NOTIFICATION APPLIANCE CIRCUITS VOLTAGE DROP CALCULATIONS – DETAIL 1

VOLTAGE DROP CALCULATIONS: CIRCUIT V17

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
V17–1	0.079	0.079	70	140	14	3.26	0.0361
V17–2	0.079	0.158	45	90	14	3.26	0.0464
V17–3	0.052	0.21	30	60	14	3.26	0.0411
V17–4	0.052	0.262	25	50	14	3.26	0.0427
V17–5	0.079	0.341	100	200	14	3.26	0.2223
V17–6	0.079	0.42	55	110	14	3.26	0.1506
V17–7	0.178	0.598	200	400	14	3.26	0.7798
V17–8	0.052	0.65	385	770	14	3.26	1.6316
	Total Load:	0.65				Total V-Drop	2.9506

21.0494 VOLTS REMAINING (within the voltage range of the appliances)
0.65 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 V18

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
V18–1	0.178	0.178	40	80	14	3.26	0.0464
V18–2	0.178	0.356	55	110	14	3.26	0.1277
V18–3	0.178	0.534	95	190	14	3.26	0.3308
V18–4	0.178	0.712	340	680	14	3.26	1.5784
	Total Load:	0.712				Total V-Drop	2.0832

21.9168 VOLTS REMAINING (within the voltage range of the appliances)
0.712 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 V19

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
V19–1	0.178	0.178	60	120	14	3.26	0.0696
V19–2	0.178	0.356	70	140	14	3.26	0.1625
V19–3	0.052	0.408	100	200	14	3.26	0.2660
V19–4	0.052	0.46	340	680	14	3.26	1.0197
	Total Load:	0.46				Total V-Drop	1.5179

22.4821 VOLTS REMAINING (within the voltage range of the appliances)
0.46 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 V20

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)

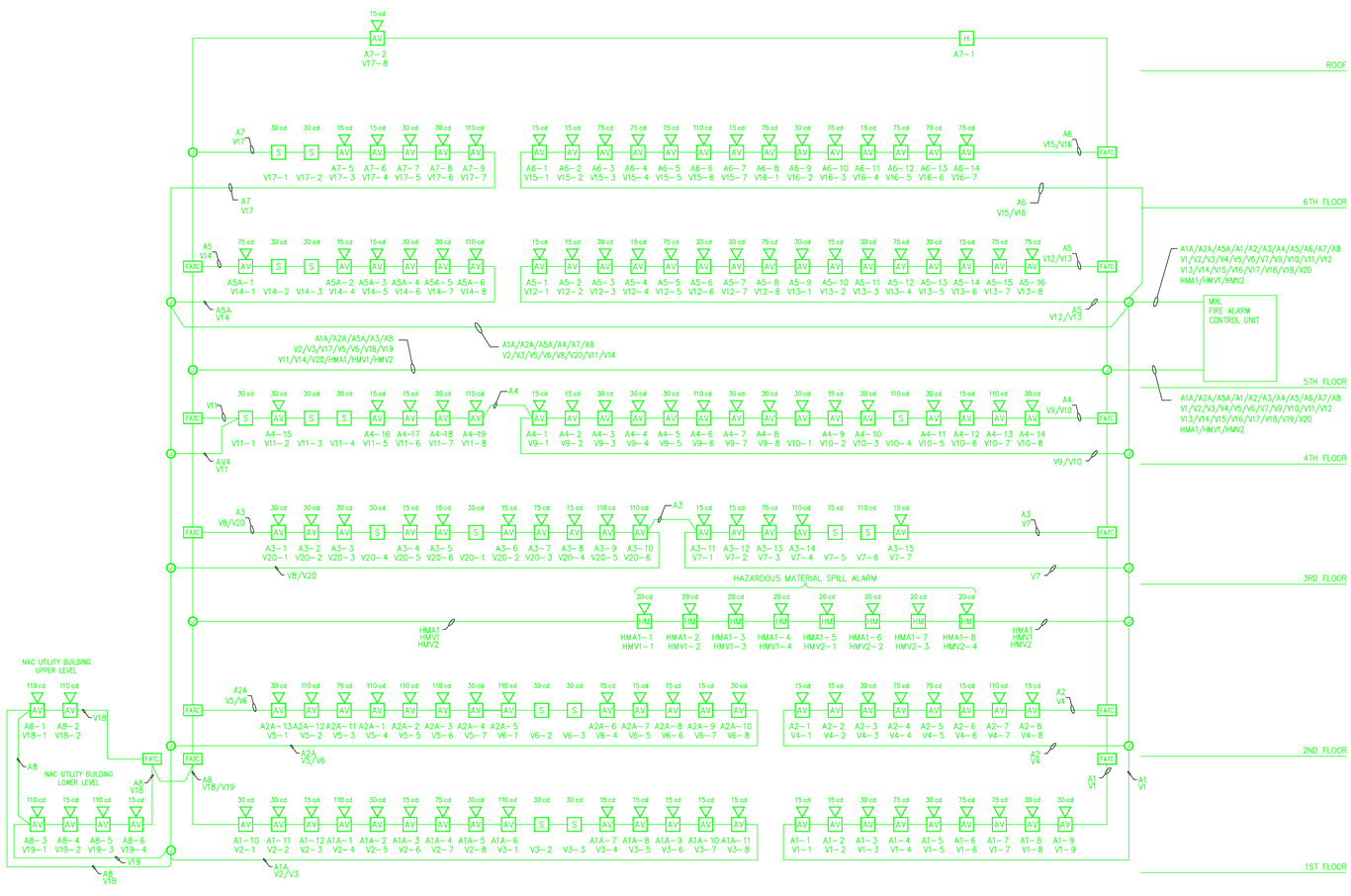
Appliance Type	Appliance Load (amps)	Cummulative Load (amp)	Actual Distance (ft)	Conductor Distance (ft)	Conductor Gauge	Resistance per 1,000 ft	Voltage Drop
V20–1	0.079	0.079	70	140	14	3.26	0.0361
V20–2	0.052	0.131	60	120	14	3.26	0.0512
V20–3	0.148	0.279	45	90	14	3.26	0.0819
V20–4	0.052	0.331	65	130	14	3.26	0.1403
V20–5	0.178	0.509	75	150	14	3.26	0.2489
V20–6	0.178	0.687	400	800	14	3.26	1.7917
	Total Load:	0.687				Total V-Drop	2.3500

21.6500 VOLTS REMAINING (within the voltage range of the appliances)
0.687 TOTAL AMPS REQUIRED (within the listed power supply output)

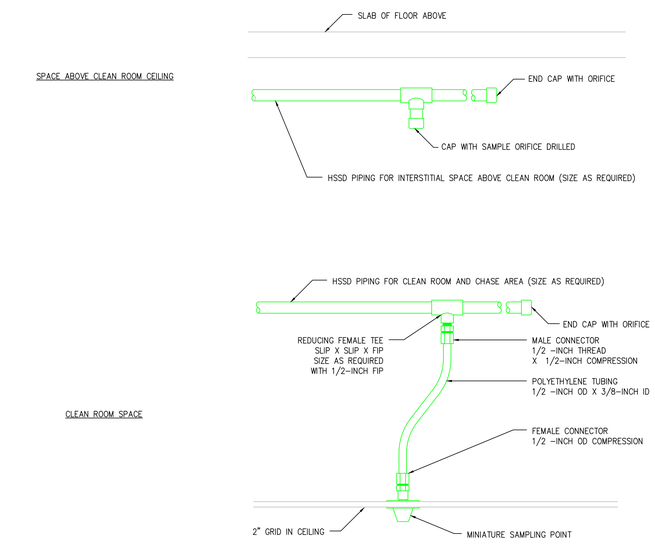
NOTIFICATION APPLIANCES:

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

NOTIFICATION APPLIANCE CIRCUITS RISER DIAGRAMS – DETAIL 2



CLEAN ROOM HSSD PIPING DETAIL – DETAIL 3 (N.T.S.)



CONDUIT FILL CALCULATIONS – DETAIL 4

TYPICAL FLOOR (WORST CASE)

CIRCUIT # OF CONDUCTORS CONDUCTOR AREA

ALD 4 16 0.0316
AUDIBLE 2 14 0.0174
VISIBLE 6 14 0.0522
RCC 2 16 0.0158
HSSD POWER 2 14 0.0174
HSSD SIGNAL 2 16 0.0158
0.1502
3/4–INCH CONDUIT CAPABLE OF 0.21 SQ IN FILL.

5TH FLOOR (FAP TO MAIN CORRIDOR – WORST CASE)

CIRCUIT # OF CONDUCTORS CONDUCTOR AREA

ALD 60 16 0.4740
AUDIBLE 32 14 0.2784
VISIBLE 80 14 0.6960
RCC 4 16 0.0316
HSSD POWER 12 14 0.1044
HSSD SIGNAL 4 16 0.0316
1.616
2 1/2–INCH CONDUIT CAPABLE OF 1.92 SQ IN FILL.

5TH FLOOR (MAIN CORRIDOR – WORST CASE)

CIRCUIT # OF CONDUCTORS CONDUCTOR AREA

ALD 30 16 0.2370
AUDIBLE 16 14 0.1392
VISIBLE 40 14 0.3480
RCC 2 16 0.0158
HSSD POWER 6 14 0.5220
HSSD SIGNAL 2 16 0.0158
0.8080
1 1/2–INCH CONDUIT CAPABLE OF 0.82 SQ IN FILL.

NOTES

1. CONDUCTOR AREA (SQ IN) FROM NEC.

2. ALLOWABLE ARE OF FILL (SQ IN) FROM NEC.

3. LABORATORY FLOORS 1 THROUGH 4 AND 6 THROUGH 7 AND THE UTILITY BUILDING REPRESENTATIVE OF A WORST CASE TYPICAL FLOOR FOR THE PURPOSES OF DETERMINING CONDUIT FILL. THE LABORATORY 5TH FLOOR REQUIRES TWO ADDITIONAL CALCULATIONS TO ADDRESS CONDITIONS CREATED BY THE HOME RUN OF THE CLASS A CIRCUITS TO THE FAP AND TO ADDRESS THE SPLIT OF THE CLASS A CIRCUITS FOR ROUTING IN THE MAIN CORRIDOR TO THE RISER.

Lawrence Berkeley National Laboratory

Molecular Foundry
Building 67

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RECORD DRAWINGS | — | 18 JAN 2007

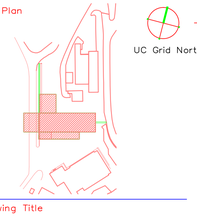
Seals and Signatures

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 SHEETS 11 AND 15 FOR INFORMATION.

LBNL Project Title: MOLECULAR FOUNDRY
LBNL Building Number: 67

Key Plan



Drawing Title
FIRE ALARM SYSTEM VOLTAGE DROP CALCULATIONS AND RISER DIAGRAMS

Scale
MF1212

SG Project Number
LBNL Project Number
FA0.10

Drawing Number
10 OF 20
5N67E019

LBNL Drawing Number
IFB 841

Plot Sheet Filename: ASBS\ASNUMBER\FILENAME
XREF Filename List: ASBS\ASNUMBER\FILENAME
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Plot Layout: PSPACE SHEET @ 1:1
Plot Date:

LBNL Drawing Status:
LBNL Issue Status:
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LBNL Date: