VOLTAGE DROP CALCULATIONS

CIRCUIT #01
1 - STROBE (C.P.) x .1250 A = .1250 AMPS
TOTAL DISTANCE = 100 FT
VD = (.1250 A x 100 FT x 2/0 (12AWG)) / 1000 FT = .256 VOLTS
% VD = (.256 VOLTS x 100) / 24V = 1.06 %
L1M75

CIRCUIT #02
1 - BELLS (C.P.) x .0210 A = .0210 AMPS
TOTAL DISTANCE = 100 FT
VD = (.0210 A x 100 FT x 2/0 (12AWG)) / 1000 FT = .043 VOLTS
% VD = (.043 VOLTS x 100) / 24V = 0.17 %
L1M76

CIRCUIT #03
2 - STROBES (WHITE) .0093 A = 0.186 AMPS
TOTAL DISTANCE = 165 FT
VD = (.186 A x 165 FT x 3/26 (14AWG)) / 1000 FT = .10 VOLTS
% VD = (.10 VOLTS x 100) / 24V = 0.42 %
L1M67

CIRCUIT #04
2 - BELLS x .0030 A = .0060 AMPS
TOTAL DISTANCE = 165 FT
VD = (.0060 A x 165 FT x 3/26 (14AWG)) / 1000 FT = .03 VOLTS
% VD = (.03 VOLTS x 100) / 24V = 0.14 %
L1M68

CIRCUIT #05
4 - STROBE (WHITE) x .0093 A = 0.372 AMPS
TOTAL DISTANCE = 190 FT
VD = (.372 A x 190 FT x 3/26 (14AWG)) / 1000 FT = .23 VOLTS
% VD = (.23 VOLTS x 100) / 24V = 0.96 %
L1M69

CIRCUIT #06
4 - BELLS x .0030 A = 0.120 AMPS
TOTAL DISTANCE = 190 FT
VD = (.120 A x 190 FT x 3/26 (14AWG)) / 1000 FT = .070 VOLTS
% VD = (.070 VOLTS x 100) / 24V = 0.31 %
L1M70

CIRCUIT #07
3 - STROBES (WHITE) x .0093 A = 0.279 AMPS
TOTAL DISTANCE = 190 FT
VD = (.279 A x 190 FT x 3/26 (14AWG)) / 1000 FT = .17 VOLTS
% VD = (.17 VOLTS x 100) / 24V = 0.72 %
L1M71

CIRCUIT #08
3 - BELLS x .0030 A = .0090 AMPS
TOTAL DISTANCE = 190 FT
VD = (.0090 A x 190 FT x 3/26 (14AWG)) / 1000 FT = .058 VOLTS
% VD = (.058 VOLTS x 100) / 24V = 0.24 %
L1M72

CIRCUIT #09
1 - STROBE (RED) x .100 A = .100 AMPS
TOTAL DISTANCE = 240 FT
VD = (.100 A x 240 FT x 2/0 (12AWG)) / 1000 FT = .43 VOLTS
% VD = (.43 VOLTS x 100) / 24V = 1.80 %
L1M73

CIRCUIT #10
1 - STROBE (WHITE)(C.P.) x .1250 A = .1250 AMPS
TOTAL DISTANCE = 175 FT
VD = (.1250 A x 175 FT x 2/0 (12AWG)) / 1000 FT = .45 VOLTS
% VD = (.45 VOLTS x 100) / 24V = 1.88 %
L1M77

CIRCUIT #11
1 - BELL (C.P.) x .0210 A = .0210 AMPS
TOTAL DISTANCE = 175 FT
VD = (.210 A x 175 FT x 2/0 (12AWG)) / 1000 FT = .08 VOLTS
% VD = (.08 VOLTS x 100) / 24V = .33 %
L1M78

CIRCUIT #12
1 - STROBE (WHITE)(C.P.) x .1250 A = .1250 AMPS
TOTAL DISTANCE = 180 FT
VD = (.1250 A x 180 FT x 2/0 (12AWG)) / 1000 FT = .46 VOLTS
% VD = (.46 VOLTS x 100) / 24V = 1.90 %
L1M79

CIRCUIT #13
2 - STROBES (WHITE) x .0093 A = 0.186 AMPS
TOTAL DISTANCE = 55 FT
VD = (.093 A x 55 FT x 3/26 (14AWG)) / 1000 FT = .033 VOLTS
% VD = (.033 VOLTS x 100) / 24V = 0.14 %
L1M33

CIRCUIT #14
2 - BELLS x .0030 A = 0.060 AMPS
TOTAL DISTANCE = 100 FT
VD = (.060 A x 100 FT x 3/26 (14AWG)) / 1000 FT = .12 VOLTS
% VD = (.12 VOLTS x 100) / 24V = 0.49 %
L1M34

CIRCUIT #15
2 - STROBES(WHITE)(C.P.) x .1250 A = .2500 AMPS
TOTAL DISTANCE = 90 FT
VD = (.2500 A x 90 FT x 2/0 (12AWG)) / 1000 FT = .46 VOLTS
% VD = (.46 VOLTS x 100) / 24V = 1.90 %
L1M35

CIRCUIT #16
1 - STROBES(RED)(C.P.) x .1250 A = .1250 AMPS
TOTAL DISTANCE = 90 FT
VD = (.1250 A x 90 FT x 2/0 (12AWG)) / 1000 FT = .23 VOLTS
% VD = (.46 VOLTS x 100) / 24V = .23 %
L1M36

CIRCUIT #17
1 - STROBE (RED)(C.P.) x .1250 A = .1250 AMPS
TOTAL DISTANCE = 120 FT
VD = (.1250 A x 120 FT x 2/0 (12AWG)) / 1000 FT = .30 VOLTS
% VD = (.30 VOLTS x 100) / 24V = 1.28 %
L1M37

CIRCUIT #18
2 - STROBE (WHITE)(C.P.) x .1250 A = .2500 AMPS
TOTAL DISTANCE = 140 FT
VD = (.2500 A x 140 FT x 2/0 (12AWG)) / 1000 FT = .71 VOLTS
% VD = (.71 VOLTS x 100) / 24V = 2.90 %
L1M38

CIRCUIT #19
2 - STROBE (RED) (C.P.) x .1250 A = .2500 AMPS
TOTAL DISTANCE = 130 FT
VD = (.2500 A x 130 FT x 2/0 (12AWG)) / 1000 FT = .66 VOLTS
% VD = (.66 VOLTS x 100) / 24V = 2.77 %
L1M39

CIRCUIT #20
3 - BELLS (C.P.) x .0210 A = 0.0630 AMPS
TOTAL DISTANCE = 140 FT
VD = (.0630 A x 140 FT x 2/0 (12AWG)) / 1000 FT = .18 VOLTS
% VD = (.18 VOLTS x 100) / 24V = 0.75 %
L1M40

CIRCUIT #21
3 - BELLS (C.P.) x .0210 A = 0.0630 AMPS
TOTAL DISTANCE = 195 FT
VD = (.0630 A x 195 FT x 2/0 (12AWG)) / 1000 FT = .25 VOLTS
% VD = (.25 VOLTS x 100) / 24V = 1.05 %
L1M41

CIRCUIT #22
1 - STROBE (WHITE)(C.P.) x .1250 A = .1250 AMPS
TOTAL DISTANCE = 130 FT
VD = (.1250 A x 130 FT x 2/0 (12AWG)) / 1000 FT = .38 VOLTS
% VD = (.38 VOLTS x 100) / 24V = 1.60 %
L1M42

CIRCUIT #23
1 - STROBE (RED) (C.P.) x .1250 A = .1250 AMPS
TOTAL DISTANCE = 160 FT
VD = (.1250 A x 160 FT x 2/0 (12AWG)) / 1000 FT = .41 VOLTS
% VD = (.41 VOLTS x 100) / 24V = 1.70 %
L1M43

CIRCUIT #24
2 - STROBE (WHITE) (C.P.) x .1250 A = .2500 AMPS
TOTAL DISTANCE = 130 FT
VD = (.2500 A x 130 FT x 2/0 (12AWG)) / 1000 FT = .66 VOLTS
% VD = (.66 VOLTS x 100) / 24V = 2.70 %
L1M44

CIRCUIT #25
1 - STROBE (RED) (C.P.) x .1250 A = .12500 AMPS
TOTAL DISTANCE = 120 FT
VD = (.1250 A x 120 FT x 2/0 (12AWG)) / 1000 FT = .30 VOLTS
% VD = (.30 VOLTS x 100) / 24V = 1.28 %
L1M45

CIRCUIT #26
1 - BELL (C.P.) x .0210 A = 0.210 AMPS
TOTAL DISTANCE = 175 FT
VD = (.210 A x 175 FT x 2/0 (12AWG)) / 1000 FT = .08 VOLTS
% VD = (.08 VOLTS x 100) / 24V = .33 %
L1M80

CIRCUIT #27
1 - STROBE (RED) x .100 A = .100 AMPS
TOTAL DISTANCE = 215 FT
VD = (.100 A x 120 FT x 2/0 (12AWG)) / 1000 FT = .05 VOLTS
% VD = (.05 VOLTS x 100) / 24V = .19 %
L3M70

CIRCUIT #28
1 - STROBE (RED) x .100 A = .100 AMPS
TOTAL DISTANCE = 210 FT
VD = (.100 A x 210 FT x 3/26 (14AWG)) / 1000 FT = .07 VOLTS
% VD = (.07 VOLTS x 100) / 24V = .29 %
L3M63

CIRCUIT #29
1 - STROBE (RED) x .100 A = .100 AMPS
TOTAL DISTANCE = 175 FT
VD = (.100 A x 175 FT x 3/26 (14AWG)) / 1000 FT = .057 VOLTS
% VD = (.057 VOLTS x 100) / 24V = .24 %
L3M62

CIRCUIT #30
1 - STROBE (RED) x .100 A = .100 AMPS
TOTAL DISTANCE = 150 FT
VD = (.100 A x 150 FT x 3/26 (14AWG)) / 1000 FT = .049 VOLTS
% VD = (.049 VOLTS x 100) / 24V = .20 %
L3M61

CIRCUIT #31
1 - STROBE (RED) x .100 A = .100 AMPS
TOTAL DISTANCE = 140 FT
VD = (.100 A x 140 FT x 3/26 (14AWG)) / 1000 FT = .045 VOLTS
% VD = (.045 VOLTS x 100) / 24V = .19 %
L3M69

CIRCUIT #32
1 - STROBE (RED) x .100 A = .100 AMPS
TOTAL DISTANCE = 120 FT
VD = (.100 A x 120 FT x 3/26 (14AWG)) / 1000 FT = .039 VOLTS
% VD = (.039 VOLTS x 100) / 24V = .16 %
L3M60

CIRCUIT #33
1 - STROBE (RED)(C.P.) x .1250 A = .1250 AMPS
TOTAL DISTANCE = 155 FT
VD = (.1250 A x 155 FT x 2/0 (12AWG)) / 1000 FT = .40 VOLTS
% VD = (.40 VOLTS x 100) / 24V = 1.65 %
L3M64

CIRCUIT #34
1 - STROBE (RED)(C.P.) x .1250 A = .1250 AMPS
TOTAL DISTANCE = 125 FT
VD = (.1250 A x 125 FT x 2/0 (12AWG)) / 1000 FT = .32 VOLTS
% VD = (.32 VOLTS x 100) / 24V = 1.34 %
L3M65

CIRCUIT #35
1 - STROBE (RED)(C.P.) x .1250 A = .1250 AMPS
TOTAL DISTANCE = 110 FT
VD = (.1250 A x 110 FT x 2/0 (12AWG)) / 1000 FT = .28 VOLTS
% VD = (.28 VOLTS x 100) / 24V = 1.17 %
L3M66

CIRCUIT #36
1 - STROBE (RED)(C.P.) x .1250 A = .1250 AMPS
TOTAL DISTANCE = 60 FT
VD = (.1250 A x 60 FT x 2/0 (12AWG)) / 1000 FT = .15 VOLTS
% VD = (.15 VOLTS x 100) / 24V = .64 %
L3M67

VOLTAGE DROP CALCULATION FORMULA

VD = (Amps x LENGTH x DC RESISTANCE) / 1000 FT = VOLTS

% VD = (VOLTS x 100) / 24V = %

FROM DWG 4N85E048

BATTERY CALCULATIONS (FACP)

AM-2020 SYSTEM CURRENT DRAW CALCULATIONS

DEVICE TYPE	# OF DEVICES	MULTIPLY BY	CURRENT IN AMPS	TOTAL CURRENT
BE-2020	1	X	.118	= .118
MPS-24A	1	X	.104	= .104
ICA-4L	1	X	.002	= .002
LIB-200	3	X	.049	= .147
SIB-2048	1	X	.055	= .055
SDX-551	38	X	.00020	= .0076
FDX-551	11	X	.00020	= .0022
MMX-101	102	X	.00030	= .0306
BGX-101L	5	X	.00030	= .0015
CMX-2	71	X	.00030	= .0213
DHX-501	6	X	.015	= .090
ISO-X	10	X	.00045	= .0045
LCD-80	3	X	.050	= .15
ACM-8R	16	X	.030	= .48
SECONDARY STANDBY LOAD				= 1.21 AMPS

MAXIMUM SECONDARY POWER FIRE ALARM CURRENT DRAW

DEVICE TYPE	# OF DEVICES	MULTIPLY BY	CURRENT IN AMPS	TOTAL CURRENT
MPS-24A	1	X	6.0	6.0
SECONDARY FIRE ALARM LOAD = 6.00 AMPS				

SECONDARY POWER STANDBY AND FIRE ALARM LOAD

SECONDARY NON-FIRE ALARM LOAD		REQUIRED SECONDARY NON-FIRE ALARM STANDBY TIME (24 OR 60 HOURS)		TOTAL AMP HOURS
1.21	X	24	=	29.28

SECONDARY FIRE ALARM LOAD		REQUIRED FIRE ALARM TIME (0.084 FOR 5 MINUTES) (0.25 FOR 15 MINUTES)		TOTAL AMP HOURS
30.319	X	0.084	=	2.5467

TOTAL	=	31.8267
X 1.2 DERATING FACTOR	=	38.192
TOTAL SECONDARY AMPERE HOURS REQUIRED	=	39.00

PROVIDE (2) PS12250, 12V-50 A. H. BATTERIES

FROM DWG 4N85E049

POWER SUPPLY (PSU) CALCULATIONS

A36F-50-24V-ABD1 POWER SUPPLY

CIRCUIT #	NUMBER OF DEVICES	TYPE OF DEVICES	CURRENT DRAW (AMPS)	TOTAL CURRENT (AMPS)
FLAMMABLE STORAGE BLDG.				
CIRCUIT #1	1	EP/STROBE	1.25	1.25
CIRCUIT #2	1	EP/BELL	0.21	0.21
YARD AREA #1				
CIRCUIT #12	1	EP\STROBE	1.25	1.25
CIRCUIT #26	1	EP\BELL	0.21	0.21
YARD AREA #3				
CIRCUIT #10	1	EP\STROBE	1.25	1.25
CIRCUIT #11	1	EP\BELL	0.21	0.21
BLDG.85 - 3RD. FLOOR				
CIRCUIT #3	2	STROBES	0.093	0.186
CIRCUIT #4	2	BELLS	0.030	0.060
BLDG.85 - 2ND. FLOOR				
CIRCUIT #5	4	STROBES	0.093	0.372
CIRCUIT #6	4	BELLS	0.030	0.12
CIRCUIT #7	3	STROBES	0.093	0.279
CIRCUIT #8	3	BELLS	0.030	0.090
CIRCUIT #9	1	STROBE	0.100	0.1
CIRCUIT #27	1	STROBE	0.100	0.1
CIRCUIT #28	1	STROBE	0.100	0.1
CIRCUIT #29	1	STROBE	0.100	0.1
CIRCUIT #30	1	STROBE	0.100	0.1
CIRCUIT #31	1	STROBE	0.100	0.1
CIRCUIT #32	1	STROBE	0.100	0.1
BLDG.85 - 1ST. FLOOR				
CIRCUIT #13	2	STROBES	0.093	0.186
CIRCUIT #14	2	BELLS	0.030	0.060
CIRCUIT #15	2	EP/STROBES	1.25	2.50
CIRCUIT #16	1	EP/STROBE	1.25	1.25
CIRCUIT #17	2	EP/STROBES	1.25	2.50
CIRCUIT #18	2	EP/STROBES	1.25	2.50
CIRCUIT #19	2	EP/STROBES	1.25	2.50
CIRCUIT #20	3	EP/BELLS	0.21	0.63
CIRCUIT #21	3	EP/BELLS	0.21	0.63
CIRCUIT #22	1	EP/STROBES	1.25	1.25
CIRCUIT #23	1	EP/STROBE	1.25	1.25
CIRCUIT #24	2	EP/STROBES	1.25	2.50
CIRCUIT #25	2	EP/STROBES	1.25	2.50
CIRCUIT #33	1	EP/STROBE	1.25	1.25
CIRCUIT #34	1	EP/STROBE	1.25	1.25
CIRCUIT #35	1	EP/STROBE	1.25	1.25
CIRCUIT #36	1	EP/STROBE	1.25	1.25

TOTAL AMPERAGE = 30.319

FROM DWG 4N85E049

	AS BUILT — 08/20/13						
		_	LDD	LDD	MCD	08/20/13	AS BUILT
PROFESSIONAL SEAL (IF REVISION, APPLIES ONLY TO REVISED WORK)	ISSUE (PROGRESS, ESTIMATE, BID, CONSTRUCTION, CONFORMED, REVISION, RECORD)	REVISION NUMBER	DRAWN BY	CHECKED BY	APPR'D BY	DATE	REMARKS

BLDG 85, 85A FIRE ALARM CALCULATIONS NOTIFIER SYSTEM

UNIVERSITY OF CALIFORNIA
LAWRENCE BERKELEY NATIONAL LABORATORY
FACILITIES DIVISION

DRAWN BY LDD	DATE 08/20/2013	
CHECKED BY LDD	08/20/2013	
APPROVED BY MCD	08/20/2013	
SCALE AS NOTED		
DRAWING NO. 4B85E082_		SHEET 2 OF 2
PROJECT NO. 000000		