened both valves.

TEST ENGINEER: R. JOHNSON DATE: 12/11/75

CIRCUIT BREAKER DATA SHEET

SUBSTATION: Bldg #1700 #1

JOB NO. CHM 349

CUSTOMER: Camp LeJeune

TRIP COIL RATING 2500A

BREAKER MFG. & TYPE (W) DA-75

T.U. TYPE/STYLE DA Oil Dashpot

S.O./SERIAL NO. 1-87Y347

L.D. SETTING 100% P.U. / 100% T.D. S.D. SETTING --

INTERRUPTING CAPACITY 75,000A

INSTANTANEOUS

FEEDER NAME Main 3A

MECHANICAL

PHASE	AS FOUND A	AS FOUND B	AS FOUND C	AS LEFT A	AS LEFT B	AS LEFT C
PRIMARY FINGERS						
CONTROL FINGERS						
ARC CHUTES	S	S	S	S	S	S
MAIN CONTACTS Condition	S	S	S	S	S	S
Pressure	S	S	S	S	S	S
Alignment	S	S	S	S	S	S
ARC CONTACTS	S*	S*	S*	S*	S*	S*
TRIP BAR	S	S	S	S	S	S
MECHANISM	S	S	S	S	S	S

CODED RESULTS

N - New

G - Good condition, slight wear, correct adjustment

S - Satisfactory condition, normal wear, acceptable adjustment.

C - Corrective action required

** SEE NOTES FOR DETAIL

NOTES: * Arc contacts are erroded on all 3 phases. Bumpers are worn will not return all the way.

ELECTRICAL

	AS FOUND Test Amps	AS FOUND Curve Secs.	AS FOUND A	AS FOUND B	AS FOUND C	AS LEFT Test Amps	AS LEFT Curve Secs.	AS LEFT A	AS LEFT B	AS LEFT C
TRIP SETTING (Amps)			2500A	2500A	2500A			2500A	2500A	2500A
T.D. @ 150 %	3750A	24-48"	35"	26"	39"	3750A	24-48"	35"	26"	39"
T.D. @ %										
INST. TRIP (Amps)										

* MEGGER (megohms) @ 1000 V. O-GND A-G 200 B-G 100 C-G 150 — AS LEFT: A-G B-G C-G

O-O A-B 300 B-C 300 C-A 300 — AS LEFT: A-B B-C C-A

NOTES: Changed oil in dashpots all 3 phases.

* Meggar includes switchgear bus and load side of main.

TEST ENGINEER R. JOHNSON DATE 12/10/75

CIRCUIT BREAKER DATA SHEET

SUBSTATION: Bldg. #1700 #1

JOB NO. CHM 349

CUSTOMER: Camp LeJeune

TRIP COIL RATING 2000A

BREAKER MFG. & TYPE (W) DA-75

T.U. TYPE/STYLE DA Oil Dashpot

S.O./SERIAL NO. 2-87Y348

L.D. SETTING 100% P.U. S.D. SETTING 100% T.D.

INTERRUPTING CAPACITY 75,000A

INSTANTANEOUS -------

FEEDER NAME Tie Breaker 3C

MECHANICAL

	AS FOUND			AS LEFT		
PHASE	A	B	C	A	B	C
PRIMARY FINGERS						
CONTROL FINGERS						
ARC CHUTES	S	S	S	S	S	S
MAIN CONTACTS Condition	S	S	S	S	S	S
Pressure	S	S	S	S	S	S
Alignment	S	S	S	S	S	S
ARC CONTACTS	S*	S*	S*	S*	S*	S*
TRIP BAR	S	S	S	S	S	S
MECHANISM	S	S	S	S	S	S

CODED RESULTS

N - New

G - Good condition, slight wear, correct adjustment

S - Satisfactory condition, normal wear, acceptable adjustment.

C - Corrective action require

** SEE NOTES FOR DETAIL

NOTES: * Some pitting of arc contacts. UV device operational.

ELECTRICAL

	AS FOUND					AS LEFT				
	Test Amps	Curve Secs.	A	B	C	Test Amps	Curve Secs.	A	B	C
TRIP SETTING (Amps)			2000A	2000A	2000A			2000A	2000A	2000
T.D. @ 150 %	3000A	24-48"	39"	24"	21"	3000A	24-48"	39"	24"	21"
T.D. @ ____ %										
INST. TRIP (Amps)										

MEGGER (megohms) @ 1000 V.

	AS FOUND			AS LEFT		
O-GND	A-G	B-G	C-G	A-G	B-G	C-G
O-O	A-B	B-C	C-A	A-B	B-C	C-A

NOTES: Changed oil in dahpots on all three phases.

TEST ENGINEER R. JOHNSON DATE 12/10/75

CIRCUIT BREAKER DATA SHEET

SUBSTATION: Bldg #1700 #1 JOB NO. CHM 349

CUSTOMER: Camp LeJeune TRIP COIL RATING 300A

BREAKER MFG. & TYPE (W) DK-25 T.U. TYPE/STYLE DK Oil Sucker

S.O./SERIAL NO. 2-77H219 L.D. SETTING 100% P.U. 100% T.D. S.D. SETTING

INTERRUPTING CAPACITY 25,000A INSTANTANEOUS 10X @ 3000A

FEEDER NAME ID FAN #1 Boiler 2-A

MECHANICAL

	AS FOUND			AS LEFT		
PHASE	A	B	C	A	B	C
PRIMARY FINGERS	S	S	S	S	S	S
CONTROL FINGERS	S	S	S**	S	S	S
ARC CHUTES	S	S	S	S	S	S
MAIN CONTACTS Condition	S	S	S	S	S	S
Pressure	S	S	S	S	S	S
Alignment	S	S	S	S	S	S
ARC CONTACTS	C*	C *	C*	C*	C*	C*
TRIP BAR	S	S	S	S	S	S
MECHANISM	S	S	S	S	S	S

CODED RESULTS

N - New

G - Good condition, slight wear, correct adjustment

S - Satisfactory condition, normal wear, acceptable adjustment.

C - Corrective action require

** SEE NOTES FOR DETAI

NOTES: Found loose hardware on breaker. Cleaned main contacts as they were heavily corrod
* Arc contacts burned and erroded. ** One of aux. contacts had been bent and broke
Replaced with one that had been repaired. Insulating bracket for manual close mec
loose. Removed capacitor across trip coil aux. contact. adjusted trip bar tripping
so bkr would trip electrically

ELECTRICAL

UV device operational. Bkr closed fin

	AS FOUND					AS LEFT				
	Test Amps	Curve Secs.	A	B	C	Test Amps	Curve Secs.	A	B	C
TRIP SETTING (Amps)			600A	600A	600A			600A	600A	600
T.D. @ 300 %	900A	6"-*	65"	145"	142"	900A	6-*	65"	145"	142
T.D. @ %										
INST. TRIP (Amps)	3000A	--	3000A	2700A	2800A	3000A	--	3000A	2700A	2800

MEGGER (megohms) @ 1000 V. O-GND A-G 2000 B-G 2000 C-G 2000 A-G 2000 B-G 2000 C-G 2000

O-O A-B 2000 B-C 2000 C-A 2000 A-B 2000 B-C 2000 C-A 2000

NOTES: * Up to several hundred % of 6 seconds. Changed oil in dashpots all 3 phases.

TEST ENGINEER R. JOHNSON DATE 12/8/75

CIRCUIT BREAKER DATA SHEET

SUBSTATION: Bldg. #1700 #1

JOB NO. CHM 349

CUSTOMER: Camp LeJeune

TRIP COIL RATING 300A

BREAKER MFG. & TYPE (W) DK-25

T.U. TYPE/STYLE DK Oil Sucker

S.O./SERIAL NO. 3-87Y351

L.D. SETTING 200% P.U. / 100% T.D. S.D. SETTING --

INTERRUPTING CAPACITY 25,000A

INSTANTANEOUS 30X @ 3000A

FEEDER NAME FD Fan #1 - Boiler -1A

MECHANICAL

	AS FOUND			AS LEFT		
PHASE	A	B	C	A	B	C
PRIMARY FINGERS	S	S	S	S	S	S
CONTROL FINGERS	S	S	S	S	S	S
ARC CHUTES	S	S	C*	S	S	C*
MAIN CONTACTS Condition	S	S	S	S	S	S
Pressure	S	S	S	S	S	S
Alignment	S	S	S	S	S	S
ARC CONTACTS	C**	C**	C**	C**	C**	C**
TRIP BAR	S	S	S	S	S	S
MECHANISM	S	S	S	S	S	S

CODED RESULTS

N - New

G - Good condition, slight wear, correct adjustment

S - Satisfactory condition, normal wear, acceptable adjustment.

C - Corrective action require

** SEE NOTES FOR DETAI

NOTES: Breaker very dusty. Loose hardware on breaker. * C phase had a small chip out of the bottom of arc chute. &* Arc contacts pitted and unnealed from heat. Operated OK electrically. (Both trip and close operations).

ELECTRICAL

	AS FOUND					AS LEFT				
	Test Amps	Curve Secs.	A	B	C	Test Amps	Curve Secs.	A	B	C
TRIP SETTING (Amps)			600A	600A	600A			600A	600A	600A
T.D. @ 300 %	900A	6"-*	165"	133"	128"	900A	6-*	165"	133"	128"
T.D. @ %										
INST. TRIP (Amps)	3000A	--	3200A	3400A	2800A	3000A	--	3200A	3400A	2800A

MEGGER (megohms) @ 1000 V. O-GND A-G 1000 B-G 2000 C-G 2000 — AS LEFT: A-G 1000 B-G 2000 C-G 2000

O-O A-B 2000 B-C 2000 C-A 2000 — AS LEFT: A-B 2000 B-C 2000 C-A 2000

NOTES: * Up to several hundred % of 6 secs. Put new oil in dashpots all 3 phases.

TEST ENGINEER R. JOHNSON DATE 12/8/75

CIRCUIT BREAKER DATA SHEET

SUBSTATION: Bldg #1700 #1 JOB NO. CHM 349

CUSTOMER: Camp LeJeune TRIP COIL RATING 300A

BREAKER MFG. & TYPE (W) DK-25 T.U. TYPE/STYLE DK Oil Sucker

S.O./SERIAL NO. 3-77H127 L.D. SETTING 150% P.U. S.D. SETTING 700% T.D.

INTERRUPTING CAPACITY 25,000A INSTANTANEOUS 10 X @ 3000A

FEEDER NAME 1A Pulverizer 2B

MECHANICAL

	AS FOUND			AS LEFT		
PHASE	A	B	C	A	B	C
PRIMARY FINGERS	S	S	S	S	S	S
CONTROL FINGERS	S	S	S	S	S	S
ARC CHUTES	S	S	S	S	S	S
MAIN CONTACTS Condition	S	S	S	S	S	S
Pressure	S	S	S	S	S	S
Alignment	S	S	S	S	S	S
ARC CONTACTS	S*	C*	S*	S*	C*	S*
TRIP BAR	S	S	S	S	S	S
MECHANISM	S	S	S	S	S	S

CODED RESULTS

N - New

G - Good condition, slight wear, correct adjustment

S - Satisfactory condition, normal wear, acceptable adjustment.

C - Corrective action require

** SEE NOTES FOR DETAI

NOTES: Loose hardware on breaker. * Arc contacts are pitted and burned. Lubricated mech. and readjusted tripping force to get breaker to trip electrically. Closes fine electrically.

ELECTRICAL

	AS FOUND					AS LEFT				
	Test Amps	Curve Secs.	A	B	C	Test Amps	Curve Secs.	A	B	C
TRIP SETTING (Amps)			450A	450A	450A			450A	450A	450A
T.D. @ 300 %	600A	6"-*	175"	136"	140"	600A	6"-*	175"	136"	140"
T.D. @ %										
INST. TRIP (Amps)	3000A	--	3000	3200	3100	3000A	--	3000	3200	3100

MEGGER (megohms) @ 1000 V. O-GND A-G 2000 B-G 2000 C-G 2000 A-G 2000 B-G 2000 C-G 2000

O-O A-B 2000 B-C 2000 C-A 2000 A-B 2000 B-C 2000 C-A 2000

NOTES: * Up to several hundred percent of 6 secs. Put new oil in dashpots all 3 phases.

TEST ENGINEER R. JOHNSON DATE 12/8/75

CIRCUIT BREAKER DATA SHEET

SUBSTATION: Bldg. #1700 #1

JOB NO. CHM 349

CUSTOMER: Camp LeJeune

TRIP COIL RATING 300A

BREAKER MFG. & TYPE GE DK-25

T.U. TYPE/STYLE DK-. Oil Sucker

S.O./SERIAL NO. No Nameplate

L.D. SETTING 200% P.U. S.D. SETTING ____
100% T.D.

INTERRUPTING CAPACITY 25,000A

INSTANTANEOUS 10 X @ 3000A

FEEDER NAME #1B Pulverizer 1B

MECHANICAL

PHASE	AS FOUND A	AS FOUND B	AS FOUND C	AS LEFT A	AS LEFT B	AS LEFT C
PRIMARY FINGERS	S	S*	S	S	S	S
CONTROL FINGERS	S	S	S	S	S	S
ARC CHUTES	S	S	S	S	S	S
MAIN CONTACTS Condition	S	S	S	S	S	S
Pressure	S	S	S	S	S	S
Alignment	S	S	S	S	S	S
ARC CONTACTS	S**	S**	S**	S**	S**	S**
TRIP BAR	S	S	S	S	S	S
MECHANISM	S	S	S	S	S	S

CODED RESULTS

N - New

G - Good condition, slight wear, correct adjustment.

S - Satisfactory condition, normal wear, acceptable adjustment.

C - Corrective action required

** SEE NOTES FOR DETAIL

NOTES: * Installed contact cluster load side of B phase from spares. **Arc contacts have s pitting and burning. Loose hardware on breaker. Adjusted tripping force to get br to trip electrically. Closed electrically without any trouble.

ELECTRICAL

	AS FOUND Test Amps	Curve Secs.	A	B	C	AS LEFT Test Amps	Curve Secs.	A	B	C
TRIP SETTING (Amps)			600A	600A	600A			600A	600A	600A
T.D. @ 300 %	900A	6"-*	17"	25"	20"	900A	6"-*	82"	115"	60"
T.D. @ ____ %										
INST. TRIP (Amps)	3000A	--	2400A	2300A	2100A	3000A	---	2800A	2700A	2800A

MEGGER (megohms) @ 1000 V. O-GND A-G 2000 B-G 2000 C-G 2000 — A-G 2000 B-G 2000 C-G 2000

O-O A-B 2000 B-C 2000 C-A 2000 — A-B 2000 B-C 2000 C-A 2000

NOTES: * Up to serveral hundred percent of 6 secs. Changed oil in dahspots all 3 phaees. Cotter keys that hold the sucker piece on the plunger were almost out. Replaced them. Lapped disks on all 3 phaees. Discs were very rough.

TEST ENGINEER R. JOHNSON DATE 12/28/75

CIRCUIT BREAKER DATA SHEET

SUBSTATION: Bldg. #1700 #1

JOB NO. CHM 349

CUSTOMER: Camp LeJeune

TRIP COIL RATING 300A

BREAKER MFG. & TYPE Ⓦ DK-25

T.U. TYPE/STYLE DK Oil Sucker

S.O./SERIAL NO. 2-77H127

L.D. SETTING 200% P.U. 100% T.D. S.D. SETTING

INTERRUPTING CAPACITY 25,000A

INSTANTANEOUS 10 X @ 3000A

FEEDER NAME 2A Pulverizer 4C

MECHANICAL

PHASE	AS FOUND A	AS FOUND B	AS FOUND C	AS LEFT A	AS LEFT B	AS LEFT C
PRIMARY FINGERS	S	S	S	S	S	S
CONTROL FINGERS	S	S	S	S	S	S
ARC CHUTES	S	S	S	S	S	S
MAIN CONTACTS						
Condition	S	S	S	S	S	S
Pressure	S	S	S	S	S	S
Alignment	S	S	S	S	S	S
ARC CONTACTS	S*	S*	S*	S*	S*	S*
TRIP BAR	S	S	S	S	S	S
MECHANISM	S	S	S	S	S	S

CODED RESULTS

N - New

G - Good condition, slight wear, correct adjustment

S - Satisfactory condition, normal wear, acceptable adjustment.

C - Corrective action require

** SEE NOTES FOR DETAI

NOTES: * Slight pitting and burning of arc contacts. Closing motor would not operate as there was a wiring error on the Y relay. Changed one of the motor leads around and it worked OK. Had to adjust tripping force to get breaker to trip elec.

ELECTRICAL

	AS FOUND Test Amps	Curve Secs.	A	B	C	AS LEFT Test Amps	Curve Secs.	A	B	C
TRIP SETTING (Amps)			600A	600A	600A			600A	600A	600A
T.D @ 300 %	900A	6"-*	53"	109"	56"	900A	6"-*	53"	109"	56"
T.D. @ %										
INST. TRIP (Amps)	3000A	--	3300A	3200A	2900A	3000A	--	3300A	3200A	2900

MEGGER (megohms) @1000 V. O-GND A-G 500 B-G 300 C-G 500 A-G 500 B-G 300 C-G 500

O-O A-B 300 B-C 350 C-A 800 A-B 300 B-C 350 C-A 800

NOTES: * Up to several hundred % of 6 secs. Changed oil in all 3 phases.

TEST ENGINEER R. JOHNSON DATE 12/9/75

CIRCUIT BREAKER DATA SHEET

SUBSTATION: Bldg. #1700 #1

JOB NO. CHM 349

CUSTOMER: Camp LeJeune

TRIP COIL RATING 300A

BREAKER MFG. & TYPE Ⓦ DK-25

T.U. TYPE/STYLE DK Oil Sucker

S.O./SERIAL NO. 4-77H220

L.D. SETTING 175% P.U. 100% T.D. S.D. SETTING —

INTERRUPTING CAPACITY 25,000A

INSTANTANEOUS 10 X @ 3000A

FEEDER NAME 2B Pulverizer 4D

MECHANICAL

	AS FOUND			AS LEFT		
PHASE	A	B	C	A	B	C
PRIMARY FINGERS	S	S	S	S	S	S
CONTROL FINGERS	S	S	S	S	S	S
ARC CHUTES	S	S	S	S	S	S
MAIN CONTACTS						
Condition	S	S	S	S	S	S
Pressure	S	S	S	S	S	S
Alignment	S	S	S	S	S	S
ARC CONTACTS	S*	S*	S*	S*	S*	S*
TRIP BAR	S	S	S	S	S	S
MECHANISM	S	S	S	S	S	S

CODED RESULTS

N - New

G - Good condition, slight wear, correct adjustment

S - Satisfactory condition, normal wear, acceptable adjustment.

C - Corrective action require

** SEE NOTES FOR DETAI

NOTES: *Arc contacts have some amount of pitting and burning. Resistors in series with trip coil were burned up. Removed them and breaker would then trip fine electrica the arc contact on C phase had a high spot. Had to file contact.

ELECTRICAL

	AS FOUND					AS LEFT				
	Test Amps	Curve Secs.	A	B	C	Test Amps	Curve Secs.	A	B	C
TRIP SETTING (Amps)			525A	525A	525A			525A	525A	525
T.D. @ 300 %	900A	5"-*	61"	42"	36"	900A	5"-*	61"	42"	36"
T.D. @ %										
INST. TRIP (Amps)	3000A	--	2500A	3000A	2800A	3000A	--	2500A	3000A	2800

MEGGER (megohms) @ 1000 V. O-GND A-G 2000 B-G 2000 C-G 2000 — A-G 2000 B-G 2000 C-G 2000

O-O A-B 2000 B-C 2000 C-A 2000 — A-B 2000 B-C 2000 C-A 200

NOTES: * Up to several hundred % of 5 secs. Changed oil in dashpots all 3 phases.

TEST ENGINEER R. JOHNSON DATE 12/9/75

CIRCUIT BREAKER DATA SHEET

SUBSTATION: Bldg. # 1700 #1

JOB NO. CHM 349

CUSTOMER: Camp LeJeune

TRIP COIL RATING 600A

BREAKER MFG. & TYPE Ⓦ DK-25

T.U. TYPE/STYLE DK - Oil Sucker

S.O./SERIAL NO. 3-77H218

L.D. SETTING 200% P.U. 100% T.D. S.D. SETTING ===

INTERRUPTING CAPACITY 25,000A

INSTANTANEOUS 10X @ 6000A

FEEDER NAME ID Fan #2 Boiler 4A

MECHANICAL

PHASE	AS FOUND A	AS FOUND B	AS FOUND C	AS LEFT A	AS LEFT B	AS LEFT C
PRIMARY FINGERS	S**	S**	S**	S**	S**	S**
CONTROL FINGERS	S	S	S	S	S	S
ARC CHUTES	C	C	C	C	C	C
MAIN CONTACTS Condition	S	S	S	S	S	S
Pressure	S	S	S	S	S	S
Alignment	S	S	S	S	S	S
ARC CONTACTS	C*	C*	C*	C*	C*	C*
TRIP BAR	S	S	S	S	S	S
MECHANISM	S	S	S	S	S	S

CODED RESULTS

N - New

G - Good condition, slight wear, correct adjustment

S - Satisfactory condition, normal wear, acceptable adjustment.

C - Corrective action require

** SEE NOTES FOR DETAI

NOTES: See Attached Sheet

ELECTRICAL

	AS FOUND Test Amps	Curve Secs.	A	B	C	AS LEFT Test Amps	Curve Secs.	A	B	C
TRIP SETTING (Amps)			1200A	1200A	1200A			1200A	1200A	1200
T.D. @ 300 %	1800A	6-*	36"	78"	27"	1800A	6-*	36"	78"	27"
T.D. @ %										
INST. TRIP (Amps)	6000A	--	4000A	4400A	4100A	6000A	--	4000A	4400A	4100

MEGGER (megohms) @ 1000 V. O-GND A-G 2000 B-G 2000 C-G 2000 — AS LEFT: A-G 2000 B-G 2000 C-G 2000

O-O A-B 2000 B-C 2000 C-A 2000 — AS LEFT: A-B 2000 B-C 2000 C-A 2000

NOTES: * Up to several hundred % of 6 secs. Changed oil in dashpots all 3 phases. Lapped the discs. on "C" phase.

TEST ENGINEER R. JOHNSON DATE 12/9/75

Notes:

* Arc contacts are heavily erroded and burned. Arc chutes are burned and some of the porcelian has been worn away. Both should be replaced.

** Load side stationary primary contacts and one line side have been arched at one time. They are badly pitted and burned and need replacing. The insulating board that supports them is burned badly and also needs to re replaced. Some of the primary fingers were damaged slightly, but the contact surface was not. The backplate finish between A & B phase load side was damaged by smoke.

The screw that holds the lever on the trip bar, for the cell puterlock, was broken off in the trip bar. The end of the trip bar was also damaged. Need to replace trip bar and lever for cell interlock and UV device. Apparently this caused the damage above as a breaker was raced in closed.

UV device is in-operative because of above. Lever on UV device bent badly and needs to be replaced. Has to dis-assemble the UV device as it would stick and not allow breaker to open.

Removed series resistor in trip coil circuit to get breaker to trip electrically. Insulating sheath around main closing arm broken off by "A" phase. Taped with scotch 33 tape. Should be replaced.

CIRCUIT BREAKER DATA SHEET

SUBSTATION: Bldg #1700 #1

JOB NO. CHM 349

CUSTOMER: Camp LeJeune

TRIP COIL RATING 600A

BREAKER MFG. & TYPE GE DK-25

T.U. TYPE/STYLE DK Oil Sucker

S.O./SERIAL NO. 79H287

L.D. SETTING 175% P.U S.D. SETTING
100% T.D.

INTERRUPTING CAPACITY 25,000A

INSTANTANEOUS 10X @ 6000A

FEEDER NAME FD Fan #2 Boiler 4B

MECHANICAL

	AS FOUND			AS LEFT		
PHASE	A	B	C	A	B	C
PRIMARY FINGERS	S	S	S	S	S	S
CONTROL FINGERS	S	S	S	S	S	S
ARC CHUTES	C	C	C	C	C	C
MAIN CONTACTS						
Condition	S	S	S	S	S	S
Pressure	S	S	S	S	S	S
Alignment	S	S	S	S	S	S
ARC CONTACTS	C*	C*	C*	C*	C*	C*
TRIP BAR	S**	S**	S**	S**	S**	S**
MECHANISM	S	S	S	S	S	S

CODED RESULTS

N - New

G - Good condition, slight wear, correct adjustment

S - Satisfactory condition, normal wear, acceptable adjustment

C - Corrective action required

** SEE NOTES FOR DETAILS

NOTES: See Attached Notes

ELECTRICAL

	AS FOUND					AS LEFT				
	Test Amps	Curve Secs.	A	B	C	Test Amps	Curve Secs.	A	B	C
TRIP SETTING (Amps)			1050A	1050A	1050A			1050A	1050A	1050A
T.D. @ 300 %	1800A	5"-*	10"	29"	12"	1800A	5"-*	29"	29"	18"
T.D. @ %										
INST. TRIP (Amps)	6000A	--	4000A	4000A	4000A	6000A	--	4800A	4600A	4800A

MEGGER (megohms) O-GND A-G 150 B-G 150 C-G 60 A-G 150 B-G 150 C-G 60

@ 1000 V. O-O A-B 200 B-C 150 C-A 300 A-B 200 B-C 150 C-A 300

NOTES: * Up to several hundred % of 5secs. Changed oil in all 3 phases. Lapped A&C phase discs. Disc surfaces in poor condition.

TEST ENGINEER R. JOHNSON DATE 12/9/75

NOTES:

* Arc contacts heavily erroded need to be replaced.

** Plunger was sticking indise of trip coil. Held the mechanism in a trip free position. Dis-assembled trip coil and filed the inside. Reset OK after reassembly.

Cell interlock lever was not in the right position to operate. Had to remove it to put it in the right positon.

UV device operational. The electrical close operation was fine.

TRANSFORMER
INSPECTION REPORT

CUSTOMER: Camp LeJeune JOB NO.: CHM 349

SUBSTATION: #2 Bldg # 1700 S.O. #: -----

MFG. & TYPE: (W) KVA: 750

VOLTS: 12470 to 120/208 LTC TY -----

OIL ☐ ASKAREL ☒ DRY TYPE ☐ 3 Ø ☒ 1 Ø ☐

TEST

	XFMR # 1	XFMR # 2	XFMR # 3	XFMR # 4
SERIAL NUMBER	3152944			
INSULATION RESISTANCE				
MEGGER VOLTS 1000 @ °F AMB.	150MΩ to grd.			
DIELECTRIC TEST - TOP	30 KV			
BOTTOM				
ACIDITY				
OTHER				

INTERNAL/EXTERNAL INSPECTION

BUSHINGS	OK			
TANK	OK*			
PUMPS AND VALVES	--			
PAINT	SATISFACTORY			
OIL LEVEL	25°C+			
TEMP. GAUGE	25°C			
INTERNAL CONDITION	--			
NLTC	--			
LTC	--			
TANK PRESSURE	No Gauge			
GROUNDING	OK			
FANS	None			

NOTES: * Tank covered with coal dust. Small leak by sampling valve. Tightened valve.

TEST ENGINEER: R. JOHNSON DATE: 12/11/75

CIRCUIT BREAKER DATA SHEET

SUBSTATION: Bldg. #1700 #2

JOB NO. CHM 349

CUSTOMER: Camp LeJeune

TRIP COIL RATING 2500A

BREAKER MFG. & TYPE DA-75

T.U. TYPE/STYLE DA Oil Dashpot

S.O./SERIAL NO. 77Y34

L.D. SETTING 100% P.U. S.D. SETTING --
100% T.D.

INTERRUPTING CAPACITY 75,000A

INSTANTANEOUS ------

FEEDER NAME Main 3A

MECHANICAL

PHASE	AS FOUND A	AS FOUND B	AS FOUND C	AS LEFT A	AS LEFT B	AS LEFT C
PRIMARY FINGERS						
CONTROL FINGERS						
ARC CHUTES	S	S	S	S	S	S
MAIN CONTACTS						
Condition	S	S	S	S	S	S
Pressure	S	S	S	S	S	S
Alignment	S	S	S	S	S	S
ARC CONTACTS	S*	S*	S*	S*	S*	S*
TRIP BAR	S	S	S	S	S	S
MECHANISM	S	S	S	S	S	S

CODED RESULTS

N - New

G - Good condition, slight wear, correct adjustment

S - Satisfactory condition, normal wear, acceptable adjustment.

C - Corrective action required

** SEE NOTES FOR DETAILS

NOTES: Breaker and cubicle very dusty. * Slight erosion of arc contacts.

ELECTRICAL

	AS FOUND Test Amps	AS FOUND Curve Secs.	AS FOUND A	AS FOUND B	AS FOUND C	AS LEFT Test Amps	AS LEFT Curve Secs.	AS LEFT A	AS LEFT B	AS LEFT C
TRIP SETTING (Amps)			2500A	2500A	2500A			2500A	2500A	2500A
T.D. @ 150 %	3750A	24-48"	19"	15"	11"	3750A	24-48"	19"	15"	11"
T.D. @ %										
INST. TRIP (Amps)										

* MEGGER (megohms) O-GND A-G 125 B-G 100 C-G 125 — AS LEFT: A-G ____ B-G ____ C-G ____

@000 V. O-O A-B 200 B-C 250 C-A 150 — AS LEFT: A-B ____ B-C ____ C-A ____

NOTES: Put new oil in dashpots on all 3 phases. * Meggar includes switchgear bus and load of main breaker.

TEST ENGINEER R. Johnson DATE 12/4/75

CIRCUIT BREAKER DATA SHEET

SUBSTATION: Bldg. # 1700 #2

JOB NO. CHM 349

CUSTOMER: Camp LeJeune

TRIP COIL RATING 2000A

BREAKER MFG. & TYPE Ⓦ DK-25

T.U. TYPE/STYLE DA Dashpot

S.O./SERIAL NO. 87Y346

L.D. SETTING 100% P.U. 100% T.D. S.D. SETTING ---

INTERRUPTING CAPACITY 25,000A

INSTANTANEOUS ---

FEEDER NAME Tie 3C

MECHANICAL

PHASE	AS FOUND A	AS FOUND B	AS FOUND C	AS LEFT A	AS LEFT B	AS LEFT C
PRIMARY FINGERS						
CONTROL FINGERS						
ARC CHUTES	S	S	S	S	S	S
MAIN CONTACTS Condition	S	S	S	S	S	S
Pressure	S	S	S	S	S	S
Alignment	S	S	S	S	S	S
ARC CONTACTS	S*	S*	S*	S*	S*	S*
TRIP BAR	S	S	S	S	S	S
MECHANISM	S	S	S	S	S	S

CODED RESULTS

N - New

G - Good condition, slight wear, correct adjustment

S - Satisfactory condition, normal wear, acceptable adjustment.

C - Corrective action require

** SEE NOTES FOR DETAIL

NOTES: * Slight pitting of arc contacts.

ELECTRICAL

	AS FOUND Test Amps	AS FOUND Curve Secs.	AS FOUND A	AS FOUND B	AS FOUND C	AS LEFT Test Amps	AS LEFT Curve Secs.	AS LEFT A	AS LEFT B	AS LEFT C
TRIP SETTING (Amps)			2000A	2000A	2000A			2000A	2000A	2000A
T.D. @ 150 %	3000A	24-48"	28"	10"	26"	3000A	24-48"	28"	10"	26"
T.D. @ ____ %										
INST TRIP (Amps)										

MEGGER (megohms) O-GND A-G ____ B-G ____ C-G ____ A-G ____ B-G ____ C-G ____

@ ____ V. O-O A-B ____ B-C ____ C-A ____ A-B ____ B-C ____ C-A ____

NOTES: Put new oil in dashpots on all 3 phases.

TEST ENGINEER R. JOHNSON DATE 12/4/75

CIRCUIT BREAKER DATA SHEET

SUBSTATION: Bldg. # 1700 #2

JOB NO. CHM 349

CUSTOMER: Camp LeJeune

TRIP COIL RATING 600A

BREAKER MFG. & TYPE W DK-25

T.U. TYPE/STYLE DK Oil Sucker

S.O./SERIAL NO. No nameplate

L.D. SETTING 200% P.U. / 100% T.D. S.D. SETTING ------

INTERRUPTING CAPACITY 25,000A

INSTANTANEOUS 10X @ 6000A

FEEDER NAME I.D. FAN # 3 Boiler 2A

MECHANICAL

	AS FOUND			AS LEFT		
PHASE	A	B	C	A	B	C
PRIMARY FINGERS	S	S	S	S	S	S"
CONTROL FINGERS	S	S	S	S	S	S
ARC CHUTES	C*	S	C*	C*	S	C*
MAIN CONTACTS Condition	S**	S	S	S**	S	S
Pressure	S	S	S	S	S	S
Alignment	S	S	S	S	S	S
ARC CONTACTS	C	C	C	C	C	C
TRIP BAR	S	S	S	S	S	S
MECHANISM	S	S	S	S	S	S

CODED RESULTS

N - New

G - Good condition, slight wear, correct adjustment

S - Satisfactory condition, normal wear, acceptable adjustment.

C - Corrective action required

** SEE NOTES FOR DETAIL

NOTES: See Attached Notes

ELECTRICAL

	AS FOUND					AS LEFT				
	Test Amps	Curve Secs.	A	B	C	Test Amps	Curve Secs.	A	B	C
TRIP SETTING (Amps)			1200A	1200A	1200A			1200A	1200A	1200A
T.D. @ ____ %										
T.D. @ 300 %	1800A	6"-*	54"	85"	41"	1800A	6-*	54"	85"	41"
INST. TRIP (Amps)	6000A	--	5000A	5400A	5400A	6000A	--	5000A	5400A	5400A

MEGGER (megohms) @ 1000 V. O-GND A-G 2000 B-G 2000 C-G 2000 — AS LEFT: A-G 2000 B-G 2000 C-G 2000

O-O A-B 2000 B-C 2000 C-A 2000 — AS LEFT: A-B 2000 B-C 2000 C-A 2000

NOTES: * Up to several hundred Ω of 6secs. Put new oil in the dashpots on all 3 phases.

TEST ENGINEER R. JOHNSON DATE 12/2/75

Notes:

* Erosion of porcelian surface. Should be replaced.

** Claned corrosion from mains. "C" phase strap connections had both screws missing. Put in new screws. "C" phase arc contact badly erroded needs new contacts all 3 phases.

UV device operative. Adjusted arc contact synchronization. Taped piece that holds the bottom of face plate cracked phase cross bar insulating sheath cracked badly at "B" phase. Capacitor across "B" contact in trip circuit blown. Removed capacitor and series resistor. Adjusted trip force to get breaker to trip electrically.

CIRCUIT BREAKER DATA SHEET

SUBSTATION: Bldg. # 1700 #2

JOB NO. CHM 349

CUSTOMER: Camp LeJeune

TRIP COIL RATING 300A

BREAKER MFG. & TYPE (W) DK-25

T.U. TYPE/STYLE DK Oil Sucker

S.O./SERIAL NO. 5-77H220

L.D. SETTING 150% P.U. S.D. SETTING ----
100% T.D.

INTERRUPTING CAPACITY 25,000A

INSTANTANEOUS 10X @ 3000A

FEEDER NAME Forced Draft Fan
#3 Boiler 1A

MECHANICAL

	AS FOUND			AS LEFT		
PHASE	A	B	C	A	B	C
PRIMARY FINGERS	S	S	S	S	S	S
CONTROL FINGERS	S	S	S	S	S	S
ARC CHUTES	S	S	S	S	S	S
MAIN CONTACTS						
Condition	S*	S*	S*	S*	S*	S*
Pressure	S	S	S	S	S	S
Alignment	S	S	S	S	S	S
ARC CONTACTS	S**	S**	S**	S**	S**	S**
TRIP BAR	S	S	S	S	S	S
MECHANISM	S	S	S	S	S	S

CODED RESULTS

N - New

G - Good condition, slight wear, correct adjustment

S - Satisfactory condition, normal wear, acceptable adjustment.

C - Corrective action require

** SEE NOTES FOR DETAI

NOTES: *Cleaned main contacts as they we e corroded. **Slight erosion of arc contacts. arc chutes have been buring inside. Loose hardware on breaker. Screw in front plate strip Replaced with new screw. Adjusted trip force to get breaker to trip electrically.

ELECTRICAL

	AS FOUND					AS LEFT				
	Test Amps	Curve Secs.	A	B	C	Test Amps	Curve Secs.	A	B	C
TRIP SETTING (Amps)			450A	450A	450A			450A	450A	450
T.D. @ 200 %	600A	7"-*	41"	30"	23"	600A	7"-*	41"	30"	23"
T.D. @ %										
INST. TRIP (Amps)	3000A	--	2500A	2800A	2600A	3000A	--	2500A	2800A	2600

MEGGER (megohms) O-GND A-G 2000 B-G 2000 C-G 2000 A-G B-G C-G
@ 1000 V. O-O A-B 2000 B-C 2000 C-A 2000 A-B B-C C-A

NOTES: * Up to several hundred % of 7 secs. Changed dashpot oil all 3 phases. Electrical operation of breaker OK.

TEST ENGINEER R. JOHNSON DATE 12/2/75

CIRCUIT BREAKER DATA SHEET

SUBSTATION: Bldg. # 1700 #2

JOB NO. CHM 349

CUSTOMER: Camp LeJeune

TRIP COIL RATING 300A

BREAKER MFG. & TYPE (W) DK-25

T.U. TYPE/STYLE DK Oil Sucker

S.O./SERIAL NO. 5-77H220

L.D. SETTING 150% P.U. S.D. SETTING ----
100% T.D.

INTERRUPTING CAPACITY 25,000A

INSTANTANEOUS 10X @ 3000A

FEEDER NAME Forced Draft Fan
#3 Boiler 1A

MECHANICAL

	AS FOUND			AS LEFT		
PHASE	A	B	C	A	B	C
PRIMARY FINGERS	S	S	S	S	S	S
CONTROL FINGERS	S	S	S	S	S	S
ARC CHUTES	S	S	S	S	S	S
MAIN CONTACTS						
Condition	S*	S*	S*	S*	S*	S*
Pressure	S	S	S	S	S	S
Alignment	S	S	S	S	S	S
ARC CONTACTS	S**	S**	S**	S**	S**	S**
TRIP BAR	S	S	S	S	S	S
MECHANISM	S	S	S	S	S	S

CODED RESULTS

N - New

G - Good condition, slight wear, correct adjustment

S - Satisfactory condition, normal wear, acceptable adjustment

C - Corrective action require

** SEE NOTES FOR DETAI

NOTES: *Cleaned main contacts as they we e corroded, **Slight erosion of arc contacts. arc chutes have been buring inside. Loose hardware on breaker. Screw in front plate strip Replaced with new screw. Adjusted trip force to get breaker to trip electrically.

ELECTRICAL

	AS FOUND					AS LEFT				
	Test Amps	Curve Secs.	A	B	C	Test Amps	Curve Secs.	A	B	C
TRIP SETTING (Amps)			450A	450A	450A			450A	450A	450
T.D. @ 200 %	600A	7"-*	41"	30"	23"	600A	7"-*	41"	30"	23"
T.D. @ ____ %										
INST. TRIP (Amps)	3000A	--	2500A	2800A	2600A	3000A	--	2500A	2800A	2600

MEGGER (megohms) O-GND A-G 2000 B-G 2000 C-G 2000 A-G ____ B-G ____ C-G ____
@ 1000 V. O-O A-B 2000 B-C 2000 C-A 2000 A-B ____ B-C ____ C-A ____

NOTES: * Up to several hundred % of 7 secs. Changed dashpot oil all 3 phases. Electrical operation of breaker OK.

TEST ENGINEER R. JOHNSON DATE 12/2/75

CIRCUIT BREAKER DATA SHEET

SUBSTATION: Bldg. # 1700 #2

JOB NO. CHM 349

CUSTOMER: Camp LeJeune

TRIP COIL RATING 300A

BREAKER MFG. & TYPE (W) DK-25

T.U. TYPE/STYLE DK Oil Sucker

S.O./SERIAL NO. 1-77H219

L.D. SETTING 200% P.U. 100% T.D. S.D. SETTING --

INTERRUPTING CAPACITY 25,000A

INSTANTANEOUS 10X @ #000A

FEEDER NAME #3A Pulverizer 2B

MECHANICAL

	AS FOUND			AS LEFT		
PHASE	A	B	C	A	B	C
PRIMARY FINGERS	S	S	S	S	S	S
CONTROL FINGERS	S	S	S	S	S	S
ARC CHUTES	S	S	S	S	S	S
MAIN CONTACTS						
Condition	S*	S	S	S	S	S
Pressure	S	S	S	S	S	S
Alignment	S	S	S	S	S	S
ARC CONTACTS	S	S	S	S	S	S
TRIP BAR	S	S	S	S	S	S
MECHANISM	S	S	S	S	S	S

CODED RESULTS

N - New

G - Good condition, slight wear, correct adjustment

S - Satisfactory condition, normal wear, acceptable adjustment.

C - Corrective action require

** SEE NOTES FOR DETAI

NOTES: * Cleaned corrosion from main contacts. Loose hardware on breaker. Tapped piece tha holds front plate missing. 100Ω 10W resistor in series with shunt trip broken nearly in h 1mfd cap. blown. Removed resistor and cap, adjusted trip force to get breaker to trip electrically.

ELECTRICAL

	AS FOUND					AS LEFT				
	Test Amps	Curve Secs.	A	B	C	Test Amps	Curve Secs.	A	B	C
TRIP SETTING (Amps)			600A	600A	600A			600A	600A	600
T.D. @ 300 %	900A	6"-*	113"	180"	155"	900A	6"-*	113"	180"	155"
T.D. @ %										
INST. TRIP (Amps)	3000A	--	2900A	2900A	2700A	3000A	--	2900A	2900A	270

MEGGER (megohms) @ 1000 V. O-GND A-G B-G C-G A-G B-G C-G

O-O A-B B-C C-A A-B B-C C-A

NOTES: * Up to several hundred % of 6secs & 2 secs. changed oil in dashpots all 3 phases.

TEST ENGINEER R. JOHNSON DATE 12/2/75

CIRCUIT BREAKER DATA SHEET

SUBSTATION: Bldg. #1700 #2

JOB NO. CHM 349

CUSTOMER: Camp LeJeune

TRIP COIL RATING 300A

BREAKER MFG. & TYPE (W) DK-25

T.U. TYPE/STYLE DK Oil Sucker

S.O./SERIAL NO. 87Y352

L.D. SETTING 100% P.U. S.D. SETTING ---
100% T.D.

INTERRUPTING CAPACITY 25,000

INSTANTANEOUS 10X @ 3000A

FEEDER NAME Exhaust Fan 2C
(Labeled Spare)

MECHANICAL

PHASE	AS FOUND A	AS FOUND B	AS FOUND C	AS LEFT A	AS LEFT B	AS LEFT C
PRIMARY FINGERS	S	S	S	S	S	S
CONTROL FINGERS	S	S	S	S	S	S
ARC CHUTES	C	C	C	C	C	C
MAIN CONTACTS Condition	S	S	S	S	S	S
Pressure	S	S	S	S	S	S
Alignment	S	S	S	S	S	S
ARC CONTACTS	C	C	C	C	C	C
TRIP BAR	S	S	S	S	S	S
MECHANISM	S*	S	S	S*	S	S

CODED RESULTS

N - New

G - Good condition, slight wear, correct adjustment.

S - Satisfactory condition, normal wear, acceptable adjustment.

C - Corrective action required

** SEE NOTES FOR DETAIL

NOTES: Electrical operation OK. Arc chutes have evidence of a large number of fault interruptions and the porcelain is begininning to erode. Need to be replaced. Arc contacts h heavy erosion also need to be replaced. Primary finers had to be cleaned as they had a heavy accumulation, on and around the contact point of grease, and dirt. *Mechanism would not rese after trip. Lubricated mech. screw holding ELECTRICAL front plate stripped-replaced with new s

	AS FOUND Test Amps	AS FOUND Curve Secs.	AS FOUND A	AS FOUND B	AS FOUND C	AS LEFT Test Amps	AS LEFT Curve Secs.	AS LEFT A	AS LEFT B	AS LEFT C
TRIP SETTING (Amps)			300A	300A	300A			300A	300A	300A
T.D. @ 200 %	600A	2"-*	21"	20"	55"	600A	2"-*	21"	20"	55"
T.D. @ ____ %										
INST. TRIP (Amps)	3000A	--	3200A	2800A	3000A	3000A	--	3200A	2800A	3000A

MEGGER (megohms) @ 1000 V. O-GND A-G 2000 B-G 2000 C-G 2000 — A-G 2000 B-G 1000 C-G 1000
O-O A-B 2000 B-C 2000 C-A 2000 — A-B 2000 B-C 1000 C-A 1000

NOTES: * Up to several hundred % of 2 secs. Put new oil in dashpots on all 3 phases. Disk surfaces on A&B dashpots slightly worn.

TEST ENGINEER R. JOHNSON DATE 12/3/75

CIRCUIT BREAKER DATA SHEET

SUBSTATION: Bldg. # 1700 #2

CUSTOMER: Camp LeJeune

BREAKER MFG. & TYPE Ⓦ DK-25

S.O./SERIAL NO. 1-77H218

INTERRUPTING CAPACITY 25,000A

FEEDER NAME ID FAN #4 Boiler 4A

JOB NO. CHM 349

TRIP COIL RATING 600A

T.U. TYPE/STYLE DK Oil Sucker

L.D. SETTING 200% P.U. 100% T.D. S.D. SETTING --

INSTANTANEOUS 10X @ 6000A

MECHANICAL

	AS FOUND			AS LEFT		
PHASE	A	B	C	A	B	C
PRIMARY FINGERS	S	S	S	S	S	S
CONTROL FINGERS	S*	S	S	S*	S	S
ARC CHUTES	C	C	C	C	C	C
MAIN CONTACTS Condition	S	S	S	S	S	S
Pressure	S	S	S	S	S	S
Alignment	S	S	S	S	S	S
ARC CONTACTS	C**	C**	C**	C**	C**	C**
TRIP BAR	S	S	S	S	S	S
MECHANISM	S	S	S	S	S	S

CODED RESULTS

N - New

G - Good condition, slight wear, correct adjustment

S - Satisfactory condition, normal wear, acceptable adjustment.

C - Corrective action require

** SEE NOTES FOR DETAI

NOTES: See Attached Notes;

ELECTRICAL

	AS FOUND					AS LEFT				
	Test Amps	Curve Secs.	A	B	C	Test Amps	Curve Secs.	A	B	C
TRIP SETTING (Amps)			1200A	1200A	1200A			1200A	1200A	1200
T.D. @ 300 %	1800A	6"-*	39"	58"	32"	1800A	6"-*	39"	58"	32"
T.D. @ ____ %										
INST. TRIP (Amps)	6000A	--	4800A	5200A	5200A	6000A	--	4800A	5200A	5200

	AS FOUND			AS LEFT		
MEGGER (megohms) O-GND @ 1000 V.	A-G 1500	B-G 2000	C-G 1000	A-G 1500	B-G 2000	C-G 1000
O-O	A-B 2000	B-C 1500	C-A 1500	A-B 2000	B-C 1500	C-A 1500

NOTES: * Up to several hundred % of 6 secs. Changed oil in the dashpot on all 3 phases.

TEST ENGINEER R. JOHNSON DATE 12/3/75

NOTES:

* 4th control finger from left on bottom broken out of positon.

** Arc contacts very erroded. Found loose hardware on breaker, breaker was very dusty. Put in new contact from spare on FD fan breaker. Breaker would not trip electrically. Removed burned up resistor and capacitor in the trip circuit,breaker would then trip but was errotic. Readjusted trip force. Breaker tripped fine UV device working properly.

CIRCUIT BREAKER DATA SHEET

SUBSTATION: Bldg. # 1700 #2

JOB NO. CHM 349

CUSTOMER: Camp LeJeune

TRIP COIL RATING 300A

BREAKER MFG. & TYPE (W) DK-25

T.U. TYPE/STYLE DK Oil Sucker

S.O./SERIAL NO. 3-77H220

L.D. SETTING 150% P.U. S.D. SETTING --
100% T.D.

INTERRUPTING CAPACITY 25,000A

INSTANTANEOUS 10X @ 3000A

FEEDER NAME FD DAN #4 Boiler 4B

MECHANICAL

	AS FOUND			AS LEFT		
PHASE	A	B	C	A	B	C
PRIMARY FINGERS	S	S	S	S	S	S
CONTROL FINGERS	S	S	S	S	S	S
ARC CHUTES	C*	C*	C*	C*	C*	C*
MAIN CONTACTS						
Condition	S	S	S	S	S	S
Pressure	S	S	S	S	S	S
Alignment	S	S	S	S	S	S
ARC CONTACTS	C*	C*	C*	C*	C*	C*
TRIP BAR	S	S	S	S	S	S
MECHANISM	S	S	S	S	S	S

CODED RESULTS

N - New

G - Good condition, slight wear, correct adjustment.

S - Satisfactory condition, normal wear, acceptable adjustment.

C - Corrective action required

** SEE NOTES FOR DETAIL

NOTES: * Arc chutes and arc contacts in very bad conditon need to be replaced. Breaker very dust. Loos hardware on back of breaker. Shunt trip coil burned up. Close motor operated OK.

ELECTRICAL

	AS FOUND					AS LEFT				
	Test Amps	Curve Secs.	A	B	C	Test Amps	Curve Secs.	A	B	C
TRIP SETTING (Amps)			450A	450A	450A			450A	450A	450A
T.D. @ 200 %	600A	6"-*	NT**	40"	82"	600A	6"-*	28"	40"	82"
T.D. @ %										
INST. TRIP (Amps)	3000A	--	2800A	2700A	2500A	3000A	--	2800A	2700A	2500A

MEGGER (megohms) O-GND A-G 2000 B-G 1000 C-G 1000 A-G 2000 B-G 1000 C-G 1000
@ 1000 V. O-O A-B 1000 B-C 1000 C-A 2000 A-B 1000 B-C 1000 C-A 2000

NOTES: * Up to several hundred % of 6 secs. New oil was put in dashpot on all 3 phases.
** Readjusted trip force as it took to much force to trip breaker.

TEST ENGINEER R. JOHNSON DATE 12/3/75

CIRCUIT BREAKER DATA SHEET

SUBSTATION: Bldg. # 1700 #2 JOB NO. CHM 349

CUSTOMER: Camp LeJeune TRIP COIL RATING 300A

BREAKER MFG. & TYPE W DK-25 T.U. TYPE/STYLE DK Oil Sucker

S.O./SERIAL NO. 2-77H220 L.D. SETTING 200% P.U. 100% T.D. S.D. SETTING --

INTERRUPTING CAPACITY 25,000A INSTANTANEOUS 10X @ 3000A

FEEDER NAME 4A Pulverizer 4C

MECHANICAL

	AS FOUND			AS LEFT		
PHASE	A	B	C	A	B	C
PRIMARY FINGERS	S	S	S	S	S	S
CONTROL FINGERS	S	S	S	S	S	S
ARC CHUTES	C	C	C	C	C	C
MAIN CONTACTS						
Condition	S	S	S	S	S	S
Pressure	S	S	S	S	S	S
Alignment	S	S	S	S	S	S
ARC CONTACTS	C*	C*	C*	C*	C*	C*
TRIP BAR	S	S	S	S	S	S
MECHANISM	S	S	S	S	S	S

CODED RESULTS

N - New

G - Good condition, slight wear, correct adjustment.

S - Satisfactory condition, normal wear, acceptable adjustment.

C - Corrective action required

** SEE NOTES FOR DETAIL

NOTES: Cleaned control fingers & main contacts as they were corroded. Loose hardware on breaker had to be tightened. Breaker very heavily covered in coal dust. * Arc cont heavily eroded. Need to replaced. Electrical operation OK.

ELECTRICAL

	AS FOUND					AS LEFT				
	Test Amps	Curve Secs.	A	B	C	Test Amps	Curve Secs.	A	B	C
TRIP SETTING (Amps)			600A	600A	600A			600A	600A	600A
T.D. @ 200 %	900A	6"-*	6"	80"	70"	900A	6"-*	10"	92"	70"
T.D. @ %										
INST. TRIP (Amps)	3000A	--	2500A	2800A	2800A	3000A	--	2500A	2800A	2800

MEGGER (megohms) @ 1000 V. O-GND A-G 2000 B-G 2000 C-G 2000 A-G 2000 B-G 2000 C-G 2000

O-O A-B 400 B-C 2000 C-A 2000 A-B 500 B-C 2000 C-A 2000

NOTES: *Up to several hundred % of 6 secs. Changed oil in dashpots all 3 phases. "A" ph dashpot disc worn. Lapped disc "A" phase best time 10 seconds.

TEST ENGINEER R. JOHNSON DATE 12/3/75

CIRCUIT BREAKER DATA SHEET

SUBSTATION: Bldg. # 1700 #2 JOB NO. CHM 349

CUSTOMER: Camp Lejeune TRIP COIL RATING 300A

BREAKER MFG. & TYPE (W) DK-25 T.U. TYPE/STYLE DK Oil Sucker

S.O./SERIAL NO. 4-87Y351 L.D. SETTING 150% P.U. 100% T.D. S.D. SETTING ----

INTERRUPTING CAPACITY 25,000A INSTANTANEOUS 10X @ 3000A

FEEDER NAME 4B Pulverizer 4D

MECHANICAL

	AS FOUND			AS LEFT		
PHASE	A	B	C	A	B	C
PRIMARY FINGERS	S	S	S	S	S	S
CONTROL FINGERS	S*	S	S	S*	S	S
ARC CHUTES	C*	C*	C*	C*	C*	C*
MAIN CONTACTS Condition	SØ	S	S	S	S	S
Pressure	S	S	S	S	S	S
Alignment	S	S	S	S	S	S
ARC CONTACTS	C*	C*	C*	C*	C*	C*
TRIP BAR	S	S	S	S	S	S
MECHANISM	S	S	S	S	S	S

CODED RESULTS

N - New

G - Good condition, slight wear, correct adjustment.

S - Satisfactory condition, normal wear, acceptable adjustment.

C - Corrective action required

** SEE NOTES FOR DETAILS

NOTES: Ø cleaned grease and dirty from contact surface. *Arc contacts are eroded-arc chutes have damaged porcelain. Both need to be replaced. Ø cleaned contacts. Checked out OK electrically.

ELECTRICAL

	AS FOUND					AS LEFT				
	Test Amps	Curve Secs.	A	B	C	Test Amps	Curve Secs.	A	B	C
TRIP SETTING (Amps)			450A	450A	450A			450A	450A	450A
T.D. @ 200 %	600A	6"-*	16"	80"	96"	600A	6"-*	16"	80"	96"
T.D. @ ____ %										
INST. TRIP (Amps)	3000A	--	3400A	3400A	3300A	3000A	--	3400A	3400A	3300A

MEGGER (megohms) @ 1000 V. O-GND A-G 2000 B-G 2000 C-G 2000 A-G 2000 B-G 2000 C-G 2000

O-O A-B 2000 B-C 2000 C-A 2000 A-B 2000 B-C 2000 C-A 2000

NOTES: *Up to several hundred % of 6 secs. Put new oil in dashpots all 3 phaeses. "A" pha dashpot disc worn.

TEST ENGINEER R. JOHNSON DATE 12/3/75

Westinghouse

750 KV-A. 12470 TO 120/208 VOLTS 60 CYCLES IMPEDANCE 5.7 % AT ABOVE RATING L. SPEC. 403371	THREE PHASE UNIT-SUBSTATION INERTEEN TRANSFORMER SELF COOLED	FULL LOAD CONTINUOUSLY 55°C. RISE GALLONS INERTEEN 350 SERIAL 315294 21590

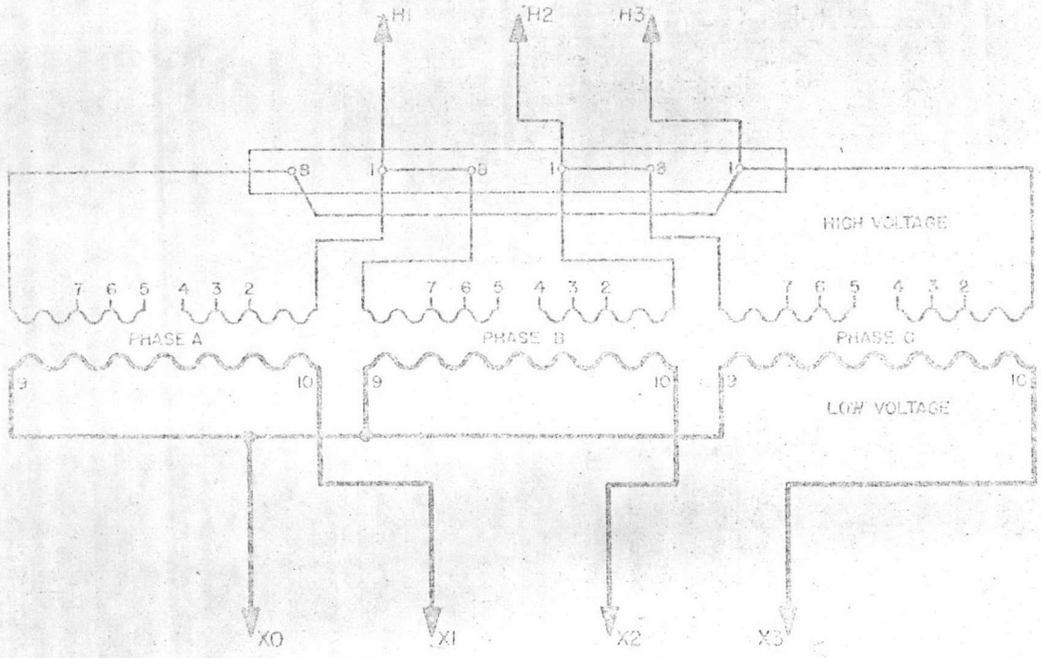
SEE INSTRUCTION BOOK 6802

APPROX. WEIGHT IN LBS.-TRANSFORMER 4150 CASE 6500 INERTEEN 5100 TOTAL 15750

PATENTS 1454826—1460135—1460223—1492136—1492161—1552107—1557032—1605532—1587284
1597235—1599339—1601308—1601326—1605026—1621039—1639763—1726078—1751223
1802764—1827813—1834114—1899720—1931373

MADE IN U.S.A. WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY

10,600 LBS.



CONNECTIONS

WINDING	VOLTS	AMPERES	TAP CHANGER POS.	TAP CHANGER CONNECT IN EACH PHASE	
DELTA HIGH VOLTAGE	12470	34.8	1	4 TO 5	60:1
	12150	35.7	2	3 TO 5	58.5:1
	11845	36.8	3	3 TO 6	57:1
	11535	37.5	4	2 TO 6	55.5:1
	11225	38.6	5	2 TO 7	54:1
STAR LOW VOLTAGE	208	2085	—	—	

AMPERE RATING GIVEN IS MAXIMUM CURRENT IN OUTLET LEADS FOR CONTINUOUS OPERATION.
CONNECTIONS FOR HIGH VOLTAGE TAPS ARE MADE BY TAP CHANGER OPERATED OUTSIDE THE CASE.
TRANSFORMER MUST BE DISCONNECTED FROM LINES WHEN THIS DEVICE IS OPERATED.
FILL TRANSFORMER WITH INERTEEN UNTIL GAGE INDICATES "25°C. LEVEL".
NEVER OPERATE TRANSFORMER WHEN THE INDICATOR IS BELOW THE BOTTOM OF THE SCALE.
THE TRANSFORMER TANK IS DESIGNED TO WITHSTAND COMPLETE VACUUM.

POLARITY

OUTDOOR DIAGRAM INSTRUCTION PLATE

EXCEPT WORD "INERTEEN" IN CENTER SQUARE TO BE FILLED WITH [illegible] ENAMEL.

STAINLESS STEEL #6240—SATIN FINISH—ETCHED—FILLED WITH BLACK [illegible] ENAMEL.

PROPORTION 2:1 AREA 98 SQ. IN.

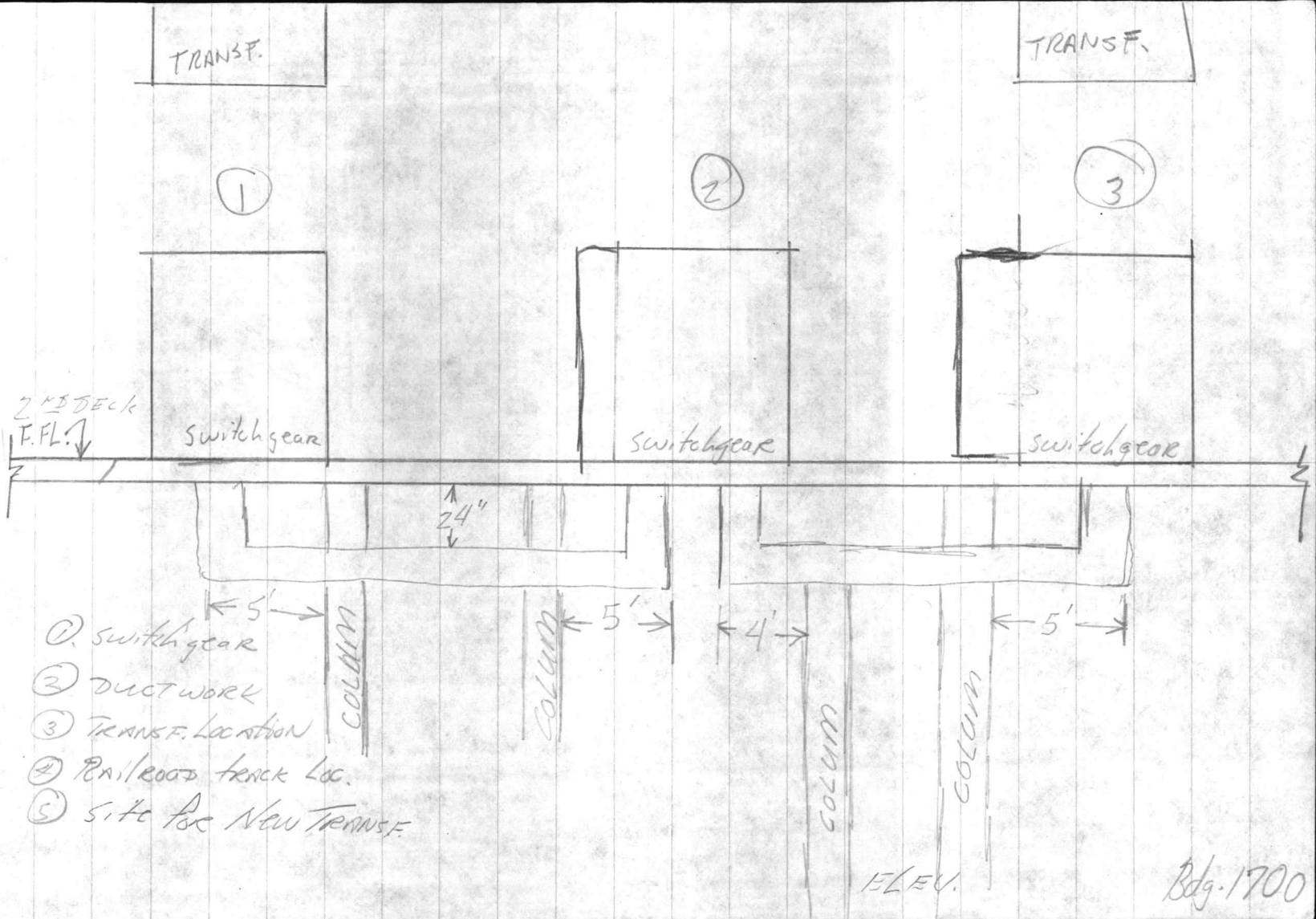
[illegible] PER INCH = HOLES FOR 1-20 [illegible] BOLTS.

11 1/2 = BETWEEN CENTERS OF HOLES FOR LONG SIDE OF PLATE.

ASTM A. SPEC. B1A80/1

8 1/2 = BETWEEN CENTERS OF HOLES ON SHORT SIDE OF PLATE.

RETURN TO WESTINGHOUSE ELECTRIC & MANUFACTURING CO., SUNBURY DIVISION, SUNBURY, PA., U.S.A.


TRANSF.
TRANSF.
1
2
3
2ND DECK F.F.L.
switchgear
switchgear
switchgear
24"
5'
5'
4'
5'
COLUMN
COLUMN
COLUMN
COLUMN
ELEV.
1. switchgear
2. DUCTWORK
3. TRANSF. LOCATION
4. RAILROAD TRACK LOC.
5. SITE FOR NEW TRANSF.
Bdg. 1700

Replace transformers (old transformers abandon in place)

" Panel A 2500 AMP

" Panel B 2500 A

Auxiliary Panel

Replace incandescent Lighting

(1) head area 6-4T/4'

(2) 2nd floor 60-4T/4' — Dwg at floor total

(3) 3rd floor 28 fluorescent 4 1/4

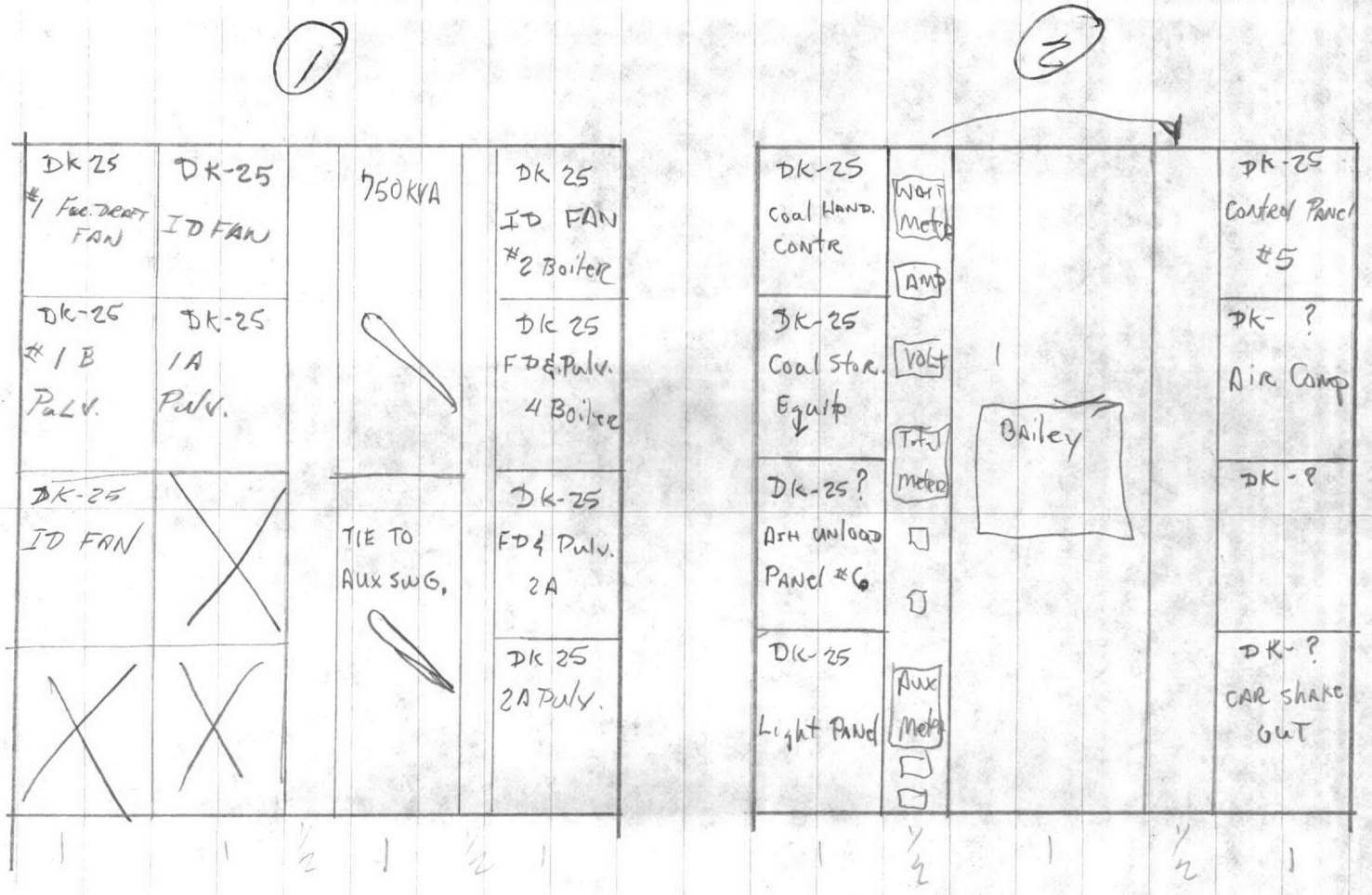
(4) 4th floor 28 " " — "

(5) Surge tank Rm. 7 fluores 4T/4

(6) 1st floor 86 fluor 4T/4'

(7) ~~Battery~~ ROOM 1 expls fix

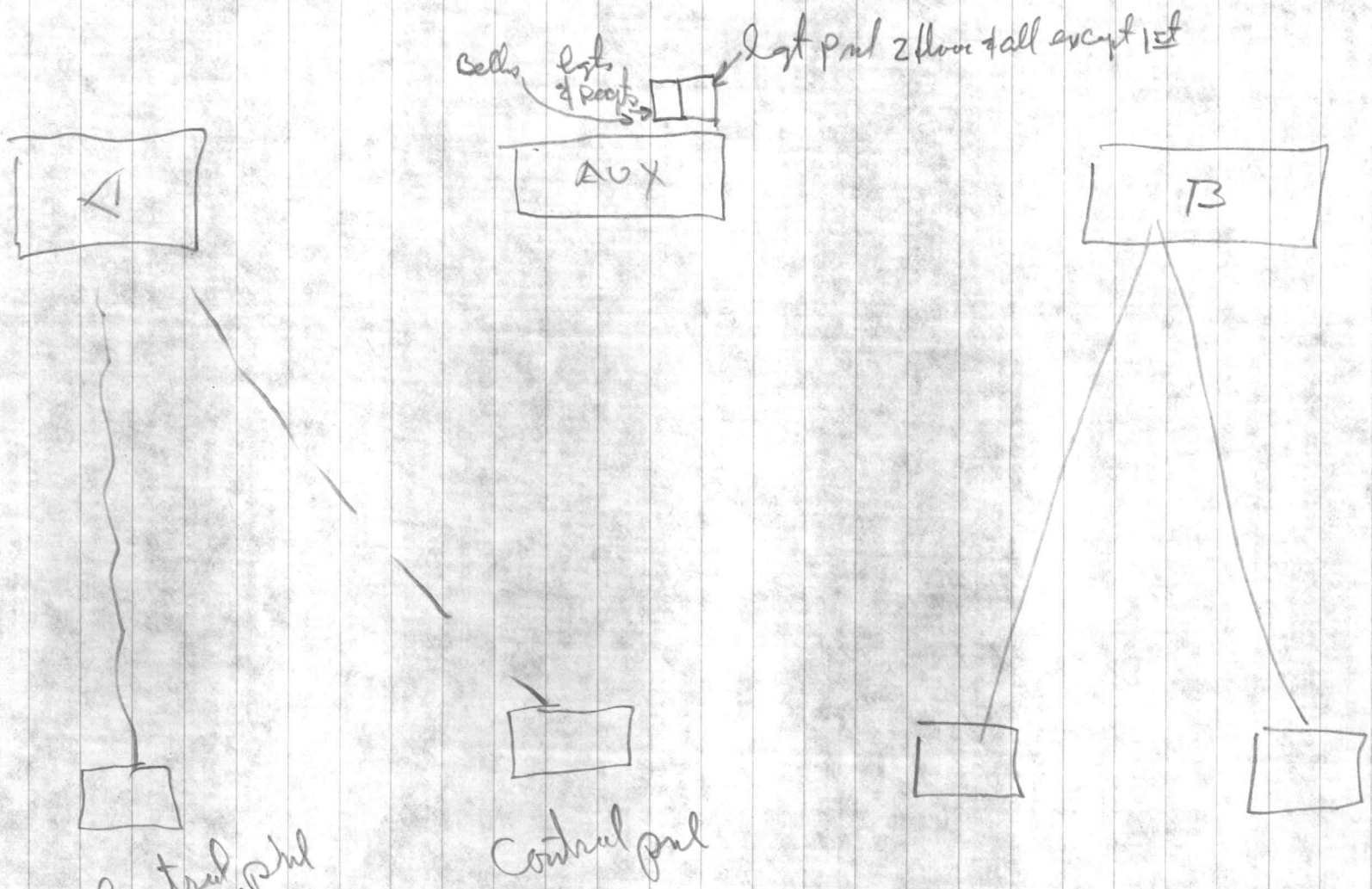
Provide new Ckts


1
DK 25 #1 Fac. Draft Fan
DK-25 ID Fan
750 KVA
DK 25 ID Fan #2 Boiler
DK-25 #1B Pulv.
DK-25 1A Pulv.
DK 25 FD & Pulv. 4 Boiler
DK-25 ID Fan
TIE TO AUX SWG.
DK-25 FD & Pulv. 2A
DK 25 2A Pulv.
2
DK-25 Coal Hand. Contr
Watt Meter
AMP
DK-25 Coal Stor. Equip
Volt
TFJ meter
DK-25? Ash Unload Panel #6
Aux Meter
DK-25 Light Panel
Bailey
DK-25 Control Panel #5
DK- ? Air Comp
DK-?
DK-? Car Shake Out

(3)

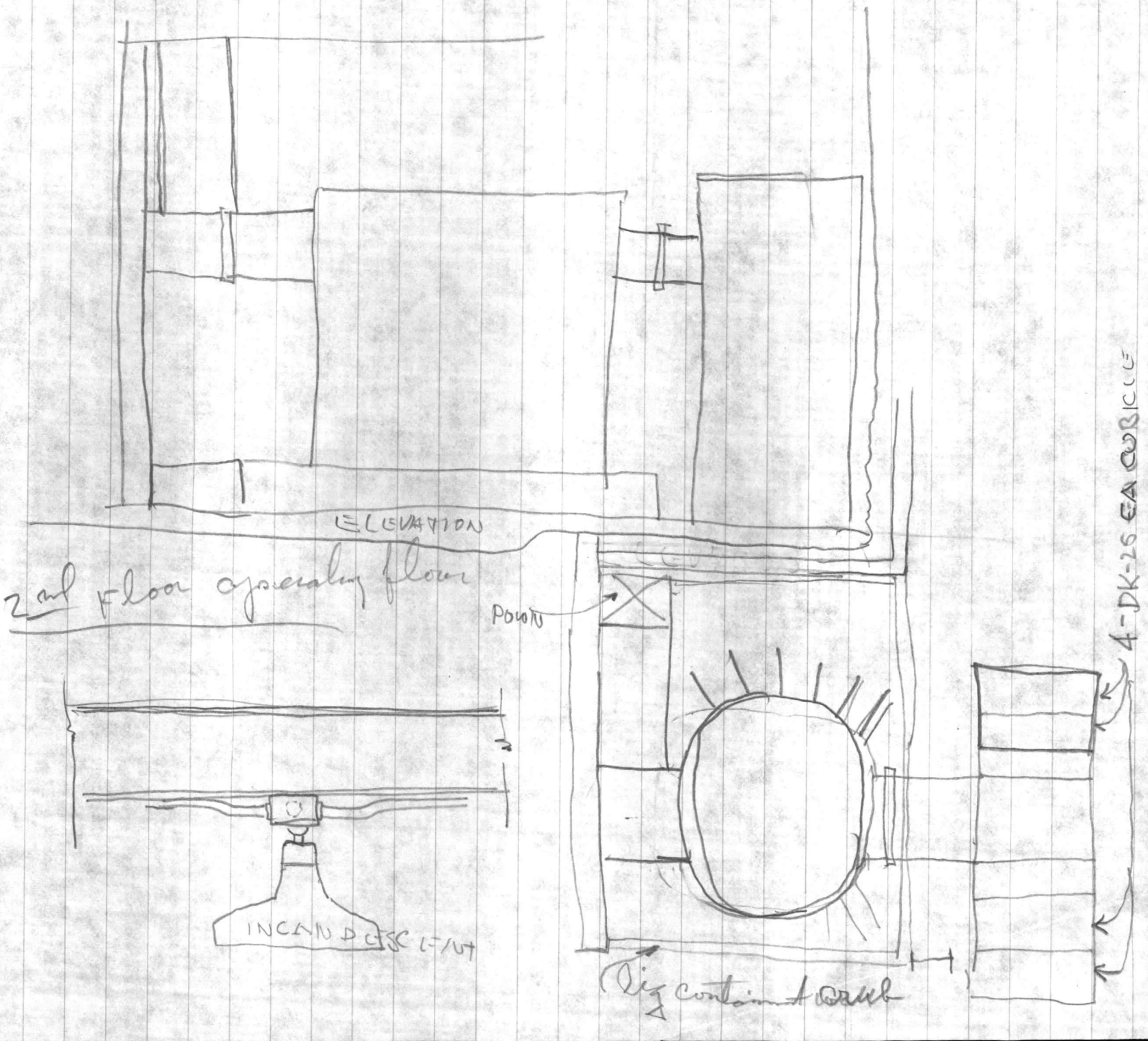
DK-25 Forc. DRAFT FAN. #3 Boiler	DK-25 IN. DUCE DRAFT FAN #3 Boiler	750 KVA		DK-25 150 H.P. I.D. FAN
DK-25 #3B Pulv.	DK-25 No 3A Pulv.			DK-25 75 H.P. F.D. FAN
X	DK-25 SPARE	TIE TO Aux		DK-25 75 H.P. Pulv. #1
DK-25 SPARE	DK-25 SPARE	SW. G.		DK-25 75 H.P. Pulv. #2

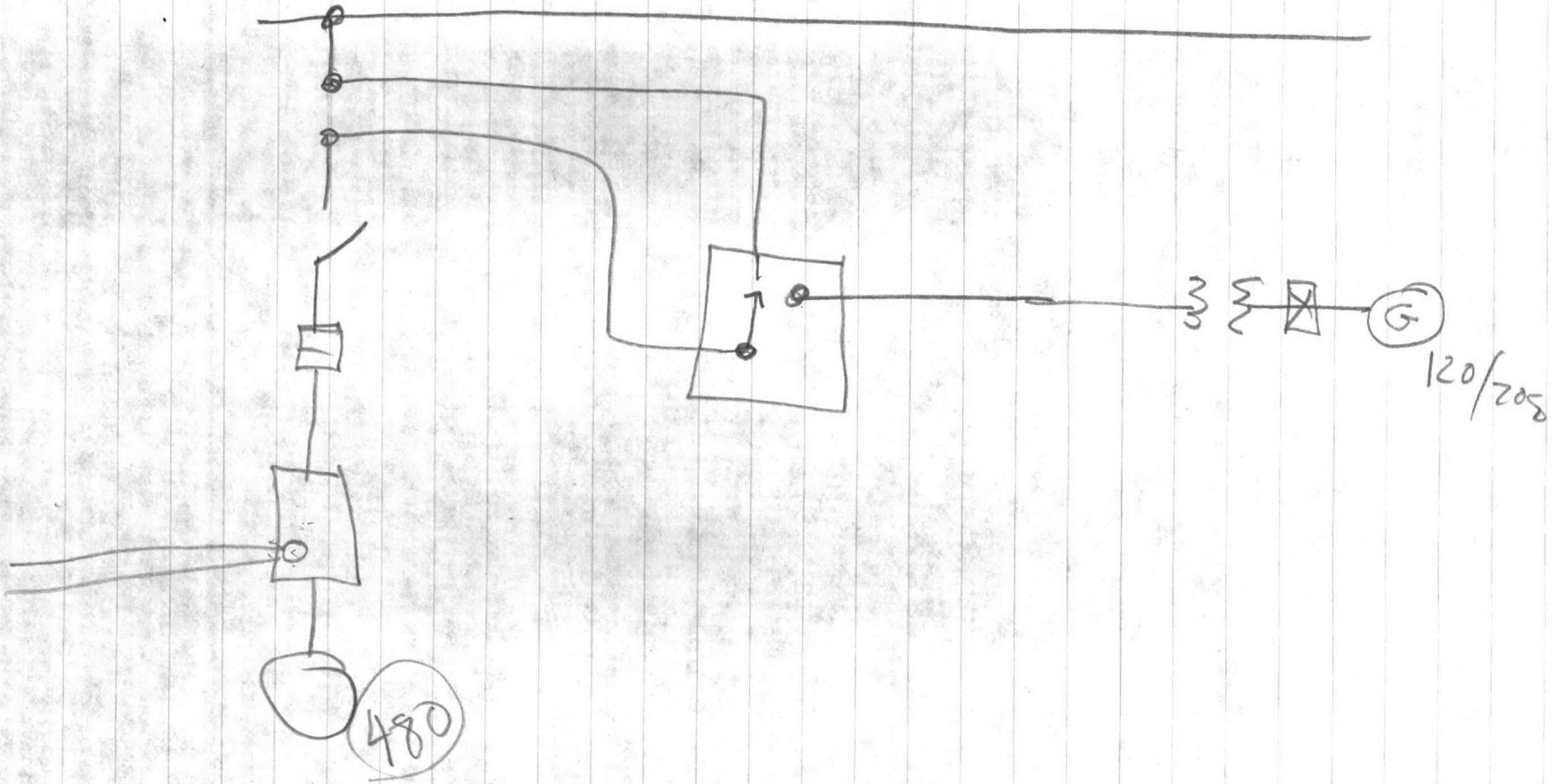
1 1 1/2 1 2



Control Pnl controls were modified in 1972 for oil controls Contract # N62470-71-C-0952

1972 - Elk Elect - Sam Smyliel -


ELEVATION
2nd floor operating floor
POWER
INCANDESCENT LIGHT
4-DK-26 EA CUBICLE
Fig Contaminated


G
120/208
480

1- TRANSFORMER - OUTDOOR UNIT SUB, 750KVA 3Ø
12470HV/120-208LV $\frac{Y}{4}$ - 2 REQUIRED

2- LOW VOLTAGE AUX SWGR

FOR BLDG 1700

SWITCHGEAR.

1. OVERALL DIMENSIONS (FRONT VIEW & SIDE) COMPLETE.

2. BUS ARRANGEMENTS INCLUDING DIMENSIONS AND AMPERE RATINGS OF ALL BUS BARS.

3. TYPE OF SPACING OF BUS SUPPORTS.

4. MAXIMUM SHORT CIRCUIT BRACING.

5. CIRCUIT BREAKER TYPE, INTERRUPTING RATING, AND TRIP SETTING.

ALSO:

MAIN BUS SHALL BE RATED IN AMPERES AT A CERTAIN VOLTAGE AND SHALL HAVE A SHORT CIRCUIT RATING OF ____ RMS. AMPERS. DEVICES SHALL BE (FRONT) GEAR, (FRONT AND REAR) ACCESSIBLE AND SHALL BE COMPLETELY ISOLATED BETWEEN SECTIONS BY VERTICAL STEEL.

2, 3, 4, 5

BUS BAR (ALUM) (CU)
(SIZE OF NEUTRAL BUS % OF FULL LOAD AMPERES.

TYPE OF BREAKER (DRAW OUT) POWER

WATTHOUR METER (NEMA E1 20) W/PROVISIONS FOR PULSE INITIATION.

VOLTMETER & AMMETER ANSI C39.1

POTENTIAL AND CURRENT TRANSFORMER ANSI C57.13

(2)

MAIN CIRCUIT BREAKER (MANUALLY OR ELECTRICALLY), DRAWOUT WITH AN INTERRUPTING RATING NOT LESS THAN _____ AMPERES SYMMETRICAL AT _____ VOLTS. MAGNETIC TRIP DEVICE WITH INSTANTANEOUS TRIPPING CHARACTERISTICS.

SETTING FOR MAIN BREAKER.

(1) LONG TIME DELAY SETTING _____ PERCENT OF COIL RATING.

(2) INSTANTANEOUS: ADJUSTABLE WITH CALIBRATED MARKS SET AT _____ PERCENT OF TRIP UNIT RATING.

3. TRIPS: SET AT _____ AMPERES.

SECONDARY FEEDER BREAKERS SHALL BE AS SPECIFIED FOR MAIN BREAKER, EXCEPT THEY SHALL HAVE AN INTERRUPTING RATING NOT LESS THAN 42,000 AMPERES SYMMETRICAL AT 208 VOLTS, AND THE DELAY AND TRIP SETTINGS SHALL BE AS FOLLOWS:

(1) LONG TIME DELAY SETTING _____ PERCENT OF COIL RATING.

(2) INSTANTANEOUS PICKUP SETTINGS: _____ PERCENT OF TRIP UNIT RATING.

3. TRIPS: _____ AMPERES.

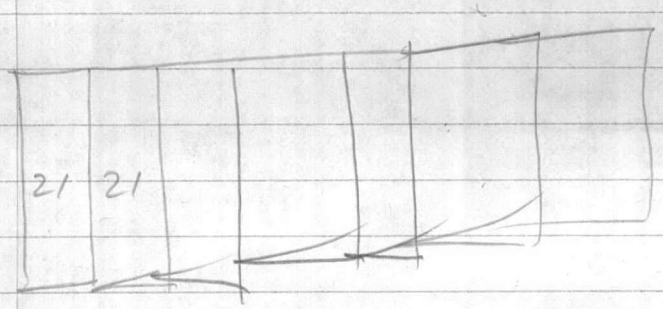
#4

THE EXISTING AUXILIARY SWITCHGEAR WILL BE REMOVED IN THE SECOND PHASE.

THE EXISTING AUXILIARY SWITCHGEAR SHALL BE STRIPPED OF ALL POWER EQUIPMENT, AND LEAVE ONLY THE A LIQUID LEVEL INDICATOR LOCATED ON END OF SWITCHGEAR CABINET. A FLOW GRAPH INDICATOR IS LOCATED IN CENTER OF SWITCHGEAR CABINET, THE IDEAS AND

NEW. SWITCH GEAR. 2500 Amps, 120/208V,

DS-2061 (F), DS 632 (T), (M) DS-632.



$A = \frac{bc}{a} + b + c.$

21-21-21-21-21-21 =

12 | 26 —
2 1

10'6" - LENGTH.
5'-00' - WIDTH.
9'-8" - HEIGHTS.

THE NOW DUAL 2500 AMP
BUS DUCTS LOCATED OUTSIDE
THE BUILDING SHALL BE A
WEATHERPROOF ENCLOSURE.

THIS ELEVATION IS TYPICAL FOR
SWITCHGEAR "B" EXCEPT FOR THE
AUXILIARY SECTION BEING 10.
REVERSE, ~~AND THE SWITCHGEAR~~
~~SECTION~~

7'-4"

3'-6"

2"

3' 208V/~~3~~ amp.
Cont. Rating.

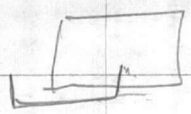
REMOVE FROM EXISTING
2000 amp AUXILIARY
SWITCHGEAR ALL
~~POWER~~ CONNECTIONS PERTAINING
TO ~~THE~~ POWER, ~~FEEDER~~
CIRCUIT BREAKERS, AND
POWER INSTRUMENTS.

100

17.39

2,082

W/ HEATER



$$\frac{750 \times 100}{(5.75)(1.73)(.2)} = \frac{75000}{1.9895}$$

750,002

ADD TO SPECIAL SWITCHGEAR NOTES.

AS — NEW AMPERE SWITCH.

VS — NEW VOLTAGE SWITCH.

S — NEW FEEDER BREAKER SPACE
SPACE ~~OR SPARE~~

TB — ~~NEED~~ 1 TIE BREAKER BETWEEN FOR
NEW NEW SWITCHGEARS "A" AND "B"
~~AND NEW S~~.

DS-206
300 — 420 — DS-632

206-
AMP. RATING. CONTINUOUS CURRENT RATING.

SWITCHGEAR CIRCUIT BREAKERS

300 — 378-
450
2000
2500
225-
125-
90

TER. 15

300A	
450A	42,000
225A	
125A	
90A	

208V, 3Φ, 300A, CONTINUOUS CURRENT RATING., INTERRUPTING CURRENT RATING 42,000 AMPS.

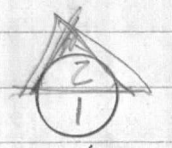
300 / 450 / 225 / 125 / 90 /

EXISTING CONDUCTOR AND CONDUIT RUN.

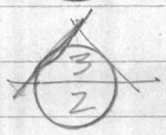
NEW CONDUCTORS IN EXISTING CONDUIT.

EXISTING EQUIPMENT

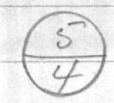
NEW EQUIPMENT.



SECTION DETAIL. TOP NUMBER IS DETAIL NUMBER, BOTTOM NUMBER IS PAGE WHERE DETAIL IS TAKEN OR PAGE WHERE DETAIL IS LOCATED.



ELEVATION DETAIL.



PLAN VIEW.

BOTTOM NUMBER IS THE SHEET WHERE DETAIL IS LOCATED OR DRAWN.

BREAKER △	AMPERE FOR CURRENT BREAKER.	DRAW OUT TYPE	STATIONARY MANUAL TYPE	INTERRUPTING RATING. SYMM.
A-1, 3 4 AND 6.	300	✓		42,000
A-2 AND 5	450	✓		42,000.
A-8 B-9	2000			
A-7 B-8	2500.			

PLAN VIEW DIETAIL (13/B)
OF NEW SW GEAR A INSTALLED
IN THE AREA OF THE REMOVED
EXISTING 750KVA TRANSFORMER
SCALE ½"-1'-0"

E.T.L.

BUS DUCT. W/ NEUTRAL & 50% INTERNAL GND BAR.

2000 → SECTION – 4' – @ $348 P/FT. = $1392.00

2500 → 348

CRI – COLOR RENDERING INDEX

CIE – commission Internationale De l'Eclairage.

18.
13.
31.

CT's REQUIRED. PER SWITCHGEAR.

~~WATTMETER~~

3 INSTANT. TRIP. INTERRUPTER SWITCH GEAR. ~~$3,760~~

42,000 DS-206 → FEEDER $3,760

85,000 DS-632 → MAIN. 9,355

65,000 DS-420 TIE.

750 KVA, 12,470 Δ // 120/208 V Y, 3Φ, 5.75% impedance
PAD MOUNTED,
$13,482.25 @ 2 = $26,964.50

Qo

2,500 Bus Duct.

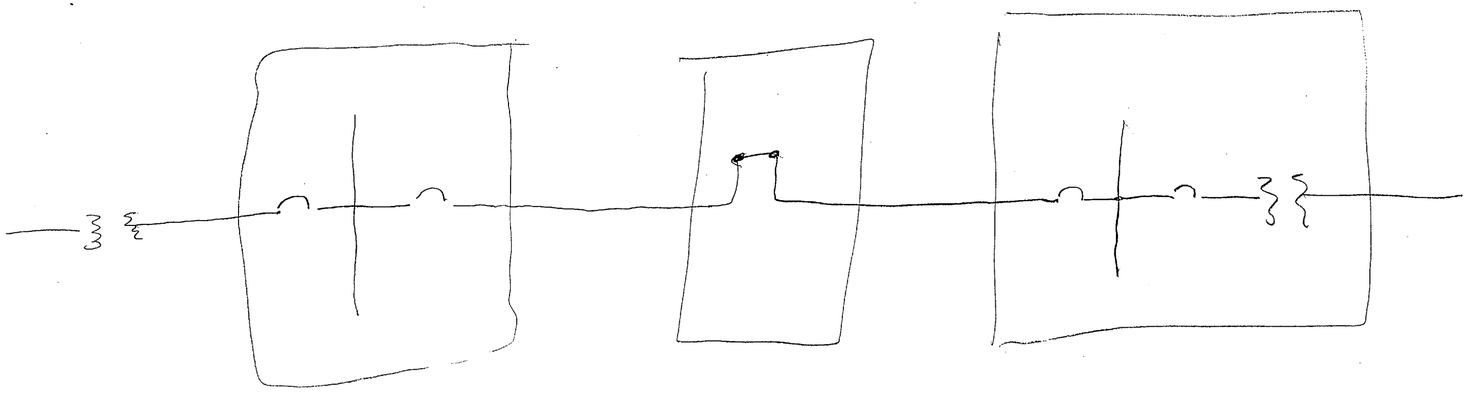
INDOOR STRAIGHT RUN. 301.22 P/F
OUTDOOR " " $251.22 P/F
GROUND ADDER 23.00 P/F
90° ELBOW O/D — 359.98
90° ELBOW I/D — 299.98
END TAP BOX — 906.30
S/G. CONNECTIONS. — 1,014.42

251.22
50.24
301.46
24.38
325.84

2000 Amp Bus Duct (INSERT)
200.34 @ 4 FT = $801.36

1200 Amp Bus Duct. @ 134.00
90° ELBOW - 300.00
T FITTING - 300.00
S/G Connections 507.00
END TAP BOX - 467 -

253
299.75
59.99
359.74



①

DK-25 #1 Force Draft Fan	DK-25 ID Fan
DK-25 #1 Boiler Pulv.	DK-25 1A-Pulv.
DK-25 ID Fan	

750 KVA

TIE TO AUX. SW. gear

DK-25 ID Fan #2 Boiler
DK-25 F.D. Pulv. #4 Boiler
DK-25 FD & Pulv. 2A
DK-25 2A Pulv.

F.D. = FORCED DRAFT FAN
I.D. = INDUCE DRAFT FAN

FIN. FL. 2ND DECK

②

DK-25 Coal Hand. Control	DK-25 CONTROL PANEL #5
DK-25 Coal Stor. Equip.	DK-? 25 Air Comp.
DK-25 Ash Unload Panel #6	DK-? 25
DK-25 Light Panel	DK-? 25 CAR SHAKEOUT

③

DK-25 F.D. Fan #3 Boil	DK-25 INDUCE DRAFT FAN #3 Boil
DK-25 #3 Pulv.	DK-25 No 3A Pulv.
	DK-25 Spare
DK-25 Spare	DK-25 Spare

750 KVA

TIE TO Aux Sw. Gear

DK-25 150 H.P. I.D. FAN
DK-25 75 H.P. F.D. FAN
DK-25 75 H.P. Pulv. #1
DK-25 75 H.P. Pulv. #2

@EILING 1st FL.

24"±

EXIST. DUCT

EXIST. DUCT

5'±

5'±

5'±

5'±

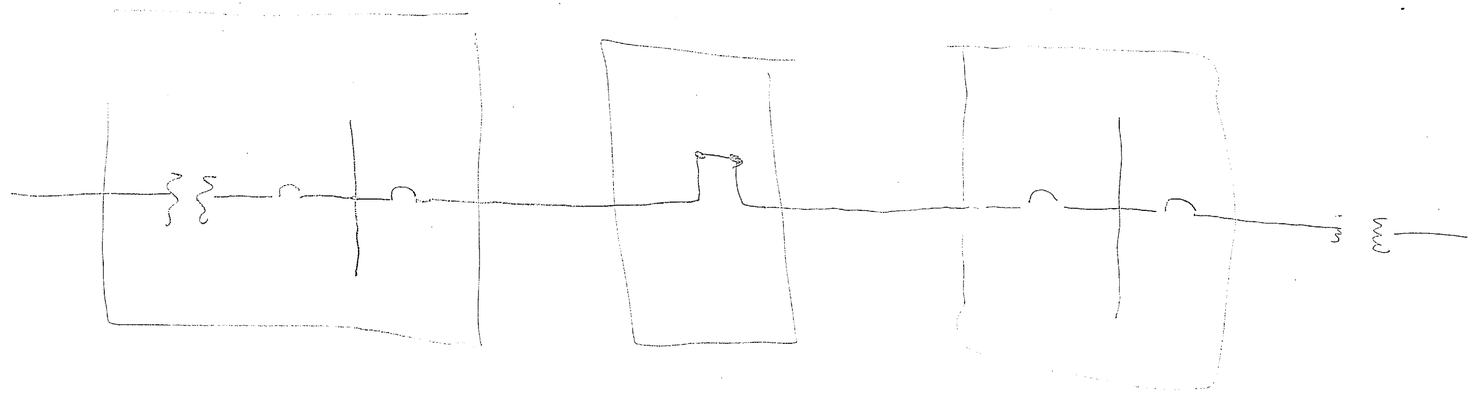
COLUMN

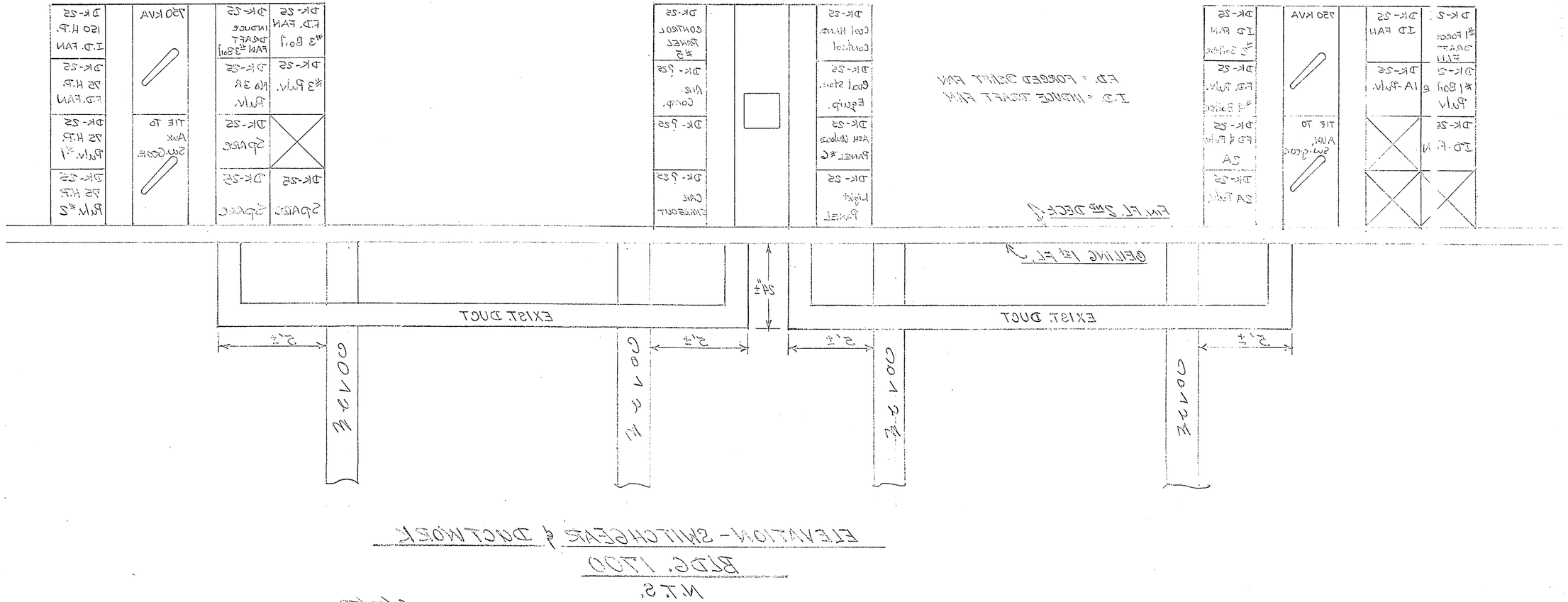
COLUMN

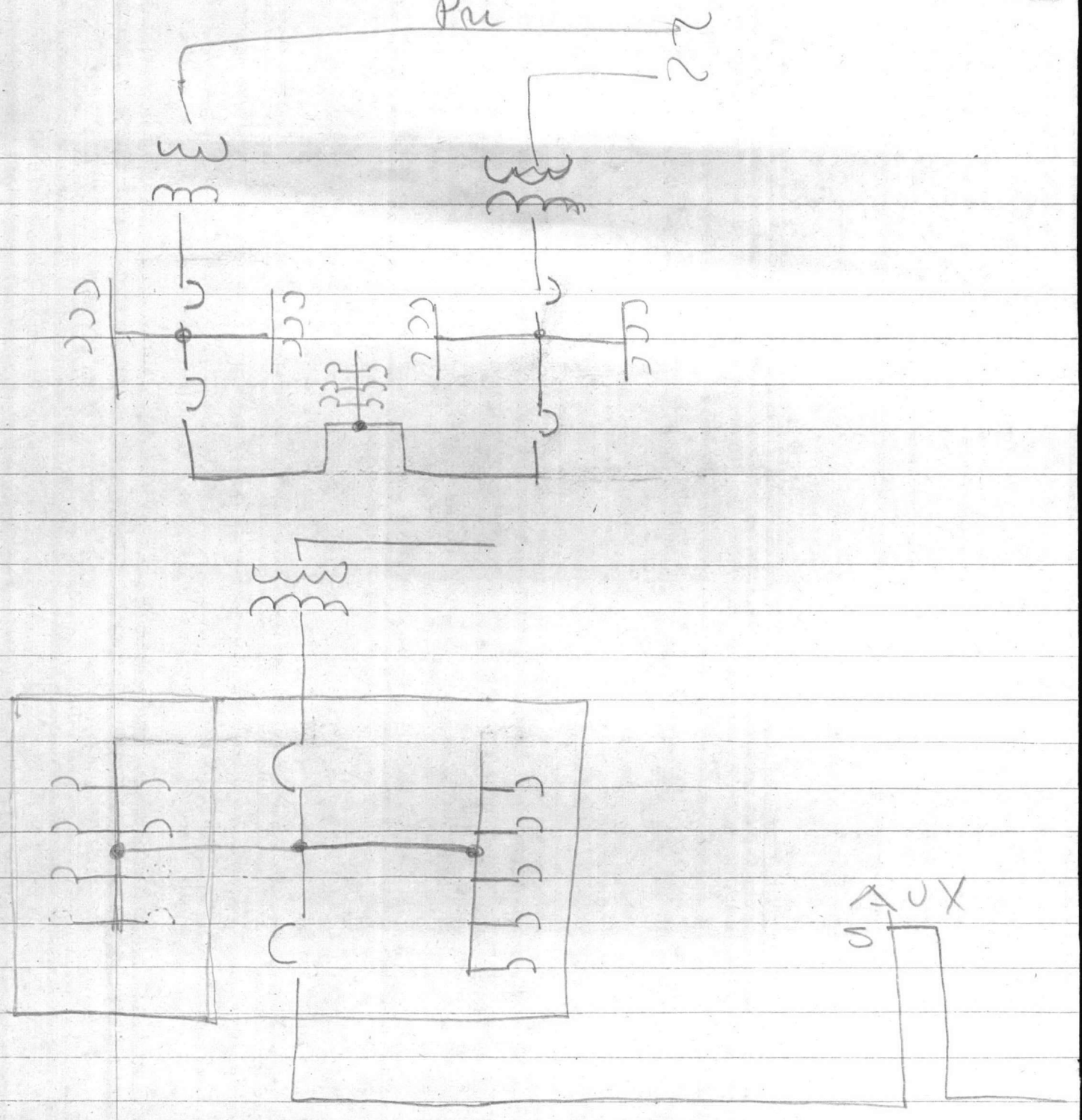
COLUMN

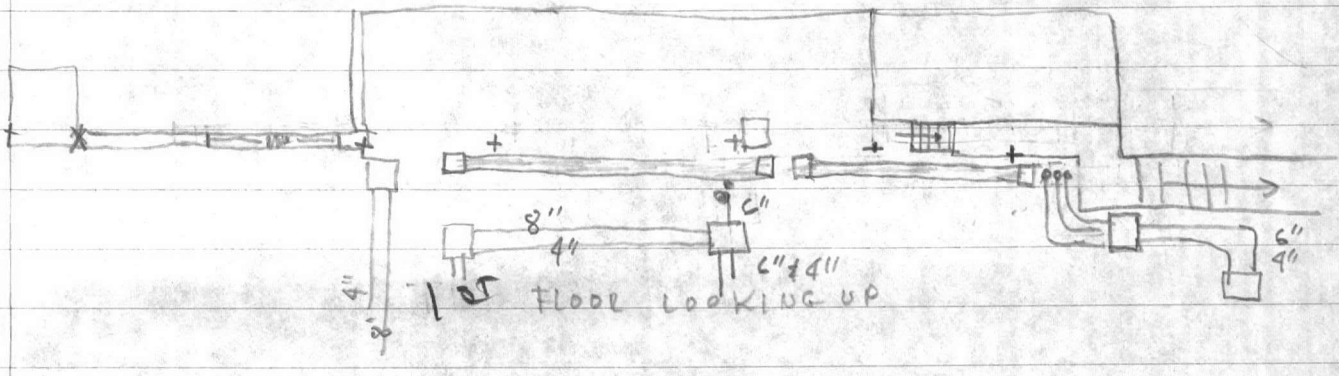
ELEVATION - SWITCHGEAR & DUCTWORK
BLDG. 1700
N.T.S.

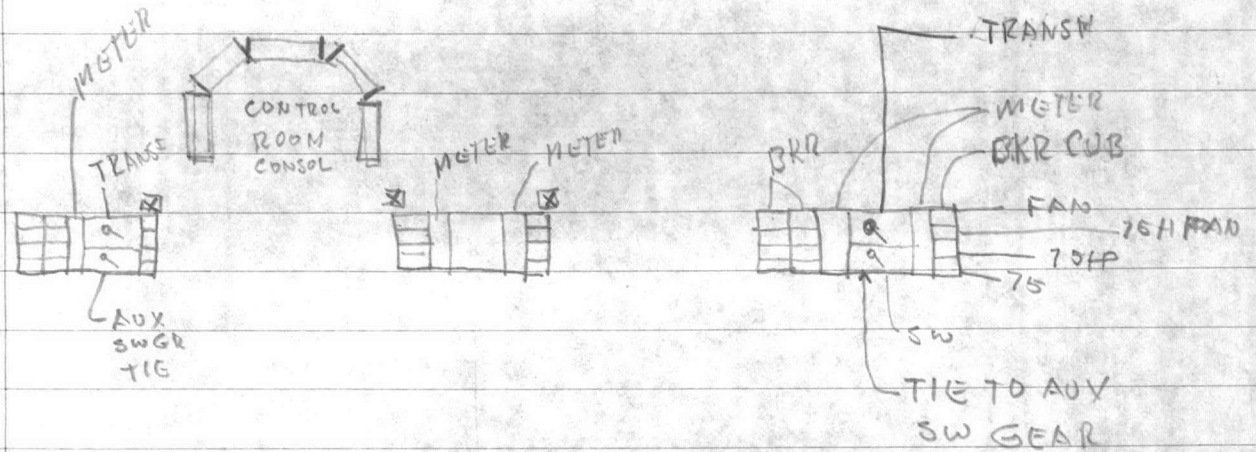
6/14/79 DWG. G.H.



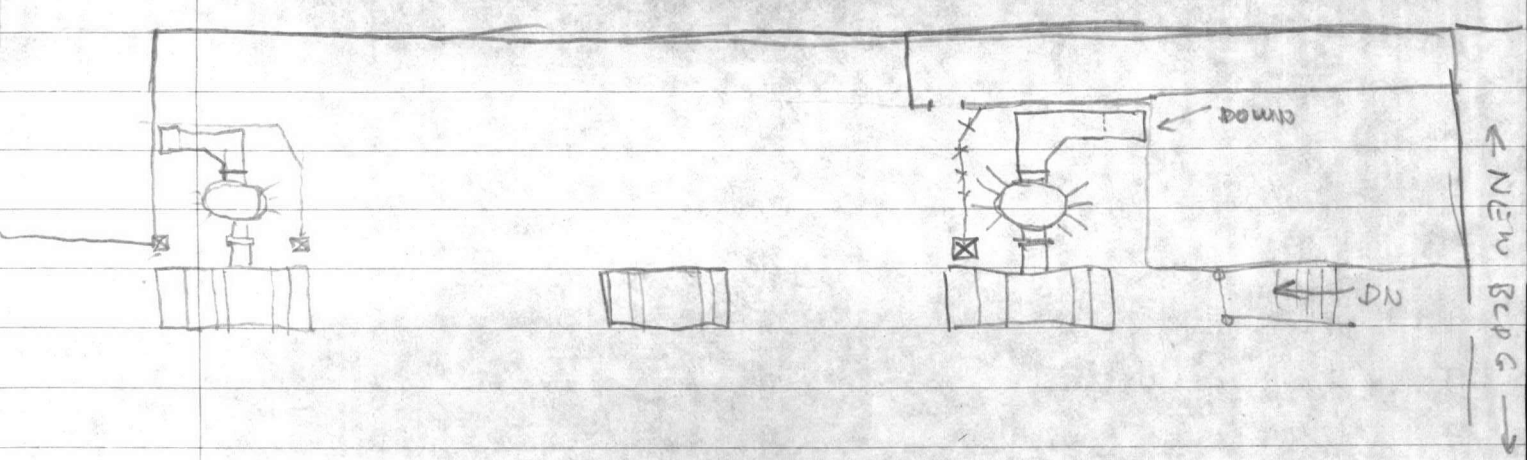

ELEVATION - SWITCHGEAR & DUCTWORK
SCALE: 1"=10'-0"
N.T.S.
EXIST. DUCT
EXIST. DUCT
DEMOLISH AS REQ'D
FUT. FL. 2ND DECK
F.D. - FORCED DRAFT FAN
I.D. - INDUCE DRAFT FAN
DK-25 SPACE
DK-25 SPACE
DK-25 SPACE


Pri
2
AUX
S





ELEVATION



PLAN

MATL LIST

1. TRANSFORMER, 750KVA, 12,470//120-208 ΔY
   OIL FILLED. - 2 REQ'D.

2. SWITCH GEAR, BUSDUCT & PRIMARY FEEDERS.

3. CONNECTIONS.

		MAT	LAB
(1)	TRANSFORMERS & ASSOCIATED EQUIPMENT	70,000	10,000
(2)	SWITCH GEAR	200,000	15,000
(3)	BUSDUCT, PRIMARY FEEDERS, CONNECTIONS, CUT & PATCH, ETC	70,000	10,000
		340,000	35,000

½ 70,000
70
340,000
35
375,000

TOTAL = 375,000

2 - 750 oil filled transf

2000 Amp Bus Duct

1 - Square D 100,000 AIC 12-DK-26