FACP Battery Calculation

4/19/2016

PROJECT NAME: 17 WESTFIELD ST
Required Standby Time: 24 Hours
Required Alarm Time: 5 Minutes

Regulated Load in Standby

Device Type	Number of Devices		Current (Amps)		Total Current (Amps)
FACP – MS-9200UDLS MAIN CIRCUIT BOARD	1	X	0.14500	=	0.14500
SD355 – SMOKE DETECTOR	1	X	0.00030	=	0.00030
MMF-300 – MONITOR MODULE	2	X	0.00040	=	0.00080
BG-12LX – PULL STATION	7	X	0.00030	=	0.00210
MAX ALARM DRAW – ALL ADDRESS DEVICES	1	X	0.00000	=	0.00000
TOTAL STANDBY LOAD					0.14820

Regulated Load in ALARM

Device Type	Number of Devices		Current (Amps)		Total Current (Amps)
FACP – MS-9200UDLS MAIN CIRCUIT BOARD	1	X	0.27500	=	0.27500
MAX ALARM DRAW – ALL ADDRESS DEVICES	1	X	0.40000	=	0.40000
NAC-1 (See Voltage Drop Calculations)	1	X	0.89400	=	0.89400
NAC-2 (See Voltage Drop Calculations)	1	X	0.78500	=	0.78500
NAC-3 (See Voltage Drop Calculations)	1	X	1.17000	=	1.17000
NAC-4 (See Voltage Drop Calculations)	1	X	0.65700	=	0.65700
TOTAL ALARM LOAD					4.18100

Battery Requirements

Standby Load			Required Standby Time in Hours		
Current (Amps)	0.14820	X	24.00000	=	3.55680
Alarm Load			Required Alarm Time in Hours		
Current (Amps)	4.18100	X	0.08333	=	0.34842
Total Ampere Hours (before derating factor)					3.90522
Derating Factor				X	1.2
TOTAL AMPERE HOURS REQUIRED				=	4.68626
BATTERIES TO BE PROVIDED (2 – 12v)					7 AH

Point to Point NAC Voltage Drop Calculation — 4/19/2016

Project Name: 17 WESTFIELD ST
Circuit Number: NAC-1

			Wire Gauge	Resistance Per 1000
Nominal System Voltage	20.4	volts		
Minimum Device Voltage	16.0	volts		
Distance from source to 1st device	15	feet	14	3.07
Wire Gauge for balance of circuit			14	3.07
Max Output Current	1.50	amps		
Total Circuit Current	0.894	amps		
End of Line Voltage	19.71	volts		

Circuit is within limits

	Device Current	Distance previous device	Voltage at Device	Drop from source	Percent Drop
Device 1	0.079	15	20.32	0.082	0.40%
Device 2	0.079	19	20.22	0.177	0.87%
Device 3	0.079	31	20.08	0.318	1.56%
Device 4	0.066	21	20.00	0.402	1.97%
Device 5	0.066	3	19.99	0.413	2.03%
Device 6	0.066	17	19.93	0.468	2.29%
Device 7	0.107	22	19.87	0.530	2.60%
Device 8	0.176	55	19.75	0.649	3.18%
Device 9	0.176	38	19.71	0.690	3.38%
Totals	0.894	221			

Notes:
Wire resistance is doubled in the calculations for two wires (Positive and Negative).
The voltage calculated to the last device must not be lower than the manufactures listed minimum operating voltage (IE: rated operating voltage 16–33 VDC (24 VDC nominal)).

Point to Point NAC Voltage Drop Calculation — 4/19/2016

Project Name: 17 WESTFIELD ST
Circuit Number: NAC-2

			Wire Gauge	Resistance Per 1000
Nominal System Voltage	20.4	volts		
Minimum Device Voltage	16.0	volts		
Distance from source to 1st device	80	feet	14	3.07
Wire Gauge for balance of circuit			14	3.07
Max Output Current	1.50	amps		
Total Circuit Current	0.785	amps		
End of Line Voltage	19.70	volts		

Circuit is within limits

	Device Current	Distance previous device	Voltage at Device	Drop from source	Percent Drop
Device 1	0.066	80	20.01	0.386	1.89%
Device 2	0.066	14	19.95	0.447	2.19%
Device 3	0.079	22	19.86	0.536	2.63%
Device 4	0.176	15	19.81	0.588	2.88%
Device 5	0.079	11	19.78	0.615	3.02%
Device 6	0.107	40	19.71	0.694	3.40%
Device 7	0.212	3	19.70	0.698	3.42%
Totals	0.785	185			

Notes:
Wire resistance is doubled in the calculations for two wires (Positive and Negative).
The voltage calculated to the last device must not be lower than the manufactures listed minimum operating voltage (IE: rated operating voltage 16–33 VDC (24 VDC nominal)).

Point to Point NAC Voltage Drop Calculation — 4/19/2016

Project Name: 17 WESTFIELD ST
Circuit Number: NAC-3

			Wire Gauge	Resistance Per 1000
Nominal System Voltage	20.4	volts		
Minimum Device Voltage	16.0	volts		
Distance from source to 1st device	55	feet	14	3.07
Wire Gauge for balance of circuit			14	3.07
Max Output Current	1.50	amps		
Total Circuit Current	1.170	amps		
End of Line Voltage	19.50	volts		

Circuit is within limits

	Device Current	Distance previous device	Voltage at Device	Drop from source	Percent Drop
Device 1	0.176	55	20.00	0.395	1.94%
Device 2	0.176	21	19.88	0.523	2.57%
Device 3	0.218	50	19.63	0.774	3.80%
Device 4	0.212	12	19.58	0.819	4.01%
Device 5	0.176	32	19.51	0.895	4.39%
Device 6	0.212	3	19.50	0.899	4.41%
Totals	1.170	173			

Notes:
Wire resistance is doubled in the calculations for two wires (Positive and Negative).
The voltage calculated to the last device must not be lower than the manufactures listed minimum operating voltage (IE: rated operating voltage 16–33 VDC (24 VDC nominal)).

Point to Point NAC Voltage Drop Calculation — 4/19/2016

Project Name: 17 WESTFIELD ST
Circuit Number: NAC-4

			Wire Gauge	Resistance Per 1000
Nominal System Voltage	20.4	volts		
Minimum Device Voltage	16.0	volts		
Distance from source to 1st device	125	feet	14	3.07
Wire Gauge for balance of circuit			14	3.07
Max Output Current	1.50	amps		
Total Circuit Current	0.657	amps		
End of Line Voltage	19.79	volts		

Circuit is within limits

	Device Current	Distance previous device	Voltage at Device	Drop from source	Percent Drop
Device 1	0.176	125	19.90	0.504	2.47%
Device 2	0.176	12	19.86	0.540	2.65%
Device 3	0.066	3	19.85	0.545	2.67%
Device 4	0.066	20	19.83	0.575	2.82%
Device 5	0.107	22	19.80	0.598	2.93%
Device 6	0.066	20	19.79	0.606	2.97%
Totals	0.657	202			

Notes:
Wire resistance is doubled in the calculations for two wires (Positive and Negative).
The voltage calculated to the last device must not be lower than the manufactures listed minimum operating voltage (IE: rated operating voltage 16–33 VDC (24 VDC nominal)).

GENERAL NOTES:

1. THESE DRAWINGS ARE DIAGRAMMATIC. REFER TO THE ARCHITECTURAL DRAWINGS FOR EXACT DIMENSIONS.
2. INSTALLATION SHALL COMPLY WITH NEC, NFPA 72 AND ALL OTHER APPLICABLE CODES AS REQUIRED BY THE LOCAL AUTHORITY HAVING JURISDICTION.
3. WIRING DEPICTED ON THESE PLANS IS SCHEMATIC – ACTUAL WIRE LOCATIONS MAY DIFFER FROM THESE PLANS. WIRING SHALL BE PERFORMED AS ACTUAL BUILDING CONSTRUCTION CONDITIONS ALLOW AND TO MINIMIZE PENETRATIONS THROUGH AREA SEPARATION WALLS AND FIRE WALLS. THE USE OF A RACEWAY IS PERMITTED AS LONG AS NO 110V OR HIGHER VOLTAGE CABLES ARE IN THE SAME RACEWAY.
4. FIRE RATINGS SHALL BE MAINTAINED FOR ALL PENETRATIONS THROUGH FIRE-RATED CONSTRUCTION.
5. POWER FOR ALL FIRE ALARM PANELS AND FIRE ALARM POWER SUPPLIES MUST BE PROVIDED BY A DEDICATED AC BRANCH CIRCUIT.
6. POWER-LIMITED AND NONPOWER-LIMITED CIRCUIT WIRING MUST REMAIN SEPARATED IN CABINET. ALL POWER-LIMITED CIRCUIT WIRING MUST REMAIN AT LEAST 0.25" AWAY FROM ANY NONPOWER-LIMITED CIRCUIT WIRING. FURTHERMORE, ALL POWER-LIMITED AND NONPOWER-LIMITED CIRCUIT WIRING MUST ENTER AND EXIT THE CABINET THROUGH DIFFERENT KNOCK OUTS AND/OR SEPARATE CONDUITS.
7. WHEN UTILIZING CLASS "A" CIRCUITS, SEPARATE OUTGOING AND RETURN CONDUCTORS OF CLASS "A" CIRCUITS BY A MINIMUM OF 12" WHERE RUN VERTICALLY AND 48" WHERE RUN HORIZONTALLY.
8. WHEN UTILIZING SHIELDED CABLE TIE SHIELDS THROUGH AND INSULATE AT EACH JUNCTION BOX. INSULATE AND TAPE BACK AT END.
9. ALL FIRE ALARM CABLING SHALL BE ACCEPTABLE TO THE FIRE ALARM EQUIPMENT MANUFACTURER FOR THE INTENDED PURPOSE.
10. SMOKE DETECTORS SHALL NOT BE INSTALLED UNTIL AFTER CONSTRUCTION CLEAN-UP IS COMPLETED AND FINAL.
11. LOCATE SMOKE DETECTORS A MINIMUM OF THREE (3) FEET FROM MECHANICAL DIFFUSERS. WALL-MOUNTED SMOKE DETECTORS SHALL BE LOCATED A MINIMUM OF 4" AND A MAXIMUM OF 12" FROM CEILING. CEILING-MOUNTED SMOKE DETECTORS SHALL BE MOUNTED ON CEILINGS AND NOT ON THE BOTTOMS OF BEAMS OR JOISTS.
12. PROVIDE SYNCHRONIZATION OF ALL VISUAL NOTIFICATION APPLIANCE CIRCUITS. PROVIDE ALL REQUIRED SYNC MODULES. PROVIDE A MULTI-SYNC MODE SLAVE CONNECTION BETWEEN ALL SYNC MODULES.
13. VERIFY ALL FIELD SELECTABLE AUDIBILITY SETTINGS OF NOTIFICATION APPLIANCES WITH FIRE ALARM CONTRACTOR.
14. UPON COMPLETION OF THE FIRE ALARM SYSTEM INSTALLATION AND PROGRAMMING, THE INSTALLING CONTRACTOR SHALL PERFORM FINAL TESTING OF THE ENTIRE SYSTEM, PER ALL APPLICABLE CODES, AND SHALL COORDINATE AND PERFORM A FINAL FIRE ALARM SYSTEM INSPECTION.
15. PROVIDE OFF-SITE MONITORING AS REQUIRED BY THE INTERNATIONAL FIRE CODE, SECTION 907.15 AND THE LOCAL AUTHORITY HAVING JURISDICTION.
16. INSTALLING CONTRACTOR SHALL, PHYSICALLY, LABEL ALL INITIATING DEVICES AND NOTIFICATION APPLIANCE CIRCUIT END OF LINE (WHEN WIRING CLASS "B"). THESE LABELS SHALL BE IN PLACE PRIOR TO START-UP AND TESTING.

FIRE ALARM SYMBOL LEGEND

NOTE: ALL SYMBOLS MAY NOT BE USED ON THIS PROJECT

SYMBOL	DESCRIPTION	MOUNTING
FACP	FIRE ALARM CONTROL PANEL	WALL-TOP @ 66"
FPS	FIRE ALARM POWER SUPPLY	FIELD VERIFY
FSA	FIRE SYSTEM ANNUNCIATOR	WALL-TOP @ 66"
FSD	FIRE/SMOKE DAMPER	BY OTHERS
(2)	SMOKE DETECTOR	CEILING
(2)-D	DUCT SMOKE DETECTOR	BY OTHERS
(I)	HEAT DETECTOR	CEILING
M	ADDRESSABLE MONITOR MODULE	FIELD VERIFY
MM	ADDRESSABLE MINI MONITOR MODULE	FIELD VERIFY
P	MANUAL PULL STATION	WALL @ 48"
R	CONTROL RELAY (MULTI-VOLTAGE)	FIELD VERIFY
RM	ADDRESSABLE RELAY MODULE	FIELD VERIFY
MD	MAGNETIC DOOR HOLDER	FIELD VERIFY
WF	WATER FLOW SWITCH	BY OTHERS
VT	VALVE TAMPER SWITCH	BY OTHERS
BELL	BELL	BY OTHERS
CM	CEILING MOUNT STROBE	FIELD VERIFY
CMH	CEILING MOUNT HORN / STROBE	FIELD VERIFY
CMS	CEILING MOUNT SPEAKER / STROBE	FIELD VERIFY
H	HORN	WALL @ 10'-0
HS	HORN / STROBE	WALL 80"-96"
SS	SPEAKER / STROBE	WALL 80"-96"
SP	SPEAKER	WALL @ 90"
S	STROBE	WALL 80"-96"
KB	KNOX BOX	FIELD VERIFY

ABBREVIATION	DESCRIPTION
E	EXISTING
G	WITH GUARD
P	PENDENT MOUNT
R	RESIDENTIAL (110V)
S	SOUNDER BASE
WP	WEATHER PROOF
EOL	END OF LINE RESISTOR
EOLR	END OF LINE RELAY
AWG	AMERICAN WIRE GAUGE
TWP	TWISTED PAIR
TWSP	TWISTED SHIELDED PAIR
FPLP	FIRE POWER LIMITED PLENUM
FPLR	FIRE POWER LIMITED RISER

SPEAKER WATTAGE (SS (3W) 75) STROBE CANDELA (30)

(2) DEVICE ADDRESS (1) — L1D001 OR D01 — (L = DENOTES LOOP #) (D or M = DENOTES DETECTOR OR MODULE #)

1-#16/2 TWP — WIRE TYPE ABBREVIATED; CONDUCTOR COUNT; WIRE SIZE; # OF CABLES (IF OMITTED ONLY 1 CABLE NEEDED)

APPLICABLE CODES:

MAINE UNIFORM ENERGY & BUILDING CODE
PORTLAND CITY CODE, CHAPTER10, FIRE PREVENTION & PROTECTION
NFPA 1, FIRE CODE, & NFPA 101, LIFE SAFETY CODE

RESERVED FOR CITY STAMP

REVISION	DESCRIPTION	DATE
0	ISSUED FOR REVIEW & APPROVAL	4/20/2016

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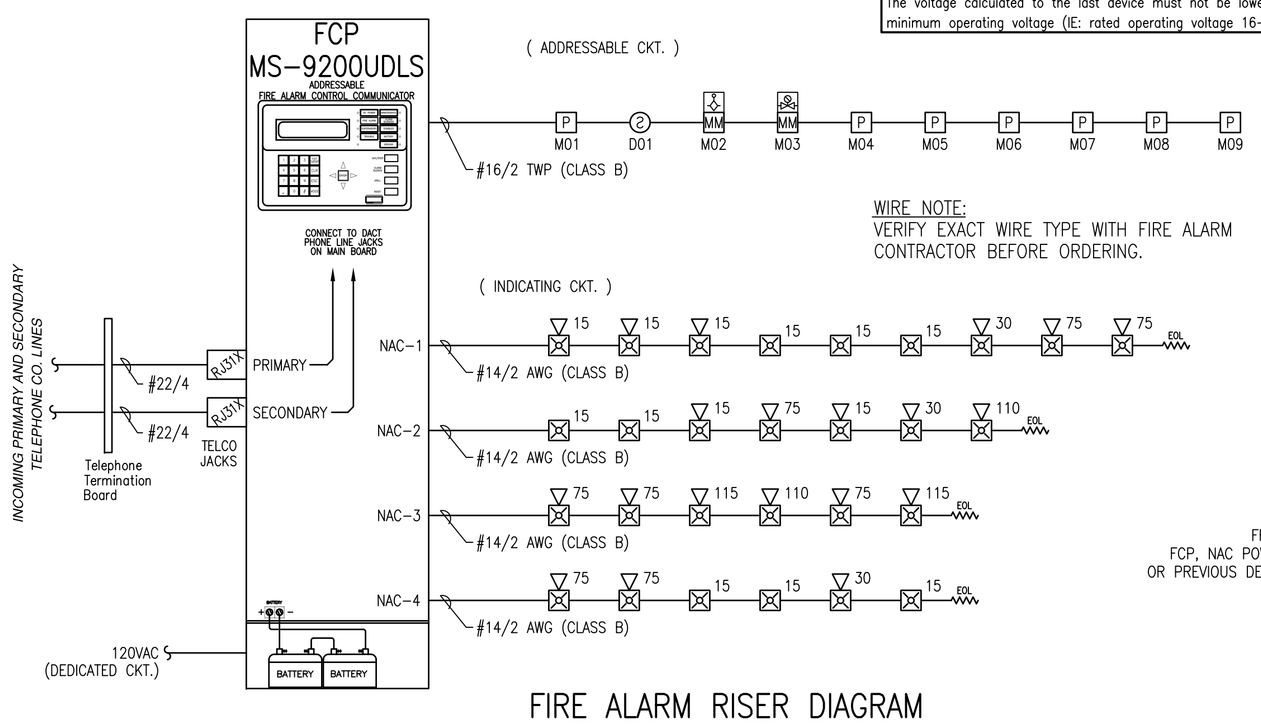
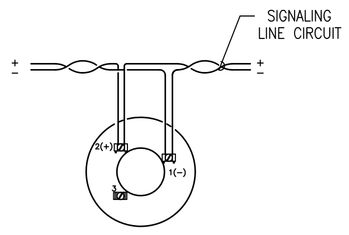
CALCS, DETAILS, LEGEND, MATRIX, NOTES, RISER

DRAWN	JPB UNICAD JOB #16227
CHECKED	WAYNE B. HAWS NICET IV 90496
DATE	4/20/2016
REVISION	0
SCALE	NONE

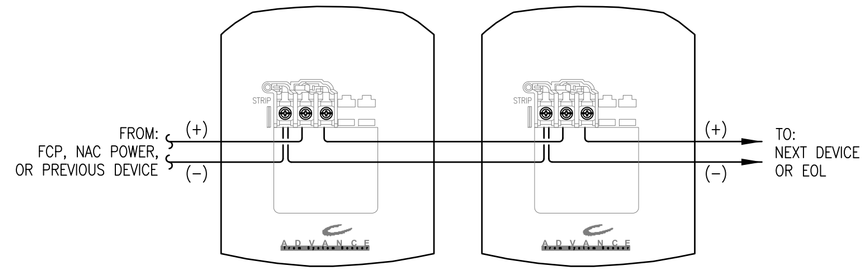
FA-1



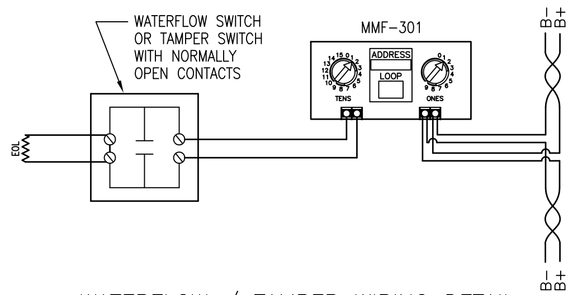
FIRE ALARM RISER DIAGRAM
SCHEMATIC: NO SCALE



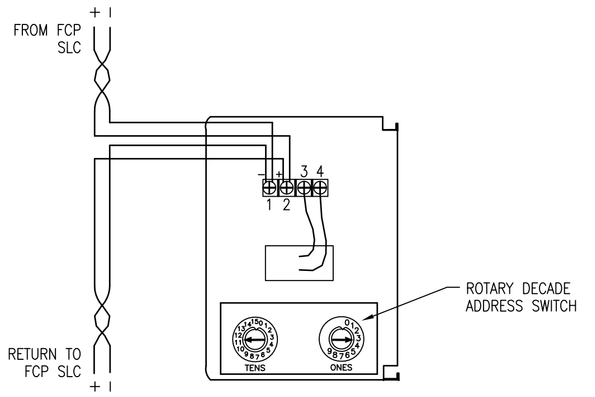
ADDRESSABLE SMOKE DETECTOR WIRING DETAIL
SCHEMATIC: NO SCALE



TYPICAL 2 WIRE STROBE WIRING DETAIL
SCHEMATIC: NO SCALE



WATERFLOW / TAMPER WIRING DETAIL
SCHEMATIC: NO SCALE



MANUAL PULL STATION WIRING DETAIL
SCHEMATIC: NO SCALE

OPERATIONS MATRIX

FIRE ALARM INPUT	FIRE ALARM OUTPUT	ACTIVATE ALARM INDICATOR	ACTIVATE AUDIBLE ALARM	ACTIVATE SUPERVISORY INDICATOR	ACTIVATE AUDIBLE SUPERVISORY SIGNAL	ACTIVATE TROUBLE INDICATOR	ACTIVATE AUDIBLE TROUBLE INDICATOR	TRANSMIT ALARM SIGNAL	TRANSMIT SUPERVISORY SIGNAL	TRANSMIT TROUBLE SIGNAL
SMOKE DETECTORS		●	●					●		
PULL STATIONS		●	●					●		
WATERFLOW SWITCHES		●	●					●		
VALVE TAMPER SWITCHES				●	●				●	
FIRE ALARM AC POWER FAIL						●	●			●
FIRE ALARM LOW BATTERY						●	●			●
OPEN CIRCUIT						●	●			●
GROUND FAULT						●	●			●
NAC SHORT CIRCUIT						●	●			●
LOSS OF AC TO BUILDING						●	●			●

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