NOTIFICATION APPLIANCE CIRCUITS VOLTAGE DROP CALCULATIONS – DETAIL 1

VOLTAGE DROP CALCULATIONS: CIRCUIT A1

Voltage Drop = (L/1000)(A)(R)
Where:
L = Conductor Distance (twice actual distance)
A = Load (amps)
R = Resistance per 1,000 ft (NEC Table 8)

Appliance Type	Appliance Load (amps)	Cummulative Load (amp)	Actual Distance (ft)	Conductor Distance (ft)	Conductor Gauge	Resistance per 1,000 ft	Voltage Drop
A1–1	0.019	0.019	50	100	14	3.26	0.0062
A1–2	0.019	0.038	50	100	14	3.26	0.0124
A1–3	0.019	0.057	30	60	14	3.26	0.0111
A1–4	0.019	0.076	40	80	14	3.26	0.0198
A1–5	0.019	0.095	40	80	14	3.26	0.0248
A1–6	0.019	0.114	30	60	14	3.26	0.0223
A1–7	0.019	0.133	50	100	14	3.26	0.0434
A1–8	0.019	0.152	30	60	14	3.26	0.0297
A1–9	0.019	0.171	15	30	14	3.26	0.0167
A1–10	0.019	0.19	30	60	14	3.26	0.0372
A1–11	0.019	0.209	15	30	14	3.26	0.0204
A1–12	0.019	0.228	40	80	14	3.26	0.0595
A1–13	0.019	0.247	30	60	14	3.26	0.0483
A1–14	0.019	0.266	15	30	14	3.26	0.0260
A1–15	0.019	0.285	30	60	14	3.26	0.0557
A1–16	0.019	0.304	50	100	14	3.26	0.0991
A1–17	0.019	0.323	30	60	14	3.26	0.0632
A1–18	0.019	0.342	105	210	14	3.26	0.2341
A1–19	0.019	0.361	25	50	14	3.26	0.0588
A1–20	0.019	0.38	30	60	14	3.26	0.0743
A1–21	0.019	0.399	40	80	14	3.26	0.1041
A1–22	0.019	0.418	60	120	14	3.26	0.1635
A1–23	0.019	0.437	450	900	14	3.26	1.2822
	Total Load:	0.437				Total V–Drop	2.5129

21.4871 VOLTS REMAINING (within the voltage range of the appliances)
0.437 TOTAL AMPS REQUIRED (within the listed power supply output)

NOTIFICATION APPLIANCES:

TYPE	MAKE	MODEL	CANDELA	LOAD	V–RANGE	NOTE
HORN	WHEELOCK	NS4	NA	0.019	16–33	

VOLTAGE DROP CALCULATIONS: CIRCUIT A2

Voltage Drop = (L/1000)(A)(R)
Where:
L = Conductor Distance (twice actual distance)
A = Load (amps)
R = Resistance per 1,000 ft (NEC Table 8)

Appliance Type	Appliance Load (amps)	Cummulative Load (amp)	Actual Distance (ft)	Conductor Distance (ft)	Conductor Gauge	Resistance per 1,000 ft	Voltage Drop
A2–1	0.019	0.019	50	100	14	3.26	0.0062
A2–2	0.019	0.038	75	150	14	3.26	0.0186
A2–3	0.019	0.057	40	80	14	3.26	0.0149
A2–4	0.019	0.076	40	80	14	3.26	0.0198
A2–5	0.019	0.095	40	80	14	3.26	0.0248
A2–6	0.019	0.114	40	80	14	3.26	0.0297
A2–7	0.019	0.133	30	60	14	3.26	0.0260
A2–8	0.019	0.152	35	70	14	3.26	0.0347
A2–9	0.019	0.171	60	120	14	3.26	0.0669
A2–10	0.019	0.19	30	60	14	3.26	0.0372
A2–11	0.019	0.209	35	70	14	3.26	0.0477
A2–12	0.019	0.228	35	70	14	3.26	0.0520
A2–13	0.019	0.247	35	70	14	3.26	0.0564
A2–14	0.019	0.266	190	380	14	3.26	0.3295
A2–15	0.019	0.285	55	110	14	3.26	0.1022
A2–16	0.019	0.304	100	200	14	3.26	0.1982
A2–17	0.019	0.323	35	70	14	3.26	0.0737
A2–18	0.019	0.342	30	60	14	3.26	0.0669
A2–19	0.019	0.361	420	840	14	3.26	0.9886
	Total Load:	0.361				Total V–Drop	2.1939

21.8061 VOLTS REMAINING (within the voltage range of the appliances)
0.361 TOTAL AMPS REQUIRED (within the listed power supply output)

NOTIFICATION APPLIANCES:

TYPE	MAKE	MODEL	CANDELA	LOAD	V–RANGE	NOTE
HORN	WHEELOCK	NS4	NA	0.019	16–33	

VOLTAGE DROP CALCULATIONS: CIRCUIT A3

Voltage Drop = (L/1000)(A)(R)
Where:
L = Conductor Distance (twice actual distance)
A = Load (amps)
R = Resistance per 1,000 ft (NEC Table 8)

Appliance Type	Appliance Load (amps)	Cummulative Load (amp)	Actual Distance (ft)	Conductor Distance (ft)	Conductor Gauge	Resistance per 1,000 ft	Voltage Drop
A3–1	0.019	0.019	50	100	14	3.26	0.0062
A3–2	0.019	0.038	60	120	14	3.26	0.0149
A3–3	0.019	0.057	60	120	14	3.26	0.0223
A3–4	0.019	0.076	140	280	14	3.26	0.0694
A3–5	0.019	0.095	40	80	14	3.26	0.0248
A3–6	0.019	0.114	40	80	14	3.26	0.0297
A3–7	0.019	0.133	20	40	14	3.26	0.0173
A3–8	0.019	0.152	105	210	14	3.26	0.1041
A3–9	0.019	0.171	95	190	14	3.26	0.1059
A3–10	0.019	0.19	60	120	14	3.26	0.0743
A3–11	0.019	0.209	50	100	14	3.26	0.0681
A3–12	0.019	0.228	60	120	14	3.26	0.0892
A3–13	0.019	0.247	35	70	14	3.26	0.0564
A3–14	0.019	0.266	300	600	14	3.26	0.5203
	Total Load:	0.266				Total V–Drop	1.2029

22.7971 VOLTS REMAINING (within the voltage range of the appliances)
0.266 TOTAL AMPS REQUIRED (within the listed power supply output)

NOTIFICATION APPLIANCES:

TYPE	MAKE	MODEL	CANDELA	LOAD	V–RANGE	NOTE
HORN	WHEELOCK	NS4	NA	0.019	16–33	

VOLTAGE DROP CALCULATIONS: CIRCUIT A4

Voltage Drop = (L/1000)(A)(R)
Where:
L = Conductor Distance (twice actual distance)
A = Load (amps)
R = Resistance per 1,000 ft (NEC Table 8)

Appliance Type	Appliance Load (amps)	Cummulative Load (amp)	Actual Distance (ft)	Conductor Distance (ft)	Conductor Gauge	Resistance per 1,000 ft	Voltage Drop
A4–1	0.019	0.019	50	100	14	3.26	0.0062
A4–2	0.019	0.038	60	120	14	3.26	0.0149
A4–3	0.019	0.057	20	40	14	3.26	0.0074
A4–4	0.019	0.076	40	80	14	3.26	0.0198
A4–5	0.019	0.095	25	50	14	3.26	0.0155
A4–6	0.019	0.114	35	70	14	3.26	0.0260
A4–7	0.019	0.133	45	90	14	3.26	0.0390
A4–8	0.019	0.152	55	110	14	3.26	0.0545
A4–9	0.019	0.171	25	50	14	3.26	0.0279
A4–10	0.019	0.19	65	130	14	3.26	0.0805
A4–11	0.019	0.209	20	40	14	3.26	0.0273
A4–12	0.019	0.228	35	70	14	3.26	0.0520
A4–13	0.019	0.247	35	70	14	3.26	0.0564
A4–14	0.019	0.266	65	130	14	3.26	0.1127
A4–15	0.019	0.285	185	370	14	3.26	0.3438
A4–16	0.019	0.304	35	70	14	3.26	0.0694
A4–17	0.019	0.323	15	30	14	3.26	0.0316
A4–18	0.019	0.342	40	80	14	3.26	0.0892
A4–19	0.019	0.361	240	480	14	3.26	0.5649
	Total Load:	0.361				Total V–Drop	1.6389

22.3611 VOLTS REMAINING (within the voltage range of the appliances)
0.361 TOTAL AMPS REQUIRED (within the listed power supply output)

NOTIFICATION APPLIANCES:

TYPE	MAKE	MODEL	CANDELA	LOAD	V–RANGE	NOTE
HORN	WHEELOCK	NS4	NA	0.019	16–33	

VOLTAGE DROP CALCULATIONS: CIRCUIT A5

Voltage Drop = (L/1000)(A)(R)
Where:
L = Conductor Distance (twice actual distance)
A = Load (amps)
R = Resistance per 1,000 ft (NEC Table 8)

Appliance Type	Appliance Load (amps)	Cummulative Load (amp)	Actual Distance (ft)	Conductor Distance (ft)	Conductor Gauge	Resistance per 1,000 ft	Voltage Drop
A5–1	0.019	0.019	50	100	14	3.26	0.0062
A5–2	0.019	0.038	45	90	14	3.26	0.0111
A5–3	0.019	0.057	15	30	14	3.26	0.0056
A5–4	0.019	0.076	25	50	14	3.26	0.0124
A5–5	0.019	0.095	35	70	14	3.26	0.0217
A5–6	0.019	0.114	35	70	14	3.26	0.0260
A5–7	0.019	0.133	40	80	14	3.26	0.0347
A5–8	0.019	0.152	50	100	14	3.26	0.0496
A5–9	0.019	0.171	50	100	14	3.26	0.0557
A5–10	0.019	0.19	15	30	14	3.26	0.0186
A5–11	0.019	0.209	40	80	14	3.26	0.0545
A5–12	0.019	0.228	40	80	14	3.26	0.0595
A5–13	0.019	0.247	25	50	14	3.26	0.0403
A5–14	0.019	0.266	35	70	14	3.26	0.0607
A5–15	0.019	0.285	50	100	14	3.26	0.0929
A5–16	0.019	0.304	40	80	14	3.26	0.0793
A5–17	0.019	0.323	135	270	14	3.26	0.2843
A5–18	0.019	0.342	50	100	14	3.26	0.1115
A5–19	0.019	0.361	30	60	14	3.26	0.0706
A5–20	0.019	0.38	40	80	14	3.26	0.0991
A5–21	0.019	0.399	70	140	14	3.26	0.1821
A5–22	0.019	0.418	50	100	14	3.26	0.1363
	Total Load:	0.418				Total V–Drop	2.1258

21.8742 VOLTS REMAINING (within the voltage range of the appliances)
0.418 TOTAL AMPS REQUIRED (within the listed power supply output)

NOTIFICATION APPLIANCES:

TYPE	MAKE	MODEL	CANDELA	LOAD	V–RANGE	NOTE
HORN	WHEELOCK	NS4	NA	0.019	16–33	

VOLTAGE DROP CALCULATIONS: CIRCUIT A6

Voltage Drop = (L/1000)(A)(R)
Where:
L = Conductor Distance (twice actual distance)
A = Load (amps)
R = Resistance per 1,000 ft (NEC Table 8)

Appliance Type	Appliance Load (amps)	Cummulative Load (amp)	Actual Distance (ft)	Conductor Distance (ft)	Conductor Gauge	Resistance per 1,000 ft	Voltage Drop
A6–1	0.019	0.019	50	100	14	3.26	0.0062
A6–2	0.019	0.038	50	100	14	3.26	0.0124
A6–3	0.019	0.057	35	70	14	3.26	0.0130
A6–4	0.019	0.076	45	90	14	3.26	0.0223
A6–5	0.019	0.095	40	80	14	3.26	0.0248
A6–6	0.019	0.114	45	90	14	3.26	0.0334
A6–7	0.019	0.133	15	30	14	3.26	0.0130
A6–8	0.019	0.152	25	50	14	3.26	0.0248
A6–9	0.019	0.171	30	60	14	3.26	0.0334
A6–10	0.019	0.19	25	50	14	3.26	0.0310
A6–11	0.019	0.209	15	30	14	3.26	0.0204
A6–12	0.019	0.228	70	140	14	3.26	0.1041
A6–13	0.019	0.247	30	60	14	3.26	0.0483
A6–14	0.019	0.266	170	340	14	3.26	0.2948
A6–15	0.019	0.285	30	60	14	3.26	0.0557
A6–16	0.019	0.304	25	50	14	3.26	0.0496
A6–17	0.019	0.323	100	200	14	3.26	0.2106
A6–18	0.019	0.342	55	110	14	3.26	0.1226
A6–19	0.019	0.361	240	480	14	3.26	0.5649
	Total Load:	0.361				Total V–Drop	1.6854

22.3146 VOLTS REMAINING (within the voltage range of the appliances)
0.361 TOTAL AMPS REQUIRED (within the listed power supply output)

NOTIFICATION APPLIANCES:

TYPE	MAKE	MODEL	CANDELA	LOAD	V–RANGE	NOTE
HORN	WHEELOCK	NS4	NA	0.019	16–33	

VOLTAGE DROP CALCULATIONS: CIRCUIT A7

Voltage Drop = (L/1000)(A)(R)
Where:
L = Conductor Distance (twice actual distance)
A = Load (amps)
R = Resistance per 1,000 ft (NEC Table 8)

Appliance Type	Appliance Load (amps)	Cummulative Load (amp)	Actual Distance (ft)	Conductor Distance (ft)	Conductor Gauge	Resistance per 1,000 ft	Voltage Drop
A7–1	0.019	0.019	285	570	14	3.26	0.0353
A7–2	0.019	0.038	265	530	14	3.26	0.0657
	Total Load:	0.038				Total V–Drop	0.1010

23.8990 VOLTS REMAINING (within the voltage range of the appliances)
0.038 TOTAL AMPS REQUIRED (within the listed power supply output)

NOTIFICATION APPLIANCES:

TYPE	MAKE	MODEL	CANDELA	LOAD	V–RANGE	NOTE
HORN	WHEELOCK	NS4	NA	0.019	16–33	

VOLTAGE DROP CALCULATIONS: CIRCUIT A8

Voltage Drop = (L/1000)(A)(R)
Where:
L = Conductor Distance (twice actual distance)
A = Load (amps)
R = Resistance per 1,000 ft (NEC Table 8)

Appliance Type	Appliance Load (amps)	Cummulative Load (amp)	Actual Distance (ft)	Conductor Distance (ft)	Conductor Gauge	Resistance per 1,000 ft	Voltage Drop
A8–1	0.019	0.019	40	80	14	3.26	0.0050
A8–2	0.019	0.038	55	110	14	3.26	0.0136
A8–3	0.019	0.057	95	190	14	3.26	0.0353
A8–4	0.019	0.076	60	120	14	3.26	0.0297
A8–5	0.019	0.095	70	140	14	3.26	0.0434
A8–6	0.019	0.114	100	200	14	3.26	0.0743
A8–7	0.019	0.133	340	680	14	3.26	0.2948
	Total Load:	0.133				Total V–Drop	0.4961

23.5039 VOLTS REMAINING (within the voltage range of the appliances)
0.133 TOTAL AMPS REQUIRED (within the listed power supply output)

NOTIFICATION APPLIANCES:

TYPE	MAKE	MODEL	CANDELA	LOAD	V–RANGE	NOTE
HORN	WHEELOCK	NS4	NA	0.019	16–33	

VOLTAGE DROP CALCULATIONS: CIRCUIT V1

Voltage Drop = (L/1000)(A)(R)
Where:
L = Conductor Distance (twice actual distance)
A = Load (amps)
R = Resistance per 1,000 ft (NEC Table 8)

Appliance Type	Appliance Load (amps)	Cummulative Load (amp)	Actual Distance (ft)	Conductor Distance (ft)	Conductor Gauge	Resistance per 1,000 ft	Voltage Drop
V1–1	0.052	0.052	50	100	14	3.26	0.0170
V1–2	0.052	0.104	50	100	14	3.26	0.0339
V1–3	0.079	0.183	30	60	14	3.26	0.0358
V1–4	0.148	0.331	40	80	14	3.26	0.0863
V1–5	0.079	0.41	40	80	14	3.26	0.1069
V1–6	0.148	0.558	30	60	14	3.26	0.1091
V1–7	0.148	0.706	50	100	14	3.26	0.2302
V1–8	0.079	0.785	30	60	14	3.26	0.1535
V1–9	0.079	0.864	332	664	14	3.26	1.8702
	Total Load:	0.864				Total V–Drop	2.6430

21.3570 VOLTS REMAINING (within the voltage range of the appliances)
0.864 TOTAL AMPS REQUIRED (within the listed power supply output)

NOTIFICATION APPLIANCES:

TYPE	MAKE	MODEL	CANDELA	LOAD	V–RANGE	NOTE
STROBE	WHEELOCK	NS4	15	0.052	16–33	MULTI CANDELA
STROBE	WHEELOCK	NS4	30	0.079	16–33	MULTI CANDELA
STROBE	WHEELOCK	NS4	75	0.148	16–33	MULTI CANDELA
STROBE	WHEELOCK	NS4	110	0.178	16–33	MULTI CANDELA

VOLTAGE DROP CALCULATIONS: CIRCUIT V2

Voltage Drop = (L/1000)(A)(R)
Where:
L = Conductor Distance (twice actual distance)
A = Load (amps)
R = Resistance per 1,000 ft (NEC Table 8)

Appliance Type	Appliance Load (amps)	Cummulative Load (amp)	Actual Distance (ft)	Conductor Distance (ft)	Conductor Gauge	Resistance per 1,000 ft	Voltage Drop
V2–1	0.079	0.079	30	60	14	3.26	0.0155
V2–2	0.079	0.158	15	30	14	3.26	0.0155
V2–3	0.052	0.21	40	80	14	3.26	0.0548
V2–4	0.178	0.388	30	60	14	3.26	0.0759
V2–5	0.079	0.467	15	30	14	3.26	0.0457
V2–6	0.052	0.519	30	60	14	3.26	0.1015
V2–7	0.079	0.598	50	100	14	3.26	0.1949
V2–8	0.079	0.677	336	672	14	3.26	1.4831
	Total Load:	0.677				Total V–Drop	1.9868

22.0132 VOLTS REMAINING (within the voltage range of the appliances)
0.677 TOTAL AMPS REQUIRED (within the listed power supply output)

NOTIFICATION APPLIANCES:

TYPE	MAKE	MODEL	CANDELA	LOAD	V–RANGE	NOTE
STROBE	WHEELOCK	NS4	15	0.052	16–33	MULTI CANDELA
STROBE	WHEELOCK	NS4	30	0.079	16–33	MULTI CANDELA
STROBE	WHEELOCK	NS4	75	0.148	16–33	MULTI CANDELA
STROBE	WHEELOCK	NS4	110	0.178	16–33	MULTI CANDELA

VOLTAGE DROP CALCULATIONS: CIRCUIT V3

Voltage Drop = (L/1000)(A)(R)
Where:
L = Conductor Distance (twice actual distance)
A = Load (amps)
R = Resistance per 1,000 ft (NEC Table 8)

Appliance Type	Appliance Load (amps)	Cummulative Load (amp)	Actual Distance (ft)	Conductor Distance (ft)	Conductor Gauge	Resistance per 1,000 ft	Voltage Drop
V3–8	0.052	0.052	60	120	14	3.26	0.0203
V3–7	0.052	0.104	40	80	14	3.26	0.0271
V3–6	0.052	0.156	30	60	14	3.26	0.0305
V3–5	0.052	0.208	25	50	14	3.26	0.0339
V3–4	0.052	0.26	45	90	14	3.26	0.0763
V3–3	0.079	0.339	65	130	14	3.26	0.1437
V3–2	0.079	0.418	30	60	14	3.26	0.0818
V3–1	0.178	0.596	250	500	14	3.26	0.9715
	Total Load:	0.596				Total V–Drop	1.3851

22.6149 VOLTS REMAINING (within the voltage range of the appliances)
0.596 TOTAL AMPS REQUIRED (within the listed power supply output)

NOTIFICATION APPLIANCES:

TYPE	MAKE	MODEL	CANDELA	LOAD	V–RANGE	NOTE
STROBE	WHEELOCK	NS4	15	0.052	16–33	MULTI CANDELA
STROBE	WHEELOCK	NS4	30	0.079	16–33	MULTI CANDELA
STROBE	WHEELOCK	NS4	75	0.148	16–33	MULTI CANDELA
STROBE	WHEELOCK	NS4	110	0.178	16–33	MULTI CANDELA

VOLTAGE DROP CALCULATIONS: CIRCUIT V4

Voltage Drop = (L/1000)(A)(R)
Where:
L = Conductor Distance (twice actual distance)
A = Load (amps)
R = Resistance per 1,000 ft (NEC Table 8)

Appliance Type	Appliance Load (amps)	Cummulative Load (amp)	Actual Distance (ft)	Conductor Distance (ft)	Conductor Gauge	Resistance per 1,000 ft	Voltage Drop
V4–1	0.052	0.052	50	100	14	3.26	0.0170
V4–2	0.052	0.104	75	150	14	3.26	0.0509
V4–3	0.079	0.183	40	80	14	3.26	0.0477
V4–4	0.148	0.331	40	80	14	3.26	0.0863
V4–5	0.148	0.479	40	80	14	3.26	0.1249
V4–6	0.052	0.531	40	80	14	3.26	0.1385
V4–7	0.178	0.709	30	60	14	3.26	0.1387
V4–8	0.052	0.761	400	800	14	3.26	1.9847
	Total Load:	0.761				Total V–Drop	2.5886

21.4114 VOLTS REMAINING (within the voltage range of the appliances)
0.761 TOTAL AMPS REQUIRED (within the listed power supply output)

NOTIFICATION APPLIANCES:

TYPE	MAKE	MODEL	CANDELA	LOAD	V–RANGE	NOTE
STROBE	WHEELOCK	NS4	15	0.052	16–33	MULTI CANDELA
STROBE	WHEELOCK	NS4	30	0.079	16–33	MULTI CANDELA
STROBE	WHEELOCK	NS4	75	0.148	16–33	MULTI CANDELA
STROBE	WHEELOCK	NS4	110	0.178	16–33	MULTI CANDELA

Plot Sheet Filename:
XREF Filename List:
Named Page Setup:
Plot Layout:
Plot Date:

LBNL Drawing Status:
LBNL Issue Status:
LBNL Revision:
LBNL Date:

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Building 67

Issued for	Rev	Date
RECORD DRAWINGS		18 JAN 2007

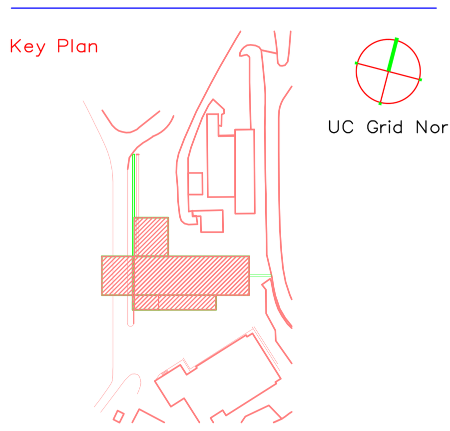
Seals and Signatures

RECORD DRAWINGS

SPECIAL NOTE:
THE INFORMATION SHOWN IN THIS DRAWING WAS DEVELOPED USING THE RECORD DRAWINGS PROVIDED BY SIEMENS BUILDING TECHNOLOGIES, INC. FOLLOWING THE COMPLETION OF THIS PROJECT (IDENTIFIED AS JOB NUMBER 107739, SHEETS 1 THROUGH 24). SPECIFICALLY, SEE SHEET 11 OF 24 FOR INFORMATION.

LBNL Project Title: MOLECULAR FOUNDRY
LBNL Building Number: 67

Key Plan



Drawing Title: FIRE ALARM SYSTEM VOLTAGE DROP CALCULATIONS

Scale

SG Project Number
LBNL Project Number: MF1212

FA0.8

Drawing Number: 8 OF 20

5N67E028

LBNL Drawing Number: IFB 841