

**EMERGENCY STANDBY
GENERATOR FEASIBILITY STUDY
For Various Buildings
Project No. 958993-2**

FOR
UNIVERSITY OF CALIFORNIA
RIVERSIDE, CALIFORNIA



PREPARED FOR:
UNIVERSITY OF CALIFORNIA
Office of Design and Construction
University of California Riverside
3615A Canyon Crest Drive
Riverside, CA 92507

BY:
JMD Engineering, Inc.
1543 West Garvey Ave. North, Suite 210
West Covina, CA 91790

X-Sender: timothy@ucr.edu@webmail.ucr.edu
X-Mailer: QUALCOMM Windows Eudora Version 6.1.2.0
Date: Tue, 25 Sep 2007 14:34:19 -0700
To: Kieron.Brunelle@ucr.edu (Kieron Brunelle)
From: Timothy Ralston <timothy.ralston@ucr.edu>
Subject: Two Items
X-Junkmail-Whitelist: YES (by domain whitelist at sentrell.ucr.edu)

Kieron,

These can wait until our weekly tomorrow, but am sending this along now so I don't lose sight of them.

1. Confirmed with Leroy that the Housing Plan update does not warrant going to DRB. We're on the docket for November C-3.
2. I'm putting together a summary of available funds from sundry "investors" for the \$2M emergency generator proposal. I need to get a sense of how much funding might be available from the Boyce/Webber and Batchelor projects.

Thanks, Tim

Timothy D. Ralston, AIA
Assistant Vice Chancellor
Capital and Physical Planning
Academic Planning and Budget
University of California, Riverside

(951) 827-2432 (voice)

(951) 827-2402 (fax)

timothy.ralston@ucr.edu

Subject: RE: EH&S - Site 2
Date: Wed, 26 Sep 2007 08:40:15 -0700
Thread-Topic: EH&S - Site 2
Thread-Index: Acf/zaRIg4LxV9BmSvCGYG4xN9q1iAAhAb6w
From: "Darius Maroufkhani" <darius.maroufkhani@ucr.edu>
To: "Kieron Brunelle" <Kieron.Brunelle@ucr.edu>
X-Junkmail-Whitelist: YES (by domain whitelist at sententia.ucr.edu)

Kieron,

Based on my calculation, we will experience a deficit (\$63,000) to produce schematic design and design development (P); however we will recuperate the deficit once the working drawings (W) funds are appropriated. Contrary to the formulas used by OP to break down the funds for P & W; in real world "P" has always cost of more than the "P" budget mostly due to the start up costs of EIR, survey, geotechnical and travels by the team to other places as well as OP. Below please see the break down based on my best estimate. I will be happy to discuss it with you.

darius

From: Kieron Brunelle [mailto:Kieron.Brunelle@ucr.edu]
Sent: Tuesday, September 25, 2007 4:40 PM
To: Darius Maroufkhani
Subject: EH&S - Site 2

Darius,

Eileen has requested a breakdown of projected expenditures for the 'P' phase on site #2. To this end, I would appreciate your assistance in amending your earlier sheet to reflect same.

With thanks.

- Architectural/ engineering fee \$	\$328,000 (25% of the fee)
- ODC fee \$	\$63,000
- Survey \$	\$18,500
- Geotechnical \$	\$8,000
- Value engineering fee \$	\$15,000
- CEQUA \$	\$100,000
- Estimating \$	\$20,000

- New site studies \$	0
- Misc. expanses \$	\$15,000
TOTAL \$	\$567,500

In

Subject: ** Cancelled - MS&E Meeting
From: "Gloria Becerril" <GBecerril@vcamail.ucr.edu>
To: "Darius Maroufkhani" <darius.maroufkhani@ucr.edu>,
...snip... "Sandi Evelyn-Veere" <sandi.evelyn-veere@ucr.edu>
Cc: "Leslie Rose" <leslie.rose@ucr.edu ...snip... norma.millangarlock@ucr.edu>

Hello All,

The MS&E meeting has been cancelled. Please remove it from your calendar.

Thank you,

Gloria

Gloria Becerril

Administrative Assistant

gloria.becerril@ucr.edu

Design & Construction

3615A Canyon Crest Drive

Riverside, CA 92507

951-827-1273

951-827-3890 fax

From: Gloria Becerril
Sent: Wednesday, September 12, 2007 3:55 PM
To: Darius Maroufkhani; Mike Delo; 'Gretchen Bolar

(gretchen.bolar@ucr.edu); Timothy Ralston; Kieron Brunelle; Reza Abbaschian (reza.abbaschian@ucr.edu); Tim Willette (tim.willette@ucr.edu); Donald Cooksey (donald.cooksey@ucr.edu); Jory Yarmoff (jory.yarmoff@ucr.edu); Tina Bryant (tina.bryant@ucr.edu); Michael Maiese (mmaiese@bcj.com); Jonathan Hayes; Sandi Evelyn-Veere
Cc: 'Leslie Rose'; 'Mindy Matthew (mindy.matthews@ucr.edu)'; 'Mary Darnell'; 'Eilene Montoya'; 'Norma Millan-Garlock'
Subject: * Confirmation - MS&E

Hello All,

This is to confirm that the MS&E meeting is as follows:

Subject: Review Bid Alternates

Date: Friday September 28, 2007

Time: 9:30am - 11:30am

Location: College Bldg North, Rm. 205

Please let me know if you have any questions.

Thank you,

Gloria

Gloria Becerril

Administrative Assistant

gloria.becerril@ucr.edu <<mailto:gloria.becerril@ucr.edu>>

In

Design & Construction

3615A Canyon Crest Drive

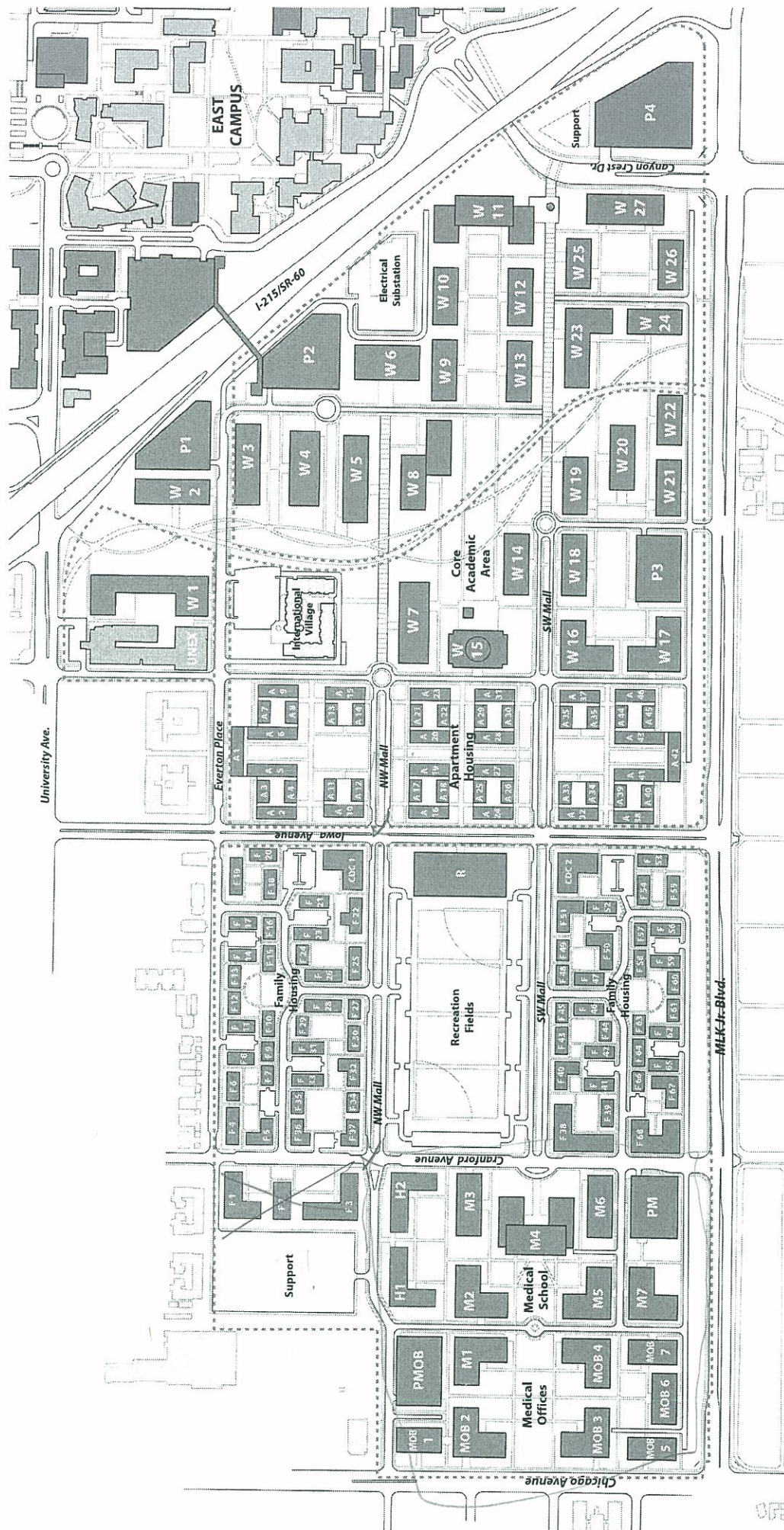
Riverside, CA 92507

951-827-1273

951-827-3890 fax



winmail192.dat



KEY PLAN
UC RIVERSIDE CAMPS
WEST CAMPUS CAPACITY

July 19, 2007
 not to scale

Numbers correspond to
 accompanying spreadsheet
 UCR CAMPS WC Plan Capacity.xls

UNIVERSITY RIVERSIDE AT CALIFORNIA
Emergency Standby Generator Feasibility Study
For Various Buildings
UCR #958993-2
JMD #06-0502

Option "C"

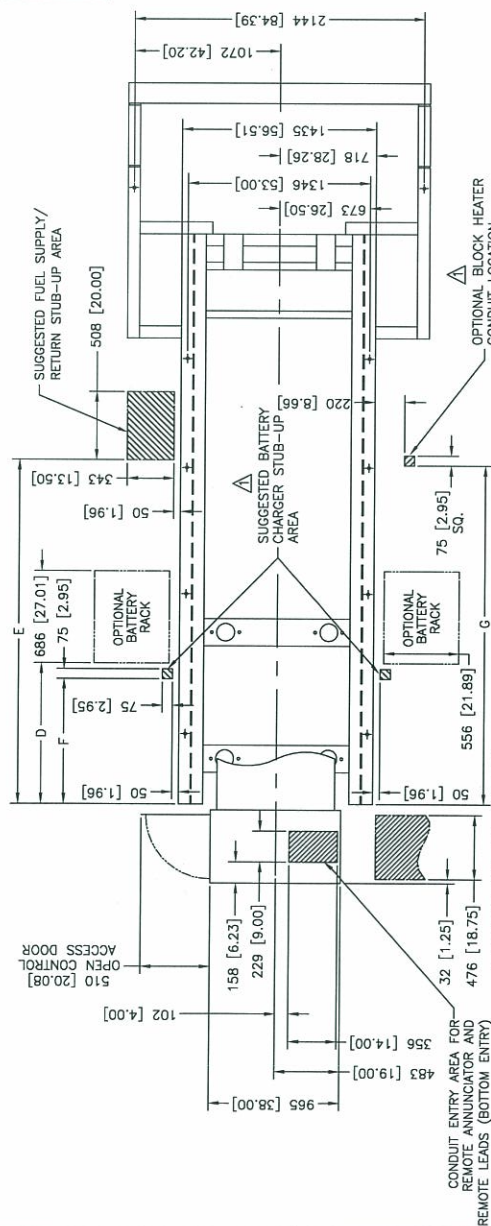
Description of Work	Units	Quantity	Materials	Labor	Extension
Mobilization	LOT	1	\$ -	\$ 24,000.00	\$ 24,000.00
2000 KW diesel generator	LOT	3	\$ 595,915.00	\$ 17,877.45	\$ 1,841,377.35
Standard weatherproof Protective enclosure					
Critical silencer					
12,000 gal above concrete fuel tank	LOT	1	\$ 103,650.00	\$ 6,229.00	\$ 109,879.00
Diesel fuel piping	LOT	1	\$ 6,000.00	\$ 8,000.00	\$ 14,000.00
15KV Parallelling Switchgear & Auto Transfer Switch	LOT	1	\$ 575,000.00	\$ 24,250.00	\$ 599,250.00
5" PVC Conduit	LF	1250	\$ 2.35	\$ 2.58	\$ 6,162.50
#250 Kcmil, 15KV	LF	2400	\$ 9.70	\$ 2.10	\$ 28,320.00
#500 Kcmil, 15KV	LF	3000	\$ 15.10	\$ 2.80	\$ 53,700.00
#1/0 Conductor	LF	3600	\$ 2.30	\$ 1.02	\$ 11,952.00
#350 Kcmil 600V	LF	2000	\$ 6.90	\$ 1.87	\$ 17,540.00
#2 600V	LF	3000	\$ 1.50	\$ 0.75	\$ 6,750.00
#4/0 600V	LF	500	\$ 4.35	\$ 1.53	\$ 2,940.00
#6 600V	LF	1000	\$ 0.68	\$ 0.52	\$ 1,200.00
#8 600V	LF	300	\$ 0.45	\$ 0.42	\$ 261.00
#1 600V	LF	500	\$ 2.00	\$ 0.84	\$ 1,420.00
3' x 5' x 3' intercept pull box	EA	2	\$ 695.00	\$ 600.00	\$ 2,590.00
2' x 3' x 3' intercept pull box	EA	1	\$ 268.00	\$ 408.50	\$ 676.50
New 15KV Load Interruptor Switch	EA	1	\$ 20,000.00	\$ 2,575.00	\$ 22,575.00
600 Amp Main Circuit Breaker for CLHV	EA	1	\$ 4,150.00	\$ 210.00	\$ 4,360.00
3" Rigid Conduit	EA	300	\$ 18.85	\$ 13.45	\$ 9,690.00
3" PVC Conduit	LF	200	\$ 1.03	\$ 1.68	\$ 542.00
4" PVC Conduit	LF	300	\$ 1.48	\$ 2.10	\$ 1,074.00
2" PVC Conduit	LF	900	\$ 0.75	\$ 1.40	\$ 1,935.00
600 Amp W.P. Distriution Board	EA	1	\$ 4,675.00	\$ 2,100.00	\$ 6,775.00
225 Amp Circuit Breaker	EA	2	\$ 535.00	\$ 105.00	\$ 1,280.00
100 Amp Circuit Breaker	EA	8	\$ 535.00	\$ 84.00	\$ 4,952.00
Demolition of Substation "APEP" and A.C, Paving	LOT	1	\$ -	\$ 20,000.00	\$ 20,000.00
Structural Generator and Switchgear Pad	LOT	1	\$ 190,000.00	\$ 60,000.00	\$ 250,000.00
Temporary Generator Rental	LOT	4	\$ -	\$ 4,600.00	\$ 18,400.00
Connect Batchelor Subs for Operation @12KV	LOT	2	\$ -	\$ 4,000.00	\$ 8,000.00
High Voltage fuses for Batchelor Hall Subs	EA	6	\$ 1,500.00	\$ 160.00	\$ 9,960.00
High Voltage demolition of switch and conductors	LOT	1	\$ -	\$ 12,000.00	\$ 12,000.00
High Voltage termination	EA	33	\$ 205.00	\$ 73.00	\$ 9,174.00
High Connectors, Reconnectable Type	EA	9	\$ 250.00	\$ 260.00	\$ 4,590.00
Concrete encasement	LOT	1	\$ -	\$ 6,000.00	\$ 6,000.00
Trench & Backfill	LF	3,000	\$ -	\$ 12.00	\$ 36,000.00
A.C. Patch	LF	800	\$ 2.50	\$ 3.50	\$ 4,800.00
Manhole/wall conduit penetration	EA	22		\$ 300.00	\$ 6,600.00
1000 KVA Pad Mount Transformer	EA	2	\$ 26,100.00	\$ 4,265.00	\$ 60,730.00
1500 KVA Pad Mount Transformer	EA	1	\$ 33,000.00	\$ 49,150.00	\$ 82,150.00
5" PVC Conduit	LF	7,200	\$ 2.35	\$ 2.58	\$ 35,496.00
500Kcmil, 15KV	LF	30,000	\$ 15.10	\$ 2.80	\$ 537,000.00
250 Kcmil, 15KV	LF	65,000	\$ 9.70	\$ 2.10	\$ 767,000.00
#1/0 Conductor	LF	10,200	\$ 6.90	\$ 1.87	\$ 89,454.00
Load Control Conductors	LF	22,800	\$ 0.15	\$ 0.34	\$ 11,172.00
Shunt Trip Operators	EA	5	\$ 6,000.00	\$ 2,000.00	\$ 40,000.00
Underground Vault	EA	1	\$ 4,800.00	\$ 3,000.00	\$ 7,800.00
15 KV Terminations	EA	42	\$ 205.00	\$ 73.00	\$ 11,676.00
High Connectors, Reconnectable Type	EA	24	\$ 250.00	\$ 260.00	\$ 12,240.00
			\$ -	\$ -	\$ -

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UCR #958993-2
JMD #06-0502

Option "C"

Description of Work	Units	Quantity	Materials	Labor	Extension
			\$ -	\$ -	\$ -
			\$ -	\$ -	\$ -
			\$ -	\$ -	\$ -
			\$ -	\$ -	\$ -
			\$ -	\$ -	\$ -
			\$ -	\$ -	\$ -
Miscellaneous fittings	LOT	1	\$ 76,690.00	\$ -	\$ 76,690.00
Subtotal					\$ 4,892,133
Sales Tax 8.5%					\$ 358,091
Subtotal					\$ 5,250,224
25% Contingency					\$ 1,312,556
Subtotal					\$ 6,562,780
20% Overhead and Profit					\$ 1,312,556
Subtotal					\$ 7,875,336
Generator System for Glasshouse/Headhouse 1-3					\$ 138,000
Generator System for Environment Health & Safety					\$ 108,000
Subtotal					\$ 8,121,336
CALL IT					\$8,200,000.00

INSTALLATION NOTE
 IF SUBBASE FUEL TANK AND/OR SOUND HOUSING IS USED, REFER TO SUBBASE FUEL TANK ADV TO DETERMINE MOUNTING LOCATIONS.

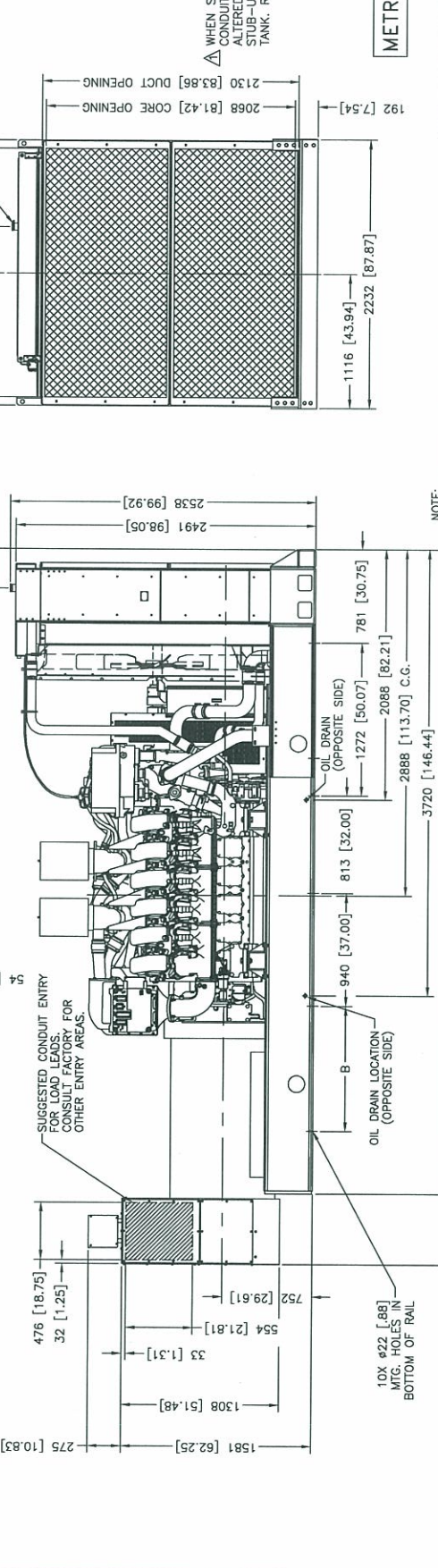


CONDUIT ENTRY AREA FOR REMOTE ANNUNCIATOR AND REMOTE LEADS (BOTTOM ENTRY)
 SUGGESTED LOAD LEAD ENTRANCE WITHIN THIS BOUNDARY OUTSIDE OF SKID. CONSULT FACTORY FOR OTHER ENTRY AREAS.

FOR CIRCUIT BREAKER OR REMOTE ANNUNCIATOR CONDUIT ENTRY AREAS, SEE SHEET 4.

(8) 750 MCM 2 HOLE LUGS MAX PER PHASE (LUGS NOT INCLUDED)
 BUS CONNECTIONS L0, L1, L2 & L3 TYP
 54 [2.13] TYP
 44 [1.75] TYP

2" NPT REMOVABLE FILL NECK & CAP
 2202 [86.69] DUCT OPENING
 2064 [81.25] CORE OPENING
 381 [15.00]



NOTE: MAX. WET WEIGHT OF GENSET: 14,061 KG [31,000 LBS]

WHEN SUBBASE TANK IS USED CONDUIT LOCATION SHOULD BE ALTERED ACCORDINGLY, OR IN STUB-UP AREA FOR SUBBASE TANK. REFER TO SUBBASE ADV.

METRIC CAD FILE

REV	DATE	REVISION
D	2-21-07	(A-C) 2008 WAS 2012, 2008 WAS 2013, 2012 WAS 2014, (A/B-7/2)
C	1-2-07	DUCT OPENING AREA, 192 WAS 204, 2008 WAS 2014, (D-2) 8114
B	4-29-06	WAS 4529, 2300 WAS 5630, 5000 WAS 5294, 5050 WAS 5000, 6120 WAS 5980, ALL DIMENSIONS EXCEPT UPDATES (REMOVED)
A	3-8-07	WAS 5980, ALL DIMENSIONS EXCEPT UPDATES (REMOVED)
F	4-3-07	SEE SHEET 3 (REVISED)
E	4-3-07	SEE SHEET 1 (REVISED)
REV	DATE	REVISION

1250/1500 KW ALTERNATOR FRAME SIZE	
1250 (7M4048)	7M4052, 7M4174, 7M4176
1500 (7M4050)	7M4290, 7M4368, 7M4370
A	5014 [197.38] 5369 [211.36] 1041 [41.0]
B	660 [26.0] 5955 [2334.45]
C	5790 [227.95] 6120 [240.95] (7M4176 ONLY)
D	664 [26.14] 1046 [41.18]
E	2180 [85.83] 2960 [100.79]
F	600 [23.62] 930 [36.61]
G	2140 [84.25] 2520 [99.21]

1250/1500 KW 60HZ/40C COOLING 12V 4000 SERIES DDC TIER II

MAX. WET WEIGHT OF GENSET: 14,061 KG [31,000 LBS]

NOTE: DIMENSION PRINT

ADV-7256

1-6

ADV-7256

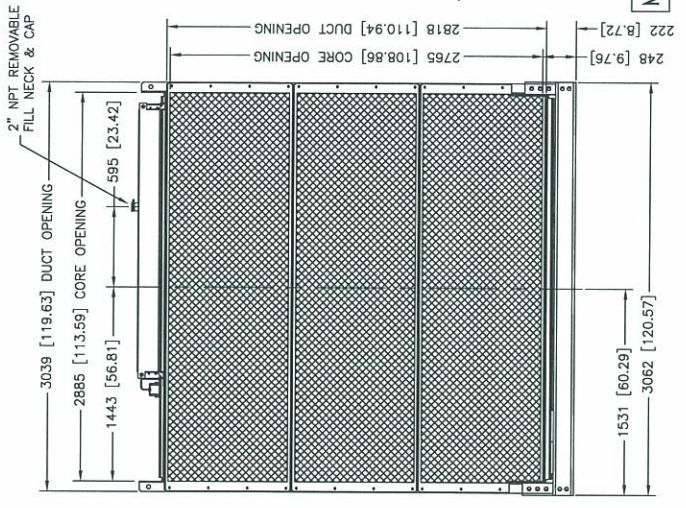
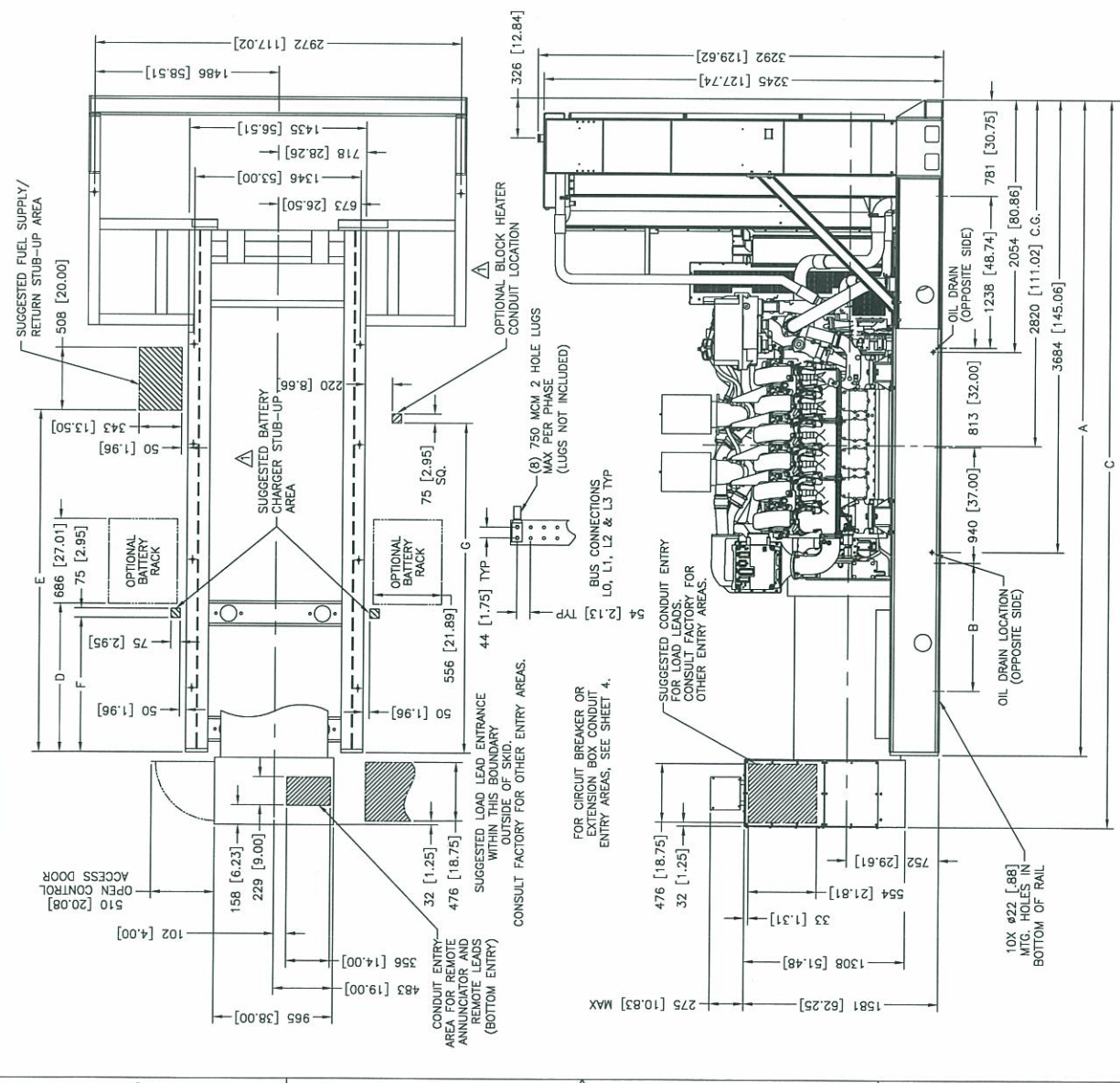
1-6

ADV-7256

INSTALLATION NOTE
 IF SUBBASE FUEL TANK AND/OR SOUND HOUSING IS USED, REFER TO SUBBASE FUEL TANK ADV TO DETERMINE MOUNTING LOCATIONS.

REV	DATE	REVISION
E	3-18-07 (A-2)	222 (6.73) WAS 238 (6.41) (B0046)
F	4-3-07	SEE SHEET 4 (B0046)
REV	DATE	REVISION
CHG		
DWG		

1250/1500 KW W/ 50C COOLING ALTERNATOR FRAME SIZE	
1250 (7M4048)	7M4052, 7M4174, 7M4176
1500 (7M4050)	7M4290, 7M4366, 7M4370
A	4978 [195.99]
B	660 [26.0]
C	5333 [209.97]
D	1041 [41.0]
E	5919 [233.05]
F	6085 [239.55] (7M4176 ONLY)
G	1046 [41.18]
H	2180 [85.83]
I	2560 [100.79]
J	600 [23.62]
K	930 [36.61]
L	2140 [84.25]
M	2520 [99.21]



△ WHEN SUBBASE TANK IS USED, CONDUIT LOCATION SHOULD BE ALTERED ACCORDINGLY OR IN STUB-UP AREA FOR SUBBASE TANK. REFER TO SUBBASE ADV.

METRIC CAD FILE

KOHLER CO.
 POWER GENERATION GROUP
 1250/1500 KW W/ 50C COOLING
 12V 4000 SERIES DDC
 TIER II

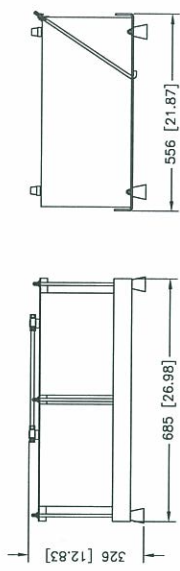
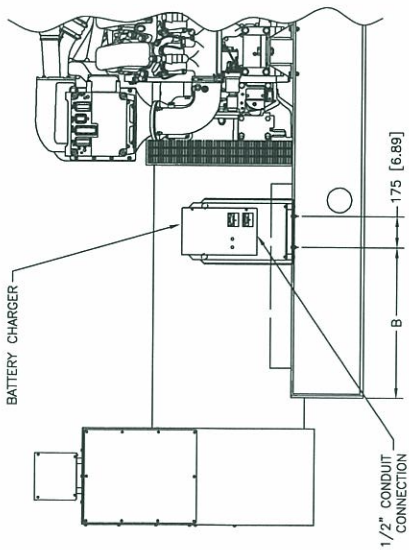
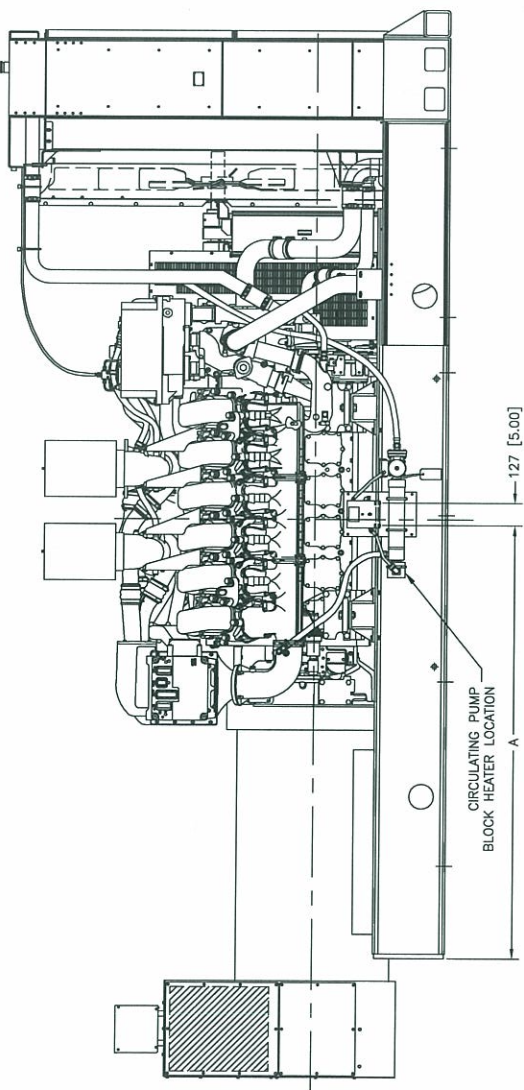
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 DRAWN BY: J. J. JONES
 CHECKED BY: J. J. JONES
 APPROVED BY: J. J. JONES
 PART NO.: ADV7256C.DWG
 SHEET: 3 OF 3
 DIMENSION PRINT
 ADV-7256

1250/1500 KW
 60HZ/50C COOLING
 12V 4000 SERIES DDC
 TIER II

DIMENSIONS IN [] ARE INCH EQUIVALENTS

REV	DATE	REVISION
D	2-23-07	SEE SHEETS 1.2.2 & 4 [06003]
E	3-16-07	SEE SHEET 3 [06046]
F	4-2-07	SEE SHEET 4 [06045]
DWG		

1250/1500 KW	
ALTERNATOR FRAME SIZE	
1250 (7M4048)	7M4052,
1500 (7M4050)	7M4174, 7M4176, 7M4288
	7M4368, 7M4370
A	2091 [82.32]
B	546 [21.50]



BATTERY & BATTERY RACK
SCALE: 2X

METRIC CAD FILE

NOTE: DIMENSIONS IN [] ARE INCH EQUIVALENT

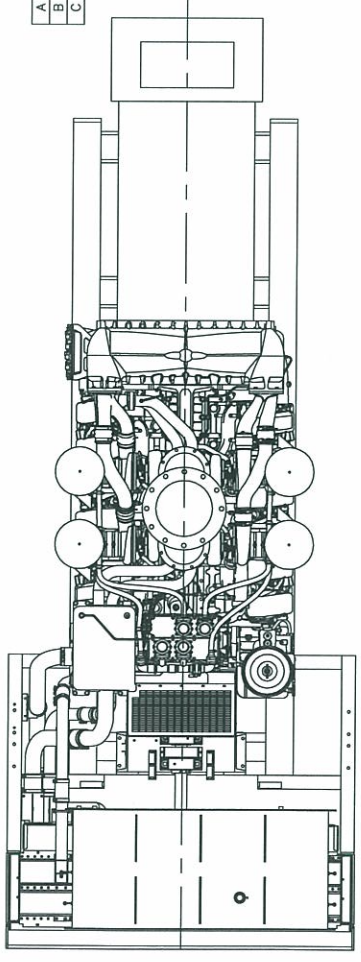
1250/1500 KW
 60HZ/40C & 50C COOLING
 12V 4000 SERIES DDC
 TIER II

KOHLER CO.
 POWER SYSTEMS DIVISION
 1250/1500 KW
 METRIC DIMENSION PRINT
 ADV-7256

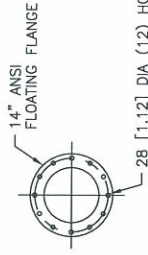
DIMENSION PRINT
 ADV-7256

REV	DATE	DESCRIPTION
D	2-21-07	REVISION [60003]
E	3-9-07	SEE SHEET 3 [60046]
F	4-3-07	SEE SHEET 4 [60045]

1500 KW ALTERNATOR FRAME SIZE	
	7M4052, 7M4288
7M4050	7M4174, 7M4176, 7M4288
	7M4368, 7M4370
A	3010 [118.50]
B	2425 [95.47]
C	1936 [76.22]
	2291 [90.20]

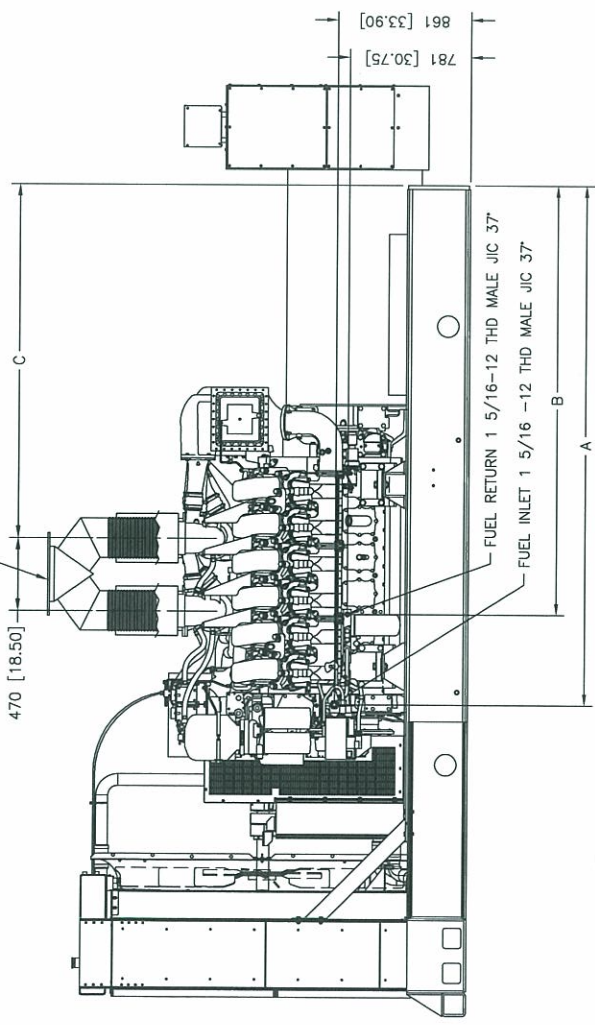
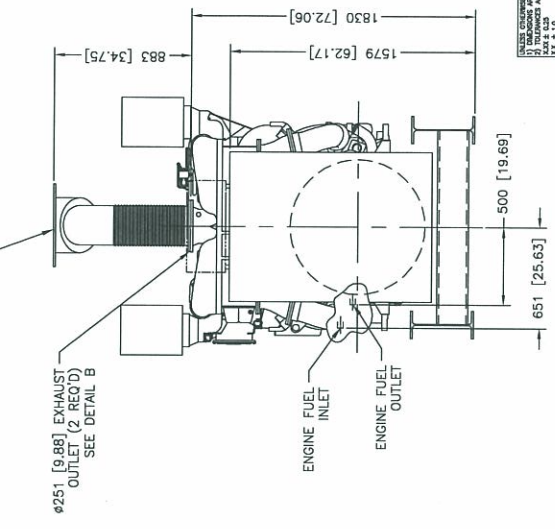


14 [.56] DIA THRU 8 HOLES EQUALLY SPACED ON A Ø302 [11.88] B.C.



OPTIONAL "Y" FLEXIBLE EXHAUST SEE DETAIL D

OPTIONAL "Y" FLEXIBLE EXHAUST CONNECTION



METRIC CAD FILE

UNLESS OTHERWISE SPECIFIED - DIMENSIONS ARE IN MILLIMETERS	UNLESS OTHERWISE SPECIFIED - DIMENSIONS ARE IN INCHES
FINISHES: 1.0 SURFACE FINISH	1.0 SURFACE FINISH
2.0 12.0	2.0 12.0
3.0 12.0	3.0 12.0
4.0 12.0	4.0 12.0
5.0 12.0	5.0 12.0
6.0 12.0	6.0 12.0
7.0 12.0	7.0 12.0
8.0 12.0	8.0 12.0
9.0 12.0	9.0 12.0
10.0 12.0	10.0 12.0

KOHLER CO
POWER SYSTEMS, FORT MILWAUKEE, WI 53044 U.S.A.
KOHLENERWERKE AG, FRIEDLAND, GERMANY
KOHLENERWERKE AG, FRIEDLAND, GERMANY
KOHLENERWERKE AG, FRIEDLAND, GERMANY

1250/1500 KW
60HZ/40C & 50C COOLING
12V 4000 SERIES DDC
TIER II

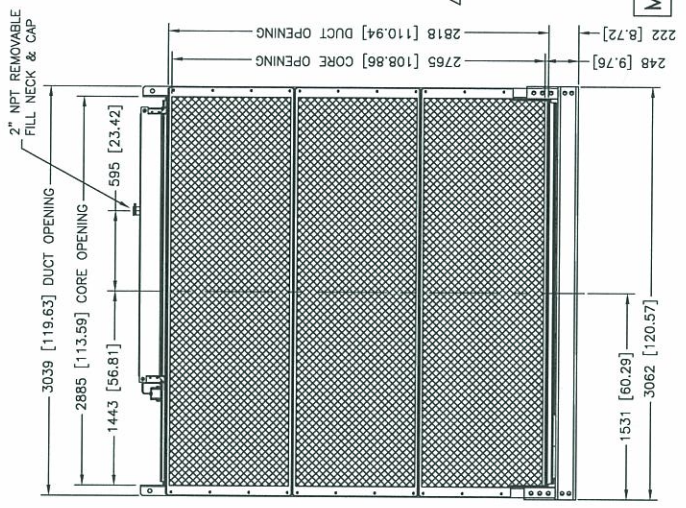
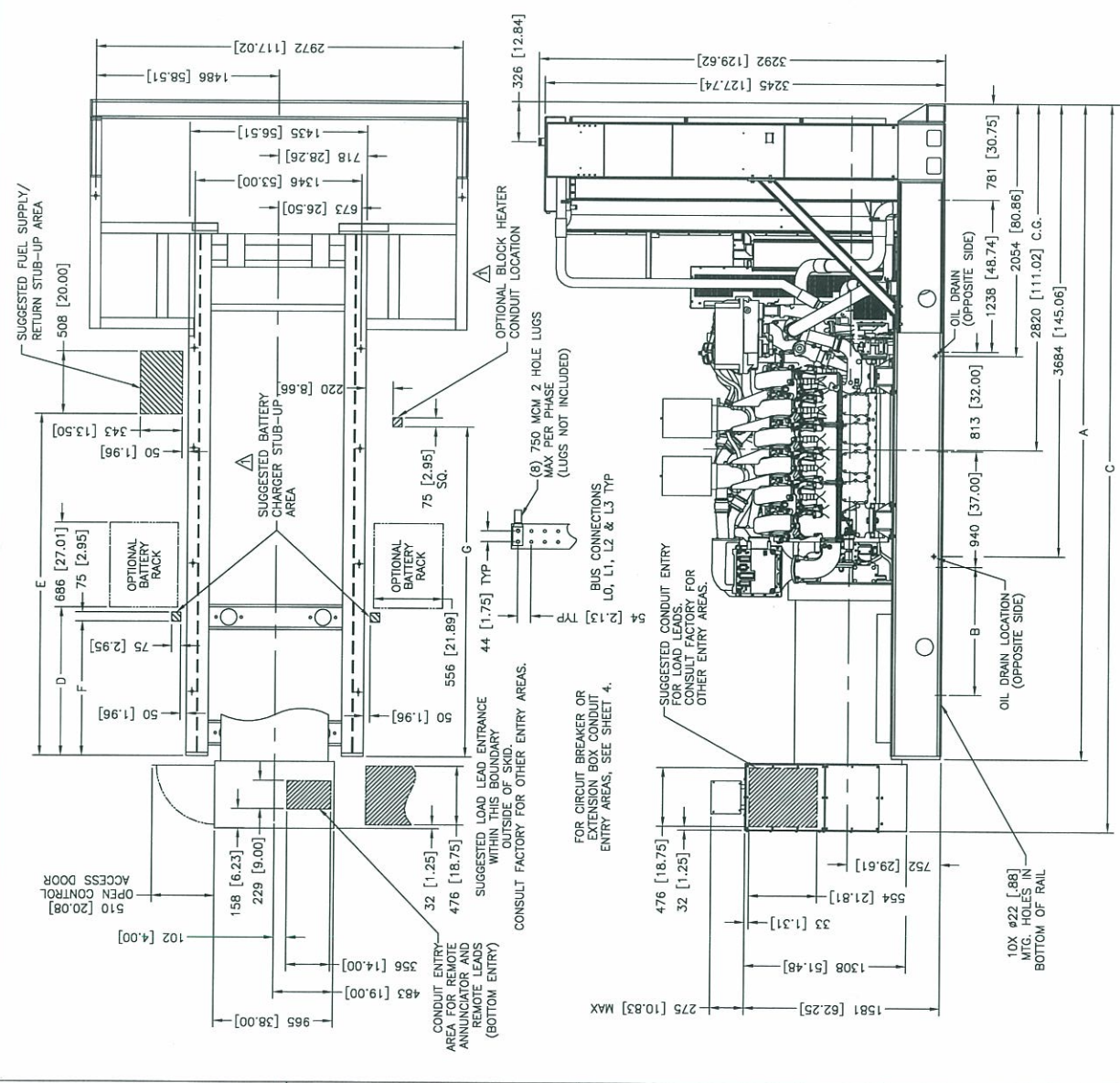
DIMENSIONS IN [] ARE INCH EQUIVALENTS

ADV-7256

INSTALLATION NOTE
 IF SUBBASE FUEL TANK AND/OR SOUND HOUSING IS USED, REFER TO SUBBASE FUEL TANK ADV TO DETERMINE MOUNTING LOCATIONS.

REV	DATE	REVISION
E	3-8-07	(A-2) 222 (B-72) WAS 238 (B-47) (B-64)
F	4-3-07	SEE SHEET 4 (B-64)
DWG		
APP		

1250/1500 KW W/ 50C COOLING ALTERNATOR FRAME SIZE	
1250 (7M4048)	7M4052, 7M4174, 7M4176
1500 (7M4050)	7M4290, 7M4368, 7M4370
A	4978 [195.99] 5333 [209.97] 1041 [41.0]
B	660 [26.0]
C	5754 [226.55] 5919 [233.05] 6085 [239.55] (7M4176 ONLY)
D	684 [26.14] 1046 [41.18]
E	2180 [85.83] 2560 [100.79]
F	600 [23.62] 930 [36.61]
G	2140 [84.25] 2520 [99.21]



△ WHEN SUBBASE TANK IS USED, CONDUIT LOCATION SHOULD BE ALTERED ACCORDINGLY OR IN STUB-UP AREA FOR SUBBASE TANK. REFER TO SUBBASE ADV.

METRIC CAD FILE

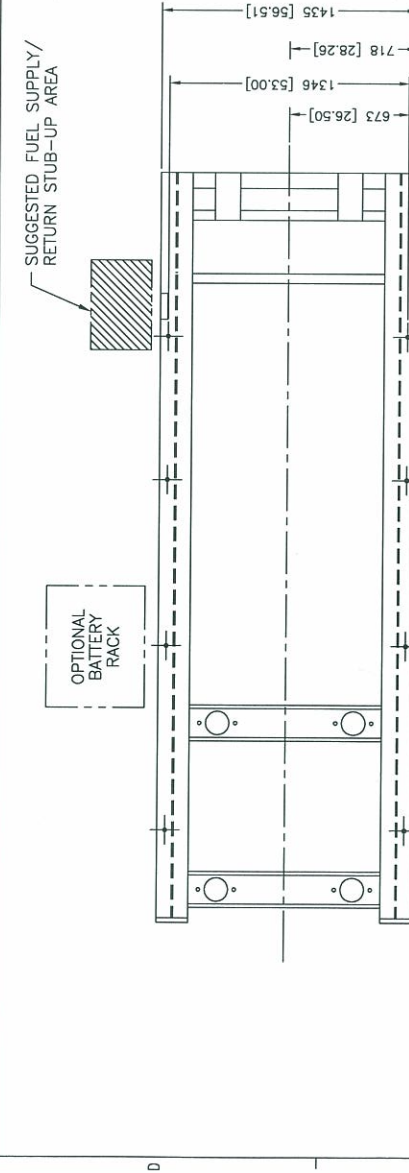
REV	DATE	REVISION
E	3-8-07	(A-2) 222 (B-72) WAS 238 (B-47) (B-64)
F	4-3-07	SEE SHEET 4 (B-64)
DWG		
APP		

1250/1500 KW
 60HZ/50C COOLING
 12V 4000 SERIES DDC
 TIER II

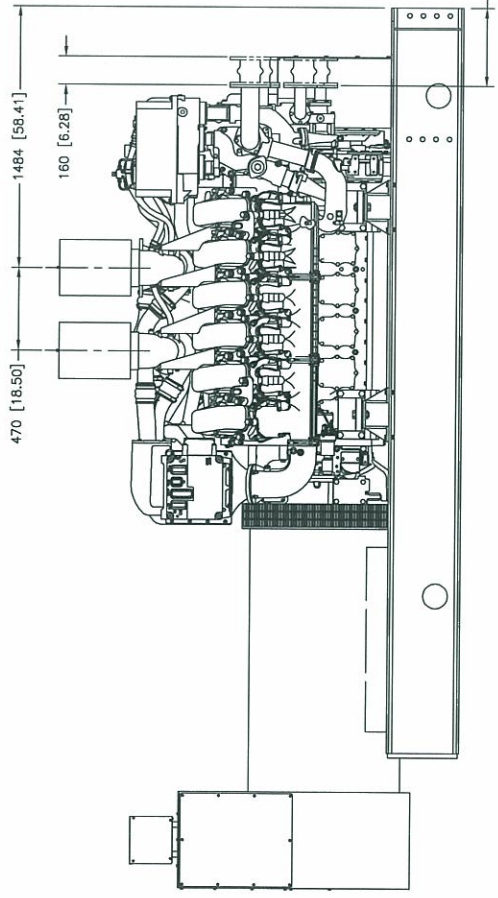
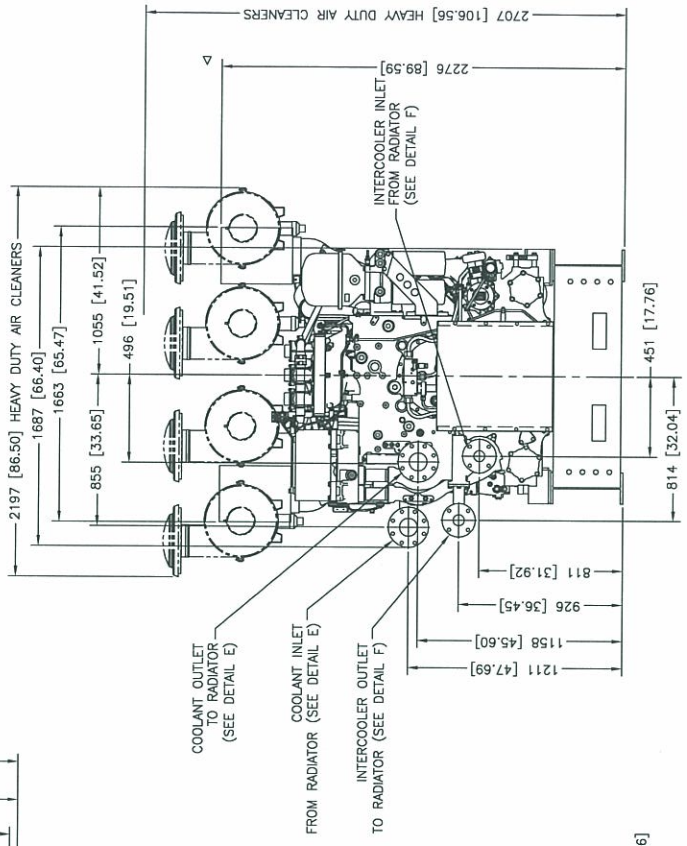
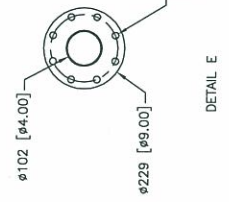
ALL DIMENSIONS IN [] ARE INCH EQUIVALENTS
 DIMENSIONS IN [] ARE INCH EQUIVALENTS

KOHLER CO
 POWER SYSTEMS GROUP
 1250/1500 KW
 60HZ/50C COOLING
 12V 4000 SERIES DDC
 TIER II
 DIMENSION PRINT
 PART NO. ADV7256C.DWG
 SHEET 3-8
 ADV-7256

REV	DATE	DESCRIPTION
D	2-23-07	(A-3) 444 (17.46) MNS 358 (11.51), (C-5) 1484 (58.41) MNS 1409 (55.49) [60203]
CNF		
E	3-18-07	SEE SHEET 3 [60246]
CNF		
F	4-3-07	(D-1) 876 (34.20) MNS #64 [64250] [60245]
DWG		



NOTE:
FOR FUEL INLET, RETURN, CONDUIT
AREAS AND BATTERY RACK LOCATION
SEE SHEETS 1 AND 2



METRIC CAD FILE

PLEASE CONSULT SPECIFICATIONS FOR: (1) TOLERANCES (2) SURFACE FINISH (3) DIMENSIONS (4) MATERIALS (5) FINISHES (6) COATINGS (7) PAINTS (8) SPECIAL REQUIREMENTS (9) DIMENSIONS (10) DIMENSION PRINT

KOHLER CO.
POWER SYSTEMS DIVISION
2600 N. W. 10TH AVENUE
MIAMI, FL 33150 U.S.A.
TELEPHONE: 305-486-1000 FAX: 305-486-1001
WWW.KOHLER.COM

1250/1500 KW
60HZ/40C COOLING
12V 4000 SERIES DDC
TIER II

DATE: 04/23/08
DRAWN: JSA
CHECKED: JSA
APPROVED: JSA

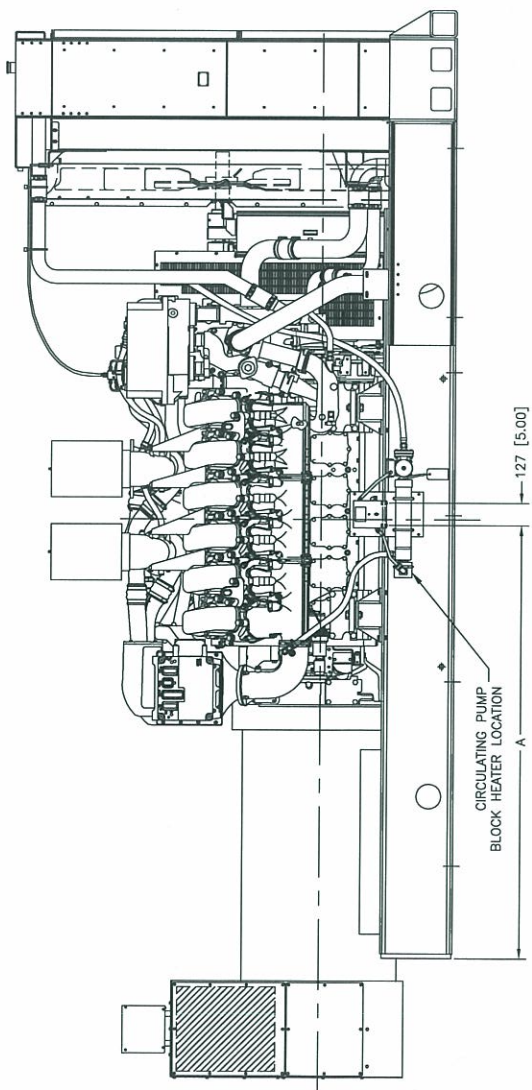
ADV-7256

NOTE: DIMENSIONS IN [] ARE INCH EQUIVALENTS.

2 3 4 5 6 7 8

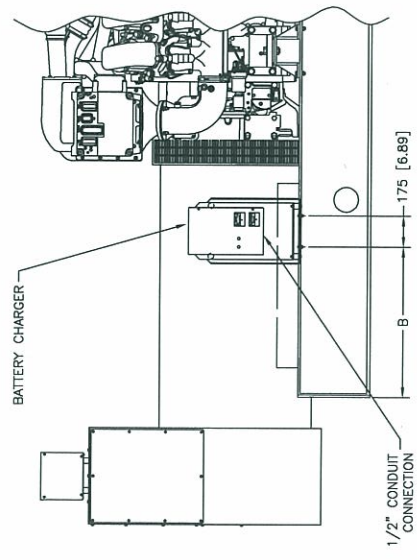
REV	DATE	REVISION
D	2-25-07	SEE SHEETS 1,2,3 & 4 [00003]
E	3-5-07	SEE SHEET 3 [00046]
F	4-2-07	SEE SHEET 4 [00045]

1250/1500 KW	
ALTERNATOR FRAME SIZE	
1250 (7M4048)	7M4052, 7M4174, 7M4176, 7M4288
1500 (7M4050)	7M4368, 7M4370
A	2091 [82.32] 2446 [96.30]
B	546 [21.50] 901 [35.47]



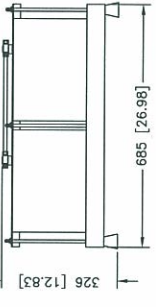
BLOCK HEATER

CIRCULATING PUMP
BLOCK HEATER LOCATION
127 [5.00]

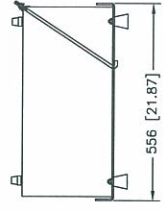


BATTERY CHARGER

1/2" CONDUIT
CONNECTION
175 [6.89]



BATTERY & BATTERY RACK
SCALE: 2X



METRIC CAD FILE

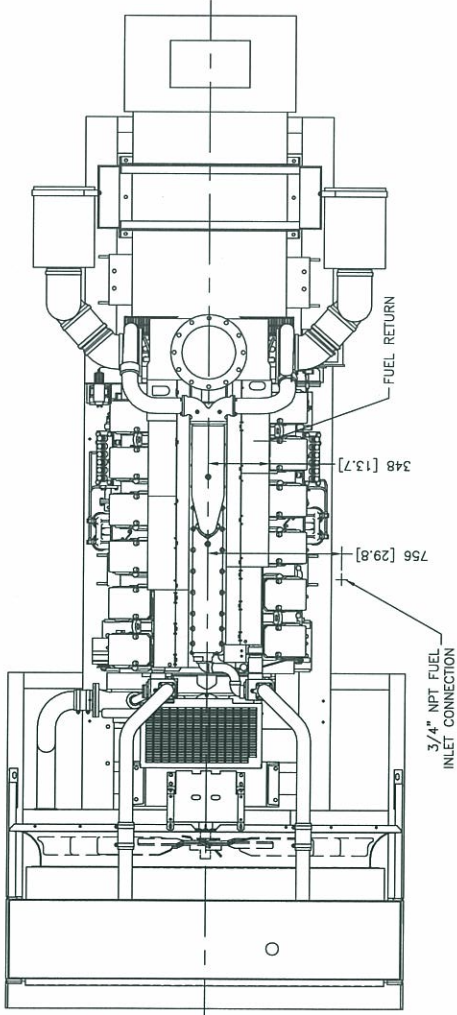
NOTE: DIMENSIONS IN [] ARE INCH EQUIVALENT

KOHLER CO.
 1250/1500 KW
 60HZ/40C & 50C COOLING
 12V 4000 SERIES DDC
 TIER II

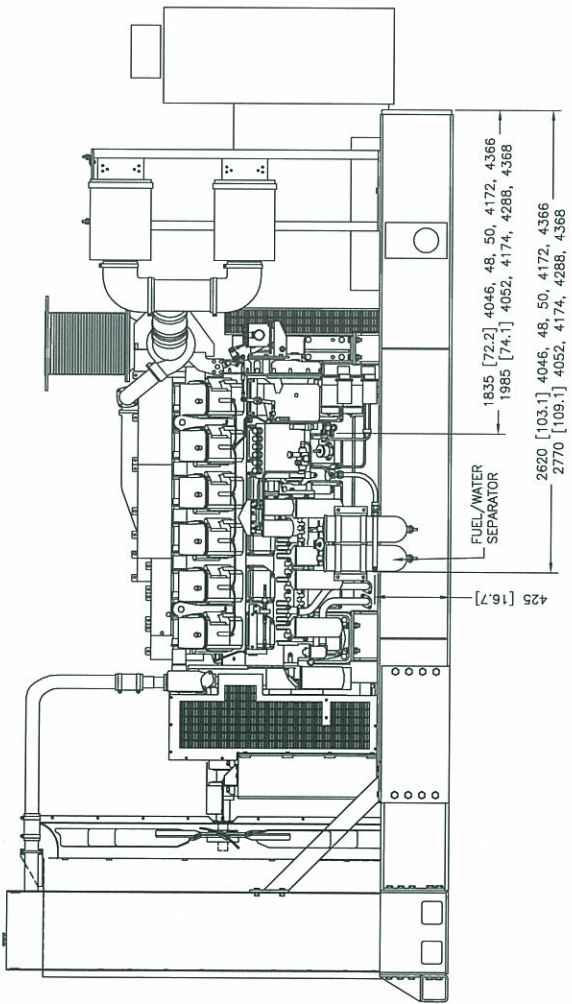
DIMENSION PRINT
 ADV-7256

D C B A

REV	DATE	REVISION
C	08-28-04	SEE SHEETS 1 & 3 OF 6 [72409]
D	10-18-04	SEE SHEETS 2 & 3 OF 6 [23513]
E	2-15-05	SEE SHEET 6 OF 6 [74986]
F	3-3-05	SEE SHEETS 1 AND 4 [74790]
G	1-28-08	(K-1) ACT. 4052 RELOCATED FROM 1885 DIM TO 1835 DIM & DIM 2770 TO 2420 DIM [20910]
SAU		



OPTIONAL FUEL INLET AND RETURN LOCATIONS



FUEL AND WATER SEPARATOR

METRIC CAD FILE

PLEASE CONTACT SUPPLIER FOR DIMENSIONS AND TOLERANCES AND MATERIALS. THE ABOVE IS FOR INFORMATION ONLY. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SPECIFIED.

KOHLER CO.
 POWER GENERATION DIVISION
 1250 REOZM
 MILWAUKEE, WI 53141-0001
 U.S.A.

DATE: 11-2-03
 DRAWN BY: SAU
 CHECKED BY: SAU
 APPROVED BY: SAU

FIGURE NO: ADV-6913

SCALE: 1:1

UNIT: METRIC

PROJ: ADV-6913

REV: 0-0

1 2 3 4 5 6 7 8

D

C

B

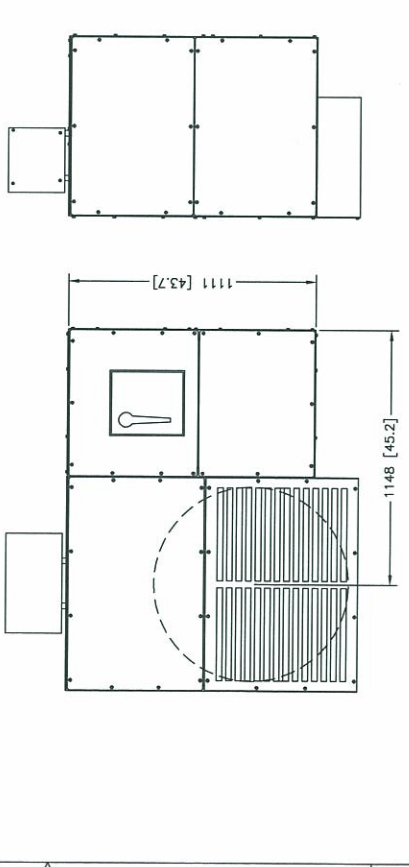
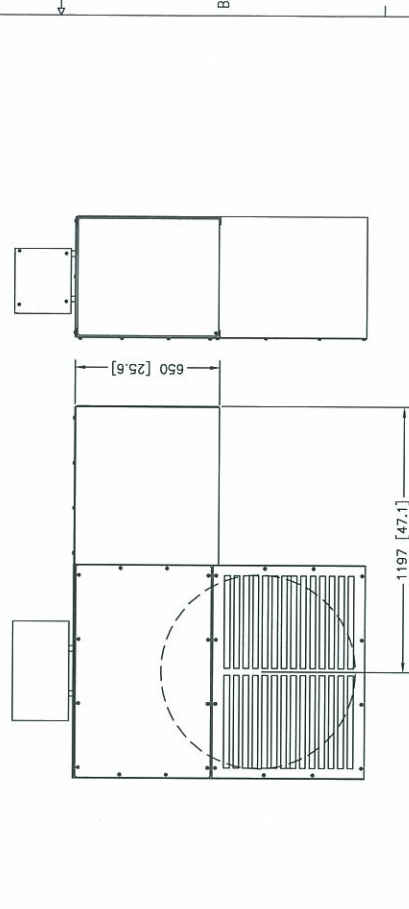
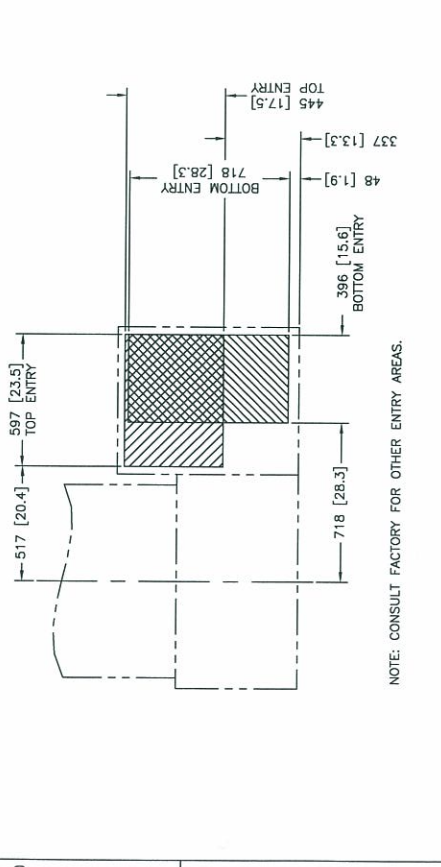
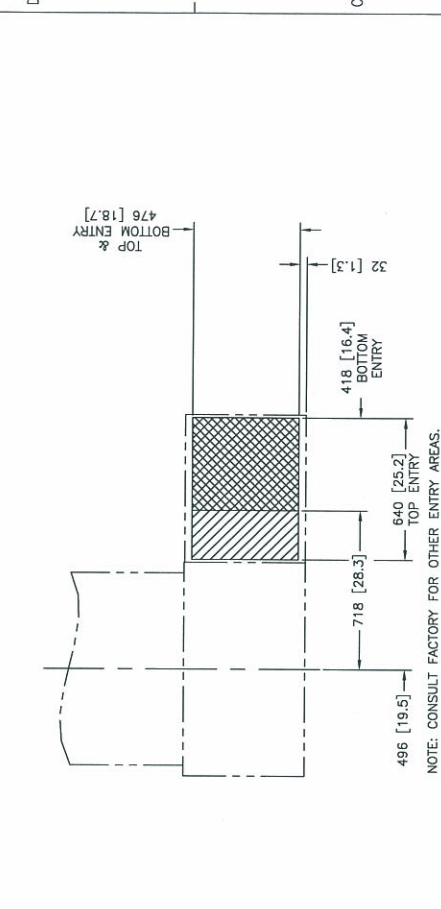
A

1250 REOZM

2

ADV-6913

REV	DATE	REVISION
B	4-22-04	SIZE SHEET 1 [72070]
C	8-28-04	SEE SHEETS 1, 2 & 3 OF 8 [72409]
D	10-18-04	SEE SHEETS 2 & 3 OF 8 [73113]
E	2-15-05	[4-1] UL SQUARE D 3000 AMP LOAD CONN. ADDED TO CHART
F	8-1-05	[4-1] 1600-3000A BREAKER KITS WEISE 1400-2500A [74595]
G	1-28-06	SEE SHEETS 1 AND 2 [74810]



1600-3000A BREAKER KITS

1600-3000A BREAKER KITS

CIRCUIT BREAKER	TRIP AMPS	MECHANICAL CONNECTOR (INCLUDED FOR A, B & C PHASE)	QTY PER PHASE
UL SQUARE D	1600-2000	(1) #4-600MCM OR (2) 1/0-250MCM	6
UL SQUARE D	2500	(1) 1/0-750MCM OR (2) 1/0-300MCM	6
UL SQUARE D	3000	(1) #4-600MCM OR (2) 1/0-250MCM	6
IEC MERLIN GERIN	1600-2000	(1) #2-600MCM	6
IEC MERLIN GERIN	2500	(1) #2-600MCM	6

NEUTRALS FOR ABOVE UNITS SIZED FOR MAX (8) 750MCM 2-HOLE COMPRESSION LUGS (NOT INCLUDED)
SEE SHEET 1 FOR TYPICAL LUG HOLE SPACING.

CIRCUIT BREAKER KIT LOAD CONNECTIONS:

1600-3000A BREAKER KITS

1250 RE02M

EXTENSION BOX KIT

NOTE: DIMENSIONS IN [] ARE IN ENGLISH EQUIVALENTS.

METRIC CAD FILE

1250 RE02M

ADV-6913

1600-3000A BREAKER KITS

1250 RE02M

EXTENSION BOX KIT

NOTE: DIMENSIONS IN [] ARE IN ENGLISH EQUIVALENTS.

METRIC CAD FILE

1250 RE02M

ADV-6913

1600-3000A BREAKER KITS

1250 RE02M

EXTENSION BOX KIT

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METRIC CAD FILE

1250 RE02M

ADV-6913

1600-3000A BREAKER KITS

1250 RE02M

EXTENSION BOX KIT

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METRIC CAD FILE

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ADV-6913

1600-3000A BREAKER KITS

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EXTENSION BOX KIT

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EXTENSION BOX KIT

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ADV-6913

1600-3000A BREAKER KITS

1250 RE02M

EXTENSION BOX KIT

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1250 RE02M

EXTENSION BOX KIT

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ADV-6913

1600-3000A BREAKER KITS

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EXTENSION BOX KIT

NOTE: DIMENSIONS IN [] ARE IN ENGLISH EQUIVALENTS.

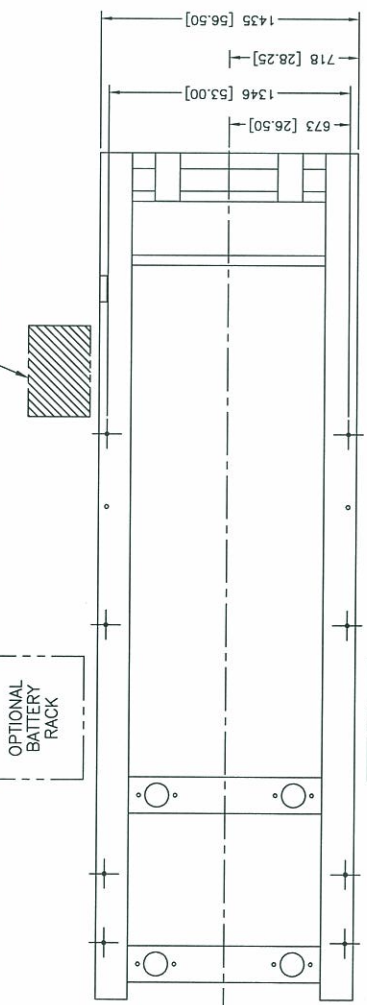
METRIC CAD FILE

1250 RE02M

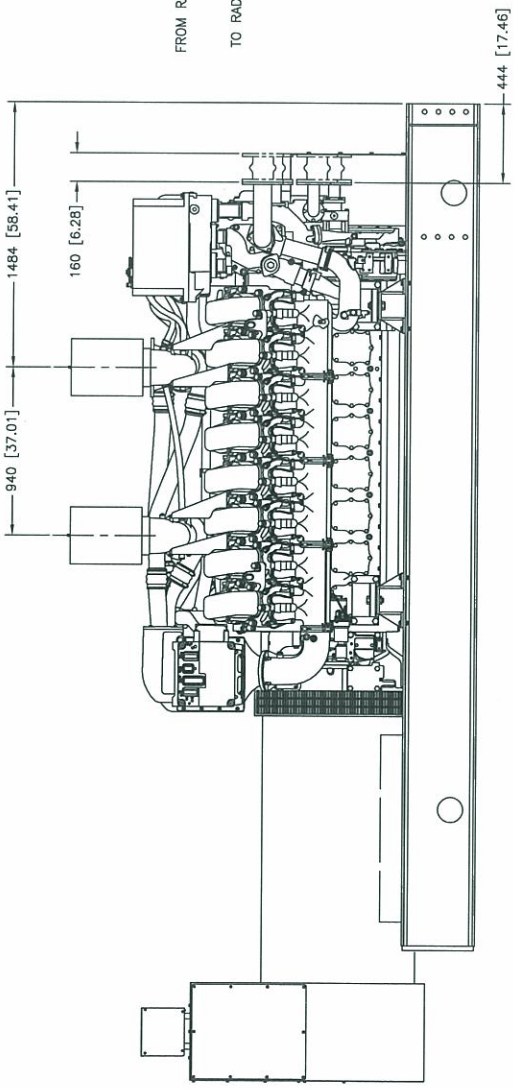
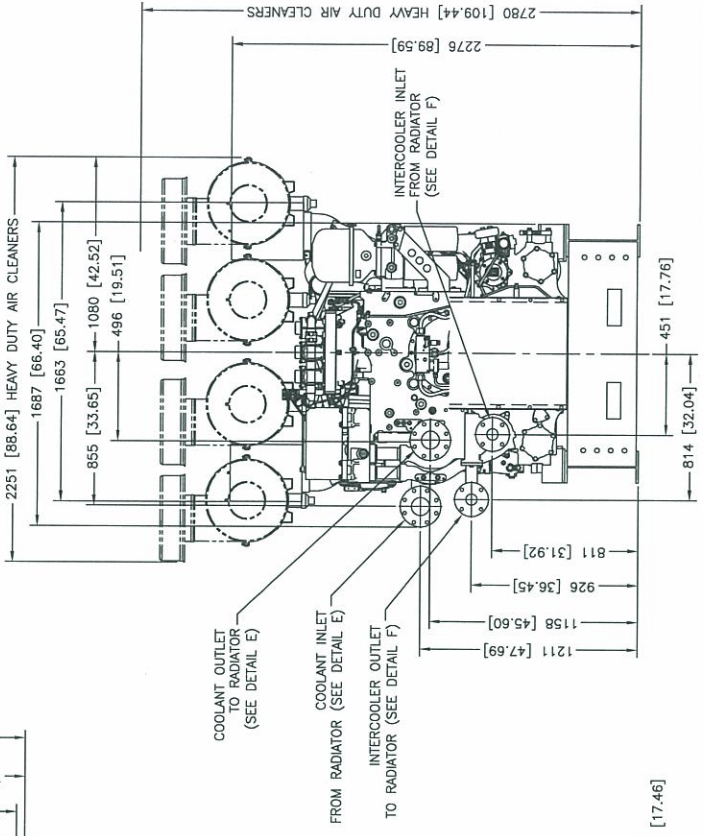
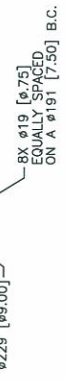
ADV-6913

REV	DATE	DESCRIPTION
E	2-28-07	(A-3) 444 (12.43) WAS 356 (11.51), (C-3) 1066 (32.41) WAS 1460 (35.40) [60003]
F	3-7-07	SEE SHEETS 2 & 3 [00046]
G	4-3-07	(D-1) 976 (33.20) WAS #64 [6250] [00045]
DWG		

SUGGESTED FUEL SUPPLY/
RETURN STUB-UP AREA



NOTE:
FOR FUEL INLET, RETURN, CONDUIT
AREAS AND BATTERY RACK LOCATION
SEE SHEETS 1 AND 2



METRIC CAD FILE

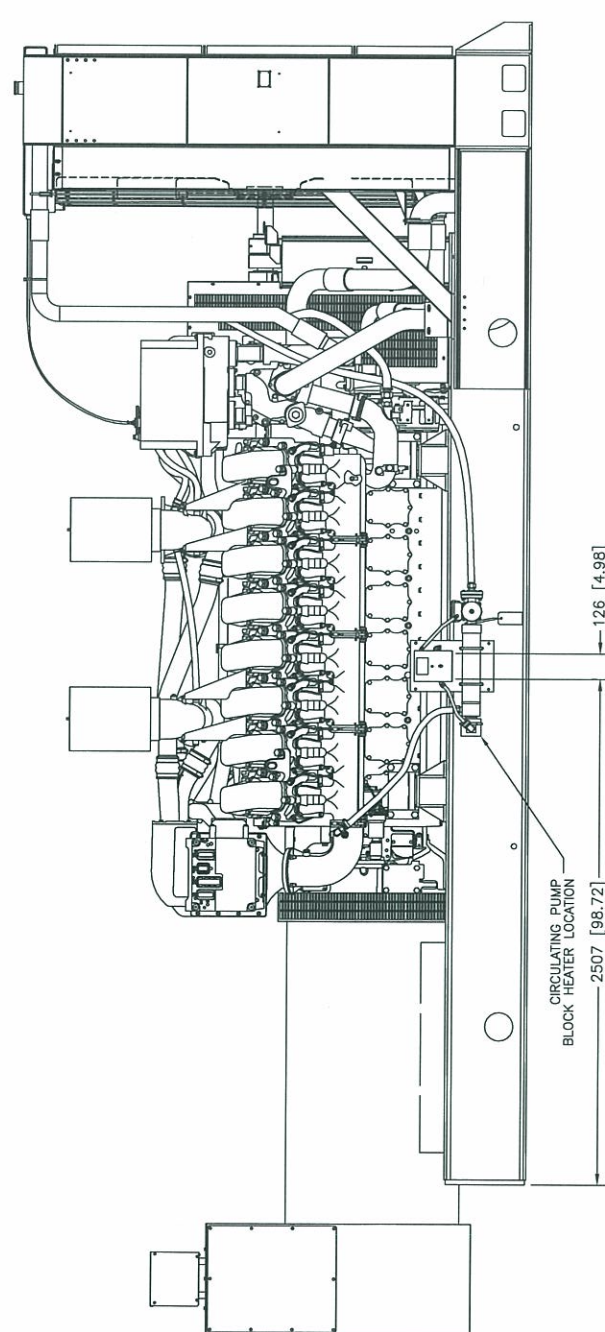
PLEASE CONSULT SPECIFIC TO:	
1) DIMENSIONS AND TOLERANCES	2) SURFACE FINISH
3) DIMENSIONS AND TOLERANCES	4) DIMENSIONS AND TOLERANCES
5) DIMENSIONS AND TOLERANCES	6) DIMENSIONS AND TOLERANCES
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97) DIMENSIONS AND TOLERANCES	98) DIMENSIONS AND TOLERANCES
99) DIMENSIONS AND TOLERANCES	100) DIMENSIONS AND TOLERANCES

2000 KW
60HZ/40C COOLING
16V 4000 SERIES DDC
TIER II

NOTE: DIMENSIONS IN [] ARE INCH EQUIVALENTS.

35,000 H

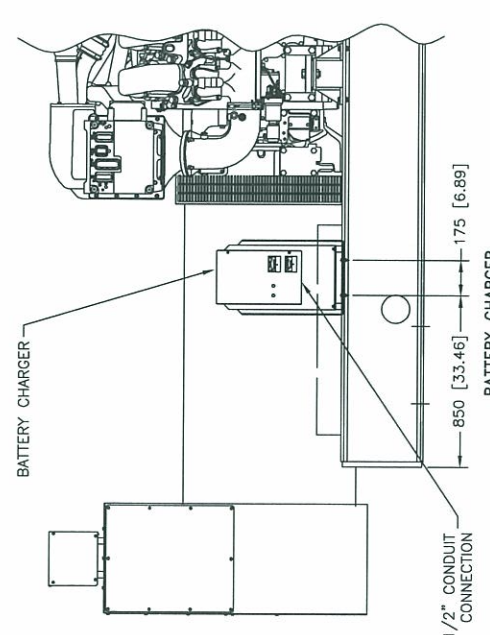
REV.	DATE	REVISION
E	12-24-07	BASE UPDATES, SEE SHEETS 1, 2, 3 & 4 (60603)
F	3-7-07	SEE SHEETS 2 & 3 (60646)
G	4-3-07	SEE SHEET 4 (60646)
DWG		



CIRCULATING PUMP
BLOCK HEATER LOCATION
2507 [98.72]

126 [4.98]

BLOCK HEATER



BATTERY CHARGER

1/2" CONDUIT
CONNECTION

850 [33.46]

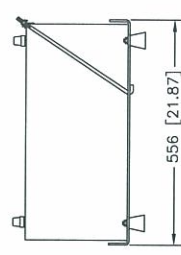
175 [6.89]

BATTERY CHARGER

326 [12.83]

685 [26.98]

BATTERY & BATTERY RACK
SCALE: 2X



556 [21.87]

METRIC CAD FILE

NOTE: DIMENSIONS IN [] ARE INCH EQUIV.

PLEASE OBSERVE SPECIFIED -
 1) TOLERANCES UNLESS OTHERWISE SPECIFIED
 2) DIMENSIONS IN MILLIMETERS
 3) FINISHES UNLESS OTHERWISE SPECIFIED
 4) SURFACE FINISH UNLESS OTHERWISE SPECIFIED
 5) ALL DIMENSIONS TO BE TAKEN TO CENTER UNLESS OTHERWISE SPECIFIED
 6) DIMENSIONS TO BE TAKEN TO SURFACE UNLESS OTHERWISE SPECIFIED
 7) DIMENSIONS TO BE TAKEN TO CENTER UNLESS OTHERWISE SPECIFIED
 8) DIMENSIONS TO BE TAKEN TO SURFACE UNLESS OTHERWISE SPECIFIED

KOHLER CO.
 POWER SYSTEMS DIVISION
 1000 N. MILWAUKEE AVENUE
 MILWAUKEE, WISCONSIN 53217 U.S.A.
 TEL: 414-761-1000 FAX: 414-761-1001
 WWW.KOHLER.COM

DATE: 12-24-07
 DRAWN BY: JCS
 CHECKED BY: JCS
 APPROVED BY: JCS
 TITLE: DIMENSION PRINT
 PART NO.: ADV-7258
 REV: 5-5

2000KW
 60HZ/40C & 50C
 18V 4000 SERIES D1C
 TIER II

EMERGENCY STANDBY GENERATOR FEASIBILITY STUDY COMMENTS

Executive Summary

- Study addresses “feasibility of installing one or several standby generators to serve the total power loads of various buildings.” There are a numbers of issues with this premise:
 - Financial Issue – How is this large all encompassing project going to be funded?
 - The original idea was to consolidate funds from a number of existing projects (Boyce / Webber, Batchelor, Statistics and Computing) into a larger generator. This is apparently more or less addressed in Option “A” a single generator for \$2,000,000. Even this has temporal issues since the projects have a funding time line.
 - Although addressing the overall standby / emergency power issue on a Campus level is a good approach, there are no apparent funds available to address this need. Options “B” and “C” for \$7,500,000 and \$8,200,000 respectively have no apparent funding source.
 - Practical Issue – Does the Campus really need to serve the total power loads of various buildings?
 - If commercial power is out for a prolonged time, the faculty, students and staff will not have power at home and will probably not be concerned with whether capital buildings are in operation or not.
 - The magnitude of the project is exponentially expanded if the project is trying to address total power loads versus emergency power loads.

Purpose

- “The purpose of this feasibility study is to determine the size, quantity and location of the standby generators that will be required to serve the total electrical loads of various campus buildings in the event of loss of normal power service to the campus.” This seems like an extreme solution both financially and practically!
 - Unless the student housing is also addressed, will the students be ready, willing and able to take advantage of these buildings being operational?
 - Will the faculty and staff, who are without power at home, be ready, willing and able to support the buildings?

An emergency power only approach would seem to be more logical both financially and practically.

Description of the Various Emergency Power Systems

- Based on Article 700, 701 and 702 seem to also point the reader into taking the “Emergency Generator Power” approach rather than the total power approach.

Existing Emergency System Description

- “Several of the buildings covered under this study have an operable Emergency System as defined in Article 700 of the CEC.” Based on code, it would seem that

Bill Johnson
Tuesday, June 12, 2007

EMERGENCY STANDBY GENERATOR FEASIBILITY STUDY COMMENTS

Boyce Hall, Webber Hall, Batchelor Hall, and Statistics and Computing already meet legal requirements.

What I understood was the objective was to keep the existing systems (i.e. on the roof of Boyce keep the generator in support of the Vivarium) and consolidate their overall emergency power into a centralized, more efficient, easier to maintain, better ecologically generator.

Bill Johnson
Tuesday, June 12, 2007

Item Description	Quantity	Unit	Rate	Total
Including main switchboard, metering, surge suppression, motor control, distribution boards, transformers, feeder conduit and cable - replace main systems - including removal of PCBs	2,000	kVA	175.00	350,000
12 KV dual power feeders				N/A
Provide selector HV switch, 12 KV				N/A
Emergency power	1,500	KW	550.00	825,000
Provide emergency power generator, transfer switches, associated distribution equipment and feeders (20% spare capacity)				
Machine and equipment power	1	LS	100,000.00	100,000
Connections and switches, including conduit and cable	1	LS	25,000.00	25,000
Mechanical equipment - allow (including power factor correctors)				
Miscellaneous connections, < 100 A				
User convenience power	756	EA	75.50	57,078
Panelboard breakers, 120 V	1,540	LF	22.50	34,650
Feeder conduit and cable				
Lighting				
Panelboard breakers, 277 V	420	EA	95.00	39,900
Feeder conduit and cable	1,000	LF	25.00	25,000
Fixtures/switching, including conduit and cable				
Revise corridor egress lighting and replace LED type exit fixtures	120	EA	500.00	60,000
Exterior egress lighting	1	LS	25,000.00	25,000
T-24 requirement re interior lighting, including re lamp and motion sensors	126,374	SF	0.75	94,781
Alarm and security				
Fire alarm systems - upgrades (including "loss of power")	126,374	SF	1.00	126,374
Security				
Upgrade head-end equipment	1	LS	35,000.00	35,000
Access control only (card-key)	1	LS	50,000.00	50,000

Item Description	Quantity	Unit	Rate	Total
Telephone and communications				
Interconnect new communication rooms to the MPOE (10 x 11), (4" conduit and copper / fiber including "passive" equipment, rough-in, terminations and 6th floor extension	2	EA	25,000.00	50,000
Vivarium				
Emergency power				
Vivarium emergency power, including generator, transfer switch, distribution equipment and feeders				Existing
Machine and equipment power				
Connections and switches, including conduit and cable				
Mechanical connections, < 100 A	1	LS	25,000.00	25,000
User convenience power				
User convenience power outlets/wiremold - including conduit and cable				
Lighting				
Egress/lobby lighting only	1	LS	25,000.00	25,000
Telephone and communications				
Telephone/data outlets, including conduit and cable				Existing
Alarm and security				
Fire alarm systems - upgrades re TI				Existing
Security				Existing
Access control only (card-key)				Existing
Automatic wet sprinkler system - reconfigure existing				Existing
				1,947,783

UNIVERSITY RIVERSIDE AT CALIFORNIA
Emergency Standby Generator Feasibility Study
For Various Buildings
UCR #958993-2
JMD #06-0502

Option "C"

Description of Work	Units	Quantity	Materials	Labor	Extension
Mobilization	LOT	1	\$ -	\$ 24,000.00	\$ 24,000.00
2000 KW diesel generator					
Standard weatherproof Protective enclosure	LOT	3	\$ 595,915.00	\$ 17,877.45	\$ 1,841,377.35
Critical silencer					
12,000 gal above concrete fuel tank	LOT	1	\$ 103,650.00	\$ 6,229.00	\$ 109,879.00
Diesel fuel piping	LOT	1	\$ 6,000.00	\$ 8,000.00	\$ 14,000.00
15KV Parallelling Switchgear & Auto Transfer Switch	LOT	1	\$ 575,000.00	\$ 24,250.00	\$ 599,250.00
5" PVC Conduit	LF	1250	\$ 2.35	\$ 2.58	\$ 6,162.50
#250 Kcmil, 15KV	LF	2400	\$ 9.70	\$ 2.10	\$ 28,320.00
#500 Kcmil, 15KV	LF	3000	\$ 15.10	\$ 2.80	\$ 53,700.00
#1/0 Conductor	LF	3600	\$ 2.30	\$ 1.02	\$ 11,952.00
#350 Kcmil 600V	LF	2000	\$ 6.90	\$ 1.87	\$ 17,540.00
#2 600V	LF	3000	\$ 1.50	\$ 0.75	\$ 6,750.00
#4/0 600V	LF	500	\$ 4.35	\$ 1.53	\$ 2,940.00
#6 600V	LF	1000	\$ 0.68	\$ 0.52	\$ 1,200.00
#8 600V	LF	300	\$ 0.45	\$ 0.42	\$ 261.00
#1 600V	LF	500	\$ 2.00	\$ 0.84	\$ 1,420.00
3' x 5' x 3' intercept pull box	EA	2	\$ 695.00	\$ 600.00	\$ 2,590.00
2' x 3' x 3' intercept pull box	EA	1	\$ 268.00	\$ 408.50	\$ 676.50
New 15KV Load Interruptor Switch	EA	1	\$ 20,000.00	\$ 2,575.00	\$ 22,575.00
600 Amp Main Circuit Breaker for CLHV	EA	1	\$ 4,150.00	\$ 210.00	\$ 4,360.00
3" Rigid Conduit	EA	300	\$ 18.85	\$ 13.45	\$ 9,690.00
3" PVC Conduit	LF	200	\$ 1.03	\$ 1.68	\$ 542.00
4" PVC Conduit	LF	300	\$ 1.48	\$ 2.10	\$ 1,074.00
2" PVC Conduit	LF	900	\$ 0.75	\$ 1.40	\$ 1,935.00
600 Amp W.P. Distriution Board	EA	1	\$ 4,675.00	\$ 2,100.00	\$ 6,775.00
225 Amp Circuit Breaker	EA	2	\$ 535.00	\$ 105.00	\$ 1,280.00
100 Amp Circuit Breaker	EA	8	\$ 535.00	\$ 84.00	\$ 4,952.00
Demolition of Substation "APEP" and A.C, Paving	LOT	1	\$ -	\$ 20,000.00	\$ 20,000.00
Structural Generator and Switchgear Pad	LOT	1	\$ 190,000.00	\$ 60,000.00	\$ 250,000.00
Temporary Generator Rental	LOT	4	\$ -	\$ 4,600.00	\$ 18,400.00
Connect Batchelor Subs for Operation @12KV	LOT	2	\$ -	\$ 4,000.00	\$ 8,000.00
High Voltage fuses for Batchelor Hall Subs	EA	6	\$ 1,500.00	\$ 160.00	\$ 9,960.00
High Voltage demolition of switch and conductors	LOT	1	\$ -	\$ 12,000.00	\$ 12,000.00
High Voltage termination	EA	33	\$ 205.00	\$ 73.00	\$ 9,174.00
High Connectors, Reconnectable Type	EA	9	\$ 250.00	\$ 260.00	\$ 4,590.00
Concrete encasement	LOT	1	\$ -	\$ 6,000.00	\$ 6,000.00
Trench & Backfill	LF	3,000	\$ -	\$ 12.00	\$ 36,000.00
A.C. Patch	LF	800	\$ 2.50	\$ 3.50	\$ 4,800.00
Manhole/wall conduit penetration	EA	22		\$ 300.00	\$ 6,600.00
1000 KVA Pad Mount Transformer	EA	2	\$ 26,100.00	\$ 4,265.00	\$ 60,730.00
1500 KVA Pad Mount Transformer	EA	1	\$ 33,000.00	\$ 49,150.00	\$ 82,150.00
5" PVC Conduit	LF	7,200	\$ 2.35	\$ 2.58	\$ 35,496.00
500Kcmil, 15KV	LF	30,000	\$ 15.10	\$ 2.80	\$ 537,000.00
250 Kcmil, 15KV	LF	65,000	\$ 9.70	\$ 2.10	\$ 767,000.00
#1/0 Conductor	LF	10,200	\$ 6.90	\$ 1.87	\$ 89,454.00
Load Control Conductors	LF	22,800	\$ 0.15	\$ 0.34	\$ 11,172.00
Shunt Trip Operators	EA	5	\$ 6,000.00	\$ 2,000.00	\$ 40,000.00
Underground Vault	EA	1	\$ 4,800.00	\$ 3,000.00	\$ 7,800.00
15 KV Terminations	EA	42	\$ 205.00	\$ 73.00	\$ 11,676.00
High Connectors, Reconnectable Type	EA	24	\$ 250.00	\$ 260.00	\$ 12,240.00
			\$ -	\$ -	\$ -

UNIVERSITY RIVERSIDE AT CALIFORNIA
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UCR #958993-2
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Option "C"

Description of Work	Units	Quantity	Materials	Labor	Extension
			\$ -	\$ -	\$ -
			\$ -	\$ -	\$ -
			\$ -	\$ -	\$ -
			\$ -	\$ -	\$ -
			\$ -	\$ -	\$ -
			\$ -	\$ -	\$ -
Miscellaneous fittings	LOT	1	\$ 76,690.00	\$ -	\$ 76,690.00
Subtotal					\$ 4,892,133
Sales Tax 8.5%					\$ 358,091
Subtotal					\$ 5,250,224
25% Contingency					\$ 1,312,556
Subtotal					\$ 6,562,780
20% Overhead and Profit					\$ 1,312,556
Subtotal					\$ 7,875,336
Generator System for Glasshouse/Headhouse 1-3					\$ 138,000
Generator System for Environment Health & Safety					\$ 108,000
Subtotal					\$ 8,121,336
CALL IT					\$8,200,000.00

	DPP	Generator Only	Other Funding	Total
Building				
2,000kw Generator				
Boyce/Webber	\$1,370,974	\$848,684		\$848,684
Batchelor Hall	\$625,093	\$278,000		\$278,000
CNAS				\$0
C&C			\$375,000	\$375,000
Sub Total:	\$399,213	\$225,337		\$1,501,684
Soft Costs:	\$2,395,280			\$225,337
Total Available Funds:				\$1,727,021
Shortfall				

175

4.12

300K

1.7M
350
2.050

Every Source

Energy Credits

625
625

1.76

1/1

**EMERGENCY STANDBY
GENERATOR FEASIBILITY STUDY
For Various Buildings
Project No. 958993-2**

FOR
UNIVERSITY OF CALIFORNIA
RIVERSIDE, CALIFORNIA



PREPARED FOR:
UNIVERSITY OF CALIFORNIA
Office of Design and Construction
University of California Riverside
3615A Canyon Crest Drive
Riverside, CA 92507

BY:
JMD Engineering, Inc.
1543 West Garvey Ave. North, Suite 210
West Covina, CA 91790

EMERGENCY STANDBY GENERATOR FEASIBILITY STUDY COMMENTS

Executive Summary

- Study addresses “feasibility of installing one or several standby generators to serve the total power loads of various buildings.” There are a numbers of issues with this premise:
 - Financial Issue – How is this large all encompassing project going to be funded?
 - The original idea was to consolidate funds from a number of existing projects (Boyce / Webber, Batchelor, Statistics and Computing) into a larger generator. This is apparently more or less addressed in Option “A” a single generator for \$2,000,000. Even this has temporal issues since the projects have a funding time line.
 - Although addressing the overall standby / emergency power issue on a Campus level is a good approach, there are no apparent funds available to address this need. Options “B” and “C” for \$7,500,000 and \$8,200,000 respectively have no apparent funding source.
 - Practical Issue – Does the Campus really need to serve the total power loads of various buildings?
 - If commercial power is out for a prolonged time, the faculty, students and staff will not have power at home and will probably not be concerned with whether capital buildings are in operation or not.
 - The magnitude of the project is exponentially expanded if the project is trying to address total power loads versus emergency power loads.

Purpose

- “The purpose of this feasibility study is to determine the size, quantity and location of the standby generators that will be required to serve the total electrical loads of various campus buildings in the event of loss of normal power service to the campus.” This seems like an extreme solution both financially and practically!
 - Unless the student housing is also addressed, will the students be ready, willing and able to take advantage of these buildings being operational?
 - Will the faculty and staff, who are without power at home, be ready, willing and able to support the buildings?

An emergency power only approach would seem to be more logical both financially and practically.

Description of the Various Emergency Power Systems

- Based on Article 700, 701 and 702 seem to also point the reader into taking the “Emergency Generator Power” approach rather than the total power approach.

Existing Emergency System Description

- “Several of the buildings covered under this study have an operable Emergency System as defined in Article 700 of the CEC.” Based on code, it would seem that

EMERGENCY STANDBY GENERATOR FEASIBILITY STUDY
COMMENTS

Boyce Hall, Webber Hall, Batchelor Hall, and Statistics and Computing already meet legal requirements.

What I understood was the objective was to keep the existing systems (i.e. on the roof of Boyce keep the generator in support of the Vivarium) and consolidate their overall emergency power into a centralized, more efficient, easier to maintain, better ecologically generator.

Bill Johnson
Tuesday, June 12, 2007

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EXECUTIVE SUMMARY

At the request of the University, this study examines the feasibility of installing one or several standby generators to serve the total power loads of various buildings. The buildings included in this study were selected by the University based on the priority rating ranging from one thru ten with one having the highest priority and ten having the lowest priority. The buildings and priority ratings included in this study are as follows:

<u>Building Name</u>	<u>Priority Rating</u>
Computer-Statistics	1
Boyce Hall	1
Webber Hall	1
Batchelor Hall	1
Spieth Hall and Life Science	2
Fawcett Lab	3
Green Houses 8 thru 21	4
Air Pollution Engineering Pad and Green House 6 & 7	5
Environmental Health and Safety	6
Physics	7
Science Laboratories (Addition)	8
Geology Building	9

This study presents three Options for installing standby generators to serve the total power loads of the various buildings. A brief description of each Option is as follows:

Option "A" provides a single generator located on campus at the Air Pollution Engineering Pad Site to serve the total power loads of the buildings in Prior group "1". The estimated construction cost for Option "A" is \$2,000,000.

Option "B" provides three generators located off campus at the Main UCR Utility Substation Site to serve the total power loads of the buildings in the priority group with exception of Glasshouse/Headhouse 1-3 and Environmental Health and Safety. These two buildings will have their own independent generator to serve their total power loads. Under this option, existing 12 KV circuit 4A will be used to provide standby power to the selected buildings. The estimated construction cost for Option "B" is \$7,500,000.

Option "C" is the same as Option "B" except that a new dual 12KV emergency feeder will be provided to serve the selected buildings. The estimated construction cost for Option "C" is \$8,200,000.

Summary:

We feel that the all Options presented in this study are reliable, economical and aesthetically pleasing to the University environment with minimal disruption to the campus daily activities. Our recommendations would be Option "A" for the buildings in priority group "1" or Option "C" all buildings in the priority group if funding is available. There are no known issues that would be unfavorable to either Option other than those listed under the detailed discussion for each Option.

PURPOSE

The purpose of this feasibility study is to determine the size, quantity and location of the standby generators that will be required to serve the total electrical loads of various buildings in the event of loss of normal utility power service to the campus. The buildings that are to be served by standby generators were selected by the University based on a priority rating from one to ten with one having the highest priority for emergency power. Three Options are presented in this study with a detailed discussion on the advantages and disadvantages of each Option. Each Option includes a statement of probable construction cost. The location, size and quantity of standby generators required to serve the total electrical loads of each building are discussed under each Option with a brief narrative on the proposed generator(s) and their impact on the existing power system for the building and the campus power distribution systems. This study examines the possibility of locating the new generators on campus and off campus at a remote site. Drawings in 11 x17 format are provided in the Appendix for each Option. The drawings illustrate the location of each generator and switchgear site with associated site work and modifications that will be required to the existing electrical distribution systems for each Option. Full size color drawings are provided as a separate attachment to this study.

Two standby generator Options are recommended in the Executive Summary as being the most reliable and economically feasible for the University.

NORMAL POWER DISTRIBUTION SYSTEM DESCRIPTION

12KV POWER DISTRIBUTION SYSTEM:

The main UCR electrical substation is located on the west side of the 60 Freeway remote from the campus. The main substation has two serving utility company 69KV overhead transmission lines each terminating on a pole structure at the substation. The two incoming overhead transmission lines originate from separate and remote utility company substations. Service is taken from the utility company at 12 KV from two 69/12 KV transformers, each feeding one half of the UCR main switchgear designated "A" & "B". Metering of the two services are combined and has a total maximum demand of 16 megawatts as recorded by the utility company in July of 2005. A tie circuit breaker in the utility switchgear line allows manual operation so that the main UCR substation can be fed from either 69KV utility transmission line. This is a fortunate and unique feature for UCR in that it allows the utility company to close the tie circuit breaker to energize either side of the main substations should one of the transmission lines or utility transformer fail. This 12KV distribution system serving the UCR campus is known as a radial dual primary selective system.

Each of the two distribution "A" & "B" sections of the main switchgear provides (4) four 12KV three phase distribution circuits designated as 1A, 2A, 3A and 1B, 2B, 4A and the newly installed 12KV distribution circuit 4A which serves the new Satellite Utility Plant.

The intent of the dual radial primary selective system serving the campus is to have circuits 1A & 1B (or 2A & 2B, 3A & 3B etc.) terminate at each building or load in a primary selector switch, allowing the buildings' loads to be placed on either circuit. Thus the total campus load could be balanced on the two systems if so desired. It should also be noted that should one of the 12KV circuits fail or intentionally be de-energized, the buildings' loads could be switched to the other circuit. It should also be noted that this primary selector switch may not be installed for all buildings.

A portion of the campus is served at 4160 volts from two primary transformers in the central plant via the 12 KV power distribution systems. Approximately 75% of the campus loads are served from the main 12KV utility company substation.

5KV POWER DISTRIBUTION SYSTEM

The original UCR electrical substation is located on the west side of the 60 Freeway remote from the campus adjacent to the 12KV substation. This substation is served from the same 69KV overhead transmission lines as the main UCR 12KV electrical substation. Service is taken from the utility company at 5 KV from two 69/5 KV transformers, each feeding two 5KV switchgear designated "1" & "2". These two 5KV utility company services served approximately 25% of the campus building loads and have a maximum demand of 5 megawatts as recorded by the utility company in July of 2005. It is the intent that this utility service be moved and its associated loads be served from the 12KV service.

DESCRIPTION OF THE VARIOUS EMERGENCY POWER SYSTEMS

The terms "Emergency Power", "Emergency Generator Power" and "Emergency Standby Generator Power" have been used interchangeably to describe the need or requirement for emergency power. Before discussing the Options that are presented in this "Emergency Standby Generator Feasibility Study" we must first define Emergency Systems as they are defined in the 2004 California Electrical Code (CEC). Basically the code defines three types of Emergency Systems that under apply to the University and this study. The following emergency system descriptions are quotes from the CEC:

ARTICLE 700 -- Emergency Systems

"Emergency systems are those systems legally required and classed as emergency by municipal, state, federal, or other codes, or by any governmental agency having jurisdiction. These systems are intended to automatically supply illumination or power, or both, to designated areas and equipment in the event of failure of the normal supply or in the event of accident to elements of a system intended to supply, distribute, and control power and illumination essential for safety to human life.

Emergency systems are generally installed in places of assembly where artificial illumination is required for safe exiting and for panic control in buildings subject to occupancy by large numbers of persons, such as hotels, theaters, sports arenas, health care facilities, and similar institutions. Emergency systems may also provide power for such functions as ventilation where essential to maintain life, fire detection and alarm systems, elevators, fire pumps, public safety communications systems, industrial processes where current interruption would produce serious life safety or health hazards, and similar functions."

ARTICLE 701 -- Legally Required Standby Systems

"Legally required standby systems are those systems required and so classed as legally required standby by municipal, state, federal, or other codes or by any governmental agency having jurisdiction. These systems are intended to automatically supply power to selected loads (other than those classed as emergency systems) in the event of failure of the normal source.

Legally required standby systems are typically installed to serve loads, such as heating and refrigeration systems, communications systems, ventilation and smoke removal systems, sewerage disposal, lighting systems, and industrial processes, that, when stopped during any interruption of the normal electrical supply, could create hazards or hamper rescue or fire-fighting operations."

ARTICLE 702 -- Optional Standby Systems

"Optional standby systems are intended to protect public or private facilities or property where life safety does not depend on the performance of the system.

Optional standby systems are intended to supply on-site generated power to selected loads either automatically or manually.

Optional standby systems are typically installed to provide an alternate source of electric power for such facilities as industrial and commercial buildings, farms, and residences, and to serve loads such as heating and refrigeration systems, data processing and communications systems, and industrial processes that, when stopped during any power outage, could cause discomfort, serious interruption of the process, damage to the product or process, or the like."

The emergency standby generator system proposed under this study fall under Article 702 "Optional standby systems" as defined in the CEC.

EXISTING EMERGENCY SYSTEM DESCRIPTION

Several of the buildings covered under this study have an operable Emergency System as defined in Article 700 of the CEC. These emergency systems will be retained as part of the Code requirement and will not be modified. The buildings with a Code required Emergency System are as follows:

- Computer-Statistics
- Boyce Hall
- Webber Hall
- Batchelor Hall
- Physics
- Science Laboratories (Addition)
- Geology Building

The Environmental Health and Safety has a Legally Required Standby System which will be replaced under this study with a larger generator system capable of serving the entire power loads of the building.

EMERGENCY STANDBY GENERATOR SYSTEM OPTIONS:

The following detailed discussions describes the emergency generator, generator switchgear and modifications that will be required to install an Optional Standby Emergency System for each Option as proposed in this study. The Options are as follows:

Option "A":

Under Option "A", a single 2000KW diesel generator rated at 12KV with a sub-base fuel with a capacity for 36 hours. The generator will be housed in a weatherproof sound shield enclosure with a critical grade muffler and particulate filter. The generator and associated automatic transfer switch with a A-B selector switch will be located on the Air Pollution Engineering Pad Site. This generator system will serve the total electrical power loads of the buildings in Priority Group #1. These buildings and maximum recorded demand loads are as follows:

Computer-Statistics	322.2KW
Boyce Hall	690.6KW
Webber Hall	273.8KW
Batchelor Hall	451.5KW
Total Demand Load	1738.1KW
25% Safety Factor	434.5KW
Size Generator Required	2172.6KW

Since the total demand load plus the safety factor is more than the serving capacity of the generator, load shedding controls will be provided to all buildings so that unnecessary loads can be shedded as required by the University.

Modifications to the Existing Power Distribution System will consist of the following:

1. The existing Substation "APEP" located at the Air Pollution Engineering Pad site will be removed to make room for the new generator and associated switchgear. The loads served by this substation, approximately 35.0KW will be connected to Existing Substation "CLHV" in the Computer-Statistic Building.
2. The two existing Substations "DSA" and "DSC" in Batchelor Hall which are served from the 5KV system will be connected to 12KV circuit 2A in Boyce Hall utilizing the existing 5KV conduit system. A fused 15KV load intercept switch will be installed in the electrical room of Boyce Hall at the location of the abandon 5KW ram switch. The substations in Batchelor Hall which are dual rated 5/12KV will be connected for operation at 15KV
3. Site work will consist of installing underground 15KV conduits and conductors from the automatic transfer switch to existing underground Vault "V13" to intercept the existing normal 12KV circuits 2A and 2B". A 15KV emergency feeder and conduit with

shedding control conductors will be routed with normal feeders to back feed the loads of the buildings indicated above. The existing 15KV normal feeder circuit 12KV 2B will be disconnected and labeled "spare".

Advantages:

1. The advantage of this location for the generator and associated switchgear is that it is closest to buildings to be served in Priority Group #1.
2. The generator is partly hidden from view and will have minimal impact on the campus operation during construction.

Disadvantages:

1. The generator location may have an impact on any planned development of the site for a building in the future.
2. The diesel exhaust from the generator may travel northward to open lunch area location between Boyce Hall and the Computer-Statistics Building if the wind is blowing in that direction. This area is a gathering point for students during lunchtime.

Option "B":

Under Option "B", three 2000KW diesel generators rated at 12KV with a standard weatherproof enclosure will be located off-site adjacent to main utility substation located on the west side of the 60 Freeway. Two 12,000 gallon above ground concrete fuel tanks with a fuel capacity to supply fuel the generator for 36 hours or more. The generator switchgear will consist of a paralleling section with generator output circuit breakers, A-B selector switch for 12KV circuit 4A and future 12KV circuit 4B and an emergency feeder circuit breaker with provisions for a future emergency feeder for a dual 12KV emergency feeder. Emergency feeder to serve the emergency loads will utilize existing conductors for 12KV circuit 4A which presently serves the new Satellite Utility Plant. The Satellite Utility Plant will be connected to existing 12KV circuit 2A. The emergency will be used to serve all in the selected in the priority group with the exception of Environmental Health and Safety and Glasshouse/Headhouse 1-3 which will have their own independent generator system to serve their electrical loads.

The maximum recorded demand loads of the buildings to be served by the emergency feeder are as follows:

Computer-Statistics	322.2KW
Boyce Hall	690.6KW
Webber Hall	273.8KW
Batchelor Hall	451.5KW
Spieth Hall	103.8KW
Life Science	352.1KW
Fawcett Lab	181.9KW
Glasshouse/Headhouse 1-3	0.0KW (See Note a)
Green Houses 8 thru 21	449.5KW
Air Pollution Engineering	
Pad and Green Houses 6 & 7	0.0KW (See Note b)
Environmental Health and Safety	0.0KW (See Note a)
Physics	217.5KW
Science Laboratories (Addition)	643.9KW
Geology Building	280.2KW
Total Demand Load	3,967.0KW
25% Safety Factor	991.8KW
Size Generator Required	4,958.8KW

The three new 2000KW generators have a total serving capacity of 6,000 KW and more that adequate to handle total demand load plus the safety factor. Load shedding control conductors will be installed with the emergency feeder so that buildings which can not be reconnected to another normal 12KV circuit can be shed when the generators are providing emergency power. The load shedding can be used by the University to shed unnecessary emergency loads so that other buildings be connected to the emergency distribution system

Modifications to the Existing Power Distribution System will consist of the following:

4. The existing Substation "APEP" located at the Air Pollution Engineering Pad site will be removed to make room for the new 12KV to 4160 volt pad mount transformer. This transformer will be used to serve Fawcett Lab and Green 8 thru 21. The loads served by existing Substation "APEP", approximately 35.0KW will be connected to Existing Substation "CLHV" in the Computer-Statistic Building.
5. The two existing Substations "DSA" and "DSC" in Batchelor Hall which are served from the 5KV system will be connected to 12KV circuit 4A in Boyce Hall utilized the existing 5KV conduit system. A fused 15KV load intercept switch will be installed in the electrical room of Boyce Hall at the location of the abandon 5KW ram switch. The substations in Batchelor Hall which are dual rated 5/12KV will be connected for operation at 15KV

6. Site work on campus at the Air Pollution Engineering Pad Site will consist of installing underground 15KV conduits and conductors from the new pad mount transformer switch with a primary A-B selector switch to existing underground Vault "V13" to connect the new 12KV emergency circuit 4A and future emergency circuit 4B. The transformer will be equipped with secondary switch and fuse with 5KV conduit and conductors to the existing 5KV ram switch in Tunnel Vault "TV-9". This transformer will be to connect Fawcett Lab and the Green House to the emergency using the existing 5KV conduit system that exists in the tunnel and 5KV manhole system.
7. Site work on campus at existing Central Plant will consist of installing underground 15KV conduits and conductors from the new pad mount transformer switch with a primary A-B selector switch to existing underground Vault "V8" to connect the new 12KV emergency circuit 4A and future emergency circuit 4B. The transformer will be equipped with secondary switch and fuse with new 5KV conduit and conductors to the existing Manhole #16 so that the loads of Spieth Hall and Life Sciences can be connected to the new emergency distribution system.
8. Site work on campus at the existing Physics building will consist of installing underground 15KV conduits and conductors from the new pad mount transformer switch with a primary A-B selector switch to existing underground Vault "V17" to connect the new 12KV emergency circuit 4A and future emergency circuit 4B. The transformer will be equipped with secondary switch and fuse with new 5KV conduit and conductors to the Substation in the Physics Building so that this building can be disconnected from the 5KV distribution system and connected the new 12 KV emergency distribution system.
9. Other on campus work will consist of extending the conductors for 12KV circuit 4A from Vault "V11 to Vault "V17" and disconnection the buildings from their normal 12KV circuit 2A and connecting these buildings to the new 12KV emergency circuit. Some selector switches and load interrupter switch will have to be equipped with shedding equipment to disconnect unnecessary buildings when the generators are providing power.

Advantages:

3. The advantage of locating the generators and associated switchgear off-site is that it is closest to the incoming utility power and will allow the existing 12KV conduit system and some existing feeders to be used to provide emergency power to the selected buildings
4. The generators fueling, noise and maintenance will have no impact on campus activities.
5. The construction and installation of the emergency generator will not disrupt campus activities and traffic flow.

6. The diesel exhaust will not affect the student and facility.

Disadvantages:

3. There are no known disadvantages of locating the generators and associated switchgear adjustment to the main utility substation other coordinating the exact of switchgear with Riverside Public Utilities.

Notes:

- a. Due to the distance and associate cost of connecting these buildings to the new emergency distribution system, a dedicated emergency generator and automatic transfer will be provided to serve these buildings.
- b. The loads of these buildings will be connected to existing Substation "CLHV" in the Computer-Statistic Building.

Option "C":

Option "C" is the same as Option "B", except that a second new 12KV emergency feeder will be installed along with existing 12KV circuit 4A for a dual emergency distribution system similar the existing normal 12KV distribution system. The main advantage of a dual emergency distribution is its reliability and the ability to add more generators and buildings to the emergency distribution system in the future.

EMERGENCY POWER EQUIPMENT PRODUCT LITERATURE

The following pages are equipment brochures and photographs of the equipment being proposed under Option "A". The equipment brochures and pws:

2000 KW DIESEL GENERATOR RATED 12,470 VOLTS.

SOUND SHIELD WEATHERPROOF ENCLOSURE.

PHOTO OF SIMILAR GENERATOR WITH A SOUND SHIELD ENCLOSURE.

5,000 GALLON SUB-BASE DIESEL FUEL TANK.

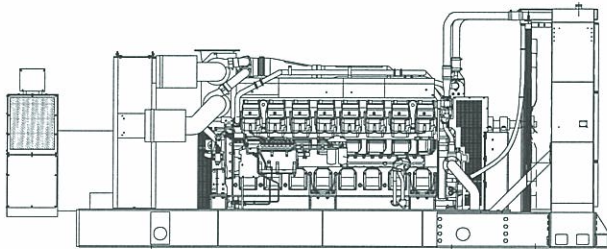
15 KV RATED GENERATOR TRANSFER WITH 15KV A-B- SELECTOR SWITCH OF THE NORMAL POWER FEEDERS.



Ratings Range

60 Hz

Standby:	kW	1590-2000
	kVA	1988-2500
Prime:	kW	1440-1820
	kVA	1800-2275



Standard Features

- Kohler Co. provides one-source responsibility for the generating system and accessories.
- The generator set and its components are prototype-tested, factory-built, and production-tested.
- The 60 Hz generator set offers a UL 2200 listing.
- The generator set accepts rated load in one step.
- The 60 Hz generator set meets NFPA 110, Level 1, when equipped with the necessary accessories and installed per NFPA standards.
- The generator set complies with ISO 8528-5, Class G3, requirements for transient performance.
- The 60 Hz generator set engine is certified by the Environmental Protection Agency (EPA) to conform to Tier 2 nonroad emissions regulations.
- A one-year limited warranty covers all systems and components. Two-, five-, and ten-year extended warranties are also available.
- Alternator features:
 - The pilot-excited, permanent-magnet (PM) alternator provides superior short-circuit capability.
 - The brushless, rotating-field alternator has broadrange reconnectability.
- Other features:
 - The low coolant level shutdown prevents overheating (standard on radiator models only).
 - The generator set is direct-mounted to the skid.
 - An electronic, isochronous governor delivers precise frequency regulation.

Generator Set Ratings

Alternator	Voltage	Ph	Hz	150°C Rise Standby Rating		130°C Rise Standby Rating		125°C Rise Prime Rating		105°C Rise Prime Rating	
				kW/kVA	Amps	kW/kVA	Amps	kW/kVA	Amps	kW/kVA	Amps
7M4054	220/380	3	60	1590/1988	3020	1590/1988	3020	1440/1800	2735	1440/1800	2735
	240/416	3	60	1840/2300	3192	1840/2300	3192	1800/2250	3123	1680/2100	2915
	277/480	3	60	2000/2500	3007	2000/2500	3007	1820/2275	2736	1820/2275	2736
7M4056	220/380	3	60	1850/2313	3513	1790/2238	3400	1750/2188	3324	1650/2063	3134
	240/416	3	60	2000/2500	3470	1950/2438	3383	1820/2275	3157	1780/2225	3088
	277/480	3	60	2000/2500	3007	2000/2500	3007	1820/2275	2736	1820/2275	2736
7M4058	220/380	3	60	2000/2500	3798	1950/2438	3703	1820/2275	3457	1790/2238	3400
	240/416	3	60	2000/2500	3470	2000/2500	3470	1820/2275	3157	1820/2275	3157
	277/480	3	60	2000/2500	3007	2000/2500	3007	1820/2275	2736	1820/2275	2736
7M4176	220/380	3	60	2000/2500	3798	2000/2500	3798	1820/2275	3457	1820/2275	3457
7M4292	347/600	3	60	2000/2500	2406	2000/2500	2406	1820/2275	2189	1820/2275	2189
7M4374	2400/4160	3	60	2000/2500	347	2000/2500	347	1820/2275	316	1820/2275	316

RATINGS: All three-phase units are rated at 0.8 power factor. **Standby Ratings:** Standby ratings apply to installations served by a reliable utility source. The standby rating is applicable to varying loads for the duration of a power outage. There is no overload capability for this rating. Ratings are in accordance with ISO-3046/1, BS 5514, AS 2789, and DIN 6271. **Prime Power Ratings:** Prime power ratings apply to installations where utility power is unavailable or unreliable. At varying load, the number of generator set operating hours is unlimited. A 10% overload capacity is available for one hour in twelve. Ratings are in accordance with ISO-8528/1, overload power in accordance with ISO-3046/1, BS 5514, AS 2789, and DIN 6271. For limited running time and base load ratings, consult the factory. Obtain the technical information bulletin (TIB-101) on ratings guidelines for the complete ratings definitions. The generator set manufacturer reserves the right to change the design or specifications without notice and without any obligation or liability whatsoever. **GENERAL GUIDELINES FOR DERATION:** *Altitude:* Derate 2.5% per 300 m (984 ft.) elevation above 1500 m (4921 ft.). *Temperature:* Derate 11.5% per 10°C (18°F) temperature above 40°C (104°F) up to a maximum temperature of 55°C (131°F).

Alternator Specifications

Specifications	Alternator
Type	4-Pole, Rotating-Field
Exciter type	Brushless, Permanent-Magnet Pilot Exciter
Voltage regulator	Solid State, Volts/Hz
Insulation:	NEMA MG1
Material	Class H, Synthetic, Nonhygroscopic
Temperature rise	130°C, 150°C Standby
Bearing: quantity, type	1, Sealed
Coupling	Flexible Disc
Amortisseur windings	Full
Rotor balancing	125%
Voltage regulation, no-load to full-load (with <0.5% drift due to temp. variation)	3-Phase Sensing, ±0.25%
One-step load acceptance	100% of Rating
Unbalanced load capability	100% of Rated Standby Current
Peak motor starting kVA:	(35% dip for voltages below)
380 V	7M4176 (4 bus bar) 5400
480 V	7M4054 (4 bus bar) 7000
480 V	7M4056 (4 bus bar) 7200
480 V	7M4058 (4 bus bar) 11000
600 V	7M4292 (4 bus bar) 4250
4160 V	7M4374 (6 lead) 6200

- NEMA MG1, IEEE, and ANSI standards compliance for temperature rise and motor starting.
- Sustained short-circuit current of up to 300% of the rated current for up to 10 seconds.
- Sustained short-circuit current enabling downstream circuit breakers to trip without collapsing the alternator field.
- Self-ventilated and dripproof construction.
- Superior voltage waveform from two-thirds pitch windings and skewed stator.
- Digital solid-state, volts-per-hertz voltage regulator with ±0.25% no-load to full-load regulation.
- Brushless alternator with brushless pilot exciter for excellent load response.

Application Data

Engine

Engine Specifications	
Manufacturer	Mitsubishi
Engine model	S16R-Y2PTAW2-1
Engine type	4-Cycle, Turbocharged
Cylinder arrangement	16 V
Displacement, L (cu. in.)	65.4 (3989)
Bore and stroke, mm (in.)	170 x 180 (6.69 x 7.09)
Compression ratio	14.0:1
Piston speed, m/min. (ft./min.)	648 (2126)
Main bearings: quantity, type	7, Precision Half-Shell
Rated rpm	1800
Max. power at rated rpm, kWm (BHP)	2180 (2923)
Cylinder head material	Cast Iron
Crankshaft material	Forged Steel
Governor type	Electronic
Frequency regulation, no-load to full-load	Isochronous
Frequency regulation, steady state	±0.25%
Frequency	Fixed
Air cleaner type, all models	Dry

Exhaust

Exhaust System	
Exhaust manifold type	Dry
Exhaust flow at rated kW, m ³ /min. (cfm)	544 (19209)
Exhaust temperature at rated kW, dry exhaust, °C (°F)	708 (1306)
Maximum allowable back pressure, kPa (in. Hg)	5.9 (1.7)
Exhaust outlet size at engine hookup, mm (in.)	See ADV drawing

Engine Electrical

Engine Electrical System		
Battery charging alternator:		
Ground (negative/positive)	Negative	
Volts (DC)	24	
Ampere rating	30	
Starter motor rated voltage (DC)	Dual, 24	
Battery, recommended cold cranking amps (CCA):		
Quantity, CCA rating each	Four, 1150	
Battery voltage (DC)	12	

Fuel

Fuel System	
Fuel supply line, min. ID, mm (in.)	25 (1.0)
Fuel return line, min. ID, mm (in.)	19 (0.75)
Max. lift, engine-driven fuel pump, m (ft.)	1.0 (3.0)
Max. fuel flow, Lph (gph)	660 (174)
Max. fuel pump restriction, kPa (in. Hg)	10 (3.0)
Fuel filter: quantity, type	4, Secondary
Recommended fuel	#2 Diesel

Lubrication

Lubricating System	
Type	Full Pressure
Oil pan capacity, L (qt.)	200 (211)
Oil pan capacity with filter, L (qt.)	230 (243)
Oil filter: quantity, type	4, Cartridge
Oil cooler	Water-Cooled

Application Data

Cooling

Radiator System	
Ambient temperature, °C (°F)	40 (104)
Engine jacket water capacity, L (gal.)	170 (44.9)
Radiator system capacity, including engine, L (gal.)	367 (96.9)
Engine jacket water flow, Lpm (gpm)	1850 (489)
Charge cooler water flow, Lpm (gpm)	920 (243)
Heat rejected to cooling water at rated kW, dry exhaust, kW (Btu/min.)	780 (44374)
Heat rejected to charge cooling air at rated kW, dry exhaust, kW (Btu/min.)	780 (44374)
Water pump type	Centrifugal
Fan diameter, including blades, mm (in.)	2057 (81)
Fan kWm (HP)	81 (109)
Max. restriction of cooling air, intake and discharge side of radiator, kPa (in. H ₂ O)	0.125 (0.5)

High Ambient Radiator System	
Ambient temperature, °C (°F)	50 (122)
Engine jacket water capacity, L (gal.)	170 (44.9)
Radiator system capacity, including engine, L (gal.)	386 (102)
Engine jacket water flow, Lpm (gpm)	1850 (489)
Charge cooler water flow, Lpm (gpm)	920 (243)
Heat rejected to charge cooling air at rated kW, dry exhaust, kW (Btu/min.)	780 (44374)
Heat rejected to charge cooling air at rated kW, dry exhaust, kW (Btu/min.)	780 (44374)
Water pump type	Centrifugal
Fan diameter, including blades, mm (in.)	2362 (93)
Fan kWm (HP)	63 (84)
Max. restriction of cooling air, intake and discharge side of radiator, kPa (in. H ₂ O)	0.125 (0.5)

Remote Radiator System*	
Exhaust manifold type	Dry
Connection sizes:	
Jacket water engine inlet, mm (in.)	95 (3.75)
Jacket water engine outlet, mm (in.)	95 (3.75)
Intercooler water engine inlet, mm (in.)	83 (3.25)
Intercooler water engine outlet, mm (in.)	70 (2.75)
Static head allowable above engine, kPa (ft. H ₂ O)	98 (32.8)

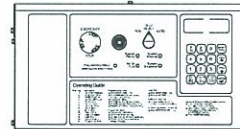
* Contact your local distributor for cooling system options and specifications based on your specific requirements.

Operation Requirements

Air Requirements	
Radiator-cooled cooling air, m ³ /min. (scfm)†	2112 (74600)
High ambient radiator-cooled cooling air, m ³ /min. (scfm)†	2532 (89400)
Cooling air required for generator set when equipped with city water cooling or remote radiator, based on 14°C (25°F) rise, m ³ /min. (scfm)†	991 (35100)
Combustion air, m ³ /min. (cfm)	206 (7274)
Heat rejected to ambient air:	
Engine, kW (Btu/min.)	180 (10240)
Alternator, kW (Btu/min.)	97 (5516)
† Air density = 1.20 kg/m ³ (0.075 lbm/ft ³)	

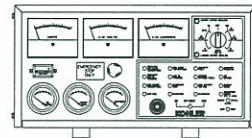
Fuel Consumption	
Diesel, Lph (gph) at % load	Standby Rating
100%	606 (160.1)
75%	442 (116.8)
50%	299 (79.0)
25%	164 (43.2)
Diesel, Lph (gph) at % load	Prime Rating
100%	536 (141.6)
75%	403 (106.6)
50%	271 (71.6)
25%	154 (40.6)

Controllers



Decision-Maker™ 550 Controller

Audiovisual annunciation with NFPA 110 Level 1 capability. Programmable microprocessor logic and digital display features. Alternator safeguard circuit protection. 12- or 24-volt engine electrical system capability. Remote start, remote annunciation, and remote communication options. Refer to G6-46 for additional controller features and accessories.



Decision-Maker™ 3+, 16-Light Controller

Audiovisual annunciation with NFPA 110 Level 1 capability. Microprocessor logic, AC meters, and engine gauge features. 12- or 24-volt engine electrical system capability. Remote start, prime power, and remote annunciation options. Refer to G6-30 for additional controller features and accessories.

Additional Standard Features

- Alternator Protection
- Oil Drain Extension
- Operation and Installation Literature

Available Accessories

Open Unit

- Exhaust Silencer, Hospital (kit: PA-361627)
- Exhaust Silencer, Critical (kit: PA-361625)
- Flexible Exhaust Connector, Stainless Steel

Cooling System

- Block Heater
 [recommended for ambient temperatures below 20°C (68°F)]

Fuel System

- Flexible Fuel Lines
- Fuel Pressure Gauge

Electrical System

- Battery
- Battery Charger, Equalize/Float Type
- Battery Heater
- Battery Rack and Cables

Engine and Alternator

- Air Cleaner, Heavy Duty
- Air Cleaner Restriction Indicator
- Alternator Strip Heater
- Bus Bar Kits (standard on 7M alternators, 380–600 volt only)
- Crankcase Emissions Canister
- Fuel/Water Separator
- Line Circuit Breaker (NEMA type 1 enclosure)
- Line Circuit Breaker with Shunt Trip (NEMA type 1 enclosure)
- Oil Temperature Gauge
- Rated Power Factor Testing
- Spring Isolators

Paralleling System

- Load-Sharing Module
- Voltage Adjustment Control (manual)

Maintenance

- General Maintenance Literature Kit
- Maintenance Kit (includes air, oil, and fuel filters)
- NFPA 110 Literature
- Overhaul Literature Kit
- Production Literature Kit

Controller

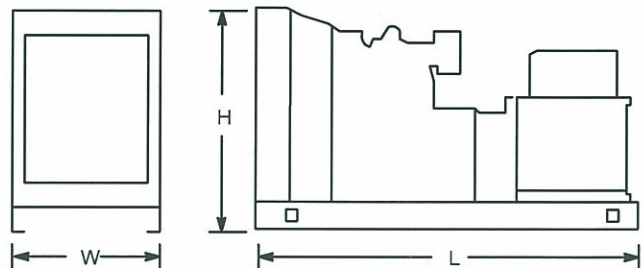
- Common Failure Relay Kit
- Communication Products and PC Software
- Customer Connection Kit
- Dry Contact Kit (isolated alarm)
- Remote Annunciator Panel
- Remote Audiovisual Alarm Panel
- Remote Emergency Stop Kit
- Remote Mounting Cable
- Run Relay Kit

Miscellaneous Accessories

- _____
- _____
- _____
- _____
- _____
- _____
- _____
- _____

Dimensions and Weights

Overall Size, max., L x W x H, mm (in.): 6445 x 2766 x 3091
 (253.7 x 108.9 x 121.7)
 Weight (radiator model), wet, kg (lb.): 15876 (35000)



Note: This drawing is provided for reference only and should not be used for planning the installation. Contact your local distributor for more detailed information.

DISTRIBUTED BY:



The photo above is a typical generator in a weatherproof sound shield enclosure with a 1600 gallon sub-base fuel tank. The muffler is housed within the enclosure. The 2000KW generator will look similar to this unit, except larger.

ASSY NO.	DWG NO.	GALLONS	PACKAGE WEIGHT W/ FUEL	A	B
1400-15447	119-15197	LIFT BASE	51374lbs [233224kg]	2760 [6401]	3000 [7620]
1400-15448	119-15198	500	57567lbs [26135kg]	2760 [7101]	3000 [7620]
1400-15449	119-15199	660	58735lbs [26666kg]	2760 [7101]	3000 [7620]
1400-15450	119-15200	850	60393lbs [27418kg]	2760 [7101]	3000 [7620]
1400-15451	119-15201	1000	61759lbs [28039kg]	2760 [7101]	3000 [7620]
1400-15452	119-15202	1250	63855lbs [28990kg]	2760 [7101]	3000 [7620]
1400-15453	119-15203	1500	65952lbs [29942kg]	2760 [7101]	3000 [7620]
1400-15454	119-15204	1750	68048lbs [30894kg]	2760 [7101]	3000 [7620]
1400-15455	119-15205	2000	70144lbs [31845kg]	2760 [7101]	3000 [7620]
1400-15456	119-15206	2500	75872lbs [34446kg]	3840 [9754]	4080 [10363]
1400-15457	119-15207	3000	79860lbs [36256kg]	3840 [9754]	4080 [10363]
1400-15458	119-15208	3500	84719lbs [38462kg]	4380 [11125]	4620 [11735]

CUSTOMER APPROVAL

NAME: _____

DATE: _____

IMPORTANT: BY SIGNING THIS DRAWING YOU ARE APPROVING IT AS IS. IF CHANGES ARE REQUIRED A NEW DRAWING WILL BE REQUIRED.

GENSET INFORMATION

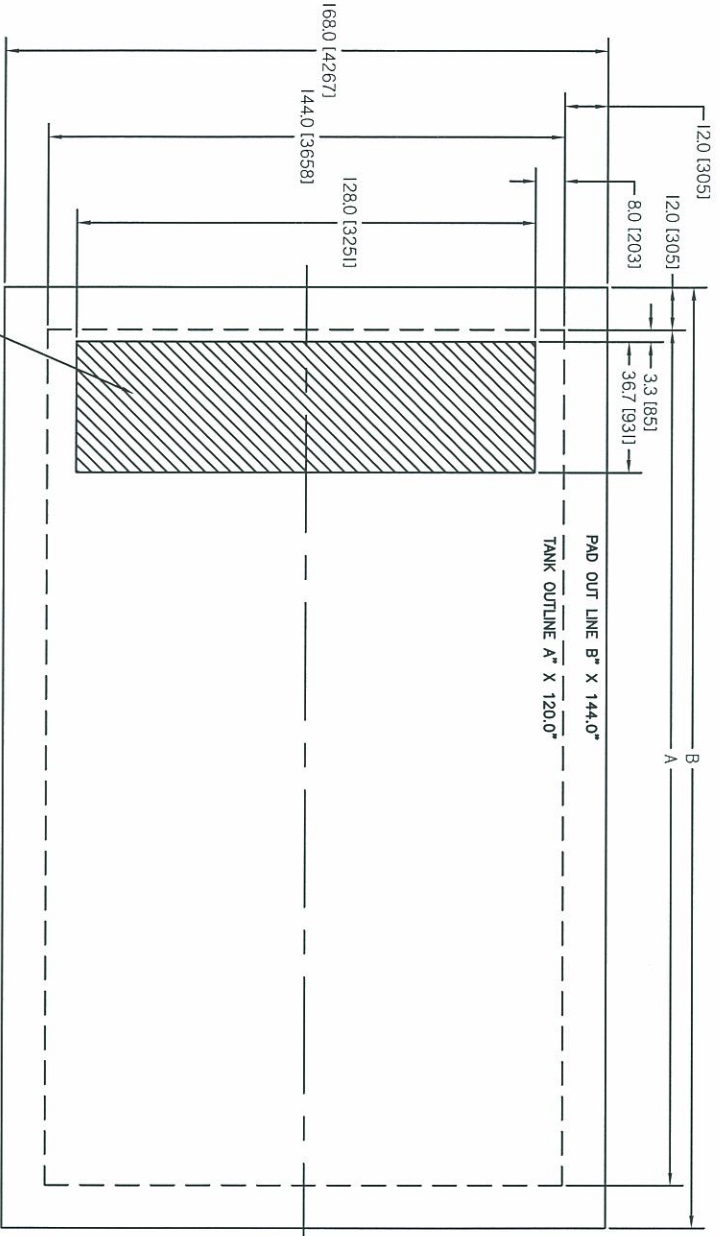
GENSET MODEL 2000 ZDC HA

GENSET DRG# ADV-7258

SILENCER 361655

FLEX -

BREAKER -



OPEN ELECTRICAL STUB-UP
 (SEE MANUFACTURES DRAWING FOR
 EXACT CIRCUIT BREAKER LOCATION)

NOTE: 12.0" TYPICAL AROUND TANK OR
 AS RECOMMENDED BY INSTALLING CONTRACTOR.

A	04/02/07	START (FROM 1115-14766)	CYT	TRAMONT CORPORATION SCALE NTS DATE 04/02/07 FRACTIONS= +/- .5 .xx= +/- .125 .x= +/- .250 .xxx= +/- .062		FOR	THIS DESIGN IS THE CONFIDENTIAL PROPERTY OF TRAMONT CORP. FOR USE BY TRAMONT CORP. CUSTOMERS FOR SUBMITTAL PURPOSES ONLY. COPYRIGHT TRAMONT CORP. 2007.
LETTER	DATE	DESCRIPTION	NAME			DRAWN BY: CYT	
CHANGE BLOCK						LEVEL 2 SOUND ATTENUATED ASSEMBLY (PAD)	
				DRAWING NO. 1400-15447			



General Description

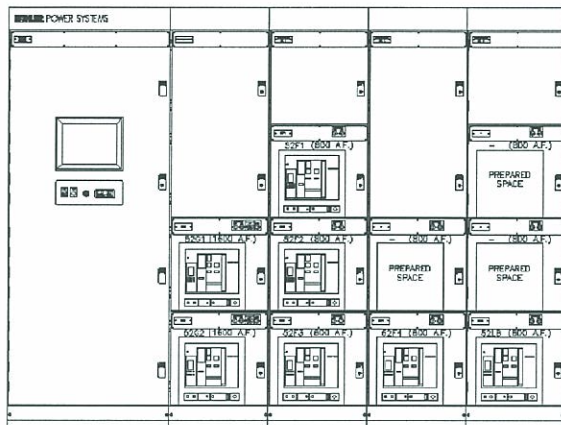
Integrating the operation of onsite generators, utility services, automatic transfer switches, generator controls, and distribution equipment into a fully functioning system requires the engineering expertise and dedication to quality that is Kohler paralleling switchgear.

Kohler's PD series digital paralleling switchgear provides an industry-leading platform for command and control of multiple power sources. Designed to be integrated with Kohler generator sets or combined with other major brands of generation equipment, the PD series delivers outstanding reliability along with the most intuitive user interface in the industry.

The PD series is extremely flexible. Incorporating Kohler's patented mode configuration technology, the owner may select from a variety of operational parameters and sequences without any additional cost. In addition to the digital control interface, the PD series may be constructed with any of the more traditional metering, control, and other component requirements based on an engineer's or owner's preferences (see ED options).

The PD Series paralleling controls are available in:

- PD-200: UL 891 listed and labeled switchboard
- PD-300: UL 1558 listed and labeled switchgear
- PD-400: UL listed and labeled medium voltage switchgear



Typical PD-300 Switchgear

Standard Features

- 15 in. color graphical user interface (touch screen), Windows® CE-based
- Digital real (kW) and reactive (kVAR) load sharing
- Digital synchronizer
- User-definable generator management
- User-definable load add/shed control
- Modbus RS485 and TCP/IP communications connections
- Internal web server
- Complete system metering, annunciation, settings, and control functions through touch screen
- Event monitoring and logging
- Power trend measurements

Available Applications

- Emergency standby
- Prime power
- Base load (peak shave)
- Import/export mode (peak shave)
- Isolate (interruptible rate)

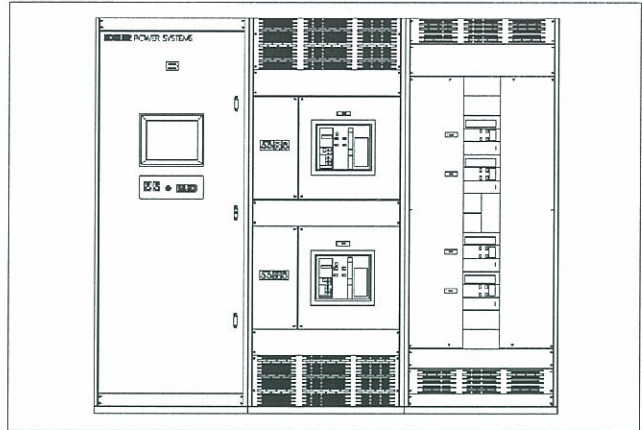
Windows® is a registered trademark of Microsoft®.

System Configurations

PD-200 Series

The PD-200 series product offering is UL 891 listed and allows for extreme flexibility in design while providing a strong standard for safety and performance. Features include:

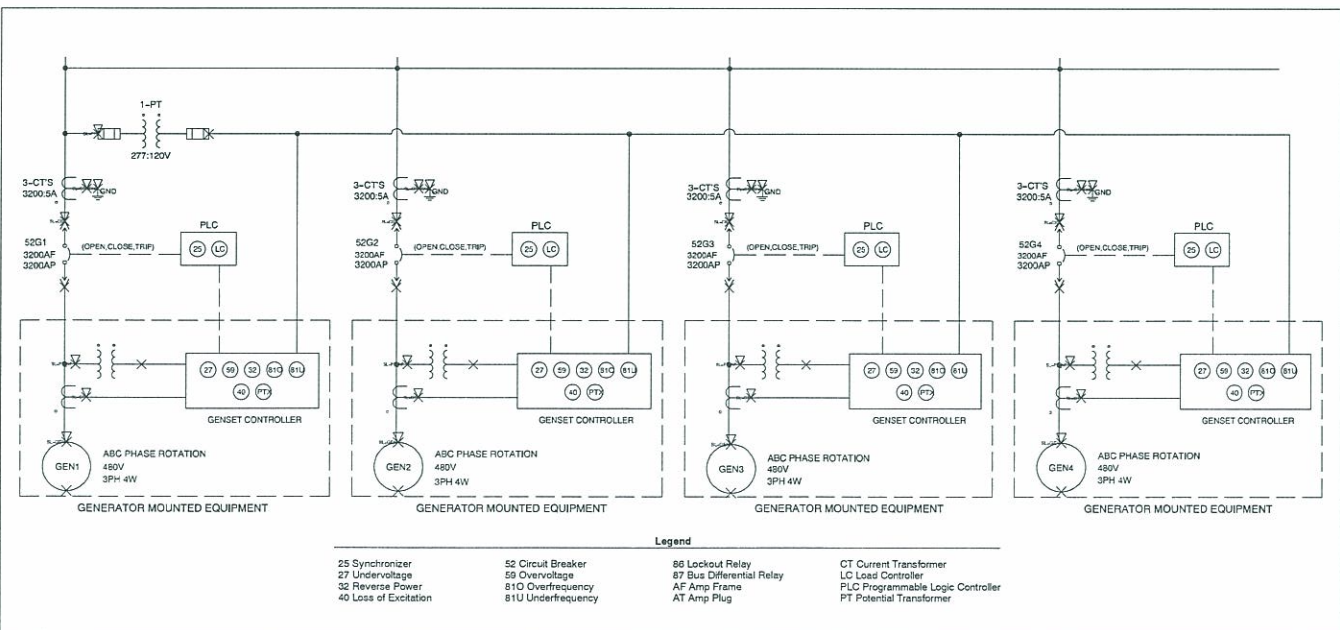
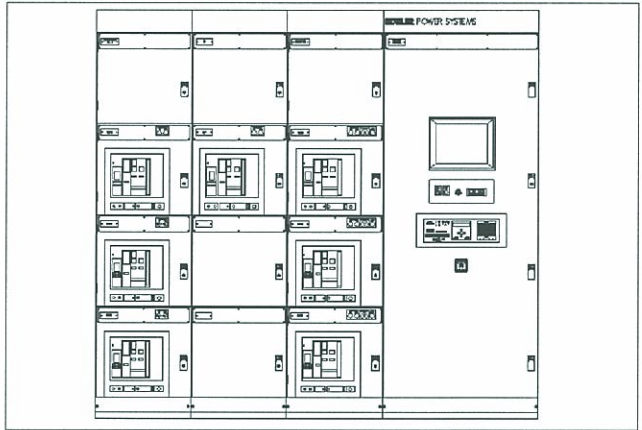
- PD series digital system control standard
- Rear access standard, front access available
- Shallow depth (36-42 in. available)
- UL 489 fixed or drawout breakers for generator sets, utility, and distribution
- Molded-case breakers available for distribution
- Transfer switches can be mounted in switchgear lineup
- Bus ratings through 10,000 amps/200 kA withstand
- Complete selection of breaker manufacturers, trip options, and power monitoring
- NEMA 1, NEMA 3R walk-up and walk-in available



PD-300 Series

Offering the highest standard in bus withstand and breaker ratings, the PD-300 series is listed under UL 1558. Featuring drawout breakers as standard, the PD-300 series is designed with reliability and serviceability in mind. Features include:

- PD series digital system control standard
- UL 1066 drawout breakers for generator sets, utility, and distribution
- Complies with ANSI C37.20.1
- Bus ratings through 6,000 amps/200 kA withstand
- Complete selection of breaker manufacturers, trip options, and power monitoring
- NEMA 1, NEMA 3R walk-up and walk-in available



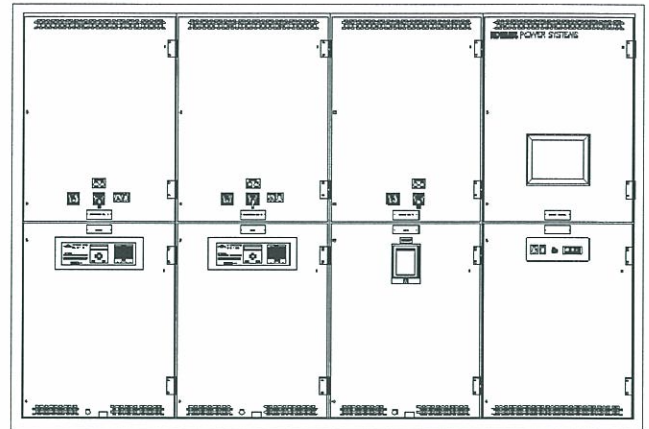
System Configurations, continued

PD-400 Series

Medium voltage generation applications continue to grow with distributed generation and large standby systems leading the way. Available through 26 kV, the PD-400 series utilizes the strength of the digital control system combined with utility grade protective relays for a complete system solution.

Features include:

- PD series digital system control standard
- UL MV switchgear listing through 15 kV
- Complies with ANSI metal-clad switchgear requirements
- Bus and breaker ratings through 3000 amps
- Complete selection of breaker manufacturers, protective relay options, power monitoring, neutral grounding resistors and control battery systems
- NEMA 1, NEMA 3R walk-up and shelter aisle available



ED200, 300, and 400 Series

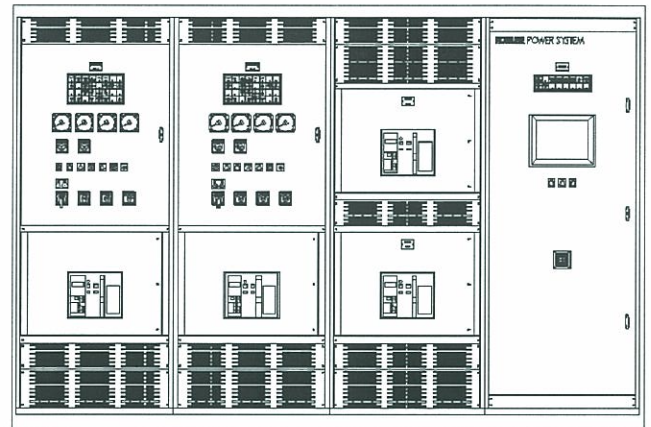
Kohler Power Systems seeks to provide the widest selection of products available in the market as well as meeting the diverse needs of our customers. With this goal in mind, we offer the ED paralleling series.

Combining the PD series controls with more traditional features, the ED series is available in all configurations. With the ED product line, the customer may choose from a wide variety of options including:

- Analog meters
- Window light annunciators
- Selector switches, pushbuttons, etc.
- Sync scope, lights on swing panel
- Hot standby/redundant PLC's
- Woodward or similar synchronizing and load sharing components

In most cases, the ED product is designed with the same PLC logic and touch screen interface allowing system setup and monitoring while also providing the user with a more traditional interface.

Kohler's desire to provide the owner with the system they want, rather than a standard off-the-shelf product, drives our engineers to bring ideas to the table to improve, simplify, and ensure the reliability of your system.



Applications

PD series paralleling switchgear is extremely versatile and can be configured for *on the fly* operational mode change. Kohler's patented field configurable operation modes can allow the owner to select a system that will provide soft-load closed transition emergency operation today and extended parallel/peak shave in the future without significant modifications.

Typical applications for the PD series include:

Standby

ATS Start

A start signal from an automatic transfer switch or other control device starts all generator sets. The generators synchronize and connect to the paralleling bus.

Utility Breaker Sensing

In many systems, transfer switches are not present. When the utility fails, the utility breaker opens. The PLC logic starts the generator sets and connects them to the generator set paralleling bus. When the required number of generator sets are online, the tie breaker closes.

Return of Utility

After utility power is restored, the return-to-utility sequence starts. Several options are available for return of utility power.

ATS Transfer: Standard, delayed transition or closed transition switches can restore the load to the utility source.

Circuit Breaker Transfer: Where a system does not employ automatic transfer switches, the system breakers can effect transfer in multiple modes:

Open Transfer: The tie breaker opens and, after a time delay, the utility breaker closes.

Soft Transfer: The generator bus synchronizes to the utility. When synchronized, the utility breaker closes. The switchgear soft-unloads the generator sets and then opens the generator bus tie breaker.

Prime Power

A system-start signal starts all generator sets. The generator sets synchronize and connect to the generator set paralleling bus.

Isolate (Interruptible Rate)

A system-start signal starts all generator sets. The generator sets synchronize and connect to the generator set paralleling bus. With all generator sets online, the generator bus synchronizes to the utility and the generator bus tie breaker closes. The generator sets ramp up to assume system load. When the power flow across the utility breaker reaches a preset level, the utility breaker opens.

Base Load Generators (Peak Shave)

A system-start signal starts the generator sets. The generator sets synchronize and connect to the generator set paralleling bus. With all generator sets connected, the generator bus parallels to the utility and the generator bus tie breaker closes. The generator sets soft-load to a preset, user-adjustable kW level.

Generator set output remains constant and utility power fluctuates to supply the difference between the generator set output and the load requirement. When the generator set output exceeds the system load requirements, the excess power is exported to the utility.

Import/Export (Peak Shave)

A system-start signal starts the generator sets. The generator sets synchronize and connect to the generator paralleling bus. With all generator sets connected, the generator bus parallels to the utility and the generator bus tie breaker closes. The generator sets soft-load to a preset, user-adjustable kW power flow across the utility breaker. The power flow to the utility remains constant and the generator set power output fluctuates to meet the requirements of the load.

If the import/export level is positive, the system imports a set power level from the utility; if the import/export level is negative, the system exports a set power level to the utility.

If the load requirement exceeds the generator set rating, the generator set produces its rated power and the utility supplies the difference.

Touch Screen Interface

The PD series of digital switchgear incorporates a high resolution touch screen interface (HMI) to provide control and monitoring of all system parameters in one strategic location. Unlike older style switchgear that requires significant panel space for each generator set's analog metering, annunciation, and control switches, the PD series locates components in less than one third the traditional space. This approach leads to a more reliable system through wiring and component reduction as well as a more user-friendly interface. Rather than setting system parameters through special programmers, small input screens and multiple analog devices scattered throughout the lineup, the user works from a single location for all operations.

The operator interface is configured in a user-friendly tab format with direct access to multiple levels of control and monitoring and runs in Windows® CE environment. Screen programs are held on a standard PC card that is simple to upgrade as future customer requirements develop. User programming is performed through a password-protected pop-up keypad available on all screens. Each system includes:

System One Line Diagram

The one line overview screen displays system status through animation, color indications, system feedback, and operating parameters. The screen includes:

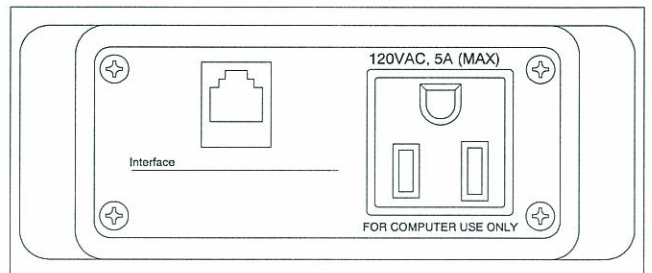
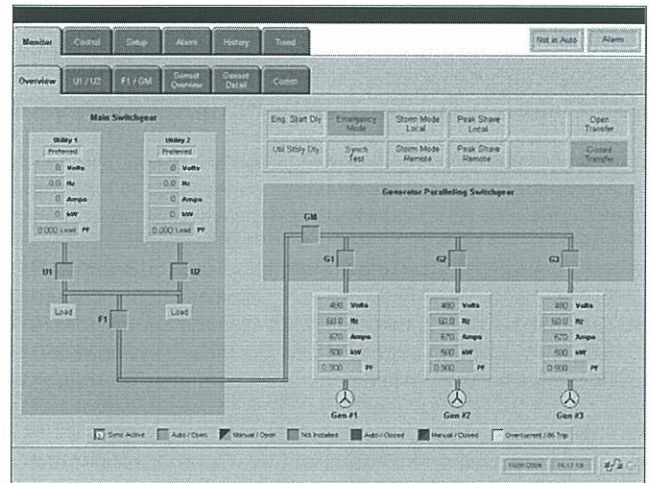
Breaker Status: System breakers including generator paralleling, utility, distribution and tie breakers (as provided), and other customer-specified system protective devices. Color indications include open, closed, energized, deenergized, tripped, load shed active, and automatic/manual control.

Generator Sets: Generator running or offline, individual generator voltage, frequency, current, kilowatts, power factor, total generator bus kilowatts, and master control annunciator windows (indications/alarms).

Standard on all systems is a front-mounted interface portal containing a power receptacle and a CAT 5 connection. These can be used for field programming, testing, or use of a laptop as a temporary screen should there be an issue with the unit-mounted touch screen. All controls are accessible through a standard web browser such as Internet Explorer®.

Utility Feeders: In systems where the PD series is interfacing with a utility feed, the customer's utility is included in the system one line. This may be a single or multiple feeders based on the specific system layout and operational requirements. Parameters for the utility monitored include: voltage, frequency, current, kilowatts, power factor, and protective relay operation.

System Operation: Master control and annunciation indicators are included on the system one line screen. These are project specific and would include operational mode (such as emergency system ready, base load operation, peak shave operation, soft-load, or open transition mode selected). Major system time delays such as retransfer to utility are displayed when active and system security and operational interface control are accessed through this screen. The system features as standard: multiple level password protection, time and date stamping of events, and communications network monitoring.

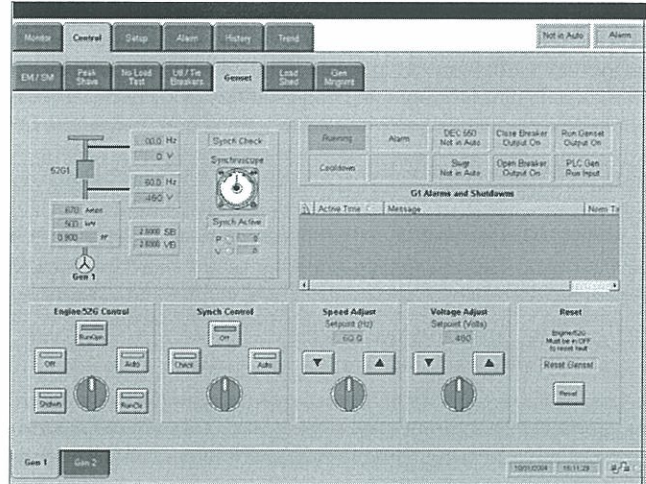


Windows® is a registered trademark of Microsoft®.

Generator Control

The generator set control screen provides a graphical interface to a specific generator set's operation. Simple and complete, the generator control screen provides a familiar environment for operators while incorporating digital benefits. The generator control screen includes:

- Generator and bus monitoring of voltage and frequency for manual paralleling
- Generator output monitoring
- Digital sync-scope and phase/voltage differential indications
- Generator control switch with five positions: automatic, run open (no load test), run closed (load test), off (cool down), shutdown
- Synchronizer control switch with three positions: automatic, check (manual paralleling), and off
- Speed and voltage adjust switches: up/down adjustments with digital indication of setting for manual paralleling
- Generator set alarms:
 - Displays pre and shutdown alarms for the generator set being monitored
 - Displays recorded alarm events for that generator
 - Includes reset switch for alarms, as well as interface monitoring for the Decision-Maker 550 engine-mounted controller for projects where that device is used



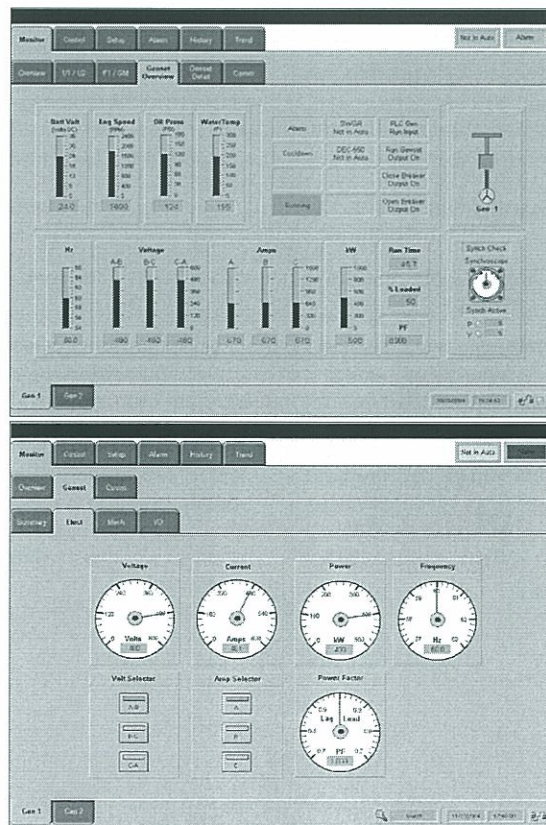
The user may move from one generator to another through the push of a single button.

Generator Monitoring

Detailed electrical and mechanical data for each generator is gathered on this screen. When paired with the 550 engine-mounted controller, over 400 points are available for each engine generator should the customer desire extended data. Standard information is represented in bar graph and digital readouts and includes:

- Generator Electrical: voltage (3-phase), frequency, kilowatts, current (3-phase), power factor
- Generator Mechanical: water temperature, oil pressure, engine speed, battery voltage
- General Information: number of starts, running time, percentage loaded, sync-scope, sync-lights and voltage/phase indications, sync-active indication, generator pre and shutdown alarms

The bar graph displays are color coded to indicate normal operation and pre and shutdown values, with these values displayed for customer monitoring. Analog meter representations are also available at the press of a button.

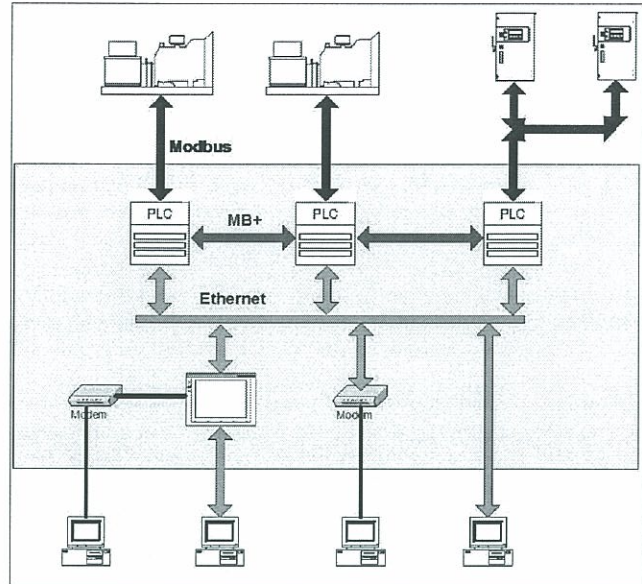


Communications

Each PD system is constructed with an integrated web server allowing remote monitoring and control through any ethernet network. The PD network is integrated with the generator-mounted controllers, transfer switches, and other devices to provide the owner with remote data, monitoring, and control of his entire power system without the need for expensive custom software packages. The system screens may be viewed through any major web browser and are identical to those featured on the system touch screens.

Modbus® is Kohler's standard protocol providing the industries' widest selection of compatible components as well as an open protocol for integration into existing systems.

Modbus® is utilized between generator sets, transfer switches, and other devices to monitor and control the system. Internal to the switchgear, Modbus® Plus is used to gain speed on the inter-PLC data network. A Modbus® port is available for external communications.



Additional Features

All Kohler paralleling switchgear is designed specifically for your project. Thousands of additional features and components can be incorporated. A sampling of those available are:

Controls:

- Power quality metering
- Transfer switch control screens
- SCADA systems

Low Voltage:

- Integrated breaker metering networks
- Insulated bus, isolated bus
- Seismic zone 4 construction

Medium Voltage:

- Distribution or station class lightning arrestors
- Station battery systems

Structure:

- Special environmental requirements for location, temperature, and humidity
- Complete walk-in switchgear houses with HVAC

Kohler's strength is the ability to design a complete, integrated system for your installation. Working with the engineer, contractor, and owner, the project team will be with you from concept to acceptance to ensure a smooth installation and, teamed with our distributors, to provide future service on the complete system.

Modbus® is a registered trademark of Schneider Electric.

DISTRIBUTED BY:

Availability is subject to change without notice. Kohler Co. reserves the right to change the design or specifications without notice and without any obligation or liability whatsoever. Contact your local Kohler® generator set distributor for availability.

EMERGENCY POWER EQUIPMENT PRODUCT LITERATURE

The following pages are equipment brochures and photographs of the equipment being proposed for Options "B" and "C":

2000 KW DIESEL GENERATOR RATED 12,470 VOLTS

STANDARD WEATHERPROOF ENCLOSURE

12,000 GALLON ABOVE GROUND DIESEL FUEL TANK

15 KV RATED GENERATOR PARALLELING SWITCHGEAR WITH 12KV A-B
SELECTOR SWITCH FOR THE NORMAL FEEDERS

PAD MOUNT TRANSFORMER

EMERGENCY POWER EQUIPMENT PRODUCT LECTURE FOR GLASSHOUSE / HEADHOUSE 1-3:

150 KW DIESEL GENERATOR RATED 120/208V, 3PH, 4W

STANDARD WEATHERPROOF ENCLOSURE

800 AMP AUTOMATIC TRANSFORMER SWITCH

SUB-BASE FUEL TANK

EMERGENCY POWER EQUIPMENT PRODUCT LECTURE FOR ENVIRONMENTAL HEALTH AND SAFETY:

100 KW DIESEL GENERATOR RATED 120/208V, 3PH, 4W

STANDARD WEATHERPROOF ENCLOSURE

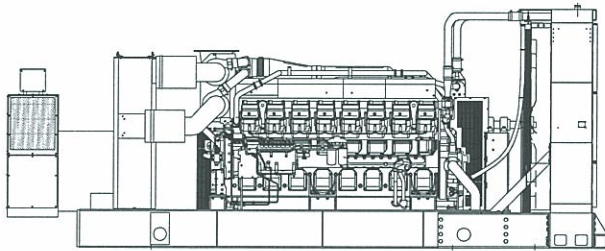
400 AMP AUTOMATIC TRANSFORMER SWITCH



Ratings Range

60 Hz

Standby:	kW	1590-2000
	kVA	1988-2500
Prime:	kW	1440-1820
	kVA	1800-2275



Standard Features

- Kohler Co. provides one-source responsibility for the generating system and accessories.
- The generator set and its components are prototype-tested, factory-built, and production-tested.
- The 60 Hz generator set offers a UL 2200 listing.
- The generator set accepts rated load in one step.
- The 60 Hz generator set meets NFPA 110, Level 1, when equipped with the necessary accessories and installed per NFPA standards.
- The generator set complies with ISO 8528-5, Class G3, requirements for transient performance.
- The 60 Hz generator set engine is certified by the Environmental Protection Agency (EPA) to conform to Tier 2 nonroad emissions regulations.
- A one-year limited warranty covers all systems and components. Two-, five-, and ten-year extended warranties are also available.
- Alternator features:
 - The pilot-excited, permanent-magnet (PM) alternator provides superior short-circuit capability.
 - The brushless, rotating-field alternator has broadrange reconnectability.
- Other features:
 - The low coolant level shutdown prevents overheating (standard on radiator models only).
 - The generator set is direct-mounted to the skid.
 - An electronic, isochronous governor delivers precise frequency regulation.

Generator Set Ratings

Alternator	Voltage	Ph	Hz	150°C Rise Standby Rating		130°C Rise Standby Rating		125°C Rise Prime Rating		105°C Rise Prime Rating	
				kW/kVA	Amps	kW/kVA	Amps	kW/kVA	Amps	kW/kVA	Amps
7M4054	220/380	3	60	1590/1988	3020	1590/1988	3020	1440/1800	2735	1440/1800	2735
	240/416	3	60	1840/2300	3192	1840/2300	3192	1800/2250	3123	1680/2100	2915
	277/480	3	60	2000/2500	3007	2000/2500	3007	1820/2275	2736	1820/2275	2736
7M4056	220/380	3	60	1850/2313	3513	1790/2238	3400	1750/2188	3324	1650/2063	3134
	240/416	3	60	2000/2500	3470	1950/2438	3383	1820/2275	3157	1780/2225	3088
	277/480	3	60	2000/2500	3007	2000/2500	3007	1820/2275	2736	1820/2275	2736
7M4058	220/380	3	60	2000/2500	3798	1950/2438	3703	1820/2275	3457	1790/2238	3400
	240/416	3	60	2000/2500	3470	2000/2500	3470	1820/2275	3157	1820/2275	3157
	277/480	3	60	2000/2500	3007	2000/2500	3007	1820/2275	2736	1820/2275	2736
7M4176	220/380	3	60	2000/2500	3798	2000/2500	3798	1820/2275	3457	1820/2275	3457
7M4292	347/600	3	60	2000/2500	2406	2000/2500	2406	1820/2275	2189	1820/2275	2189
7M4374	2400/4160	3	60	2000/2500	347	2000/2500	347	1820/2275	316	1820/2275	316

RATINGS: All three-phase units are rated at 0.8 power factor. **Standby Ratings:** Standby ratings apply to installations served by a reliable utility source. The standby rating is applicable to varying loads for the duration of a power outage. There is no overload capability for this rating. Ratings are in accordance with ISO-3046/1, BS 5514, AS 2789, and DIN 6271. **Prime Power Ratings:** Prime power ratings apply to installations where utility power is unavailable or unreliable. At varying load, the number of generator set operating hours is unlimited. A 10% overload capacity is available for one hour in twelve. Ratings are in accordance with ISO-8528/1, overload power in accordance with ISO-3046/1, BS 5514, AS 2789, and DIN 6271. For limited running time and base load ratings, consult the factory. Obtain the technical information bulletin (TIB-101) on ratings guidelines for the complete ratings definitions. The generator set manufacturer reserves the right to change the design or specifications without notice and without any obligation or liability whatsoever. **GENERAL GUIDELINES FOR DERATION:** *Altitude:* Derate 2.5% per 300 m (984 ft.) elevation above 1500 m (4921 ft.). *Temperature:* Derate 11.5% per 10°C (18°F) temperature above 40°C (104°F) up to a maximum temperature of 55°C (131°F).

Alternator Specifications

Specifications	Alternator	
Type	4-Pole, Rotating-Field	
Exciter type	Brushless, Permanent-Magnet Pilot Exciter	
Voltage regulator	Solid State, Volts/Hz	
Insulation:	NEMA MG1	
Material	Class H, Synthetic, Nonhygroscopic	
Temperature rise	130°C, 150°C Standby	
Bearing: quantity, type	1, Sealed	
Coupling	Flexible Disc	
Amortisseur windings	Full	
Rotor balancing	125%	
Voltage regulation, no-load to full-load (with <0.5% drift due to temp. variation)	3-Phase Sensing, ±0.25%	
One-step load acceptance	100% of Rating	
Unbalanced load capability	100% of Rated Standby Current	
Peak motor starting kVA:	(35% dip for voltages below)	
380 V	7M4176 (4 bus bar)	5400
480 V	7M4054 (4 bus bar)	7000
480 V	7M4056 (4 bus bar)	7200
480 V	7M4058 (4 bus bar)	11000
600 V	7M4292 (4 bus bar)	4250
4160 V	7M4374 (6 lead)	6200

- NEMA MG1, IEEE, and ANSI standards compliance for temperature rise and motor starting.
- Sustained short-circuit current of up to 300% of the rated current for up to 10 seconds.
- Sustained short-circuit current enabling downstream circuit breakers to trip without collapsing the alternator field.
- Self-ventilated and dripproof construction.
- Superior voltage waveform from two-thirds pitch windings and skewed stator.
- Digital solid-state, volts-per-hertz voltage regulator with ±0.25% no-load to full-load regulation.
- Brushless alternator with brushless pilot exciter for excellent load response.

Application Data

Engine

Engine Specifications	
Manufacturer	Mitsubishi
Engine model	S16R-Y2PTAW2-1
Engine type	4-Cycle, Turbocharged
Cylinder arrangement	16 V
Displacement, L (cu. in.)	65.4 (3989)
Bore and stroke, mm (in.)	170 x 180 (6.69 x 7.09)
Compression ratio	14.0:1
Piston speed, m/min. (ft./min.)	648 (2126)
Main bearings: quantity, type	7, Precision Half-Shell
Rated rpm	1800
Max. power at rated rpm, kWm (BHP)	2180 (2923)
Cylinder head material	Cast Iron
Crankshaft material	Forged Steel
Governor type	Electronic
Frequency regulation, no-load to full-load	Isochronous
Frequency regulation, steady state	±0.25%
Frequency	Fixed
Air cleaner type, all models	Dry

Exhaust

Exhaust System	
Exhaust manifold type	Dry
Exhaust flow at rated kW, m ³ /min. (cfm)	544 (19209)
Exhaust temperature at rated kW, dry exhaust, °C (°F)	708 (1306)
Maximum allowable back pressure, kPa (in. Hg)	5.9 (1.7)
Exhaust outlet size at engine hookup, mm (in.)	See ADV drawing

Engine Electrical

Engine Electrical System		
Battery charging alternator:		
Ground (negative/positive)		Negative
Volts (DC)		24
Ampere rating		30
Starter motor rated voltage (DC)		Dual, 24
Battery, recommended cold cranking amps (CCA):		
Quantity, CCA rating each		Four, 1150
Battery voltage (DC)		12

Fuel

Fuel System	
Fuel supply line, min. ID, mm (in.)	25 (1.0)
Fuel return line, min. ID, mm (in.)	19 (0.75)
Max. lift, engine-driven fuel pump, m (ft.)	1.0 (3.0)
Max. fuel flow, Lph (gph)	660 (174)
Max. fuel pump restriction, kPa (in. Hg)	10 (3.0)
Fuel filter: quantity, type	4, Secondary
Recommended fuel	#2 Diesel

Lubrication

Lubricating System	
Type	Full Pressure
Oil pan capacity, L (qt.)	200 (211)
Oil pan capacity with filter, L (qt.)	230 (243)
Oil filter: quantity, type	4, Cartridge
Oil cooler	Water-Cooled

Application Data

Cooling

Radiator System	
Ambient temperature, °C (°F)	40 (104)
Engine jacket water capacity, L (gal.)	170 (44.9)
Radiator system capacity, including engine, L (gal.)	367 (96.9)
Engine jacket water flow, Lpm (gpm)	1850 (489)
Charge cooler water flow, Lpm (gpm)	920 (243)
Heat rejected to cooling water at rated kW, dry exhaust, kW (Btu/min.)	780 (44374)
Heat rejected to charge cooling air at rated kW, dry exhaust, kW (Btu/min.)	780 (44374)
Water pump type	Centrifugal
Fan diameter, including blades, mm (in.)	2057 (81)
Fan kWm (HP)	81 (109)
Max. restriction of cooling air, intake and discharge side of radiator, kPa (in. H ₂ O)	0.125 (0.5)

High Ambient Radiator System	
Ambient temperature, °C (°F)	50 (122)
Engine jacket water capacity, L (gal.)	170 (44.9)
Radiator system capacity, including engine, L (gal.)	386 (102)
Engine jacket water flow, Lpm (gpm)	1850 (489)
Charge cooler water flow, Lpm (gpm)	920 (243)
Heat rejected to charge cooling air at rated kW, dry exhaust, kW (Btu/min.)	780 (44374)
Heat rejected to charge cooling air at rated kW, dry exhaust, kW (Btu/min.)	780 (44374)
Water pump type	Centrifugal
Fan diameter, including blades, mm (in.)	2362 (93)
Fan kWm (HP)	63 (84)
Max. restriction of cooling air, intake and discharge side of radiator, kPa (in. H ₂ O)	0.125 (0.5)

Remote Radiator System*	
Exhaust manifold type	Dry
Connection sizes:	
Jacket water engine inlet, mm (in.)	95 (3.75)
Jacket water engine outlet, mm (in.)	95 (3.75)
Intercooler water engine inlet, mm (in.)	83 (3.25)
Intercooler water engine outlet, mm (in.)	70 (2.75)
Static head allowable above engine, kPa (ft. H ₂ O)	98 (32.8)

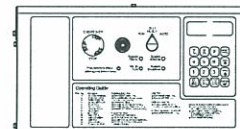
* Contact your local distributor for cooling system options and specifications based on your specific requirements.

Operation Requirements

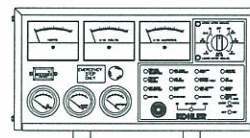
Air Requirements	
Radiator-cooled cooling air, m ³ /min. (scfm)†	2112 (74600)
High ambient radiator-cooled cooling air, m ³ /min. (scfm)†	2532 (89400)
Cooling air required for generator set when equipped with city water cooling or remote radiator, based on 14°C (25°F) rise, m ³ /min. (scfm)†	991 (35100)
Combustion air, m ³ /min. (cfm)	206 (7274)
Heat rejected to ambient air:	
Engine, kW (Btu/min.)	180 (10240)
Alternator, kW (Btu/min.)	97 (5516)
† Air density = 1.20 kg/m ³ (0.075 lbm/ft ³)	

Fuel Consumption	
Diesel, Lph (gph) at % load	Standby Rating
100%	606 (160.1)
75%	442 (116.8)
50%	299 (79.0)
25%	164 (43.2)
Diesel, Lph (gph) at % load	Prime Rating
100%	536 (141.6)
75%	403 (106.6)
50%	271 (71.6)
25%	154 (40.6)

Controllers



Decision-Maker™ 550 Controller
 Audiovisual annunciation with NFPA 110 Level 1 capability. Programmable microprocessor logic and digital display features. Alternator safeguard circuit protection. 12- or 24-volt engine electrical system capability. Remote start, remote annunciation, and remote communication options. Refer to G6-46 for additional controller features and accessories.



Decision-Maker™ 3+, 16-Light Controller
 Audiovisual annunciation with NFPA 110 Level 1 capability. Microprocessor logic, AC meters, and engine gauge features. 12- or 24-volt engine electrical system capability. Remote start, prime power, and remote annunciation options. Refer to G6-30 for additional controller features and accessories.

Additional Standard Features

- Alternator Protection
- Oil Drain Extension
- Operation and Installation Literature

Available Accessories

Open Unit

- Exhaust Silencer, Hospital (kit: PA-361627)
- Exhaust Silencer, Critical (kit: PA-361625)
- Flexible Exhaust Connector, Stainless Steel

Cooling System

- Block Heater
 [recommended for ambient temperatures below 20°C (68°F)]

Fuel System

- Flexible Fuel Lines
- Fuel Pressure Gauge

Electrical System

- Battery
- Battery Charger, Equalize/Float Type
- Battery Heater
- Battery Rack and Cables

Engine and Alternator

- Air Cleaner, Heavy Duty
- Air Cleaner Restriction Indicator
- Alternator Strip Heater
- Bus Bar Kits (standard on 7M alternators, 380-600 volt only)
- Crankcase Emissions Canister
- Fuel/Water Separator
- Line Circuit Breaker (NEMA type 1 enclosure)
- Line Circuit Breaker with Shunt Trip (NEMA type 1 enclosure)
- Oil Temperature Gauge
- Rated Power Factor Testing
- Spring Isolators

Paralleling System

- Load-Sharing Module
- Voltage Adjustment Control (manual)

Maintenance

- General Maintenance Literature Kit
- Maintenance Kit (includes air, oil, and fuel filters)
- NFPA 110 Literature
- Overhaul Literature Kit
- Production Literature Kit

Controller

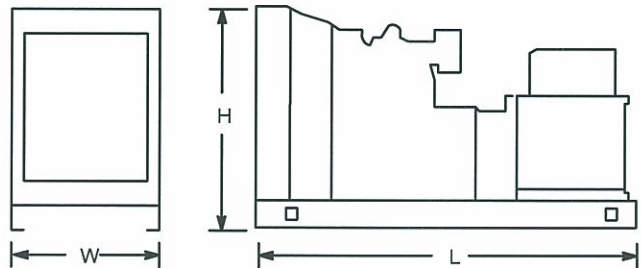
- Common Failure Relay Kit
- Communication Products and PC Software
- Customer Connection Kit
- Dry Contact Kit (isolated alarm)
- Remote Annunciator Panel
- Remote Audiovisual Alarm Panel
- Remote Emergency Stop Kit
- Remote Mounting Cable
- Run Relay Kit

Miscellaneous Accessories

- _____
- _____
- _____
- _____
- _____
- _____
- _____
- _____

Dimensions and Weights

Overall Size, max., L x W x H, mm (in.): 6445 x 2766 x 3091
 (253.7 x 108.9 x 121.7)
 Weight (radiator model), wet, kg (lb.): 15876 (35000)



Note: This drawing is provided for reference only and should not be used for planning the installation. Contact your local distributor for more detailed information.

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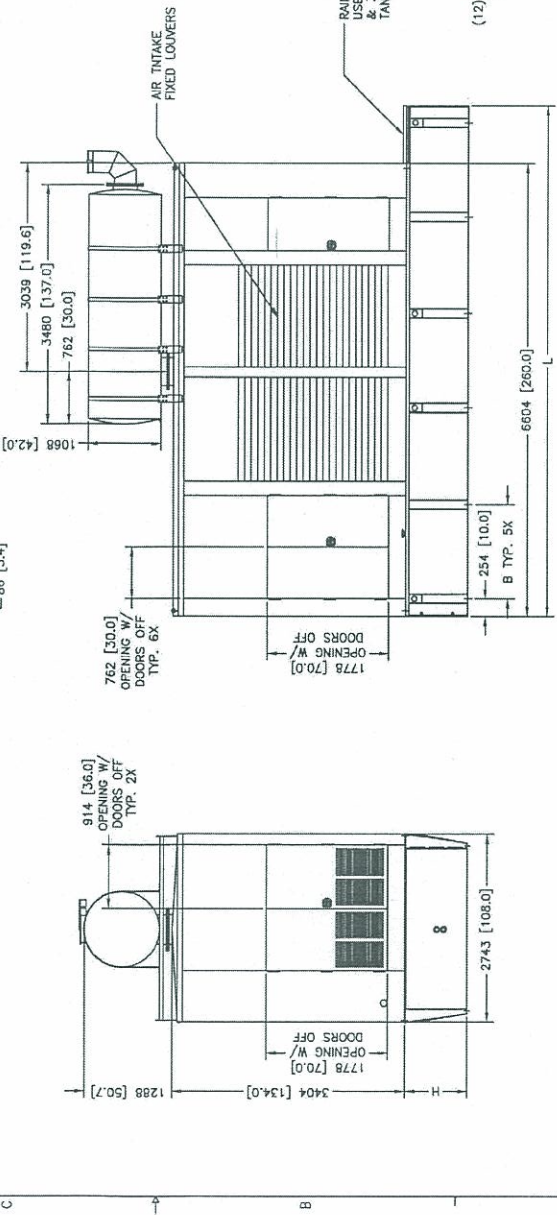
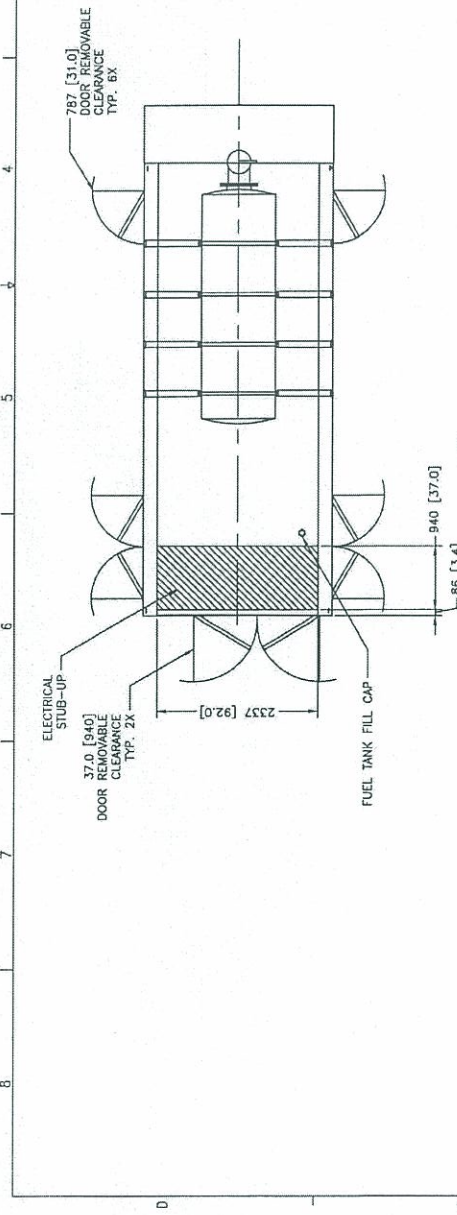
REV	DATE	REVISION
1	5-23-02	NEW DRAWING (D1300)
2	7-23-02	REVISED (S.A.) OVER/REWORK
3	7-23-02	CHART MOD. (D-3) WEIGHT CALCULATION NOTE REVISED.
4	7-23-02	REVISED (S.A.) OVER/REWORK
5	7-23-02	REVISED (S.A.) OVER/REWORK
6	7-23-02	REVISED (S.A.) OVER/REWORK
7	7-23-02	REVISED (S.A.) OVER/REWORK
8	7-23-02	REVISED (S.A.) OVER/REWORK
9	7-23-02	REVISED (S.A.) OVER/REWORK
10	7-23-02	REVISED (S.A.) OVER/REWORK

NOTE: W4 X 13 BEAMS REQUIRED AT SAME MOUNTING LOCATION AS TANK FOR FLORIDA DEPARTMENT OF ENVIRONMENTAL RESOURCES MANAGEMENT.

FOR ESTIMATED TOTAL PACKAGE WEIGHT ADD THE FOLLOWING ITEMS:

HOUSING WEIGHT = 2007KG [4600LBS]
 APPROXIMATE GENSET WEIGHT (WET) (SEE CHART C) = _____
 TANK WEIGHT (DRY) (SEE CHART A) = _____
 SILENCER WEIGHT = 513KG [1130LBS]

ESTIMATED TOTAL WEIGHT = _____



METRIC CAD FILE

DIMENSIONS IN [] ARE INCH EQUIVALENT

TANK INFORMATION (CHART A)				GENSET WEIGHT (WET) (CHART C)			
GALLONS	B. DIM.	H. DIM.	L. DIM.	GENSET MODEL	APPROX. WEIGHT	APPROX. WEIGHT	APPROX. WEIGHT
1400	1219.2 [48.0]	203 [8.0]	6604 [260.0]	1757KG [3830LBS]	1564KG [3450LBS]	1564KG [3450LBS]	1564KG [3450LBS]
1600	1219.2 [48.0]	508 [20.0]	6604 [260.0]	2721KG [6000LBS]	1564KG [3450LBS]	1564KG [3450LBS]	1564KG [3450LBS]
2800	1219.2 [48.0]	589 [22.0]	6604 [260.0]	2812KG [6200LBS]	1564KG [3450LBS]	1564KG [3450LBS]	1564KG [3450LBS]
3200	1239.5 [48.8]	914 [36.0]	6705 [264.0]	3538KG [7800LBS]	1564KG [3450LBS]	1564KG [3450LBS]	1564KG [3450LBS]
1600 (NYC)	1192.0 [44.8]	914 [36.0]	7468 [294.0]	3637KG [8060LBS]	1564KG [3450LBS]	1564KG [3450LBS]	1564KG [3450LBS]
				3175KG [7000LBS]			

MADE IN U.S.A. BY KOHLER CO. 1000 N. CENTRAL AVENUE, MILWAUKEE, WI 53212, U.S.A. TEL: 414-774-4000 FAX: 414-774-4001

GENSET MODEL: 1820, 2000, 2800, 3200

WEATHER ENCLOSURE AND SILENCER W/SUB BASE TANK OPTION 1820/2000 1BY 4000 SERIES DCC 1820/2000 400 COOLING SYSTEM

DATE: 5-11-02

BY: [Signature]

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NO. ADV-6752

STATEMENT OF PROBABLE CONSTRUCTION COST

The Statement of probable Construction Cost is the engineer's opinion of electrical construction cost for each Option that is presented in this study. The estimated electrical construction cost for each Option is shown in detail in the following pages. A summary of the estimated electrical construction cost are as follows:

Option "A"	\$2,000,000.
Option "B"	\$7,500,000.
Option "C"	\$8,200,000.

UNIVERSITY RIVERSIDE AT CALIFORNIA
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For Various Buildings
UCR #958993-2
JMD #06-0502

Option "A"

Description of Work	Units	Quantity	Materials	Labor	Extension
Mobilization	LOT	1	\$ -	\$ 12,000.00	\$ 12,000.00
2000 KW diesel generator					
Weatherproof sound shield enclosure					
5000 gallon fuel tank	LOT	1	\$ 636,210.00	\$ 26,700.00	\$ 662,910.00
Critical silencer					
Partiulate Filter					
15KV Automatic Transfer Switch	EA	1	\$ 179,000.00	\$ 10,140.00	\$ 189,140.00
5" PVC Conduit	LF	1250	\$ 2.35	\$ 2.58	\$ 6,162.50
#250 Kcmil, 15KV	LF	2400	\$ 9.70	\$ 2.10	\$ 28,320.00
#500 Kcmil, 15KV	LF	3000	\$ 15.10	\$ 2.80	\$ 53,700.00
#1/0 Conductor	LF	3600	\$ 2.30	\$ 1.02	\$ 11,952.00
#350 Kcmil 600V	LF	2000	\$ 6.90	\$ 1.87	\$ 17,540.00
#2 600V	LF	3000	\$ 1.50	\$ 0.75	\$ 6,750.00
#4/0 600V	LF	500	\$ 4.35	\$ 1.53	\$ 2,940.00
#6 600V	LF	1000	\$ 0.68	\$ 0.52	\$ 1,200.00
#8 600V	LF	300	\$ 0.45	\$ 0.42	\$ 261.00
#1 600V	LF	500	\$ 2.00	\$ 0.84	\$ 1,420.00
3' x 5' x 3' intercept pull box	EA	2	\$ 695.00	\$ 600.00	\$ 2,590.00
2' x 3' x 3' intercept pull box	EA	1	\$ 268.00	\$ 408.50	\$ 676.50
New 15KV Load Interruptor Switch	EA	1	\$ 20,000.00	\$ 2,575.00	\$ 22,575.00
600 Amp Main Circuit Breaker for CLHV	EA	1	\$ 4,150.00	\$ 210.00	\$ 4,360.00
3" Rigid Conduit	EA	300	\$ 18.85	\$ 13.45	\$ 9,690.00
3" PVC Conduit	LF	200	\$ 1.03	\$ 1.68	\$ 542.00
4" PVC Conduit	LF	300	\$ 1.48	\$ 2.10	\$ 1,074.00
2" PVC Conduit	LF	900	\$ 0.75	\$ 1.40	\$ 1,935.00
600 Amp W.P. Distriution Board	EA	1	\$ 4,675.00	\$ 2,100.00	\$ 6,775.00
225 Amp Circuit Breaker	EA	2	\$ 535.00	\$ 105.00	\$ 1,280.00
100 Amp Circuit Breaker	EA	8	\$ 535.00	\$ 84.00	\$ 4,952.00
Demolition of Substation "APEP" and A.C, Paving	LOT	1	\$ -	\$ 20,000.00	\$ 20,000.00
Structural Generator and Switchgear Pad	LOT	1	\$ 45,000.00	\$ 10,000.00	\$ 55,000.00
Temporary Generator Rental for Batchelor Hall	LOT	2	\$ -	\$ 4,600.00	\$ 9,200.00
Connect Batchelor Subs for Operation @12KV	LOT	2	\$ -	\$ 4,000.00	\$ 8,000.00
High Voltage fuses for Batchelor Hall Subs	EA	6	\$ 1,500.00	\$ 160.00	\$ 9,960.00
High Voltage demolition of switch and conductors	LOT	1	\$ -	\$ 12,000.00	\$ 12,000.00
High Voltage termination	EA	33	\$ 205.00	\$ 73.00	\$ 9,174.00
High Connectors, Reconnectable Type	EA	9	\$ 250.00	\$ 260.00	\$ 4,590.00
Concrete encasement	LOT	1	\$ -	\$ 6,000.00	\$ 6,000.00
Trench & Backfill	LF	500	\$ -	\$ 12.00	\$ 6,000.00
A.C. Patch	LF	500	\$ 2.50	\$ 3.50	\$ 3,000.00
					\$ -
Miscellaneous fittings	LOT	1	\$ 21,134.17		\$ 21,134.17
Subtotal					\$ 1,214,803
Sales Tax 8.5%					\$ 73,653
Subtotal					\$ 1,288,456
25% Contingency					\$ 322,114
Subtotal					\$ 1,610,571
20% Overhead and Profit					\$ 322,114
Subtotal					\$ 1,932,685
CALL IT					\$ 2,000,000

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Option "B"

Description of Work	Units	Quantity	Materials	Labor	Extension
Mobilization	LOT	1	\$ -	\$ 24,000.00	\$ 24,000.00
2000 KW diesel generator	LOT	3	\$ 595,915.00	\$ 17,877.45	\$ 1,841,377.35
Standard weatherproof Protective enclosure					
Critical silencer					
12,000 gal above concrete fuel tank	LOT	1	\$ 103,650.00	\$ 6,229.00	\$ 109,879.00
Diesel fuel piping	LOT	1	\$ 6,000.00	\$ 8,000.00	\$ 14,000.00
15KV Parallelling Switchgear & Auto Transfer Switch	LOT	1	\$ 575,000.00	\$ 24,250.00	\$ 599,250.00
5" PVC Conduit	LF	1250	\$ 2.35	\$ 2.58	\$ 6,162.50
#250 Kcmil, 15KV	LF	2400	\$ 9.70	\$ 2.10	\$ 28,320.00
#500 Kcmil, 15KV	LF	3000	\$ 15.10	\$ 2.80	\$ 53,700.00
#1/0 Conductor	LF	3600	\$ 2.30	\$ 1.02	\$ 11,952.00
#350 Kcmil 600V	LF	2000	\$ 6.90	\$ 1.87	\$ 17,540.00
#2 600V	LF	3000	\$ 1.50	\$ 0.75	\$ 6,750.00
#4/0 600V	LF	500	\$ 4.35	\$ 1.53	\$ 2,940.00
#6 600V	LF	1000	\$ 0.68	\$ 0.52	\$ 1,200.00
#8 600V	LF	300	\$ 0.45	\$ 0.42	\$ 261.00
#1 600V	LF	500	\$ 2.00	\$ 0.84	\$ 1,420.00
3' x 5' x 3' intercept pull box	EA	2	\$ 695.00	\$ 600.00	\$ 2,590.00
2' x 3' x 3' intercept pull box	EA	1	\$ 268.00	\$ 408.50	\$ 676.50
New 15KV Load Interruptor Switch	EA	1	\$ 20,000.00	\$ 2,575.00	\$ 22,575.00
600 Amp Main Circuit Breaker for CLHV	EA	1	\$ 4,150.00	\$ 210.00	\$ 4,360.00
3" Rigid Conduit	EA	300	\$ 18.85	\$ 13.45	\$ 9,690.00
3" PVC Conduit	LF	200	\$ 1.03	\$ 1.68	\$ 542.00
4" PVC Conduit	LF	300	\$ 1.48	\$ 2.10	\$ 1,074.00
2" PVC Conduit	LF	900	\$ 0.75	\$ 1.40	\$ 1,935.00
600 Amp W.P. Distriution Board	EA	1	\$ 4,675.00	\$ 2,100.00	\$ 6,775.00
225 Amp Circuit Breaker	EA	2	\$ 535.00	\$ 105.00	\$ 1,280.00
100 Amp Circuit Breaker	EA	8	\$ 535.00	\$ 84.00	\$ 4,952.00
Demolition of Substation "APEP" and A.C, Paving	LOT	1	\$ -	\$ 20,000.00	\$ 20,000.00
Structural Generator and Switchgear Pad	LOT	1	\$ 190,000.00	\$ 60,000.00	\$ 250,000.00
Temporary Generator Rental	LOT	4	\$ -	\$ 4,600.00	\$ 18,400.00
Connect Batchelor Subs for Operation @12KV	LOT	2	\$ -	\$ 4,000.00	\$ 8,000.00
High Voltage fuses for Batchelor Hall Subs	EA	6	\$ 1,500.00	\$ 160.00	\$ 9,960.00
High Voltage demolition of switch and conductors	LOT	1	\$ -	\$ 12,000.00	\$ 12,000.00
High Voltage termination	EA	33	\$ 205.00	\$ 73.00	\$ 9,174.00
High Connectors, Reconnectable Type	EA	9	\$ 250.00	\$ 260.00	\$ 4,590.00
Concrete encasement	LOT	1	\$ -	\$ 6,000.00	\$ 6,000.00
Trench & Backfill	LF	3,000	\$ -	\$ 12.00	\$ 36,000.00
A.C. Patch	LF	800	\$ 2.50	\$ 3.50	\$ 4,800.00
Manhole/wall conduit penetration	EA	22	\$ -	\$ 300.00	\$ 6,600.00
1000 KVA Pad Mount Transformer	EA	2	\$ 26,100.00	\$ 4,265.00	\$ 60,730.00
1500 KVA Pad Mount Transformer	EA	1	\$ 33,000.00	\$ 49,150.00	\$ 82,150.00
5" PVC Conduit	LF	7,200	\$ 2.35	\$ 2.58	\$ 35,496.00
500Kcmil, 15KV	LF	12,600	\$ 15.10	\$ 2.80	\$ 225,540.00
250 Kcmil, 15KV	LF	65,000	\$ 9.70	\$ 2.10	\$ 767,000.00
#1/0 Conductor	LF	1,500	\$ 6.90	\$ 1.87	\$ 13,155.00
Load Control Conductors	LF	22,800	\$ 0.15	\$ 0.34	\$ 11,172.00
Shunt Trip Operators	EA	5	\$ 6,000.00	\$ 2,000.00	\$ 40,000.00
Underground Vault	EA	1	\$ 4,800.00	\$ 3,000.00	\$ 7,800.00
15 KV Terminations	EA	42	\$ 205.00	\$ 73.00	\$ 11,676.00
High Connectors, Reconnectable Type	EA	24	\$ 250.00	\$ 260.00	\$ 12,240.00
			\$ -	\$ -	\$ -

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Option "B"

Description of Work	Units	Quantity	Materials	Labor	Extension
			\$ -	\$ -	\$ -
			\$ -	\$ -	\$ -
			\$ -	\$ -	\$ -
			\$ -	\$ -	\$ -
			\$ -	\$ -	\$ -
			\$ -	\$ -	\$ -
			\$ -	\$ -	\$ -
Miscellaneous fittings	LOT	1	\$ 76,690.00	\$ -	\$ 76,690.00
Subtotal					\$ 4,504,374
Sales Tax 8.5%					\$ 330,655
Subtotal					\$ 4,835,029
25% Contingency					\$ 1,208,757
Subtotal					\$ 6,043,787
20% Overhead and Profit					\$ 1,208,757
Subtotal					\$ 7,252,544
Generator System for Glasshouse/Headhouse 1-3					\$ 138,000
Generator System for Environment Health & Safety					\$ 108,000
Subtotal					\$ 7,498,544
CALL IT					\$ 7,500,000.00

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Option "C"

Description of Work	Units	Quantity	Materials	Labor	Extension
Mobilization	LOT	1	\$ -	\$ 24,000.00	\$ 24,000.00
2000 KW diesel generator	LOT	3	\$ 595,915.00	\$ 17,877.45	\$ 1,841,377.35
Standard weatherproof Protective enclosure					
Critical silencer					
12,000 gal above concrete fuel tank	LOT	1	\$ 103,650.00	\$ 6,229.00	\$ 109,879.00
Diesel fuel piping	LOT	1	\$ 6,000.00	\$ 8,000.00	\$ 14,000.00
15KV Parallelling Switchgear & Auto Transfer Switch	LOT	1	\$ 575,000.00	\$ 24,250.00	\$ 599,250.00
5" PVC Conduit	LF	1250	\$ 2.35	\$ 2.58	\$ 6,162.50
#250 Kcmil, 15KV	LF	2400	\$ 9.70	\$ 2.10	\$ 28,320.00
#500 Kcmil, 15KV	LF	3000	\$ 15.10	\$ 2.80	\$ 53,700.00
#1/0 Conductor	LF	3600	\$ 2.30	\$ 1.02	\$ 11,952.00
#350 Kcmil 600V	LF	2000	\$ 6.90	\$ 1.87	\$ 17,540.00
#2 600V	LF	3000	\$ 1.50	\$ 0.75	\$ 6,750.00
#4/0 600V	LF	500	\$ 4.35	\$ 1.53	\$ 2,940.00
#6 600V	LF	1000	\$ 0.68	\$ 0.52	\$ 1,200.00
#8 600V	LF	300	\$ 0.45	\$ 0.42	\$ 261.00
#1 600V	LF	500	\$ 2.00	\$ 0.84	\$ 1,420.00
3' x 5' x 3' intercept pull box	EA	2	\$ 695.00	\$ 600.00	\$ 2,590.00
2' x 3' x 3' intercept pull box	EA	1	\$ 268.00	\$ 408.50	\$ 676.50
New 15KV Load Interruptor Switch	EA	1	\$ 20,000.00	\$ 2,575.00	\$ 22,575.00
600 Amp Main Circuit Breaker for CLHV	EA	1	\$ 4,150.00	\$ 210.00	\$ 4,360.00
3" Rigid Conduit	EA	300	\$ 18.85	\$ 13.45	\$ 9,690.00
3" PVC Conduit	LF	200	\$ 1.03	\$ 1.68	\$ 542.00
4" PVC Conduit	LF	300	\$ 1.48	\$ 2.10	\$ 1,074.00
2" PVC Conduit	LF	900	\$ 0.75	\$ 1.40	\$ 1,935.00
600 Amp W.P. Distriution Board	EA	1	\$ 4,675.00	\$ 2,100.00	\$ 6,775.00
225 Amp Circuit Breaker	EA	2	\$ 535.00	\$ 105.00	\$ 1,280.00
100 Amp Circuit Breaker	EA	8	\$ 535.00	\$ 84.00	\$ 4,952.00
Demolition of Substation "APEP" and A.C, Paving	LOT	1	\$ -	\$ 20,000.00	\$ 20,000.00
Structural Generator and Switchgear Pad	LOT	1	\$ 190,000.00	\$ 60,000.00	\$ 250,000.00
Temporary Generator Rental	LOT	4	\$ -	\$ 4,600.00	\$ 18,400.00
Connect Batchelor Subs for Operation @12KV	LOT	2	\$ -	\$ 4,000.00	\$ 8,000.00
High Voltage fuses for Batchelor Hall Subs	EA	6	\$ 1,500.00	\$ 160.00	\$ 9,960.00
High Voltage demolition of switch and conductors	LOT	1	\$ -	\$ 12,000.00	\$ 12,000.00
High Voltage termination	EA	33	\$ 205.00	\$ 73.00	\$ 9,174.00
High Connectors, Reconnectable Type	EA	9	\$ 250.00	\$ 260.00	\$ 4,590.00
Concrete encasement	LOT	1	\$ -	\$ 6,000.00	\$ 6,000.00
Trench & Backfill	LF	3,000	\$ -	\$ 12.00	\$ 36,000.00
A.C. Patch	LF	800	\$ 2.50	\$ 3.50	\$ 4,800.00
Manhole/wall conduit penetration	EA	22		\$ 300.00	\$ 6,600.00
1000 KVA Pad Mount Transformer	EA	2	\$ 26,100.00	\$ 4,265.00	\$ 60,730.00
1500 KVA Pad Mount Transformer	EA	1	\$ 33,000.00	\$ 49,150.00	\$ 82,150.00
5" PVC Conduit	LF	7,200	\$ 2.35	\$ 2.58	\$ 35,496.00
500Kcmil, 15KV	LF	30,000	\$ 15.10	\$ 2.80	\$ 537,000.00
250 Kcmil, 15KV	LF	65,000	\$ 9.70	\$ 2.10	\$ 767,000.00
#1/0 Conductor	LF	10,200	\$ 6.90	\$ 1.87	\$ 89,454.00
Load Control Conductors	LF	22,800	\$ 0.15	\$ 0.34	\$ 11,172.00
Shunt Trip Operators	EA	5	\$ 6,000.00	\$ 2,000.00	\$ 40,000.00
Underground Vault	EA	1	\$ 4,800.00	\$ 3,000.00	\$ 7,800.00
15 KV Terminations	EA	42	\$ 205.00	\$ 73.00	\$ 11,676.00
High Connectors, Reconnectable Type	EA	24	\$ 250.00	\$ 260.00	\$ 12,240.00
			\$ -	\$ -	\$ -

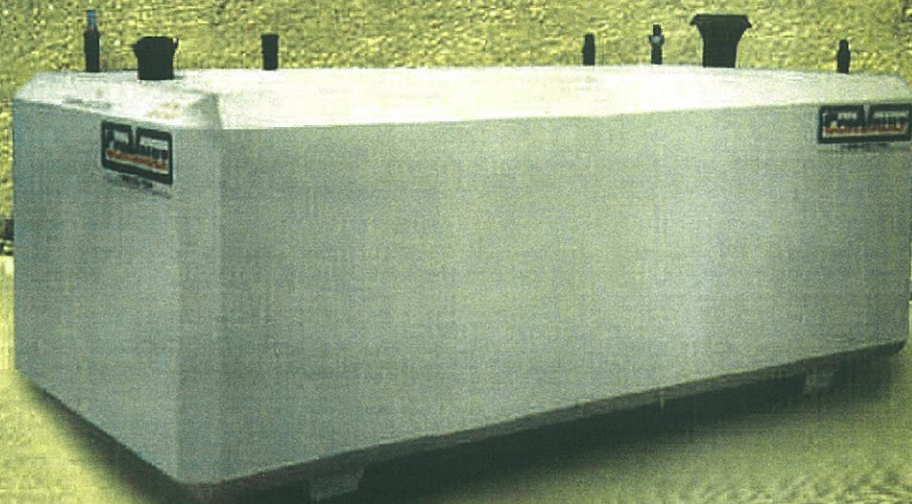
UNIVERSITY RIVERSIDE AT CALIFORNIA
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Option "C"

Description of Work	Units	Quantity	Materials	Labor	Extension
			\$ -	\$ -	\$ -
			\$ -	\$ -	\$ -
			\$ -	\$ -	\$ -
			\$ -	\$ -	\$ -
			\$ -	\$ -	\$ -
			\$ -	\$ -	\$ -
Miscellaneous fittings	LOT	1	\$ 76,690.00	\$ -	\$ 76,690.00
Subtotal					\$ 4,892,133
Sales Tax 8.5%					\$ 358,091
Subtotal					\$ 5,250,224
25% Contingency					\$ 1,312,556
Subtotal					\$ 6,562,780
20% Overhead and Profit					\$ 1,312,556
Subtotal					\$ 7,875,336
Generator System for Glasshouse/Headhouse 1-3					\$ 138,000
Generator System for Environment Health & Safety					\$ 108,000
Subtotal					\$ 8,121,336
CALL IT					\$ 8,200,000.00



The Safest Fuel Storage on the Planet



Built to stand the test of time...

The Aboveground Solution to the Underground Problem

Interest in the preservation of our environment has prompted all levels of many governments to issue strict guidelines for the installation, operation and removal of underground storage tanks (UST's). As a result, owners and operators are faced with tedious and complicated rules and paperwork. They may also be faced with expensive upgrades, purchase of monitoring equipment, testing, and obtaining pollution liability insurance to comply with these requirements. In the event of a leak, the actual costs for soil and groundwater clean-up can be catastrophic. As aboveground storage tanks (AST's) replace UST's on a more regular basis, strict guidelines are being issued for AST's as well. ConVault's innovative Protected AST's are the proven solution for these problems.



Engineered for Safety

ConVault Protected AST's are engineered to survive in the real world. Utilizing patented manufacturing procedures, the resulting product is a tank for flammable liquids seamlessly encapsulated in six-inch thick concrete with integral secondary containment, thermal stability, vehicle impact protection, and projectile protection. The system contains no cold joints or heat transfer points on the bottom or the sides.

ConVault primary steel tanks (including spill containment basins) are fabricated in accordance with UL 142 (Seventh Edition). Each unit is pressure tested twice at the factory using ConVault patented processes to insure proper performance in the field. ConVault Protected AST's are shop-fabricated under strict quality controls in accordance with UL 2085 and ULC-S655 and ULC-S602 for Protected Tanks. Primary and secondary containment are independently tested at the plant in accordance with UL and ULC requirements.



The ConVault Protected AST is listed in accordance with UL 2085, ULC-S655, and ULC-S602 Insulated/Secondary Containment for Aboveground Storage Tanks, Protected Type.

The six-inch thick (6") concrete exterior acts as a thermal mass reducing temperature variations, provides a non-corrosive, durable exterior, and provides protection for the secondary containment.

The ConVault Protected AST system has passed numerous performance tests including 2-hour liquid-pool and furnace fire tests, vehicle impact test and projectile-resistance test. Numerous real-life events have also proven the safety of the system. The end result: owners and operators of ConVault Protected AST's are provided with PEACE OF MIND.



Meets Government, Environmental and Fire Safety Regulations

Each ConVault Protected AST is exhaustively production-tested at the factory before shipment to its destination. ConVault Protected AST's meet NFPA 30, 30A and 31; UFC, BOCA, SBCCI, and International Fire Code fire safety requirements and provide grounding connections in accordance with NFPA 780. ConVault Protected AST's have been approved by environmental and fire protection officials in all states of Australia, all provinces of Canada, all states of the USA, and by government officials of the Czech Republic, England, Finland, Germany, Poland, Russia, and Slovakia.



The California Air Resources Board has certified ConVault Protected AST's for Phase I and II balanced vapor recovery, including methanol/ethanol blends. ConVault Protected AST's meet all safety requirements for primary and secondary containment, leak monitoring, spill containment and overfill protection. Specific jurisdictions may have special requirements for tank accessories. Contact your local representative for local regulations.

With the first installation in 1986, over 27,000 tanks are now in service at extremely diverse locations in over 20 different countries without a single reported system failure to-date! It is this historical performance that has been the cornerstone of regulatory comfort with the ConVault protected AST product.

Designed for Value

The ConVault Protected AST system will provide ongoing value for fuel storage. More stringent regulations are consistently on the horizon; however, with a ConVault Protected AST the need for updating is greatly reduced. ConVault operating costs are substantially lower than virtually any other AST on the market. The concrete exterior provides protection for the secondary containment, and acts as a thermal mass, reducing temperature variations (which reduces fuel vapor loss and water vapor gain), while providing a non-corrosive, durable exterior.

To meet your fuel storage needs, ConVault Protected AST's are manufactured in sizes ranging from 125 to 12,000 US gallons, or 500 to 45 000 liters (including multi-compartment options). ConVault AST's have a 20 or 30-year warranty. ConVault Protected AST's are produced at manufacturing sites around the world. The unit is shipped as a finished assembly, normally limiting the need for major on-site work to providing a concrete pad and electrical service. Although the units are intended for stationary service, in the event of changing requirements they can be moved and reinstalled. ConVault Protected AST's are thus an asset, compared to UST's or "tanks in dikes" which are usually considered a liability.



Always consult local fire and building codes before installing a ConVault Protected AST since environmental and fire safety regulations can vary between jurisdictions.

To find out more about ConVault products, please visit the web site at <http://www.convault.com>, inquire by email to info@convault.com, or call 209-632-7571 (800-222-7099 in the USA) for the ConVault representative nearest you.

US Measurements					Metric Measurements				
ConVault Size Gallons	Weight Pounds	A (Length) ft. & in.	B (Width) ft. & in.	C (Height) ft. & in.	ConVault Size Liters	Weight kg	A (Length) mm	B (Width) mm	C (Height) mm
125	6,200	4' 0.5"	4' 0.5"	3' 11"	1 000	4 000	2 350	1 150	1 100
250	8,000	7' 8"	3' 9.5"	3' 3"	2 000	6 000	3 300	1 450	1 100
500	12,000	11' 0"	4' 6"	3' 4"	4 000	9 000	3 300	1 750	1 450
1,000	18,000	11' 0"	5' 8"	4' 4"	6 000	12 000	3 400	2 400	1 500
2,000	30,000	11' 3"	8' 0"	5' 6"	8 000	13 500	3 400	2 400	1 800
3,000 LP	36,000	11' 3"	8' 0"	7' 3.5"	12 000	18 000	4 900	2 400	1 800
4,000 LP	44,000	17' 7"	8' 0"	6' 5.25"	16 000 LP	22 000	5 800	2 400	1 950
4,000 DW	44,000	12' 2"	8' 0"	8' 9"	16 000 HP	20 000	4 050	2 400	2 650
5,200 HP	47,000	15' 6"	8' 0"	8' 9"	20 000 LP	21 000	7 150	2 400	1 950
6,000 HP	60,000	17' 7"	8' 0"	8' 9.25"	20 000 HP	24 000	4 950	2 400	2 650
8,000 HP	72,000	23' 1"	8' 0"	8' 9.25"	22 000	25 000	5 400	2 400	2 650
10,000 HP	87,000	28' 7"	8' 0"	8' 9.25"	25 000	28 000	6 100	2 400	2 650
12,000 HP	101,000	34' 1"	8' 0"	8' 9.25"	30 000	34 000	7 250	2 400	2 650
					35 000	41 000	9 100	2 400	2 650
					45 000	46 000	10 700	2 400	2 650

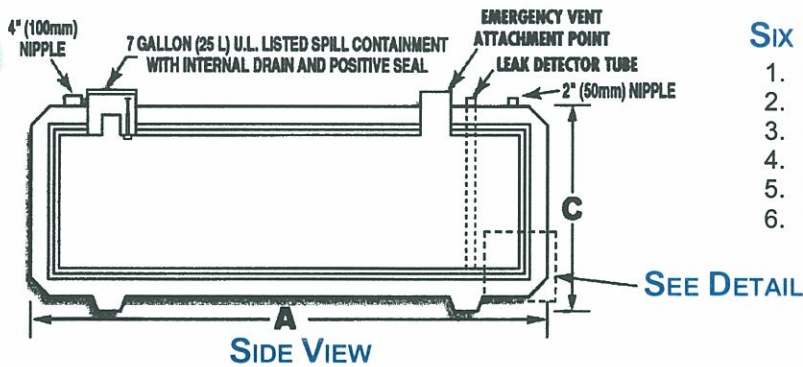
Cylindrical			
Size Gallons	Weight Pounds	Diameter ft. & in.	Length ft. & in.
4,000 Cyl	46,000	9' 4.5"	11' 11"
5,200 Cyl	52,000	9' 4.5"	15' 1.5"
6,000 Cyl	60,000	9' 4.5"	17' 3"
8,000 Cyl	72,000	9' 4.5"	22' 7"
10,000 Cyl	80,000*	9' 4.5"	27' 11"
12,000 Cyl	90,000*	9' 4.5"	33' 3"

* If "lightweight Concrete is used."

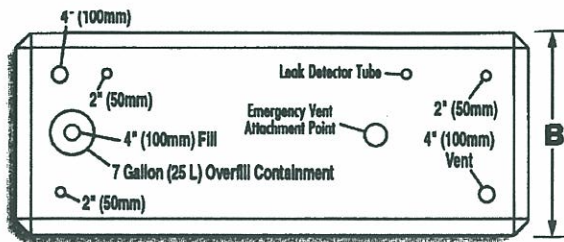
Most units are also available as a split unit in several configurations.

Caution! All sizes are not available from all manufacturing plants. Shape, dimensions, and weights may vary between manufacturing plants. Other sizes not listed may be available.

Check with your local representative.



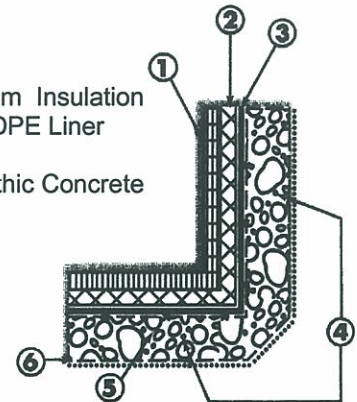
SIDE VIEW



TOP VIEW

SIX STEP PROCESS

1. Steel Tank
2. 1/4" (6mm) Styrofoam Insulation
3. 30 Mil. (0.76mm) HDPE Liner
4. 1/2" (12mm) Rebar
5. 6" (105mm) Monolithic Concrete
6. Finish



DETAIL

U.S. PATENT #4,826,644; #4,931,235;
#4,934,122; #4,963,082; #4,986,436;
#5,064,155; #5,157,888; #5,174,079;
#5,234,191; #5,126,095



(OTHER U.S. & FOREIGN PATENTS PENDING)



CORPORATE OFFICES
4109 ZEERING ROAD
DANAIR, CALIFORNIA 95316

(209) 632-7571
OR 1-800-222-7099 IN THE USA
WWW.CONVAULT.COM
INFO@CONVAULT.COM



General Description

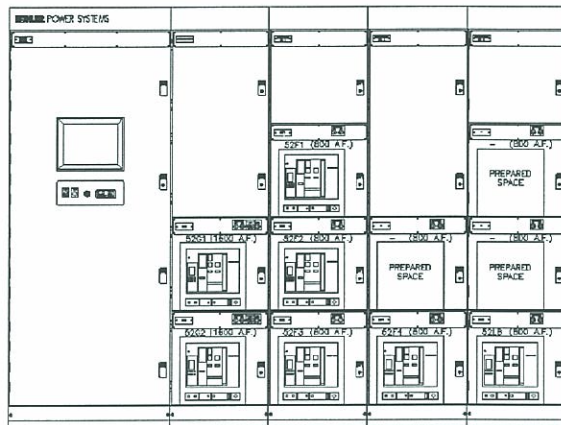
Integrating the operation of onsite generators, utility services, automatic transfer switches, generator controls, and distribution equipment into a fully functioning system requires the engineering expertise and dedication to quality that is Kohler paralleling switchgear.

Kohler's PD series digital paralleling switchgear provides an industry-leading platform for command and control of multiple power sources. Designed to be integrated with Kohler generator sets or combined with other major brands of generation equipment, the PD series delivers outstanding reliability along with the most intuitive user interface in the industry.

The PD series is extremely flexible. Incorporating Kohler's patented mode configuration technology, the owner may select from a variety of operational parameters and sequences without any additional cost. In addition to the digital control interface, the PD series may be constructed with any of the more traditional metering, control, and other component requirements based on an engineer's or owner's preferences (see ED options).

The PD Series paralleling controls are available in:

- PD-200: UL 891 listed and labeled switchboard
- PD-300: UL 1558 listed and labeled switchgear
- PD-400: UL listed and labeled medium voltage switchgear



Typical PD-300 Switchgear

Standard Features

- 15 in. color graphical user interface (touch screen), Windows® CE-based
- Digital real (kW) and reactive (kVAR) load sharing
- Digital synchronizer
- User-definable generator management
- User-definable load add/shed control
- Modbus RS485 and TCP/IP communications connections
- Internal web server
- Complete system metering, annunciation, settings, and control functions through touch screen
- Event monitoring and logging
- Power trend measurements

Available Applications

- Emergency standby
- Prime power
- Base load (peak shave)
- Import/export mode (peak shave)
- Isolate (interruptible rate)

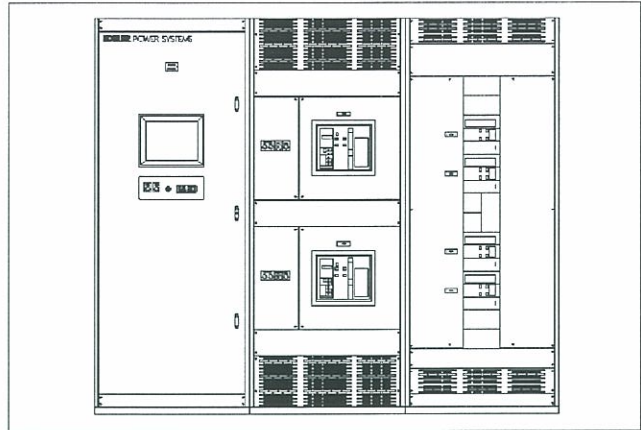
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System Configurations

PD-200 Series

The PD-200 series product offering is UL 891 listed and allows for extreme flexibility in design while providing a strong standard for safety and performance. Features include:

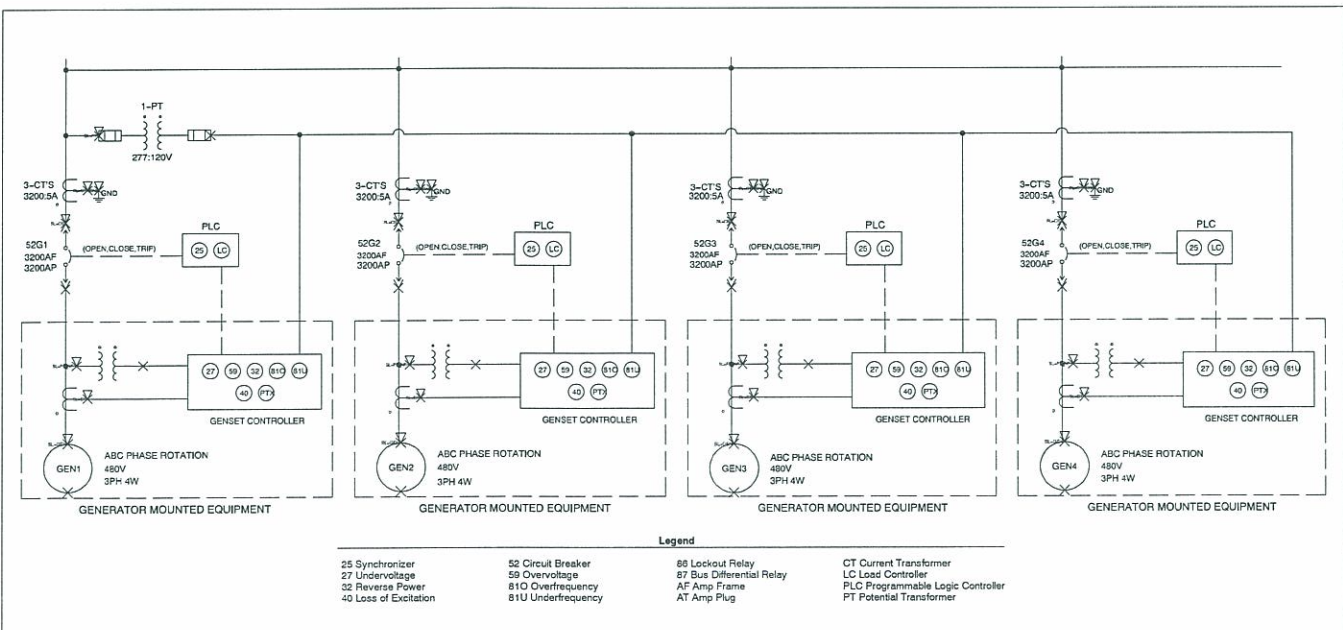
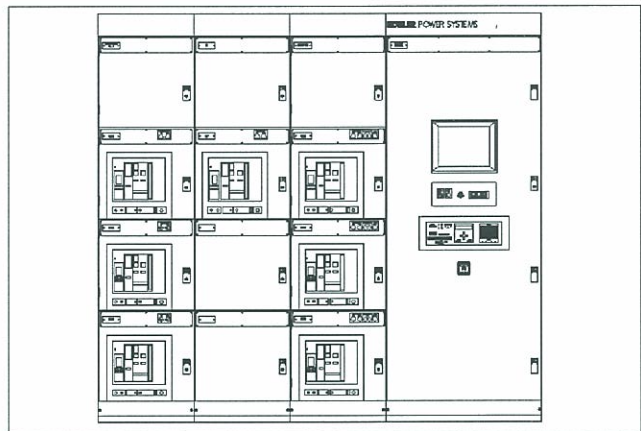
- PD series digital system control standard
- Rear access standard, front access available
- Shallow depth (36-42 in. available)
- UL 489 fixed or drawout breakers for generator sets, utility, and distribution
- Molded-case breakers available for distribution
- Transfer switches can be mounted in switchgear lineup
- Bus ratings through 10,000 amps/200 kA withstand
- Complete selection of breaker manufacturers, trip options, and power monitoring
- NEMA 1, NEMA 3R walk-up and walk-in available



PD-300 Series

Offering the highest standard in bus withstand and breaker ratings, the PD-300 series is listed under UL 1558. Featuring drawout breakers as standard, the PD-300 series is designed with reliability and serviceability in mind. Features include:

- PD series digital system control standard
- UL 1066 drawout breakers for generator sets, utility, and distribution
- Complies with ANSI C37.20.1
- Bus ratings through 6,000 amps/200 kA withstand
- Complete selection of breaker manufacturers, trip options, and power monitoring
- NEMA 1, NEMA 3R walk-up and walk-in available



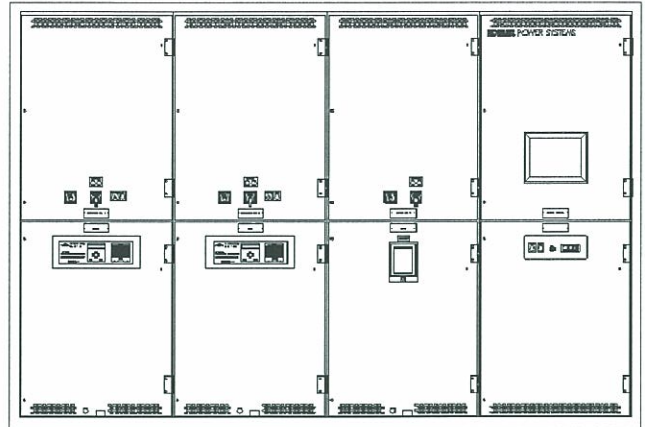
System Configurations, continued

PD-400 Series

Medium voltage generation applications continue to grow with distributed generation and large standby systems leading the way. Available through 26 kV, the PD-400 series utilizes the strength of the digital control system combined with utility grade protective relays for a complete system solution.

Features include:

- PD series digital system control standard
- UL MV switchgear listing through 15 kV
- Complies with ANSI metal-clad switchgear requirements
- Bus and breaker ratings through 3000 amps
- Complete selection of breaker manufacturers, protective relay options, power monitoring, neutral grounding resistors and control battery systems
- NEMA 1, NEMA 3R walk-up and shelter aisle available



ED200, 300, and 400 Series

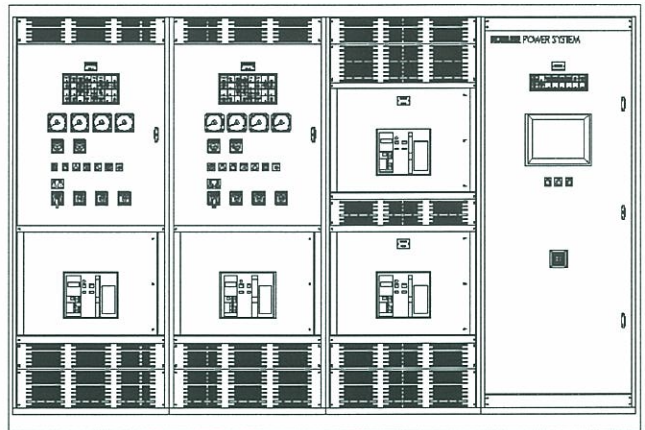
Kohler Power Systems seeks to provide the widest selection of products available in the market as well as meeting the diverse needs of our customers. With this goal in mind, we offer the ED paralleling series.

Combining the PD series controls with more traditional features, the ED series is available in all configurations. With the ED product line, the customer may choose from a wide variety of options including:

- Analog meters
- Window light annunciators
- Selector switches, pushbuttons, etc.
- Sync scope, lights on swing panel
- Hot standby/redundant PLC's
- Woodward or similar synchronizing and load sharing components

In most cases, the ED product is designed with the same PLC logic and touch screen interface allowing system setup and monitoring while also providing the user with a more traditional interface.

Kohler's desire to provide the owner with the system they want, rather than a standard off-the-shelf product, drives our engineers to bring ideas to the table to improve, simplify, and ensure the reliability of your system.



Applications

PD series paralleling switchgear is extremely versatile and can be configured for *on the fly* operational mode change. Kohler's patented field configurable operation modes can allow the owner to select a system that will provide soft-load closed transition emergency operation today and extended parallel/peak shave in the future without significant modifications.

Typical applications for the PD series include:

Standby

ATS Start

A start signal from an automatic transfer switch or other control device starts all generator sets. The generators synchronize and connect to the paralleling bus.

Utility Breaker Sensing

In many systems, transfer switches are not present. When the utility fails, the utility breaker opens. The PLC logic starts the generator sets and connects them to the generator set paralleling bus. When the required number of generator sets are online, the tie breaker closes.

Return of Utility

After utility power is restored, the return-to-utility sequence starts. Several options are available for return of utility power.

ATS Transfer: Standard, delayed transition or closed transition switches can restore the load to the utility source.

Circuit Breaker Transfer: Where a system does not employ automatic transfer switches, the system breakers can effect transfer in multiple modes:

Open Transfer: The tie breaker opens and, after a time delay, the utility breaker closes.

Soft Transfer: The generator bus synchronizes to the utility. When synchronized, the utility breaker closes. The switchgear soft-unloads the generator sets and then opens the generator bus tie breaker.

Prime Power

A system-start signal starts all generator sets. The generator sets synchronize and connect to the generator set paralleling bus.

Isolate (Interruptible Rate)

A system-start signal starts all generator sets. The generator sets synchronize and connect to the generator set paralleling bus. With all generator sets online, the generator bus synchronizes to the utility and the generator bus tie breaker closes. The generator sets ramp up to assume system load. When the power flow across the utility breaker reaches a preset level, the utility breaker opens.

Base Load Generators (Peak Shave)

A system-start signal starts the generator sets. The generator sets synchronize and connect to the generator set paralleling bus. With all generator sets connected, the generator bus parallels to the utility and the generator bus tie breaker closes. The generator sets soft-load to a preset, user-adjustable kW level.

Generator set output remains constant and utility power fluctuates to supply the difference between the generator set output and the load requirement. When the generator set output exceeds the system load requirements, the excess power is exported to the utility.

Import/Export (Peak Shave)

A system-start signal starts the generator sets. The generator sets synchronize and connect to the generator paralleling bus. With all generator sets connected, the generator bus parallels to the utility and the generator bus tie breaker closes. The generator sets soft-load to a preset, user-adjustable kW power flow across the utility breaker. The power flow to the utility remains constant and the generator set power output fluctuates to meet the requirements of the load.

If the import/export level is positive, the system imports a set power level from the utility; if the import/export level is negative, the system exports a set power level to the utility.

If the load requirement exceeds the generator set rating, the generator set produces its rated power and the utility supplies the difference.

Touch Screen Interface

The PD series of digital switchgear incorporates a high resolution touch screen interface (HMI) to provide control and monitoring of all system parameters in one strategic location. Unlike older style switchgear that requires significant panel space for each generator set's analog metering, annunciation, and control switches, the PD series locates components in less than one third the traditional space. This approach leads to a more reliable system through wiring and component reduction as well as a more user-friendly interface. Rather than setting system parameters through special programmers, small input screens and multiple analog devices scattered throughout the lineup, the user works from a single location for all operations.

The operator interface is configured in a user-friendly tab format with direct access to multiple levels of control and monitoring and runs in Windows® CE environment. Screen programs are held on a standard PC card that is simple to upgrade as future customer requirements develop. User programming is performed through a password-protected pop-up keypad available on all screens. Each system includes:

System One Line Diagram

The one line overview screen displays system status through animation, color indications, system feedback, and operating parameters. The screen includes:

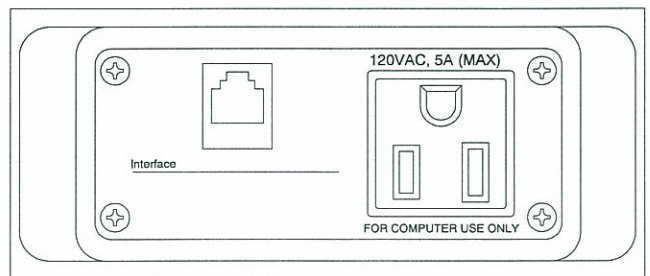
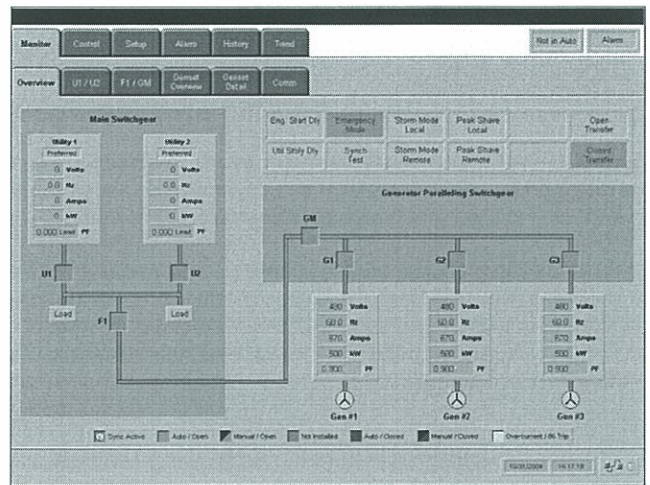
Breaker Status: System breakers including generator paralleling, utility, distribution and tie breakers (as provided), and other customer-specified system protective devices. Color indications include open, closed, energized, deenergized, tripped, load shed active, and automatic/manual control.

Generator Sets: Generator running or offline, individual generator voltage, frequency, current, kilowatts, power factor, total generator bus kilowatts, and master control annunciator windows (indications/alerts).

Standard on all systems is a front-mounted interface portal containing a power receptacle and a CAT 5 connection. These can be used for field programming, testing, or use of a laptop as a temporary screen should there be an issue with the unit-mounted touch screen. All controls are accessible through a standard web browser such as Internet Explorer®.

Utility Feeders: In systems where the PD series is interfacing with a utility feed, the customer's utility is included in the system one line. This may be a single or multiple feeders based on the specific system layout and operational requirements. Parameters for the utility monitored include: voltage, frequency, current, kilowatts, power factor, and protective relay operation.

System Operation: Master control and annunciation indicators are included on the system one line screen. These are project specific and would include operational mode (such as emergency system ready, base load operation, peak share operation, soft-load, or open transition mode selected). Major system time delays such as retransfer to utility are displayed when active and system security and operational interface control are accessed through this screen. The system features as standard: multiple level password protection, time and date stamping of events, and communications network monitoring.

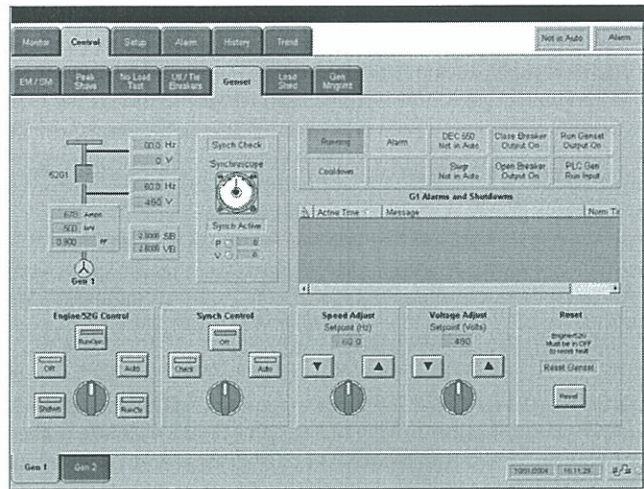


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Generator Control

The generator set control screen provides a graphical interface to a specific generator set's operation. Simple and complete, the generator control screen provides a familiar environment for operators while incorporating digital benefits. The generator control screen includes:

- Generator and bus monitoring of voltage and frequency for manual paralleling
- Generator output monitoring
- Digital sync-scope and phase/voltage differential indications
- Generator control switch with five positions: automatic, run open (no load test), run closed (load test), off (cool down), shutdown
- Synchronizer control switch with three positions: automatic, check (manual paralleling), and off
- Speed and voltage adjust switches: up/down adjustments with digital indication of setting for manual paralleling
- Generator set alarms:
 - Displays pre and shutdown alarms for the generator set being monitored
 - Displays recorded alarm events for that generator
 - Includes reset switch for alarms, as well as interface monitoring for the Decision-Maker 550 engine-mounted controller for projects where that device is used



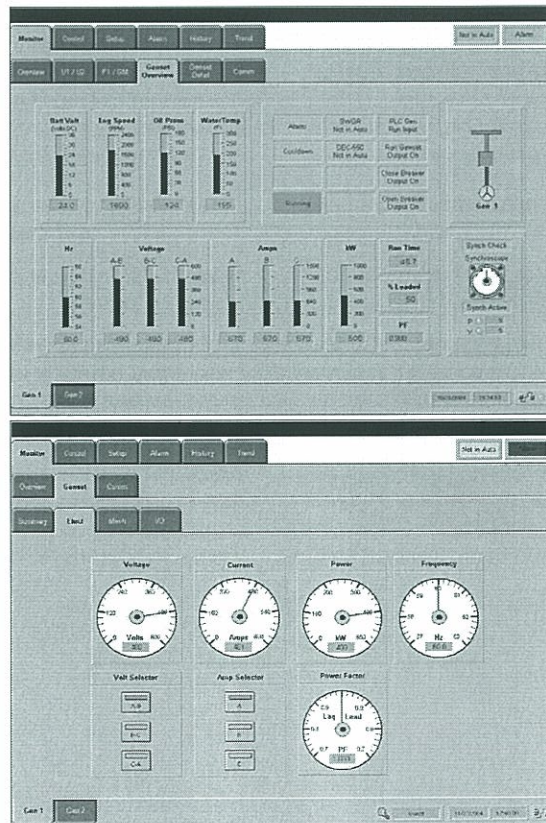
The user may move from one generator to another through the push of a single button.

Generator Monitoring

Detailed electrical and mechanical data for each generator is gathered on this screen. When paired with the 550 engine-mounted controller, over 400 points are available for each engine generator should the customer desire extended data. Standard information is represented in bar graph and digital readouts and includes:

- Generator Electrical: voltage (3-phase), frequency, kilowatts, current (3-phase), power factor
- Generator Mechanical: water temperature, oil pressure, engine speed, battery voltage
- General Information: number of starts, running time, percentage loaded, sync-scope, sync-lights and voltage/phase indications, sync-active indication, generator pre and shutdown alarms

The bar graph displays are color coded to indicate normal operation and pre and shutdown values, with these values displayed for customer monitoring. Analog meter representations are also available at the press of a button.

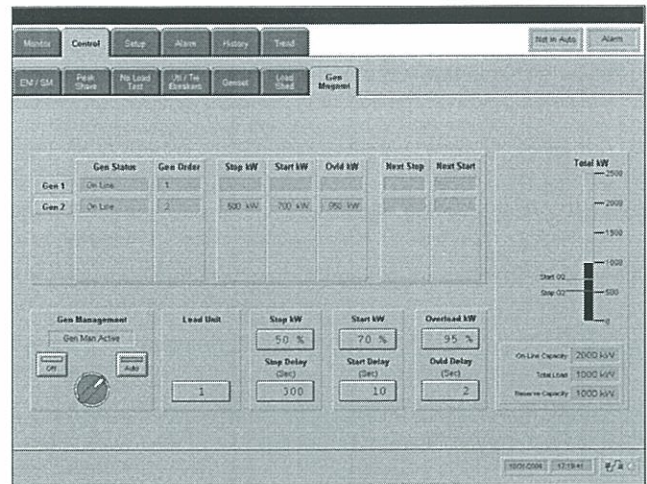


Generator Management

A standard feature of the PD series, generator management allows the system to decide the appropriate number of generators required to feed the load. With user-definable parameters, this management system can be configured to:

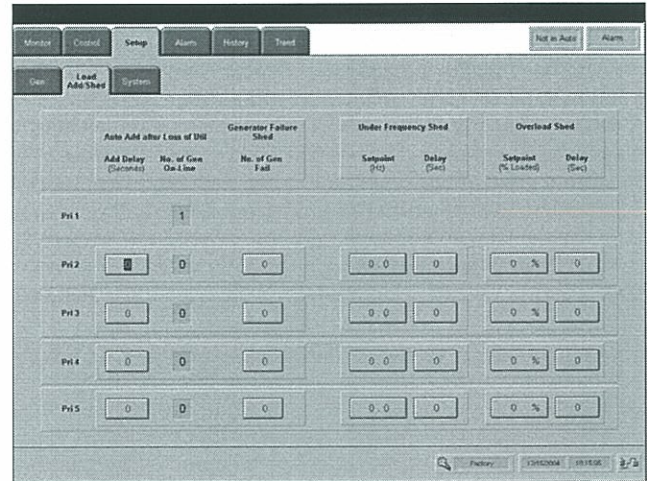
- Start the required number of generators for certain operations
- Run the generators in *available* mode for a preset period of time
- Optimize the number of running generators, shutting down those that are not required
- Bring additional capacity online based on load requirements

The system will then monitor total installation requirements and automatically bring generators online and offline as needed.



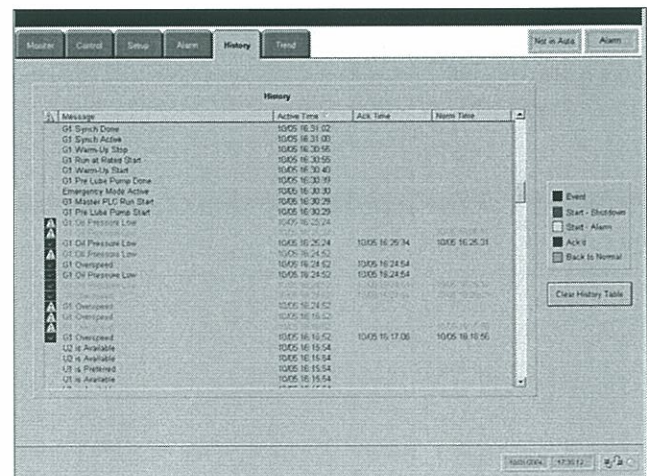
Load Management

Another standard feature of the PD series, and one that is often overlooked in specifications, is load management/load shedding. A multiple generator system must have the ability to add and remove loads depending on available generators and system requirements. The digital interface allows the user to select not only which loads are grouped into priorities (normally priorities 1 through 4) but when to bring them online after system start, when to remove those loads, and how to choose these actions through the number of generators available, operational mode, and generator monitoring of under frequency or kilowatt demand.



Event Log

Each PD-series product provides monitoring of system events including alarms, operation, and system-setting changes. A minimum of 500 events are logged and date/time stamped providing the user and service personnel with valuable information.

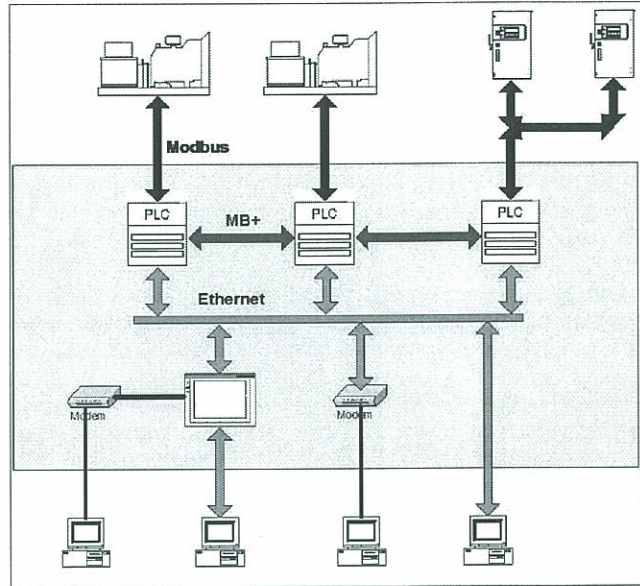


Communications

Each PD system is constructed with an integrated web server allowing remote monitoring and control through any ethernet network. The PD network is integrated with the generator-mounted controllers, transfer switches, and other devices to provide the owner with remote data, monitoring, and control of his entire power system without the need for expensive custom software packages. The system screens may be viewed through any major web browser and are identical to those featured on the system touch screens.

Modbus® is Kohler's standard protocol providing the industries' widest selection of compatible components as well as an open protocol for integration into existing systems.

Modbus® is utilized between generator sets, transfer switches, and other devices to monitor and control the system. Internal to the switchgear, Modbus® Plus is used to gain speed on the inter-PLC data network. A Modbus® port is available for external communications.



Additional Features

All Kohler paralleling switchgear is designed specifically for your project. Thousands of additional features and components can be incorporated. A sampling of those available are:

Controls:

- Power quality metering
- Transfer switch control screens
- SCADA systems

Low Voltage:

- Integrated breaker metering networks
- Insulated bus, isolated bus
- Seismic zone 4 construction

Medium Voltage:

- Distribution or station class lightning arrestors
- Station battery systems

Structure:

- Special environmental requirements for location, temperature, and humidity
- Complete walk-in switchgear houses with HVAC

Kohler's strength is the ability to design a complete, integrated system for your installation. Working with the engineer, contractor, and owner, the project team will be with you from concept to acceptance to ensure a smooth installation and, teamed with our distributors, to provide future service on the complete system.

Modbus® is a registered trademark of Schneider Electric.

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Availability is subject to change without notice. Kohler Co. reserves the right to change the design or specifications without notice and without any obligation or liability whatsoever. Contact your local Kohler® generator set distributor for availability.

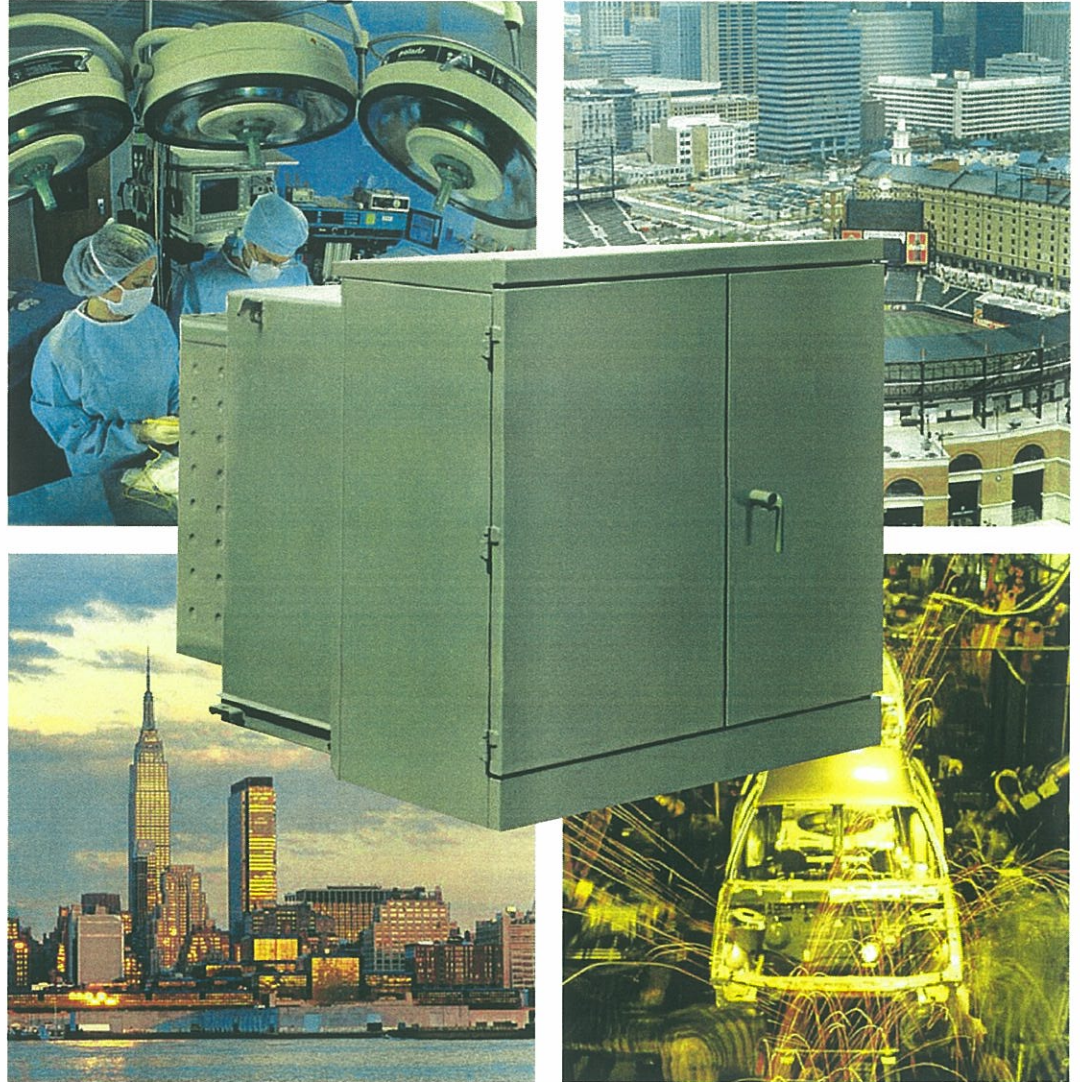
Pad-Mount

Small Power Transformers

75 kVA through 20,000 kVA

5 kV through 46 kV primary voltage

120V through 25 kV secondary voltage



a brand of
Schneider
Electric



SQUARE D

COMPACT AND TAMPER- RESISTANT



Pad-Mounted Transformers

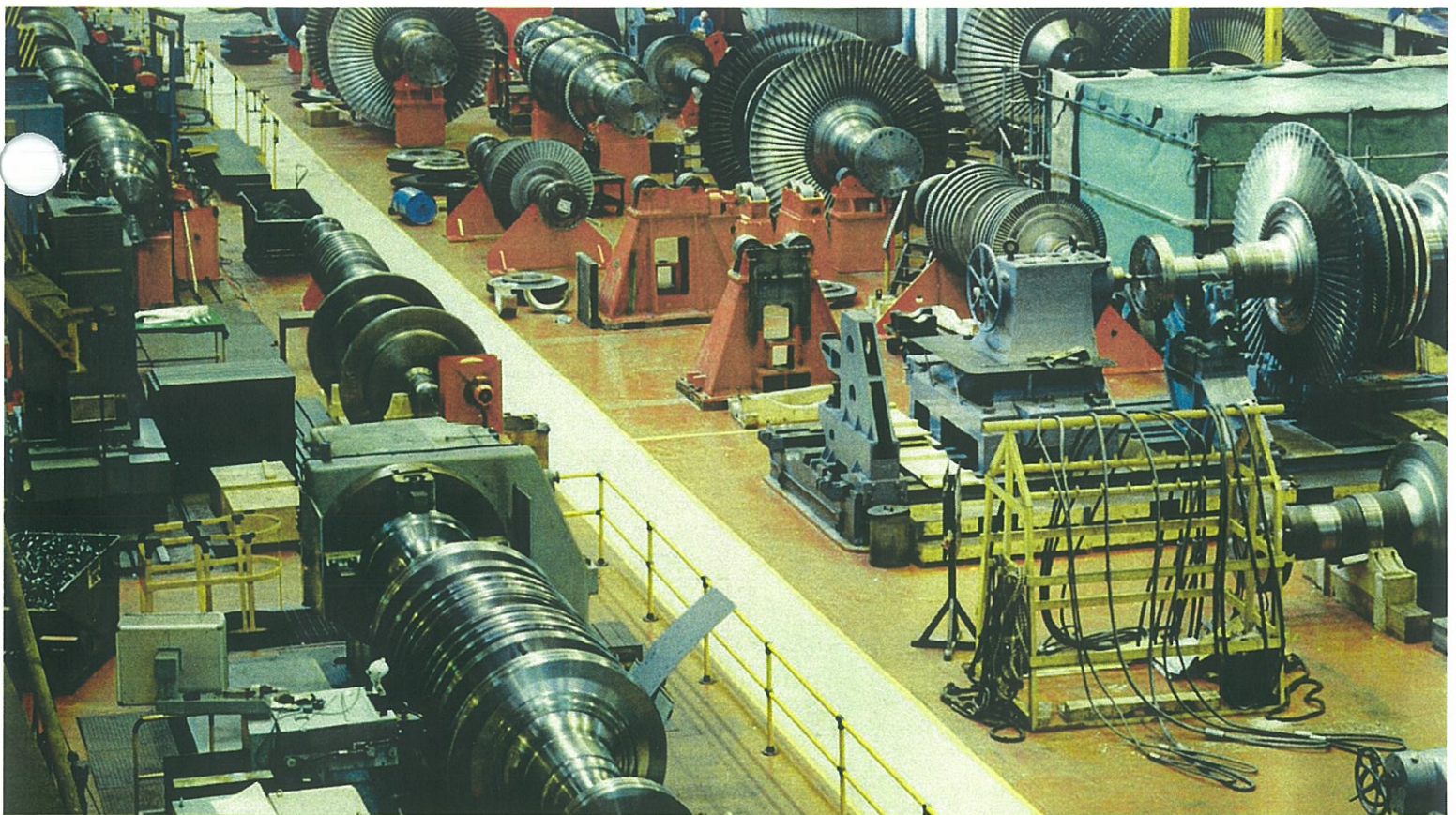
Schneider Electric is a recognized market leader, offering a full range of distinctively Square D®-designed transformer products such as the pad-mounted transformer. Like all of our transformers, it is manufactured in ISO-registered facilities that use the industry's leading manufacturing technology, ensuring products of the highest quality and performance.

At Schneider Electric, we are committed to excellence. Our pad-mounted transformers are built and tested to stringent Square D brand specifications, and meet or exceed applicable ANSI/IEEE, CSA and NEMA standards. These transformers may be UL, cUL or FM labeled upon request.

Medium-Voltage, Liquid-Filled

Pad-mounted, liquid-filled transformers provide medium-voltage, world-class power distribution. Pad-mounted transformers use a choice of either mineral oil or less-flammable seed-oil based fluid.

For more information about pad-mounted transformers or other transformers, please visit www.us.SquareD.com or call 1-888-SquareD.



Flexibility and Strength

Three-phase, pad-mounted transformers provide compact, tamper-resistant protection for underground power distribution systems. Offering flexibility, excellent mechanical strength and dependability, these transformers are ideal for commercial applications in public access areas where safety is a concern.

Space-Saving, Protective Design

Meeting modern design requirements for flexibility, pad-mounted transformers use a rectangular core and coil design. Designed to save space and energy, they provide high efficiency with low operating costs.

Because the bolts, hinges, screws and fasteners are not accessible in these self-contained units, their tamper-resistant construction prevents entry by unauthorized personnel. This construction also eliminates the need for protective fencing or vaults, allowing for visually pleasing installation in locations that are accessible to the general public.

Commercial Applications

Pad-mounted transformers are ideally suited for apartment buildings, schools, hospitals, shopping centers, commercial buildings and industrial sites.

These transformers are completely factory-assembled and shipped as one piece. Standard liquid-filled sizes range from 75 to 5,000 kVA with primary ratings from 2,400V to 46,000V.

Environmental Information

The sealed-tank construction of pad-mounted transformers ensures that the gas-plus-oil volume remains constant within industry standards.

Certified PCB-free, the transformer insulating fluid meets or exceeds requirements of appropriate standards. Mineral oil is primarily used in outdoor applications. When flammability is a concern, such as with indoor applications, or in areas of heightened environmental sensitivity where any insulating fluid spill could require expensive cleanup procedures, less-flammable seed-oil based fluid, a fully biodegradable, environmentally friendly dielectric fluid, is the fluid of choice.

Pad-Mounted Transformer Ratings

75–20,000 kVA
2.5 to 46 kV primary
120°C insulation temperature limit
Temperature rise: 65° C
ISO 9001 registered
Optional UL and cUL certification

Special Design Options

Special sound requirements
Special altitude requirements
Retrofit designs
Higher efficiency requirements
Special ambient conditions
55/65° C rise

Applicable Standards

IEEE C57.12.00™

Standard general requirements for liquid-immersed distribution, power and regulating transformers (ANSI).

IEEE C57.12.34™

Requirements for pad-mounted, compartmental-type, self-cooled, three-phase distribution transformers; 2,500 kVA and smaller: high voltage, 34,500 GrdY/19,920 volts and below; low-voltage, 480 volts and below.

ANSI C57.12.28

Standard for pad-mounted equipment — enclosure integrity.

IEEE C57.12.70™

Standard for terminal markings and connections for distribution and power transformers.

IEEE C57.12.80™

Standard terminology for power and distribution transformers.

IEEE C57.12.90™

Standard test code for liquid-immersed distribution power, and regulating transformers and guide for short-circuit testing of distribution and power transformers (ANSI).

IEEE C57.13™

Requirements for instrument transformers.

ANSI/IEEE 386

Separable insulated connector systems for power distribution systems above 600V.

ASTM D877

Test method for dielectric breakdown voltage of insulating liquids using disk electrodes.

NEMA AB1

Molded case circuit breakers.

NEMA TR1

Transformers, regulators and reactors.

CAN/CSA-C88-M90

Electrical power systems and equipment.

1-888-SQUARED

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Schneider Electric – North American Operating Division

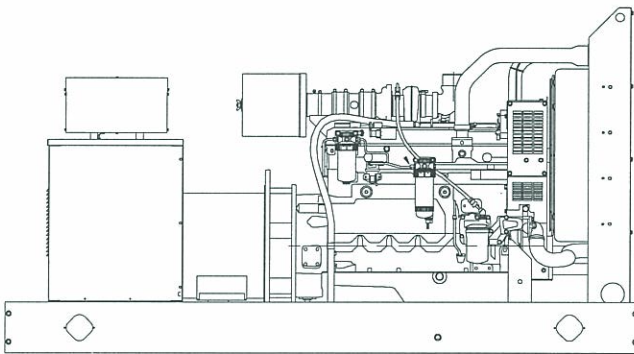
1415 S. Roselle Road
Palatine, IL 60067
Tel: 847-397-2600
Fax: 847-925-7500

Document Number 7230BR0401R6/06



Ratings Range

		60 Hz	
Standby:	kW	100-155	
	kVA	100-194	
Prime:	kW	90-140	
	kVA	90-175	



Standard Features

- Kohler Co. provides one-source responsibility for the generating system and accessories.
- The generator set and its components are prototype-tested, factory-built, and production-tested.
- The 60 Hz generator set offers a UL 2200 listing.
- The generator set accepts rated load in one step.
- The generator set complies with ISO 8528-5, Class G2, requirements for transient performance in all generator set configurations. Select the Decision-Maker™ 550 controller for improved voltage regulation and ISO 8528-5, Class G3, compliance.
- The 60 Hz generator set engine is certified by the Environmental Protection Agency (EPA) to conform to Tier 3 nonroad emissions regulations.
- A one-year limited warranty covers all systems and components. Two-, five-, and ten-year extended warranties are also available.
- Alternator features:
 - The Fast-Response™ III wound field (WF) design alternator provides excellent voltage response and short-circuit capability using an auxiliary power brushless exciter.
 - The unique Fast-Response™ II excitation system delivers excellent voltage response and short circuit capability using a permanent magnet (PM)-excited alternator.
 - The brushless, rotating-field alternator has broadrange reconnectability.
- Other features:
 - Controllers are available for all applications. See controller features inside.
 - The low coolant level shutdown prevents overheating (standard on radiator models only).
 - Integral vibration isolation eliminates the need for under-unit vibration spring isolators.

Generator Set Ratings

Alternator	Voltage	Ph	Hz	130°C Rise Standby Rating		105°C Rise Prime Rating	
				kW/kVA	Amps	kW/kVA	Amps
4S13W/ 4S13	120/208	3	60	155/194	538	140/175	486
	127/220	3	60	155/194	508	140/175	459
	120/240	3	60	155/194	466	140/175	421
	120/240	1	60	100/100	417	90/90	375
	139/240	3	60	155/194	466	140/175	421
	220/380	3	60	145/181	275	140/175	266
	277/480	3	60	155/194	233	140/175	210
4S15W/ 4S15	347/600	3	60	155/194	186	140/175	168
	120/208	3	60	155/194	538	140/175	486
	127/220	3	60	155/194	508	140/175	459
	120/240	3	60	150/188	452	140/175	421
	120/240	1	60	110/110	458	105/105	438
	139/240	3	60	155/194	466	140/175	421
	220/380	3	60	145/181	275	140/175	266
277/480	3	60	155/194	233	140/175	210	
347/600	3	60	155/194	186	140/175	168	

RATINGS: All three-phase units are rated at 0.8 power factor. All single-phase units are rated at 1.0 power factor. *Standby Ratings:* Standby ratings apply to installations served by a reliable utility source. The standby rating is applicable to varying loads for the duration of a power outage. There is no overload capability for this rating. Ratings are in accordance with ISO-3046/1, BS 5514, AS 2789, and DIN 6271. *Prime Power Ratings:* Prime power ratings apply to installations where utility power is unavailable or unreliable. At varying load, the number of generator set operating hours is unlimited. A 10% overload capacity is available for one hour in twelve. Ratings are in accordance with ISO-8528/1, overload power in accordance with ISO-3046/1, BS 5514, AS 2789, and DIN 6271. For limited running time and base load ratings, consult the factory. Obtain the technical information bulletin (TIB-101) on ratings guidelines for the complete ratings definitions. The generator set manufacturer reserves the right to change the design or specifications without notice and without any obligation or liability whatsoever. GENERAL GUIDELINES FOR DERATION: *Altitude:* Derate 0.5% per 100 m (328 ft.) elevation above 1600 m (5250 ft.). *Temperature:* Derate 1.0% per 10°C (18°F) temperature above 25°C (77°F).

Alternator Specifications

Specifications	Alternator
Manufacturer	Kohler
Type	4-Pole, Rotating-Field
Exciter type	
Wound field (WF)	Wound Exciter Field with Separate Excitation Power Winding
Permanent magnet (PM)	Brushless, Permanent-Magnet
Leads: quantity, type	12, Reconnectable
Voltage regulator	Solid State, Volts/Hz
Insulation:	NEMA MG1
Material	Class H
Temperature rise	130°C, Standby
Bearing: quantity, type	1, Sealed
Coupling	Flexible Disc
Amortisseur windings	Full
Voltage regulation, no-load to full-load	
Wound field (WF) alternator	±0.25% Average
Permanent magnet (PM) alternator	±2% Average
550 controller (with 0.5% drift due to temperature variation)	3-Phase Sensing, ±0.25%
Unbalanced load capability	100% of Rated Standby Current
One-step load acceptance	100% of Rating
Peak motor starting kVA:	(35% dip for voltages below)
480 V 4S13W/4S13 (12 lead)	515
480 V 4S15W/4S15 (12 lead)	620

- NEMA MG1, IEEE, and ANSI standards compliance for temperature rise and motor starting.
- Sustained short-circuit current of up to 300% of the rated current for up to 10 seconds.
- Sustained short-circuit current enabling downstream circuit breakers to trip without collapsing the alternator field.
- Self-ventilated and dripproof construction.
- Vacuum-impregnated windings with fungus-resistant epoxy varnish for dependability and long life.
- Fast-Response™ III wound field (WF) brushless alternator with auxiliary power brushless exciter for excellent load response.
- Fast-Response™ II brushless alternator with brushless exciter for excellent load response.

Application Data

Engine

Engine Specifications	
Manufacturer	John Deere
Engine model	6068HF285
Engine type	4-Cycle, Turbocharged
Cylinder arrangement	6 Inline
Displacement, L (cu. in.)	6.79 (414)
Bore and stroke, mm (in.)	106 x 127 (4.19 x 5.00)
Compression ratio	17.0:1
Piston speed, m/min. (ft./min.)	457 (1500)
Main bearings: quantity, type	7, Replaceable Insert
Rated rpm	1800
Max. power at rated rpm, kWm (BHP)	177 (237)
Cylinder head material	Cast Iron
Crankshaft material	Forged Steel
Valve material:	
Intake	Chromium-Silicon Steel
Exhaust	Stainless Steel
Governor: type, make/model	JDEC Electronic L16 Denso HP3
Frequency regulation, no-load to full-load	Isochronous
Frequency regulation, steady state	±0.25%
Frequency	Fixed
Air cleaner type, all models	Dry

Exhaust

Exhaust System	
Exhaust manifold type	Dry
Exhaust flow at rated kW, m ³ /min. (cfm)	33.9 (1197)
Exhaust temperature at rated kW, dry exhaust, °C (°F)	510 (950)
Maximum allowable back pressure, kPa (in. Hg)	7.5 (2.2)
Exhaust outlet size at engine hookup, mm (in.)	98 (3.86)

Engine Electrical

Engine Electrical System (12/24 Volt*)	
Battery charging alternator:	12 Volt/24 Volt
Ground (negative/positive)	Negative
Volts (DC)	12/24
Ampere rating	65/45
Starter motor rated voltage (DC)	12/24
Battery, recommended cold cranking amps (CCA):	12 Volt/24 Volt
Quantity, CCA rating each	One, 640/Two, 570
Battery voltage (DC)	12

*12-volt or 24-volt engine electrical systems are available.

Application Data

Fuel

Fuel System	
Fuel supply line, min. ID, mm (in.)	11.0 (0.44)
Fuel return line, min. ID, mm (in.)	6.0 (0.25)
Max. lift, fuel pump: type, m (ft.)	Electronic, 1.8 (6.0)
Max. fuel flow, Lph (gph)	96.9 (25.6)
Fuel prime pump	Manual
Fuel filter	
Secondary	2 Microns @ 98% Efficiency
Primary	30 Microns
Water Separator	Yes
Recommended fuel	#2 Diesel

Lubrication

Lubricating System	
Type	Full Pressure
Oil pan capacity, L (qt.)	27.0 (28.5)
Oil pan capacity with filter, L (qt.)	27.9 (29.5)
Oil filter: quantity, type	1, Cartridge
Oil cooler	Water-Cooled

Cooling

Radiator System	
Ambient temperature, °C (°F)*	50 (122)
Engine jacket water capacity, L (gal.)	11.3 (3.0)
Radiator system capacity, including engine, L (gal.)	25.7 (6.8)
Engine jacket water flow, Lpm (gpm)	174 (46)
Heat rejected to cooling water at rated kW, dry exhaust, kW (Btu/min.)	76.3 (4340)
Heat rejected to charge cooler at rated kW, dry exhaust, kW (Btu/min.)	31.8 (1810)
Water pump type	Centrifugal
Fan diameter, including blades, mm (in.)	660 (26)
Fan, kWm (HP)	7.7 (10.3)
Max. restriction of cooling air, intake and discharge side of radiator, kPa (in. H ₂ O)	0.125 (0.5)

* Enclosure with enclosed silencer reduces ambient temperature capability by 5°C (9°F).

Operation Requirements

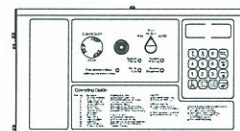
Air Requirements	
Radiator-cooled cooling air, m ³ /min. (scfm)‡	226.5 (8000)
Combustion air, m ³ /min. (cfm)	13.6 (480)
Heat rejected to ambient air:	
Engine, kW (Btu/min.)	35.9 (2040)
Alternator, kW (Btu/min.)	12.3 (700)

‡ Air density = 1.20 kg/m³ (0.075 lbm/ft³)

Fuel Consumption

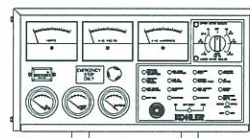
Fuel Consumption	
Diesel, Lph (gph) at % load	Standby Rating
100%	44.3 (11.7)
75%	35.1 (9.3)
50%	26.3 (6.9)
25%	16.2 (4.3)
Fuel Consumption	
Diesel, Lph (gph) at % load	Prime Rating
100%	40.6 (10.7)
75%	32.3 (8.5)
50%	24.0 (6.3)
25%	14.4 (3.8)

Controllers



Decision-Maker™ 550 Controller

Audiovisual annunciation with NFPA 110 Level 1 capability. Programmable microprocessor logic and digital display features. Alternator safeguard circuit protection. 12- or 24-volt engine electrical system capability. Remote start, remote annunciation, and remote communication options. Refer to G6-46 for additional controller features and accessories.



Decision-Maker™ 3+, 16-Light Controller

Audiovisual annunciation with NFPA 110 Level 1 capability. Microprocessor logic, AC meters, and engine gauge features. 12- or 24-volt engine electrical system capability. Remote start, prime power, and remote annunciation options. Refer to G6-30 for additional controller features and accessories.

Additional Standard Features

- Alternator Protection (standard with 550 controller)
- Battery Rack and Cables
- Integral Vibration Isolation
- Oil Drain Extension
- Operation and Installation Literature

Available Accessories

Enclosed Unit

- Sound Enclosure (with enclosed critical silencer)
- Weather Enclosure (with enclosed critical silencer)
- Weather Housing (with roof-mounted critical silencer)

Open Unit

- Exhaust Silencer, Critical (kit: PA-354809)
- Exhaust Silencer, Hospital (kit: PA-365349)
- Flexible Exhaust Connector, Stainless Steel

Cooling System

- Block Heater (recommended for ambient temperatures below 0°C [32°F])
- Radiator Duct Flange

Fuel System

- Auxiliary Fuel Pump
- Flexible Fuel Lines
- Fuel Pressure Gauge
- Subbase Fuel Tanks
- Subbase Fuel Tank with Day Tank

Electrical System

- Battery
- Battery Charger, Equalize/Float Type
- Battery Heater

Engine and Alternator

- Alternator, Wound Field (WF)
- Alternator, Permanent Magnet (PM)
- Air Cleaner, Heavy Duty
- Air Cleaner Restriction Indicator
- Alternator Strip Heater
- Bus Bar Kits
- Closed Crankcase Canister
- CSA Certification
- Current Transformer Kit
- Line Circuit Breaker (NEMA type 1 enclosure)
- Line Circuit Breaker with Shunt Trip (NEMA type 1 enclosure)
- Rated Power Factor Testing
- Rodent Guards
- Safeguard Breaker (not available with 550 controller)
- Skid End Caps
- Voltage Regulation, 1%
- Voltage Regulator Sensing, 3-Phase

Paralleling System

- Reactive Droop Compensator
- Voltage Adjust Control
- Voltage Regulator Relocation Kit

Maintenance

- General Maintenance Literature Kit
- Maintenance Kit (includes standard air, oil, and fuel filters)
- NFPA 110 Literature
- Overhaul Literature Kit
- Production Literature Kit

Controller

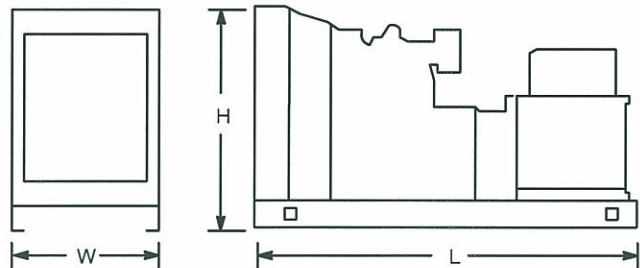
- Common Failure Relay Kit
- Communication Products and PC Software (550 controller only)
- Customer Connection Kit
- Dry Contact Kit (isolated alarm)
- Engine Prealarm Sender Kit
- Prime Power Switch (550 controller only)
- Remote Annunciator Panel
- Remote Audiovisual Alarm Panel
- Remote Emergency Stop Kit
- Remote Mounting Cable
- Run Relay Kit

Miscellaneous Accessories

- _____
- _____

Dimensions and Weights

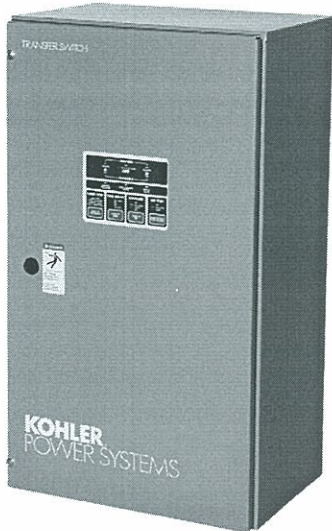
Overall Size, L x W x H, mm (in.): 2800 x 1040 x 1538
 (110.24 x 40.94 x 60.55)
 Weight (radiator model), wet, kg (lb.): 1429-1497 (3150-3300)



NOTE: This drawing is provided for reference only and should not be used for planning installation. Contact your local distributor for more detailed information.

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 POWER SYSTEMS
 NATIONALLY REGISTERED



Ratings

Voltage: 208–600 VAC 50/60 Hz

Current: 30–4000 amps

Standard Contactor Features

- Open-transition operation with either automatic or non-automatic control
- 2, 3, or 4 poles
- Electrically operated, mechanically held
- Double-throw, inherently interlocked design (break-before-make power contacts)
- Solid, switched, or overlapping neutral (make-before-break type)
- High withstand and closing ratings
- Design suitable for emergency and standby applications on all classes of load, 100% tungsten rated through 400 amps
- Open-transition transfer time less than 100 milliseconds (6 cycles @ 60 Hz)
- Silver alloy main contacts
- Front-accessible contacts for easy inspection
- Front-replaceable main and arcing contacts (600–4000 amps)
- Reliable, field-proven solenoid mechanism
- Switching mechanisms lubricated for life
- Internal manual operating handle
- Main shaft auxiliary contacts

Modbus® is a registered trademark of Schneider Electric.

MPAC 1000™ Controller Standard Features

- Microprocessor controller
- Real-time clock with battery backup
- Broadrange voltage sensing (208–600 VAC) with 2% accuracy on both sources
- Frequency sensing with 1% accuracy on both sources
- Environmentally sealed user interface
- Keypad with tactile feedback pushbuttons
- LED indicators
- Selectable operating modes
- Programmable inputs and outputs
- Load/no load exercise function
- Anti-single phasing protection
- Load control inputs and outputs
- Phase rotation sensing
- Time-stamped event log
- Gold-flashed engine start contacts
- Modbus® communication with network and setup connections

MPAC 1000™ Controller Programmable Features

- System voltage and frequency
- Adjustable over/undervoltage and over/underfrequency for the normal and emergency sources
- Adjustable time delays
- Commit/no commit transfer
- ABC/BAC phase rotation selection with error detection
- Resettable historical data
- In-phase monitor
- Password protection

Accessories

- Programmable input/output (I/O) modules with two inputs and six outputs (isolated SPDT form C contacts, output rating 2 amps @ 30 VDC/250 VAC); four I/O module maximum
- Three-stage charging, dual-output battery charger (6 amps @ 12 VDC/3 amps @ 24 VDC)
- Padlockable user interface cover
- Preferred source switch
- Supervised transfer control switch
- Setup software
- Line-to-neutral monitoring
- Chicago alarm module
- External battery supply module (allows extended engine start time delay)

Controller Features

Standard Controller Features

User Interface Keypad

- Start/end system test
- Set/end exercise
- End time delay
- Lamp test/service reset

User Interface Indicators

- Contactor position: Normal, Emergency
- Source available: Normal, Emergency
- Service required: immediate, maintenance
- Not in automatic mode
- Four-stage time delay remaining
- Exercise: load, no load, set/disabled
- Test: load, no load
- Load control active: peak shave, pre/post-transfer signal
- In-phase monitor active

Selectable Operating Modes*

- 1 week/2 week manually set exercise (1 week)
- Disable/enable exercise (enable)
- Load/no load exercise (no load)
- Load/no load test (load)
- Enable/disable transfer (enable)

Programmable Inputs (factory settings)

- End time delay
- Peak shave/area protection

Outputs

- Generator engine start, normally closed gold-flashed contact rated 2 amps @ 30 VDC/250 VAC
- Pre-transfer load control, one normally open contact rated 10 amps @ 30 VDC/250 VAC
- One programmable output, factory-set to load bank control isolated SPDT form C contact rated 2 amps @ 30 VDC/250 VAC

Software Event Monitoring

Use a personal computer with the optional setup software or a Modbus® link to view historical data and system events.

- Historical data (total and resettable)
- System events (time and date-stamped)
- System faults (time and date-stamped)
- Line-to-line voltage
- System frequency
- Time delay active
- Time delay remaining
- System status
- Source available
- Contactor position
- Exerciser schedule, mode, and time remaining on active exercise

Communications

- Serial port for PC connection
- Modbus® network interface

Programmable Features

Use a personal computer with the optional setup software or a Modbus® link to view, select, or adjust programmable features.

Programmable Features*

- System voltage†
- System frequency†
- Single/three-phase operation†
- ABC or CBA phase rotation (ABC)
- In-phase monitor (disabled)
- Commit/no commit switch (no commit)
- User-defined password
- Calendar mode exerciser (up to 21 events)

Programmable Inputs and Outputs

Use a personal computer with the optional setup software or a Modbus® link to define inputs and outputs.

Programmable Inputs

- End time delay input (default)
- Inhibit transfer
- Low battery fault
- Load shed (forced transfer to OFF; programmed-transition models only)
- Peak shave/area protection input (default)
- Remote common fault
- Remote test

Programmable Outputs

- Auxiliary switch fault
- Common fault
- Contactor position
- Exercise active
- Failure to acquire standby source
- Failure to transfer fault
- Generator engine start
- Load bank control (default)
- Load control (pre/post-transfer, up to 9 outputs)
- Loss of phase fault
- Low backup battery
- Modbus®-controlled relay outputs (4 maximum)
- Not in automatic mode
- Non-emergency transfer
- Over and undervoltage faults
- Over and underfrequency faults
- Peak shave/area protection active
- Phase rotation error
- Source available
- Test active

* Factory default settings are shown in parentheses. All settings are stored in non-volatile memory.

† System parameters set per order.

Controller Features, continued

Voltage and Frequency Sensing		
Parameter	Default	Adjustment Range
Undervoltage pickup	90% of nominal	85%–100% of nominal
Undervoltage dropout	90% of pickup	75%–98% of pickup
Overvoltage dropout	115% of nominal	105%–135% of nominal*
Overvoltage pickup	95% of dropout	95%–100% of dropout
Voltage dropout time	0.5 sec.	0.1–9.9 sec.
Underfrequency pickup	90% of nominal	85%–95% of nominal
Underfrequency dropout	99% of pickup	95%–99% of pickup
Overfrequency dropout	101% of pickup	101%–105% of pickup
Overfrequency pickup	110% of nominal	105%–120% of nominal
Frequency dropout time	3 sec.	0.1–15 sec.

* 690 volts, maximum

Adjustable Time Delays		
Time Delay	Default	Adjustment Range
Engine start	3 sec.	0–6 sec. †
Preferred to standby	1 sec.	0–60 min. †
Standby to preferred	15 min.	
Engine cooldown	0 min.	
Failure to acquire standby source	1 min.	
Pre-transfer to preferred signal	3 sec.	
Pre-transfer to standby signal	3 sec.	
Post-transfer to preferred signal	0 sec.	
Post-transfer to standby signal	0 sec.	

† Adjustable in 1 second increments. Can be extended to 60 minutes with an External Battery Supply Module Kit.

Application Data

UL-Listed Solderless Screw-Type Terminals for External Power Connections		
Normal, Emergency, and Load Terminals		
Switch Rating (Amps)	Maximum Number of Cables per Pole	Range of Wire Sizes, Copper or Aluminum ‡
30–230	1	#14 AWG to 4/0 AWG ‡
260–400	1	#4 AWG to 600 MCM
	2	#1/0 AWG to 250 MCM
600	2	#2 AWG to 600 MCM
800–1200	4	#1/0 AWG to 750 MCM
1600–2000	6	#1/0 AWG to 750 MCM
2600–3000	12	#1/0 AWG to 750 MCM
4000	Bus Bar	

‡ 230 amp/600 volt use copper only

Input and Output Connection Specifications		
Component	Number of Wires	Wire Size Range
Terminal strip I/O terminals	1	#12–24 AWG
I/O module terminals	1	#14–24 AWG

Auxiliary Position Indicating Contacts (rated 10 amps @ 32 VDC/250 VAC)		
Switch Rating (Amps)	Number of Contacts Indicating Normal, Emergency	
	Open-Transition	Programmed-Transition
30–104	2, 2	—
150–400	2, 2	2, 2
600–800	2, 2	6, 6
1000–3000	8, 8	7, 7
4000	4, 4	4, 3

Environmental Specifications	
Operating Temperature	–20°C to 70°C (–4°F to 158°F)
Storage Temperature	–40°C to 70°C (–40°F to 158°F)
Humidity	5% to 95% noncondensing
Altitude	0 to 3050 m (10000 ft.) without derating

Codes and Standards

The ATS meets or exceeds the requirements of the following specifications:

- Underwriters Laboratories UL 508, Standard for Industrial Control Equipment
- Underwriters Laboratories UL 1008, Standard for Automatic Transfer Switches for Use in Emergency Standby Systems
- Underwriters Laboratories Inc., listed to Canadian Safety Standards (cUL)
- NFPA 70, National Electrical Code
- NFPA 99, Essential Electrical Systems for Health Care Facilities
- NFPA 110, Emergency and Standby Power Systems
- IEEE Standard 446, IEEE Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications
- NEMA Standard IC10-1993 (formerly ICS2-447), AC Automatic Transfer Switches
- EN61000-4-5 Surge Immunity Class 4 (voltage sensing and programmable inputs only)
- EN61000-4-4 Fast Transient Immunity Severity Level 4
- IEC Specifications for EMI/EMC Immunity:
 - CISPR 11, Radiated Emissions
 - IEC 1000-4-2, Electrostatic Discharge
 - IEC 1000-4-3, Radiated Electromagnetic Fields
 - IEC 1000-4-4, Electrical Fast Transients (Bursts)
 - IEC 1000-4-5, Surge Voltage
 - IEC 1000-4-6, Conducted RF Disturbances
 - IEC 1000-4-8, Magnetic Fields
 - IEC 1000-4-11, Voltage Variations and Interruptions

Withstand Current Ratings (WCR) Open- and Programmed-Transition Models

Maximum current in RMS symmetrical amperes when coordinated with customer-supplied fuses or circuit breakers.

Withstand Current Ratings in RMS Symmetrical Amperes§								
Switch Rating, Amps	Any Circuit Breaker			Specific Circuit Breaker Max. Amps @ 480 VAC	Current-Limiting Fuses			
	Cycles @ 60 Hz	Maximum Circuit Amps @ 480 VAC	Maximum Circuit Amps @ 600 VAC		Maximum Circuit Amps	Volts, Max.	Maximum Fuse Size, Amps	Type
30	1.5	10,000	10,000	N/A	100,000	480	60	LPS-RK, J
70 104 150	1.5	10,000	10,000	22,000	200,000	480	200	
200	1.5	10,000	N/A	22,000	200,000	480	200	J
230	1.5	10,000	22,000	22,000	100,000	480	300	
260 400	3	35,000	22,000	42,000	200,000	480	600	L
600 800 1000 1200	3	50,000	50,000	65,000	200,000	600	1600	
	18 **	36,000	36,000					
1600‡ 2000‡	3 30 **	100,000 65,000	100,000 65,000	N/A	200,000	600	3000	
2600 3000	3 30 **	100,000 65,000	100,000 65,000	N/A	200,000	600	4000	
4000	3 30 **	100,000 65,000	100,000 65,000	N/A	200,000	480	6000	

‡ Optional front-connected service limited to 85,000 amps for specific and any breaker ratings.

§ All values are available symmetrical RMS amperes and tested in accordance with the withstand and close-on requirements of UL 1008. Application requirements may permit higher withstand ratings for certain size switches. Contact Kohler Co. for assistance.

** Short time ratings are provided for applications involving breakers that do not have instantaneous trips for systems coordination.

Ratings with Specific Manufacturers' Circuit Breakers

The following charts list power switching device withstand current ratings (WCR) in RMS symmetrical amperes for specific manufacturers' circuit breakers. Circuit breakers are supplied by the customer.

Switch Rating, Amps	Molded-Case Circuit Breakers				
	WCR, Amps RMS	Voltage, Max.	Manufacturer	Type	Max. Size, Amps
70	22,000	480	Square D	FH	80
				FC, FI	100
				KA, KC, KH, KI, LA, LH	250
			GE	TB1	100
				TEL, THED, THLC1, THLC2	150
				TFL	225
			ITE	CED6, ED6, HED4, HED6	125
				CFD6	150
				FD6, FXD6, HFD6	250
			Cutler-Hammer	FCL, Tri-Pac FB	100
				FD, FDC, HFD	150
				HJD, JD, JDB, JDC	250
				HKD, KD, KDB, KDC, LCL, Tri-Pac LA	400
			ABB	S1	125
				S3	150
			Merlin Gerin	CE104, CE106	100
104	22,000	480	Square D	FC, FI	100
				KA, KC, KH, KI, LA, LH	250
				TB1	100
			GE	TEL, THED, THLC1, THLC2	150
				TFL	225
				CED6, ED6, HED4, HED6	125
			ITE	CFD6	150
				FD6, FXD6, HFD6	250
				FCL, Tri-Pac FB	100
			Cutler-Hammer	FD, FDC, HFD	150
				HJD, JD, JDB, JDC	250
				HKD, KD, KDB, KDC, LCL, Tri-Pac LA	400
				S1	125
			ABB	S3	150
				Merlin Gerin	CE104, CE106
			150	22,000	480
TFL, THFK, THLC2	225				
SFL, SFP, TFJ, TFK	250				
SGL4, SGP4, TLB4	400				
ITE	CFD6, FD6, FXD6, HFD6	225			
	CJD6, HHJD6, HHJXD6, HJD6, JD6, JXD6, SCJD6, SHJD6, SJD6	400			
Square D	KA, KC, KH, KI	250			
	LC, LI	300			
	LA, LH	400			
Cutler-Hammer	FD, FDC, HFD	150			
	HJD, JD, JDB, JDC	250			
	LCL, Tri-Pac LA, HKD, KD, KDB, KDC	400			
ABB	S3	150			
Merlin Gerin	CF250	250			
	CJ400	400			

Ratings with Specific Manufacturers' Circuit Breakers, continued

Switch Rating, Amps	Molded-Case Circuit Breakers							
	WCR, Amps RMS	Voltage, Max.	Manufacturer	Type	Max. Size, Amps			
200 230	22,000	480	GE	TFL, THFK, THLC2	225			
				SFL, SFP, TFJ, TFK	250			
				SGL4, SGP4, TLB4	400			
			ITE	CFD6, FD6, FXD6, HFD6	225			
				CJD6, HHJD6, HHJXD6, HJD6, JD6, JXD6, SCJD6, SHJD6, SJD6	400			
			Square D	KA, KC, KH, KI	250			
				LC, LI	300			
				LA, LH	400			
			Cutler-Hammer	HJD, JD, JDB, JDC	250			
				LCL, Tri-Pac LA, HKD, KD, KDB, KDC	400			
			Merlin Gerin	CF250	250			
				CJ400	400			
260	42,000	480	GE	TFL, THLC2	225			
				SFL, SFLA, SFP	250			
				SGL4, SGP4, TB4, THLC4, TLB4	400			
				SGLA, SGL6, SGP6, TB6	600			
				SKHA, SKLB, SKP8, TKL	800			
			ITE	CFD6, FD6, FXD6, HFD6	250			
				CJD6, HHJD6, HHJXD6, HJD6, JD6, JXD6, SCJD6, SHJD6, SJD6	400			
				CLD6, HHL6, HHLXD6, HLD6, SCLD6, SHLD6	600			
				CMD6, HMD6, HND6, MD6, MXD6, SCMD6, SHMD6, SMD6, SND6	800			
					800			
			Square D	KC, KI	250			
				LC, LI	600			
				MH	800			
			Cutler-Hammer	HJD, JDC	250			
				HKD, KDC, LCL, Tri-Pac LA	400			
				HLD	600			
				Tri-Pac NB	800			
			ABB	S5	400			
				S6	600			
			Merlin Gerin	CF250	250			
				CJ400	400			
			400	42,000	480	GE	SGL4, SGP4, TB4, THLC4, TLB4	400
							SGLA, SGL6, SGP6, TB6	600
							SKHA, SKL8, SKP8, TKL	800
ITE	CJD6, HHJD6, HHJXD6, HJD6, SCJD6, SHJD6	400						
	CLD6, HHJD6, HHLXD6, HLD6, SCLD6, SHLD6	600						
	CMD6, HMD6, HND6, MD6, MXD6, SCMD6, SHMD6, SMD6, SND6	800						
Square D	LC, LI	600						
	MH	800						
Cutler-Hammer	HKD, KDC, LCL, Tri-Pac LA	400						
	HLD	600						
	Tri-Pac NB	800						
ABB	S5	400						
	S6	800						
Merlin Gerin	CJ600	600						
600 800 1000 1200	65,000	480				GE	TB8	800
			Microversatrip TKL	1200				
			ITE	CLD6, HHL6, HHLXD6, HLD6, SCLD6, SHLD6	600			
				CMD6, HMD6, SCMD6, SHMD6	800			
				CND6, HND6, SCND6, SHND6	1200			
				CPD6	1600			
					1600			
			Square D	MH Series 2	1000			
				SE (LS Trip), SEH (LS Trip)	2500			
		600	Cutler-Hammer	Tri-Pac NB	800			
				Tri-Pac PB	1600			
				RDC	2500			
		42,000	480	ABB	S6	800		
					S7	1200		
				Merlin Gerin	CJ600	600		
CK1200	1200							

Weights and Dimensions

Weights and dimensions are shown for transfer switches in NEMA type 1 enclosures, type 3R enclosures, and open units. Consult the factory for NEMA type 12, 4, and 4X enclosures.

Note: This information is provided for reference only and should not be used for planning installation. Contact your local distributor for more detailed information.

Amps	Poles	NEMA Type	Dimensions mm (in.)			Weight kg (lb.)		
			Height	Width	Depth	2-Pole	3-Pole	4-Pole
30-200	2,3,4	1, 3R	791 (31)	450 (18)	314 (12.4)‡	28 (62)	30 (65)	31 (68)
230-400	2,3,4	1, 3R	1223 (48)	560 (22)	362 (14.3)‡	52 (115)	56 (123)	59 (131)
600-1000	2,3,4	1, 3R	1932 (76)*	864 (34)	515 (20.3)‡	220 (485)	231 (510)	238 (525)
1200	3,4	1	2286 (90)	963 (38)	686 (27)	—	356 (785)	379 (835)
	3,4	3R	2286 (90)	641 (25.2)	717 (28.2)	—	356 (785)	379 (835)
1600-2000	3,4	1	2286 (90)	965 (38)	1220 (48)	—	472 (1040)	494 (1090)
	3,4	3R	2286 (90)	940 (37)	1434 (56.4)	—	472 (1040)	494 (1090)
1600-2000F†	3,4	1	2286 (90)	963 (38)	688 (27)	—	472 (1040)	494 (1090)
2600-3000	3,4	1	2286 (90)	963 (38)	1524 (60)	—	649 (1430)	679 (1495)
	3,4	3R	2286 (90)	641 (25.2)	1738 (68.4)	—	649 (1430)	679 (1495)
4000	3,4	1	2286 (90)	1168 (46)	1829 (72)	—	1043 (2300)	1089 (2400)
30-200	2,3,4	Open Unit §	787 (31)	445 (17.5)	296 (11.6)	8 (17)	9 (20)	11 (23)
230-400	2,3,4		1219 (48)	457 (18.0)	330 (13.0)	17 (37)	21 (45)	—
600-1000	2,3,4		1829 (72)	864 (34)	508 (20)	68 (150)	78 (170)	90 (196)
1200	2,3,4		2210 (87)	965 (38)	584 (23)	68 (150)	78 (170)	90 (196)
1600-2000	3,4		2286 (90)	965 (38)	1219 (48)	—	190 (420)	213 (470)
1600-2000F†	3,4		2210 (87)	965 (38)	635 (25)	—	190 (420)	213 (470)
2600-3000	3,4		2286 (90)	965 (38)	1524 (60)	—	213 (470)	243 (535)
4000	3,4		2286 (90)	1168 (46)	1828 (72)	—	545 (1200)	590 (1300)

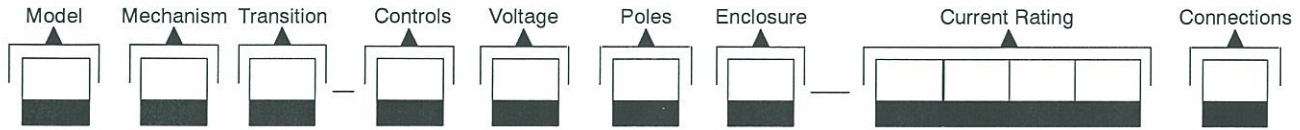
* Includes mounting feet

† F = Front connected

‡ On 30-1000 amp models, the NEMA type 3R enclosures have a security cover on the controller that extends 54 mm (2.1 in.) beyond the door.

§ Dimensions shown for open units are the minimum required enclosure size. Open units weights are shipping weights for the contactor only.

Record the transfer switch model designation in the boxes below. The transfer switch model designation defines characteristics and ratings as explained in the accompanying chart.



Kohler® Model Designation Key

This chart explains the Kohler® transfer switch model designation system. The sample model designation shown is for a Model K automatic transfer switch that uses a standard-transition contactor with MPAC 1000™ electrical controls rated at 480 volts/60 Hz, 3 poles, 4 wires, and solid neutral in a NEMA 1 enclosure with a current rating of 400 amperes. Not all possible combinations are available.

SAMPLE MODEL DESIGNATION

KCT-AMTA-0400S

Model

K: Model K automatic transfer switch

Mechanism

C: Automatic
 B: Bypass Isolation (See G11-81)
 N: Non-automatic

Transition

T: Standard-Transition

Electrical Controls

A: MPAC™ 1000 (Microprocessor ATS Controls)

Voltage/Frequency

C: 208 Volts/60 Hz	H: 400 Volts/50 Hz	N: 600 Volts/60 Hz
D: 220 Volts/50 Hz	J: 416 Volts/50 Hz	P: 380 Volts/60 Hz
F: 240 Volts/60 Hz	K: 440 Volts/60 Hz	S: 220 Volts/60 Hz
G: 380 Volts/50 Hz	M: 480 Volts/60 Hz	

Number of Poles/Wires

N: 2-pole, 3-wire, solid neutral	Z: 3-pole, 4-wire, integral solid neutral (Solid neutral mounted on the contactor. Not available on all amperages.)
T: 3-pole, 4-wire, solid neutral	
V: 4-pole, 4-wire, switched neutral	
W: 4-pole, 4-wire, overlapping neutral	

Enclosure

A: NEMA 1†	C: NEMA 3R‡	F: NEMA 4X§
B: NEMA 12§	D: NEMA 4§	G: Open unit

† Standard on 30-4000 A models.
 ‡ Available to order on 30-3000 A models. Contact the factory for 4000 A models.
 § Available to order on 30-1000 A models. Contact the factory for larger units.

Current Rating: Numbers indicate the current rating of the switch in amperes:

0030	0200	0600	1200	2600
0070	0230	0800	1600	3000
0104	0260	1000	2000	4000
0150	0400			

Power Connections

S: Standard
 F: Front bus (available on 1600 and 2000 A models only)

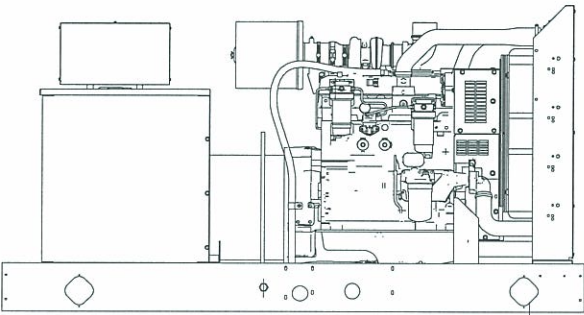
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Availability is subject to change without notice. Kohler Co. reserves the right to change the design or specifications without notice and without any obligation or liability whatsoever. Contact your local Kohler® generator set distributor for availability.



Ratings Range

		60 Hz
Standby:	kW	80-100
	kVA	80-125
Prime:	kW	71-92
	kVA	71-115



Generator Set Ratings

Alternator	Voltage	Ph	Hz	130°C Rise Standby Rating		105°C Rise Prime Rating	
				kW/kVA	Amps	kW/kVA	Amps
4S9W/4S9	120/208	3	60	100/125	347	90/113	312
	127/220	3	60	100/125	328	90/113	295
	120/240	3	60	100/125	301	90/113	271
	120/240	1	60	80/80	333	71/71	296
	139/240	3	60	100/125	301	91/114	274
	220/380	3	60	88/110	167	90/113	171
	277/480	3	60	100/125	150	91/114	137
	347/600	3	60	100/125	120	91/114	109
4S11W/4S11	120/208	3	60	100/125	347	91/114	316
	127/220	3	60	100/125	328	91/114	299
	120/240	3	60	100/125	301	91/114	274
	120/240	1	60	95/95	396	86/86	358
	139/240	3	60	100/125	301	92/115	277
	220/380	3	60	100/125	190	91/114	173
	277/480	3	60	100/125	150	92/115	138
4V11W/4V11	120/240	1	60	95/95	396	86/86	358

Standard Features

- Kohler Co. provides one-source responsibility for the generating system and accessories.
- The generator set and its components are prototype-tested, factory-built, and production-tested.
- The 60 Hz generator set offers a UL 2200 listing.
- The generator set accepts rated load in one step.
- The generator set complies with ISO 8528-5, Class G2, requirements for transient performance in all generator set configurations. Select the Decision-Maker™ 550 controller for improved voltage regulation and ISO 8528-5, Class G3, compliance.
- The 60 Hz generator set engine is certified by the Environmental Protection Agency (EPA) to conform to Tier 3 nonroad emissions regulations.
- A one-year limited warranty covers all systems and components. Two-, five-, and ten-year extended warranties are also available.
- Alternator features:
 - The Fast-Response™ III wound field (WF) design alternator provides excellent voltage response and short-circuit capability using an auxiliary power brushless exciter.
 - The unique Fast-Response™ II excitation system delivers excellent voltage response and short circuit capability using a permanent magnet (PM)-excited alternator.
 - The brushless, rotating-field alternator has broadrange reconnectability.
- Other features:
 - Controllers are available for all applications. See controller features inside.
 - The low coolant level shutdown prevents overheating (standard on radiator models only).
 - Integral vibration isolation eliminates the need for under-unit vibration spring isolators.

RATINGS: All three-phase units are rated at 0.8 power factor. All single-phase units are rated at 1.0 power factor. *Standby Ratings:* Standby ratings apply to installations served by a reliable utility source. The standby rating is applicable to varying loads for the duration of a power outage. There is no overload capability for this rating. Ratings are in accordance with ISO-3046/1, BS 5514, AS 2789, and DIN 6271. *Prime Power Ratings:* Prime power ratings apply to installations where utility power is unavailable or unreliable. At varying load, the number of generator set operating hours is unlimited. A 10% overload capacity is available for one hour in twelve. Ratings are in accordance with ISO-8528/1, overload power in accordance with ISO-3046/1, BS 5514, AS 2789, and DIN 6271. For limited running time and base load ratings, consult the factory. Obtain the technical information bulletin (TIB-101) on ratings guidelines for the complete ratings definitions. The generator set manufacturer reserves the right to change the design or specifications without notice and without any obligation or liability whatsoever. GENERAL GUIDELINES FOR DERATION: *Altitude:* Derate 1.3% per 100 m (328 ft.) elevation above 2500 m (8200 ft.). *Temperature:* Derate 1.0% per 10°C (18°F) temperature above 25°C (77°F).

Alternator Specifications

Specifications	Alternator
Manufacturer	Kohler
Type	4-Pole, Rotating-Field
Exciter type	
Wound field (WF)	Wound Exciter Field with Separate Excitation Power Winding
Permanent magnet (PM)	Brushless, Permanent-Magnet
Leads: quantity, type	12, Reconnectable
Voltage regulator	Solid State, Volts/Hz
Insulation:	NEMA MG1
Material	Class H
Temperature rise	130°C, Standby
Bearing: quantity, type	1, Sealed
Coupling	Flexible Disc
Amortisseur windings	Full
Voltage regulation, no-load to full-load	
Wound field (WF) alternator	±0.25% Average
Permanent magnet (PM) alternator	±2% Average
550 controller (with 0.5% drift due to temperature variation)	3-Phase Sensing, ±0.25%
Unbalanced load capability	100% of Rated Standby Current
One-step load acceptance	100% of Rating
Peak motor starting kVA:	(35% dip for voltages below)
480 V 4S9W/4S9 (12 lead)	315
480 V 4S11W/4S11 (12 lead)	460
480 V 4V11W/4V11 (12 lead)	—

- NEMA MG1, IEEE, and ANSI standards compliance for temperature rise and motor starting.
- Sustained short-circuit current of up to 300% of the rated current for up to 10 seconds.
- Sustained short-circuit current enabling downstream circuit breakers to trip without collapsing the alternator field.
- Self-ventilated and dripproof construction.
- Vacuum-impregnated windings with fungus-resistant epoxy varnish for dependability and long life.
- Superior voltage waveform from a two-thirds pitch stator and skewed rotor.
- Fast-Response™ III wound field (WF) brushless alternator with auxiliary power brushless exciter for excellent load response.
- Fast-Response™ II brushless alternator with brushless exciter for excellent load response.

Application Data

Engine

Engine Specifications	
Manufacturer	John Deere
Engine model	4045HF285I
Engine type	4-Cycle, Turbocharged
Cylinder arrangement	4 Inline
Displacement, L (cu. in.)	4.5 (276)
Bore and stroke, mm (in.)	106 x 127 (4.19 x 5.00)
Compression ratio	19:1
Piston speed, m/min. (ft./min.)	457 (1500)
Main bearings: quantity, type	5, Replaceable Insert
Rated rpm	1800
Max. power at rated rpm, kWm (BHP)	118 (158)
Cylinder head material	Cast Iron
Crankshaft material	Forged Steel
Valve material:	
Intake	Chromium-Silicon Steel
Exhaust	Stainless Steel
Governor: type, make/model	JDEC Electronic L16 Denso HP3
Frequency regulation, no-load to full-load	Isochronous
Frequency regulation, steady state	±0.25%
Frequency	Fixed
Air cleaner type, all models	Dry

Exhaust

Exhaust System	
Exhaust manifold type	Dry
Exhaust flow at rated kW, m ³ /min. (cfm)	22.8 (805)
Exhaust temperature at rated kW, dry exhaust, °C (°F)	580 (1076)
Maximum allowable back pressure, kPa (in. Hg)	7.5 (2.2)
Exhaust outlet size at engine hookup, mm (in.)	98 (3.86)

Engine Electrical

Engine Electrical System (12/24 Volt*)	
Battery charging alternator:	12 Volt/24 Volt
Ground (negative/positive)	Negative
Volts (DC)	12/24
Ampere rating	65/45
Starter motor rated voltage (DC)	12/24
Battery, recommended cold cranking amps (CCA):	12 Volt/24 Volt
Quantity, CCA rating each	One, 640/Two, 570
Battery voltage (DC)	12

*12-volt or 24-volt engine electrical systems are available.

Application Data

Fuel

Fuel System	
Fuel supply line, min. ID, mm (in.)	11.0 (0.44)
Fuel return line, min. ID, mm (in.)	6.0 (0.25)
Max. lift, fuel pump: type, m (ft.)	Engine-Driven, 1.8 (6.0)
Max. fuel flow, Lph (gph)	74.6 (19.7)
Fuel prime pump	Manual
Fuel filter	
Secondary	2 Microns @ 98% Efficiency
Primary	30 Microns
Water Separator	Yes
Recommended fuel	#2 Diesel

Lubrication

Lubricating System	
Type	Full Pressure
Oil pan capacity, L (qt.)	14.7 (15.5)
Oil pan capacity with filter, L (qt.)	15.6 (16.5)
Oil filter: quantity, type	1, Cartridge
Oil cooler	Water-Cooled

Cooling

Radiator System	
Ambient temperature, °C (°F)*	50 (122)
Engine jacket water capacity, L (gal.)	8.5 (2.25)
Radiator system capacity, including engine, L (gal.)	20.1 (5.3)
Engine jacket water flow, Lpm (gpm)	4182 (48)
Heat rejected to cooling water at rated kW, dry exhaust, kW (Btu/min.)	62 (3544)
Heat rejected to charge cooler at rated kW, dry exhaust, kW (Btu/min.)	20 (1127)
Water pump type	Centrifugal
Fan diameter, including blades, mm (in.)	600 (23.6)
Fan, kWm (HP)	5.7 (7.6)
Max. restriction of cooling air, intake and discharge side of radiator, kPa (in. H ₂ O)	0.125 (0.5)

* Enclosure with enclosed silencer reduces ambient temperature capability by 5°C (9°F).

Operation Requirements

Air Requirements	
Radiator-cooled cooling air, m ³ /min. (scfm)‡	161 (5700)
Combustion air, m ³ /min. (cfm)	8.2 (288)
Heat rejected to ambient air:	
Engine, kW (Btu/min.)	25.0 (1420)
Alternator, kW (Btu/min.)	11.6 (660)

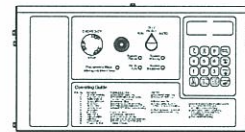
‡ Air density = 1.20 kg/m³ (0.075 lbf/ft³)

Fuel Consumption

Diesel, Lph (gph) at % load	Standby Rating
100%	31.0 (8.2)
75%	25.0 (6.6)
500%	17.8 (4.7)
25%	9.5 (2.5)

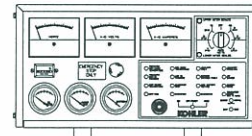
Diesel, Lph (gph) at % load	Prime Rating
100%	27.6 (7.3)
75%	22.7 (6.0)
500%	14.4 (3.8)
25%	7.6 (2.0)

Controllers



Decision-Maker™ 550 Controller

Audiovisual annunciation with NFPA 110 Level 1 capability. Programmable microprocessor logic and digital display features. Alternator safeguard circuit protection. 12- or 24-volt engine electrical system capability. Remote start, remote annunciation, and remote communication options. Refer to G6-46 for additional controller features and accessories.



Decision-Maker™ 3+, 16-Light Controller

Audiovisual annunciation with NFPA 110 Level 1 capability. Microprocessor logic, AC meters, and engine gauge features. 12- or 24-volt engine electrical system capability. Remote start, prime power, and remote annunciation options. Refer to G6-30 for additional controller features and accessories.

Additional Standard Features

- Alternator Protection (standard with 550 controller)
- Battery Rack and Cables
- Emission Compliant Engine
- Integral Vibration Isolation
- Oil Drain Extension
- Operation and Installation Literature

Available Accessories

Enclosed Unit

- Sound Enclosure (with enclosed critical silencer)
- Weather Enclosure (with enclosed critical silencer)
- Weather Housing (with roof-mounted critical silencer)

Open Unit

- Exhaust Silencer, Critical (kit: PA-354809)
- Exhaust Silencer, Hospital (kit: PA-365349)
- Flexible Exhaust Connector, Stainless Steel

Cooling System

- Block Heater
(recommended for ambient temperatures below 0°C [32°F])
- Radiator Duct Flange

Fuel System

- Auxiliary Fuel Pump
- Flexible Fuel Lines
- Fuel Pressure Gauge
- Subbase Fuel Tanks
- Subbase Fuel Tank with Day Tank

Electrical System

- Battery
- Battery Charger, Equalize/Float Type
- Battery Heater

Engine and Alternator

- Alternator, Wound Field (WF)
- Alternator, Permanent Magnet (PM)
- Air Cleaner, Heavy Duty
- Air Cleaner Restriction Indicator
- Alternator Strip Heater
- Bus Bar Kits
- Closed Crankcase Canister
- CSA Certification
- Current Transformer Kit
- Line Circuit Breaker (NEMA type 1 enclosure)
- Line Circuit Breaker with Shunt Trip (NEMA type 1 enclosure)
- Optional Alternators
- Rated Power Factor Testing
- Rodent Guards
- Safeguard Breaker (not available with 550 controller)
- Skid End Caps
- Voltage Regulation, 1%
- Voltage Regulator Sensing, 3-Phase

Paralleling System

- Reactive Droop Compensator
- Voltage Adjust Control
- Voltage Regulator Relocation Kit

Maintenance

- General Maintenance Literature Kit
- Maintenance Kit (includes standard air, oil, and fuel filters)
- NFPA 110 Literature
- Overhaul Literature Kit
- Production Literature Kit

Controller

- Common Failure Relay Kit
- Communication Products and PC Software (550 controller only)
- Customer Connection Kit
- Dry Contact Kit (isolated alarm)
- Prime Power Switch (550 controller only)
- Remote Annunciator Panel
- Remote Audiovisual Alarm Panel
- Remote Emergency Stop Kit
- Remote Mounting Cable
- Run Relay Kit

Miscellaneous Accessories

- _____
- _____
- _____

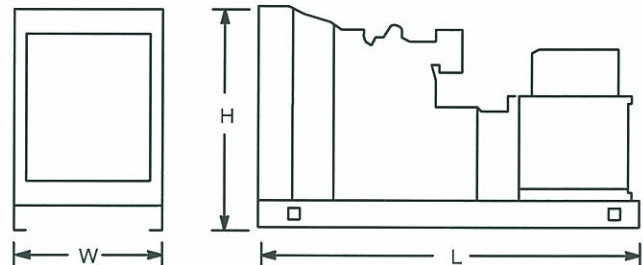
Dimensions and Weights

Overall Size, L x W x H, mm (in.):

Wide Skid: 2400 x 1040 x 1274 (94.49 x 40.94 x 50.15)

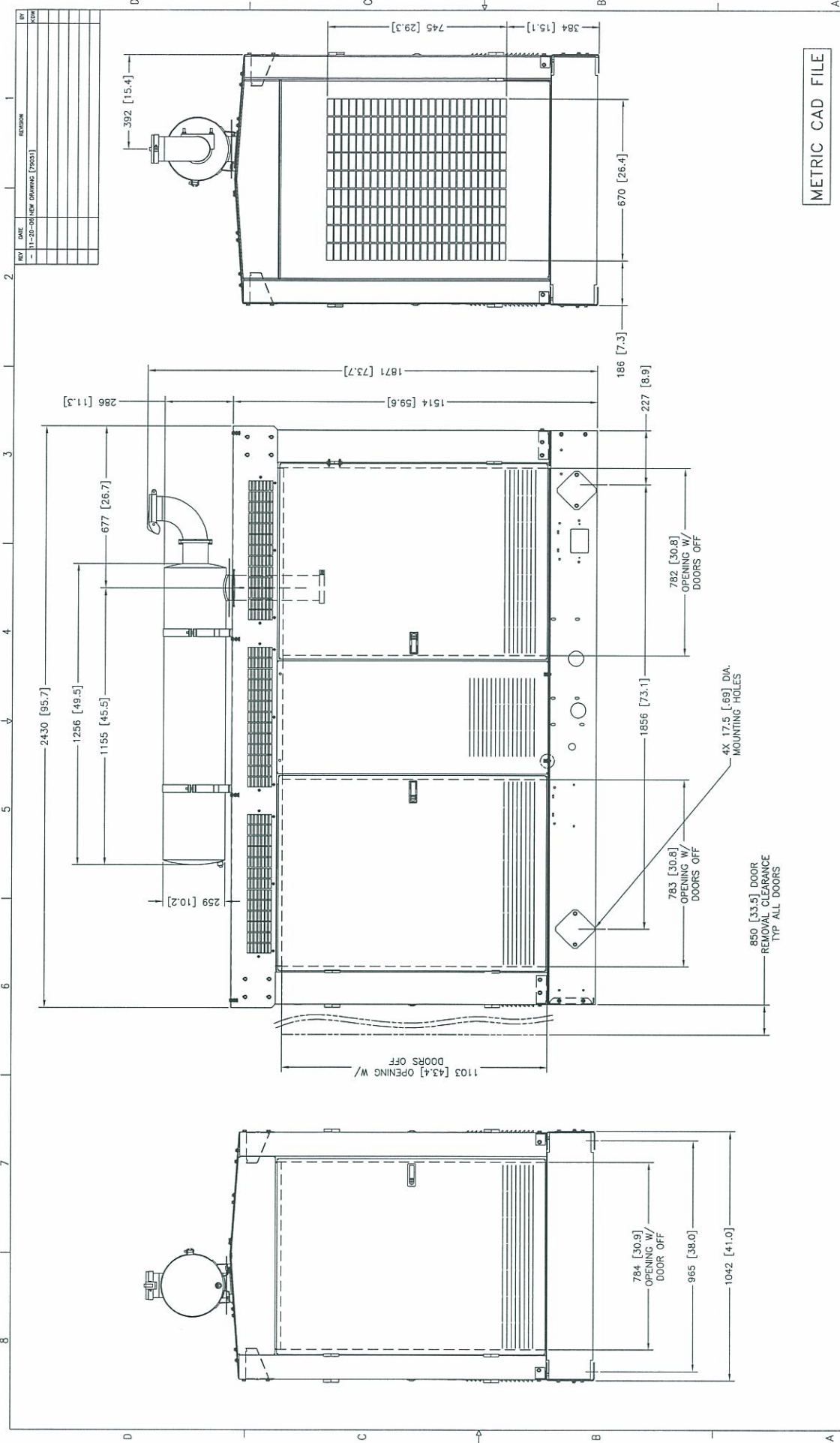
Narrow Skid: 2400 x 864 x 1274 (94.49 x 34.02 x 50.15)

Weight (radiator model), wet, kg (lb.): 1234 (2720)



NOTE: This drawing is provided for reference only and should not be used for planning installation. Contact your local distributor for more detailed information.

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METRIC CAD FILE

PLEASE CHECK THESE DIMENSIONS IN MILLIMETERS

STANDARD FINISH: UNLESS OTHERWISE SPECIFIED

UNIT: DIMENSIONS IN [] ARE INCH EQUIVALENT

SCALE: 1:1

DATE: 11-20-2006

APPROVED BY: [Signature]

DESIGNED BY: [Signature]

DRAWN BY: [Signature]

PROJECT NO.: ADV-7322

REV: 1-A

WEATHER ENCLOSURE W/ROOF MOUNTED CRITICAL SILENCER

80 MODEL, 457, 459, 4V9

100 MODEL, 459, 4511, 4V11

IMPROVED MOTOR STARTING (MS) RECONNECTABLE

600V & 1 PHASE ALTERNATOR

4045HF285 JOHN DEERE, TIER III

NOTE: EXPENSE SCREWS, NUTS, AND WASHERS ARE LISTED AS "TYP" AND ARE NOT SPECIFIED ON BILLS OF MATERIAL FOR PROPER ASSEMBLY METHOD, USE G-585 AS A GUIDELINE.

MODEL	GENSET WEIGHT (WET) W/STEEL WEATHER ENCL ENCLOSURE ONLY	STEEL WEATHER ENCLOSURE ONLY
80 457	1294 KG [2852 LBS]	239 KG [525 LBS]
80 459, 4V9	1363 KG [3004 LBS]	239 KG [525 LBS]
100 459	1518 KG [3346 LBS]	239 KG [525 LBS]

9001
KOHLER
 POWER SYSTEMS
 NATIONALLY REGISTERED



Ratings

Voltage: 208–600 VAC 50/60 Hz

Current: 30–4000 amps

Standard Contactor Features

- Open-transition operation with either automatic or non-automatic control
- 2, 3, or 4 poles
- Electrically operated, mechanically held
- Double-throw, inherently interlocked design (break-before-make power contacts)
- Solid, switched, or overlapping neutral (make-before-break type)
- High withstand and closing ratings
- Design suitable for emergency and standby applications on all classes of load, 100% tungsten rated through 400 amps
- Open-transition transfer time less than 100 milliseconds (6 cycles @ 60 Hz)
- Silver alloy main contacts
- Front-accessible contacts for easy inspection
- Front-replaceable main and arcing contacts (600–4000 amps)
- Reliable, field-proven solenoid mechanism
- Switching mechanisms lubricated for life
- Internal manual operating handle
- Main shaft auxiliary contacts

Modbus® is a registered trademark of Schneider Electric.

MPAC 1000™ Controller Standard Features

- Microprocessor controller
- Real-time clock with battery backup
- Broadrange voltage sensing (208–600 VAC) with 2% accuracy on both sources
- Frequency sensing with 1% accuracy on both sources
- Environmentally sealed user interface
- Keypad with tactile feedback pushbuttons
- LED indicators
- Selectable operating modes
- Programmable inputs and outputs
- Load/no load exercise function
- Anti-single phasing protection
- Load control inputs and outputs
- Phase rotation sensing
- Time-stamped event log
- Gold-flashed engine start contacts
- Modbus® communication with network and setup connections

MPAC 1000™ Controller Programmable Features

- System voltage and frequency
- Adjustable over/undervoltage and over/underfrequency for the normal and emergency sources
- Adjustable time delays
- Commit/no commit transfer
- ABC/BAC phase rotation selection with error detection
- Resettable historical data
- In-phase monitor
- Password protection

Accessories

- Programmable input/output (I/O) modules with two inputs and six outputs (isolated SPDT form C contacts, output rating 2 amps @ 30 VDC/250 VAC); four I/O module maximum
- Three-stage charging, dual-output battery charger (6 amps @ 12 VDC/3 amps @ 24 VDC)
- Padlockable user interface cover
- Preferred source switch
- Supervised transfer control switch
- Setup software
- Line-to-neutral monitoring
- Chicago alarm module
- External battery supply module (allows extended engine start time delay)

Controller Features

Standard Controller Features

User Interface Keypad

- Start/end system test
- Set/end exercise
- End time delay
- Lamp test/service reset

User Interface Indicators

- Contactor position: Normal, Emergency
- Source available: Normal, Emergency
- Service required: immediate, maintenance
- Not in automatic mode
- Four-stage time delay remaining
- Exercise: load, no load, set/disabled
- Test: load, no load
- Load control active: peak shave, pre/post-transfer signal
- In-phase monitor active

Selectable Operating Modes*

- 1 week/2 week manually set exercise (1 week)
- Disable/enable exercise (enable)
- Load/no load exercise (no load)
- Load/no load test (load)
- Enable/disable transfer (enable)

Programmable Inputs (factory settings)

- End time delay
- Peak shave/area protection

Outputs

- Generator engine start, normally closed gold-flashed contact rated 2 amps @ 30 VDC/250 VAC
- Pre-transfer load control, one normally open contact rated 10 amps @ 30 VDC/250 VAC
- One programmable output, factory-set to load bank control isolated SPDT form C contact rated 2 amps @ 30 VDC/250 VAC

Software Event Monitoring

Use a personal computer with the optional setup software or a Modbus® link to view historical data and system events.

- Historical data (total and resettable)
- System events (time and date-stamped)
- System faults (time and date-stamped)
- Line-to-line voltage
- System frequency
- Time delay active
- Time delay remaining
- System status
- Source available
- Contactor position
- Exerciser schedule, mode, and time remaining on active exercise

Communications

- Serial port for PC connection
- Modbus® network interface

Programmable Features

Use a personal computer with the optional setup software or a Modbus® link to view, select, or adjust programmable features.

Programmable Features*

- System voltage†
- System frequency†
- Single/three-phase operation†
- ABC or CBA phase rotation (ABC)
- In-phase monitor (disabled)
- Commit/no commit switch (no commit)
- User-defined password
- Calendar mode exerciser (up to 21 events)

Programmable Inputs and Outputs

Use a personal computer with the optional setup software or a Modbus® link to define inputs and outputs.

Programmable Inputs

- End time delay input (default)
- Inhibit transfer
- Low battery fault
- Load shed (forced transfer to OFF; programmed-transition models only)
- Peak shave/area protection input (default)
- Remote common fault
- Remote test

Programmable Outputs

- Auxiliary switch fault
- Common fault
- Contactor position
- Exercise active
- Failure to acquire standby source
- Failure to transfer fault
- Generator engine start
- Load bank control (default)
- Load control (pre/post-transfer, up to 9 outputs)
- Loss of phase fault
- Low backup battery
- Modbus®-controlled relay outputs (4 maximum)
- Not in automatic mode
- Non-emergency transfer
- Over and undervoltage faults
- Over and underfrequency faults
- Peak shave/area protection active
- Phase rotation error
- Source available
- Test active

* Factory default settings are shown in parentheses. All settings are stored in non-volatile memory.

† System parameters set per order.

Controller Features, continued

Voltage and Frequency Sensing		
Parameter	Default	Adjustment Range
Undervoltage pickup	90% of nominal	85% - 100% of nominal
Undervoltage dropout	90% of pickup	75% - 98% of pickup
Overvoltage dropout	115% of nominal	105% - 135% of nominal*
Overvoltage pickup	95% of dropout	95% - 100% of dropout
Voltage dropout time	0.5 sec.	0.1 - 9.9 sec.
Underfrequency pickup	90% of nominal	85% - 95% of nominal
Underfrequency dropout	99% of pickup	95% - 99% of pickup
Overfrequency dropout	101% of pickup	101% - 105% of pickup
Overfrequency pickup	110% of nominal	105% - 120% of nominal
Frequency dropout time	3 sec.	0.1 - 15 sec.

* 690 volts, maximum

Adjustable Time Delays		
Time Delay	Default	Adjustment Range
Engine start	3 sec.	0-6 sec. †
Preferred to standby	1 sec.	0-60 min. †
Standby to preferred	15 min.	
Engine cooldown	0 min.	
Failure to acquire standby source	1 min.	
Pre-transfer to preferred signal	3 sec.	
Pre-transfer to standby signal	3 sec.	
Post-transfer to preferred signal	0 sec.	
Post-transfer to standby signal	0 sec.	

† Adjustable in 1 second increments. Can be extended to 60 minutes with an External Battery Supply Module Kit.

Application Data

UL-Listed Solderless Screw-Type Terminals for External Power Connections		
Normal, Emergency, and Load Terminals		
Switch Rating (Amps)	Maximum Number of Cables per Pole	Range of Wire Sizes, Copper or Aluminum ‡
30-230	1	#14 AWG to 4/0 AWG ‡
260-400	1	#4 AWG to 600 MCM
	2	#1/0 AWG to 250 MCM
600	2	#2 AWG to 600 MCM
800-1200	4	#1/0 AWG to 750 MCM
1600-2000	6	#1/0 AWG to 750 MCM
2600-3000	12	#1/0 AWG to 750 MCM
4000	Bus Bar	

‡ 230 amp/600 volt use copper only

Input and Output Connection Specifications		
Component	Number of Wires	Wire Size Range
Terminal strip I/O terminals	1	#12-24 AWG
I/O module terminals	1	#14-24 AWG

Auxiliary Position Indicating Contacts (rated 10 amps @ 32 VDC/250 VAC)		
Switch Rating (Amps)	Number of Contacts Indicating Normal, Emergency	
	Open-Transition	Programmed-Transition
30-104	2, 2	—
150-400	2, 2	2, 2
600-800	2, 2	6, 6
1000-3000	8, 8	7, 7
4000	4, 4	4, 3

Environmental Specifications	
Operating Temperature	-20°C to 70°C (-4°F to 158°F)
Storage Temperature	-40°C to 70°C (-40°F to 158°F)
Humidity	5% to 95% noncondensing
Altitude	0 to 3050 m (10000 ft.) without derating

Codes and Standards

The ATS meets or exceeds the requirements of the following specifications:

- Underwriters Laboratories UL 508, Standard for Industrial Control Equipment
- Underwriters Laboratories UL 1008, Standard for Automatic Transfer Switches for Use in Emergency Standby Systems
- Underwriters Laboratories Inc., listed to Canadian Safety Standards (cUL)
- NFPA 70, National Electrical Code
- NFPA 99, Essential Electrical Systems for Health Care Facilities
- NFPA 110, Emergency and Standby Power Systems
- IEEE Standard 446, IEEE Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications
- NEMA Standard IC10-1993 (formerly ICS2-447), AC Automatic Transfer Switches
- EN61000-4-5 Surge Immunity Class 4 (voltage sensing and programmable inputs only)
- EN61000-4-4 Fast Transient Immunity Severity Level 4
- IEC Specifications for EMI/EMC Immunity:
 - CISPR 11, Radiated Emissions
 - IEC 1000-4-2, Electrostatic Discharge
 - IEC 1000-4-3, Radiated Electromagnetic Fields
 - IEC 1000-4-4, Electrical Fast Transients (Bursts)
 - IEC 1000-4-5, Surge Voltage
 - IEC 1000-4-6, Conducted RF Disturbances
 - IEC 1000-4-8, Magnetic Fields
 - IEC 1000-4-11, Voltage Variations and Interruptions

Withstand Current Ratings (WCR) Open- and Programmed-Transition Models

Maximum current in RMS symmetrical amperes when coordinated with customer-supplied fuses or circuit breakers.

Withstand Current Ratings in RMS Symmetrical Amperes§								
Switch Rating, Amps	Any Circuit Breaker			Specific Circuit Breaker Max. Amps @ 480 VAC	Current-Limiting Fuses			Type
	Cycles @ 60 Hz	Maximum Circuit Amps @ 480 VAC	Maximum Circuit Amps @ 600 VAC		Maximum Circuit Amps	Volts, Max.	Maximum Fuse Size, Amps	
30	1.5	10,000	10,000	N/A	100,000	480	60	LPS-RK, J
70 104 150	1.5	10,000	10,000	22,000	200,000	480	200	
200	1.5	10,000	N/A	22,000	200,000	480	200	
230	1.5	10,000	22,000	22,000	100,000	480	300	J
260 400	3	35,000	22,000	42,000	200,000	480	600	L
600 800 1000 1200	3	50,000	50,000	65,000	200,000	600	1600	
	18 **	36,000	36,000					
1600‡ 2000‡	3	100,000	100,000	N/A	200,000	600	3000	
	30 **	65,000	65,000					
2600 3000	3	100,000	100,000	N/A	200,000	600	4000	
	30 **	65,000	65,000					
4000	3	100,000	100,000	N/A	200,000	480	6000	
	30 **	65,000	65,000					

‡ Optional front-connected service limited to 85,000 amps for specific and any breaker ratings.

§ All values are available symmetrical RMS amperes and tested in accordance with the withstand and close-on requirements of UL 1008. Application requirements may permit higher withstand ratings for certain size switches. Contact Kohler Co. for assistance.

** Short time ratings are provided for applications involving breakers that do not have instantaneous trips for systems coordination.

Ratings with Specific Manufacturers' Circuit Breakers

The following charts list power switching device withstand current ratings (WCR) in RMS symmetrical amperes for specific manufacturers' circuit breakers. Circuit breakers are supplied by the customer.

Switch Rating, Amps	Molded-Case Circuit Breakers				
	WCR, Amps RMS	Voltage, Max.	Manufacturer	Type	Max. Size, Amps
70	22,000	480	Square D	FH	80
				FC, FI	100
				KA, KC, KH, KI, LA, LH	250
			GE	TB1	100
				TEL, THED, THLC1, THLC2	150
				TFL	225
			ITE	CED6, ED6, HED4, HED6	125
				CFD6	150
				FD6, FXD6, HFD6	250
			Cutler-Hammer	FCL, Tri-Pac FB	100
				FD, FDC, HFD	150
				HJD, JD, JDB, JDC	250
				HKD, KD, KDB, KDC, LCL, Tri-Pac LA	400
			ABB	S1	125
				S3	150
			Merlin Gerin	CE104, CE106	100
104	22,000	480	Square D	FC, FI	100
				KA, KC, KH, KI, LA, LH	250
				TB1	100
			GE	TEL, THED, THLC1, THLC2	150
				TFL	225
				CED6, ED6, HED4, HED6	125
			ITE	CFD6	150
				FD6, FXD6, HFD6	250
				FCL, Tri-Pac FB	100
			Cutler-Hammer	FD, FDC, HFD	150
				HJD, JD, JDB, JDC	250
				HKD, KD, KDB, KDC, LCL, Tri-Pac LA	400
				S1	125
			ABB	S3	150
				Merlin Gerin	CE104, CE106
			150	22,000	480
TFL, THFK, THLC2	225				
SFL, SFP, TFJ, TFK	250				
SGL4, SGP4, TLB4	400				
ITE	CFD6, FD6, FXD6, HFD6	225			
	CJD6, HHJD6, HHJXD6, HJD6, JD6, JXD6, SCJD6, SHJD6, SJD6	400			
Square D	KA, KC, KH, KI	250			
	LC, LI	300			
	LA, LH	400			
Cutler-Hammer	FD, FDC, HFD	150			
	HJD, JD, JDB, JDC	250			
	LCL, Tri-Pac LA, HKD, KD, KDB, KDC	400			
ABB	S3	150			
Merlin Gerin	CF250	250			
	CJ400	400			

Ratings with Specific Manufacturers' Circuit Breakers, continued

Switch Rating, Amps	Molded-Case Circuit Breakers							
	WCR, Amps RMS	Voltage, Max.	Manufacturer	Type	Max. Size, Amps			
200 230	22,000	480	GE	TFL, THFK, THLC2	225			
				SFL, SFP, TFJ, TFK	250			
				SGL4, SGP4, TLB4	400			
			ITE	CFD6, FD6, FXD6, HFD6	225			
				CJD6, HHJD6, HHJXD6, HJD6, JD6, JXD6, SCJD6, SHJD6, SJD6	400			
			Square D	KA, KC, KH, KI	250			
				LC, LI	300			
			Cutler-Hammer	LA, LH	400			
				HJD, JD, JDB, JDC	250			
			Merlin Gerin	LCL, Tri-Pac LA, HKD, KD, KDB, KDC	400			
				CF250	250			
						CJ400	400	
260	42,000	480	GE	TFL, THLC2	225			
				SFL, SFLA, SFP	250			
				SGL4, SGP4, TB4, THLC4, TLB4	400			
				SGLA, SGL6, SGP6, TB6	600			
				SKHA, SKLB, SKP8, TKL	800			
				CFD6, FD6, FXD6, HFD6	250			
			ITE	CJD6, HHJD6, HHJXD6, HJD6, JD6, JXD6, SCJD6, SHJD6, SJD6	400			
				CLD6, HHL6, HHLXD6, HLD6, SCLD6, SHLD6	600			
				CMD6, HMD6, HND6, MD6, MXD6, SCMD6, SHMD6, SMD6, SND6	800			
				KC, KI	250			
			Square D	LC, LI	600			
				MH	800			
				HJD, JDC	250			
			Cutler-Hammer	HKD, KDC, LCL, Tri-Pac LA	400			
				HLD	600			
				Tri-Pac NB	800			
			ABB	S5	400			
				S6	600			
			Merlin Gerin	CF250	250			
				CJ400	400			
			400	42,000	480	GE	SGL4, SGP4, TB4, THLC4, TLB4	400
							SGLA, SGL6, SGP6, TB6	600
							SKHA, SKL8, SKP8, TKL	800
						ITE	CJD6, HHJD6, HHJXD6, HJD6, SCJD6, SHJD6	400
CLD6, HHJD6, HHLXD6, HLD6, SCLD6, SHLD6	600							
CMD6, HMD6, HND6, MD6, MXD6, SCMD6, SHMD6, SMD6, SND6	800							
Square D	LC, LI	600						
	MH	800						
Cutler-Hammer	HKD, KDC, LCL, Tri-Pac LA	400						
	HLD	600						
	Tri-Pac NB	800						
ABB	S5	400						
	S6	800						
Merlin Gerin	CJ600	600						
600 800 1000 1200	65,000	480	GE	TB8	800			
				Microversatrip TKL	1200			
			ITE	CLD6, HHL6, HHLXD6, HLD6, SCLD6, SHLD6	600			
				CMD6, HMD6, SCMD6, SHMD6	800			
				CND6, HND6, SCND6, SHND6	1200			
				CPD6	1600			
			Square D	MH Series 2	1000			
				SE (LS Trip), SEH (LS Trip)	2500			
			Cutler-Hammer	Tri-Pac NB	800			
				Tri-Pac PB	1600			
				RDC	2500			
			ABB	S6	800			
				S7	1200			
				Merlin Gerin	CJ600	600		
CK1200	1200							
	42,000	480	ABB	S6	800			
				S7	1200			
				Merlin Gerin	CJ600	600		
					CK1200	1200		

Weights and Dimensions

Weights and dimensions are shown for transfer switches in NEMA type 1 enclosures, type 3R enclosures, and open units. Consult the factory for NEMA type 12, 4, and 4X enclosures.

Note: This information is provided for reference only and should not be used for planning installation. Contact your local distributor for more detailed information.

Amps	Poles	NEMA Type	Dimensions mm (in.)			Weight kg (lb.)		
			Height	Width	Depth	2-Pole	3-Pole	4-Pole
30-200	2,3,4	1, 3R	791 (31)	450 (18)	314 (12.4)‡	28 (62)	30 (65)	31 (68)
230-400	2,3,4	1, 3R	1223 (48)	560 (22)	362 (14.3)‡	52 (115)	56 (123)	59 (131)
600-1000	2,3,4	1, 3R	1932 (76)*	864 (34)	515 (20.3)‡	220 (485)	231 (510)	238 (525)
1200	3,4	1	2286 (90)	963 (38)	686 (27)	—	356 (785)	379 (835)
	3,4	3R	2286 (90)	641 (25.2)	717 (28.2)	—	356 (785)	379 (835)
1600-2000	3,4	1	2286 (90)	965 (38)	1220 (48)	—	472 (1040)	494 (1090)
	3,4	3R	2286 (90)	940 (37)	1434 (56.4)	—	472 (1040)	494 (1090)
1600-2000F†	3,4	1	2286 (90)	963 (38)	688 (27)	—	472 (1040)	494 (1090)
2600-3000	3,4	1	2286 (90)	963 (38)	1524 (60)	—	649 (1430)	679 (1495)
	3,4	3R	2286 (90)	641 (25.2)	1738 (68.4)	—	649 (1430)	679 (1495)
4000	3,4	1	2286 (90)	1168 (46)	1829 (72)	—	1043 (2300)	1089 (2400)
30-200	2,3,4	Open Unit §	787 (31)	445 (17.5)	296 (11.6)	8 (17)	9 (20)	11 (23)
230-400	2,3,4		1219 (48)	457 (18.0)	330 (13.0)	17 (37)	21 (45)	—
600-1000	2,3,4		1829 (72)	864 (34)	508 (20)	68 (150)	78 (170)	90 (196)
1200	2,3,4		2210 (87)	965 (38)	584 (23)	68 (150)	78 (170)	90 (196)
1600-2000	3,4		2286 (90)	965 (38)	1219 (48)	—	190 (420)	213 (470)
1600-2000F†	3,4		2210 (87)	965 (38)	635 (25)	—	190 (420)	213 (470)
2600-3000	3,4		2286 (90)	965 (38)	1524 (60)	—	213 (470)	243 (535)
4000	3,4		2286 (90)	1168 (46)	1828 (72)	—	545 (1200)	590 (1300)

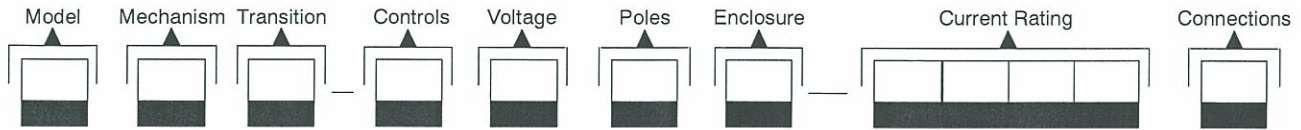
* Includes mounting feet

† F = Front connected

‡ On 30-1000 amp models, the NEMA type 3R enclosures have a security cover on the controller that extends 54 mm (2.1 in.) beyond the door.

§ Dimensions shown for open units are the minimum required enclosure size. Open units weights are shipping weights for the contactor only.

Record the transfer switch model designation in the boxes below. The transfer switch model designation defines characteristics and ratings as explained in the accompanying chart.



Kohler® Model Designation Key

This chart explains the Kohler® transfer switch model designation system. The sample model designation shown is for a Model K automatic transfer switch that uses a standard-transition contactor with MPAC 1000™ electrical controls rated at 480 volts/60 Hz, 3 poles, 4 wires, and solid neutral in a NEMA 1 enclosure with a current rating of 400 amperes. Not all possible combinations are available.

SAMPLE MODEL DESIGNATION

KCT-AMTA-0400S

Model

K: Model K automatic transfer switch

Mechanism

C: Automatic
 B: Bypass Isolation (See G11-81)
 N: Non-automatic

Transition

T: Standard-Transition

Electrical Controls

A: MPAC™ 1000 (Microprocessor ATS Controls)

Voltage/Frequency

C: 208 Volts/60 Hz	H: 400 Volts/50 Hz	N: 600 Volts/60 Hz
D: 220 Volts/50 Hz	J: 416 Volts/50 Hz	P: 380 Volts/60 Hz
F: 240 Volts/60 Hz	K: 440 Volts/60 Hz	S: 220 Volts/60 Hz
G: 380 Volts/50 Hz	M: 480 Volts/60 Hz	

Number of Poles/Wires

N: 2-pole, 3-wire, solid neutral	Z: 3-pole, 4-wire, integral solid neutral (Solid neutral mounted on the contactor. Not available on all amperages.)
T: 3-pole, 4-wire, solid neutral	
V: 4-pole, 4-wire, switched neutral	
W: 4-pole, 4-wire, overlapping neutral	

Enclosure

A: NEMA 1†	C: NEMA 3R‡	F: NEMA 4X§
B: NEMA 12§	D: NEMA 4§	G: Open unit

† Standard on 30-4000 A models.
 ‡ Available to order on 30-3000 A models. Contact the factory for 4000 A models.
 § Available to order on 30-1000 A models. Contact the factory for larger units.

Current Rating: Numbers indicate the current rating of the switch in amperes:

0030	0200	0600	1200	2600
0070	0230	0800	1600	3000
0104	0260	1000	2000	4000
0150	0400			

Power Connections

S: Standard
 F: Front bus (available on 1600 and 2000 A models only)

DISTRIBUTED BY:

Availability is subject to change without notice. Kohler Co. reserves the right to change the design or specifications without notice and without any obligation or liability whatsoever. Contact your local Kohler® generator set distributor for availability.

ELECTRICAL DEMAND LOAD RECORDINGS

The following spreadsheet and emergency load calculation is summary of the electrical demand recordings for each building or groups of buildings that are presented in this study. A detailed demand recording of the buildings' loads are provided in a set of four binders as a separate attachment.

LOAD SUMMARY

STUDY PRIORITY No.	BUILDING NUMBER	BUILDING	TRANSFORMER CAPACITY	TOTAL DEMAND KW	TOTAL LOAD	TOTAL LOAD FOR OPTION		TOTAL LOAD	
					FOR OPTION "A"	"B"	FOR OPTION "C"		
VOLTAGE					12 KV	12KV	4160V	12KV	
1	1	COMPUTER-STATISTICS	1,000.0	322.2	322.2	322.2		322.2	
1	2	BOYCE HALL	1,750.0	690.6	690.6	690.6		690.6	
1	3	WEBBER HALL	525.0	273.8	273.8	273.8		273.8	
1	4	BATCHELOR HALL	1,300.0	451.5	451.5	451.5		451.5	
2	5A	SPIETH HALL	500.0	103.8			103.8	103.8	
	5B	LIFE SCIENCE	1,350.0	352.1			352.1	352.1	
3	6	FAWCETT LAB	750.0	181.9			181.9	181.9	
4	7A	GREEN HOUSES 8-13	150.0	449.5			449.5	449.5	
	7B	GREEN HOUSES 11-14	225.0						
	7C	GREEN HOUSES 15	112.5						
	7D	GREEN HOUSES 16-17	75.0						
	7E	GREEN HOUSES 18-21	300.0						67.2
	7F	GLASSHOUSE/HEADHOUSE 1-3	500.0						81.8
5	8	AIR POLLUTION ENGINEERING PAD & GREEN HOUSE 6&7 (35.0 KW included with Com-Stat)	500.0						
6	9	ENVIRONMENTAL HEALTH AND SAFETY	500.0	41.4					
7	10	PHYSICS	2,150.0	217.5		217.5		217.5	
8	11	SCIENCE LABORATORIES	1,500.0	643.9		643.9		643.9	
9	12	GEOLOGY BUILDING	1,500.0	280.2		280.2		280.2	
TOTAL KW			14,687.5	4,157.4	1,738.1	2,879.7	1,087.3	3,967.0	
TOTAL AMPS AT SERVICE VOLTAGE					80.5	133.3	150.9	183.7	



ENGINEERING, INC.

Electrical Engineering

1543 West Garvey Ave. North, Ste. 210

West Covina, California 91790

626.337.1965 * Fax: 626.337.1902

PROJECT CALCULATIONS

JMD Project No. _____

Page _____ of _____

Date _____

Design _____ Check _____

Project Name: UCR EMERG. STANDBY GENERATOR FEASIBILITY STUDY
Subject: ENVIRONMENTAL HEALTH AND SAFETY (EHS)

OPTIONS "B" AND "C"

POWER SERVICE: 400AMP, 120/208V, 3PH, 4W FEEDER
FROM REMOTE 500KVA SUBSTATION

EMERG. POWER: EXISTING 15KW DIESEL GENERATOR
SERVES LIGHTING, DATA, FIRE ALARM
AND SELECTED MISC. POWER EQUIPMENT

NORMAL POWER DEMANDS

MAXIMUM RECORDED DEMAND OVER A 7-DAY
PERIOD 02/15/07 THRU 02/22/07 = 41.4KW

GENERATOR SIZE REQUIRED TO SERVE THE TOTAL
BUILDING LOAD = $41.4KW \times 125\% = 51.8KW$.

RECOMMENDATIONS:

BUILDING IS TOO REMOTE FROM OTHER BUILDINGS IN THE
STUDY GROUP FOR CONNECTION TO A CENTRALIZED
EMERGENCY DISTRIBUTION SYSTEM. THE BUILDING SHOULD
BE SERVED BY A STAND-ALONE EMERGENCY GENERATOR
WITH A SUB-BASE FUEL FOR 30 HOURS.

THE GENERATOR WOULD BE LOCATED IN THE SAME
LOCATION AS THE EXISTING UNIT, COMPLETE WITH
100KW GENERATOR IN A WEATHERPROOF ENCLOSURE, SUB-BASE
TANK AND 400A-4P WEATHERPROOF ATS.

ESTIMATED COST:

REFERENCE DRAWING: "B/E-17"



ENGINEERING, INC.
Electrical Engineering
1543 West Garvey Ave. North, Ste. 210
West Covina, California 91790
626.337.1965 * Fax: 626.337.1902

PROJECT CALCULATIONS

JMD Project No. _____
Page _____ of _____
Date _____
Design _____ Check _____

Project Name: UCR EMERG. STANDBY GENERATOR FEASIBILITY STUDY
Subject: GLASS/GREEN HOUSES 1-3

OPTIONS "B" & "C"

POWER SERVICE: 800AMP 120/208V, 3PH, 4W FEEDER
FROM A REMOTE 500KVA SUBSTATION

EMERGENCY POWER: NONE EXISTING

NORMAL POWER DEMAND: MAXIMUM RECORDED DEMAND
RECORDED WEEK OF 02/22/07 = 81.8 KW
FIELD NOTE: A PORTION OF THE BUILDING APPEARED
TO BE UNOCCUPIED.

GENERATOR SIZE REQUIRED TO SERVE THE TOTAL
BUILDING LOAD = $81.8 \times 150\% = 122.7 \text{ KW}$

RECOMMENDATIONS:

BUILDING IS TOO REMOTE FROM OTHER BUILDINGS IN THE
STUDY GROUP FOR CONNECTION TO A CENTRALIZED
EMERGENCY DISTRIBUTION SYSTEM. THE BUILDING
SHOULD BE SERVED BY A STAND ALONE EMERGENCY
GENERATOR WITH A SUB-BASE 30 HOUR FUEL TANK

THE GENERATOR WOULD BE LOCATED ALONG THE
SERVICE ROAD ADJACENT THE SERVING SUBSTATION
OR ON A HILL ABOVE THE SUBSTATION. THE
GENERATOR WOULD BE 125KW IN A WEATHER PROOF
ENCLOSURE WITH SUB-BASE FUEL TANK, 800A-4P
WEATHERPROOF ATS.

ESTIMATED COST:

REFERENCE DRAWING: "C/E-17"

ELECTRICAL DRAWINGS

The following is a list of Electrical Drawings in 11 x 17 format. Four sets of full drawings are provided as a separate attachment.

E-0	TITLE SHEET, KEY PLAN AND SHEET INDEX.
E-1	PARTIAL ELECTRICAL SITE PLAN - SOUTH PORTION
E-2	PARTIAL ELECTRICAL SITE PLAN - NORTH PORTION
E-3A	ENLARGED GENERATOR SITE PLAN - OPTION "A"
E-3BC	ENLARGED GENERATOR SITE PLANS - OPTIONS "B" AND "C"
E-4A	PARTIAL 12KV SINGLE LINE DIAGRAM - OPTION "A"
E-5A	PARTIAL 12KV SINGLE LINE DIAGRAM - OPTION "A"
E-6A	5KV SINGLE LINE DIAGRAM – OPTION "A"
E-7A	UCR CAMPUS ELECTRICAL LOAD SCHEDULES – OPTION "B"
E-4B	PARTIAL 12KV SINGLE LINE DIAGRAM - OPTION "B"
E-5B	PARTIAL 12KV SINGLE LINE DIAGRAM - OPTION "B"
E-6C	5KV SINGLE LINE DIAGRAM - OPTION "B"
E-7C	UCR CAMPUS ELECTRICAL LOAD SCHEDULES
E-4C	PARTIAL 12KV SINGLE LINE DIAGRAM - OPTION "C"
E-5C	PARTIAL 12KV SINGLE LINE DIAGRAM - OPTION "C"
E-6C	5KV SINGLE LINE DIAGRAM - OPTION "C"
E-7C	UCR CAMPUS ELECTRICAL LOAD SCHEDULES – OPTION "C"
E-8	COMPUTER-STATISTICS SINGLE LINE DIAGRAM
E-9	BOYCE HALL SINGLE LINE DIAGRAM
E-10	BOYCE HALL SINGLE LINE DIAGRAM
E-11	WEBBER HALL SINGLE LINE DIAGRAM
E-12	BACHELOR HALL SINGLE LINE DIAGRAM
E-13	SPIETH HALL SINGLE LINE DIAGRAM
E-14	LIFE SCIENCE SINGLE LINE DIAGRAM
E-15	FAWCETT LAB, AIR POLLUTION ENGINEERING PAD AND GREEN HOUSES 6&7 SINGLE LINE DIAGRAMS
E-16	GREEN HOUSES 8-13, 11-14 AND 15-17 SINGLE LINE DIAGRAM
E-17	GLASSHOUSE/HEADHOUSE 1-3, ENVIRONMENTAL HEALTH AND SAFETY AND GREEN HOUSES 18-21 SINGLE LINE DIAGRAMS
E-18	PHYSICS SINGLE LINE DIAGRAM - NORMAL POWER
E-19	PHYSICS SINGLE LINE DIAGRAM - EMERGENCY POWER
E-20	SCIENCE LABORATORIES SINGLE LINE DIAGRAM
E-21	GEOLOGY BUILDING SINGLE LINE DIAGRAM
E-22	GEOLOGY BUILDING SINGLE LINE DIAGRAM

UNIVERSITY OF CALIFORNIA RIVERSIDE

EMERGENCY STANDBY GENERATOR FEASIBILITY STUDY FOR VARIOUS BUILDINGS Project No. 958993-2



UNIVERSITY OF CALIFORNIA RIVERSIDE

OFFICE OF:
DESIGN & CONSTRUCTION

3615 CANYON CREST DRIVE - D102
RIVERSIDE, CA 92507
TEL: (951) 787-4201 FAX: (951) 787-3690

JMD ENGINEERING, INC.
ELECTRICAL ENGINEERS
1545 West Garvey Ave., North, Suite 210
West Covina, CA 91790
(626) 337-1965 • Fax: (626) 337-1902

STRUCTURAL ENGINEERS:

ARCHITECT'S STAMP:

CONSULTANT:

AGENCY APPROVAL:

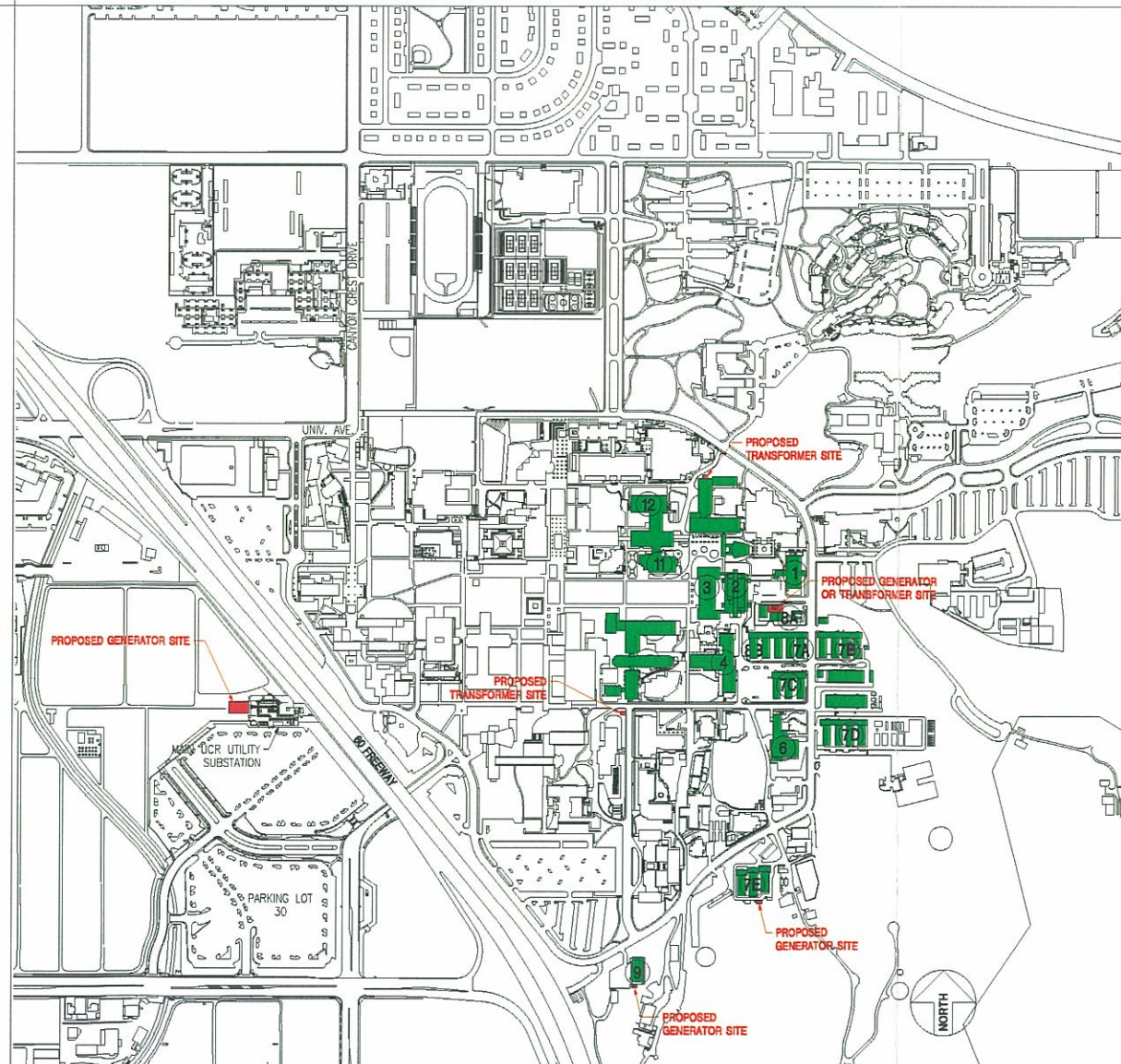
SHEET INDEX

- E-0 TITLE SHEET, KEY PLAN AND SHEET INDEX.
- E-1 PARTIAL ELECTRICAL SITE PLAN - SOUTH PORTION.
- E-2 PARTIAL ELECTRICAL SITE PLAN - NORTH PORTION.
- E-3A ENLARGED GENERATOR SITE PLAN - OPTION "A".
- E-3BC ENLARGED GENERATOR AND TRANSFORMER SITE PLANS - OPTIONS "B" AND "C".
- E-4A PARTIAL 12KV SINGLE LINE DIAGRAM - OPTION "A".
- E-5A PARTIAL 12KV SINGLE LINE DIAGRAM - OPTION "A".
- E-6A SKV SINGLE LINE DIAGRAM OPTION "A".
- E-7A UCR CAMPUS ELECTRICAL LOAD SCHEDULES - OPTION "A".
- E-4B PARTIAL 12KV SINGLE LINE DIAGRAM - OPTION "B".
- E-5B PARTIAL 12KV SINGLE LINE DIAGRAM - OPTION "B".
- E-6B SKV SINGLE LINE DIAGRAM - OPTION "B".
- E-7B UCR CAMPUS ELECTRICAL LOAD SCHEDULES - OPTION "B".
- E-4C PARTIAL 12KV SINGLE LINE DIAGRAM - OPTION "C".
- E-5C PARTIAL 12KV SINGLE LINE DIAGRAM - OPTION "C".
- E-6C SKV SINGLE LINE DIAGRAM - OPTION "C".
- E-7C UCR CAMPUS ELECTRICAL LOAD SCHEDULES - OPTION "C".
- E-8 COMPUTER-STATISTICS SINGLE LINE DIAGRAM.
- E-9 BOYCE HALL SINGLE LINE DIAGRAM.
- E-10 WEBBER HALL SINGLE LINE DIAGRAM.
- E-11 BATCHELOR HALL SINGLE LINE DIAGRAM.
- E-13 SPIETH HALL SINGLE LINE DIAGRAM.
- E-14 LIFE SCIENCE SINGLE LINE DIAGRAM.
- E-15 FAWCETT LAB, AIR POLLUTION ENGINEERING PAD AND GREEN HOUSES 6&7 SINGLE LINE DIAGRAMS.
- E-16 GREEN HOUSES 8-13, 11-14 AND 15-17 SINGLE LINE DIAGRAM.
- E-17 GLASSHOUSE/HEADHOUSE 1-3, ENVIRONMENTAL HEALTH AND SAFETY AND GREEN HOUSES 18-21 SINGLE LINE DIAGRAMS.
- E-18 PHYSICS SINGLE LINE DIAGRAM - NORMAL POWER.
- E-19 PHYSICS SINGLE LINE DIAGRAM - EMERGENCY POWER.
- E-20 SCIENCE LABORATORIES SINGLE LINE DIAGRAM.
- E-21 GEOLOGY BUILDING SINGLE LINE DIAGRAM.
- E-22 GEOLOGY BUILDING SINGLE LINE DIAGRAM.

LIST OF STUDY BUILDINGS

STUDY PRIORITY No.	BUILDING No.	BUILDING NAME
1	①	COMPUTER-STATISTICS
1	②	BOYCE HALL
1	③	WEBBER HALL
1	④	BATCHELOR HALL
2	⑤A	SPIETH HALL
	⑤B	LIFE SCIENCE
3	⑥	FAWCETT LAB
		GREEN HOUSES
	⑦A	GREEN HOUSES 8-13
	⑦B	GREEN HOUSES 11-14
	⑦C	GREEN HOUSES 15-17
	⑦D	GREEN HOUSES 18-21
	⑦E	GLASSHOUSE/HEADHOUSE 1-3
5	⑧A	AIR POLLUTION ENGINEERING PAD
	⑧B	GREEN HOUSES 6 & 7
6	⑨	ENVIRONMENTAL HEALTH AND SAFETY
7	⑩	PHYSICS
8	⑪	SCIENCE LABORATORIES (ADDITION)
9	⑫	GEOLOGY BUILDING

KEY PLAN



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EMERGENCY STANDBY GENERATOR
FEASIBILITY STUDY - VARIOUS BUILDINGS
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TITLE SHEET, KEY PLAN,
SHEET INDEX AND
LIST OF STUDY BUILDINGS

PROJECT NO:
958993-2
DATE:
May 22, 2007

SHEET NO:
E-0



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OFFICE OF:
DESIGN & CONSTRUCTION

3615 CANYON CREST DRIVE - D102
RIVERSIDE, CA 92507
TEL:(909) 787-4201 FAX:(909) 787-3890

JMD ENGINEERING, INC.
ELECTRICAL ENGINEERS
1545 West Garvey Ave. North, Suite 210
West Covina, CA 91790
(626) 337-1955 • Fax: (626) 337-1902

STRUCTURAL ENGINEERS:

ARCHITECT'S STAMP:

CONSULTANT:

AGENCY APPROVAL:

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FEASIBILITY STUDY - VARIOUS BUILDINGS
UNIVERSITY OF CALIFORNIA
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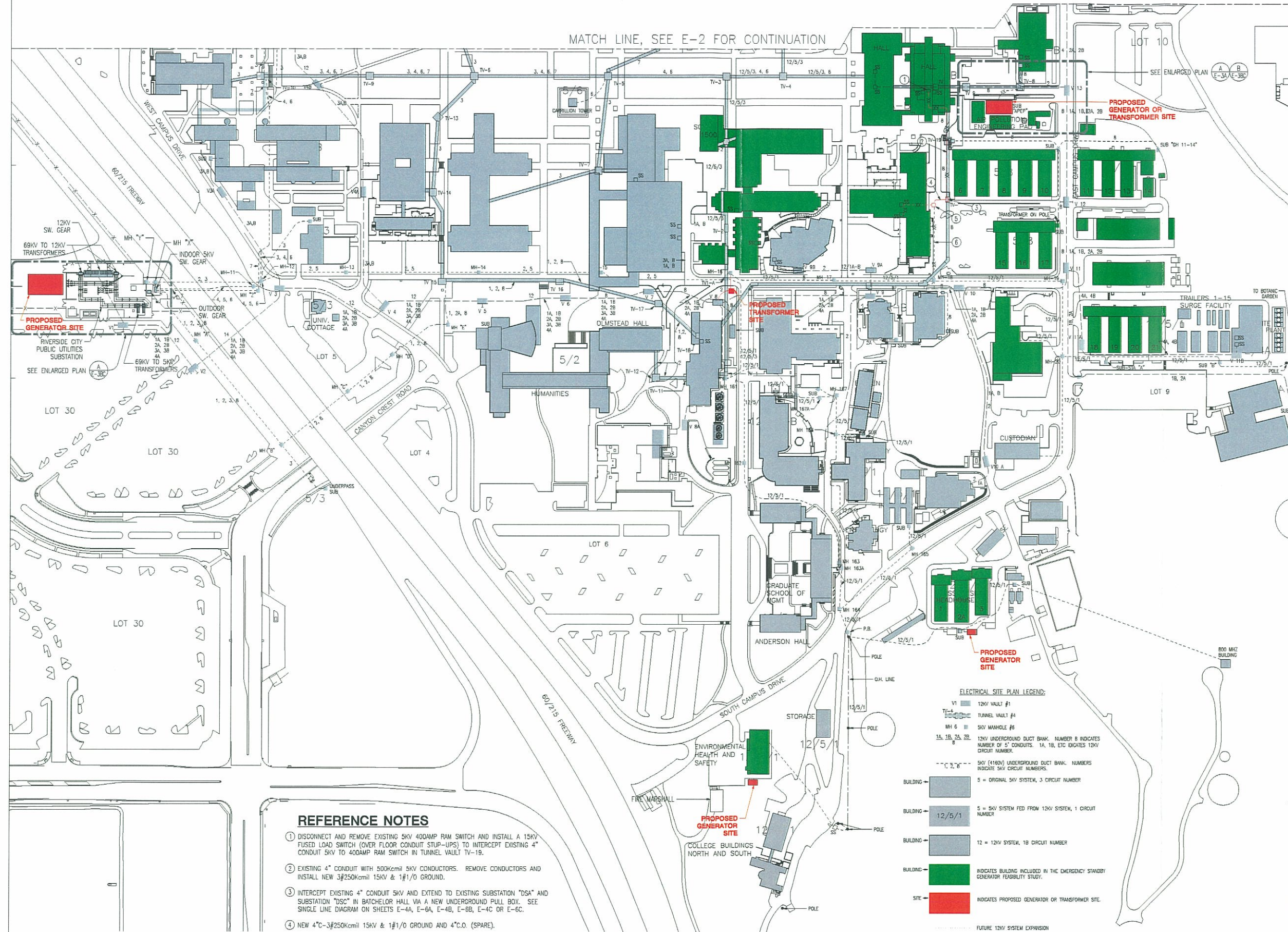
PARTIAL ELECTRICAL SITE PLAN - SOUTH PORTION

PROJECT NO:
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DATE:
May 22, 2007

SHEET NO:

E-1

MATCH LINE, SEE E-2 FOR CONTINUATION

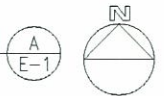


- ELECTRICAL SITE PLAN LEGEND:**
- TV-# 12KV VAULT #1
 - TUNNEL VAULT #4
 - MH # 5KV MANHOLE #6
 - 1A, 1B, 2A, 2B 12KV UNDERGROUND DUCT BANK, NUMBER 8 INDICATES NUMBER OF 5' CONDUITS. 1A, 1B, ETC INDICATES 12KV CIRCUIT NUMBER.
 - 1, 2, 3, 4 --- 5KV (116KV) UNDERGROUND DUCT BANK, NUMBERS INDICATE 5KV CIRCUIT NUMBERS.
 - BUILDING - 5 = ORIGINAL 5KV SYSTEM, 3 CIRCUIT NUMBER
 - BUILDING - 12/5/1 5 = 5KV SYSTEM FED FROM 12KV SYSTEM, 1 CIRCUIT NUMBER
 - BUILDING - 12 = 12KV SYSTEM, 1B CIRCUIT NUMBER
 - BUILDING - [Green Box] INDICATES BUILDING INCLUDED IN THE EMERGENCY STANDBY GENERATOR FEASIBILITY STUDY.
 - SITE - [Red Box] INDICATES PROPOSED GENERATOR OR TRANSFORMER SITE.
 - FUTURE 12KV SYSTEM EXPANSION
 - SUB, SS, SD EXISTING SUBSTATION

REFERENCE NOTES

- 1 DISCONNECT AND REMOVE EXISTING 5KV 400AMP RAM SWITCH AND INSTALL A 15KV FUSED LOAD SWITCH (OVER FLOOR CONDUIT STUP-UPS) TO INTERCEPT EXISTING 4" CONDUIT 5KV TO 400AMP RAM SWITCH IN TUNNEL VAULT TV-19.
- 2 EXISTING 4" CONDUIT WITH 500kcmil 5KV CONDUCTORS. REMOVE CONDUCTORS AND INSTALL NEW 3#250kcmil 15KV & 1#1/0 GROUND.
- 3 INTERCEPT EXISTING 4" CONDUIT 5KV AND EXTEND TO EXISTING SUBSTATION "DSA" AND SUBSTATION "DSC" IN BATCHELOR HALL VIA A NEW UNDERGROUND PULL BOX. SEE SINGLE LINE DIAGRAM ON SHEETS E-4A, E-6A, E-4B, E-6B, E-4C OR E-6C.
- 4 NEW 4"-3#250kcmil 15KV & 1#1/0 GROUND AND 4"C.O. (SPARE).
- 5 INSTALL A NEW UNDERGROUND INTERCEPT PULL BOX 3' x 5' x 36" DEEP TO INTERCEPT EXISTING CONDUIT AND CONDUCTORS.
- 6 EXISTING 4"-3#500kcmil 5KV & GROUND. DISCONNECT AND REMOVE CONDUCTORS AND ABANDON CONDUIT IN PLACE FOR FUTURE USE.

PARTIAL ELECTRICAL SITE PLAN - SOUTH PORTION
SCALE: 1" = 100'-0"





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DESIGN & CONSTRUCTION

3615 CANYON CREST DRIVE - 0102
RIVERSIDE, CA 92507
TEL:(951) 787-4201 FAX:(951) 787-3890

JMD ENGINEERING, INC.
ELECTRICAL ENGINEERS
1543 West Garvey Ave. North, Suite 210
West Covina, CA 91790
(626) 337-1955 • Fax: (626) 337-1902

STRUCTURAL ENGINEERS:

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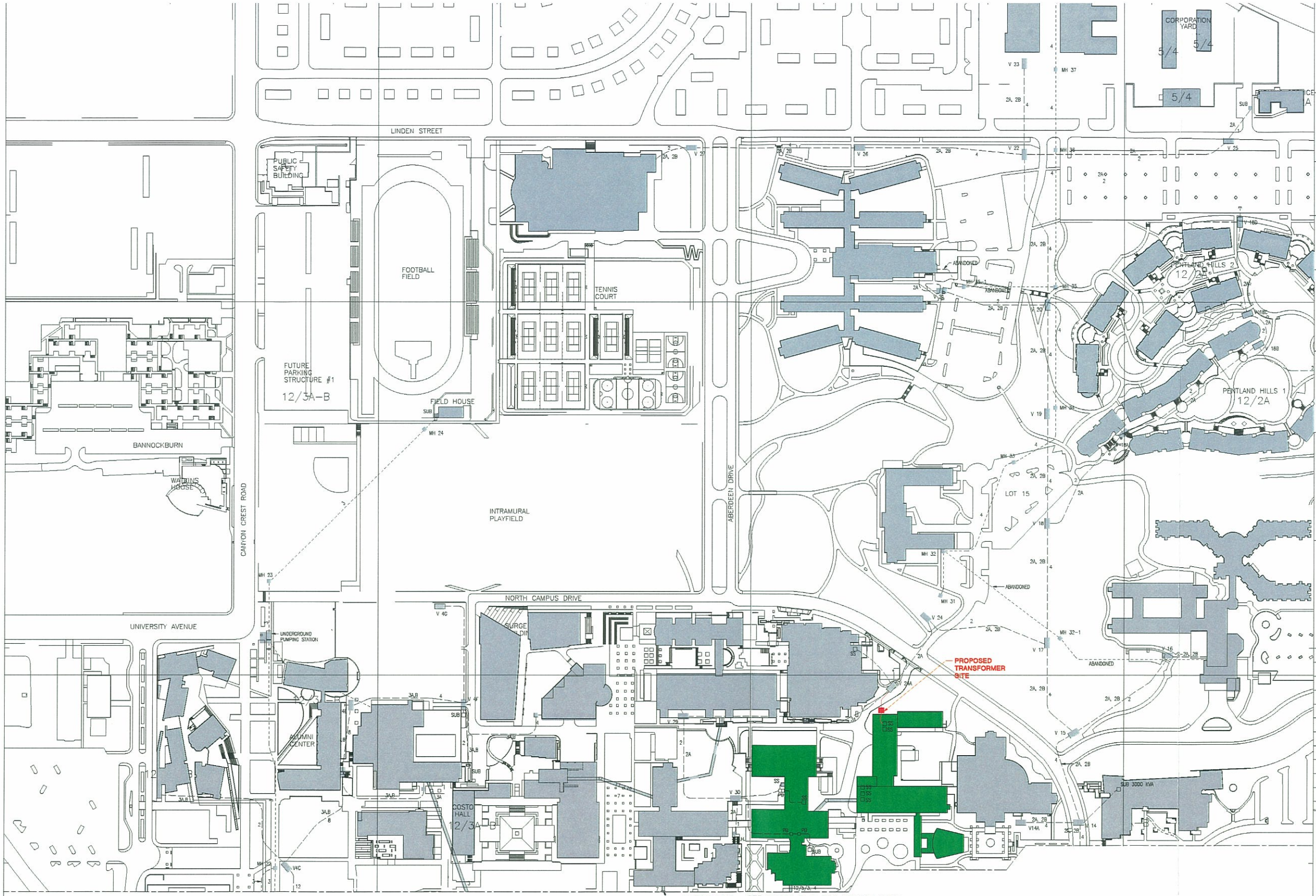
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PARTIAL ELECTRICAL SITE PLAN - NORTH PORTION

PROJECT NO: 958993-2
DATE: May 22, 2007
SHEET NO: **E-2**

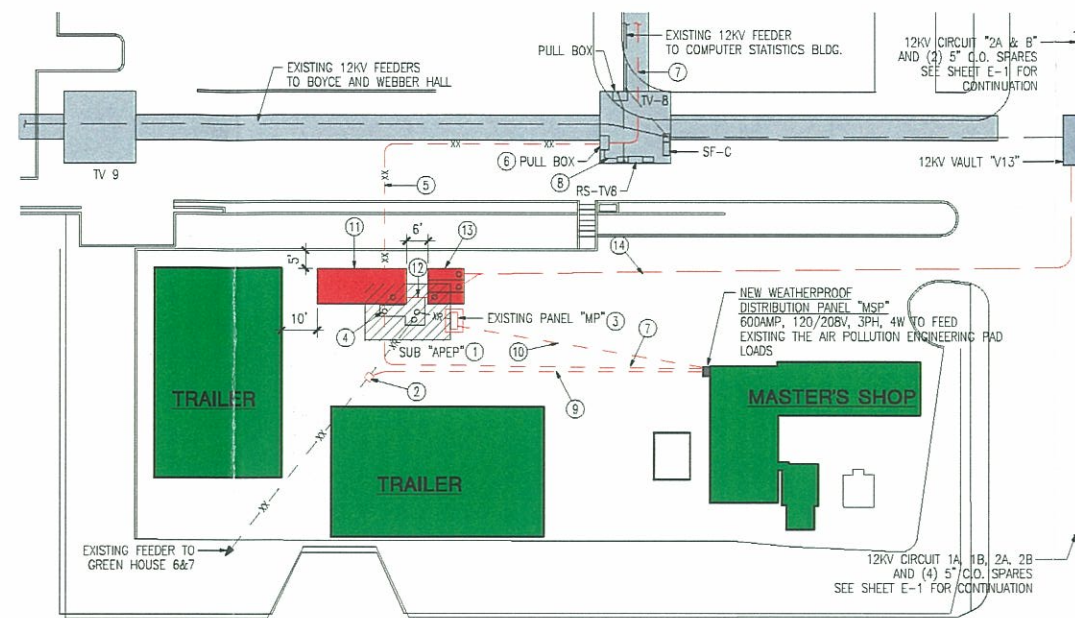


PARTIAL ELECTRICAL SITE PLAN - NORTH PORTION
SCALE: 1" = 100'-0"
A
E-2

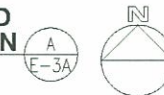


REFERENCE NOTES OPTION "A"

- ① DISCONNECT AND REMOVE EXISTING UNIT SUBSTATION "APEP" AND ITS PRIMARY FEEDER BACK TO THE EXISTING RAM SWITCH IN TUNNEL VAULT "TV-8".
- ② INTERCEPT EXISTING FEEDER TO GREEN HOUSE 6 & 7 AND INSTALL A NEW UNDERGROUND PULL BOX FLUSH WITH EXISTING A.C. PAVING. EXTEND NEW CONDUIT AND CONDUCTORS TO NEW DISTRIBUTION PANEL "MSP". SEE SINGLE LINE DIAGRAM "B" ON SHEET E-15.
- ③ DISCONNECT AND REMOVE EXISTING PANEL "MS". INSTALL A UNDERGROUND PULL BOX TO INTERCEPT EXISTING BRANCH CIRCUIT FEEDERS AND ROUTE TO NEW DISTRIBUTION PANEL "MSP". RECONNECT ALL CIRCUIT FEEDERS AND SHOWN ON THE SINGLE LINE DIAGRAM "B" ON SHEET E-15.
- ④ INTERCEPT EXISTING 4160 VOLT CONDUIT AND EXTEND WITH 4" C-4#600kcmil AND 1#2 GROUND TO NEW DISTRIBUTION PANEL "MSP"
- ⑤ EXISTING 4160 VOLT CONDUIT TO BE USED FOR NEW FEEDER TO NEW DISTRIBUTION PANEL "MSP".
- ⑥ EXISTING 4160 VOLT PULL BOX TO BECOME A LOW VOLTAGE PULL BOX FOR FEEDER TO NEW DISTRIBUTION PANEL "MS".
- ⑦ NEW CONDUIT AND CONDUCTORS TO EXISTING UNIT SUBSTATION "CLHV" FOR FEEDER TO NEW DISTRIBUTION PANEL "MSP". SEE SINGLE LINE DIAGRAM ON SHEET E-8.
- ⑧ DISCONNECT AND REMOVE EXISTING 4160 VOLT CONDUIT AND CONDUCTORS. CAP ALL UNUSED OPENINGS IN EXISTING PULL BOX AND EXISTING 5KV RAM SWITCH.
- ⑨ NEW CONDUIT AND CONDUCTORS AS REQUIRED TO RECONNECT EXISTING FEEDER TO GREEN HOUSE 6 & 7 TO NEW DISTRIBUTION PANEL "MSP".
- ⑩ NEW CONDUITS AND CONDUCTORS AS REQUIRED TO RECONNECT THE BRANCH CIRCUIT LOADS OF EXISTING PANEL "MS" TO THE NEW DISTRIBUTION PANEL "MSP". SEE SINGLE LINE DIAGRAM "B" ON SHEET E-15.
- ⑪ NEW 2000 KW, 12,470 VOLT STANDBY EMERGENCY DIESEL GENERATOR WITH 36 HOUR SUB-BASE FUEL TANK AND SOUND SHIELD IN ENCLOSURE ON NEW CONCRETE PAD.
- ⑫ NEW 5" C-3#500kcmil 15KV AND 1#1/0 15KV GENERATOR FEEDER TO "ATS-A". SEE SINGLE LINE DIAGRAM ON SHEET E-5A.
- ⑬ NEW WEATHERPROOF 15KV RATED AUTOMATIC TRANSFER SWITCH AND A-B SELECTOR SWITCH "ATS-A". SEE SINGLE LINE DIAGRAM ON SHEET E-5A.
- ⑭ NEW (2) 5" C-3#500kcmil 15KV AND 1#1/0 GROUND NORMAL POWER CIRCUIT 12KV A&B, 5" C-3#500kcmil & 1#1/0 GROUND EMERGENCY FEEDER AND 5" CONDUIT WITH LOAD SHEDDING CONTROL CONDUCTORS. SEE SINGLE LINE DIAGRAM ON SHEET E-5A.


OPTION "A"
AIR POLLUTION ENGINEERING PAD
ENLARGED GENERATOR SITE PLAN

SCALE: 1" = 20'-0"

 OPTION "A" SERVES COMPUTER-STATISTICS, BOYCE HALL,
 WEBBER HALL AND BACHELOR HALL.


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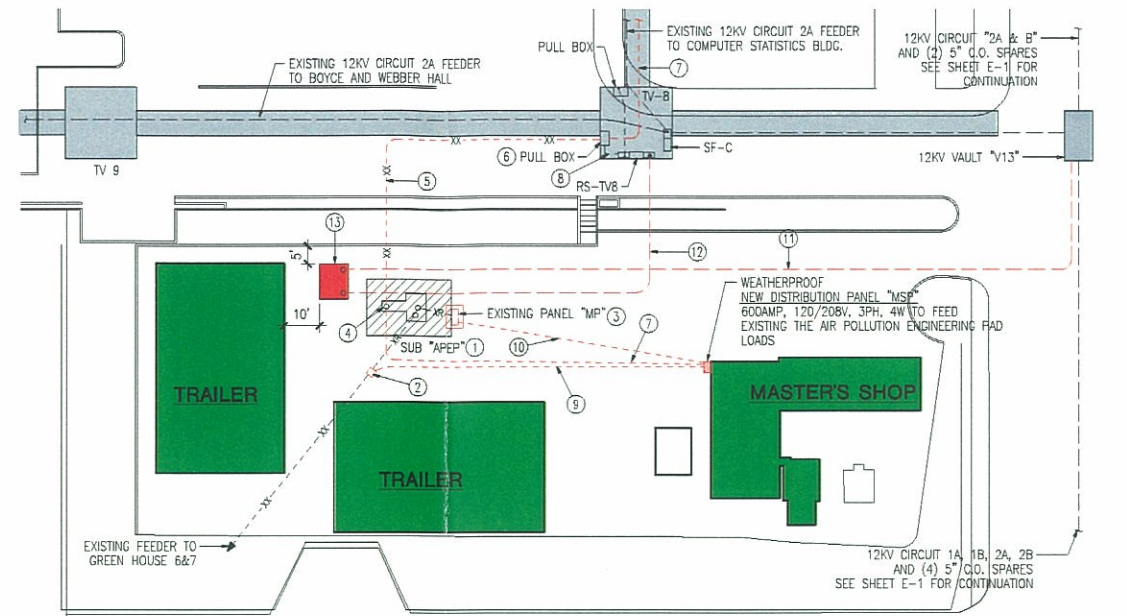
ENLARGED GENERATOR
SITE PLAN - OPTION "A"

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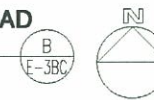
 SHEET NO:
E-3A

REFERENCE NOTES OPTION "C"

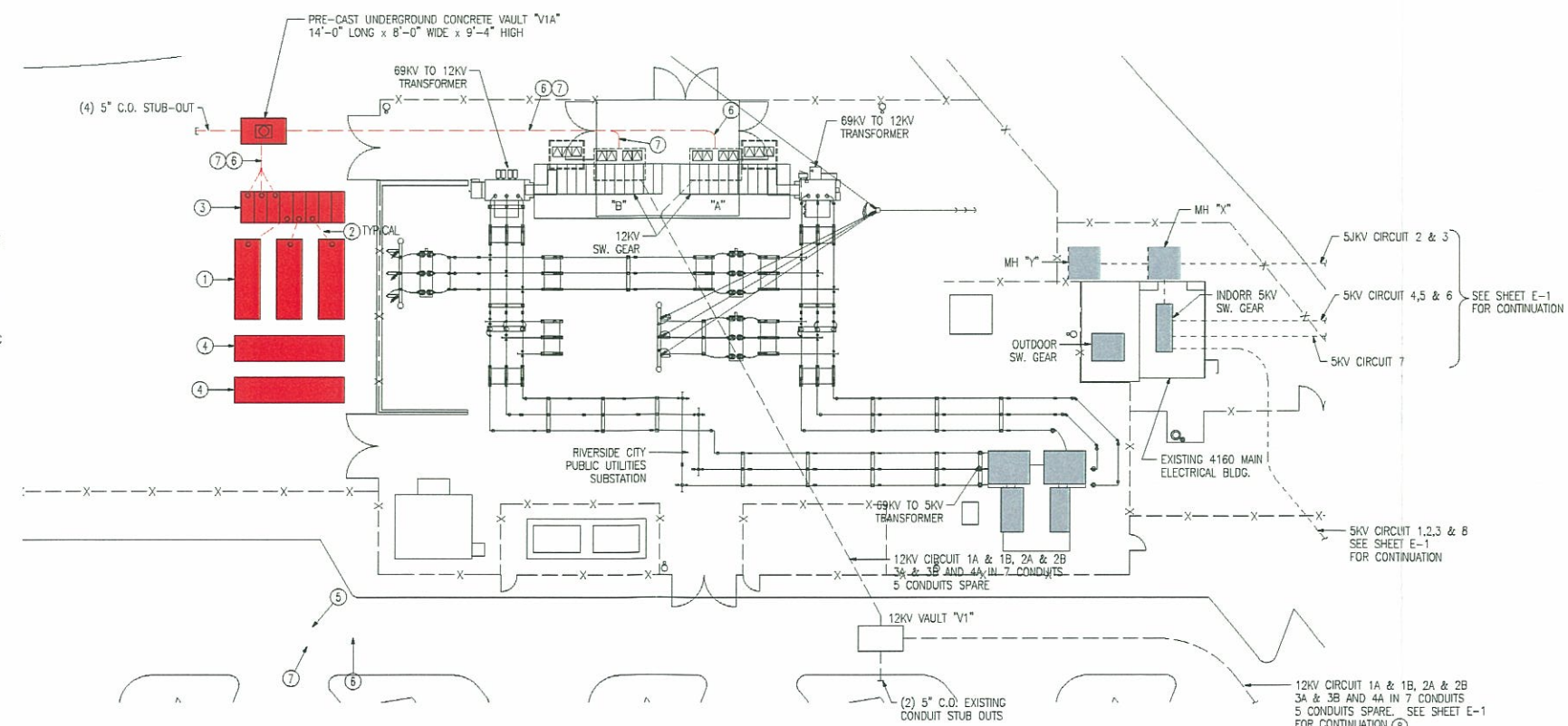
- ① DISCONNECT AND REMOVE EXISTING UNIT SUBSTATION "APEP" AND ITS PRIMARY FEEDER BACK TO THE EXISTING RAM SWITCH IN TUNNEL VAULT "TV-B".
- ② INTERCEPT EXISTING FEEDER TO GREEN HOUSE 6 & 7 AND INSTALL A NEW UNDERGROUND PULL BOX FLUSH WITH EXISTING A.C. PAVING. EXTEND NEW CONDUIT AND CONDUCTORS TO NEW DISTRIBUTION PANEL "MSP". SEE SINGLE LINE DIAGRAM ON SHEET E-15.
- ③ DISCONNECT AND REMOVE EXISTING PANEL "MS". INSTALL AN UNDERGROUND PULL BOX TO INTERCEPT EXISTING BRANCH CIRCUIT FEEDERS AND ROUTE TO NEW DISTRIBUTION PANEL "MSP". RECONNECT ALL CIRCUIT FEEDERS AND SHOWN ON THE SINGLE LINE DIAGRAM ON SHEET E-15.
- ④ INTERCEPT EXISTING 4160 VOLT CONDUIT AND EXTEND TO NEW DISTRIBUTION PANEL "MSP"
- ⑤ EXISTING 4160 VOLT CONDUIT TO BE USED FOR NEW FEEDER TO NEW DISTRIBUTION PANEL "MSP".
- ⑥ EXISTING 4160 VOLT PULL BOX TO BECOME A LOW VOLTAGE PULL BOX FOR FEEDER TO NEW DISTRIBUTION PANEL "MS".
- ⑦ NEW CONDUIT AND CONDUCTORS TO EXISTING UNIT SUBSTATION "CLHV" FOR FEEDER TO NEW DISTRIBUTION PANEL "MSP". SEE SINGLE LINE DIAGRAM ON SHEET E-8.
- ⑧ DISCONNECT AND REMOVE EXISTING 4160 VOLT CONDUIT AND CONDUCTORS. CAP ALL UNUSED OPENINGS IN EXISTING PULL BOX AND EXISTING SKV RAM SWITCH.
- ⑨ NEW CONDUIT AND CONDUCTORS AS REQUIRED TO RECONNECT EXISTING FEEDER TO GREEN HOUSE 6 & 7 TO NEW DISTRIBUTION PANEL "MSP".
- ⑩ NEW CONDUITS AND CONDUCTORS AS REQUIRED TO RECONNECT THE BRANCH CIRCUIT LOADS OF EXISTING PANEL "MS" TO THE NEW DISTRIBUTION PANEL "MSP". SEE SINGLE LINE DIAGRAM ON SHEET E-15.
- ⑪ NEW 5" C-3#500kcmil AND 1#1/0 15KV, NEW SELECTOR SWITCH "12KV A-B" TO 1500 KVA PAD MOUNT TRANSFORMER". SEE SINGLE LINE DIAGRAM ON SHEETS E-5C AND E-6C.
- ⑫ NEW 5" C-3#500kcmil AND 1#1/0 15KV FROM NEW 1500KVA PAD MOUNT TRANSFORMER TO THE EXISTING 400AMP RAM SWITCH IN EXISTING TUNNEL VAULT "TV-B". SEE SINGLE LINE DIAGRAM ON SHEET E-6C.
- ⑬ NEW PAD MOUNT TRANSFORMER, 1500KVA, 12,470 VOLTS TO 4160 VOLTS ON NEW CONCRETE PAD.


OPTION "C"
AIR POLLUTION ENGINEERING PAD
ENLARGED SITE PLAN

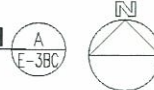
SCALE: 1" = 20'-0"


REFERENCE NOTES OPTION "B" AND "C"

- ① NEW 2000 KW, 12,470 VOLT STANDBY EMERGENCY DIESEL GENERATOR WITH WEATHERPROOF ENCLOSURE ON NEW CONCRETE PAD. TYPICAL FOR THREE.
- ② NEW 5" C-3#500kcmil AND 1#1/0 15KV GENERATOR FEEDER AND 2" CONDUIT WITH GENERATOR CONTROL CONDUCTORS TO THE NEW PARALLELING SWITCHGEAR. SEE SINGLE LINE DIAGRAM ON SHEETS E-4B, E-5B, E-4C AND E-5C.
- ③ NEW WEATHERPROOF 15KV RATED GENERATOR PARALLELING AND SWITCH AUTOMATIC TRANSFER SWITCH "ATS-B" FOR ONE EMERGENCY FEEDER CIRCUIT 4A UNDER OPTION "B". OPTION "C" WILL INCLUDE FEEDER A SECOND FEEDER FOR DUAL 12KV EMERGENCY FEEDERS. SEE SINGLE LINE DIAGRAM ON SHEETS E-4B, E-5B, E-4C AND E-5C.
- ④ TWO 12,000 GAL ABOVE GRADE CONCRETE VAULT (CONVAULT) DIESEL FUEL TANKS.
- ⑤ UNDER OPTION "B" EXISTING 12KV CIRCUIT 4A WILL BE USED AS THE EMERGENCY FEEDER. NEW LOAD SHEDDING CONDUCTORS WILL BE INSTALLED IN ONE THE EXISTING SPARE 5" CONDUITS. UNDER OPTION "C" A NEW SECOND FEEDER CONSISTING OF 3#500kcmil AND 1#1/0 15KV WILL BE INSTALLED IN EXISTING CONDUITS FOR A DUAL 12KV EMERGENCY DISTRIBUTION SYSTEM. SEE SINGLE LINE DIAGRAM ON SHEETS E-4B, E-5B, E-4C AND E-5C.
- ⑥ OPTIONS "B" AND "C" WILL CONSIST OF A NEW 5" C-3#500kcmil AND 1#1/0 15KV, 12KV NORMAL POWER CIRCUIT "4A", (1) 5" C-3#500kcmil AND 1#1/0 GROUND EMERGENCY FEEDER "4A", (2) 5" C.O. SPARE AND 5" CONDUIT WITH LOAD SHEDDING TO THE PARALLELING SWITCHGEAR AND AUTOMATIC TRANSFER SWITCH "ATS-B". SEE SINGLE LINE DIAGRAM ON SHEETS E-4B, E-5B, E-4C AND E-5C.
- ⑦ OPTION "C" WILL CONSIST OF A NEW 5" C-3#500kcmil AND 1#1/0 15KV, 12KV NORMAL POWER CIRCUIT "4B" AND 5" C-3#500kcmil AND 1#1/0 GROUND FOR A DUAL EMERGENCY FEEDER AND (2) 5" C.O. SPARE TO THE PARALLELING SWITCHGEAR AND AUTOMATIC TRANSFER SWITCH "ATS-B". SEE SINGLE LINE DIAGRAM ON SHEETS E-4C AND E-5C.


OPTION "B" AND "C"
ENLARGED GENERATOR SITE PLAN

SCALE: 1" = 20'-0"



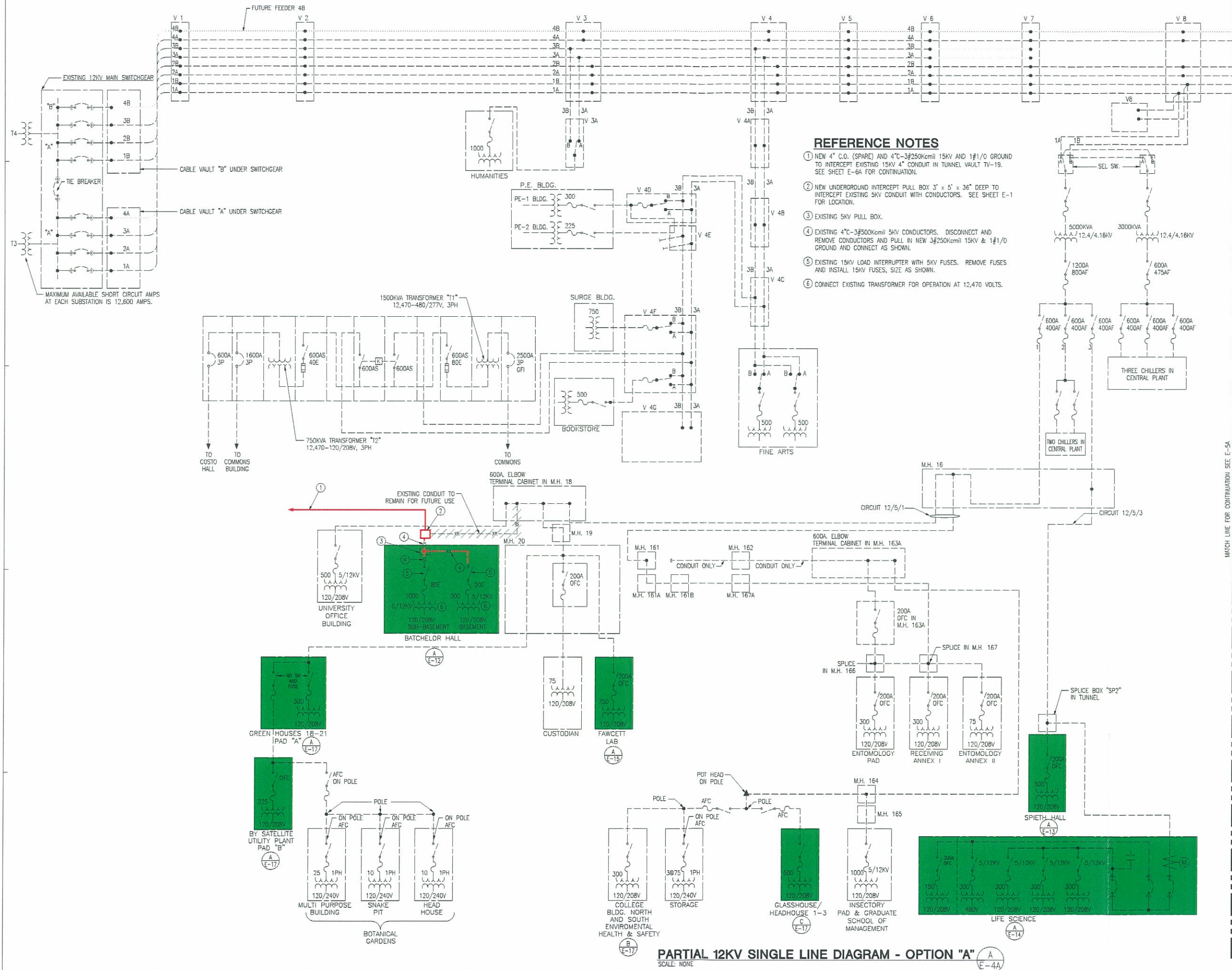
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**ENLARGED GENERATOR AND
TRANSFORMER SITE PLANS -
OPTIONS "B" AND "C"**

 PROJECT NO:
958993-2
DATE:
May 22, 2007

 SHEET NO:
E-3BC



REFERENCE NOTES

- ① NEW 4" C.O. (SPARE) AND 4" 3#250kcmil 15KV AND 1#1/0 GROUND TO INTERCEPT EXISTING 15KV 4" CONDUIT IN TUNNEL VAULT TV-19. SEE SHEET E-6A FOR CONTINUATION.
- ② NEW UNDERGROUND INTERCEPT PULL BOX 3' x 5' x 36" DEEP TO INTERCEPT EXISTING 5KV CONDUIT WITH CONDUCTORS. SEE SHEET E-1 FOR LOCATION.
- ③ EXISTING 5KV PULL BOX.
- ④ EXISTING 4" 3#500kcmil 5KV CONDUCTORS. DISCONNECT AND REMOVE CONDUCTORS AND PULL IN NEW 3#250kcmil 15KV & 1#1/0 GROUND AND CONNECT AS SHOWN.
- ⑤ EXISTING 15KV LOAD INTERRUPTER WITH 5KV FUSES. REMOVE FUSES AND INSTALL 15KV FUSES, SIZE AS SHOWN.
- ⑥ CONNECT EXISTING TRANSFORMER FOR OPERATION AT 12,470 VOLTS.

PARTIAL 12KV SINGLE LINE DIAGRAM - OPTION "A"
SCALE: NONE

STRUCTURAL ENGINEERS:

ARCHITECT'S STAMP: CONSULTANT:

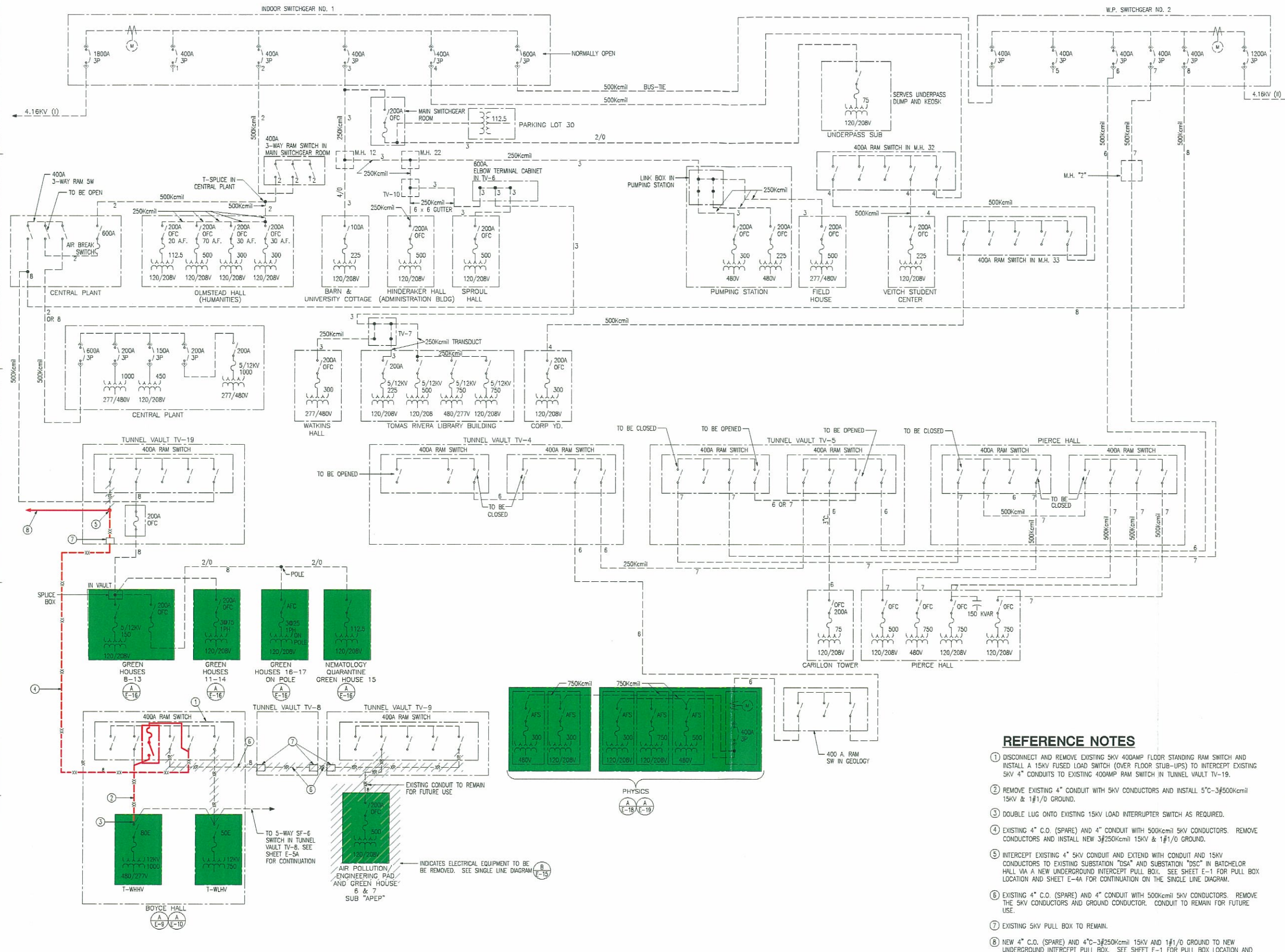
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**5KV SINGLE LINE
DIAGRAM - OPTION 'A'**

PROJECT NO: 958993-2 SHEET NO: **E-6A**
DATE: May 22, 2007



REFERENCE NOTES

- DISCONNECT AND REMOVE EXISTING 5KV 400AMP FLOOR STANDING RAM SWITCH AND INSTALL A 15KV FUSED LOAD SWITCH (OVER FLOOR STUB-UPS) TO INTERCEPT EXISTING 5KV 4" CONDUITS TO EXISTING 400AMP RAM SWITCH IN TUNNEL VAULT TV-19.
- REMOVE EXISTING 4" CONDUIT WITH 5KV CONDUCTORS AND INSTALL 5"C-3#500Kcmil 15KV & 1#1/0 GROUND.
- DOUBLE LUG ONTO EXISTING 15KV LOAD INTERRUPTER SWITCH AS REQUIRED.
- EXISTING 4" C.O. (SPARE) AND 4" CONDUIT WITH 500Kcmil 5KV CONDUCTORS. REMOVE CONDUCTORS AND INSTALL NEW 3#250Kcmil 15KV & 1#1/0 GROUND.
- INTERCEPT EXISTING 4" 5KV CONDUIT AND EXTEND WITH CONDUIT AND 15KV CONDUCTORS TO EXISTING SUBSTATION "DSA" AND SUBSTATION "DSC" IN BATCHELOR HALL VIA A NEW UNDERGROUND INTERCEPT PULL BOX. SEE SHEET E-1 FOR PULL BOX LOCATION AND SHEET E-4A FOR CONTINUATION ON THE SINGLE LINE DIAGRAM.
- EXISTING 4" C.O. (SPARE) AND 4" CONDUIT WITH 500Kcmil 5KV CONDUCTORS. REMOVE THE 5KV CONDUCTORS AND GROUND CONDUCTOR. CONDUIT TO REMAIN FOR FUTURE USE.
- EXISTING 5KV PULL BOX TO REMAIN.
- NEW 4" C.O. (SPARE) AND 4"C-3#250Kcmil 15KV AND 1#1/0 GROUND TO NEW UNDERGROUND INTERCEPT PULL BOX. SEE SHEET E-1 FOR PULL BOX LOCATION AND SHEET E-4A FOR CONTINUATION ON THE SINGLE LINE DIAGRAM.

5KV SINGLE LINE DIAGRAM - OPTION 'A'
SCALE: NONE

UCR CAMPUS ELECTRICAL LOAD SCHEDULE - OPTION "A"



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OFFICE OF:
DESIGN & CONSTRUCTION
3615 CANYON CREEK DRIVE - D102
RIVERSIDE, CA 92507
TEL (951) 787-4201 FAX (951) 787-3880

JMD ENGINEERING, INC.
ELECTRICAL ENGINEERS
1543 West Garvey Ave. North, Suite 210
West Covina, CA 91790
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ELECTRICAL ENGINEERS

STRUCTURAL ENGINEERS

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**UCR CAMPUS ELECTRICAL
LOAD SCHEDULE
OPTION "A"**

PROJECT NO: 958993-2 SHEET NO: **E-7A**
DATE: May 22, 2007

5 KV SYSTEM

5 KV CIRCUIT 2				
FACILITY	SQ. FT. AREA	TOTAL XFMR KVA	DEMAND LOAD	REMARKS
OLMSTEAD HALL (HUMANITIES)	112,411	1,212.5	404.0	--
TOTALS	--	1,212.5	404.0	--
TOTAL AMPS @ 4,160 VOLTS	--	168.3	56.1	--

5 KV CIRCUIT 3				
FACILITY	SQ. FT. AREA	TOTAL XFMR KVA	DEMAND LOAD	REMARKS
UNDERPASS SUBSTATION	N/A	75.0	75.0	--
PARKING LOT 30	N/A	112.5	112.5	--
BARN, UNIVERSITY COTTAGE	5,175	225.0	112.5	--
HENDERKER HALL (ADM.)	46,490	500.0	90.0	--
SPRING HALL	78,870	500.0	85.0	--
PUMPING STATION	N/A	525.0	525.0	--
FIELD HOUSE	N/A	500.0	500.0	--
WATKINS HALL	63,913	300.0	51.0	--
TOMAS RIVERA LIBRARY	230,013	2,225.0	1,112.5	--
TOTALS	--	4962.5	2683.5	--
TOTAL AMPS @ 4,160 VOLTS	--	688.7	399.7	--

5 KV CIRCUIT 4				
FACILITY	SQ. FT. AREA	TOTAL XFMR KVA	DEMAND LOAD	REMARKS
VEITCH STUDENT CENTER	--	225.0	112.5	--
CORPORATION YARD	--	300.0	150.0	--
TOTALS	--	525.0	182.5	--
TOTAL AMPS @ 4,160 VOLTS	--	72.8	22.6	--

5 KV CIRCUIT 6				
FACILITY	SQ. FT. AREA	TOTAL XFMR KVA	DEMAND LOAD	REMARKS
CARILLON TOWER	4,774	75.0	37.5	--
STAIRS	11,658	1,500.0	117.0	--
TOTALS	--	1,575.0	154.5	--
TOTAL AMPS @ 4,160 VOLTS	--	308.8	35.4	--

5 KV CIRCUIT 7				
FACILITY	SQ. FT. AREA	TOTAL XFMR KVA	DEMAND LOAD	REMARKS
PERCE HALL	113,073	2,750.0	1,375.0	--
TOTALS	--	2,750.0	1,375.0	--
TOTAL AMPS @ 4,160 VOLTS	--	381.7	190.8	--

5 KV CIRCUIT 8				
FACILITY	SQ. FT. AREA	TOTAL XFMR KVA	DEMAND LOAD	REMARKS
CENTRAL PLANT (FEEDER #1)	N/A	1,450.0	1,450.0	--
GREEN HOUSES (1-13)	--	150.0	--	(SUBSTATION BY VALLEY)
GREEN HOUSES 14-15	--	225.0	--	--
GREEN HOUSES 16-17	--	75.0	44.5	XFMR ON POLE
ENTOMOLOG QUARANTINE (GREEN HOUSE 18)	--	112.5	--	--
ENTOMOLOG QUARANTINE (GREEN HOUSE 19)	--	112.5	--	--
ENTOMOLOG QUARANTINE (GREEN HOUSE 20)	--	112.5	--	--
ENTOMOLOG QUARANTINE (GREEN HOUSE 21)	--	112.5	--	--
ENTOMOLOG QUARANTINE (GREEN HOUSE 22)	--	112.5	--	--
TOTALS	--	2,512.5	1,934.5	--
TOTAL AMPS @ 4,160 VOLTS	--	348.7	268.5	--

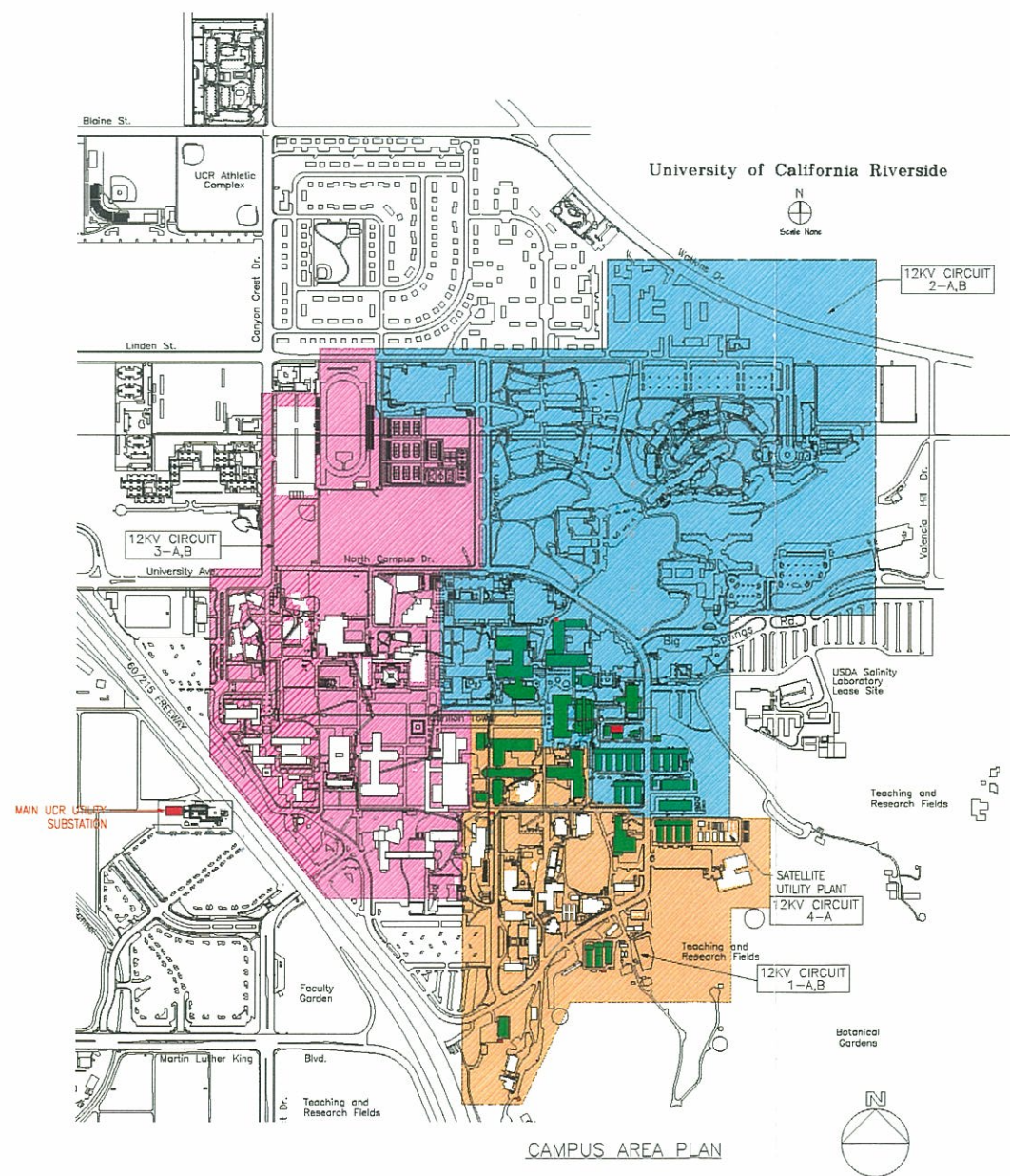
12 KV SYSTEM

12 KV CIRCUIT NO. 1					
FACILITY	SQ. FT. AREA	TOTAL XFMR KVA	DEMAND LOAD CKT A	DEMAND LOAD CKT B	REMARKS
TWO CHILLERS IN CENTRAL PLANT	48,387	--	1,500.0	--	FED VIA 5000 KVA XFMR
GREEN HALL	152,931	300.0	300.0	--	5KV XFMR FED VIA 5000 KVA XFMR
LIFE SCIENCE	114,860	350.0	350.0	--	5KV XFMR FED VIA 5000 KVA XFMR
UNIV. OFFICE BUILDING	9,087	500.0	250.0	--	--
EAST BLDG HOUSES (5-21) (ENT #1)	8,915	100.0	87.5	--	5KV XFMR FED VIA 5000 KVA XFMR
CUSTOMER	20,996	75.0	37.5	--	5KV XFMR FED VIA 5000 KVA XFMR
ENTOMOLOG PAD	--	75.0	187.5	--	--
EAST GREEN HOUSE PAD 10	850	225.0	112.5	--	5KV XFMR FED VIA 5000 KVA XFMR
EAST-PURPOSE BUILDING (GREENHOUSE)	725	12.5	12.5	--	5KV XFMR FED VIA 5000 KVA XFMR
GREENHOUSE (BOTANICAL GARDEN)	51,841	10.0	5.0	--	5KV XFMR FED VIA 5000 KVA XFMR
GREENHOUSE (BOTANICAL GARDEN)	10,565	10.0	5.0	--	5KV XFMR FED VIA 5000 KVA XFMR
ENTOMOLOG PAD	16,895	300.0	150.0	--	5KV XFMR FED VIA 5000 KVA XFMR
RECEIVING ANNEX	--	300.0	150.0	--	5KV XFMR FED VIA 5000 KVA XFMR
ENTOMOLOG ANEX II	--	75.0	37.5	--	5KV XFMR FED VIA 5000 KVA XFMR
COLLEGE BUILDING NORTH	--	150.0	150.0	--	5KV XFMR FED VIA 5000 KVA XFMR
COLLEGE BUILDING SOUTH	--	300.0	5.0	--	5KV XFMR FED VIA 5000 KVA XFMR
ENTOMOLOG QUARANTINE (GREENHOUSE)	--	41.4	41.4	--	5KV XFMR FED VIA 5000 KVA XFMR
STORAGE (CHEMICAL BUILDING)	--	225.0	112.5	--	5KV XFMR FED VIA 5000 KVA XFMR
ENTOMOLOG QUARANTINE (GREENHOUSE)	--	100.0	87.5	--	5KV XFMR FED VIA 5000 KVA XFMR
INSECTORY PAD & GRND. SCHOOL OF MGMT.	8,765	1,000.0	500.0	--	5KV XFMR FED VIA 5000 KVA XFMR
THREE CHILLERS IN CENTRAL PLANT	3,000.0	--	2,500.0	--	5KV XFMR FED VIA 5000 KVA XFMR
INSECTORY QUARANTINE	--	1,000.0	--	500.0	--
UNIVERSITY LAB	11,803	150.0	--	75.0	--
ENTOMOLOG	64,000	1,000.0	--	750.0	--
COMPUTING & COMMUNICATIONS SERVICES	--	300.0	--	150.0	--
BIOLOGICAL SCIENCE	--	1,500.0	--	750.0	--
TOTALS	--	13,395.0	3,835.72E	4725.0	--
TOTAL AMPS @ 12,470 VOLTS	--	620.2	177.6	216.8	--

12 KV CIRCUIT NO. 2					
FACILITY	SQ. FT. AREA	TOTAL XFMR KVA	DEMAND LOAD CKT A	DEMAND LOAD CKT B	REMARKS
SCIENCE LIBRARY	167,358	1,500.0	300.0	--	--
PERCE HALL	113,073	2,750.0	1,375.0	--	--
LOTHAN HALL	248,601	3,400.0	1,034.0	--	--
PHYSICAL SCIENCE BUILDING #1	--	3,000.0	1,500.0	--	--
ENGINEERING BUILDING #2	--	2,000.0	1,000.0	--	--
COMPUTER STATISTICS BUILDING	43,005	1,000.0	500.0	--	RELOCATED SUBSTATION (ENT #1)
BOURNS HALL	198,996	2,000.0	1,000.0	--	--
PERCE HALL	--	500.00	400.0	--	--
PHYSICAL SCIENCE BUILDING (LABORATORY)	--	3,000.0	1,500.0	--	1,500.0
PENLAND HILLS I	--	1,500.0	--	750.0	--
PENLAND HILLS II	--	2,000.0	--	1,000.0	--
ABERDEEN-INVERNESS (AM)	205,750	2,750.0	470.0	--	--
PARKING SERVICES	3,884	150.0	75.0	--	--
STUDENT RECREATION CENTER	78,331	1,000.0	400.0	--	--
ENTOMOLOG QUARANTINE (GREENHOUSE)	16,895	300.0	150.0	--	--
ELENIOR (ARROYO STUDENT HOUSING)	--	2,150.0	--	1,075.0	--
MODULAR BLDG. LOT 9	--	300.0	--	150.0	--
BIOCHEMISTRY HALL	--	1,500.0	--	750.0	--
TOTALS	--	29,325.0	6,379.0	5,637.2	--
TOTAL AMPS @ 12,470 VOLTS	--	1,397.7	295.3	281.0	--

12 KV CIRCUIT NO. 3					
FACILITY	SQ. FT. AREA	TOTAL XFMR KVA	DEMAND LOAD CKT A	DEMAND LOAD CKT B	REMARKS
HUMANITIES	57,000	1,000.0	400.0	--	--
FINE ARTS	108,300	1,000.0	350.0	--	--
PHYSICAL EDUCATION BUILDING (PE#1)	--	300.0	--	150.0	--
PHYSICAL EDUCATION BUILDING (PE#2)	--	225.0	--	112.5	--
SURGE BUILDING	--	750.0	--	350.0	--
BOOKSTORE	--	500.0	--	250.0	--
COSTO HALL COMMONS	--	2,250.0	--	1,125.0	--
TOTALS	--	6,025.0	750.0	1,987.5	--
TOTAL AMPS @ 12,470 VOLTS	--	279.0	34.7	92.0	--

12 KV CIRCUIT NO. 4					
FACILITY	SQ. FT. AREA	TOTAL XFMR KVA	DEMAND LOAD CKT A	DEMAND LOAD CKT B	REMARKS
SATELLITE UTILITY PLANT	--	4,000.0	3,000.0	--	--
TOTALS	--	4,000.0	3,000.0	--	--
TOTAL AMPS @ 12,470 VOLTS	--	185.2	138.9	--	--



CAMPUS AREA PLAN



UNIVERSITY OF CALIFORNIA RIVERSIDE

OFFICE OF:
DESIGN & CONSTRUCTION

3819 CANTON CREST DRIVE - 0102
RIVERSIDE, CA 92507
TEL: (951) 787-4251 FAX: (951) 787-3990

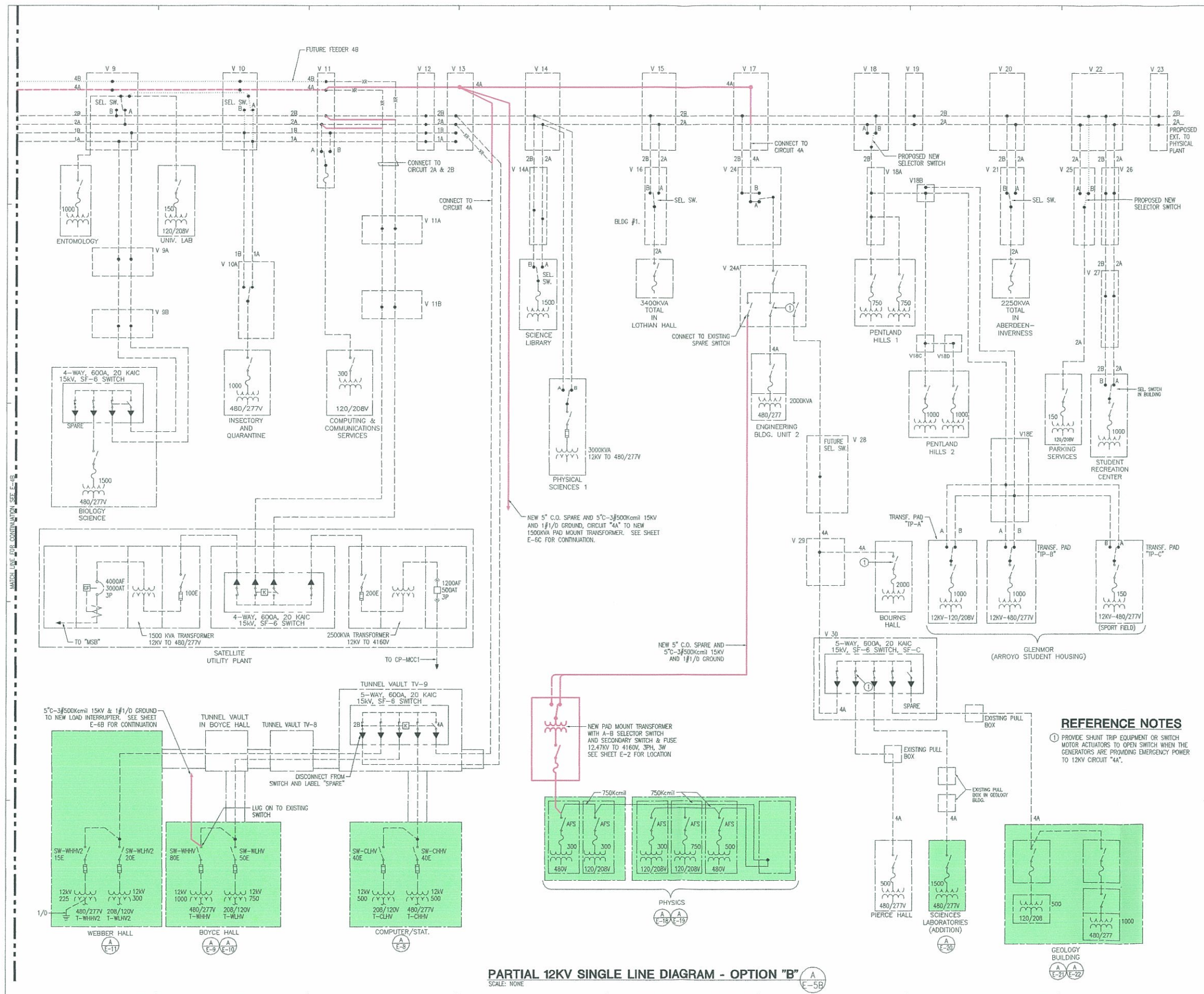
JMD ENGINEERING, INC.
ELECTRICAL ENGINEERS
1543 West Garvey Ave. North, Suite 210
West Covina, CA 91790
TEL: (626) 337-1955 • Fax: (626) 337-1902

ELECTRICAL ENGINEER:

STRUCTURAL ENGINEER:

ARCHITECT'S STAMP: CONSULTANT:

AGENCY APPROVAL:



REFERENCE NOTES

1 PROVIDE SHUNT TRIP EQUIPMENT OR SWITCH MOTOR ACTUATORS TO OPEN SWITCH WHEN THE GENERATORS ARE PROVIDING EMERGENCY POWER TO 12KV CIRCUIT "4A".

ISSUED FOR DRAFT REVIEW	5/22/07
REVISION:	DESCRIPTION:

EMERGENCY STANDBY GENERATOR
FEASIBILITY STUDY - VARIOUS BUILDINGS
UNIVERSITY OF CALIFORNIA
RIVERSIDE

**PARTIAL 12KV SINGLE LINE
DIAGRAM - OPTION "B"**

PROJECT NO: 958993-2
SHEET NO: **E-5B**
DATE: May 22, 2007

PARTIAL 12KV SINGLE LINE DIAGRAM - OPTION "B"
SCALE: NONE

UCR CAMPUS ELECTRICAL LOAD SCHEDULE - OPTION "B"



UNIVERSITY OF CALIFORNIA RIVERSIDE

OFFICE OF:
DESIGN & CONSTRUCTION

3615 CANYON CREST DRIVE - D102
RIVERSIDE, CA 92507
TEL: (951) 787-4221 FAX: (951) 787-3880

JMD ENGINEERING, INC.
ELECTRICAL ENGINEERS
1543 West Garvey Ave. North, Suite 210
West Covina, CA 91790
(626) 337-1865 • Fax: (626) 337-1802

STRUCTURAL ENGINEER: _____

ARCHITECT'S STAMP: _____ CONSULTANT: _____

AGENCY APPROVAL: _____

ISSUED FOR DRAFT REVIEW 5/22/07
REVISION: DESCRIPTION: _____ DATE: _____

EMERGENCY STANDBY GENERATOR
FEASIBILITY STUDY - VARIOUS BUILDINGS
UNIVERSITY OF CALIFORNIA
RIVERSIDE

**UCR CAMPUS ELECTRICAL
LOAD SCHEDULE
OPTION "B"**

PROJECT NO:
958993-2
DATE:
May 22, 2007

SHEET NO:
E-7B

5 KV SYSTEM

5 KV CIRCUIT 2				
FACILITY	SQ. FT. AREA	TOTAL XFMR KVA	DEMAND LOAD	REMARKS
OLMSTEAD HALL (HUMANITIES)	112,411	1,212.5	404.0	--
--	--	--	--	--
TOTALS	--	1,212.5	404.0	--
TOTAL AMPS @ 4.160 VOLTS	--	169.3	56.1	--

5 KV CIRCUIT 3				
FACILITY	SQ. FT. AREA	TOTAL XFMR KVA	DEMAND LOAD	REMARKS
UNDERPASS SUBSTATION	N/A	75.0	75.0	--
PARKING LOT 30	N/A	112.5	112.5	--
BARIL UNIVERSITY COTTAGE	5,175	225.0	112.5	--
HINDERKER HALL (ADM.)	46,480	500.0	90.0	--
SPROUL HALL	78,670	500.0	85.0	--
PUMPING STATION	N/A	525.0	525.0	--
FIELD HOUSE	N/A	500.0	500.0	--
NOTKINS HALL	63,913	300.0	51.0	--
TOMAS RIVERA LIBRARY	230,013	2,225.0	1,112.5	--
TOTALS	--	4962.5	2883.5	--
TOTAL AMPS @ 4.160 VOLTS	--	688.7	399.7	--

5 KV CIRCUIT 4				
FACILITY	SQ. FT. AREA	TOTAL XFMR KVA	DEMAND LOAD	REMARKS
YETICH STUDENT CENTER	--	225.0	112.5	--
CORPORATION YARD	--	300.0	150.0	--
TOTALS	--	525.0	262.5	--
TOTAL AMPS @ 4.160 VOLTS	--	72.8	22.6	--

5 KV CIRCUIT 6				
FACILITY	SQ. FT. AREA	TOTAL XFMR KVA	DEMAND LOAD	REMARKS
CARILLON TOWER	4,774	75.0	37.5	--
TOTALS	--	75.0	37.5	--
TOTAL AMPS @ 4.160 VOLTS	--	18.4	5.2	--

5 KV CIRCUIT 7				
FACILITY	SQ. FT. AREA	TOTAL XFMR KVA	DEMAND LOAD	REMARKS
PERCE HALL	113,073	2,750.0	1,375.0	--
TOTALS	--	2,750.0	1,375.0	--
TOTAL AMPS @ 4.160 VOLTS	--	381.7	190.8	--

5 KV CIRCUIT 8				
FACILITY	SQ. FT. AREA	TOTAL XFMR KVA	DEMAND LOAD	REMARKS
CENTRAL PLANT (FEEDER #1)	N/A	1,450.0	1,450.0	--
TOTALS	--	1,450.0	1,450.0	--
TOTAL AMPS @ 4.160 VOLTS	--	201/2	201/2	--

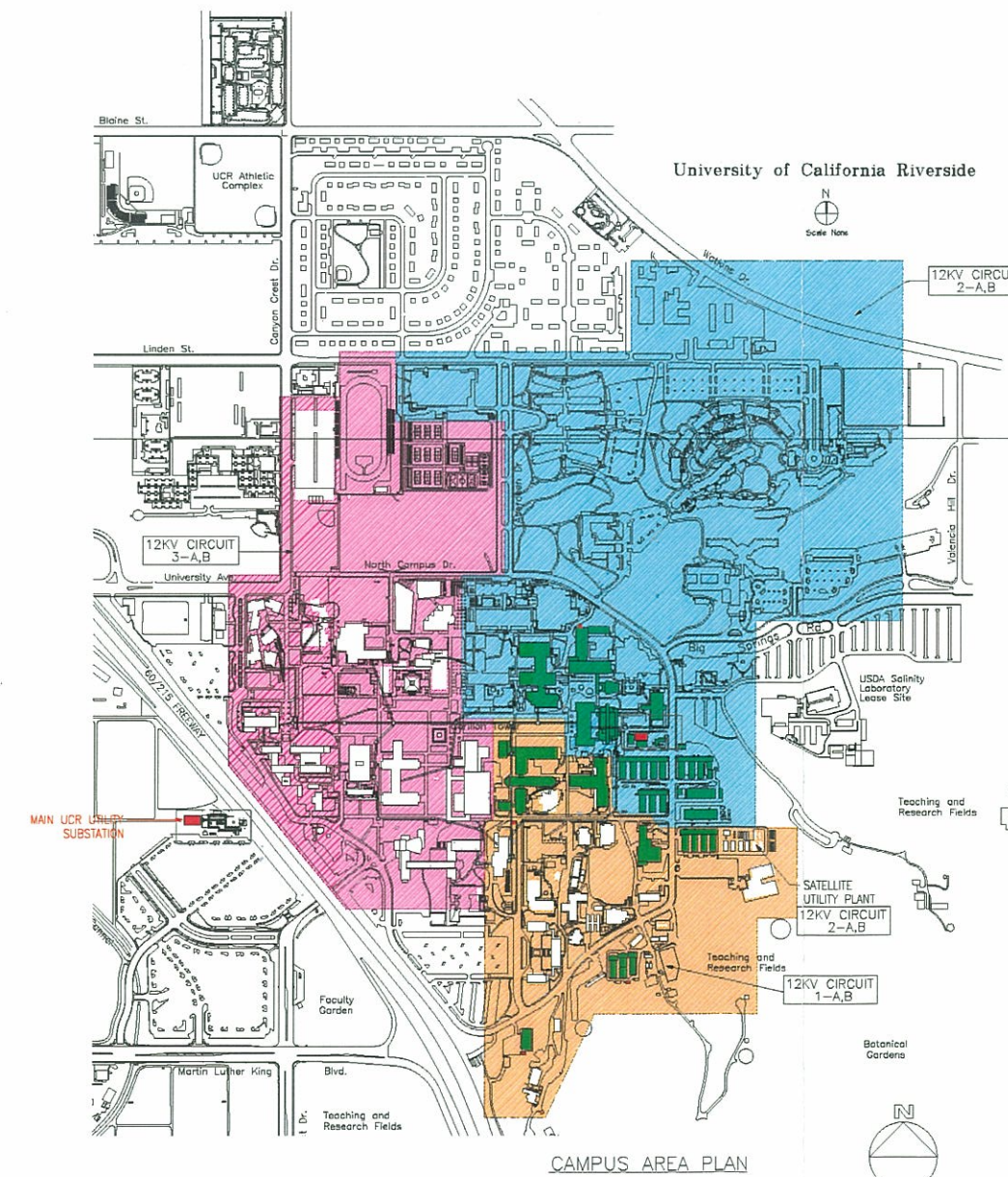
12 KV SYSTEM

12 KV CIRCUIT NO. 1					
FACILITY	SQ. FT. AREA	TOTAL XFMR KVA	DEMAND LOAD CKT A	DEMAND LOAD CKT B	REMARKS
TWO CHILLERS IN CENTRAL PLANT	48,302	--	1,500.0	--	FED VIA 5000 KVA XFMR
UNIV. OFFICE BUILDING	9,987	500.0	250.0	--	--
CUSTOMER	--	75.0	37.5	--	SKV XFMR FED VIA 5000 KVA XFMR
ENTOMOLOGY PAD	18,859	300.0	150.0	--	SKV XFMR FED VIA 5000 KVA XFMR
RECEIVING ANNEX I	--	300.0	150.0	--	SKV XFMR FED VIA 5000 KVA XFMR
ENTOMOLOGY ANNEX II	--	75.0	37.5	--	SKV XFMR FED VIA 5000 KVA XFMR
COLLEGE BUILDING NORTH	--	150.0	150.0	--	SKV XFMR FED VIA 5000 KVA XFMR
COLLEGE BUILDING SOUTH	--	300.0	5.0	--	SKV XFMR FED VIA 5000 KVA XFMR
TOTALS	--	2,000.0	1,200.0	250.0	--

12 KV CIRCUIT NO. 2					
FACILITY	SQ. FT. AREA	TOTAL XFMR KVA	DEMAND LOAD CKT A	DEMAND LOAD CKT B	REMARKS
SCIENCE LIBRARY	167,358	1,500.0	500.0	--	--
LOTHAN HALL	248,801	3,400.0	1,634.0	--	--
PHYSICAL SCIENCE BUILDING #1	--	3,000.0	1,500.0	--	--
ENGINEERING BUILDING #2	--	2,000.0	1,000.0	--	--
BOURNS HALL	159,896	2,000.0	1,000.0	--	--
PERCE HALL	--	500.0	400.0	--	--
PENLAND HILLS I	--	1,500.0	--	750.0	--
PENLAND HILLS II	--	2,000.0	--	1,000.0	--
ABERDEEN-BIRMINGHAM (AKI)	206,750	2,250.0	470.0	--	--
PARKING SERVICES	5,884	150.0	75.0	--	--
STUDENT RECREATION CENTER	79,331	1,000.0	400.0	--	--
CLEMMOR (ARMY) STUDENT HOUSING)	--	2,150.0	--	1,075.0	--
MODULAR BLDG. LOT 9	--	300.0	--	150.0	--
SATELLITE UTILITY PLANT	--	4,000.0	--	3,000.0	--
TOTALS	--	25,750.0	6,378.0	5,875.0	--
TOTAL AMPS @ 12,470 VOLTS	--	1,192.2	295.3	278.8	--

12 KV CIRCUIT NO. 3					
FACILITY	SQ. FT. AREA	TOTAL XFMR KVA	DEMAND LOAD CKT A	DEMAND LOAD CKT B	REMARKS
HUMANITIES	57,000	1,000.0	400.0	--	--
FINE ARTS	108,300	1,000.0	350.0	--	--
PHYSICAL EDUCATION BUILDING (PE#1)	--	300.0	--	150.0	--
PHYSICAL EDUCATION BUILDING (PE#2)	--	225.0	--	112.5	TENNIS COURTS AND PORTABLES
SURGE BUILDING	--	750.0	--	350.0	--
BOOKSTORE	--	500.0	--	250.0	--
COSSID HALL, COMMONS	--	2,250.0	--	1,125.0	--
TOTALS	--	6,025.0	750.0	1,987.5	--
TOTAL AMPS @ 12,470 VOLTS	--	279.0	34.7	92.0	--

12 KV CIRCUIT NO. 4 - EMERGENCY					
FACILITY	SQ. FT. AREA	TOTAL XFMR KVA	DEMAND LOAD CKT A	DEMAND LOAD CKT B	REMARKS
COMPUTER STATISTICS BUILDING	43,096	1,000.0	335.7	--	INCLUDES 350KW FOR TARP
UP POLLUTION ENGINEERING PAD	--	0.0	0.0	0.0	INCLUDES WITH COMP-STAT
SPECT HALL	109,820	1,250.0	680.8	--	--
WEBER HALL	50,801	520.0	213.8	--	--
SHAYLOR HALL	--	1,200.0	431.5	--	--
SPETH HALL	102,611	500.0	103.8	--	--
LIFE SCIENCE	114,860	1,200.0	352.1	--	--
CANNOTT LAB	--	750.0	181.9	--	--
EAST GREEN HOUSE PAD #6	1,800	225.0	12.5	--	--
HEATH-PURVIS BUILDING (BOTANIC GARDEN)	51,841	25.0	12.5	--	--
SMART POT (BOTANIC GARDEN)	--	10.0	5.0	--	--
HEAD HOUSE (BOTANIC GARDEN)	32,962	10.0	5.0	--	--
WEST GREEN HOUSES 18-31 PAD "A"	6,818	300.0	67.2	--	--
GREEN HOUSES 8-13	--	150.0	--	--	(SUBSTATION IN WALLS)
GREEN HOUSES 11-14	--	225.0	44.9	--	--
GREEN HOUSES 16-17	--	75.0	--	--	XFMR ON POLE
HEMATOLOGY QUARANTINE (GREEN HOUSE 12)	--	112.5	--	--	--
PHYSICS	64,806	2,150.0	717.5	--	--
SCIENCE LABORATORIES (ADDITION)	--	1,000.0	543.9	--	--
CHLOUGH BUILDING	133,362	1,500.0	780.7	--	--
TOTALS	--	6,547.8	4,060.5	0.0	--
TOTAL AMPS @ 12,470 VOLTS	--	303.2	188.0	0.0	--



CAMPUS AREA PLAN



UNIVERSITY OF CALIFORNIA RIVERSIDE

OFFICE OF:
DESIGN & CONSTRUCTION

3815 CANTON CREST DRIVE - 0102
RIVERSIDE, CA 92507
TEL: (951) 787-4201 FAX: (951) 787-3890



ELECTRICAL ENGINEERS

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ARCHITECT'S STAMP

CONSULTANT

AGENCY APPROVAL

ISSUED FOR DRAFT REVIEW

5/22/07

EMERGENCY STANDBY GENERATOR

FEASIBILITY STUDY - VARIOUS BUILDINGS

UNIVERSITY OF CALIFORNIA

RIVERSIDE

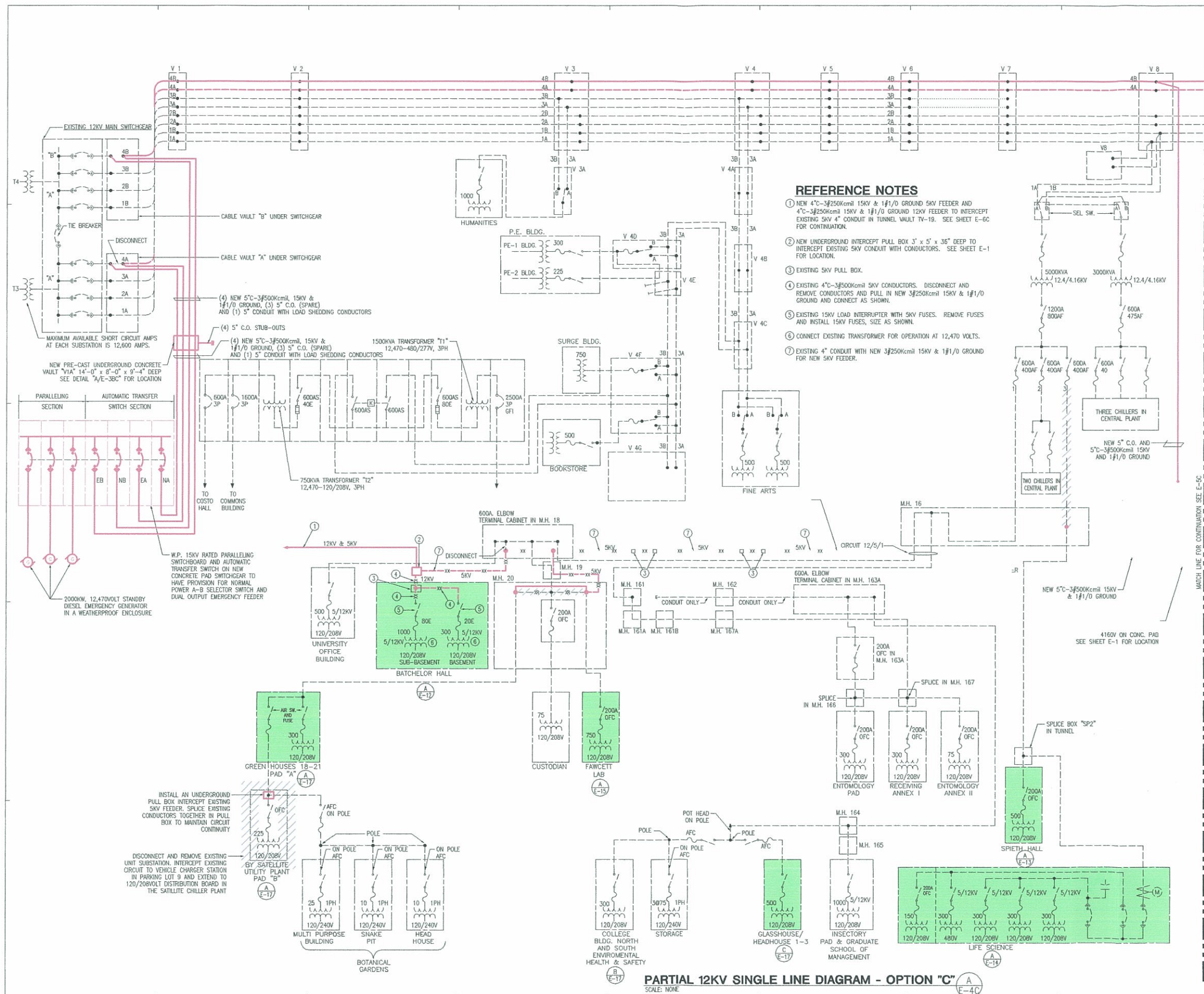
PARTIAL 12KV SINGLE LINE

DIAGRAM - OPTION "C"

PROJECT NO: 958993-2

SHEET NO: E-4C

DATE: May 22, 2007



PARTIAL 12KV SINGLE LINE DIAGRAM - OPTION "C"
SCALE: NONE

MATCH LINE FOR CONTINUATION SEE E-5C

UCR CAMPUS ELECTRICAL LOAD SCHEDULE - OPTION "C"



UNIVERSITY OF CALIFORNIA RIVERSIDE

OFFICE OF:
DESIGN & CONSTRUCTION

3615 CANYON CREST DRIVE - D102
RIVERSIDE, CA 92507
TEL: (951) 787-4201 FAX: (951) 787-3800

JMD ENGINEERING, INC.
ELECTRICAL ENGINEERS
1543 West Garvey Ave. North, Suite 210
West Covina, CA 91790
(951) 337-1866 • Fax: (626) 337-1802

ELECTRICAL ENGINEERS

STRUCTURAL ENGINEERS

ARCHITECT'S STAMP: CONSULTANT:

AGENCY APPROVAL:

ISSUED FOR DRAFT REVIEW 5/22/07

REVISION: DESCRIPTION: DATE:

EMERGENCY STANDBY GENERATOR
FEASIBILITY STUDY - VARIOUS BUILDINGS
UNIVERSITY OF CALIFORNIA
RIVERSIDE

**UCR CAMPUS ELECTRICAL
LOAD SCHEDULE
OPTION "C"**

PROJECT NO: 958993-2 SHEET NO: **E-7C**
DATE: May 22, 2007

5 KV SYSTEM

5 KV CIRCUIT 2				
FACILITY	SQ. FT. AREA	TOTAL XFMR KVA	DEMAND LOAD	REMARKS
OLMSTEAD HALL (HUMANITIES)	112,411	1,212.6	404.0	
TOTALS		1,212.6	404.0	
TOTAL AMPS @ 4,160 VOLTS			56.1	

5 KV CIRCUIT 3				
FACILITY	SQ. FT. AREA	TOTAL XFMR KVA	DEMAND LOAD	REMARKS
UNDERPASS SUBSTATION	N/A	75.0	75.0	
PARKING LOT 30	N/A	112.5	112.5	
BARIL UNIVERSITY COTTAGE	6,175	235.0	112.5	
HINDERAKER HALL (ADM.)	48,480	500.0	90.0	
SPIROU HALL	78,870	500.0	85.0	
PUMPING STATION	N/A	535.0	535.0	
FIELD HOUSE	N/A	500.0	500.0	
WATKINS HALL	63,913	300.0	51.0	
TOMAS RIVERA LIBRARY	230,013	2,225.0	1,112.5	
TOTALS		4962.5	2863.5	
TOTAL AMPS @ 4,160 VOLTS			688.7	

5 KV CIRCUIT 4				
FACILITY	SQ. FT. AREA	TOTAL XFMR KVA	DEMAND LOAD	REMARKS
YETICH STUDENT CENTER	-	225.0	112.5	
COMPOSITION YARD	-	300.0	150.0	
TOTALS		525.0	162.5	
TOTAL AMPS @ 4,160 VOLTS			72.9	

5 KV CIRCUIT 6				
FACILITY	SQ. FT. AREA	TOTAL XFMR KVA	DEMAND LOAD	REMARKS
CARLTON TOWER	4,774	75.0	37.5	
TOTALS		75.0	37.5	
TOTAL AMPS @ 4,160 VOLTS			10.4	

5 KV CIRCUIT 7				
FACILITY	SQ. FT. AREA	TOTAL XFMR KVA	DEMAND LOAD	REMARKS
PERCE HALL	113,073	2,750.0	1,375.0	
TOTALS		2,750.0	1,375.0	
TOTAL AMPS @ 4,160 VOLTS			381.7	

5 KV CIRCUIT 8				
FACILITY	SQ. FT. AREA	TOTAL XFMR KVA	DEMAND LOAD	REMARKS
CENTRAL PLANT (FEEDER #1)	N/A	1,450.0	1,450.0	
TOTALS		1,450.0	1,450.0	
TOTAL AMPS @ 4,160 VOLTS			201/2	

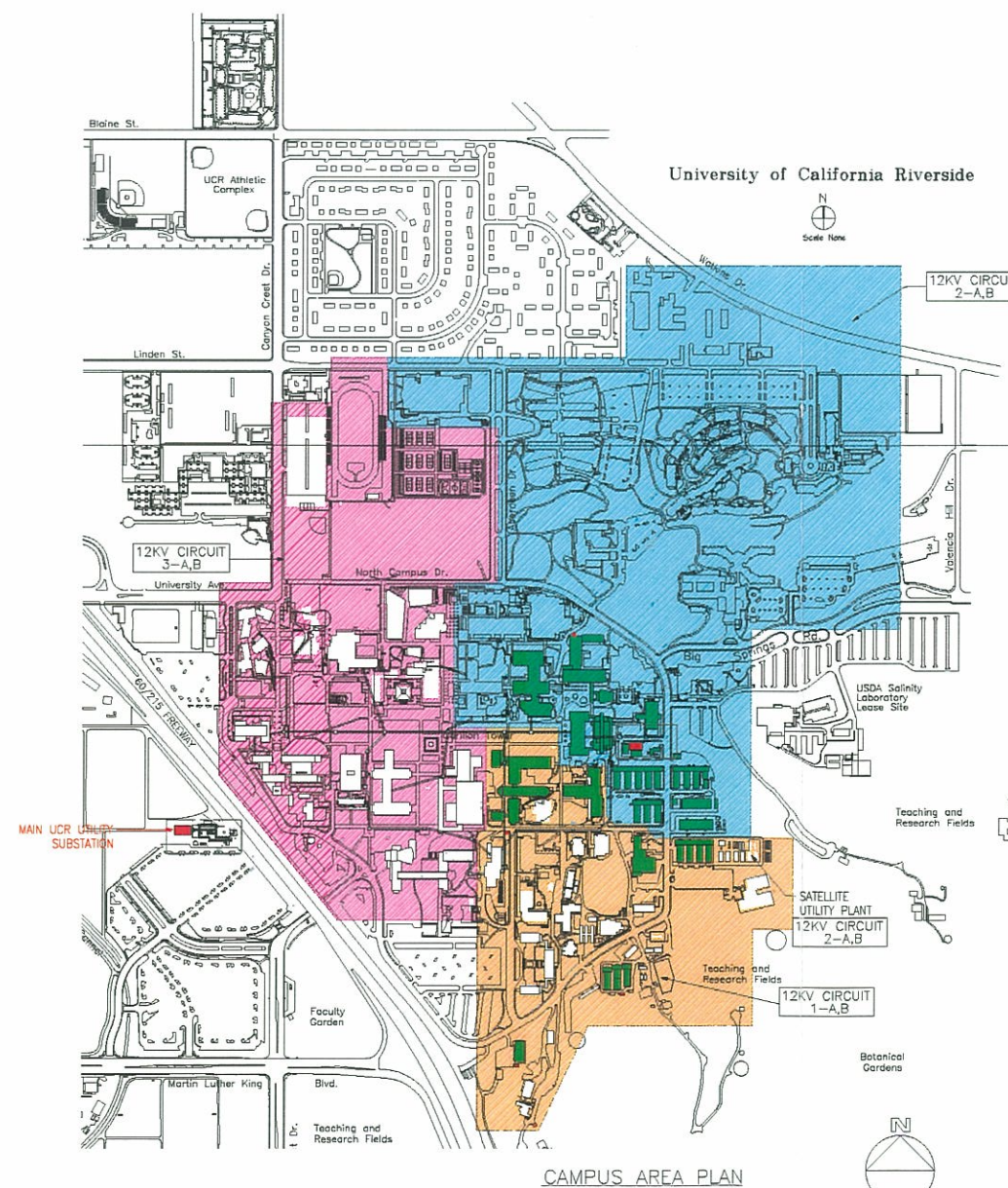
12 KV SYSTEM

12 KV CIRCUIT NO. 1					
FACILITY	SQ. FT. AREA	TOTAL XFMR KVA	DEMAND LOAD CKT A	DEMAND LOAD CKT B	REMARKS
TWO CHILLERS IN CENTRAL PLANT	48,303	-	1,500.0	-	FED VIA 5000 KVA XFMR
LABOR. OFFICE BUILDING	9,087	500.0	250.0	-	
CUSTODIAN	20,995	75.0	37.5	-	5KV XFMR FED VIA 5000 KVA XFMR
ENTOMOLOGY PAD	16,899	300.0	150.0	-	5KV XFMR FED VIA 5000 KVA XFMR
RECEIVING ANNEX I	-	300.0	150.0	-	5KV XFMR FED VIA 5000 KVA XFMR
ENTOMOLOGY ANNEX II	-	75.0	37.5	-	5KV XFMR FED VIA 5000 KVA XFMR
COLLEGE BUILDING NORTH	-	-	150.0	-	5KV XFMR FED VIA 5000 KVA XFMR
COLLEGE BUILDING SOUTH	-	300.0	5.0	-	5KV XFMR FED VIA 5000 KVA XFMR
STORAGE (CHEMICAL BUILDING)	-	225.0	112.5	-	5KV XFMR FED VIA 5000 KVA XFMR
INSPECTORY PAD & GRAD. SCHOOL OF MGMT.	8,783	1,000.0	500.0	-	5KV XFMR FED VIA 5000 KVA XFMR
THREE CHILLERS IN CENTRAL PLANT	-	3,000.0	-	2,500.0	5KV XFMR FED VIA 5000 KVA XFMR
INSPECTORY QUARANTINE	-	1,000.0	-	500.0	
UNIVERSITY LAB	11,803	150.0	75.0	-	
ENTOMOLOGY	64,000	1,000.0	-	750.0	
COMPUTING & COMMUNICATIONS SERVICES	-	300.0	-	150.0	
BIOLOGICAL SCIENCE	-	1,500.0	-	750.0	
TOTALS		10,725.0	3,015.7	4725.0	
TOTAL AMPS @ 12,470 VOLTS			473.4	138.6	

12 KV CIRCUIT NO. 2					
FACILITY	SQ. FT. AREA	TOTAL XFMR KVA	DEMAND LOAD CKT A	DEMAND LOAD CKT B	REMARKS
SCIENCE LIBRARY	167,358	1,500.0	500.0	-	
LOTHAN HALL	248,801	3,400.0	1,034.0	-	
PHYSICAL SCIENCE BUILDING #1	-	3,000.0	1,500.0	-	
ENGINEERING BUILDING #2	-	2,000.0	1,000.0	-	
BOURNE HALL	158,996	2,000.0	1,000.0	-	
PERCE HALL	-	500.0	400.0	-	
PENLAND HILLS I	-	1,500.0	-	750.0	
PENLAND HILLS II	-	2,000.0	-	1,000.0	
ABERDEEN-RIVERSIDE (A&I)	205,750	2,250.0	470.0	-	
PARKING SERVICES	5,684	150.0	75.0	-	
STUDENT RECREATION CENTER	79,331	1,000.0	400.0	-	
GLENMOR (APPROX STUDENT HOUSING)	-	2,150.0	-	1,075.0	
MODULAR BLDG. LOT 9	-	300.0	-	150.0	
SATELLITE UTILITY PLANT	-	4,000.0	-	3,000.0	
TOTALS		25,750.0	6,378.0	5,875.0	
TOTAL AMPS @ 12,470 VOLTS			1,192.2	295.3	

12 KV CIRCUIT NO. 3					
FACILITY	SQ. FT. AREA	TOTAL XFMR KVA	DEMAND LOAD CKT A	DEMAND LOAD CKT B	REMARKS
HUMANITIES	57,000	1,000.0	400.0	-	
FINE ARTS	108,300	1,000.0	350.0	-	
PHYSICAL EDUCATION BUILDING (PE#1)	-	300.0	-	150.0	
PHYSICAL EDUCATION BUILDING (PE#2)	-	225.0	-	112.5	
SHANK BUILDING	-	750.0	-	350.0	
BOOKSTORE	-	500.0	-	250.0	
COSTO HALL, COMMONS	-	2,250.0	-	1,125.0	
TOTALS		6,025.0	750.0	1,987.5	
TOTAL AMPS @ 12,470 VOLTS			278.0	34.7	

12 KV CIRCUIT NO. 4 - EMERGENCY					
FACILITY	SQ. FT. AREA	TOTAL XFMR KVA	DEMAND LOAD CKT A	DEMAND LOAD CKT B	REMARKS
COMPUTER SERVICES BUILDING	43,696	1,000.0	-	-	INCLUDES 35.0KW FOR TAPPI
WATER POLLUTION ENGINEERING PAD	-	0.0	0.0	0.0	INCLUDED WITH COMP-STA
BOYCE HALL	126,837	1,250.0	-	-	
BERRY HALL	50,801	525.0	-	-	
BATCHELLOR HALL	-	1,300.0	-	-	
SPIETH HALL	102,811	500.0	163.8	-	
LIFE SCIENCE	114,890	1,350.0	332.1	-	
FARMHOTT LAB	-	750.0	181.9	-	
EAST GREEN HOUSE PAD "C"	1,800	125.0	12.5	-	
MULTI-PURPOSE BUILDING (BOTANIC GARDEN)	-	75.0	-	-	
SWINE PIT (BOTANIC GARDEN)	51,941	10.0	5.0	-	
HEAD HOUSE (BOTANIC GARDEN)	32,980	10.0	5.0	-	
WEST GREEN HOUSES 18-21 PAD "A"	6,818	300.0	67.2	-	
GREEN HOUSES 8-13	-	150.0	-	-	(SUBSTATION IN WALK)
GREEN HOUSES 11-14	-	225.0	-	-	
GREEN HOUSES 15-17	-	75.0	-	-	XFMR ON POLE
HEMATOLOGY QUARANTINE (GREEN HOUSE 15)	-	112.5	-	-	
PHYSICS	84,808	2,150.0	717.5	-	
SCIENCE LABORATORIES (ADDITION)	-	1,200.0	543.9	-	
GEOLGY BUILDING	101,085	1,500.0	160.7	-	
TOTALS		8,547.8	2,322.5	1,738.1	
TOTAL AMPS @ 12,470 VOLTS			303.2	107.5	



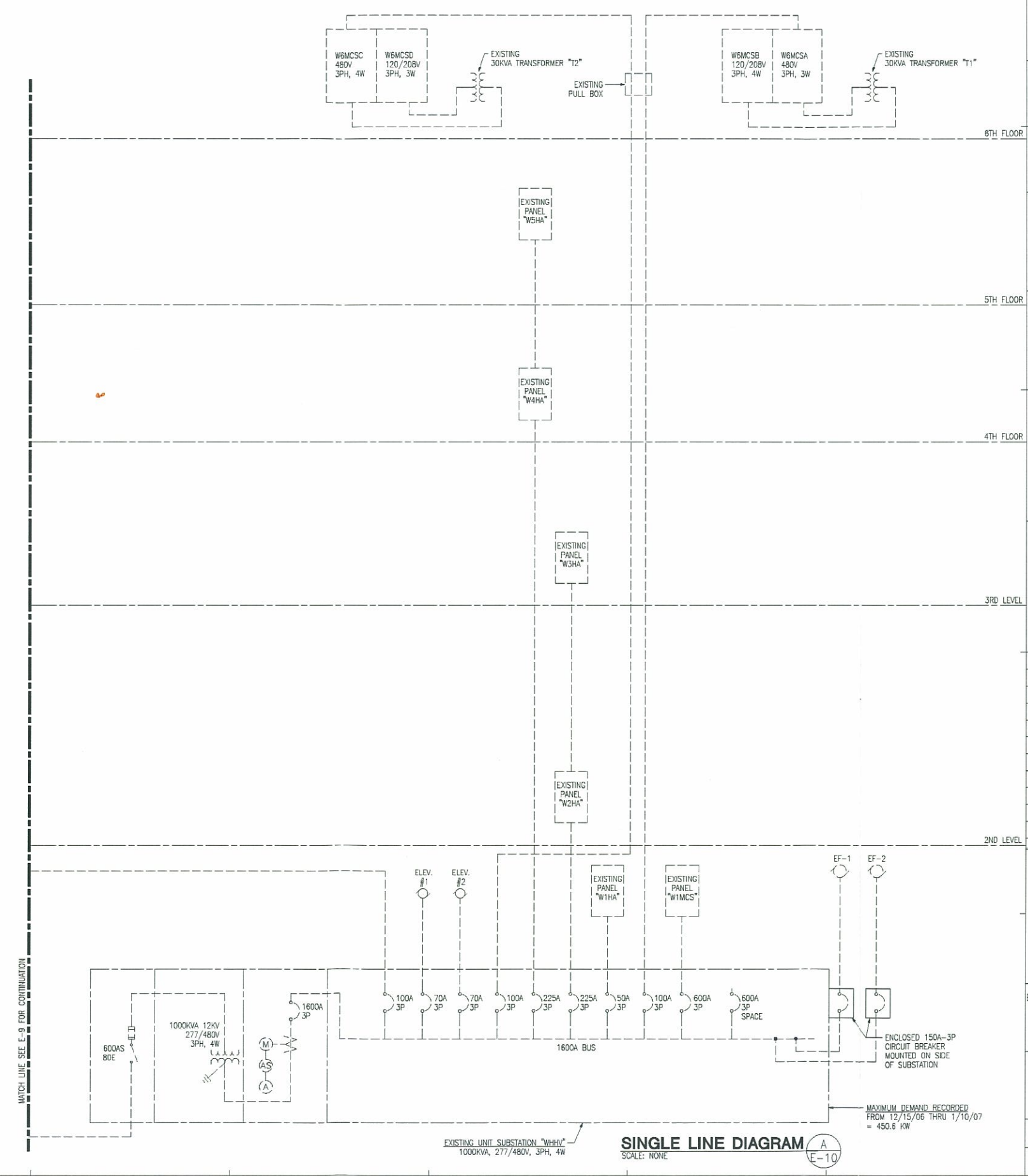
CAMPUS AREA PLAN

REVISION	DESCRIPTION	DATE
△	ISSUED FOR DRAFT REVIEW	5/22/07

EMERGENCY STANDBY GENERATOR
FEASIBILITY STUDY - VARIOUS BUILDINGS
UNIVERSITY OF CALIFORNIA
RIVERSIDE

**BOYCE HALL
SINGLE LINE DIAGRAM**

PROJECT NO: 958993-2	SHEET NO: E-10
DATE: May 22, 2007	



SINGLE LINE DIAGRAM
SCALE: NONE



UCR

UNIVERSITY OF CALIFORNIA RIVERSIDE

OFFICE OF:
DESIGN & CONSTRUCTION

3615 CANYON CREST DRIVE - 0102
RIVERSIDE, CA 92507
TEL: (909) 787-4201 FAX: (909) 787-3888

JMD ENGINEERING, INC.
ELECTRICAL ENGINEERS
1543 West Garvey Ave. North, Suite 210
West Covina, CA 91790
(626) 337-1965 • Fax: (626) 337-1902

ELECTRICAL ENGINEERS

STRUCTURAL ENGINEERS:

ARCHITECT'S STAMP: CONSULTANT:

AGENCY APPROVAL:

ISSUED FOR DRAFT REVIEW 5/22/07

REVISION: DESCRIPTION: DATE:

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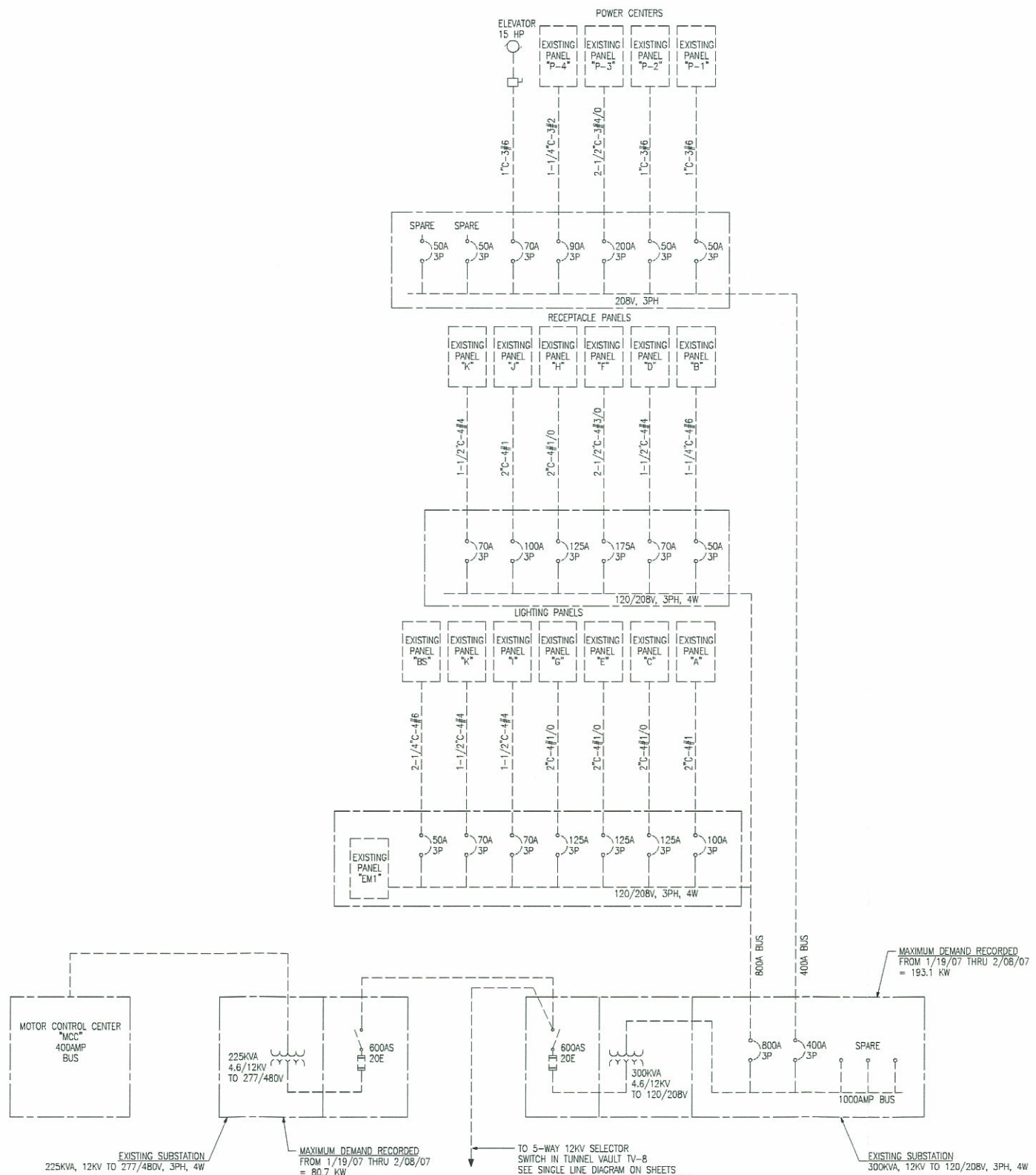
**WEBBER HALL
SINGLE LINE DIAGRAM**

PROJECT NO:
95B993-2

DATE:
May 22, 2007

SHEET NO:

E-11



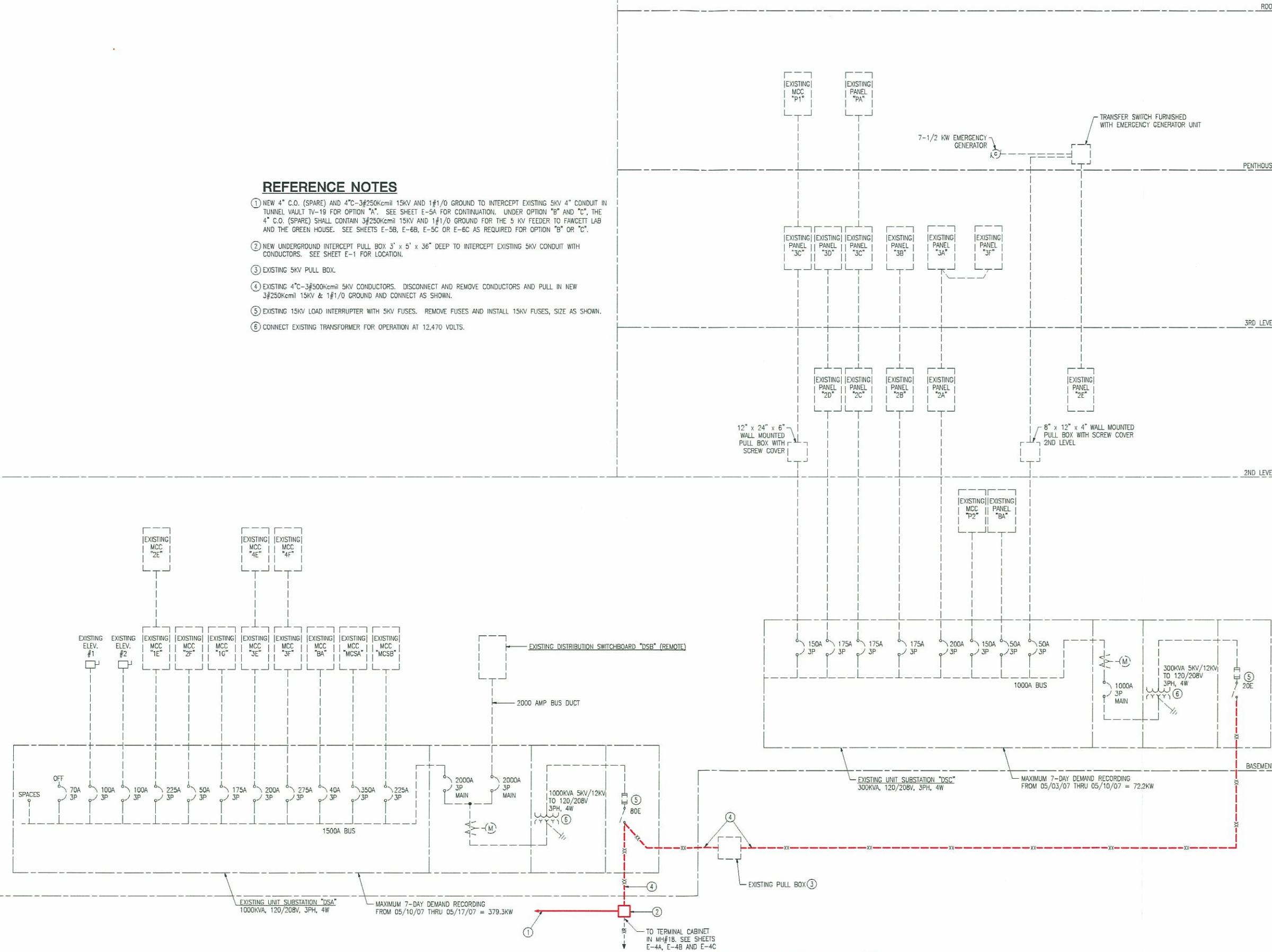
SINGLE LINE DIAGRAM
SCALE: NONE



STRUCTURAL ENGINEERS:	
ARCHITECT'S STAMP:	CONSULTANT:
AGENCY APPROVAL:	

REFERENCE NOTES

- ① NEW 4" C.O. (SPARE) AND 4C-3#250kcmil 15KV AND 1#1/0 GROUND TO INTERCEPT EXISTING 5KV 4" CONDUIT IN TUNNEL VAULT TV-19 FOR OPTION "A". SEE SHEET E-5A FOR CONTINUATION. UNDER OPTION "B" AND "C", THE 4" C.O. (SPARE) SHALL CONTAIN 3#250kcmil 15KV AND 1#1/0 GROUND FOR THE 5 KV FEEDER TO FAWCETT LAB AND THE GREEN HOUSE. SEE SHEETS E-5B, E-6B, E-5C OR E-6C AS REQUIRED FOR OPTION "B" OR "C".
- ② NEW UNDERGROUND INTERCEPT PULL BOX 3' x 5' x 36" DEEP TO INTERCEPT EXISTING 5KV CONDUIT WITH CONDUCTORS. SEE SHEET E-1 FOR LOCATION.
- ③ EXISTING 5KV PULL BOX.
- ④ EXISTING 4C-3#500kcmil 5KV CONDUCTORS. DISCONNECT AND REMOVE CONDUCTORS AND PULL IN NEW 3#250kcmil 15KV & 1#1/0 GROUND AND CONNECT AS SHOWN.
- ⑤ EXISTING 15KV LOAD INTERRUPTER WITH 5KV FUSES. REMOVE FUSES AND INSTALL 15KV FUSES, SIZE AS SHOWN.
- ⑥ CONNECT EXISTING TRANSFORMER FOR OPERATION AT 12,470 VOLTS.


SINGLE LINE DIAGRAM
 SCALE: NONE

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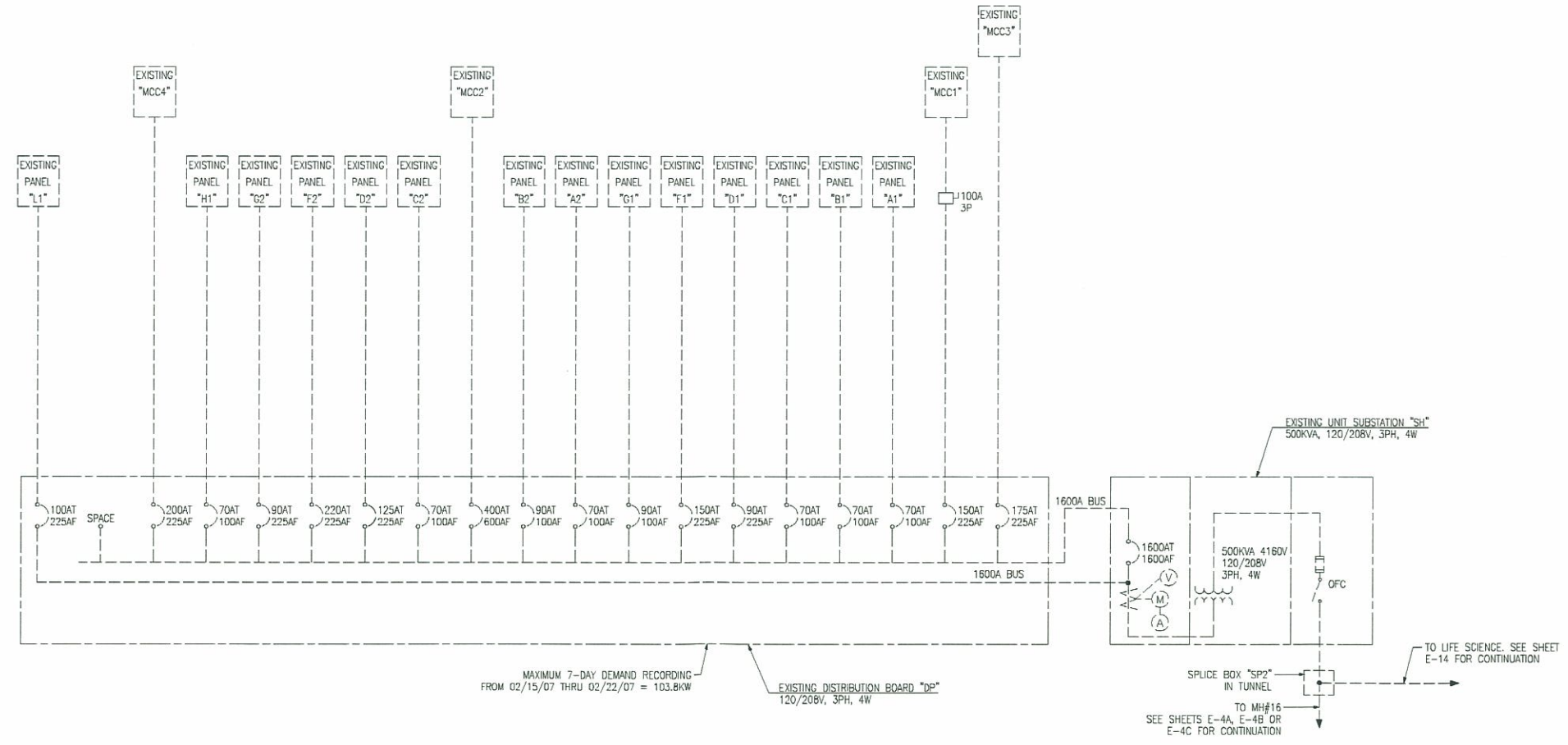
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**BATCHELOR HALL
 SINGLE LINE DIAGRAM**

PROJECT NO: 958993-2	SHEET NO: E-12
DATE: May 22, 2007	

ELECTRICAL ENGINEERS:	
STRUCTURAL ENGINEERS:	
ARCHITECT'S STAMP:	CONSULTANT:

AGENCY APPROVAL:	
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SINGLE LINE DIAGRAM A
SCALE: NONE E-13

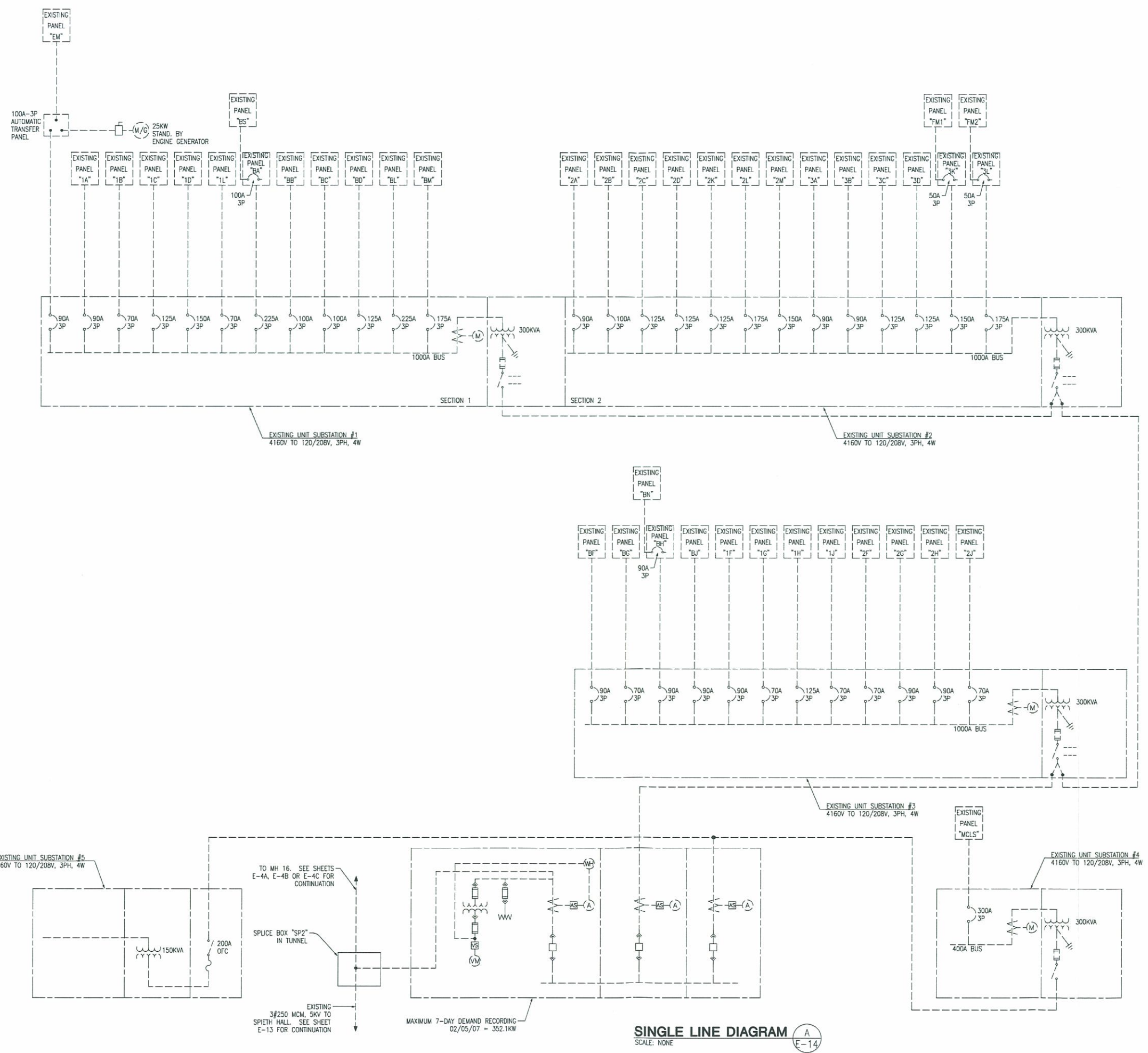
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REVISION: DESCRIPTION:	DATE:

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**SPEITH HALL
SINGLE LINE DIAGRAM**

PROJECT NO: 958993-2	SHEET NO: E-13
DATE: May 22, 2007	

STRUCTURAL ENGINEERS:	
ARCHITECT'S STAMP:	CONSULTANT:
AGENCY APPROVAL:	



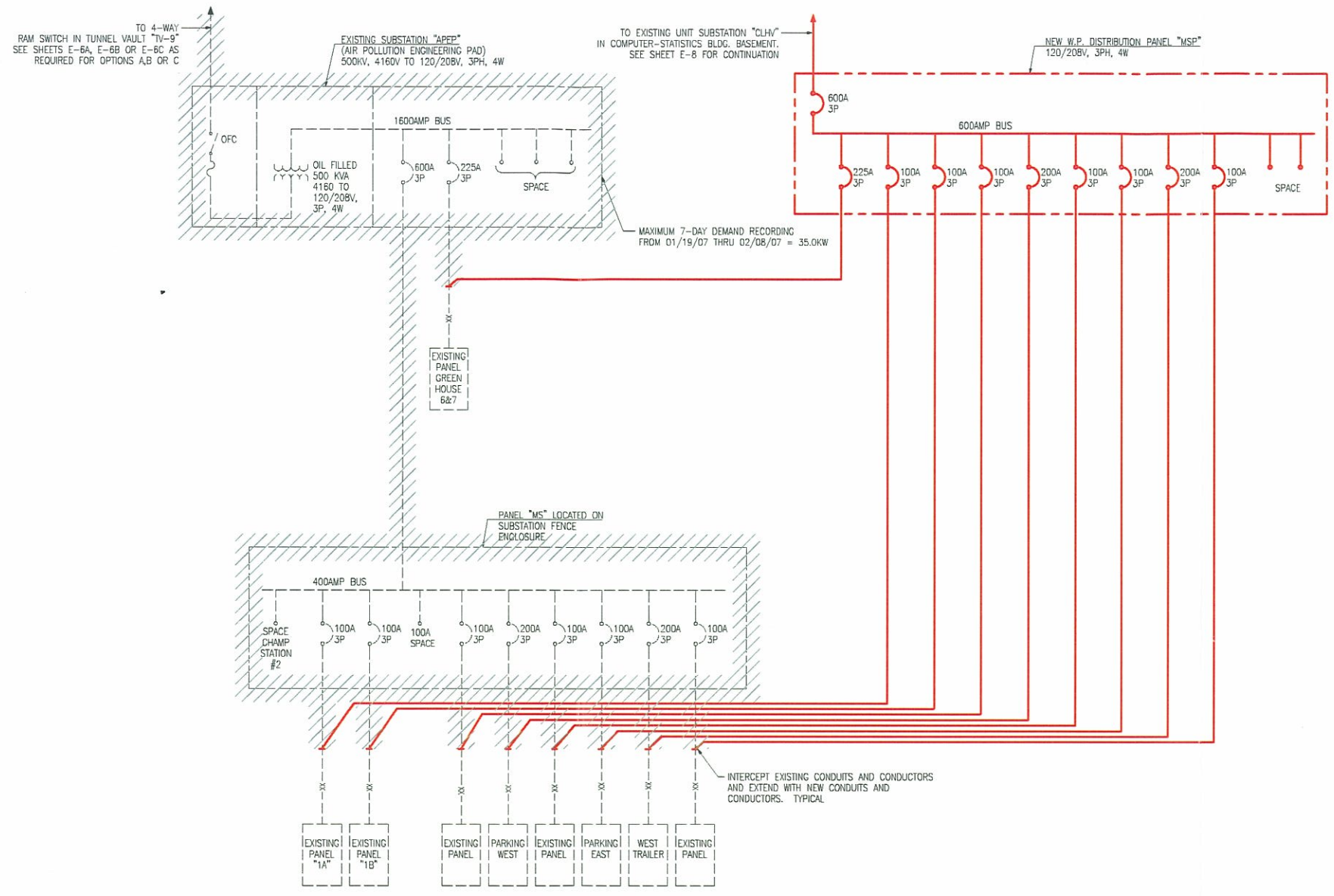
SINGLE LINE DIAGRAM
SCALE: NONE

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REVISION: DESCRIPTION: DATE:

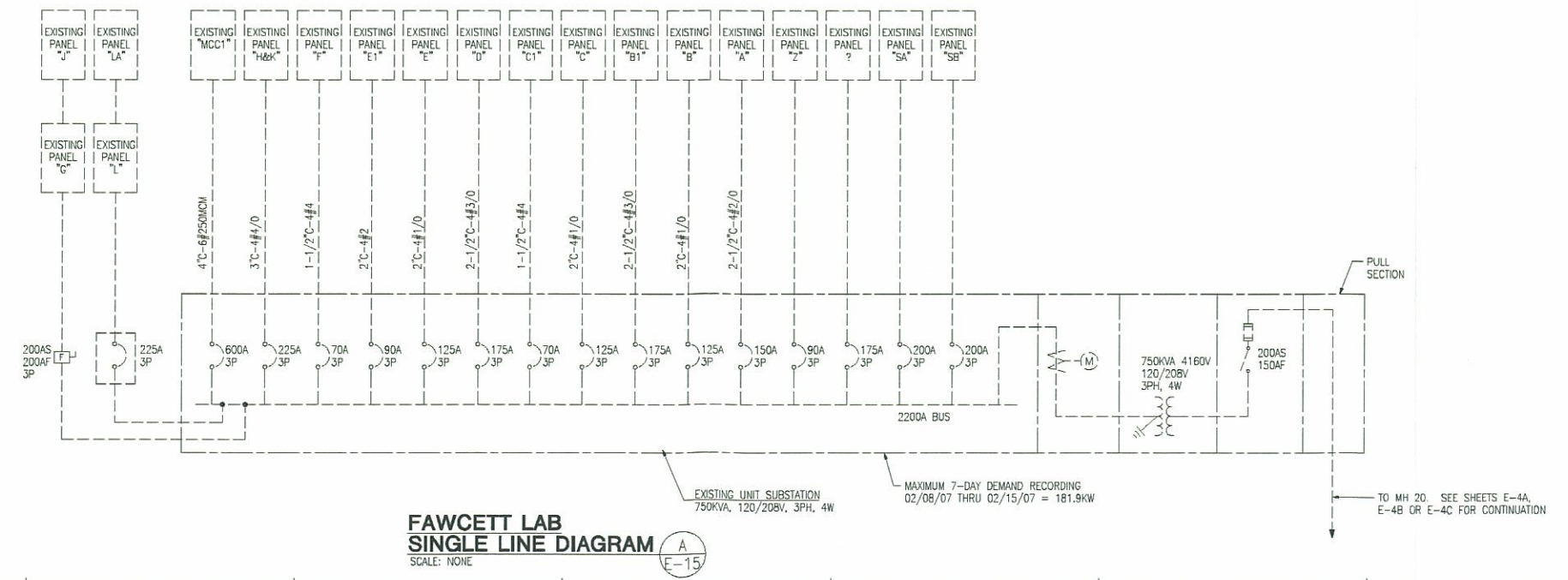
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**LIFE SCIENCE
SINGLE LINE DIAGRAM**

PROJECT NO: 958993-2 SHEET NO: E-14
DATE: May 22, 2007



**OPTIONS "A", "B" & "C"
AIR POLLUTION ENG. PAD
AND GREEN HOUSES 6&7
SINGLE LINE DIAGRAM** (B)
SCALE: NONE (E-15)

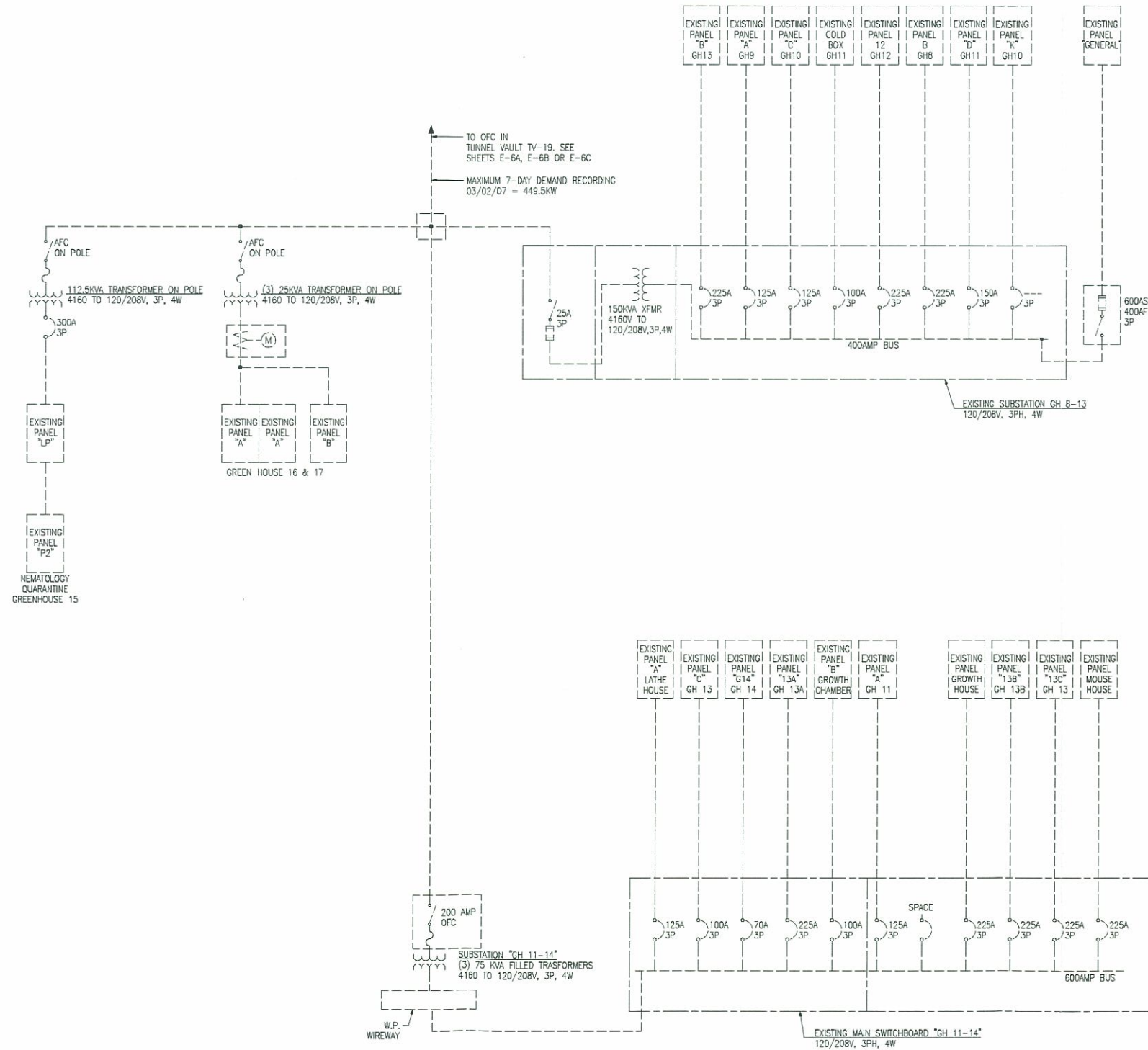


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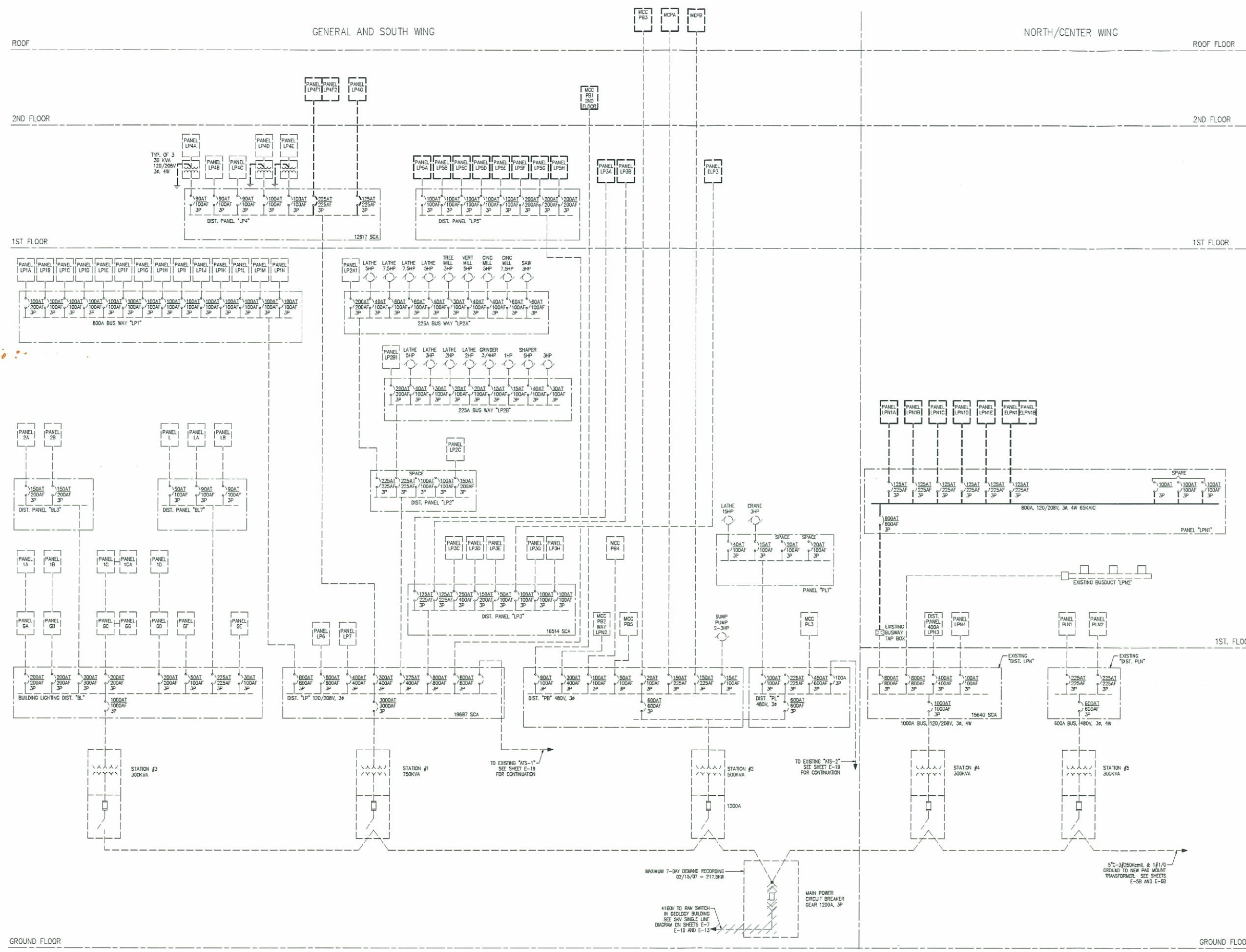
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**FAWCETT LAB, AIR POLLUTION
ENG. PAD AND GREEN HOUSES 6&7
SINGLE LINE DIAGRAMS**

PROJECT NO: 95893-2	SHEET NO: E-15
DATE: May 22, 2007	

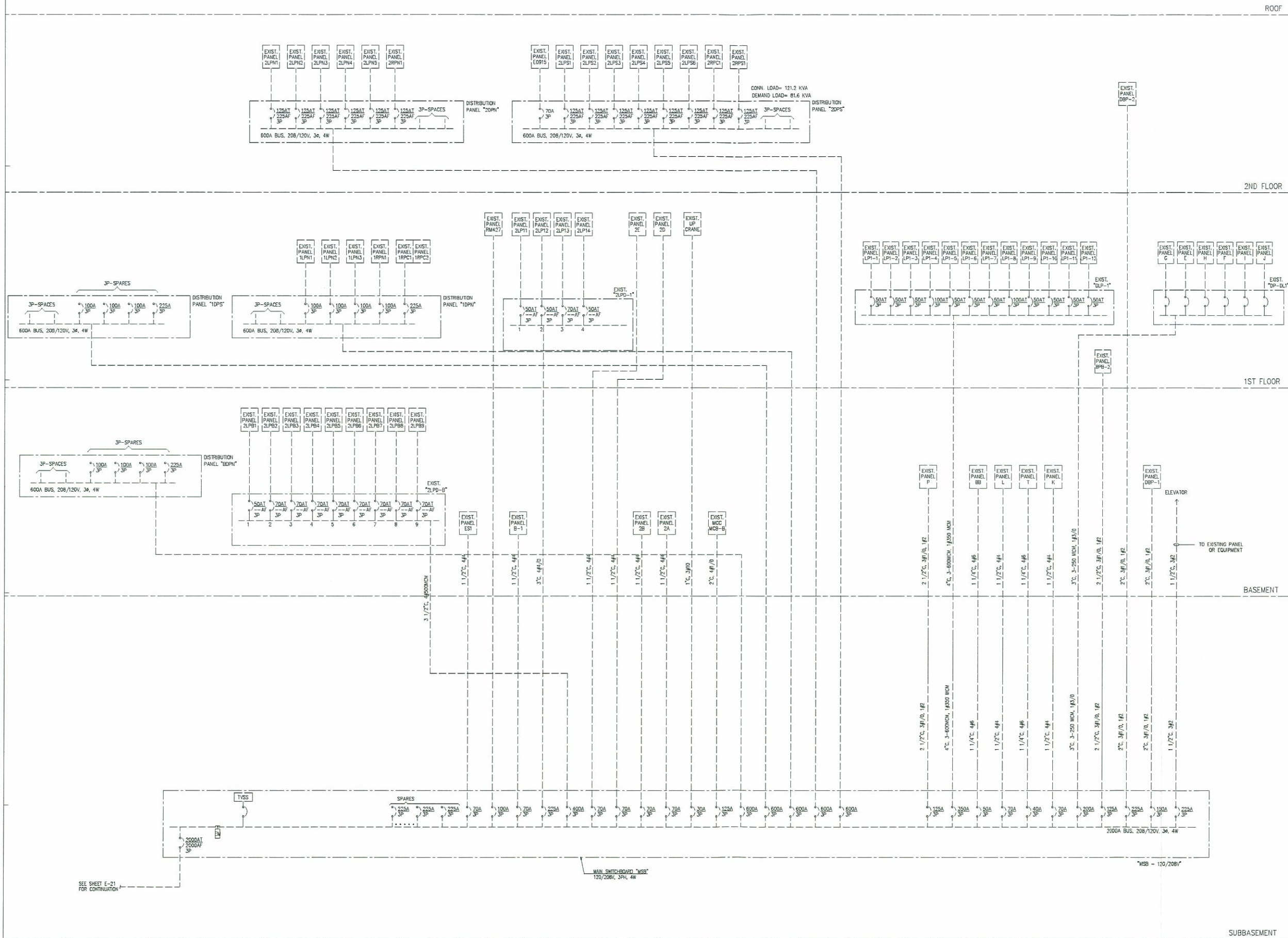


SINGLE LINE DIAGRAM
SCALE: NONE



SINGLE LINE DIAGRAM - NORMAL POWER
SCALE: NONE





SEE SHEET E-21
FOR CONTINUATION

SINGLE LINE DIAGRAM
SCALE: NONE

