SECTION 27 15 00 - COMMUNICATIONS HORIZONTAL CABLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. DRAWINGS AND GENERAL PROVISIONS OF THE CONTRACT, INCLUDING GENERAL AND SUPPLEMENTARY CONDITIONS AND DIVISION 01 SPECIFICATION SECTIONS, APPLY TO THIS SECTION.

1.2 SUMMARY

A. SECTION INCLUDES:
1. PATHWAYS.
2. UTP CABLING.
3. MULTIUSER TELECOMMUNICATIONS OUTLET ASSEMBLIES.
4. CABLE CONNECTING HARDWARE, PATCH PANELS, AND CROSS-CONNECTS.
5. TELECOMMUNICATIONS OUTLET/CONNECTORS.
6. CABLING SYSTEM IDENTIFICATION PRODUCTS.

1.3 DEFINITIONS

A. BICSI: BUILDING INDUSTRY CONSULTING SERVICE INTERNATIONAL.
B. CONSOLIDATION POINT: A LOCATION FOR INTERCONNECTION BETWEEN HORIZONTAL CABLES EXTENDING FROM BUILDING PATHWAYS AND HORIZONTAL CABLES EXTENDING INTO FURNITURE PATHWAYS.
C. CROSS-CONNECT: A FACILITY ENABLING THE TERMINATION OF CABLE ELEMENTS AND THEIR INTERCONNECTION OR CROSS-CONNECTION.
D. EMI: ELECTROMAGNETIC INTERFERENCE.
E. IDC: INSULATION DISPLACEMENT CONNECTOR.
F. LAN: LOCAL AREA NETWORK.
G. MUTOA: MULTIUSER TELECOMMUNICATIONS OUTLET ASSEMBLY, A GROUPING IN ONE LOCATION OF SEVERAL TELECOMMUNICATIONS OUTLET/CONNECTORS.
H. OUTLET/CONNECTORS: A CONNECTING DEVICE IN THE WORK AREA ON WHICH HORIZONTAL CABLE OR OUTLET CABLE TERMINATES.
I. RCDD: REGISTERED COMMUNICATIONS DISTRIBUTION DESIGNER.
J. UTP: UNSHIELDED TWISTED PAIR.

1.4 HORIZONTAL CABLING DESCRIPTION

A. HORIZONTAL CABLE AND ITS CONNECTING HARDWARE PROVIDE THE MEANS OF TRANSPORTING SIGNALS BETWEEN THE TELECOMMUNICATIONS OUTLET/CONNECTOR AND THE HORIZONTAL CROSS-CONNECT LOCATED IN THE COMMUNICATIONS EQUIPMENT ROOM. THIS CABLING AND ITS CONNECTING HARDWARE ARE CALLED "PERMANENT LINK," A TERM THAT IS USED IN THE TESTING PROTOCOLS.
1. HORIZONTAL CABLING SHALL CONTAIN NO MORE THAN ONE TRANSITION POINT OR CONSOLIDATION POINT BETWEEN THE HORIZONTAL CROSS-CONNECT AND THE TELECOMMUNICATIONS OUTLET/CONNECTOR.
2. BRIDGED TAPS AND SPLICES SHALL NOT BE INSTALLED IN THE HORIZONTAL CABLING.

B. THE MAXIMUM ALLOWABLE HORIZONTAL CABLE LENGTH IS 295 FEET. THIS MAXIMUM ALLOWABLE LENGTH DOES NOT INCLUDE AN ALLOWANCE FOR THE LENGTH OF 16 FEET TO THE WORKSTATION EQUIPMENT. THE MAXIMUM ALLOWABLE LENGTH DOES NOT INCLUDE AN ALLOWANCE FOR THE LENGTH OF 16 FEET IN THE HORIZONTAL CROSS-CONNECT.

1.5 PERFORMANCE REQUIREMENTS

A. GENERAL PERFORMANCE: HORIZONTAL CABLING SYSTEM SHALL COMPLY WITH TRANSMISSION STANDARDS IN TIA/EIA-568-B.1, WHEN TESTED ACCORDING TO TEST PROCEDURES OF THIS STANDARD.

1.6 SUBMITTALS

A. PRODUCT DATA: FOR EACH TYPE OF PRODUCT INDICATED.
B. SHOP DRAWINGS:
1. CABLING ADMINISTRATION DRAWINGS AND PRINTOUTS.
2. WIRING DIAGRAMS TO SHOW TYPICAL WIRING SCHEMATICS, INCLUDING THE FOLLOWING:
a. CROSS-CONNECTS.
b. PATCH PANELS.
c. PATCH CORDS.
3. CROSS-CONNECTS AND PATCH PANELS. DETAIL MOUNTING ASSEMBLIES, AND SHOW ELEVATIONS AND PHYSICAL RELATIONSHIP BETWEEN THE INSTALLED COMPONENTS.
C. QUALIFICATION DATA: FOR INSTALLER, QUALIFIED LAYOUT TECHNICIAN, INSTALLATION SUPERVISOR, AND FIELD INSPECTOR.
D. SOURCE QUALITY-CONTROL REPORTS.
E. FIELD QUALITY-CONTROL REPORTS.
F. MAINTENANCE DATA: FOR SPLICES AND CONNECTORS TO INCLUDE IN MAINTENANCE MANUALS.

1.7 QUALITY ASSURANCE

A. INSTALLER QUALIFICATIONS: CABLING INSTALLER MUST HAVE PERSONNEL CERTIFIED BY BICSI ON STAFF.
1. LAYOUT RESPONSIBILITY: PREPARATION OF SHOP DRAWINGS AND CABLING ADMINISTRATION DRAWINGS BY AN RCDD.
2. INSTALLATION SUPERVISION: INSTALLATION SHALL BE UNDER THE DIRECT SUPERVISION OF REGISTERED TECHNICIAN, WHO SHALL BE PRESENT AT ALL TIMES WHEN WORK OF THIS SECTION IS PERFORMED AT PROJECT SITE.
B. SURFACE-BURNING CHARACTERISTICS: AS DETERMINED BY TESTING IDENTICAL PRODUCTS ACCORDING TO ASTM E 84 BY A QUALIFIED TESTING AGENCY. IDENTIFY PRODUCTS WITH APPROPRIATE MARKINGS OF APPLICABLE TESTING AGENCY.
1. FLAME-SPREAD INDEX: 25 OR LESS.
2. SMOKE-DEVELOPED INDEX: 50 OR LESS.
C. ELECTRICAL COMPONENTS, DEVICES, AND ACCESSORIES: LISTED AND LABELED AS DEFINED IN NFPA 70, BY A QUALIFIED TESTING AGENCY, AND MARKED FOR INTENDED LOCATION AND APPLICATION.
D. TELECOMMUNICATIONS PATHWAYS AND SPACES: COMPLY WITH TIA/EIA-569-A.
E. GROUNDING: COMPLY WITH ANSI-J-STD-607-A.

1.8 DELIVERY, STORAGE, AND HANDLING

A. TEST CABLES UPON RECEIPT AT PROJECT SITE.
1. TEST EACH PAIR OF UTP CABLE FOR OPEN AND SHORT CIRCUITS.

1.9 PROJECT CONDITIONS

A. ENVIRONMENTAL LIMITATIONS: DO NOT DELIVER OR INSTALL CABLES AND CONNECTING MATERIALS UNTIL WET WORK IN SPACES IS COMPLETE AND DRY, AND TEMPORARY HVAC SYSTEM IS OPERATING AND MAINTAINING AMBIENT TEMPERATURE AND HUMIDITY CONDITIONS AT OCCUPANCY LEVELS DURING THE REMAINDER OF THE CONSTRUCTION PERIOD.

1.10 COORDINATION

A. COORDINATE LAYOUT AND INSTALLATION OF TELECOMMUNICATIONS PATHWAYS AND CABLING WITH OWNER'S TELECOMMUNICATIONS AND LAN EQUIPMENT AND SERVICE SUPPLIERS.
B. COORDINATE TELECOMMUNICATIONS OUTLET/CONNECTOR LOCATIONS WITH LOCATION OF POWER RECEPTACLES AT EACH WORK AREA.

PART 2 - PRODUCTS

2.1 PATHWAYS

A. GENERAL REQUIREMENTS: COMPLY WITH TIA/EIA-569-A.
B. CABLE SUPPORT: NRTL LABELED FOR SUPPORT OF CATEGORY 6 CABLING, DESIGNED TO PREVENT DEGRADATION OF CABLE PERFORMANCE AND PINCH POINTS THAT COULD DAMAGE CABLE.
1. SUPPORT BRACKETS WITH CABLE TIE SLOTS FOR FASTENING CABLE TIES TO BRACKETS.
2. LACING BARS, SPOOLS, J-HOOKS, AND D-RINGS.
3. STRAPS AND OTHER DEVICES.
C. CONDUIT AND BOXES: COMPLY WITH REQUIREMENTS IN DIVISION 26.
1. OUTLET BOXES SHALL BE NO SMALLER THAN 2 INCHES WIDE, 3 INCHES HIGH, AND 2-1/2 INCHES DEEP.

2.2 UTP CABLE

A. MANUFACTURERS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, AVAILABLE MANUFACTURERS OFFERING PRODUCTS THAT MAY BE INCORPORATED INTO THE WORK INCLUDE, BUT ARE NOT LIMITED TO, THE FOLLOWING:
1. BELDEN CDT INC.; ELECTRONICS DIVISION.
2. BERK-TEK; A NEXANS COMPANY.
3. COMMSCOPE, INC.
4. DRAKA USA.
5. GENESIS CABLE PRODUCTS; HONEYWELL INTERNATIONAL, INC.
6. KRONE INCORPORATED.
7. MOHAWK; A DIVISION OF BELDEN CDT.
8. NORDEX/CDT; A SUBSIDIARY OF CABLE DESIGN TECHNOLOGIES.
9. SUPERIOR ESSEX INC.
10. SYSTIMAX SOLUTIONS; A COMMSCOPE, INC. BRAND.
11. 3M.
12. TYCO ELECTRONICS/AMP NETCONNECT; TYCO INTERNATIONAL LTD.
B. DESCRIPTION: 100-OHM, 4-PAIR UTP, FORMED INTO 25-PAIR, BINDER GROUPS COVERED WITH A BLUE THERMOPLASTIC JACKET.
1. COMPLY WITH ICEA S-90-661 FOR MECHANICAL PROPERTIES.
2. COMPLY WITH TIA/EIA-568-B.1 FOR PERFORMANCE SPECIFICATIONS.
3. COMPLY WITH TIA/EIA-568-B.2, CATEGORY 5E CATEGORY 6.
4. LISTED AND LABELED BY AN NRTL ACCEPTABLE TO AUTHORITIES HAVING JURISDICTION AS COMPLYING WITH UL 444 AND NFPA 70 FOR THE FOLLOWING TYPES:
a. COMMUNICATIONS, PLENUM RATED: TYPE CMP, COMPLYING WITH NFPA 262.

2.3 UTP CABLE HARDWARE

A. MANUFACTURERS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, AVAILABLE MANUFACTURERS OFFERING PRODUCTS THAT MAY BE INCORPORATED INTO THE WORK INCLUDE, BUT ARE NOT LIMITED TO, THE FOLLOWING:
1. AMERICAN TECHNOLOGY SYSTEMS INDUSTRIES, INC.
2. DYNACOM CORPORATION.
3. HUBBELL PREMISE WIRING.
4. KRONE INCORPORATED.
5. LEVITON VOICE & DATA DIVISION.
6. MOLEX PREMISE NETWORKS; A DIVISION OF MOLEX, INC.
7. NORDEX/CDT; A SUBSIDIARY OF CABLE DESIGN TECHNOLOGIES.
8. PANDUIT CORP.
9. SIEMON CO. (THE).
10. TYCO ELECTRONICS/AMP NETCONNECT; TYCO INTERNATIONAL LTD.
B. GENERAL REQUIREMENTS FOR CABLE CONNECTING HARDWARE: COMPLY WITH TIA/EIA-568-B.2, IDC TYPE, WITH MODULES DESIGNED FOR PUNCH-DOWN CAPS OR TOOLS. CABLES SHALL BE TERMINATED WITH CONNECTING HARDWARE OF SAME CATEGORY OR HIGHER.
C. CONNECTING BLOCKS: 110-STYLE IDC FOR CATEGORY 5E AND 110-STYLE IDC FOR CATEGORY 6. PROVIDE BLOCKS FOR THE NUMBER OF CABLES TERMINATED ON THE BLOCK, PLUS 25 PERCENT SPARE. INTEGRAL WITH CONNECTOR BODIES, INCLUDING PLUGS AND JACKS WHERE INDICATED.
D. CROSS-CONNECT: MODULAR ARRAY OF CONNECTING BLOCKS ARRANGED TO TERMINATE BUILDING CABLES AND PERMIT INTERCONNECTION BETWEEN CABLES.
1. NUMBER OF TERMINALS PER FIELD: ONE FOR EACH CONDUCTOR IN ASSIGNED CABLES.
E. PATCH PANEL: MODULAR PANELS HOUSING MULTIPLE-NUMBERED JACK UNITS WITH IDC-TYPE CONNECTORS AT EACH JACK FOR PERMANENT TERMINATION OF PAIR GROUPS OF INSTALLED CABLES.
1. NUMBER OF JACKS PER FIELD: ONE FOR EACH FOUR-PAIR UTP CABLE INDICATED.
F. JACKS AND JACK ASSEMBLIES: MODULAR, COLOR-CODED, EIGHT-POSITION MODULAR RECEPTACLE UNITS WITH INTEGRAL IDC-TYPE TERMINALS.
G. PATCH CORDS: FACTORY-MADE, FOUR-PAIR CABLES IN 36-INCH LENGTHS; TERMINATED WITH EIGHT-POSITION MODULAR PLUG AT EACH END.
1. FOR CATEGORY 6 CABLES, PATCH CORDS SHALL HAVE BEND-RELIEF-COMPLIANT BOOTS AND COLOR-CODED ICONS TO ENSURE CATEGORY 6 PERFORMANCE. PATCH CORDS SHALL HAVE LATCH GUARDS TO PROTECT AGAINST SNAGGING.
2. FOR CATEGORY 5E CABLES, PATCH CORDS SHALL HAVE COLOR-CODED BOOTS FOR CIRCUIT IDENTIFICATION.

2.4 TELECOMMUNICATIONS OUTLET/CONNECTORS

A. JACKS: 100-OHM, BALANCED, TWISTED-PAIR CONNECTOR; FOUR-PAIR, EIGHT-POSITION MODULAR. COMPLY WITH TIA/EIA-568-B.1.
B. WORKSTATION OUTLETS: TWO-PORT-CONNECTOR ASSEMBLIES MOUNTED IN SINGLE FACEPLATE.
1. METAL FACEPLATE: STAINLESS STEEL, COMPLYING WITH REQUIREMENTS IN DIVISION 26 SECTION "WIRING DEVICES."
2. FOR USE WITH SNAP-IN JACKS ACCOMMODATING ANY COMBINATION OF UTP, OPTICAL FIBER, AND COAXIAL WORK AREA CORDS.
a. FLUSH MOUNTING JACKS, POSITIONING THE CORD AT A 45-DEGREE ANGLE.
3. LEGEND: MACHINE PRINTED, IN THE FIELD, USING ADHESIVE-TAPE LABEL.

2.5 GROUNDING

A. COMPLY WITH REQUIREMENTS IN DIVISION 26 SECTION "GROUNDING AND BONDING" FOR GROUNDING CONDUCTORS AND CONNECTORS.
B. COMPLY WITH ANSI-J-STD-607-A.

2.6 IDENTIFICATION PRODUCTS

A. COMPLY WITH TIA/EIA-606-A AND UL 969 FOR LABELING MATERIALS, INCLUDING LABEL STOCKS, LAMINATING ADHESIVES, AND INKS USED BY LABEL PRINTERS.
B. COMPLY WITH REQUIREMENTS IN DIVISION 26 SECTION "IDENTIFICATION FOR ELECTRICAL SYSTEMS."

2.7 SOURCE QUALITY CONTROL

A. FACTORY TEST UTP CABLES ON REELS ACCORDING TO TIA/EIA-568-B.1.
B. FACTORY TEST UTP CABLES ACCORDING TO TIA/EIA-568-B.2.
C. CABLE WILL BE CONSIDERED DEFECTIVE IF IT DOES NOT PASS TESTS AND INSPECTIONS.
D. PREPARE TEST AND INSPECTION REPORTS.

PART 3 - EXECUTION

3.1 WIRING METHODS

A. WIRING METHOD: INSTALL CABLES IN RACEWAYS AND J-HOOKS EXCEPT WITHIN CONSOLES, CABINETS, DESKS, AND COUNTERS AND EXCEPT IN ACCESSIBLE CEILING SPACES, IN ATTICS, AND IN GYPSUM BOARD PARTITIONS WHERE UNENCLOSED WIRING METHOD MAY BE USED. CONCEAL RACEWAY AND CABLES EXCEPT IN UNFINISHED SPACES.
1. INSTALL PLENUM CABLE IN ENVIRONMENTAL AIR SPACES, INCLUDING PLENUM CEILINGS.
2. COMPLY WITH REQUIREMENTS FOR RACEWAYS AND BOXES SPECIFIED IN DIVISION 26.
B. WIRING METHOD: CONCEAL CONDUCTORS AND CABLES IN ACCESSIBLE CEILINGS, WALLS, AND FLOORS WHERE POSSIBLE.
C. WIRING WITHIN ENCLOSURES: BUNDLE, LACE, AND TRAIN CABLES TO TERMINAL POINTS WITH NO EXCESS AND WITHOUT EXCEEDING MANUFACTURER'S LIMITATIONS ON BENDING RADII. PROVIDE AND USE LACING BARS AND DISTRIBUTION SPOOLS.

3.2 INSTALLATION OF PATHWAYS

A. DRAWINGS INDICATE GENERAL ARRANGEMENT OF PATHWAYS AND FITTINGS.
B. COMPLY WITH TIA/EIA-569-A FOR PULL-BOX SIZING AND LENGTH OF CONDUIT AND NUMBER OF BENDS BETWEEN PULL POINTS.
C. COMPLY WITH REQUIREMENTS IN DIVISION 26 FOR INSTALLATION OF CONDUITS AND WIREWAYS.
D. INSTALL MANUFACTURED CONDUIT SWEEPS AND LONG-RADIUS ELBOWS WHENEVER POSSIBLE.

3.3 INSTALLATION OF CABLES

A. COMPLY WITH NECA 1.
B. GENERAL REQUIREMENTS FOR CABLING:
1. COMPLY WITH TIA/EIA-568-B.1.
2. COMPLY WITH BICSI ITSIM, CH. 6, "CABLE TERMINATION PRACTICES."
3. INSTALL 110-STYLE IDC TERMINATION HARDWARE UNLESS OTHERWISE INDICATED.
4. MUTOA SHALL NOT BE USED AS A CROSS-CONNECT POINT.
5. CONSOLIDATION POINTS MAY BE USED ONLY FOR MAKING A DIRECT CONNECTION TO TELECOMMUNICATIONS OUTLET/CONNECTORS:
a. DO NOT USE CONSOLIDATION POINT AS A CROSS-CONNECT POINT, AS A PATCH CONNECTION, OR FOR DIRECT CONNECTION TO WORKSTATION EQUIPMENT.
b. LOCATE CONSOLIDATION POINTS FOR UTP AT LEAST 49 FEET FROM COMMUNICATIONS EQUIPMENT ROOM.
6. TERMINATE CONDUCTORS; NO CABLE SHALL CONTAIN UNTERMINATED ELEMENTS. MAKE TERMINATIONS ONLY AT INDICATED OUTLETS, TERMINALS, CROSS-CONNECTS, AND PATCH PANELS.
7. CABLES MAY NOT BE SPLICED. SECURE AND SUPPORT CABLES AT INTERVALS NOT EXCEEDING 30 INCHES AND NOT MORE THAN 6 INCHES FROM CABINETS, BOXES, FITTINGS, OUTLETS, RACKS, FRAMES, AND TERMINALS.
8. INSTALL LACING BARS TO RESTRAIN CABLES, TO PREVENT STRAINING CONNECTIONS, AND TO PREVENT BENDING CABLES TO SMALLER RADII THAN MINIMUMS RECOMMENDED BY MANUFACTURER.
9. BUNDLE, LACE, AND TRAIN CONDUCTORS TO TERMINAL POINTS WITHOUT EXCEEDING MANUFACTURER'S LIMITATIONS ON BENDING RADII, BUT NOT LESS THAN RADII SPECIFIED IN BICSI ITSIM, "CABLING TERMINATION PRACTICES" CHAPTER. INSTALL LACING BARS AND DISTRIBUTION SPOOLS.
10. DO NOT INSTALL BRUISED, KINKED, SCORED, DEFORMED, OR ABRADED CABLE. DO NOT SPLICE CABLE BETWEEN TERMINATION, TAP, OR JUNCTION POINTS. REMOVE AND DISCARD CABLE IF DAMAGED DURING INSTALLATION AND REPLACE IT WITH NEW CABLE.
11. COLD-WEATHER INSTALLATION: BRING CABLE TO ROOM TEMPERATURE BEFORE DEREELING. HEAT LAMPS SHALL NOT BE USED FOR HEATING.
12. IN THE COMMUNICATIONS EQUIPMENT ROOM, INSTALL A 10-FOOT-LONG SERVICE LOOP ON EACH END OF CABLE.
13. PULLING CABLE: COMPLY WITH BICSI ITSIM, CH. 4, "PULLING CABLE." MONITOR CABLE PULL TENSIONS.
C. UTP CABLE INSTALLATION:
1. COMPLY WITH TIA/EIA-568-B.2.
2. DO NOT UNTWIST UTP CABLES MORE THAN 1/2 INCH FROM THE POINT OF TERMINATION TO MAINTAIN CABLE GEOMETRY.
D. OPEN-CABLE INSTALLATION:
1. INSTALL CABLING WITH HORIZONTAL AND VERTICAL CABLE GUIDES IN TELECOMMUNICATIONS SPACES WITH TERMINATING HARDWARE AND INTERCONNECTION EQUIPMENT.
2. SUSPEND UTP CABLE NOT IN A WIREWAY OR PATHWAY A MINIMUM OF 8 INCHES ABOVE CEILINGS BY CABLE SUPPORTS NOT MORE THAN 48" APART.
3. CABLE SHALL NOT BE RUN THROUGH STRUCTURAL MEMBERS OR IN CONTACT WITH PIPES, DUCTS, OR OTHER POTENTIALLY DAMAGING ITEMS.
E. GROUP CONNECTING HARDWARE FOR CABLES INTO SEPARATE LOGICAL FIELDS.
F. SEPARATION FROM EMI SOURCES:
1. COMPLY WITH BICSI TDMM AND TIA/EIA-569-A FOR SEPARATING UNSHIELDED COPPER VOICE AND DATA COMMUNICATION CABLE FROM POTENTIAL EMI SOURCES, INCLUDING ELECTRICAL POWER LINES AND EQUIPMENT.

3.4 FIRESTOPPING

A. COMPLY WITH TIA/EIA-569-A, ANNEX A, "FIRESTOPPING."
B. COMPLY WITH BICSI TDMM, "FIRESTOPPING SYSTEMS" ARTICLE.

3.5 GROUNDING

A. INSTALL GROUNDING ACCORDING TO BICSI TDMM, "GROUNDING, BONDING, AND ELECTRICAL PROTECTION" CHAPTER.
B. COMPLY WITH ANSI-J-STD-607-A.
C. LOCATE GROUNDING BUS BAR TO MINIMIZE THE LENGTH OF BONDING CONDUCTORS. FASTEN TO WALL ALLOWING AT LEAST 2-INCH CLEARANCE BEHIND THE GROUNDING BUS BAR. CONNECT GROUNDING BUS BAR WITH A MINIMUM NO. 4 AWG GROUNDING ELECTRODE CONDUCTOR FROM GROUNDING BUS BAR TO SUITABLE ELECTRICAL BUILDING GROUND.
D. BOND METALLIC EQUIPMENT TO THE GROUNDING BUS BAR, USING NOT SMALLER THAN NO. 6 AWG EQUIPMENT GROUNDING CONDUCTOR.

3.6 IDENTIFICATION

A. IDENTIFY SYSTEM COMPONENTS, WIRING, AND CABLING COMPLYING WITH TIA/EIA-606-A. COMPLY WITH REQUIREMENTS FOR IDENTIFICATION SPECIFIED IN DIVISION 26 SECTION "IDENTIFICATION FOR ELECTRICAL SYSTEMS."
B. CABLE AND WIRE IDENTIFICATION:
1. LABEL EACH CABLE WITHIN 4 INCHES OF EACH TERMINATION AND TAP, WHERE IT IS ACCESSIBLE IN A CABINET OR JUNCTION OR OUTLET BOX, AND ELSEWHERE AS INDICATED.
2. EACH WIRE CONNECTED TO BUILDING-MOUNTED DEVICES IS NOT REQUIRED TO BE NUMBERED AT DEVICE IF COLOR OF WIRE IS CONSISTENT WITH ASSOCIATED WIRE CONNECTED AND NUMBERED WITHIN PANEL OR CABINET.
3. EXPOSED CABLES AND CABLES IN CABLE TRAYS AND WIRE TROUGHS: LABEL EACH CABLE AT INTERVALS NOT EXCEEDING 15 FEET.
4. LABEL EACH TERMINAL STRIP AND SCREW TERMINAL IN EACH CABINET, RACK, OR PANEL.
a. INDIVIDUALLY NUMBER WIRING CONDUCTORS CONNECTED TO TERMINAL STRIPS, AND IDENTIFY EACH CABLE OR WIRING GROUP BEING EXTENDED FROM A PANEL OR CABINET TO A BUILDING-MOUNTED DEVICE SHALL BE IDENTIFIED WITH NAME AND NUMBER OF PARTICULAR DEVICE AS SHOWN.
b. LABEL EACH UNIT AND FIELD WITHIN DISTRIBUTION RACKS AND FRAMES.
5. IDENTIFICATION WITHIN CONNECTOR FIELDS IN EQUIPMENT ROOMS AND WIRING CLOSETS: LABEL EACH CONNECTOR AND EACH DISCRETE UNIT OF CABLE-TERMINATING AND CONNECTING HARDWARE. WHERE SIMILAR JACKS AND PLUGS ARE USED FOR BOTH VOICE AND DATA COMMUNICATION CABLING, USE A DIFFERENT COLOR FOR JACKS AND PLUGS OF EACH SERVICE.
6. UNIQUELY IDENTIFY AND LABEL WORK AREA CABLES EXTENDING FROM THE MUTOA TO THE WORK AREA. THESE CABLES MAY NOT EXCEED THE LENGTH STATED ON THE MUTOA LABEL.
C. LABELS SHALL BE PREPRINTED OR COMPUTER-PRINTED TYPE WITH PRINTING AREA AND FONT COLOR THAT CONTRASTS WITH CABLE JACKET COLOR BUT STILL COMPLIES WITH REQUIREMENTS IN TIA/EIA-606-A.
1. CABLES USE FLEXIBLE VINYL OR POLYESTER THAT FLEX AS CABLES ARE BENT.

3.7 FIELD QUALITY CONTROL

A. TESTING AGENCY: OWNER WILL ENGAGE A QUALIFIED TESTING AGENCY TO PERFORM TESTS AND INSPECTIONS.
B. TESTS AND INSPECTIONS:
1. VISUALLY INSPECT UTP CABLE JACKET MATERIALS FOR NRTL CERTIFICATION MARKINGS. INSPECT CABLING TERMINATIONS IN COMMUNICATIONS EQUIPMENT ROOMS FOR COMPLIANCE WITH COLOR-CODING FOR PIN ASSIGNMENTS, AND INSPECT CABLING CONNECTIONS FOR COMPLIANCE WITH TIA/EIA_568-B.1.
2. VISUALLY CONFIRM CATEGORY 5E, CATEGORY 6, MARKING OF OUTLETS, COVER PLATES, OUTLET/CONNECTORS, AND PATCH PANELS.
3. VISUALLY INSPECT CABLE PLACEMENT, CABLE TERMINATION, GROUNDING AND BONDING, EQUIPMENT AND PATCH CORDS, AND LABELING OF ALL COMPONENTS.
4. TEST UTP BACKBONE COPPER CABLING FOR DC LOOP RESISTANCE, SHORTS, OPENS, INTERMITTENT FAULTS, AND POLARITY BETWEEN CONDUCTORS. TEST OPERATION OF SHORTING BARS IN CONNECTION BLOCKS. TEST CABLES AFTER TERMINATION BUT NOT CROSS-CONNECTION.
a. TEST INSTRUMENTS SHALL MEET OR EXCEED APPLICABLE REQUIREMENTS IN TIA/EIA-568-B.2. PERFORM TESTS WITH A TESTER THAT COMPLIES WITH PERFORMANCE REQUIREMENTS IN "TEST INSTRUMENTS (NORMATIVE)" ANNEX, COMPLYING WITH MEASUREMENT ACCURACY SPECIFIED IN "MEASUREMENT ACCURACY (INFORMATIVE)" ANNEX. USE ONLY TEST CORDS AND ADAPTERS THAT ARE QUALIFIED BY TEST EQUIPMENT MANUFACTURER FOR CHANNEL OR LINK TEST CONFIGURATION.
5. UTP PERFORMANCE TESTS:
a. TEST FOR EACH OUTLET AND MUTOA. PERFORM THE FOLLOWING TESTS ACCORDING TO TIA/EIA_568-B.1 AND TIA/EIA-568-B.2:
1) WIRE MAP.
2) LENGTH (PHYSICAL VS. ELECTRICAL, AND LENGTH REQUIREMENTS).
3) INSERTION LOSS.
4) NEAR-END CROSSTALK (NEXT) LOSS.
5) POWER SUM NEAR-END CROSSTALK (PSNEXT) LOSS.
6) EQUAL-LEVEL FAR-END CROSSTALK (ELFEXT).
7) POWER SUM EQUAL-LEVEL FAR-END CROSSTALK (PSELFEXT).
8) RETURN LOSS.
9) PROPAGATION DELAY.
10) DELAY SKEW.
6. FINAL VERIFICATION TESTS: PERFORM VERIFICATION TESTS FOR UTP SYSTEMS AFTER THE COMPLETE COMMUNICATIONS CABLING AND WORKSTATION OUTLET/CONNECTORS ARE INSTALLED.
a. DATA TESTS: THESE TESTS ASSUME THE INFORMATION TECHNOLOGY STAFF HAS A NETWORK INSTALLED AND IS AVAILABLE TO ASSIST WITH TESTING. CONNECT TO THE NETWORK INTERFACE DEVICE AT THE DEMARCATION POINT. LOG ONTO THE NETWORK TO ENSURE PROPER CONNECTION TO THE NETWORK.
C. DOCUMENT DATA FOR EACH MEASUREMENT. DATA FOR SUBMITTALS SHALL BE PRINTED IN A SUMMARY REPORT THAT IS FORMATTED SIMILAR TO TABLE 10.1 IN BICSI TDMM, OR TRANSFERRED FROM THE INSTRUMENT TO THE COMPUTER, SAVED AS TEXT FILES, AND PRINTED AND SUBMITTED.
D. END-TO-END CABLING WILL BE CONSIDERED DEFECTIVE IF IT DOES NOT PASS TESTS AND INSPECTIONS.
E. PREPARE TEST AND INSPECTION REPORTS.

3.8 DEMONSTRATION

A. TRAIN OWNER'S MAINTENANCE PERSONNEL IN CABLE-PLANT MANAGEMENT OPERATIONS, INCLUDING CHANGING SIGNAL PATHWAYS FOR DIFFERENT WORKSTATIONS, REROUTING SIGNALS IN FAILED CABLES, AND KEEPING RECORDS OF CABLING ASSIGNMENTS AND REVISIONS WHEN EXTENDING WIRING TO ESTABLISH NEW WORKSTATION OUTLETS.

SECTION 28 31 00 - ANALOG ADDRESSABLE FIRE ALARM SYSTEM WITH VOICE EVAC.

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. DRAWINGS AND GENERAL PROVISIONS OF THE CONTRACT, INCLUDING GENERAL AND SUPPLEMENTARY CONDITIONS AND DIVISION 01 SPECIFICATION SECTIONS, APPLY TO THIS SECTION.

1.2 SUMMARY

A. THIS SECTION INCLUDES THE FURNISHING AND INSTALLATION OF A NEW FIRE ALARM SYSTEM WITH VOICE EVACUATION. THE INSTALLED SYSTEM SHALL BE COMPLIANT WITH ALL CODES ENFORCED BY THE LOCAL AUTHORITIES AND SHALL BE FULLY FUNCTIONAL. ANY DEVICES, EQUIPMENT, WIRING, AND PROGRAMMING REQUIRED FOR THE SYSTEM WHETHER INDICATED ON THE PLANS OR NOT SHALL BE INCLUDED IN THE CONTRACTOR'S BASE BID. THE CONTRACTOR SHALL OBTAIN ALL PERMITS AND PROVIDE ALL CLOSEOUT DOCUMENTATION AS REQUIRED BY THE LOCAL CODE AUTHORITIES HAVING JURISDICTION OVER THE PROJECT.
B. DIVISION OF WORK:
1. IN ACCORDANCE WITH THE GENERAL CONDITIONS, CONTRACTOR IS RESPONSIBLE FOR DIVIDING THE WORK AMONG THE SUBCONTRACTORS AND SUPPLIERS AND FOR DELINEATING THE WORK TO BE PERFORMED BY SPECIFIC TRADES. THE FOLLOWING ARE SUGGESTIONS AS TO HOW THE WORK MAY BE DIVIDED. THIS IS NOT A COMPLETE LIST OF ALL THE WORK:
a. ELECTRICAL SUBCONTRACTOR:
1) COORDINATE EQUIPMENT.
2) INSTALL AND WIRE ALL SYSTEM COMPONENTS.
3) WIRE AND INSTALL ALL DUCT SMOKE DETECTORS. COORDINATE LOCATION AND CONTROL REQUIREMENTS WITH TEMPERATURE CONTROL SUBCONTRACTOR.
4) WIRE TAMPER AND FLOW SWITCHES PROVIDED BY FIRE PROTECTION (SPRINKLER) SYSTEM SUBCONTRACTOR.
b. FIRE ALARM SYSTEM SUPPLIER: TEST COMPLETED SYSTEM.

1.3 REFERENCES

A. EXCEPT AS HEREIN SPECIFIED OR AS INDICATED ON THE DRAWINGS, THE WORK OF THE SECTION SHALL COMPLY WITH THE FOLLOWING.
1. NFPA STANDARDS:
a. NFPA 70.
b. NFPA 72.
c. NFPA 90A.
d. NFPA 92A.
e. NFPA 92B.
f. NFPA 101.
g. NFPA 13.
h. NFPA 17.
2. UL STANDARDS
a. UL 864 - CONTROL UNITS FOR FIRE PROTECTIVE SIGNALING SYSTEMS.
b. UL 268 - SMOKE DETECTORS FOR FIRE PROTECTIVE SIGNALING SYSTEMS.
c. UL 268A - SMOKE DETECTORS FOR DUCT APPLICATIONS.
d. UL 521 - HEAT DETECTORS FOR FIRE PROTECTIVE SIGNALING SYSTEMS.
e. UL 228 - DOOR CLOSERS-HOLDERS, WITH OR WITHOUT INTEGRAL SMOKE DETECTORS.
f. UL 464 - AUDIBLE SIGNALING APPLIANCES.
g. UL 346 - WATERFLOW INDICATORS FOR FIRE PROTECTIVE SIGNALING SYSTEMS.
h. UL 1971 - SIGNALING DEVICES FOR THE HEARING-IMPAIRED.
i. UL 1481 - POWER SUPPLIES FOR FIRE PROTECTIVE SIGNALING SYSTEMS.
j. UL 1635 - DIGITAL ALARM COMMUNICATOR SYSTEM UNITS.
3. FEDERAL CODES AND REGULATIONS.
4. AMERICANS WITH DISABILITIES ACT (ADA).
5. NEW JERSEY BUILDING CODES
6. INTERNATIONAL STANDARDS ORGANIZATION (ISO):
a. ISO-9000.
b. ISO-9001.

1.4 SYSTEM DESCRIPTION

A. PROVIDE AND INSTALL NEW FIRE ALARM SYSTEM DEVICES AS INDICATED ON DRAWINGS AND THIS SPECIFICATION.

1.5 DESIGN AND PERFORMANCE REQUIREMENTS

A. SYSTEM SHALL BE PROGRAMMED TO PROVIDE EARLY DETECTION OF FIRE, TO NOTIFY BUILDING OCCUPANTS, SUMMON LOCAL FIRE DEPARTMENT, OVERRIDE HVAC OPERATION, AND ACTIVATE AUXILIARY SYSTEMS TO INHIBIT THE SPREAD OF SMOKE AND FIRE AND TO FACILITATE THE SAFE EVACUATION OF BUILDING OCCUPANTS.

1.6 GENERAL

A. UPON THE ACTIVATION OF ANY AREA SMOKE DETECTOR, DUCT TYPE SMOKE DETECTOR, HEAT DETECTOR, MANUAL PULL STATION, SPRINKLER WATERFLOW, THE FOLLOWING FUNCTIONS SHALL AUTOMATICALLY OCCUR:
1. THE INTERNAL AUDIBLE DEVICE SHALL SOUND AT THE CONTROL PANEL OR COMMAND CENTER.
2. THE LCD DISPLAY SHALL INDICATE ALL APPLICABLE INFORMATION ASSOCIATED WITH THE ALARM CONDITION INCLUDING ZONE, DEVICE TYPE, DEVICE LOCATION, AND TIME/DATE.
3. ALL REMOTE OR LOCAL ANNUNCIATOR LCD/LEDS ASSOCIATED WITH THE ALARM ZONE SHALL BE ILLUMINATED.
4. ACTIVATE VISUAL STROBES AND AUDIBLE APPLIANCES FOR GENERAL ALARM EVACUATION.
5. THE VISUAL STROBE SHALL CONTINUE TO FLASH UNTIL THE SYSTEM HAS BEEN RESET. THE VISUAL STROBE SHALL NOT STOP OPERATING WHEN THE "ALARM SILENCE" IS PRESSED.
6. ALL AUTOMATIC EVENTS PROGRAMMED TO THE ALARM POINT SHALL BE EXECUTED AND THE ASSOCIATED OUTPUTS ACTIVATED.
7. TRANSMIT SIGNAL TO THE CENTRAL STATION WITH POINT IDENTIFICATION.
8. TRANSMIT THE SIGNAL TO THE MALL'S FIRE ALARM SYSTEM.
9. APPROPRIATE HVAC EQUIPMENT SHALL BE TURNED OFF UNTIL SYSTEM IS RESET.

1.8 SUBMITTALS

A. SHOP DRAWINGS FOR ALL SYSTEM COMPONENTS:
1. DATA SHEET INDICATING MODEL NUMBER, PERFORMANCE SPECIFICATIONS AND DIMENSIONAL DATA, COLOR AND FINISH.
2. DETAILS OF CONSTRUCTION AND INSTALLATION.
3. NAME OF MANUFACTURER.
4. FULL SYSTEM SCHEMATIC.
5. WIRING DETAILS.
6. POINT-TO-POINT WIRING DIAGRAM SHOWING ALL EQUIPMENT.
7. BATTERY CALCULATIONS.
8. FLOOR PLAN INDICATING FIRE ALARM SYSTEM DEVICES ONLY.
9. DIMENSION PLAN INDICATING ALL ITEMS LOCATED INSIDE FIRE ALARM CONTROL PANEL. PLAN SHOULD INDICATE FUTURE SPACE.
10. INDICATE ALL FEATURES INDICATED IN THIS SPECIFICATION WHICH ARE NOT INCLUDED IN THE MANUFACTURER'S EQUIPMENT. LABEL THESE ITEMS AS "EXCEPTIONS TO THE SPECIFICATIONS".
B. LAYOUT DRAWINGS (PLANS) IDENTIFYING ALL FIRE DETECTION AND ALARM SYSTEM DEVICES. PLANS SHALL BE TO SCALE AND INDICATE MOUNTING HEIGHT FOR EACH DEVICE.

1.9 QUALITY ASSURANCE

A. FABRICATION AND INSTALLATION PERSONNEL QUALIFICATIONS:
1. TRAINED AND EXPERIENCED IN THE FABRICATION AND INSTALLATION OF THE MATERIALS AND EQUIPMENT.
2. KNOWLEDGEABLE OF THE DESIGN AND THE REVIEWED SUBMITTALS.
3. NICET LEVEL 2 CERTIFIED.
B. MANUFACTURER:
1. AT LEAST 5 YEARS EXPERIENCE WITH APPROVED SYSTEMS.
2. HAVING AUTHORIZED SERVICE FACILITY WITHIN 150 MILES OF SITE.
C. COMPONENTS: ALL COMPONENTS SHALL BE UL LISTED FOR INTENDED USE.
D. MANUFACTURER'S SERVICES:
1. MANUFACTURER'S CERTIFICATE:
a. SUBMIT FOR INSTALLED SYSTEM.
b. REQUIRED ASSURANCES:
1) CONFIRMATION OF FINAL INSPECTION.
2) INSTALLATION CONFORMS TO SPECIFICATIONS AND MANUFACTURER'S REQUIREMENTS.
2. PROVIDE OWNER TRAINING PROGRAM.

1.10 DELIVERY, STORAGE AND HANDLING

A. DELIVER ALL MATERIALS IN ORIGINAL, UNBROKEN, BRAND MARKED CONTAINERS OR WRAPPING AS APPLICABLE.
B. HANDLE AND STORE MATERIALS IN A MANNER WHICH WILL PREVENT DETERIORATION OR DAMAGE, CONTAMINATION WITH FOREIGN MATTER, DAMAGE BY WEATHER OR ELEMENTS, AND IN ACCORDANCE WITH MANUFACTURER'S DIRECTIONS.
C. STORE MATERIALS INDOORS AND PROTECT FROM WEATHER. WHEN NECESSARY TO STORE OUTDOORS, ELEVATE MATERIALS ABOVE GRADE AND ENCLOSE WITH DURABLE, WATERTIGHT WRAPPING.
D. REJECT DAMAGED, DETERIORATED, OR CONTAMINATED MATERIALS AND IMMEDIATELY REMOVE FROM THE SITE. REPLACE REJECTED MATERIAL WITH NEW MATERIALS AT NO ADDITIONAL COST TO OWNER.

1.11 WARRANTY

A. THE CONTRACTOR SHALL WARRANTY ALL MATERIALS, INSTALLATION AND WORKMANSHIP FOR 1 YEAR FROM DATE OF ACCEPTANCE, UNLESS OTHERWISE SPECIFIED.
B. A COPY OF THE MANUFACTURER'S WARRANTY SHALL BE PROVIDED WITH CLOSE-OUT DOCUMENTATION AND INCLUDED WITH THE OPERATION AND INSTALLATION MANUALS.
C. THE SYSTEM SUPPLIER SHALL MAINTAIN A SERVICE ORGANIZATION WITH ADEQUATE SPARE PARTS STOCK WITHIN 75 MILES OF THE INSTALLATION.
D. ANY DEFECTS THAT RENDER THE SYSTEM INOPERATIVE SHALL BE REPAIRED WITHIN 24 HOURS OF THE OWNER NOTIFYING THE CONTRACTOR.

1.12 CLOSE OUT

A. CLOSE OUT SUBMITTALS SHALL INCLUDE:
1. PROJECT SPECIFIC OPERATING MANUALS COVERING THE INSTALLED FIRE DETECTION AND ALARM SYSTEM.
2. MANUFACTURER'S DATA SHEETS AND INSTALLATION MANUALS/INSTRUCTIONS FOR ALL EQUIPMENT SUPPLIED.
3. OWNER'S INSTRUCTION AND OPERATION MANUAL.
4. RECORD DRAWINGS CONSISTING OF: A SCALED PLAN OF EACH BUILDING SHOWING THE PLACEMENT OF EACH INDIVIDUAL ITEM OF THE FIRE DETECTION AND ALARM SYSTEM AS WELL AS RACEWAY SIZE AND ROUTING, JUNCTION BOXES, AND CONDUCTOR SIZE, QUANTITY, AND COLOR IN EACH RACEWAY.
5. ALL DRAWINGS MUST REFLECT POINT TO POINT WIRING.
6. ALL DRAWINGS SHALL BE PROVIDED IN STANDARD .DXF FORMAT. A VELLUM PLOT OF EACH SHEET SHALL ALSO BE PROVIDED.
7. THE APPLICATION PROGRAM LISTING FOR THE SYSTEM AS INSTALLED AT THE TIME OF ACCEPTANCE BY THE BUILDING OWNER AND/OR LOCAL AHJ (DISK, HARD COPY PRINTOUT, AND ALL REQUIRED PASSWORDS).
8. PROVIDE THE NAME, ADDRESS, AND TELEPHONE OF THE AUTHORIZED FACTORY REPRESENTATIVE.
9. A FILLED OUT RECORD OF COMPLETION SIMILAR TO NFPA 72, 1999 EDITION FIGURE 1-6.2.1.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. PROVIDE PRODUCTS MANUFACTURED BY SIMPLEX, SIEMENS, EST & NOTIFIER.

2.2 INITIATING DEVICES

A. ANALOG ADDRESSABLE SMOKE DETECTORS - GENERAL:
1. EACH ANALOG ADDRESSABLE SMOKE DETECTOR'S SENSITIVITY SHALL BE CAPABLE OF BEING PROGRAMMED INDIVIDUALLY AS MOST SENSITIVE, MORE SENSITIVE, NORMAL, LESS SENSITIVE, OR LEAST SENSITIVE.
2. IN ADDITION TO THE FIVE SENSITIVITY LEVELS THE DETECTOR SHALL PROVIDE A PREALARM SENSITIVITY SETTING, WHICH SHALL BE SETTABLE IN 5% INCREMENTS OF THE DETECTOR'S ALARM SENSITIVITY VALUE.
3. THE DETECTOR SHALL PROVIDE A MAINTENANCE ALERT SIGNAL THAT 75% TO 99% COMPENSATION HAS BEEN USED.
4. THE DETECTOR SHALL PROVIDE A DIRTY FAULT SIGNAL THAT 100% GREATER COMPENSATION HAS BEEN USED.
5. THE SYSTEM SHALL ALLOW FOR CHANGING OF DETECTOR TYPES FOR SERVICE REPLACEMENT PURPOSES WITHOUT THE NEED TO REPROGRAM THE SYSTEM.
B. SMOKE DETECTORS:
1. SMOKE DETECTORS SHALL BE PHOTOELECTRIC TYPE, WITH VISIBLE LED ALARM LIGHT.
2. SEPARATE MOUNTING BASE AND DETACHABLE SENSOR HEAD.
C. DUCT DETECTOR HOUSING:
1. PROVIDE SMOKE DETECTOR DUCT HOUSING ASSEMBLIES WITH AIR SAMPLING TUBE SIZED FOR DUCT LOCATION TO MOUNT AN ANALOG ADDRESSABLE DETECTOR.
2. MOUNTING BASE WITH AUXILIARY RELAY.
3. PROVIDE REMOTE ALARM LED INDICATORS AND REMOTE TEST STATION FOR EACH DUCT TYPE SMOKE DETECTOR.
4. WIRED AND INSTALLED BY ELECTRICAL SUBCONTRACTOR. COORDINATE EXACT LOCATION WITH MECHANICAL SUBCONTRACTOR.
D. DETECTOR BASES: PROVIDE STANDARD DETECTOR MOUNTING BASES SUITABLE FOR MOUNTED ON 1-GANG, 3-1/2-INCH OR 4_INCH OCTAGON BOX, AND 4-INCH SQUARE BOX.
E. MANUAL PULL STATIONS:
1. SHALL BE ANALOG/ADDRESSABLE, DOUBLE ACTION, SINGLE STAGE, RECESSED PULL-LEVER, BREAK GLASS, OPEN CIRCUIT TYPE. FINISH OF THE STATION TO BE RED WITH LETTERED INSTRUCTIONS "PULL IN CASE OF FIRE."
2. PROVIDE STOPPER II MODEL STI-1000 WITH BATTERY HORN PULL STATION GUARD AS MANUFACTURED BY SAFETY TECHNOLOGY INTERNATIONAL, INC., P.O. BOX 621, WATERFORD, MI 48095.
F. FIRE PROTECTION WATER FLOW SWITCHES AND VALVE TAMPER SWITCHES:
1. TO BE PROVIDED BY FIRE PROTECTION (SPRINKLER) SYSTEM SUBCONTRACTOR IN ACCORDANCE WITH DIVISION 21.
2. FOR EACH SWITCH, PROVIDE ADDRESSABLE MODULE TO MONITOR STATUS OF SWITCH.
G. FIRE PROTECTION KITCHEN HOOD MICRO-SWITCH:
1. TO BE PROVIDED BY FIRE PROTECTION (SPRINKLER) SYSTEM SUBCONTRACTOR IN ACCORDANCE WITH DIVISION 21.
2. FOR EACH SWITCH, PROVIDE ADDRESSABLE MODULE TO MONITOR STATUS OF SWITCH.
H. ADDRESSABLE RELAYS/MONITOR AND CONTROL MODULES: FORM C NORMALLY OPEN/NORMALLY CLOSED DRY RELAY CONTACTS RATED AT 24VDC AT 2 AMPS.

2.3 NOTIFICATION APPLIANCES

A. LOW PROFILE SPEAKER STROBES/LOW PROFILE STROBES:
1. PROVIDE WALL AND CEILING MOUNTED SPEAKER/STROBE WITH ADJUSTABLE AUDIBLE OUTPUT AS REQUIRED FOR THE APPLICATION.
2. SPEAKERS SHALL BE WIRED SEPARATELY FROM STROBES.
3. DEDICATED SPEAKER CIRCUITS SHALL BE PROVIDED FOR EACH AUDITORIUM.
4. STROBES SHALL PROVIDE SYNCHRONIZED FLASH OUTPUTS.
5. STROBE CANDELA RATINGS OF 15CD, 30CD, [illegible]CD, 60CD, 75CD, 110CD. CANDELA RATINGS SHALL BE DETERMINED BY EQUIPMENT SUPPLIER.

PART 3 - EXECUTION

3.1 WIRING

A. ALL WIRING SHALL BE IN ACCORDANCE WITH MANUFACTURER'S WRITTEN RECOMMENDATIONS AND SHALL MEET ALL APPLICABLE CODE REQUIREMENTS.
B. ALL WIRING SHALL BE COPPER.
C. NO. 16 AWG MINIMUM FOR SIGNALING LINE CIRCUITS (SLCS)
D. NO. 14 AWG [illegible] MINIMUM FOR AUDIBLE AND VISUAL NOTIFICATION APPLIANCE CIRCUITS.
E. NO. 12 AWG [illegible] MINIMUM FOR LINE VOLTAGE.
F. INSTALL WIRING [illegible] IN METAL RACEWAYS IN ACCORDANCE WITH DIVISION 26 SECTION "RACEWAYS FOR ELECTRICAL SYSTEMS." PROVIDE JUNCTION BOXES AND CONDUIT SLEEVES TO MAIN CORRIDOR AREAS. INSTALL WIRING IN CONDUIT SLEEVES TO ABOVE CEILING IN CORRIDOR AREAS. WIRING IN CORRIDOR AREAS DOES NOT NEED TO BE INSTALLED IN CONDUIT. PROVIDE CABLE TRAY, CABLE SUPPORTS, NYLON STRAPS AS REQUIRED TO PROPERLY SUPPORT CABLING IN ACCORDANCE WITH CODE.
G. CABLE TYPE SHALL BE FPLP/FPLR.

3.2 EQUIPMENT INSTALLATION

A. MANUAL PULL STATIONS: UNLESS OTHERWISE INDICATED, MOUNT SEMI-FLUSH IN RECESSED BACK BOXES.
B. FIRE PROTECTION WATER FLOW SWITCHES AND VALVE TAMPER SWITCHES: TO BE INSTALLED IN ACCORDANCE WITH DIVISION 21 SECTION "WATER BASE FIRE SUPPRESSION SYSTEMS." PROVIDE WIRING AND CONNECTIONS FOR EACH FLOW AND TAMPER SWITCH REQUIRED TO BE SUPERVISED.
C. DUCT SMOKE DETECTORS: CONNECT EACH DUCT DETECTOR TO FIRE ALARM SYSTEM SO UPON SENSING SMOKE, FIRE ALARM SYSTEM GOES INTO ALARM. COORDINATE LOCATION WITH MECHANICAL SUBCONTRACTOR.
D. SMOKE DETECTORS: INSTALL DETECTORS INDICATED TO BE CEILING MOUNTED NOT LESS THAN 4 INCHES FROM A SIDE WALL TO THE NEAR EDGE. INSTALL DETECTORS LOCATED ON THE WALL AT LEAST 4 INCHES BUT NOT MORE THAN 12 INCHES BELOW THE CEILING. FOR EXPOSED SOLID JOIST CONSTRUCTION, MOUNT DETECTORS ON THE BOTTOM OF THE JOISTS. ON SMOOTH CEILINGS, INSTALL DETECTORS NOT OVER 30 FEET APART IN ANY DIRECTION. INSTALL DETECTORS NO CLOSER THAN 5 FEET FROM AIR REGISTERS.
E. AUDIO/VISUAL ALARM INDICATING DEVICES: MOUNT AT 80 INCHES ABOVE THE HIGHEST FLOOR LEVEL WITHIN SPACE OR 6 INCHES BELOW THE CEILING, WHICHEVER IS LOWER. UNLESS OTHERWISE INDICATED, INSTALL BELLS AND HORNS ON FLUSH- MOUNTED BACK BOXES WITH THE DEVICE OPERATING MECHANISM CONCEALED BEHIND A GRILLE. COMBINE AUDIBLE AND VISIBLE ALARMS AT THE SAME LOCATION INTO A SINGLE UNIT.

3.3 GROUNDING

A. GROUND EQUIPMENT AND CONDUCTOR AND CABLE SHIELDS. FOR AUDIO CIRCUITS, MINIMIZE TO THE GREATEST EXTENT POSSIBLE GROUND LOOPS, COMMON MODE RETURNS, NOISE PICKUP, CROSS TALK, AND OTHER IMPAIRMENTS. PROVIDE 5 OHM GROUND AT MAIN EQUIPMENT LOCATION. MEASURE, RECORD, AND REPORT GROUND RESISTANCE.

3.4 FIELD QUALITY CONTROL

A. ALL INTELLIGENT ANALOG ADDRESSABLE DEVICES SHALL BE TESTED FOR CURRENT ADDRESS, SENSITIVITY, AND USER DEFINED MESSAGE.
B. ALL WIRING SHALL BE TESTED FOR CONTINUITY, SHORTS, AND GROUNDS BEFORE THE SYSTEM IS ACTIVATED.
C. ALL TEST EQUIPMENT, INSTRUMENTS, TOOLS, AND LABOR REQUIRED TO CONDUCT THE TESTS SHALL BE MADE AVAILABLE BY THE INSTALLING CONTRACTOR.
D. THE SYSTEM INCLUDING ALL ITS SEQUENCE OF OPERATIONS SHALL BE DEMONSTRATED TO THE OWNER, HIS REPRESENTATIVE, AND THE LOCAL FIRE INSPECTOR. IN THE EVENT THE SYSTEM DOES NOT OPERATE PROPERLY, THE TEST SHALL BE TERMINATED. CORRECTIONS SHALL BE MADE AND THE TESTING PROCEDURE SHALL BE REPEATED UNTIL IT IS ACCEPTABLE TO THE OWNER, HIS REPRESENTATIVES AND THE FIRE INSPECTOR.
E. AT THE FINAL TEST AND INSPECTION, A FACTORY TRAINED REPRESENTATIVE OF THE SYSTEM MANUFACTURER SHALL DEMONSTRATE THAT THE SYSTEM FUNCTIONS PROPERLY IN ACCORDANCE WITH THESE SPECIFICATIONS. THE REPRESENTATIVE SHALL PROVIDE TECHNICAL SUPERVISION, AND PARTICIPATE DURING ALL OF THE TESTING FOR THE SYSTEM.
F. ALL FIRE ALARM TESTING SHALL BE IN ACCORDANCE WITH NATIONAL FIRE ALARM CODE, NFPA 72 - 1999, CHAPTER 7.
G. A LETTER FROM THE CONTRACTOR CERTIFYING THAT THE SYSTEM IS INSTALLED ENTIRELY IN ACCORDANCE WITH THE SYSTEM MANUFACTURER'S RECOMMENDATIONS AND WITHIN THE LIMITATIONS OF THE REQUIRED LISTINGS AND APPROVALS, THAT ALL SYSTEM HARDWARE AND SOFTWARE HAS BEEN VISUALLY INSPECTED AND FUNCTIONALLY TESTED BY A MANUFACTURER'S CERTIFIED REPRESENTATIVE, AND THAT THE SYSTEM IS IN PROPER WORKING ORDER.

(END OF SPECIFICATIONS)

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GEORGIA REGISTERED No. PE033486 PROFESSIONAL ENGINEER TIM L SCOTT

SIGNATURE/DATE:

GDS ENGINEERING
Gibbens, Drake, Scott, Inc.
9201 E. 63rd Street, Suite 100
Raytown, Missouri 64133
Phone: (816) 358-1790
Fax: (816) 358-2367
www.gdsengr.com
GEORGIA COA #PEF000263

SHEET LEGEND

G000's	GENERAL INFORMATION & SCOPE OF WORK
N100's	EGRESS / ADA PLANS & DETAILS
A100's	FLOOR PLANS & CEILING PLANS
A200's	EXTERIOR & INTERIOR ELEVATIONS
A300's	BUILDING SECTIONS
A400's	ENLARGED PLANS
A500's	EXTERIOR & INTERIOR DETAILS
A600's	DOOR SCHEDULE, DOOR DETAILS, FINISH SCHEDULE, FINISH PLANS
Q100's	AUDITORIUM SIGHT LINE SECTIONS
Q120's	AUDITORIUM SEATING PLAN
S's	STRUCTURAL
M's	MECHANICAL
P's	PLUMBING
E's	ELECTRICAL
WF's	WAYFINDING DETAILS
FS's	CASEWORK & EQUIPMENT

MADISON YARDS 8
AMC NEW BUILD
905 MEMORIAL DRIVE SE
ATLANTA, GA 30316

American Multi-Cinema, inc.
One AMC Way
11500 Ash Street
Leawood, KS 66211

No.	Date	Description

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