

Point to Point NAC Voltage Drop Calculation				7/31/2017	
Project Name		Waynefleete Lower School			
Circuit Number		FACP-3			
Nominal System Voltage	20.4 volts	Wire Gauge	14	Resistance Per 1000	3.07
Minimum Device Voltage	16.0 volts	Distance from source to 1st device	80 feet	Wire Gauge for balance of circuit	14
Max Output Current	3.00 amps	Total Circuit Current	0.756 amps	End of Line Voltage	19.28 volts
<b>Circuit is within limits</b>					
Device	Current	Distance previous device	Voltage at Device	Drop from source	Percent Drop
Device 1	0.121	80	20.03	0.371	1.82%
Device 2	0.121	45	19.85	0.547	2.68%
Device 3	0.074	65	19.65	0.752	3.69%
Device 4	0.071	50	19.51	0.887	4.35%
Device 5	0.121	25	19.46	0.944	4.63%
Device 6	0.043	25	19.42	0.982	4.81%
Device 7	0.043	65	19.34	1.064	5.21%
Device 8	0.162	60	19.28	1.123	5.51%
Totals	0.756	415			
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				7/31/2017	
Project Name		Waynefleete Lower School			
Circuit Number		FACP-4			
Nominal System Voltage	20.4 volts	Wire Gauge	14	Resistance Per 1000	3.07
Minimum Device Voltage	16.0 volts	Distance from source to 1st device	65 feet	Wire Gauge for balance of circuit	14
Max Output Current	3.00 amps	Total Circuit Current	0.680 amps	End of Line Voltage	19.71 volts
<b>Circuit is within limits</b>					
Device	Current	Distance previous device	Voltage at Device	Drop from source	Percent Drop
Device 1	0.162	65	20.13	0.271	1.33%
Device 2	0.074	50	19.97	0.430	2.11%
Device 3	0.074	30	19.89	0.512	2.51%
Device 4	0.054	20	19.84	0.558	2.73%
Device 5	0.121	40	19.76	0.635	3.11%
Device 6	0.074	30	19.73	0.671	3.29%
Device 7	0.121	30	19.71	0.693	3.40%
Totals	0.680	265			
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				7/31/2017	
Project Name		Waynefleete Lower School			
Circuit Number		FACP-5			
Nominal System Voltage	20.4 volts	Wire Gauge	14	Resistance Per 1000	3.07
Minimum Device Voltage	16.0 volts	Distance from source to 1st device	80 feet	Wire Gauge for balance of circuit	14
Max Output Current	3.00 amps	Total Circuit Current	0.667 amps	End of Line Voltage	19.49 volts
<b>Circuit is within limits</b>					
Device	Current	Distance previous device	Voltage at Device	Drop from source	Percent Drop
Device 1	0.121	80	20.07	0.328	1.61%
Device 2	0.121	50	19.90	0.495	2.43%
Device 3	0.043	50	19.77	0.626	3.07%
Device 4	0.074	35	19.69	0.708	3.47%
Device 5	0.074	40	19.62	0.783	3.84%
Device 6	0.074	40	19.56	0.841	4.12%
Device 7	0.043	50	19.51	0.890	4.36%
Device 8	0.043	15	19.50	0.901	4.42%
Device 9	0.074	20	19.49	0.910	4.48%
Totals	0.667	380			
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				7/31/2017	
Project Name		Waynefleete Lower School			
Circuit Number		FACP-6			
Nominal System Voltage	20.4 volts	Wire Gauge	14	Resistance Per 1000	3.07
Minimum Device Voltage	16.0 volts	Distance from source to 1st device	90 feet	Wire Gauge for balance of circuit	14
Max Output Current	3.00 amps	Total Circuit Current	0.935 amps	End of Line Voltage	18.87 volts
<b>Circuit is within limits</b>					
Device	Current	Distance previous device	Voltage at Device	Drop from source	Percent Drop
Device 1	0.074	90	19.88	0.517	2.53%
Device 2	0.121	40	19.67	0.728	3.57%
Device 3	0.074	55	19.42	0.978	4.79%
Device 4	0.054	15	19.36	1.039	5.09%
Device 5	0.121	50	19.17	1.227	6.02%
Device 6	0.054	25	19.10	1.303	6.39%
Device 7	0.121	35	19.00	1.397	6.85%
Device 8	0.074	25	18.95	1.445	7.08%
Device 9	0.121	45	18.89	1.512	7.41%
Device 10	0.121	30	18.87	1.534	7.52%
Totals	0.935	410			
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)).					

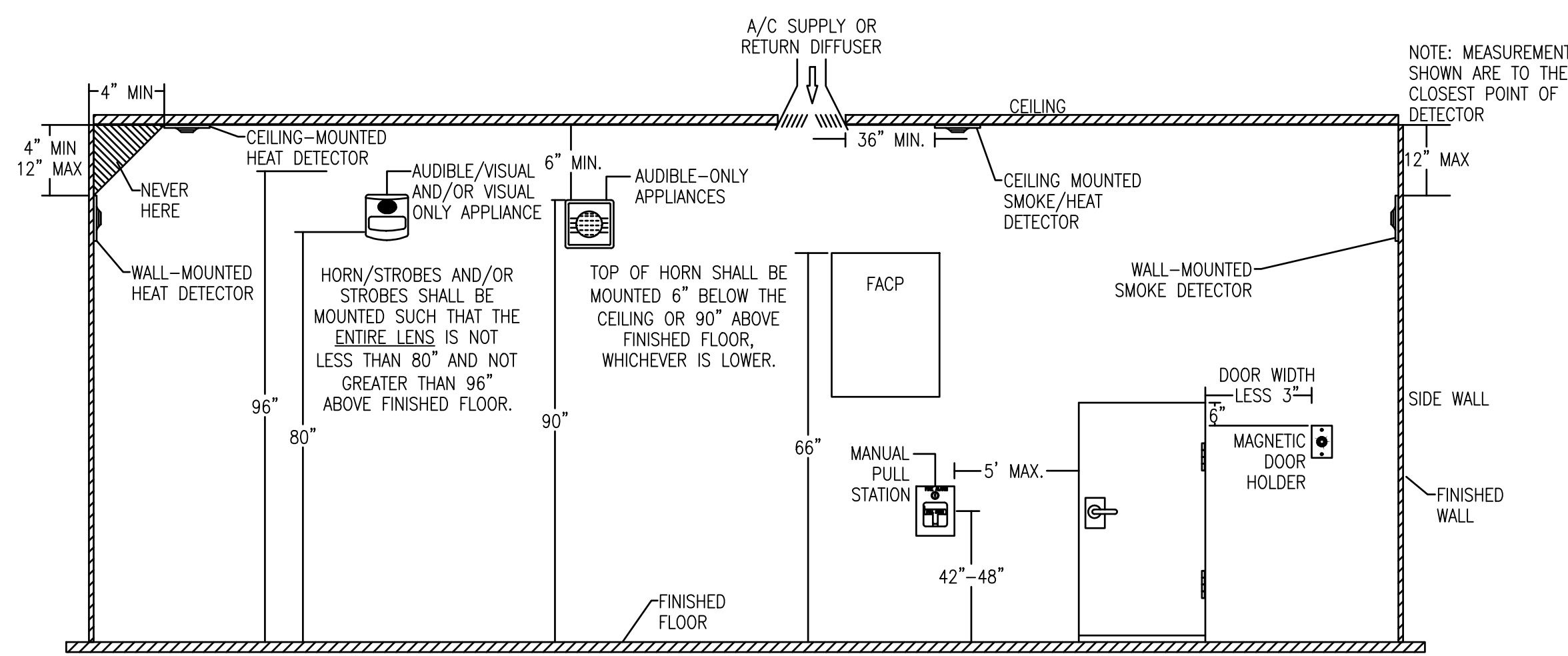
**KEY NOTES:**

- 1. ADDRESSABLE RELAY MODULE(S) PROVIDED FOR FAN SHUT DOWN. TIE TO INDICATED UNIT FAN CONTROLLER. INSTALLING CONTRACTOR SHALL FIELD VERIFY EXACT MOUNTING, CIRCUITING, AND PROGRAMMING REQUIREMENTS. FIELD VERIFY POWER SOURCE. USE MULTI-VOLTAGE CONTROL RELAY(S) IF REQUIRED. FIELD VERIFY EXACT QUANTITY AND LOCATION(S) WITH MECHANICAL DIVISION.
- 2. ADDRESSABLE RELAY MODULE(S) AND MULTI-VOLTAGE CONTROL RELAY(S) PROVIDED FOR DOOR HOLDER CONTROL. INSTALLING CONTRACTOR SHALL FIELD VERIFY EXACT MOUNTING, CIRCUITING AND PROGRAMMING REQUIREMENTS. FIELD VERIFY POWER SOURCE (24 VDC OR 120 VAC). USE MULTI-VOLTAGE CONTROL RELAY(S) IF REQUIRED. FIELD VERIFY EXACT QUANTITY AND LOCATION(S).
- 3. ADDRESSABLE MONITOR MODULE(S) PROVIDED TO MONITOR ALL WATER FLOW, PRESSURE SWITCHES, TAMPER SWITCHES AND POST INDICATING VALVES ASSOCIATED WITH THE FIRE SPRINKLER SYSTEM. INSTALLING CONTRACTOR SHALL FIELD VERIFY EXACT MOUNTING, CIRCUITING AND PROGRAMMING REQUIREMENTS. FIELD VERIFY EXACT QUANTITY AND LOCATION(S).
- 4. DUCT SMOKE DETECTORS PROVIDED FOR THE RETURN AIR PATH AT ALL AIR HANDLING UNITS HAVING A CAPACITY GREATER THAN 2,000 CFM AND FOR THE SUPPLY AIR PATH AT ALL AIR HANDLING UNITS HAVING A CAPACITY GREATER THAN 15,000 CFM. INSTALLING CONTRACTOR SHALL FIELD VERIFY EXACT MOUNTING, CIRCUITING AND PROGRAMMING REQUIREMENTS. PROVIDE FOR SHUT DOWN OF THE ASSOCIATED UNIT FAN(S). FIELD VERIFY UNIT POWER SOURCE. USE MULTI-VOLTAGE CONTROL RELAY(S) IF REQUIRED. FIELD VERIFY EXACT QUANTITY AND LOCATION(S) WITH MECHANICAL DIVISION. PROVIDE REMOTE ALARM/SUPERVISORY INDICATION IN A LOCATION ACCEPTABLE TO THE LOCAL AHJ WHEN IN-DUCT SMOKE DETECTOR INDICATOR IS NOT VISIBLE TO RESPONDING PERSONNEL.
- 5. PROVIDE HEAT DETECTOR(S) WITHIN 24" OF EACH SPRINKLER HEAD IN THE ELEVATOR CONTROL ROOM AND HOISTWAY(S). HEAT DETECTORS SHALL HAVE A LOWER TEMPERATURE RATING THAN THE SPRINKLERS IN THE AREA AND BE MONITORED FOR INTEGRITY.
- 6. ADDRESSABLE RELAY MODULES (4) PROVIDED FOR THE ELEVATOR RECALL AND SHUT DOWN. TIE TO ELEVATOR EQUIPMENT ROOM DETECTOR(S), HOISTWAY DETECTOR(S) AND LOBBY DETECTOR(S) TO INITIATE RECALL AND SHUT DOWN. ADDRESSABLE MONITOR MODULE PROVIDED TO MONITOR THE CONTROL CIRCUIT TO THE ELEVATOR SHUNT TRIP BREAKER FOR THE PRESENCE OF OPERATING VOLTAGE. LOSS OF VOLTAGE SHALL CAUSE A SUPERVISORY SIGNAL AT THE CONTROL PANEL. FIELD VERIFY EXACT MOUNTING, CIRCUITING AND PROGRAMMING REQUIREMENTS.
- 7. ADDRESSABLE MONITOR MODULE PROVIDED TO MONITOR THE KITCHEN HOOD FIRE SUPPRESSION SYSTEM. INSTALLING CONTRACTOR SHALL FIELD VERIFY EXACT MOUNTING, CIRCUITING AND PROGRAMMING REQUIREMENTS. FIELD VERIFY EXACT QUANTITY AND LOCATION(S).
- 8. FIRE ALARM SYSTEM ANNUNCIATOR TO BE INSTALLED IN A LOCATION APPROVED BY THE AHJ. CONTRACTOR TO VERIFY LOCATION PRIOR TO INSTALLATION.

**GENERAL NOTES:**

- 1. SCOPE OF WORK: THIS PROJECT SHALL INCLUDE THE INSTALLATION OF A NEW ADDRESSABLE FIRE ALARM SYSTEM.
- 2. THESE DRAWINGS ARE DIAGRAMMATIC. REFER TO THE ARCHITECTURAL DRAWINGS FOR EXACT DIMENSIONS.
- 3. INSTALLATION SHALL COMPLY WITH NEC, NFPA 72 AND ALL OTHER APPLICABLE CODES AS REQUIRED BY THE LOCAL AUTHORITY HAVING JURISDICTION.
- 4. 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.
- 5. FIRE RATINGS SHALL BE MAINTAINED FOR ALL PENETRATIONS THROUGH FIRE-RATED CONSTRUCTION.
- 6. POWER FOR ALL FIRE ALARM PANELS AND FIRE ALARM POWER SUPPLIES MUST BE PROVIDED BY A DEDICATED AC BRANCH CIRCUIT. THE LOCATION OF THE BRANCH CIRCUIT BREAKER SHALL BE PERMANENTLY IDENTIFIED AT THE CONTROL UNIT AND SHALL HAVE A RED MARKING IN ACCORDANCE WITH NFPA 72.
- 7. 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.
- 8. 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.
- 9. WHEN UTILIZING SHIELDED CABLE TIE SHIELDS THROUGH AND INSULATE AT EACH JUNCTION BOX. INSULATE AND TAPE BACK AT END.
- 10. ALL FIRE ALARM CABLING SHALL BE ACCEPTABLE TO THE FIRE ALARM EQUIPMENT MANUFACTURER FOR THE INTENDED PURPOSE.
- 11. SMOKE DETECTORS SHALL NOT BE INSTALLED UNTIL AFTER CONSTRUCTION CLEAN-UP IS COMPLETED AND FINAL.
- 12. 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.
- 13. PROVIDE SYNCHRONIZATION OF ALL VISUAL NOTIFICATION APPLIANCE CIRCUITS. PROVIDE ALL REQUIRED SYNC MODULES. PROVIDE A MULTI-SYNC MODE SLAVE CONNECTION BETWEEN ALL SYNC MODULES.
- 14. VERIFY ALL FIELD SELECTABLE AUDIBILITY SETTINGS OF NOTIFICATION APPLIANCES WITH FIRE ALARM CONTRACTOR.
- 15. 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.
- 16. PROVIDE OFF-SITE MONITORING AS REQUIRED BY THE INTERNATIONAL FIRE CODE, SECTION 907.6.5 AND THE LOCAL AUTHORITY HAVING JURISDICTION.
- 17. 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"
FSA	FIRE ALARM REMOTE ANNUNCIATOR	WALL-TOP @ 66"
RTS	REMOTE TEST SWITCH	FIELD VERIFY
AES	AES RADIO COMMUNICATOR	WALL-TOP @ 66"
KH	KITCHEN HOOD	BY OTHERS
⊙	SMOKE DETECTOR	CEILING
⊙	DUCT SMOKE DETECTOR	BY OTHERS
⊙	HEAT DETECTOR	CEILING
MM	ADDRESSABLE MONITOR MODULE	FIELD VERIFY
P	MANUAL PULL STATION	WALL @ 48"
R	CONTROL RELAY (MULTI-VOLTAGE)	FIELD VERIFY
RM	ADDRESSABLE RELAY MODULE	FIELD VERIFY
DH	MAGNETIC DOOR HOLDER	FIELD VERIFY
WF	WATER FLOW SWITCH	BY OTHERS
VS	VALVE SUPERVISORY SWITCH	BY OTHERS
⊙	CEILING MOUNT HORN / STROBE	FIELD VERIFY
⊙	HORN / STROBE	WALL 80"-96"
⊙	STROBE	WALL 80"-96"
ABBREVIATION	DESCRIPTION	
E	EXISTING	
G	WITH GUARD	
P	PENDANT 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	
NAC	NOTIFICATION APPLIANCE CIRCUIT	
SLC	SIGNALING LINE CIRCUIT	



**FIRE ALARM DEVICE MOUNTING HEIGHTS**

SCALE: NOT TO SCALE

OPERATIONS MATRIX	FIRE ALARM OUTPUT															
	ACTIVE ALARM INDICATOR	ACTIVE AUDIBLE ALARM	ACTIVE SUPERVISORY INDICATOR	ACTIVE AUDIBLE SUPERVISORY SIGNAL	ACTIVE TROUBLE INDICATOR	ACTIVE AUDIBLE TROUBLE INDICATOR	TRANSMIT ALARM SIGNAL	TRANSMIT SUPERVISORY SIGNAL	TRANSMIT TROUBLE SIGNAL	ACTIVE ALTERNATE ELEVATOR RECALL	ACTIVE PRIMARY RECALL	ACTIVE ELEVATOR SHUNT	ACTIVE FIREMAN'S HAT	ACTIVE NOTIFICATION APPLIANCES	RELEASE MAGNETICALLY HELD SMOKE DOORS	SHUTDOWN AIR HANDLERS IN EXCESS OF 2,000 CFM
FIRE ALARM INPUT																
SMOKE DETECTORS (SPOT OR BEAM)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
HEAT DETECTORS	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
DUCT 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 SUPERVISORY SWITCHES	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
FIRE ALARM AC POWER FAIL	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
FIRE ALARM LOW BATTERY	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
OPEN CIRCUIT	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
GROUND FAULT	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
NAC SHORT CIRCUIT	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
LOSS OF AC TO BUILDING	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
KITCHEN HOOD	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•

**MAINE STATE SECURITY ALARMS**

Phone: (207) 247-4371  
Toll Free: (800) 273-4371

Small Enough To Care - Large Enough To Serve  
Family owned and operated - a division of L'Heureux, Inc.

**WAYNFLETE LOWER SCHOOL**  
**360 SPRING STREET**  
**PORTLAND, MAINE 04102**  
**FIRE ALARM CALCS AND DETAILS**

DRAWN	MN UNICAD JOB #17431
CHECKED	BRADY B. HAWES NICET III 138751
DATE	8/8/17
REVISION	0
SCALE	1/8"=1'-0"

Shop drawings created by  
5784 W. 4600 St.  
Portland, ME 04115  
Office: 801.985.0410

**UNICAD** Inc.  
www.unicad.net

**FA-5**