## FACP Battery Calculation

8/19/2016

PROJECT NAME: GRAND TRUCK BUILDING
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 |
| XRM-24B | 1 | X | 0.00000 | = | 0.00000 |
| ANN-80 REMOTE ANNUNCIATOR | 1 | X | 0.01500 | = | 0.01500 |
| SD355 SMOKE DETECTOR | 11 | X | 0.00030 | = | 0.00330 |
| H355 HEAT DETECTOR | 3 | X | 0.00030 | = | 0.00090 |
| MMF-301/MMF-300 MONITOR MODULE | 3 | X | 0.00040 | = | 0.00120 |
| CRF-300 RELAY MODULE | 4 | X | 0.00027 | = | 0.00108 |
| BG-12LX PULL STATION | 7 | X | 0.00030 | = | 0.00210 |
| TOTAL STANDBY LOAD | | | | | 0.16858 |

### 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 |
| XRM-24B | 1 | X | 0.00000 | = | 0.00000 |
| ANN-80 REMOTE ANNUNCIATOR | 1 | X | 0.04000 | = | 0.04000 |
| MAX ALARM DRAW – ALL ADDRESS DEVICES | 1 | X | 0.40000 | = | 0.40000 |
| NAC-1 (See Voltage Drop Calculations) | 1 | X | 0.99100 | = | 0.99100 |
| NAC-2 (See Voltage Drop Calculations) | 1 | X | 0.61100 | = | 0.61100 |
| NAC-3 (See Voltage Drop Calculations) | 1 | X | 0.64200 | = | 0.64200 |
| NAC-4 (See Voltage Drop Calculations) | 1 | X | 0.00000 | = | 0.00000 |
| TOTAL ALARM LOAD | | | | | 2.95900 |

### Battery Requirements

| | | | | | |
|---|---|---|---|---|---|
| Standby Load | | | Required Standby Time in Hours | | |
| Current (Amps) | 0.16858 | X | 24.00000 | = | 4.04592 |
| Alarm Load | | | Required Alarm Time in Hours | | |
| Current (Amps) | 2.95900 | X | 0.08333 | = | 0.24658 |
| Total Ampere Hours (before derating factor) | | | | | 4.29250 |
| Derating Factor | | | | X | 1.2 |
| TOTAL AMPERE HOURS REQUIRED | | | | = | 5.15100 |
| BATTERIES TO BE PROVIDED (2 – 12v) | | | | | 7 AH |

## Point to Point NAC Voltage Drop Calculation

8/19/2016

Project Name: GRAND TRUCK BUILDING
Circuit Number: NAC-1

Nominal System Voltage: 20.4 volts
Minimum Device Voltage: 16.0 volts
Distance from source to 1st device: 15 feet
Wire Gauge for balance of circuit: Wire Gauge 14, 14 — Resistance Per 1000 3.07, 3.07

Max Output Current: 1.50 amps
Total Circuit Current: 0.991 amps
End of Line Voltage: 19.89 volts

Circuit is within limits

| | Device Current | Distance previous device | Voltage at Device | Drop from source | Percent Drop |
|---|---|---|---|---|---|
| Device 1 | 0.079 | 15 | 20.31 | 0.091 | 0.45% |
| Device 2 | 0.176 | 20 | 20.20 | 0.203 | 1.00% |
| Device 3 | 0.176 | 4 | 20.18 | 0.221 | 1.09% |
| Device 4 | 0.079 | 37 | 20.05 | 0.349 | 1.71% |
| Device 5 | 0.066 | 25 | 19.98 | 0.422 | 2.07% |
| Device 6 | 0.066 | 11 | 19.95 | 0.450 | 2.21% |
| Device 7 | 0.066 | 10 | 19.93 | 0.472 | 2.31% |
| Device 8 | 0.107 | 14 | 19.90 | 0.496 | 2.43% |
| Device 9 | 0.176 | 12 | 19.89 | 0.509 | 2.50% |
| Totals | 0.991 | 148 | | | |

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

8/19/2016

Project Name: GRAND TRUCK BUILDING
Circuit Number: NAC-2

Nominal System Voltage: 20.4 volts
Minimum Device Voltage: 16.0 volts
Distance from source to 1st device: 35 feet
Wire Gauge for balance of circuit: Wire Gauge 14, 14 — Resistance Per 1000 3.07, 3.07

Max Output Current: 1.50 amps
Total Circuit Current: 0.611 amps
End of Line Voltage: 20.06 volts

Circuit is within limits

| | Device Current | Distance previous device | Voltage at Device | Drop from source | Percent Drop |
|---|---|---|---|---|---|
| Device 1 | 0.176 | 35 | 20.27 | 0.131 | 0.64% |
| Device 2 | 0.079 | 19 | 20.22 | 0.182 | 0.89% |
| Device 3 | 0.066 | 47 | 20.12 | 0.285 | 1.40% |
| Device 4 | 0.066 | 13 | 20.09 | 0.308 | 1.51% |
| Device 5 | 0.079 | 10 | 20.08 | 0.322 | 1.58% |
| Device 6 | 0.066 | 11 | 20.07 | 0.331 | 1.62% |
| Device 7 | 0.079 | 17 | 20.06 | 0.340 | 1.67% |
| Totals | 0.611 | 152 | | | |

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

8/19/2016

Project Name: GRAND TRUCK BUILDING
Circuit Number: NAC-3

Nominal System Voltage: 20.4 volts
Minimum Device Voltage: 16.0 volts
Distance from source to 1st device: 35 feet
Wire Gauge for balance of circuit: Wire Gauge 14, 14 — Resistance Per 1000 3.07, 3.07

Max Output Current: 1.50 amps
Total Circuit Current: 0.642 amps
End of Line Voltage: 20.05 volts

Circuit is within limits

| | Device Current | Distance previous device | Voltage at Device | Drop from source | Percent Drop |
|---|---|---|---|---|---|
| Device 1 | 0.176 | 35 | 20.26 | 0.138 | 0.68% |
| Device 2 | 0.176 | 38 | 20.15 | 0.247 | 1.21% |
| Device 3 | 0.079 | 23 | 20.11 | 0.288 | 1.41% |
| Device 4 | 0.079 | 19 | 20.09 | 0.312 | 1.53% |
| Device 5 | 0.066 | 40 | 20.06 | 0.345 | 1.69% |
| Device 6 | 0.066 | 7 | 20.05 | 0.348 | 1.70% |
| Totals | 0.642 | 162 | | | |

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)).

MANUAL PULL STATION WIRING DETAIL

SCHEMATIC: NO SCALE

## 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" |
| CO | CARBON MONOXIDE DETECTOR | FIELD VERIFY |
| | SMOKE DETECTOR | CEILING |
| | DUCT SMOKE DETECTOR | BY OTHERS |
| | 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 |
| | MAGNETIC DOOR HOLDER | FIELD VERIFY |
| | WATER FLOW SWITCH | BY OTHERS |
| | VALVE TAMPER SWITCH | BY OTHERS |
| | BELL | BY OTHERS |
| | CEILING MOUNT STROBE | FIELD VERIFY |
| | CEILING MOUNT HORN / STROBE | FIELD VERIFY |
| | CEILING MOUNT SPEAKER / STROBE | FIELD VERIFY |
| LF | HORN, LOW FREQUENCY | WALL @ 10'–0 |
| | HORN / STROBE | WALL 80"–96" |
| SS | SPEAKER / STROBE | WALL 80"–96" |
| SP | SPEAKER | WALL @ 90" |
| | 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 (5W) 75 — STROBE CANDELA 30

DEVICE ADDRESS — 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)

RESERVED FOR CITY STAMP

| REVISION | DESCRIPTION | DATE |
|---|---|---|
| 0 | ISSUED FOR REVIEW & APPROVAL | 8/19/2016 |

## APPLICABLE CODES:

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

WIRE NOTE:
VERIFY EXACT WIRE TYPE WITH FIRE ALARM CONTRACTOR BEFORE ORDERING.

FIRE ALARM RISER DIAGRAM

SCHEMATIC: NO SCALE

ADDRESSABLE SMOKE DETECTOR WIRING DETAIL

SCHEMATIC: NO SCALE

MINI MONITOR MODULE WIRING DETAIL

SCHEMATIC: NO SCALE

TYPICAL 2 WIRE STROBE 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 | ACTIVATE ALTERNATE ELEVATOR RECALL | ACTIVATE PRIMARY RECALL | ACTIVATE ELEVATOR SHUNT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SMOKE DETECTORS | | ● | ● | | | | | ● | | | | | |
| HEAT DETECTORS | | ● | ● | | | | | ● | | | | | |
| PULL STATIONS | | ● | ● | | | | | ● | | | | | |
| PRIMARY RECALL FLR, ELEV LOBBY SMOKE DET | | ● | ● | | | | | ● | | | ● | | |
| ALTERNATE RECALL FLR, ELEV LOBBY SMOKE DET | | ● | ● | | | | | ● | | | | ● | |
| TOP OF ELEV SHAFT SMOKE DET | | ● | ● | | | | | ● | | | | ● | |
| ELEVATOR EQUIPMENT ROOM SMOKE DET | | ● | ● | | | | | ● | | | | ● | |
| ELEVATOR EQUIPMENT ROOM HEAT DET | | ● | ● | | | | | ● | | | | | ● |
| TOP OF ELEV SHAFT HEAT DET | | ● | ● | | | | | ● | | | | | ● |
| 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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# GRAND TRUCK BUILDING
## 1 INDIA STREET
## PORTLAND, MAINE 04101
## FACP BATTERIES, DETAILS, LEGEND, MATRIX, NOTES, RISER

Date: 12/29/16

Reviewed for Code Compliance
Inspections Division
Approved with Conditions

CITY OF PORTLAND, MAINE


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