SECTION 16100
ELECTRIC

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. THE WORK INCLUDED UNDER THIS SECTION CONSISTS OF COMPLETE ELECTRICAL SYSTEMS, AS REQUIRED TO ACCOMMODATE THE BUILDING RENOVATIONS/ALTERATIONS.
B. ELECTRIC SERVICE IS EXISTING TO BE MAINTAINED/UPGRADED.
C. BUILDING LIGHTING AND POWER SHALL BE WIRED FOR THREE PHASE, FOUR WIRE, 120/208 VOLT, 60 CYCLE A.C. SYSTEM SHALL BE COMPLETE WITH BREAKERS, PANELBOARDS, DISCONNECT SWITCHES, POWER AND LIGHTING OUTLETS, ETC
D. FURNISH, INSTALL AND CONNECT ALL PANELBOARDS, SWITCHES, POWER AND LIGHTING OUTLETS AS INDICATED OR REQUIRED.
E. WIRE AND CONNECT PLUMBING AND HEATING EQUIPMENT FURNISHED AND INSTALLED UNDER OTHER SECTIONS OF THESE SPECIFICATIONS. WIRING AND CONNECTIONS SHALL INCLUDE POWER SUPPLY AND SERVICE DISCONNECT.
F. FURNISH, INSTALL AND CONNECT ALL LIGHTING FIXTURES AND LAMPS AS INDICATED ON THE DRAWINGS AND IN THE FIXTURE SCHEDULE.
G. FURNISH AND INSTALL ALL REQUIRED SYSTEM AND EQUIPMENT GROUNDS IN ACCORDANCE WITH THE REQUIREMENTS OF THE NATIONAL ELECTRICAL CODE AND ADDITIONAL GROUNDING AS INDICATED AND SPECIFIED.
H. FURNISH, INSTALL AND CONNECT EXIT SIGNS AND EMERGENCY LIGHTING TO MAINTAIN A COMPLETE LIFE SAFETY SYSTEM.
I. EXTEND THE EXISTING SYSTEM OF CONDUITS, WIRING AND OUTLETS FOR THE DATA SYSTEM.
J. SECURE AND PAY FOR ALL PERMITS AND CERTIFICATES AS REQUIRED BY LOCAL, STATE AND FEDERAL LAWS.
K. ALL WORK SHALL BE IN ACCORDANCE WITH THE LATEST ISSUE OF THE NATIONAL ELECTRICAL CODE, NFPA 70.

1.02 RELATED REQUIREMENTS

A. CONDITIONS OF THE CONTRACT AND DIVISION 1, GENERAL REQUIREMENTS, APPLY TO ALL THE WORK, INCLUDING THE WORK OF THIS DIVISION. EXAMINE ALL CONTRACT DOCUMENTS FOR REQUIREMENTS AFFECTING THE WORK.

1.03 SHOP DRAWINGS

A. THE CONTRACTOR SHALL, AFTER AWARD OF CONTRACT AND BEFORE INSTALLATION, SUBMIT SHOP DRAWINGS, OWNER'S MANUALS AND OPERATING INSTRUCTIONS FOR EQUIPMENT TO BE FURNISHED UNDER THIS CONTRACT. SHOP DRAWINGS SHALL BE SUBMITTED FOR THE FOLLOWING ITEMS (SHOP DRAWINGS ARE REQUIRED PRIOR TO ACCEPTANCE):
 1. DISCONNECT SWITCHES.
 2. BREAKER PANELBOARDS.
 3. FIRE ALARM SYSTEM COMPONENTS, SHOP DRAWINGS SHALL SHOW INDICATING AND INITIATIVE DEVICE TYPE AND LOCATION AND SHALL INDICATE ANY DEVICE CONTROLLED IN SUCH CASES. SHOP DRAWINGS SHALL ALSO PROVIDE DEVICE NUMBER, AREA OR ROOM NUMBER INDICATING DEVICE LABEL, TYPE AND ENGINEERING DATA.
 4. LUMINAIRES
 5. WIRING MATERIALS AND DEVICES.
 6. SUBMITTALS AND SHOP DRAWINGS SHALL BE PROVIDED FOR ALL PROPOSED EQUIPMENT, COMPONENTS, AND ACCESSORIES.

1.04 PROJECT CLOSE-OUT DOCUMENTATION

A. SAFETY MATERIAL SAFETY DATA SHEETS RECEIVED.
B. INSTRUCTION MANUALS SHALL BE PROVIDED FOR ALL PROPOSED EQUIPMENT, COMPONENTS, AND ACCESSORIES.

1.05 RECORD DRAWINGS

A. THE CONTRACTOR SHALL KEEP A MARKED SET OF DRAWINGS AT THE SITE AS A RECORD SET INDICATING ALL REVISIONS IN THE WORK AS THE WORK PROGRESSES. AT THE COMPLETION OF THE WORK, THE DRAWINGS SHALL BE MARKED "AS-BUILT DRAWINGS" WITH THE CONTRACTOR'S NAME AND DATE, AND SHALL BE DELIVERED TO THE ARCHITECT.

PART 2 - PRODUCTS

2.01 PANELBOARDS

A. BREAKER PANELBOARDS SHALL HAVE MAINS AND CIRCUITS AS INDICATED ON THE DRAWINGS AND ALL DESIGNED FOR THREE PHASE, FOUR WIRE, SOLID NEUTRAL, 60 CYCLE SERVICE RATED FOR 120/208 VOLT SERVICE.
B. BREAKERS SHALL BE TOGGLE TYPE THERMAL-MAGNETIC, QUICK-MAKE, QUICK-BREAK, WITH SILVER-PLATED CONTACTS, BOLT-IN TYPE, AND WITH COMMON TRIP FOR MULTIPOLE CIRCUITS. BREAKERS SHALL HAVE A MINIMUM THICKNESS OF 1" PER POLE. BREAKERS SHALL HAVE A MINIMUM SYMMETRICAL INTERRUPTING RATING COORDINATED WITH THE EXISTING DISTRIBUTION SYSTEM.
C. PANELBOARDS SHALL HAVE FULL SIZE NEUTRAL BAR INSULATED FROM THE CABINET AND PROVIDED WITH LUGS FOR EACH BRANCH CIRCUIT SPACE IN THE PANEL.
D. ALL PANELBOARDS SHALL HAVE A BONDING STRAP SECURELY ATTACHED TO THE CABINET WITH LUGS AS REQUIRED TO RECEIVE THE BONDING CONDUCTORS INDICATED AND SPECIFIED.
E. PANELBOARDS SHALL BE FLUSH OR SURFACE MOUNTING, ETC., AS INDICATED BY THE PANEL SCHEDULE, CODE GAUGE GALVANIZED STEEL BOXES AND ENAMELED STEEL FRONTS SIZED FOR 6" MINIMUM SIDE, TOP AND BOTTOM GUTTERS, OR GREATER AS REQUIRED BY NEC.
F. PANELS SHALL HAVE COPPER BUS SIZED AS INDICATED ON THE DRAWINGS AND SHALL BE PROVIDED WITH SUBFEED LUGS AS REQUIRED. ALL PANELBOARD LUGS SHALL BE DESIGNED FOR USE FOR BOTH COPPER AND ALUMINUM CONDUCTORS.
G. EACH PANEL SHALL HAVE DOOR PROVIDED WITH CYLINDER LOCK AND LATCH. EACH PANEL SHALL HAVE TYPED DIRECTORY. LOCKS FOR ALL PANELS SHALL HAVE COMMON KEY. DIRECTORIES SHALL BE COMPLETELY FILLED IN INDICATING OUTLETS, FIXTURES, DEVICES AND LOCATIONS SERVED BY THE CIRCUIT.
H. PANELBOARDS SHALL BE AS MANUFACTURED BY GENERAL ELECTRIC., ITE SIEMENS, SQUARE-D OR CUTLER HAMMER.
I. PROVIDE MOLDED CASE CIRCUIT BREAKERS IN NEMA-1 ENCLOSURES WHERE INDICATED ON DRAWINGS.

2.02 DISCONNECT SWITCHES

A. FUSED AND UNFUSED DISCONNECT SWITCHES SHALL BE ENCLOSED, HEAVY DUTY TYPE, EXCEPT AS NOTED. SWITCHES SHALL HAVE VISIBLE BLADES AND SHALL HAVE NEMA-1 ENCLOSURE, 250-VOLT RATED AS REQUIRED BY THE PARTICULAR CIRCUIT WITH FUSES AND AMPERE RATING AND NUMBER OF POLES AS INDICATED ON DRAWINGS, OR AS REQUIRED BY THE SPECIFIC EQUIPMENT. WHERE REQUIRED FOR EXTERIOR USE, SWITCHES SHALL BE NEMA-3R RAIN TIGHT.
B. FUSES FOR ALL FUSE CLIPS, PLUGS, ETC., SHALL BE PROVIDED AND ONE (1) SPARE SET DELIVERED TO OWNER. A DUPLICATE SET OF SPARE FUSES SHALL BE DELIVERED TO OWNER AND A RECEIPT SHALL BE DELIVERED TO THE ARCHITECT WITH THE REQUEST FOR FINAL PAYMENT. FUSES SHALL BE BUSSMAN OR CHASE SHAWMUT.
C. DISCONNECT SWITCHES SHALL BE AS MANUFACTURED BY ITE SIEMENS, SQUARE-D, CUTLER HAMMER, OR GENERAL ELECTRIC.

2.03 WIRING MATERIALS

A. IN GENERAL, WHEREVER EXISTING BUILDING CONDITIONS ALLOW, RACEWAYS SHALL BE CONCEALED ABOVE CEILINGS AND WITHIN FINISHED WALLS-SECURELY SUPPORTED IN ACCORDANCE WITH CODE REQUIREMENTS. WIRING IN AREAS WITH NO FINISHED CEILINGS (EXPOSED CONSTRUCTION) SHALL BE EXPOSED OVERHEAD SUCH THAT ALL RACEWAYS ARE PARALLEL OR PERPENDICULAR TO JOISTS, COLUMNS OR BEAMS.
 1. OBTAIN APPROVAL FROM THE OWNER BEFORE RUNNING EXPOSED WIRING.
 2. ALL EXPOSED WIRING SHALL BE PAINTED TO MATCH SURFACE MOUNTED TO.
B. EXCEPT AS OTHERWISE SPECIFICALLY NOTED, ALL WIRING THROUGHOUT THE BUILDING, INCLUDING RACEWAYS FOR EACH OF THE SYSTEMS SPECIFIED, SHALL BE ENCLOSED IN INTERMEDIATE STEEL OR RIGID GALVANIZED STEEL OR HEAVY WALL ALUMINUM CONDUIT; OR GALVANIZED STEEL ELECTRICAL METALLIC TUBING; ALL SIZED IN ACCORDANCE WITH CODE REQUIREMENTS FOR THE CONDUCTORS INDICATED. MINIMUM SIZE SHALL BE 3/4" EXCEPT AS NOTED.
 1. ALL COUPLINGS AND CONNECTORS FOR ELECTRICAL METALLIC TUBING SHALL BE SET-SCREW OR COMPRESSION TYPE.
 2. TERMINATION FOR ALL CONDUIT AND TUBING SHALL HAVE INSULATED BUSHINGS OR INSULATED THROAT CONNECTORS IN ACCORDANCE WITH CODE EQUIREMENTS.
 3. CONNECTIONS TO ALL MOTORS WHERE FLEXIBLE PERMANENT CONNECTION IS REQUIRED SHALL BE PROVIDED WITH TWO FEET (2') OF FLEXIBLE LIQUID-TIGHT TYPE UA CONDUIT, USING APPROVED LIQUID-TIGHT FITTINGS.
 4. ALL CONDUITS SHALL BE SUBSTANTIALLY SUPPORTED WITH APPROVED CLIPS OR HANGERS SPACED NOT TO EXCEED TEN FEET (10') ON CENTERS EXCEPT 7' RIGID CONDUIT AND 2" AND 3/4" ELECTRICAL METALLIC TUBING SHALL HAVE SUPPORTS SPACED NOT TO EXCEED SIX FEET (6'). PROVIDE AND INSTALL SUPPORTING RACKS OF POWER-STRUT, OR APPROVED EQUAL, FOR PARALLEL RUNS OF CONDUIT.
C. WIREWAYS SHALL BE FURNISHED AND INSTALLED COMPLETE AS INDICATED ON THE DRAWINGS FOR THE NUMBER OF CIRCUITS INDICATED.
 1. WIREWAYS SHALL BE UNDERWRITERS' APPROVED, CODE GAUGE, ENAMELED STEEL OF SIZES AS INDICATED, WITH COUPLINGS, FITTINGS, OFFSETS, SUPPORTS, END CAPS, ETC., COMPLETE. ALL WIREWAYS SHALL HAVE SCREW TYPE COVERS, WITH BUILT-IN PROTECTION OF CONDUCTORS FROM COVER SCREWS. FITTINGS SHALL HAVE REMOVABLE FRONT COVERS FOR INSTALLATION OF WIRES. WIREWAY SHALL HAVE KNOCKOUTS TOP AND BOTTOM AND COVER ON FRONT.
 2. PROVIDE SUPPORTS AS APPROVED WITH SUPPORTS LOCATED AT EVERY SPLICE AND FITTING AND AT INTERVALS NOT EXCEEDING FIVE FEET.
 3. WIREWAYS SHALL BE AS MANUFACTURED BY ITE, SQUARE D, OR GENERAL ELECTRIC, OR APPROVED EQUAL, FOR TRIM AND NEAT INSTALLATION.
D. WIRING SHALL BE COPPER CONDUCTORS WITH THHN OR XHHW INSULATION RATED FOR 600-VOLTS, EXCEPT AS NOTED. WIRING #8 AWG AND LARGER SHALL BE STRANDED. ALL WIRING SHALL BE UL LABELED AND INDICATE MANUFACTURER'S NAME, TYPE AND SIZE.
 1. SIZES SHALL BE NOT LESS THAN INDICATED. SIZES SHALL BE NOT SMALLER THAN NO. 12 AWG. CONDUCTORS FOR BRANCH CIRCUITS OF 120 VOLTS MORE THAN 100 FEET LONG FROM PANEL TO LOAD SHALL BE NO. 10 AWG. TYPE MC (METAL CLAD) FOR BRANCH CIRCUITS #10 AND SMALLER MAY BE UTILIZED.
 2. NON-LOAD-CARRYING CONTROL CIRCUIT WIRING FROM MOTOR CONTROL DEVICES TO MOTOR CONTROL MAY BE #14 AWG WITH CONTROL CIRCUIT FUSING SIZED ACCORDINGLY. WIRE SHALL BE INSULATED FOR 600 VOLTS.
 3. FEEDER CONDUCTORS FROM MAIN SERVICE TO DISTRIBUTION PANELS TO PANELBOARDS, AND WHERE ELSEWHERE SPECIFIED, SHALL BE TYPE XHHW-2 INSULATED FOR 600 VOLTS.
 4. WIRING FOR RECESSED AND SURFACE INCANDESCENT FIXTURES SHALL BE RATED MINIMUM 300 DEGREES F IN METALLIC CONDUIT WHERE REQUIRED FOR UNDERWRITERS' APPROVAL. WIRING WITHIN FLUORESCENT FIXTURE HOUSINGS AND BETWEEN FIXTURES AND JUNCTION BOXES ABOVE CEILINGS SHALL BE TYPE THHN INSULATED CONDUCTORS RATED FOR USE AT TEMPERATURES NOT LOWER THAN 90 DEGREES C.
E. ALL EXPOSED WIRING SHALL HAVE THREADED CAST "CONDULET" TYPE FITTINGS. FITTINGS AND BOXES FOR EXTERIOR INSTALLATION SHALL BE WEATHERPROOFED.
F. JUNCTION BOXES SHALL BE STANDARD TYPE GALVANIZED STEEL MINIMUM SIZE FOUR INCH (4") OCTAGON OR FOUR INCH (4") SQUARE 2-1/8" MINIMUM DEPTH, EXCEPT AS NOTED. PROVIDE PLASTER RINGS RAISED UP TO 1-1/4" ON BOXES AS REQUIRED. JUNCTION BOXES SHALL BE SPECIALLY CONSTRUCTED OF CODE GAUGE GALVANIZED SHEET STEEL WHERE REQUIRED. LIGHT OUTLET BOXES ARE TO BE PROVIDED WITH DRILLED AND TAPPED EARS TO RECEIVE FIXTURE BARS. USE 4-11/16" SQUARE BOXES WHERE REQUIRED.
 1. OUTLET BOXES, FITTINGS, ETC., FOR EXTERIOR USE SHALL BE CAST TYPE "CONDULET" WITH GASKETS FOR WATERPROOFING.
 2. PULL BOXES SHALL BE INSTALLED WHERE INDICATED OR REQUIRED. BOXES SHALL BE GALVANIZED STEEL OF ADEQUATE SIZE FOR ALL CONDUCTORS INSTALLED THEREIN, AND SHALL HAVE EITHER SCREW TYPE OR HINGED FLUSH COVERS AS REQUIRED.
 3. ALL BOXES SHALL BE RIGIDLY SUPPORTED AS APPROVED.
 4. CONDUIT CONNECTIONS: WHEN CONDUIT IS JOINED TO A NON-THREADED OR HUBLESS NEMA 1 OR NEMA 1A BOX OR ENCLOSURE, IT SHALL BE JOINED BY MEANS OF TWO LOCKNUTS AND INSULATED OR GROUNDING BUSHING, AS REQUIRED. WHEN CONDUIT IS JOINED TO A NON-THREADED OR HUBLESS NEMA 12 OR WATERTIGHT BOX OR ENCLOSURE, IT SHALL BE JOINED BY MEANS OF MYERS "SCRU-TITE," OR EQUAL HUBS.
 5. CONDUITS AND SLEEVES PENETRATING FIRE RATED BARRIERS SHALL BE SEALED AND/OR FILLED WITH APPROVED MATERIAL TO MAINTAIN THE FIRE RATING.

2.04 WIRING DEVICES

A. WIRING DEVICES SHALL BE AS MANUFACTURED BY HUBBELL, EXCEPT AS OTHERWISE SPECIFICALLY NOTED. DEVICES HAVING EQUIVALENT DETAILS AND MATCHING INTERCHANGEABLE CHARACTERISTICS AS MANUFACTURED BY BRYANT ELECTRIC COMPANY, PASS & SEYMOUR OR LEVITON SPEC-GRADE MAY BE USED SUBJECT TO SUBMITTAL AND APPROVAL OF SHOP DRAWINGS.
B. WALL SWITCHES SHALL BE 20 AMPERE, TOGGLE TYPE, 277 VOLT RATED HBL1221 SERIES.
C. PILOT LIGHTS INDICATED WITH THE SWITCHES SHALL BE HBL1221PL.
D. CONVENIENCE OUTLET RECEPTACLES SHALL BE DUPLEX GROUNDING TYPE, 20 AMPERE. ALL RECEPTACLES SHALL BE INSTALLED WITH "U" GROUND AT TOP.
E. RECEPTACLES SHALL BE NO. CR5352I FOR 20 AMPERE.
F. INSTALL WEATHERPROOF AND WATERPROOF RECEPTACLE COVERS IN DAMP AND WET LOCATIONS, AND OUTSIDE.
G. GROUND FAULT RECEPTACLES SHALL BE HUBBELL, SPEC-GRADE, OR EQUAL, FURNISH WITH SPECIAL PLATE, AND INSTALL PER MANUFACTURER'S INSTRUCTIONS. SUPPLY LOAD TYPE GFCI TO SERVE OTHER RECEPTACLES ON SAME CIRCUIT.
 1. GFCI DUPLEX RECEPTACLE, RATED 20 AMP, 120 VOLT:
 2. HUBBELL, MODEL GF5362I SERIES.
H. SWITCHES AND RECEPTACLES SHALL BE IVORY.
I. PLATES IN GENERAL AREAS FOR RECEPTACLES, TELEPHONE/DATA, PILOT LIGHTS, ETC., SHALL BE NYLON.
J. PLATES FOR SURFACE MOUNTING IN UTILITY AREAS SHALL BE CADMIUM PLATED STEEL WITH ROUNDED EDGES.

2.05 METALLIC BONDING SYSTEM

A. PROVIDE AND INSTALL 600 VOLT INSULATED BONDING CONDUCTORS THROUGHOUT THE DISTRIBUTION SYSTEM WITH CONNECTION TO BONDING (OR GROUNDING) TERMINAL ON EACH PANEL AND PANELBOARD AND WITH CONNECTIONS TO OTHER EQUIPMENT WHERE SPECIFICALLY INDICATED AND NOTED.
B. PROVIDE AND INSTALL BONDING CONDUCTOR TO EACH ITEM OF ELECTRICAL EQUIPMENT.
C. BONDING CONDUCTORS SHALL BE CONTINUOUS WHERE POSSIBLE. WHERE SPLICES ARE REQUIRED, PROVIDE T & B, OR APPROVED EQUAL, COMPRESSION CONNECTORS OF APPROVED PATTERN. INSULATE CONNECTORS TO EQUIVALENT THICKNESS OF CONDUCTORS.

2.06 HEATING, VENTILATING, PLUMBING, AND EQUIPMENT FURNISHED UNDER OTHER SECTIONS OF THESE SPECIFICATIONS

A. WIRE AND CONNECT SUPPLY AND EXHAUST FANS, AIR HANDLING UNITS, ENERGY RECOVERY UNITS, CIRCULATORS, AND PUMPS, AS FURNISHED UNDER OTHER SECTIONS OF THESE SPECIFICATIONS, AS INDICATED ON THE DRAWINGS AND IN THE SPECIFICATIONS.
B. WIRING SHALL INCLUDE FINAL BRANCH CIRCUIT CONNECTIONS TO DISCONNECTS, MOTOR CONTROLLERS AND MOTORS.
C. FUSED AND NON-FUSED DISCONNECT SWITCHES SHALL BE FURNISHED AND INSTALLED UNDER SECTION 16100 FOR THE ABOVE EQUIPMENT, AS REQUIRED, EXCEPT DISCONNECT SWITCHES SPECIFICALLY PROVIDED WITH THE EQUIPMENT.
D. EXCEPT AS SPECIFICALLY NOTED, MOTORS, VARIABLE FREQUENCY DRIVES, MAGNETIC OR MANUAL STARTERS AND THERMAL OVERLOAD PROTECTION WILL BE FURNISHED WITH THE EQUIPMENT FOR INSTALLATION UNDER SECTION 16100, EXCEPT AS FOLLOWS:
E. SMALL MOTOR STARTER SWITCHES, PUSH BUTTONS, AND LIGHT/FAN SWITCHES SHALL BE PROVIDED AND INSTALLED UNDER THIS SECTION AS REQUIRED. COORDINATE WITH EQUIPMENT SCHEDULES ON H&V DRAWINGS.
F. TEMPERATURE CONTROL WIRING SHALL BE PROVIDED AND INSTALLED UNDER DIVISION 15.

2.07 FIRE ALARM SYSTEM

A. THE EXISTING FIRE ALARM CONTROL PANEL IS NOTIFIER MODEL NFW2-100 WITH XRM-24 TRANSFORMER. PROVIDE ALL NECESSARY DEVICES, MODULES AND COMPONENTS REQUIRED FOR A COMPLETE OPERATIONAL SYSTEM AS SPECIFIED HEREIN.
B. PROVIDE/UPDATE SYSTEM DOCUMENT STO REPRESENT FINAL CONDITION OF SYSTEM.

SYSTEM COMPONENTS

A. HORN/STROBES: COMBINATION AUDIBLE/VISIBLE SIGNALS SHALL BE SIMILAR TO WHEELOCK #NS SERIES.
 1. PEAK SOUND OUTPUT: 90 DBA.
 2. ABILITY TO SILENCE THE HORN WHILE LEAVING THE VISIBLE SIGNAL ACTIVE.
 3. CAPABLE OF MEETING THE CANDELA REQUIREMENTS OF ADA.
 4. POLARIZED TO ALLOW ELECTRICAL SUPERVISION.
 5. CANDELA RATINGS: SELECTABLE 15, 30, 75, 110, WITH VISUAL INDICATOR.
 6. SET INITIALLY AS SHOWN ON DRAWINGS. WHERE DRAWINGS SHOW 15/75, THEN USE A FIXED 15/75 OR SET SELECTION AT 75.
 7. RED FACE PLATE WITH WHITE LETTERS.
B. STROBE LIGHTS SHALL BE SIMILAR TO WHEELOCK #RSS24MC-WFR AND SHALL MEET THE REQUIREMENTS OF THE ADA, UL STANDARD 1971 AND SHALL MEET THE FOLLOWING CRITERIA:
 1. THE MAXIMUM PULSE DURATION SHALL BE 2/10 OF ONE SECOND.
 2. STROBE INTENSITY SHALL MEET THE REQUIREMENTS OF UL 1971.
 3. THE FLASH RATE SHALL MEET THE REQUIREMENTS OF UL 1971.
 4. WHERE MORE THAN ONE STROBE IS VISIBLE IN ONE LOCATION, SYNCHRONIZATION SHALL BE REQUIRED.
 5. CANDELA RATINGS: SELECTABLE 15, 30, 75, 110, WITH VISUAL INDICATOR.
 6. SET INITIALLY AS SHOWN ON DRAWINGS. WHERE DRAWINGS SHOW 15/75, THEN USE A FIXED 15/75 OR SET SELECTION AT 75.
 7. RED FACE PLATE WITH WHITE LETTERS.
C. MINI-HORN/STROBES: COMBINATION AUDIBLE/VISIBLE SIGNALS SHALL BE SIMILAR TO WHEELOCK #NS SERIES.
 1. PEAK SOUND OUTPUT: 90 DBA.
 2. ABILITY TO SILENCE THE HORN WHILE LEAVING THE VISIBLE SIGNAL ACTIVE.
 3. CAPABLE OF MEETING THE CANDELA REQUIREMENTS OF ADA.
 4. POLARIZED TO ALLOW ELECTRICAL SUPERVISION.
 5. CANDELA RATINGS: 15, 30, 75, 110, WITH VISUAL INDICATOR.
 6. SET INITIALLY AS SHOWN ON DRAWINGS. WHERE DRAWINGS SHOW 15/75, THEN USE A FIXED 15/75 OR SET SELECTION AT 75.
 7. RED FACE PLATE WITH WHITE LETTERS.
 8. MINI-HORNS IN SMALL ROOMS AND WHERE INDICATED: USE LOWEST SOUNDING LEVEL SETTING.
D. ADDRESSABLE DEVICES - GENERAL:
 1. ADDRESSABLE DEVICES SHALL MAINTAIN DECADE (NUMBERED 0 TO 15 AND 0 TO 9) TYPE ADDRESS SWITCHES.
 2. DETECTORS SHALL BE INTELLIGENT (ANALOG) AND ADDRESSABLE, AND SHALL CONNECT WITH TWO WIRES TO THE FACP SIGNALING LINE CIRCUIT.
 3. ADDRESSABLE SMOKE AND THERMAL DETECTORS SHALL PROVIDE DUAL ALARM AND POWER/POLLING LEDS. BOTH LED'S SHALL FLASH UNDER NORMAL CONDITIONS, INDICATING THAT THE DETECTOR IS OPERATIONAL AND IN REGULAR COMMUNICATION WITH THE CONTROL PANEL, AND BOTH LED'S SHALL BE PLACED INTO STEADY ILLUMINATION BY THE CONTROL PANEL, INDICATING THAT AN ALARM CONDITION HAS BEEN DETECTED. IF REQUIRED, THE LED FLASH SHALL HAVE THE ABILITY TO BE REMOVED FROM THE SYSTEM PROGRAM. AN OUTPUT CONNECTION SHALL ALSO BE PROVIDED IN THE BASE TO CONNECT AN EXTERNAL REMOTE ALARM LED.
 4. SMOKE DETECTOR SENSITIVITY SHALL BE SET IN THE FIRE ALARM CONTROL PANEL AND SHALL BE ADJUSTABLE IN THE FIELD THROUGH THE FIELD PROGRAMMING OF THE SYSTEM. SENSITIVITY MAY BE AUTOMATICALLY ADJUSTED BY THE PANEL ON A TIME-OF-DAY BASIS.
 5. USING MICROPROCESSOR BASED DETECTORS SHALL AUTOMATICALLY COMPENSATE FOR DUST ACCUMULATION AND OTHER SLOW ENVIRONMENTAL CHANGES THAT MAY AFFECT THEIR PERFORMANCE. THE DETECTORS SHALL BE LISTED BY UL AS MEETING THE CALIBRATED SENSITIVITY TEST REQUIREMENTS OF NFPA STANDARD 72, CHAPTER 7.
 6. THE DETECTORS SHALL BE CEILING-MOUNT AND SHALL INCLUDE A SEPARATE TWIST-LOCK BASE WITH TAMPER PROOF FEATURE.
 7. THE DETECTORS SHALL PROVIDE A TEST MEANS WHEREBY THEY WILL SIMULATE AN ALARM CONDITION AND REPORT THAT CONDITION TO THE CONTROL PANEL. SUCH A TEST MAY BE INITIATED AT THE DETECTOR ITSELF (BY ACTIVATING A MAGNETIC SWITCH) OR INITIATED REMOTELY ON COMMAND FROM THE CONTROL PANEL.
 8. DETECTORS SHALL ALSO STORE AN INTERNAL IDENTIFYING TYPE CODE THAT THE CONTROL PANEL SHALL USE TO IDENTIFY THE TYPE OF DEVICE (ION, PHOTO, THERMAL).
 9. DETECTORS SHALL OPERATE IN AN ANALOG FASHION, WHERE THE DETECTOR SIMPLY MEASURES ITS DESIGNED ENVIRONMENT VARIABLE AND TRANSMITS AN ANALOG VALUE TO THE FACP BASED ON REAL-TIME MEASURED VALUES. THE FACP SOFTWARE, NOT THE DETECTOR, SHALL MAKE THE ALARM/NORMAL DECISION, THEREBY ALLOWING THE SENSITIVITY OF EACH DETECTOR TO BE SET IN THE FACP PROGRAM AND ALLOWING THE SYSTEM OPERATOR TO VIEW THE CURRENT ANALOG VALUE OF EACH DETECTOR.
 10. ADDRESSABLE DEVICES SHALL PROVIDE ADDRESS-SETTING MEANS USING DECIMAL SWITCHES AND SHALL ALSO STORE USE TO IDENTIFY THE TYPE OF DEVICE. LED(S) SHALL BE PROVIDED THAT SHALL FLASH UNDER NORMAL CONDITIONS, INDICATING THAT THE DEVICE IS OPERATIONAL AND IS IN REGULAR COMMUNICATION WITH THE CONTROL PANEL.
 11. A MAGNETIC TEST SWITCH SHALL BE PROVIDED TO TEST DETECTORS AND MODULES. DETECTORS SHALL REPORT AN INDICATION OF AN ANALOG VALUE REACHING 100% OF THE ALARM THRESHOLD.
E. ADDRESSABLE PULL BOX (MANUAL STATION):
 1. ADDRESSABLE PULL BOXES SHALL, ON COMMAND FROM THE CONTROL PANEL, SEND DATA TO THE PANEL REPRESENTING THE STATE OF THE MANUAL SWITCH AND THE ADDRESSABLE COMMUNICATION MODULE STATUS. THEY SHALL USE A KEY OPERATED TEST-RESET LOCK, AND SHALL BE DESIGNED SO THAT AFTER ACTUAL EMERGENCY OPERATION, THEY CANNOT BE RESTORED TO NORMAL USE EXCEPT BY THE USE OF A KEY.
 2. ALL OPERATED STATIONS SHALL HAVE A POSITIVE, VISUAL INDICATION OF OPERATION AND UTILIZE A KEY TYPE RESET.
 3. MANUAL STATIONS SHALL BE CONSTRUCTED OF LEXAN WITH CLEARLY VISIBLE OPERATING INSTRUCTIONS PROVIDED ON THE COVER. THE WORD FIRE SHALL APPEAR ON THE FRONT OF THE STATIONS IN RAISED LETTERS, 1/75 INCHES OR LARGER.
 4. STATIONS SHALL BE SUITABLE FOR SURFACE MOUNTING AS SHOWN ON THE PLANS, AND SHALL BE INSTALLED NOT LESS THAN 42 INCHES, NOT MORE THAN 48 INCHES ABOVE THE FINISHED FLOOR.
 5. MANUAL BOXES SHALL BE THE DOUBLE ACTION TYPE.
F. INTELLIGENT PHOTOELECTRIC SMOKE DETECTOR: THE DETECTORS SHALL USE THE PHOTOELECTRIC (LIGHT-SCATTERING) PRINCIPAL TO MEASURE SMOKE DENSITY AND SHALL, ON COMMAND FROM THE CONTROL PANEL, SEND DATA TO THE PANEL REPRESENTING THE ANALOG LEVEL OF SMOKE DENSITY.
G. INTELLIGENT THERMAL DETECTORS: THERMAL DETECTORS SHALL BE INTELLIGENT ADDRESSABLE DEVICES RATED AT 135 F. (58 C.) AND HAVE A RATE-OF-RISE ELEMENT RATED AT 15 F. (9.4 C.) PER MINUTE. IT SHALL CONNECT VIA TWO WIRES TO THE FIRE ALARM CONTROL PANEL SIGNALING LINE CIRCUIT.
H. INTELLIGENT DUCT SMOKE DETECTOR:
 1. THE IN-DUCT SMOKE DETECTOR HOUSING SHALL ACCOMMODATE EITHER AN INTELLIGENT IONIZATION DETECTOR OR AN INTELLIGENT PHOTOELECTRIC DETECTOR, THAT PROVIDES CONTINUOUS ANALOG MONITORING AND ALARM VERIFICATION FROM THE PANEL. INCLUDE SAMPLING TUBE.
 2. WHEN SUFFICIENT SMOKE IS SENSED, AN ALARM SIGNAL IS INITIATED AT THE FACP, AND APPROPRIATE ACTION TAKEN TO CHANGE OVER AIR HANDLING SYSTEMS TO HELP PREVENT THE RAPID DISTRIBUTION OF TOXIC SMOKE AND FIRE GASES THROUGHOUT THE AREAS SERVED BY THE DUCT SYSTEM.
 3. WHETHER SHOWN ON PLANS OR NOT, ALL AIR HANDLING SYSTEMS OPERATING AT 2000 CFM AND ABOVE SHALL HAVE DUCT MOUNTED SMOKE DETECTION EQUIPMENT IN ACCORDANCE WITH THE REQUIREMENTS OF NFPA 90A. SEE AIR HANDLING SCHEDULES ON MECHANICAL DRAWINGS. PROVIDE LABELED REMOTE TEST AND INDICATING STATIONS AT THE FIRE ALARM CONTROL PANEL. USE PHOTOELECTRIC TYPE DETECTOR WITH DUCT HOUSING AND RELAYS APPROPRIATE FOR DUCT SIZE AND AIR VOLUME TO LENGTH (WIDTH OF DUCT).
I. ADDRESSABLE DRY CONTACT MONITOR MODULE (FMM): SHOWN ON DRAWINGS AS AMM (ADDRESSABLE MONITOR MODULE).
 1. ADDRESSABLE MONITOR MODULES SHALL BE PROVIDED TO CONNECT SUPERVISED IDC ZONE OF CONVENTIONAL ALARM INITIATING DEVICES (ANY N.O. DRY CONTACT) TO ONE OF THE ADDRESSABLE SLC LOOPS.
 2. THE MONITOR MODULE SHALL MOUNT IN A 4-INCH SQUARE, 2-1/8 INCH DEEP ELECTRICAL BOX.
 3. THE IDC ZONE MAY BE WIRE FOR STYLE D OR STYLE B OPERATION. AN LED SHALL BE PROVIDED THAT SHALL FLASH UNDER NORMAL CONDITIONS, INDICATING THAT THE MODULE IS OPERATIONAL AND IN REGULAR COMMUNICATION WITH THE CONTROL PANEL.
J. ADDRESSABLE CONTROL MODULE (FCM):SHOWN ON DRAWINGS AS ARM (ADDRESSABLE RELAY MODULE)
 1. ADDRESSABLE CONTROL MODULE SHALL BE PROVIDED TO SUPERVISE AND CONTROL THE OPERATION OF ONE CONVENTIONAL NACS OF COMPATIBLE, 24 VOLTS POWERED, POLARIZED AUDIBLE/VISUAL NOTIFICATION APPLIANCES. FOR FAN SHUTDOWN AND OTHER AUXILIARY CONTROL FUNCTIONS, THE CONTROL MODULE MAY BE SET TO OPERATE AS A DRY CONTACT RELAY.
 2. THE CONTROL MODULE SHALL MOUNT IN A STANDARD 4-INCH SQUARE, 2-1/8 INCH DEEP ELECTRICAL BOX, OR TO A SURFACE MOUNTED BACKBOX.
 3. THE CONTROL MODULE NAC MAY BE WIRED FOR STYLE Z OR STYLE Y (CLASS A/B) WITH UP TO 1 AMP OF INDUCTIVE A/V SIGNAL, OR 2 AMPS OF RESISTIVE A/V SIGNAL OPERATION, OR AS A DRY CONTACT (FORM-C) RELAY. THE RELAY COIL SHALL BE MAGNETICALLY LATCHED TO REDUCE WIRING CONNECTION REQUIREMENTS, AND TO ENSURE THAT 100% OF ALL AUXILIARY RELAY OR NACS MAY BE ENERGIZED AT THE SAME TIME ON THE SAME PAIR OF WIRES.
 4. AUDIO/VISUAL POWER SHALL BE PROVIDED BY A SEPARATE SUPERVISED POWER LOOP FROM THE MAIN FIRE ALARM CONTROL PANEL OR FROM A SUPERVISED, UL LISTED REMOTE POWER SUPPLY.
 5. THE CONTROL MODULE SHALL BE SUITABLE FOR PILOT DUTY APPLICATIONS AND RATED FOR A MINIMUM OF .6 AMPS AT 30 VDC.
K. FIRE ALARM POWER BRANCH CIRCUITS: SPECIFIED IN SECTION 16123.
L. ALARM SYSTEM WIRING WITHIN BUILDING: MINIMUM SIZE #16 AWG FOR INITIATING CIRCUITS AND #14 AWG FOR ALARM SIGNAL CIRCUITS, ALL COPPER-THWN, EXCEPT AS NOTED. NON POWER-LIMITED WIRING AND EXPOSED WIRING SHALL BE IN RIGID CONDUIT OR ELECTRICAL METALLIC TUBING OR FLEXIBLE METAL CONDUIT IN ACCORDANCE WITH WIRE AND CABLE: WIRING METHODS. CONCEALED POWER LIMITED WIRING IN DRY LOCATIONS ABOVE CEILINGS, IN ATTIC SPACE