## TECHNOLOGY SYSTEMS GENERAL NOTES

1. REFER TO SPECIFICATION SECTION "TECHNOLOGY GENERAL PROVISIONS" FOR MORE INFORMATION ABOUT DRAWINGS AND BID DOCUMENTS.

2. MANY SYMBOLS USED IN THIS PROJECT HAVE A TYPE ASSOCIATED WITH THEM. SEE SHEETS WITH DETAILS AND PROJECT SPECIFICATIONS FOR MORE INFORMATION ON THE DESCRIPTION OF EACH TYPE.

3. ALL CONDUIT FOR TECHNOLOGY SYSTEMS INDOOR ABOVE GRADE SHALL BE EMT AND ALL CONDUIT FOR BELOW GRADE SHALL BE PVC.

4. SEE LIFE SAFETY PLANS FOR LOCATIONS OF FIRE RATED PARTITIONS IN THIS PROJECT. PROVIDE AN APPROVED FIRE STOP SYSTEMS FOR EACH RACEWAY OR CABLE GOING THROUGH A RATED WALL. SEE SPECIFICATION "RACEWAYS FOR TECHNOLOGY" FOR MORE INFORMATION.

5. WORKING CLEARANCES AROUND ELECTRICAL EQUIPMENT SHALL BE MAINTAINED IN COMPLIANCE WITH THE NATIONAL ELECTRICAL CODE ARTICLE 110. COORDINATE EQUIPMENT INSTALLATION TO MAINTAIN REQUIRED CLEARANCES.

6. SYMBOLS USED ON THE TECHNOLOGY DRAWINGS ARE NOT THE SAME SIZE AS THE ACTUAL OBJECT BEING REPRESENTED. THEREFORE LOCATIONS OF THE SYMBOLS ON THE FLOOR PLANS ARE AN APPROXIMATION TO THE ACTUAL LOCATION OF THE DEVICE AND NEED TO BE CAREFULLY COORDINATED WITH OTHER ELEMENTS IN THE VICINITY. AS A GENERAL GUIDELINE:
   A. VOICE/DATA OUTLET FOR WORK-AREAS SHALL BE INSTALLED WITHIN 6 INCHES OF A POWER OUTLET INDICATED IN ELECTRICAL DRAWINGS.
   B. TV OUTLETS SHALL BE INSTALLED WITHIN 6 INCHES OF A POWER OUTLET SHOWN ON THE ELECTRICAL DRAWINGS.
   C. WHEN MULTIPLE TECHNOLOGY SYSTEMS OUTLETS ARE INDICATED NEXT TO EACH OTHER WITH SYMBOLS, THE SPACING BETWEEN OUTLETS SHALL BE CONSISTENT IF NO ELEVATION IS SHOWN ON THE DRAWINGS.
   D. WHEN INSTALLER IS NOT CERTAIN ABOUT SPECIFIC ADJACENCIES OF A DEVICE, THE QUESTION SHALL BE ASKED TO THE ENGINEER PRIOR TO INSTALLATION.

7. FOR EXACT LOCATION OF CEILING MOUNTED EQUIPMENT REFER TO THE ARCHITECTURAL REFLECTED CEILING PLAN. LOCATIONS OF EQUIPMENT NOT INCLUDED ON THE REFLECTED CEILING PLAN SHALL BE COORDINATED WITH THOSE ITEMS SHOWN. COORDINATION OF CEILING MOUNTED EQUIPMENT SHALL BE PRIOR TO ANY ROUGH-IN. NOTIFY ENGINEER OF ANY DISCREPANCY.

8. LOCATIONS OF FLOOR BOXES AND FLOOR PENETRATIONS SHALL NOT BE MEASURED FROM THIS SET OF DRAWINGS, INSTALLER SHALL REQUEST PRECISE LOCATIONS FROM ARCHITECT.

9. EACH VOICE/DATA RJ45 JACK SHALL BE CONNECTED TO A DEDICATED 4 PR CABLE.

10. THE RESPONSIBILITY OF RACEWAY INSTALLATION SHALL BE AS DIRECTED BY THE CONSTRUCTION MANAGER OR GENERAL CONTRACTOR, BUT ALL RACEWAYS FOR TECHNOLOGY ARE TO BE INCLUDED IN THIS CONTRACT.

11. WHEN CONDUIT RUNS ARE INDICATED ABOVE GRADE OR BELOW GRADE ON THESE DRAWINGS, NOT EVERY SINGLE JUNCTION BOX (OR COMMUNICATIONS VAULT) REQUIRED IS INDICATED ON THE DRAWINGS. TYPICALLY ONLY END POINT LOCATIONS OR SPECIFIC PASS-THROUGH LOCATIONS WHERE THE ENGINEER DESIRES A BOX ARE SHOWN ON THE DRAWINGS. SEE SPECIFICATION "RACEWAYS FOR TECHNOLOGY" FOR REQUIREMENTS THAT INDICATE ADDITIONAL JUNCTION BOXES OR COMMUNICATION VAULTS THAT SHALL BE PROVIDED UNDER THIS CONTRACT. SUCH REQUIREMENTS INCLUDE ADDITIONAL BOXES REQUIRED BECAUSE OF NUMBER OF CONDUIT BENDS OR CHANGES IN ELEVATION.

12. SOME SYMBOLS INCLUDED IN THE SYMBOL LEGEND MAY NOT BE USED IN THESE PROJECT DRAWINGS.

13. UNDER NO CONDITIONS, CONDUITS FOR LOW VOLTAGE FOR FLOOR BOXES SHALL BE DAISY CHAINED TOGETHER BETWEEN ADJACENT FLOOR BOXES. ALL CONDUITS FOR FLOOR BOXES SHALL BE HOME RUNS TO NEAREST ACCESSIBLE CEILING SPACE.

14. THIS SET OF DRAWINGS DOES NOT INDICATE ALL GROUNDING AND BONDING REQUIREMENTS FOR TECHNOLOGY SYSTEMS. REFER TO SPECIFICATION SECTION "GROUNDING FOR TELECOMMUNICATION SYSTEM" FOR ADDITIONAL REQUIREMENTS.

15. ALL CABLES FOR TECHNOLOGY SYSTEMS RUN UNDER SLAB OR BELOW GRADE IN CONDUITS STUBBING UP INSIDE THE TELECOM ROOM SHALL BE INDOOR/OUTDOOR RATED. FOR CONDUITS STUBBING UP IN OTHER LOCATIONS DIFFERENT FROM TELECOM ROOMS AND FURTHER THAN 50 FT. FROM A TELECOM ROOM, DO NOT USE INDOOR/OUTDOOR RATED CABLES.

16. GRAPHICS USED FOR EQUIPMENT IN ELEVATIONS AND CHANNELS (LINE DRAWINGS) DO NOT NECESSARILY REPRESENT THE PART NUMBER OF THE EQUIPMENT SPECIFIED. THE PART NUMBERS LISTED IN THE DRAWINGS AND SPECIFICATIONS ARE TO BE FOLLOWED FOR BASIS OF DESIGN, NOT THE GRAPHICS.

17. THE TECHNOLOGY DRAWINGS DO NOT SHOW ALL REQUIRED CONDUITS/RACEWAYS TO BE PROVIDED UNDER THIS CONTRACT. TYPICALLY CONDUIT SLEEVES SMALLER THAN 2" ARE NOT SHOWN ON THE DRAWINGS. SEE SPECIFICATIONS "RACEWAYS FOR TECHNOLOGY" AND DRAWING DETAILS FOR ADDITIONAL RACEWAY REQUIREMENTS.

18. DEFINITION OF ACRONYMS USED IN THESE DRAWINGS:
   A. NIC (N.I.C.) - NOT IN CONTRACT
   B. OFE (O.F.E.) = OWNER FURNISHED EQUIPMENT. SEE RESPONSIBILITY MATRIX FOR MORE INFORMATION.
   C. OHI (O.H.I.) = DOOR HARDWARE INSTALLER
   D. USC (U.S.C.) = UNDER SEPARATE CONTRACT.

19. ALL REQUIRED WALL PENETRATIONS, EXISTING AND NEW, SHALL MAINTAIN THE NEW WALL RATING AFTER CABLING HAS BEEN INSTALLED OR REMOVED.

20. ALL SPEAKERS MOUNTED IN A CEILING TILE SHALL BE CENTERED IN THE CEILING TILE.

## OWNER GENERAL NOTES

1. THE OWNER'S SPECIFICATIONS LOCATED ON SHEET T0.2 & T0.3 SHALL TAKE PRECEDENCE OVER ALL DIVISION 27 SPECIFICATION SECTIONS AND INFORMATION FOUND ON TECHNOLOGY DRAWINGS. THE OWNER'S SPECIFICATIONS SHALL BE FOLLOWED THROUGH ALL STAGES OF THIS PROJECT. ANY DISCREPANCIES BETWEEN THE DRAWINGS/SPECIFICATIONS AND THE OWNER'S SPECIFICATIONS SHALL BE COMMUNICATED TO THE EOR FOR FURTHER DIRECTION/CLARIFICATION.

2. ALL CAT. 6 CABLING SHALL BE TERMINATED IAW T-568B WIRING METHOD.

3. ALL DATA INSERTS SHALL BE KEYSTONE TYPE WITH CAT. 6 INSERTS.

4. ALL GREEN VOICE CABLES SHALL BE TERMINATED ON 110-BLOCK MOUNTED TO WALL OF ELECTRICAL ROOM 103. ALL BLUE DATA CABLES SHALL BE TERMINATED ON RACK MOUNTED CAT. 6 PATCH PANEL IN ELECTRICAL ROOM 103.

## BASIC MATERIALS

- CONDUIT TURNED UP
- CONDUIT TURNED DOWN
- CAPPED CONDUIT
- CONDUIT STUBBED AND BUSHED INTO ACCESSIBLE CEILING CAVITY
- CONDUIT CONTINUED
- CONDUIT SLEEVES (X/Y)
  X= QTY OF SLEEVES
  Y= SIZE OF CONDUITS SLEEVES PENETRATING WALL ABOVE CEILING SPACE.
  IF NO QUANTITY INDICATED USE AS MANY SLEEVES AS REQUIRED TO MATCH CROSS SECTIONAL AREA OF CABLE TRAY NEXT TO SLEEVE.
- TUBULAR RUNWAY, HUNG ABOVE CEILING OR AS NOTED
- CABLE TRAY (TYPE), HUNG ABOVE CEILING OR AS NOTED
- SURFACE MOUNTED ENCLOSED TECHNOLOGY SYSTEMS. SEE SHEETS WITH DETAILS FOR ADDITIONAL INFORMATION
- [J] JUNCTION BOX WALL MOUNTED. SIZE PER NEC IF NOT INDICATED ON DRAWING. NEMA 1 FOR INTERIOR, NEMA 4X FOR EXTERIOR USE WITH HINGED COVER AND LOCKING COVER
- (J) JUNCTION BOX CEILING MOUNTED. SIZE PER NEC IF NOT INDICATED ON DRAWING. NEMA 1 FOR INTERIOR, NEMA 4X FOR EXTERIOR USE WITH HINGED COVER AND LOCKING COVER
- [T]X TELECOMMUNICATIONS GROUND VAULT. SEE DETAILS AND SPECS FOR MORE INFORMATION
  X= BOX TYPE. IF NOT SHOWN, ONLY ONE TYPE IN PROJECT
- [PB]X TELECOMMUNICATIONS PULLBOX. SEE DETAILS AND SPECS FOR MORE INFORMATION
  X= BOX TYPE. IF NOT SHOWN, ONLY ONE TYPE IN PROJECT
- [TP] TECHNOLOGY POLE. SEE SHEETS WITH DETAILS FOR ADDITIONAL INFORMATION

## GENERAL

- NEW EQUIPMENT
- EXISTING WORK AND/OR EQUIPMENT REFERENCE, SHOWN ON MULTIPLE DRAWINGS
- DEVICE TO BE REMOVED (DEMO PLANS) UNDERFLOOR CONDUIT (NEW PLANS)
- WIRE AND/OR CONDUIT RUN CONTINUED ON REFERENCED DETAIL
- MATCH LINE REFERENCING CONTINUATION ON OTHER DRAWINGS
- DETAIL AND/OR SECTION REFERENCE
- CABLE ROUTING BOUNDARY
- FUTURE WORK

## DRAWING NOTES AND DESIGNATIONS

- (X) DRAWING KEYED NOTES
- ◇X CABLE ROUTING NOTES
- X/X DETAIL OR SECTION REFERENCE TAG

## VOICE AND DATA SYSTEM

- W,WP XNYZ +H — TELECOMMUNICATION OUTLET
  X= MOUNTING: (E= EXISTING, F= FLUSH, S= SURFACE, M= MODULAR FURNITURE ADAPTER, P= POLE, L= FLOOR, R= RACEWAY) CT= 6" ABOVE COUNTERTOP
  N= NUMBER OF DATA CABLES IN THE FACEPLATE
  Y= NUMBER OF VOICE CABLES IN THE FACEPLATE
  Z= NUMBER OF FIBER OPTIC STRANDS IN THE FACEPLATE
  +H= INSTALLATION HEIGHT IN INCHES AT CENTER OF OUTLET, COORDINATE WITH ELECTRICAL. IF NOT SHOWN INSTALL AT TYPICAL RECEPTACLE HEIGHT.
  W= WALL TELEPHONE FACEPLATE WITH SUPPORT STUDS, INSTALLED AT 48" AFF AT CENTER OF OUTLET AND 12" FROM EDGE OF WALL.
  WP=WEATHERPROOF
  EXAMPLE: F2 = TWO DATA JACKS IN A SINGLE FACEPLATE, FLUSH MOUNTED
- MECH SY — OUTLET FOR MECHANICAL/ ELECTRICAL/ FIRE ALARM/ ELEVATOR/ STAR CONNECTION
  Y: AS DESCRIBED FOR TELECOMMUNICATIONS OUTLET
- WAP XY — OUTLET FOR WIRELESS ACCESS POINT, WALL MOUNTED
  XY: AS DESCRIBED FOR TELECOMMUNICATIONS OUTLET
- XY — CEILING MOUNTED INFORMATION OUTLET, MOUNTED ON FINISHED CEILING
  XY: AS DESCRIBED FOR TELECOMMUNICATIONS OUTLET
- WAP XY — OUTLET FOR WIRELESS ACCESS POINT, MOUNTED ON FINISHED CEILING
  XY: AS DESCRIBED FOR TELECOMMUNICATIONS OUTLET
- YZ XN — FLOOR BOX FOR TECHNOLOGY SYSTEMS AND POWER OUTLETS.
  XN= AS DESCRIBED FOR COMMUNICATIONS OUTLET
  Y= DENOTES BOX TYPE (1,2,3…)
  Z= DENOTES PLATE TYPE (A,B,C…), A= NO AUDIO/VISUAL
- YZ XN — POKE-THRU FOR TECHNOLOGY SYSTEMS AND POWER OUTLETS.
  XN= AS DESCRIBED FOR COMMUNICATIONS OUTLET
  Y= DENOTES BOX TYPE (1,2,3…)
  Z= DENOTES PLATE TYPE (A,B,C…), A= NO AUDIO/VISUAL
- [FF] WALL MOUNTED FURNITURE FEED USED TO FEED CABLES TO MODULAR FURNITURE
- (FF)X POKE THRU FURNITURE FEED USED TO FEED CABLES TO MODULAR FURNITURE
  X= TYPE, IF NOT SHOWN, ONLY ONE TYPE IN PROJECT
- [PP]X POWER POLE FOR COMBINED USE - TECHNOLOGY SYSTEMS AND POWER.
  X= TYPE, IF NOT SHOWN, ONLY ONE TYPE IN PROJECT
- N-XX-Z — FIBER OPTICS ROUTING TAG FOR BACKBONE CABLING
  N= DENOTES CONNECTION TYPE (P=PRIMARY, S=SECONDARY)
  XX= DENOTES FIBER STAND QUANTITY
  Z= DENOTES RUN NUMBER
  REFER TO FIBER OPTICS RISER FOR MORE INFORMATION.

**COVERAGE FOR IDF**

COVERAGE OF EACH TELECOM ROOM. THE SHADED REGIONS REPRESENT THE MAXIMUM DISTANCE LOW VOLTAGE CABLES CAN BE RUN FROM EACH IDF.

COVERAGE FOR IT ROOM 1

COVERAGE FOR IT ROOM 2

## TELEVISION SYSTEM

- TV X +H — TELEVISION OUTLET, CORRDINATE ROUGH-IN WITH TV MOUNT INSTALLER, WALL MOUNTED
  X= DENOTES TYPE OF OUTLET, SEE DETAIL FOR MORE INFORMATION
  +H= MOUNTING HEIGHT IN INCHES AT CENTER OF OUTLET, IF NOT SHOWN, INSTALL AT 7'-0" AFF
- TV X +H — TELEVISION OUTLET, CORRDINATE ROUGH-IN WITH TV MOUNT INSTALLER, CEILING MOUNTED
  X= DENOTES TYPE OF OUTLET, SEE DETAIL FOR MORE INFORMATION
  +H= MOUNTING HEIGHT IN INCHES AT CENTER OF OUTLET, IF NOT SHOWN, INSTALL AT 7'-0" AFF

## AUDIO VISUAL EQUIPMENT

- SX YZ W — CEILING MOUNTED SPEAKER
  X= SPEAKER TYPE
  Y= SPEAKER ZONE
  Z= DENOTES SPEAKER # IN ZONE
  W= DENOTES SPEAKER WATTAGE TAP
  NO ZONE INDICATES LOCAL ZONE FOR A/V SYSTEM IN ROOM
- SX YZ W — WALL MOUNTED SPEAKER
  X= SPEAKER TYPE
  Y= SPEAKER ZONE
  Z= DENOTES SPEAKER # IN ZONE
  W= DENOTES SPEAKER WATTAGE TAP
  NO ZONE INDICATES LOCAL ZONE FOR A/V SYSTEM IN ROOM
- VC VOLUME CONTROL, WALL MOUNTED
- FT FLIP TOP DEVICE MOUNTED ON TABLE
- SM SENS MICROPHONE FOR AMBIENT NOISE, WALL MOUNTED
- SM SENS MICROPHONE FOR AMBIENT NOISE, CEILING MOUNTED
- MX MICROPHONE, DESK MOUNTED
  X= TYPE, IF NOT SHOWN, ONLY ONE TYPE IN PROJECT
- MX MICROPHONE, WALL MOUNTED
  X= TYPE, IF NOT SHOWN, ONLY ONE TYPE IN PROJECT
- MX MICROPHONE, CEILING MOUNTED
  X= TYPE, IF NOT SHOWN, ONLY ONE TYPE IN PROJECT
- TS TOUCH SCREEN FOR AUDIO/VIDEO CONTROL, DESK MOUNTED
  X= TYPE, IF NOT SHOWN, ONLY ONE TYPE IN PROJECT
- TS TOUCH SCREEN FOR AUDIO/VIDEO CONTROL, WALL MOUNTED, INCLUDES BACK BOX
  X= TYPE, IF NOT SHOWN, ONLY ONE TYPE IN PROJECT
- AV X CAMERA FOR AV SYSTEM, WALL MOUNTED
  X= TYPE
- AV X CAMERA FOR AV SYSTEM, CEILING MOUNTED
  X= TYPE
- ALT ASSISTED LISTENING TRANSMITTER, WALL MOUNTED
- RC ROOM CONTROLLER FOR AUDIO/VIDEO CONTROL, WALL MOUNTED, INCLUDES BACK BOX
  X= TYPE, IF NOT SHOWN, ONLY ONE TYPE IN PROJECT
- TT XX +YY — AUDIO VISUAL DISPLAY
  TT= DISPLAY TYPE WITH MOUNT
  XX= SCREEN SIZE
  YY= HEIGHT TO CENTER OF SCREEN
- TT XX +YY — INTERACTIVE WHITEBOARD
  TT= DISPLAY TYPE WITH MOUNT
  XX= SCREEN SIZE
  YY= HEIGHT TO CENTER OF SCREEN
- X Y — OVERHEAD PROJECTOR WITH MOUNT
  X= TYPE
  Y= LENS THROW RATIO
- X — PULLDOWN PROJECTION SCREEN
  X= DIAGONAL DIMENSION IN INCHES
- X — MOTORIZED PROJECTION SCREEN
  X= DIAGONAL DIMENSION IN INCHES
- $S_{LV}$ WALL SWITCH FOR MOTORIZED SCREEN
- PX PODIUM FOR AV EQUIPMENT, REFER TO DETAIL SHEETS
  X= TYPE
- WA WIRELESS ANTENNA FOR WIRELESS MICRPHONE, WALL MOUNTED
- BB BACK BOX FOR CREDENZA RACK, REFER TO DETAIL SHEETS
- AV X AV PLATE OUTLET, REFER TO DETAIL SHEETS
  X= TYPE, IF NOT SHOWN, ONLY ONE TYPE IN PROJECT

## ELEC-TECHNOLOGY SPECIAL OUTLET SCHEDULE

FBA

PROVIDE 4-GANG FLOOR BOX EQUAL TO WIREMOLD #RFB4-CI-NA WITH THE FOLLOWING CHARACTERISTICS:
- GANG 1: PROVIDE (1) #CIHT-D INTERNAL DUPLEX RECEPTACLE BRACKET WITH (1) 20A. 125V. 2P. 3W. NEMA 5-20R GRAY DUPLEX RECEPTACLE
- GANG 2: PROVIDE (1) #CILT-4TKD COMMUNICATION BRACKET WITH (2) BLUE DATA JACKS, (1) GREEN VOICE JACK, AND (1) BLANK INSERT, PROVIDE (1) 1-1/4" CONDUIT ROUTED UNDER FLOOR FROM DEVICE GANG TO ELECTRICAL ROOM 103 AND STUBBED UP 4-6"
- GANG 3: PROVIDE (1) #CIHT-D INTERNAL DUPLEX RECEPTACLE BRACKET WITH (1) 20A. 125V. 2P. 3W. NEMA 5-20R GRAY DUPLEX RECEPTACLE
- GANG 4: PROVIDE (1) #CIHT-GFI INTERNAL GFI DEVICE BRACKET WITH (1) FEMALE HDMI PORT AND ADDITIONAL BLANKS AS REQUIRED TO COVER DEVICE BRACKET. PROVIDE (1) 1-1/4" CONDUIT FROM DEVICE GANG TO WALL MOUNTED TV IN ROOM - SEE PLANS
- COVER: PROVIDE (1) #FPBTCAL BLANK BRUSHED ALUMINUM COVER ASSEMBLY WITH (2) EGRESS DOORS FOR CABLE ENTRY/EXIT
- CABLING: PROVIDE (3) INDOOR-OUTDOOR RATED CAT 6 CABLES FOR VOICE/DATA CONNECTIONS, VOICE/DATA CABLES SHALL BE TERMINATED ON CAT 6 PATCH PANEL IN ELECTRICAL ROOM 103, PROVIDE (1) INDOOR-OUTDOOR RATED HDMI CABLE . HDMI CABLE SHALL BE TERMINATED IN RECESSED TV BOX ON WALL IN ROOM, PROVIDE THE FOLLOWING STATION CABLES FROM FLOOR BOX TO CONFERENCE ROOM TABLE (CONFIRM TABLE TERMINATIONS WITH ARCHITECT/OWNER/FURNITURE PROVIDER): (2) CAT 6 BLUE DATA CABLES, (1) CAT 6 GREEN VOICE CABLE, (1) BLACK HDMI CABLE

TVA / TV

PROVIDE 4-GANG RECESSED TV-DISPLAY WALL BOX EQUAL TO FSR #PWB-100-WHT WITH THE FOLLOWING CHARACTERISTICS:
- GANG 1 (TOP): PROVIDE (1) #SSDDUP PRE-WIRED 20A. 125V. 2P. 3W. NEMA 5-20R GRAY DUPLEX RECEPTACLE DEVICE PLATE
- GANG 2 (TOP): PROVIDE (1) #IPS-D711S SINGLE RJ-45 IDC CAT. 6 CONNECTOR PLATE, (1) IPS-V911S SINGLE F-STYLE CONNECTOR PLATE, (1) #IPS-V610S HDMI FEMALE TO FEMALE BULKHEAD
- GANG 3 (BOTTOM): PROVIDE (1) CABLE PASS THROUGH FOR HDMI CABLE TO CONNECT TO OTHER DEVICES IN ROOM
- GANG 4 (BOTTOM): PROVIDE BLANK FOR FUTURE USE
- COVER: COVER SHALL BE PROVIDED WITH UNIT
- CABLING: PROVIDE (1) PLENUM RATED BLUE CAT 6 CABLE FOR DATA CONNECTION, DATA CABLE SHALL BE TERMINATED ON CAT 6 PATCH PANEL IN ELECTRICAL ROOM 103, PROVIDE (1) INDOOR-OUTDOOR RATED HDMI CABLE . HDMI CABLE SHALL BE TERMINATED IN FLOOR BOX IN ROOM, PROVIDE (1) RG-6 COAX CABLE FOR CABLE TV CONNECTION, COAX CABLE SHALL BE TERMINATED ON CABLE TV HEAD-END EQUIPMENT LOCATED IN ELECTRICAL ROOM 103. PROVIDE THE FOLLOWING STATION CABLES FROM RECESSED WALL BOX TO TV/DISPLAY: (1) CAT 6 BLUE DATA CABLE, (1) BLACK HDMI CABLE, (1) BLACK RG-6 COAX CABLE

TVB / TV

PROVIDE 4-GANG RECESSED TV-DISPLAY WALL BOX EQUAL TO FSR #PWB-100-WHT WITH THE FOLLOWING CHARACTERISTICS:
- GANG 1 (TOP): PROVIDE (1) #SSDDUP PRE-WIRED 20A. 125V. 2P. 3W. NEMA 5-20R GRAY DUPLEX RECEPTACLE DEVICE PLATE
- GANG 2 (TOP): PROVIDE (1) #IPS-D711S SINGLE RJ-45 IDC CAT. 6 CONNECTOR PLATE, (1) IPS-V911S SINGLE F-STYLE CONNECTOR PLATE, (1) #IPS-V610S HDMI FEMALE TO FEMALE BULKHEAD
- GANG 3 (BOTTOM): PROVIDE (1) CABLE PASS THROUGH FOR HDMI CABLE TO CONNECT TO OTHER DEVICES IN ROOM
- GANG 4 (BOTTOM): PROVIDE BLANK FOR FUTURE USE
- COVER: COVER SHALL BE PROVIDED WITH UNIT
- CABLING: PROVIDE (1) PLENUM RATED BLUE CAT 6 CABLE FOR DATA CONNECTION, DATA CABLE SHALL BE TERMINATED ON CAT 6 PATCH PANEL IN ELECTRICAL ROOM 103, PROVIDE (1) GENERAL RATED HDMI CABLE . HDMI CABLE SHALL BE TERMINATED IN WALL AV BOX LOCATED BELOW TV BOX, PROVIDE (1) RG-6 COAX CABLE FOR CABLE TV CONNECTION, COAX CABLE SHALL BE TERMINATED ON CABLE TV HEAD-END EQUIPMENT LOCATED IN ELECTRICAL ROOM 103. PROVIDE THE FOLLOWING STATION CABLES FROM RECESSED WALL BOX TO TV/DISPLAY: (1) CAT 6 BLUE DATA CABLE, (1) BLACK HDMI CABLE, (1) BLACK RG-6 COAX CABLE

TVC / TV

PROVIDE 4-GANG RECESSED TV-DISPLAY WALL BOX EQUAL TO FSR #PWB-100-WHT WITH THE FOLLOWING CHARACTERISTICS:
- GANG 1 (TOP): PROVIDE (1) #SSDDUP PRE-WIRED 20A. 125V. 2P. 3W. NEMA 5-20R GRAY DUPLEX RECEPTACLE DEVICE PLATE
- GANG 2 (TOP): PROVIDE (1) IPS-V911S SINGLE F-STYLE CONNECTOR PLATE, (3) #IPS-B00S BLANK PLATES
- GANG 3 (BOTTOM): PROVIDE (1) BLANK FOR FUTURE USE
- GANG 4 (BOTTOM): PROVIDE BLANK FOR FUTURE USE
- COVER: COVER SHALL BE PROVIDED WITH UNIT
- CABLING: PROVIDE (1) RG-6 COAX CABLE FOR CABLE TV CONNECTION, COAX CABLE SHALL BE TERMINATED ON CABLE TV HEAD-END EQUIPMENT LOCATED IN ELECTRICAL ROOM 103, PROVIDE THE FOLLOWING STATION CABLES FROM RECESSED WALL BOX TO TV/DISPLAY: (1) BLACK RG-6 COAX CABLE

DATE | DESCRIPTION | NO.

STEPHEN B. COTTON, P.E.
PE License #60046

STATE OF FLORIDA — STEPHEN B. COTTON — No. 60046 — LICENSED PROFESSIONAL ENGINEER

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LAKE COUNTY
FIRE STATION NO.71
TECHNOLOGY LEGEND & SHEET INDEX

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100% CD Submittal - Bid Set

OCTOBER 1, 2021

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## Lake County Board of County Commissioners
## Cabling System Technical Specification
## (Updated 7/16/2015)
**No Unauthorized Substitutions**

## 1.0 INTRODUCTION

### 1.1 PURPOSE
The intent of this document is to provide a standard specification that will be used for all Lake County facilities requiring cabling installation. This document provides the minimum performance criteria for the components and sub-systems comprising a complete cabling system that shall accommodate Lake County's requirements.
Product specifications, general design considerations, and installation guidelines are provided in this written document. The successful contractor shall meet or exceed all requirements for the cabling system described in this document. The Category 6 portion of the cabling system shall comply with the proposed link and channel performance requirements of TIA/EIA 568-C.2 "Performance Specifications for 4-pair 100 Ohm Category 6 Cabling".

The successful contractor must have a BICSI® certified RCDD review the drawings and meet with representatives from Facilities and the Office of Information Technology to discuss the project and to ensure that a structured cabling system is installed that provides a comprehensive telecommunications infrastructure.

### 1.2 SCOPE
This document defines the cabling system and subsystem components to include cable, termination hardware, supporting hardware, and miscellany to install a complete telecommunications system supporting voice and data. The intent of this document is to provide all pertinent information to allow the contractor to bid the materials, labor, supervision, tooling, and miscellaneous mounting hardware and consumables to install a complete system. However, it is the responsibility of the contractor to identify any and all items required for a complete system not identified in this specification.

### 1.3 APPLICABLE DOCUMENTS
The cabling system described in this specification is derived in part from the recommendations made in industry standard documents. The list of documents below are incorporated by reference:

1. This Technical Specification and Associated Drawings
2. © 2000 BICSI® *Telecommunications Distributions Methods Manual, latest edition.*
3. ANSI/TIA/EIA-568-C.1 *Commercial Building Telecommunications Cabling Standard 2012.*
4. ANSI/TIA/EIA-568-C.2 *Balanced Twisted-Pair Telecommunication Cabling and Components Standard 2014.*
5. ANSI/TIA/EIA-568-C.3 *Optical Fiber Cabling Components Standard 2011.*
6. ANSI/TIA/EIA-568-C.4 *Broadband Coaxial Cabling and Components Standard 2011.*
7. ANSI/TIA/EIA-569-B *Commercial Building Standard for Telecommunications Pathways and Spaces 2003.*
8. ANSI/TIA/EIA-606-A *Administration Standard for the Telecommunications Infrastructure of*
9. *Commercial Buildings 2002.*
10. ANSI/TIA/EIA-607-A *Commercial Building Grounding and Bonding Requirements for Telecommunications 2002.*
11. ISO/IEC 11801 *Generic Cabling for Customer Premises.*

Other standards that contain requirements pertaining to the safety of and access to private and public telecommunications networks include:

1. ANSI/NFPA 70 *The National Electrical Code®, current edition.*
2. IEEE C2-2002 *National Electrical Safety Code (NESC®) current edition.*
3. FCC Part 68 Code of Federal Regulations, Title 47, *Telecommunications.*
4. UL 1459 Underwriters Laboratories *Standard for Safety—Telephone Equipment.*
5. UL 1863 Underwriters Laboratories *Standard for Safety—Communication Circuit Accessories.*

Specifications as provided by The Division of Information Systems, Telecommunications and Facilities groups and other special codes that may apply:
If this document and any of the documents listed above are in conflict, then the more stringent requirement shall apply. All documents listed are believed to be the most current releases of the documents; the contractor is responsible to determine and adhere to the most recent release when developing the proposal for installation.

### 1.4 CONTRACTOR REQUIREMENTS

The contractor installing the telecommunications facilities and equipment herein specified shall be an experienced TELECOMUNICATIONS CONTRACTOR. Experienced meaning that the contractor has been in this type of business for a minimum of two (2) years and have personnel that have been trained and certified in the installation of telecommunications facilities equipment. Additionally, the contractor will have successfully completed installation of similar equipment and size to that specified herein within the last year of the project.

Contractors must have a BICSI Registered/Certified Communications Distribution Designer (RCDD) on staff. A copy of the contractor's current registration must be furnished with the submittal of the proposal. The supervisor or lead technician on every project must have a current Registered BICSI RCDD and/or Registered BICSI Technician Certification.

### 1.5 EQUIPMENT COMPONENT REQUIREMENTS

The contractor bidding the telecommunications facilities and equipment herein specified shall submit a bill of materials including any manufacturer specifications for proposed components to County IT for approval before submitting a final bid on all telecommunications systems projects. County IT will evaluate the manufacturer specifications and may respond with requests to substitute a preferred name brand manufacturers for specific components. Preference will be given to all bids that conform to county recommended components and standards.

## 2.0 TELECOMMUNICATIONS SYSTEM REQUIREMENTS

### 2.1 FACILITIES DESCRIPTION
Lake County's facilities vary in function and size. Most buildings have individual offices for faculty and staff; in certain areas, personnel may be situated in modular office furniture with hard wall offices around the exterior of the floor. Generally, a ceiling distribution cabling system using cable trays and conduits is used. These specifications apply primarily to new buildings and major renovations, but should be followed as closely as possible for all telecommunications cabling installations.

### 2.2 TELECOMMUNICATIONS SYSTEM DESCRIPTION
Lake County's data distribution network is based on a star topology with a collapsed-backbone. The data cabling should be designed end to end to meet or exceed 1000BASE-T/1000BASE-TX standards. As a standard configuration each work area will consist of a communications outlet containing two Category 6 jack inserts and one Category 3 jack insert (1 Voice and 2 Data) or three Category 6 cables. All data jacks are terminated using Category 6 horizontal cables pulled and terminated on Category 6 insulation displacement connector patch panels in the telecommunications room. Patch cords/equipment cords are used to connect each jack to the appropriate service connector. All voice cables and all voice pairs are terminated on 66-M150 blocks on a backboard in the telecommunications room. Generally, high pair count Category 3 CMR or CMP backbone/riser cables are employed between the Entrance facilities or Main telecommunications room and each telecommunications room for voice connectivity. Category 6 cables and 50 micron multi-mode fiber optic cables are used as backbone/riser cables for data. All CATV cable runs under 300 meters shall be accompanied by a single Category 6 data cable run that will terminate on the same wall outlet. All jack inserts need to be "Keystone" type.

## 3.0 HORIZONTAL DISTRIBUTION SYSTEM

### 3.2 TELECOMMUNICATIONS CABLING SYSTEM
The telecommunications contractor will be responsible for pulling and terminating the cables following all federal, state and local codes, accepted industry standards and the manufacturer's instructions. The telecommunications contractor must work closely with the electrical contractor to ensure that the pathways are installed correctly and that they will allow for proper installation of the cabling system. Visual inspections and upon completion of the project test results will be used to verify proper installation practices were followed.
The cabling system will consist of Lake County IT approved Category 6 components and cable. Each Category 6 data cable shall be terminated on an 8-position, 8-conductor Category 6 jack "Keystone" insert wired to the T568B color code in the work area and in the telecommunications room. Each Category 6 voice cable shall be terminated on a 6-position, 6-conductor jack insert at the work station and on 66-M150 blocks on a backboard in the telecommunications room. Voice and Data racks should be separate and located appropriately for their specific function. A single pull string should be left in the conduit at each outlet location.

### 3.2.1 WORK AREA TELECOMMUNICATIONS OUTLETS
Work area communications outlets should be placed one per 100 sq ft of useable floor space and sized to accommodate four Category 6 cables and connectors. Outlets should be within 3' of an electrical outlet and installed at the same height, unless otherwise specified. Outlets should be placed so that the work area or workstation cable does not exceed 5 meters (16 ft) in length. This length is figured into the total horizontal cabling length and must not be exceeded.

**Office Outlets**
One 3-port flush 110 Connect faceplate. Faceplates shall be constructed of ABS molding compound and be 4.53" X 2.77" X .60" in size. Each outlet shall contain three cables terminated on two Category 6, 8-position, 8-conductor jack BLUE "Keystone" inserts and one Category 6 or Category 3, jack ALMOND insert for voice following manufacturer's instructions. Faceplates shall accommodate two labels and provide a clear polycarbonate cover for each. The upper jack will be designated as the voice jack and shall be colored light almond while the data jacks shall be colored blue and shall occupy the bottom two position(s) on the faceplate unless otherwise noted on the drawings. Faceplates shall be light almond in color unless otherwise noted. Faceplates shall be an approved brand and shall be mounted to in-wall single gang boxes.

**CATV/VIDEO Outlets**
One 2-port flush 110 Connect faceplate. Faceplates shall be constructed of ABS molding compound and be 4.53" X 2.77" X .60" in size. Each outlet shall contain one cable terminated on a Category 6, 8-position, 8-conductor jack for VIDEO and one on a 75 ohm coaxial cable insert for CATV following manufacturer's instructions. Faceplates shall accommodate two labels and provide a clear polycarbonate cover for each. The upper jack will be designated as the CATV jack and while the VIDEO jack shall be colored green and shall occupy the bottom position on the faceplate unless otherwise noted on the drawings. Faceplates shall be light almond in color unless otherwise noted. Faceplates shall be an approved brand and shall be mounted to in-wall single gang boxes.

**Modular Furniture Outlets**
Use appropriate FLEX-MODE faceplate determined by modular furniture brand. FLEX-MODE faceplates shall be made of polycarbonate molding compound, black in color. The faceplate(s) shall be mounted in the appropriate knockout(s) in the furniture channel. Consult with a representative for specific instructions.

### 3.2.2 PRODUCT SPECIFICATIONS

**Category 3 Cabling – Non-plenum**
Horizontal data cabling shall be 24 AWG, solid copper, 4-pair UTP, UL/NEC CMR rated, with a white/gray/beige PVC jacket. Cable jacketing shall be lead-free. Cable shall meet standard Category 3 performance requirements. Cable shall be supplied on wooden reels or in reel-in-box. Cable shall be UL listed under file number E138034.

**Category 3 Cabling – Plenum**
Horizontal data cabling shall be 24 AWG, solid copper, 4-pair UTP, UL/NEC CMP rated, with a white/gray/beige plenum-rated PVC jacket. Individual conductors shall be FEP insulated. Cable jacketing shall be lead-free. Cable shall meet standard Category 3 performance requirements. Cable shall be supplied on wooden reels or in reel-in-box. Cable shall be UL listed under file number E138034.

**Category 6 Cabling – Non-plenum**
Horizontal data cabling shall be 23 AWG, solid copper, 4-pair UTP, UL/NEC CMR rated with a (blue PVC jacket for data) and a (green PVC jacket for voice). Cable jacketing shall be lead-free. Cable shall meet standard EIA/TIA-568-C.2 Category 6 performance requirements and shall be rated up to 550 MHz. Cable shall be supplied on wooden reels or in reel-in-box. Cable shall be UL listed under file number E138034.

**Category 6 Cabling – Plenum**
Horizontal data cabling shall be 23 AWG, solid copper, 4-pair UTP, UL/NEC CMP rated with a (blue plenum-rated PVC jacket for data) and a (green plenum-rated PVC jacket for voice). Individual conductors shall be FEP insulated. Cable jacketing shall be lead-free. Cable shall meet standard EIA/TIA-568-C.2 Category 6 performance requirements and shall be rated up to 550 MHz. Cable shall be supplied on wooden reels or in reel-in-box. Cable shall be UL listed under file number E138034.

**Fiber Optic Cable and Termination Hardware**
All multimode optical fiber must be 50/125um. All optical fiber must be manufactured by CORNING Cable Systems. CORNING Cable Systems LanScape® products will be used for all optical fiber splice and termination points. The types of cable, number of fiber strands and types of termination will vary for each project and must be stated in the project specifications.

**Modular Jacks**
All modular jacks shall be wired to the T568B wiring pattern. Modular jacks shall be of the "Keystone" type. Modular jacks shall be constructed with a housing of polyphenylene oxide, 94V-0 rated. Modular jacks shall be terminated using a 110-style pc board connector (made of 94V-0 rated polycarbonate), color-coded for both T568A and T568B wiring. The 110 connector shall terminate 22-24 AWG solid conductors with a maximum insulation diameter of .050 inches. The modular jack contacts shall be plated with a minimum of 50 micro-inches of gold in the contact area over a 50 micro-inch minimum nickel under plate. Modular jacks shall be compatible with panel thicknesses of .058" - .063". Modular jacks shall snap into a .790" X .582" opening and only approved inserts and face plates shall be used. Modular jacks shall be UL Listed under file number E81956.

### 3.2.3 WORK AREA COMMUNICATIONS OUTLET INSTALLATION
All outlets shall be installed in the following manner:

Cables shall be coiled in the in-wall or surface-mount boxes if adequate space is present to house the cable coil without exceeding the manufacturers bend radius. In hollow wall installations where box-eliminators are used, excess wire can be stored in the wall. No more than 12" of slack shall be stored in an in-wall box, modular furniture raceway, or insulated walls. Excess slack may be neatly coiled and stored in the ceiling above each drop location when there is not enough space present in the outlet box to store slack cable.

In addition, each cable type shall be terminated as indicated below:

Cables shall be dressed and terminated in accordance with the recommendations made in the BICSI® Telecommunications Distributions Methods Manual, manufacturer's recommendations and/or best industry practices.

Pair untwist at the termination shall not exceed .25 inch for Category 6 connecting hardware.

Bend radius of the cable in the termination area shall not be less than 4 times the outside diameter of the cable.

The cable jacket shall be maintained as close as possible to the termination point.

### 3.3 HORIZONTAL DISTRIBUTION CABLE INSTALLATION
If the building is renovated or rewired, abandoned cable shall be removed from the building in accordance with National Electric Code, once it is no longer in service. Unused, un-terminated cable is only allowed if there is a planned purpose for the cable and it must be documented on the as-build drawings.

The following guidelines should be used when installing Horizontal distribution cable:

All horizontal data distribution cable should be Category 6, 100 ohm, UTP of an approved vendor and shall not exceed a maximum distance of 295 feet.

All horizontal voice distribution cable should be Category 3, 100 ohm, UTP of an approved vendor.

Cable shall be installed in accordance with manufacturer's recommendations and best industry practices.

Cable raceways shall not be filled greater than the NEC maximum fill for the particular raceway type.

Cables shall be installed in continuous lengths from origin to destination (no splices).

Unshielded twisted pair cable shall be installed so that there are no bends less than four times the cables outside diameter (4 X cable O.D.) at any point in the run.

Pulling tension on 4-pair UTP cables shall not exceed 25-pounds for a single cable or cable bundle.

If a J-hook or trapeze system is used to support cable bundles all horizontal cables shall be supported at a maximum of four-foot intervals. At no point shall cable(s) rest on acoustic ceiling grids or panels.

Horizontal distribution cables shall be bundled in groups of not greater than 40 cables. Cable bundle quantities in excess of 40 cables may cause deformation of the bottom cables within the bundle.

Cable shall be installed above fire-sprinkler and systems and shall not be attached to the system or any ancillary equipment or hardware. The cabling system and support hardware shall be installed so that it does not obscure any valves, fire alarm conduit, boxes, or other control devices.

Cables shall not be attached to ceiling grid or lighting support wires. Where light support for drop cable legs are required, the contractor shall install clips to support the cabling.

☐ Any cable damaged or exceeding recommended installation parameters during installation shall be replaced by the contractor prior to final acceptance at no cost to Lake County BCC.

Cables shall be identified by a self-adhesive label in accordance with the System Documentation Section of this specification. The cable label shall be applied to the cable behind the faceplate on a section of cable that can be accessed by removing the cover plate.

### 3.4 HORIZONTAL CABLE TERMINATION
All horizontal distribution runs shall work together to produce optimum efficiency and throughput. All cable and jack combinations must be tested by an independent laboratory to determine their performance when paired together. Two such independent tests are Anixter's "levels" program and Graybar's "VIP" program. It is the responsibility of the contractor to make sure that both jack and wire are of the same "category" rating.

### 3.4.1 HORIZONTAL DATA/VIDEO CABLE TERMINATION PATCH PANELS
All horizontal data cables will be terminated on Category 6 patch panels in the telecommunications room. The horizontal cables termination patch panels shall be colored black and contained in standard 19" x 7' rack(s), wall-mount racks or equipment cabinets as specified by the project drawings. All equipment racks shall be properly secured to the floor or wall and augmented with horizontal and vertical management hardware, both front and rear, to properly dress horizontal cables. Patch panels shall provide 24 or 48 modular jack ports, wired to T568B. The front of each module shall be capable of accepting 9mm to 12mm labels. Patch panels shall terminate the building cabling on 110-style insulation displacement connectors. Patch panels must be UL Listed under file number E81956. Patch panels shall be of an approved brand. Modular inserts for use in the patch panel should be of the same manufacturer as the jacks used at the work area station outlets. All video cables shall be terminated on a single independent patch panel.

### 3.4.2 HORIZONTAL VOICE CABLE TERMINATION BLOCKS
All horizontal voice cables will be terminated on 66-M150 blocks in the telecommunications room. The horizontal cables termination 66-M150 blocks shall be contained on a backboard as specified by the project drawings. All 4 pairs of each cable will be terminated on the 66-M150 blocks and labeled 1 – XX, 2 – XX, 3 – XX, etc

### 3.4.3 HORIZONTAL CABLE SUPPORT

a 12" ladder rack system shall be installed in the telecommunications room to support the cables. The ladder should encompass the room allowing the cables to be properly dressed and supported.

secure the top of all freestanding equipment racks using 12" ladder racks to the wall or intersect with the ladder system encompassing the room.

## 4.0 BACKBONE CABLE
If the building is renovated or rewired, abandoned cable shall be removed from the building in accordance with National Electric Code, once it is no longer in service. Unused, un-terminated cable is only allowed if there is a planned purpose for the cable and it must be documented on the as-build drawings.

Data backbone cabling installed between the entrance facilities or main telecommunications room and each telecommunications room will consist of one or more of the following types of cable:

Category 6 , 100 ohm, UTP as described in the horizontal distribution section for data distances up to 295'.

High pair count TIA Category 3 CMR or CMP is adequate for voice backbone/riser cable.

50/125um multimode optical fiber (inside building) terminated with LC connectors.

☐ Single mode optical fiber (building to building) terminated with LC connectors.

the minimum strand count for the single-mode fiber optic backbone entering the building is 96 strands of SM which should be terminated on a wall mounted fiber box or a rack mounted fiber patch panel in the Main Distribution Room. Connection into Lake County's existing fiber backbone should be included in all design drawings and bids. This should include splicing, termination, testing, conduit, vaults and boring necessary to provide full connectivity into Lake County's existing fiber backbone.

the minimum strand count of fiber between telecommunications closets that exist on the same floor of a building shall be 12 strand of MM and 6 strand SM, preferably combined in a hybrid fiber cable. All fiber should be terminated on a wall mounted fiber box or in a rack mounted termination panel.

the minimum strand count of fiber between a server room and the Main Distribution Room shall be 12 strand of MM and 6 strand SM, preferably combined in a hybrid fiber cable. All fiber should be terminated on a wall mounted fiber box or in a rack mounted termination panel.

the minimum strand count of fiber from each telecommunications closet to the Main Distribution Room shall be 12 strand of MM and 6 strand SM, preferably combined in a hybrid fiber cable. All fiber should be terminated on a wall mounted fiber box or in a rack mounted termination panel.

a minimum of 25' of excess fiber shall be provided at each fiber termination point. Such service loops should conform to specifications to include total length and bend radii.

The types and number of cables used for backbone systems will vary for each project and must be documented in the project specifications and documented on the drawings. Any termination or splice enclosures used for optical fiber will be listed in the specifications and documented on the drawings.
Voice backbone cabling will be 24 AWG, 100-pair UTP, UL/NEC CMR rated or CMP if required, with a white/gray/beige PVC jacket. Cable shall be third party verified to comply with TIA Category 3 requirements. Cable shall be supplied on 1000 ft. reels. A coupled bonding conductor will be installed within the riser bundle and bonded and grounded at each end.

### 4.1 BACKBONE CABLE INSTALLATION
All copper backbone cables shall be installed in the following manner:

Backbone cables shall be installed separately from horizontal distribution cables.

where cables are housed in conduits, the backbone and horizontal cables shall be installed in separate conduits or in separate inner duct within conduits.

where cables are installed in an air return plenum, the cable shall be installed in conduit, or plenum cable shall be installed in a plenum inner duct to provide protection to the cable

where backbone cables and distribution cables are installed in a cable tray or wire way, backbone cables shall be installed first and bundled separately from the horizontal distribution cables.

For optical fiber backbone cables:

do not exceed the cable's minimum bend radius. Bending cable tighter than the minimum bend Radius may result in increased optical fiber attenuation or fiber breakage.

the minimum bend radius for indoor backbone optical fiber cable is 10 times the cables outside diameter under no load conditions and 15 times the cables outside diameter when being pulled.

☐ do not exceed the cables maximum vertical rise and tensile rating.

where cables are installed in an air return plenum, the cable shall be installed in conduit, or plenum cable shall be installed in a plenum inner duct to provide protection to the cable

where backbone cables and distribution cables are installed in a cable tray or wire way, backbone cables shall be installed first and bundled separately from the horizontal distribution cables use inner duct whenever possible.

all fiber should be from the same manufacture and preferably the same lot if possible. All lot numbers of fiber should be documented on drawings.

NOTE: Do not locate backbone cable pathways in elevator shafts. Do not over fill conduits, ducts or sleeves. Refer to the BICSI® *Telecommunications Distributions Methods Manual*, latest edition for more information.

### 4.2 FIBER LIGHTGUIDE INTERCONNECT UNIT (LIU)
Fiber LIUs shall be manufactured to fit in both 19 inch relay rack and 23 inch relay rack. The LIU shall be sized to accommodate the appropriate number of fiber connections and utilize the least amount of rack space. Even if the LIU is not fully populated with fiber connection, the LIU shall be completely populated with bulkhead panels to accommodate future use. On 72 and 144 port LIU's the termination and splice shelf must be used together due to fusion splicing on single mode and multimode fiber. The LIUs used by the contractor must be approved by Lake County IT.

### 4.3 FIBER CONNECTORS:
All single mode fiber shall be terminated using factory manufactured pigtails with LC type connectors. All multimode fiber shall be terminated using factory manufactured pigtails with LC type connectors. The pigtails used by the contractor must be approved by Lake County IT.

### 4.4 FIBER COUPLERS:
All single mode fiber LIU panels shall be equipped with LC to LC couplers. All multimode fiber LIU panels shall be equipped with LC to LC couplers. The couplers used by the contractor must be approved by Lake County IT and must be of the same manufacturer as the fiber connectors.

## 5.0 WORK AREA AND PATCH CORD CABLE ASSEMBLIES
The Division of Information Systems will provide the patch cords for the workstations unless they are specifically included as part of the project. Cables must not exceed 5 meters (16 ft) in length and should be approved by Lake County BCC IT.

## 6.0 CABLING SYSTEM TESTING
All cables and termination hardware shall be 100% tested for defects in installation and to verify cable performance under installed conditions. The contractor prior to system acceptance shall verify all conductors of each installed cable useable. Any defect in the cabling system installation including but not limited to cable, connectors, feed through couplers, patch panels, and connector blocks shall be repaired or replaced in order to ensure 100% useable conductors in all cables installed. All cables shall be tested in accordance with this document, and best industry practices. If any of these are in conflict, the Contractor shall be responsible to bring any discrepancies to the attention of the project manager for clarification and/or resolution.

### 6.1 PERFORMANCE VERIFICATION
### 6.1.1 COPPER
Category 6 data cable shall be performance verified using an automated test set. Test results shall be automatically evaluated by the equipment, using the most up-to-date criteria from the TIA/EIA Standard currently ANSI/TIA/EIA-568-C.2, and the result shown as pass/fail. Test results shall be printed directly from the test unit or from a download file using an application from the test equipment manufacturer. The printed test results shall include all tests performed, the expected test result and the actual test result achieved.

### 6.1.2 FIBER
All 50/125um multimode optical fiber and/or Single mode optical fiber must be manufactured by CORNING Cable Systems and it would be preferable that all fiber cable is from the same manufacturer lot number. After installation, it must be performance verified using an automated test set. Test results shall be automatically evaluated by the equipment, using the most up-to-date criteria from the TIA/EIA Standard currently ANSI/TIA/EIA-568-C.3, and the results shown as pass/fail. Test results shall be printed directly from the test unit or from a download file using an application from the test equipment manufacturer. The printed test results shall include all tests performed, the expected test result and the actual test result achieved.

## 7.0 SAFETY / ENVIRONMENTAL

### 7.1 FIRESTOP SYSTEMS
A fire stop system is comprised of: the item or items penetrating the fire rated structure; the opening in the structure and the materials and assembly of the materials used to seal the penetrated structure. Fire stop systems comprise an effective block for fire, heat, vapor and pressurized water stream.
All penetrations through fire rated building structures (walls and floors) shall be sealed with an appropriate fire stop system. This requirement applies to through penetrations (complete penetration) and membrane penetrations (through one side of a hollow fire rated structure). Any penetrating items i.e., riser slots and sleeves, cables, conduit, cable tray, and raceways, etc. shall be properly fire stopped.

### 7.1.1 PRODUCT SPECIFICATIONS
Fire stop systems shall be UL Classified to ASTM E814 (UL 1479) and shall be approved by the Lake County Fire Marshal. A drawing showing the proposed fire stopped system, shall be provided to Lake County's Technical Representative and Fire Marshall prior to installing the fire stop system(s).

### 7.1.2 FIRESTOP SYSTEM INSTALLATION
All fire stop systems shall be installed in accordance with the manufacturer's recommendations and shall be completely installed and available for inspection by the local inspection authorities prior to cabling system acceptance.

### 7.2 GROUNDING AND BONDING
The facility shall be equipped with a Telecommunications Bonding Backbone (TBB). This backbone shall be used to ground all telecommunications cable shields, equipment, racks, cabinets, raceways, and other associated hardware that has the potential for acting as a current carrying conductor. The TBB shall be installed independent of the buildings electrical and building ground and shall be designed in accordance with the recommendations contained in the TIA/EIA-607 Telecommunications Bonding and Grounding Standard.
The main entrance facility/equipment room in each building shall be equipped with a telecommunications main grounding bus bar (TMGB). Each telecommunications closet shall be provided with a telecommunications ground bus bar (TGB). The TMGB shall be connected to the building electrical entrance grounding facility. The intent of this system is to provide a grounding system that is equal in potential to the building electrical ground system. Therefore, ground loop current potential is minimized between telecommunications equipment and the electrical system to which it is attached.

### 7.2.1 PRODUCT SPECIFICATIONS
All racks, metallic backboards, cable sheaths, metallic strength members, splice cases, cable trays, etc. entering or residing in the TC or ER shall be grounded to the respective TGB or TMGB using a minimum #6 AWG stranded copper bonding conductor and compression connectors. Where metallic panels attached to the rack to not have sufficient metal to metal contact to provide an adequate path to ground, they shall be bonded to the rack using a minimum #14 AWG copper conductor. The copper conductor size shall be upgraded based on the largest power conductor feeding any rack mount equipment. The conductor shall be continuous; attaching all isolated components in a daisy chain fashion from top to bottom and bonded to the rack using an appropriate compression connector.
All wires used for telecommunications grounding purposes shall be identified with a green insulation. Non-insulated wires shall be identified at each termination point with a wrap of green tape. All cables, and bus bars shall be identified and labeled.

### 7.2.2 GROUND SYSTEM INSTALLATION
The TBB shall adhere to the recommendations of the TIA/EIA-607 standard, and shall be installed in accordance with best industry practices. Installation and termination of the main bonding conductor to the building service entrance ground, at a minimum, shall be performed by a licensed electrical contractor.

### 7.3 ENVIRONMENTAL CONSIDERATIONS
Environmental considerations need to be made for the telecommunications room where networking equipment will be in use. If possible air conditioning shall be installed on a separate zone so that the air can be run during the winter. If air conditioning cannot be afforded, heavy-duty airflow and exhaust fans should be used to keep the room below 90 degrees.

### 7.4 FIRE EXTINGUISHER
A fire extinguisher (CO2 or type dependent on local fire codes) shall be hung inside all equipment rooms and telecommunications rooms.

### 7.5 SPRINKLER SYSTEM
Sprinkler systems heads should be rated for higher temperature to prevent them from going off inadvertently as the water can harm networking equipment. If needed, special hoods may be fabricated to prevent water from directly assessing computer equipment.

## 8.0 SYSTEM DOCUMENTATION
The following section describes the installation, administration, testing, and as-built documentation required to be produced and maintained by the contractor during the course of the installation.

### 8.1 CABLING SYSTEM LABELING
The contractor shall develop and submit for approval a labeling system for the cable installation. Lake County BCC will negotiate an appropriate labeling scheme with the successful contractor. At a minimum, the labeling system shall clearly identify all components of the system: racks, cables, panels and outlets. The labeling system shall designate the cables origin and destination and a unique identifier for the cable within the system. Racks and patch panels shall be labeled to identify the location within the cabling system infrastructure. All labeling information shall be recorded on the as-built drawings and all test documents shall reflect the appropriate labeling scheme. All label printing will be machine generated using indelible ink ribbons or cartridges. Self-laminating labels will be used on cable jackets, appropriately sized to the OD of the cable, and placed within view at the termination point on each end. Outlet labels will be the manufacturer's labels provided with the outlet assembly.

### 8.1.1 DEFAULT LABELING SCHEME
All cable outlets and termination panels/bays or blocks will be appropriately labeled to match the cable using the following default labeling scheme is an approved scheme has not been negotiated:

Room number

– (dash)

Device Code (O-outlet, P-Patch Panel, B-Block)

☐ Device number (devices numbered 1-9 going around the room in a clockwise direction from the entrance)

D or V (for data or voice)

Outlet number on the plate, port number on the panel

### 8.2 AS-BUILT DRAWINGS
The installation contractor will be provided with 2 sets of D or E-size drawings at the start of the project. One set will be designated for as the central location to document all as-built information as it occurs throughout the project. The central set will be maintained by the Contractor's Foreman on a daily basis, and will be available to the Technical representative upon request during the course of the project. Anticipated variations from the build-to drawings may be for such things as cable routing and actual outlet placement. No variations will be allowed to the planned termination positions of horizontal and backbone cables, and grounding conductors unless approved in writing by Lake County BCC.
The Contractor shall provide the central drawing set to the Lake County BCC at the conclusion of the project. The marked up drawing set will accurately depict the as-built status of the system including termination locations, cable routing, and all administration labeling for the cabling system. In addition, a narrative will be provided that describes any areas of difficulty encountered during the installation that could potentially cause problems to the telecommunications system.

**Requirements for As-built drawings**

Backbone diagrams shall include:

one line diagrams for UTP copper cabling with cable counts.

one line diagrams for optical fiber cabling with cable counts (including lot number).

Floor Diagrams shall include:

TR locations and room numbers.

Work area outlets (WAO) and faceplate labels.

TR wiring zones, which identify WAOs served.

Horizontal cabling pathways including penetrations and fire stopping.

TR Diagrams shall include:

TR room number.

Rack locations.

Power outlet locations.

Conduit entrance locations.

### 8.3 TEST DOCUMENTATION

Test documentation shall be provided in a three ring binder(s) within three weeks after the completion of the project. The binder(s) shall be clearly marked on the outside front cover and spine with the words "Test Results", the project name, and the date of completion (month and year). The binder shall be divided by major heading tabs, Horizontal and Backbone. Each major heading shall be further sectioned by test type. Within the horizontal and backbone sections, and scanner test results (Category 6)(10GBase-T), shall be segregated by tab. Test data within each section shall be presented in the sequence listed in the administration records. The test equipment by name, manufacturer, model number and last calibration date will also be provided at the end of the document. Unless a more frequent calibration cycle is specified by the manufacturer, an annual calibration cycle is anticipated on all test equipment used for this installation. The test document shall detail the test method used and the specific settings of the equipment during the test. Scanner tests shall be printed on 8-1/2" x 11" paper.
When repairs and re-tests are performed, the problem found and corrective action taken shall be noted, and both the failed and passed test data shall be collocated in the binder.

## 9.0 WARRANTY AND SERVICES

### 9.1 CABLING SYSTEM WARRANTY
The telecommunications contractor shall facilitate a 5-Year extended System Performance Warranty between the manufacturer and Lake County BCC. The extended component warranty shall be provided which warrants functionality of all components used in the system for 5 years from the date of acceptance. The performance warranty shall warrant the installed 550 MHz horizontal copper, and if installed by the contractor both the horizontal and backbone optical fiber portions of the cabling system. Copper links shall be warranted against the link performance minimum expected results defined in TIA/EIA-568-C.2 (latest draft).

### 9.2 POST INSTALLATION MAINTENANCE
The contractor shall furnish an hourly rate with the proposal submittal, which shall be valid for a period of one year from the date of acceptance. This rate will be used when cabling support is required to affect moves, adds, and changes to the system (MACs). MACs shall not void the Contractor's nor manufacturer's warranty.

### 9.3 PROJECT MANAGEMENT / GENERAL
The contractor shall establish a point of contact with Lake County BCC who will be responsible for reporting progress and updating Lake County's Technical Representatives, (FMO Project Manager, LCIT Information Systems, LCIT Telecommunications) with issues that Lake County BCC must address to facilitate the cabling system installation. The contractor's POC shall provide daily written reports to Lake County's Technical Representatives detailing progress. Requests for access to limited access or restricted areas shall be made the day prior to the required access. Information critical to the completion of the task or project shall be communicated to the county's Technical Representatives, as the requirement becomes known. Casual information shall be passed during the scheduled progress report.
The contractor shall maintain Lake County's facility in a neat and orderly manner during the installation of the communications cabling system. Lake County's facilities shall be maintained in broom clean condition at the completion of work each day. At the completion of work in each area, the contractor will perform a final cleaning of debris prior to moving the installation crew to the next work area.

## 10.0 CABLING SYSTEM ACCEPTANCE
Lake County's Technical Representatives will make periodic inspection of the project in progress. One inspection will be performed at the conclusion of cable pulling, prior to closing of the false ceiling, to inspect the method of cable routing and support, and the fire stopping of penetrations. A second inspection will be performed at completion of cable termination to validate that cables were dressed and terminated in accordance with TIA/EIA specifications for jacket removal and pair untwist, compliance with manufacturer's minimum bend radius, and that cable ends are dressed neatly and orderly.

### 10.1 FINAL INSPECTION
Upon completion of the project, Lake County's Technical Representatives will perform a final inspection of the installed cabling system with the Contractor's Project Foreman. The final inspection will be performed to validate that all horizontal and backbone cables were installed as defined in the drawing package, and that the installation meets the aesthetic expectations of Lake County BCC.

### 10.2 TEST VERIFICATION
Upon receipt of the test documentation, Lake County reserves the right to perform spot testing of a representative sample of the cabling system to validate test results provided in the test document. Lake County BCC testing will use the same method employed by the contractor, and minor variations will be allowed to account for differences in test equipment. If significant discrepancies are found the contractor will be notified for resolution.

### 10.3 SYSTEM PERFORMANCE
During the three-week period between final inspection and delivery of the test and as-built documentation, Lake County BCC will activate the cabling system. Lake County BCC will validate operation of the cabling system during this period.

### 10.4 FINAL ACCEPTANCE
Completion of: the installation; in-progress and final inspections; receipt of the test and as-built documentation; and successful performance of the system for a two week period will constitute acceptance of the system.

## 11.0 CATV or CCTV Cabling
When CATV or CCTV requirements are identified, either a 75-ohm broadband coaxial cable or single-mode fiber optic cable system should be installed. Refer to the paragraphs related to fiber optic cable in this standard for more information.
When a coaxial system is installed, care must be taken to ensure the correct cable is used. The designer must coordinate with the cable service provider where franchised agreements are in place. Plenum cables must be provided in accordance with NFPA 70, or when directed by the BCC project team. The table below lists cable types with corresponding distance limitation. This table is derived from vendor specifications (Anixter) for coaxial cable. RG-59 will not be acceptable for CATV or CCTV projects. RG-6 quad shield cabling should be used to outlet locations and RG-11 for feeder and trunk cables for distances up to 400 feet and 625 series for lengths over 400'.

| Cable | Distance (Feet) | Distance (Meters) |
|---|---|---|
| RG-6 Quad Shield | <=200 | <=61 |
| RG-11 | <=400 | <=122 |
| 625 Series | >400 | >122 |

**Community Antenna Television (CATV) Systems**
Community Antenna Television Systems are generally referred to as Cable TV. CATV systems must be designed in accordance with the following: Where required, provide a complete system to be owned and maintained by the government including backbone consisting of backboards/cabinets and wire and conduit with outlets and jacks in all offices, and other locations as required by the user. System must be designed in accordance with applicable TIA/EIA, BICSI, and NFPA 70 standards, and must be coordinated with the local CATV service provider. System must include headend amplifier when required by the local provider, amplifiers, splitters, combiners, line taps, cables, outlets, tilt compensators and all other parts, components, and equipment necessary to provide a complete and usable system. System must provide a high quality signal to all outlets with a return path for interactive television and cable modem access. The system must be designed to operate within the 5 to 1000 MHz bandwidth using 1000 MHz passive devices and a minimum of 750 MHz active devices. Each outlet must have a minimum signal level of 0 decibel millivolts (dBmV) (1000 microvolts) and a maximum of 15 dBmV at 55 and 750 MHz.
Distribution system must be star topology with each outlet connected via home run to a communications closet with a feeder cable or a drop cable and each communications closet connected to the head end equipment with a trunk cable.
Provide cable installed in conduit as follows:
- Trunk Cable, RG-11 or 625 series
- Feeder cable, RG-11
- Drop Cable, RG-6

**APPENDIX A – Lake County Network Cabling Check List For Contractors**

**Lake County Network Cabling Check List For Contractors**
*Complete details can be found in the Lake County Telecommunications Specs and the Design Standards for Communication Wiring Systems Documents*

| | |
|---|---|
| ✓ | Cable contractor must have a BICSI Registered/Certified Communications Distribution Designer (RCDD) on staff |
| ✓ | Cable installer must be an experienced telecommunications contractor with a minimum of two years experience and must be certified in the system(s) being installing |
| ✓ | Lake County IT shall receive a set of As-Built drawings (section 8.2 County telecommunications specs) |
| ✓ | Contractor shall develop and submit to Lake County IT for approval a labeling system for cable installation (section 8.1 County telecommunications specs) |
| ✓ | Lake County IT shall receive all cable tests documented and presented in a three ring binder(s) within three weeks after completion of the project. |
| ✓ | All backbone fiber installation shall be done by a Corning certified vendor and all test results must be submitted to Corning as to comply with the Corning 25 year manufacturer warranty program |
| ✓ | Contractor shall provide cabling warranty and services as specified in section 9.0 of County telecommunications specs |
| ✓ | Proper grounding of all telecommunications equipment must meet best practices and County telecommunication specs section 7.0 |
| ✓ | All backbone fiber shall be manufactured by Corning cable systems, other fiber shall be manufactured by Corning cable systems unless approved by Lake County IT |
| ✓ | All multimode fiber shall be 50/125um and shall be terminated with LC connectors |
| ✓ | All single mode fiber shall be terminated with LC connectors |
| ✓ | All fiber shall be terminated by the contractor on a wall mounted LIU panel or rack mounted LIU whichever is most appropriate and the LIU shall be equipped with LC to LC couplers |
| ✓ | The minimum strand count for single mode backbone fiber running from building to building shall be 96 strand |
| ✓ | The minimum strand count from each telecommunications closet to the Main Distribution Room shall be 12 strand of multimode and 6 strand of single mode, preferably provided with a single hybrid fiber cable |
| ✓ | If a floor contains multiple telecommunications closets then a minimum strand count of 12 strand multimode and 6 strand single mode shall be run between each closet, preferably provided with a single a hybrid fiber cable |
| ✓ | The minimum strand count from each server room to the Main Distribution Room shall be 12 strand of multimode and 6 strand of single mode, preferably provided with a single hybrid fiber cable |
| ✓ | All data cables shall be blue colored Category 6, 100 ohm UTP and manufactured by an approved vendor |
| ✓ | All data and voice cables shall be terminated on approved category 6 patch panels in the telecommunications closet. Voice cables should be terminated on an independent patch panel and labeled as such. |
| ✓ | All data and voice cables shall be terminated at the work area using category 6 modular data jacks. Data cables and inserts are colored blue while voice cables and inserts are green. |
| ✓ | Work area telecommunications outlets shall be placed one per 100 sq ft and should be within 3' of an electrical outlet and at the same height |
| ✓ | Each work area outlet shall consist of two blue colored data jacks and two ivory colored voice jacks with a ivory colored four port flush faceplate |
| ✓ | Each work area outlet will consist of two blue jacks terminated with data cables, one ivory jack terminated with a voice cable and one un-terminated ivory jack |
| ✓ | Each CATV outlet shall consist of a 75 ohm coaxial connector as well as a single CAT6 green connector. In the case where the video run is greater than 100m then a single mode fiber LC connection should be substituted. |
| ✓ | A single pull string should be left in the conduit at each outlet position. |
| • | ¾" Plywood covering as much wall, floor to ceiling, as possible not to be any smaller than 4' x 8' for the PBX equipment |

Picture below is provided as an example of the backboard just for the telephone termination equipment

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TECHNOLOGY OWNER SPECS
3661 CR 473, LEESBURG, FL 34788
20073A

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T0.2

# LAKE COUNTY FIRE STATION #71

## DESIGN AND CONSTRUCTION RESPONSIBILITIES

| ITEM | SYSTEM | SCOPE | DESIGN RESPONSIBILITY | PROCUREMENT RESPONSIBILITY | CONSTRUCTION RESPONSIBILITY |
|---|---|---|---|---|---|
| **1.00** | **VOICE SYSTEM (TELEPHONE COMMUNICATIONS SYSTEM ALL AREAS)** | | | | |
| 1.01 | RACEWAYS | Conduit, boxes, cable tray, etc. | A&E | CM | CM |
| 1.02 | INSIDE PREMISE WIRING | Structured cabling system | A&E | CM | CM |
| 1.03 | OUTSIDE PREMISE WIRING IN PRIVATE CAMPUS | Structured cabling system | N/A | N/A | N/A |
| 1.04 | OUTSIDE PREMISE WIRING FROM SERVICE PROVIDERS | Fiber and copper for services | A&E/Owner | SP | SP |
| 1.05 | PATCHING OF VOICE LINES | Patching at patch panel and work areas | A&E | N/A | OWNER |
| 1.06 | PHONE SWITCH | Equipment selection, sizing, equipment layout, RFP | OWNER | OWNER | OWNER |
| **2.00** | **DATA SYSTEM (COMPUTER NETWORKS ALL AREAS)** | | | | |
| 2.01 | RACEWAYS | Conduit, boxes, cable tray, etc. | A&E | CM | CM |
| 2.02 | INSIDE PREMISE WIRING | Structured cabling system | A&E | CM | CM |
| 2.03 | PATCHING OF DATA LINES | Patching at patch panel and work areas | A&E | N/A | OWNER |
| 2.04 | ACTIVE ELECTRONICS (NETWORKING EQUIPMENT, SWITCHES, ROUTERS, SERVERS AND COMPUTERS) | Equipment selection, sizing, equipment layout, RFP | OWNER | OWNER | OWNER |
| 2.05 | WIRELESS SURVEY | Modeling to predict location of WAPs, including measured survey after building shell is completed | OWNER | N/A | OWNER |
| 2.06 | WAPs | Wireless access points, including installation labor, support materials, | OWNER | OWNER | CM |
| **3.00** | **TELECOM ROOM OUTFIT** | | | | |
| 3.01 | PLYWOOD AND WALL SLEEVES | Plywood and sleeves for cables | A&E | CM | CM |
| 3.02 | GROUNDING SYSTEM | Ground bar and ground bus | A&E | CM | CM |
| 3.02 | RACKS, WIRE MANAGERS AND LADDER TRAY | Racks and all passive elements | A&E | CM | CM |
| **4.00** | **CATV DISTRIBUTION (CABLE TV FOR ALL AREAS)** | | | | |
| 4.01 | RACEWAYS | Conduit, boxes, cable tray, etc. | A&E | CM | CM |
| 4.02 | INSIDE PREMISE WIRING | Coaxial cable | A&E | CM | CM |
| 4.03 | DISTRIBUTION DEVICES | TAPS, amplifiers, splitter, DC | SP | SP | SP |
| 4.04 | MOUNTS FOR TVS | Mounts for the TVS | OWNER | OWNER | CM |
| **5.00** | **AV SYSTEMS/ PAGING** | | | | |
| 5.01 | RACEWAYS | Conduit, boxes, cable tray, etc. | N/A | N/A | N/A |
| 5.02 | INSIDE PREMISE WIRING | AV wiring for systems | N/A | N/A | N/A |
| 5.03 | ACTIVE ELECTRONICS | Projectors, presentation control system, paging system, etc. | N/A | N/A | N/A |
| **6.00** | **SECURITY SYSTEMS, BUILDING CCTV AND ACCESS CONTROL** | | | | |
| 6.01 | RACEWAYS | Conduit, boxes, cable tray, etc. | N/A | N/A | N/A |
| 6.02 | INSIDE PREMISE WIRING | Cables for cameras and card access | N/A | N/A | N/A |
| 6.03 | ACTIVE ELECTRONICS | Cameras, DVRs, Access control panels, readers, etc | N/A | N/A | N/A |
| 6.04 | LOCKING DEVICES | Magnets, electric mortise locks | N/A | N/A | N/A |
| **7.00** | **EMERGENCY POWER BACKUP (UPS) FOR ACTIVE EQUIPMENT** | | | | |
| 7.01 | POWER WIRING | Conduit, cables and circuits | A&E | CM | CM |
| 7.02 | POWER DISTRIBUTION UNITS | ePDUs to be installed in racks and cabinets | OWNER | OWNER | CM |
| 7.03 | ACTIVE EQUIPMENT - WORK AREAS | UPS units in work areas | OWNER | OWNER | OWNER |
| 7.04 | ACTIVE EQUIPMENT - SMALL UNITS < 10KVA | UPS units in racks or cabinets | OWNER | OWNER | CM |
| 7.05 | ACTIVE EQUIPMENT - LARGE UNITS >10KVA | Central UPS system | N/A | N/A | N/A |
| **8.00** | **FIRE ALARM AND BUILDING MANAGEMENT SYSTEM** | | | | |
| 8.01 | RACEWAYS | Conduit, boxes, cable tray, etc. | A&E | CM | CM |
| 8.02 | INSIDE PREMISE WIRING | Cabling, grounding | A&E | CM | CM |
| 8.03 | ACTIVE ELECTRONICS | Data gathering panels, sensors, etc | A&E | CM | CM |
| **9.00** | **DISTRIBUTED ANTENNA SYSTEM (LIFESAFETY)** | | | | |
| 9.01 | RACEWAYS | Conduit, boxes, cable tray, etc. | A&E | CM | CM |
| 9.02 | INSIDE PREMISE WIRING | Cabling, grounding | A&E | CM | CM |
| 9.03 | ACTIVE ELECTRONICS | Head end system, BDA, TX/RX and antennas | A&E | CM | CM |
| **10.00** | **DISTRIBUTED ANTENNA SYSTEM (CELL PHONES)** | | | | |
| 10.01 | RACEWAYS | Conduit, boxes, cable tray, etc. | N/A | N/A | N/A |
| 10.02 | INSIDE PREMISE WIRING | Cabling, grounding | N/A | N/A | N/A |
| 10.03 | ACTIVE ELECTRONICS | Head end system, BDA, TX/RX and antennas | N/A | N/A | N/A |

NOTES: A&E: ARCHITECT AND ALL CONSULTANTS WORKING UNDER ARCHITECT, LIKE TLC ENGINEERING SOLUTIONS
CM: CONSTRUCTION MANAGER
N/A: NOT APPLICABLE
SP: SERVICE PROVIDER
VENDOR: A SYSTEM INSTALLER HIRED DIRECTLY BY THE OWNER FOR A SPECIFIC SYSTEM

**Lake County Public Safety** **9/20/2016**

## PA System Specs

*A shielded 18 Gauge 2 conductor feed/homerun is required from the desired amp location to each volume control location.

* A shielded 18 Gauge 2 conductor feed is required from each volume control location to each speaker being controlled by that volume control.

* A shielded 18 Gauge 4 conductor feed/homerun is required from the intended location of the VHF and 800MHz control stations to the amplifier.

*All wiring to be shielded 18 Gauge wire with minimum two conductors and a drain wire. All drain wires should be tied together at each volume control and at the amp.

*Minimum of 6' of slack should be provided at each speaker, volume control and the amp to allow removal for testing and troubleshooting.

*All above ceiling wire to be supported every 5' at a minimum per BICSI/NEC standards.

* All home runs for volume controls to be labeled on each end with room number

*All designated speaker locations to have a minimum of 12" clearance in all directions from obstructions (incl but not limited to duct work, sprinkler and related piping, electrical conduits, etc)

*Minimum of one speaker for every numbered room in the building and in common areas minimum of one speaker for every 200 sq feet.

Outside Speaker?

*Amplifier should be sized appropriately for the number of speakers and provide for audio at least 10db above ambient noise level

*PA system should be a 70V system

* Fire station interior lighting system should include a dry contact closure to turn on ingress/egress lights throughout the station when the station is alerted for a call. Dry contact closure should be wired with shielded 18 Gauge 2 conductor wire from the location of the 2 way radios (control stations) to the AC contactor for the lights and labeled as such on each end. The duration of the lighting during call activation is to be decided by LCFR staff at the time of acceptance (in the past the duration has typically been 3 minutes).

*A provision should be made in the station electrical system to turn off the stove if it's operational during an emergency call. This capability should have either an auto-reset or manual push button in the kitchen to reset the shunt. *Let it be noted that the radio system can provide a dry contact closure to trigger the shunt device.

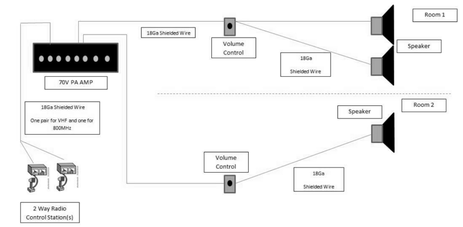
**Notes and other comments:**

All LCFR stations currently utilize Bogen Power Vector series amplifiers and Bogen speakers.

Typical interior speakers are HFCS1LP, A2T, CSD2X2U depending on the design of the station (drop ceiling or drywall, etc)

**Lake County Public Safety**

## PA System Specs (cont)



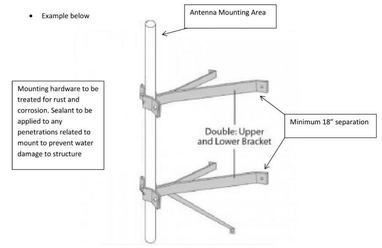

Sample drawing for reference

**Lake County Public Safety** **9/20/2016**

**Fire Station Low Voltage Specs (in addition to IT specs)**

**Requirement:**

- A 1" non-conductive, contiguous conduit pathway with pull string from the intended location of the VHF and 800MHz control stations to the peak of the exterior roof line at the rear of the station for access to the Antenna mount.
- A stranded green #6 ground wire should be homerun from the desired antenna mounting location to the main electrical panel ground or primary ground bonding bar for transient voltage mitigation.
- Antenna mount should support 2" diameter SCH 40 pipe and be galvanized or coated to prevent rust.
- Antenna mount, installation of the mount, and related components will be the contractor's responsibility and should be installed according to Lake County Facilities best practices and recommendations.
- Example below




| NO. | DESCRIPTION | DATE |
|---|---|---|

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PE License #60046

STEPHEN B. COTTON LICENSE No. 60046 STATE OF FLORIDA REGISTERED PROFESSIONAL ENGINEER

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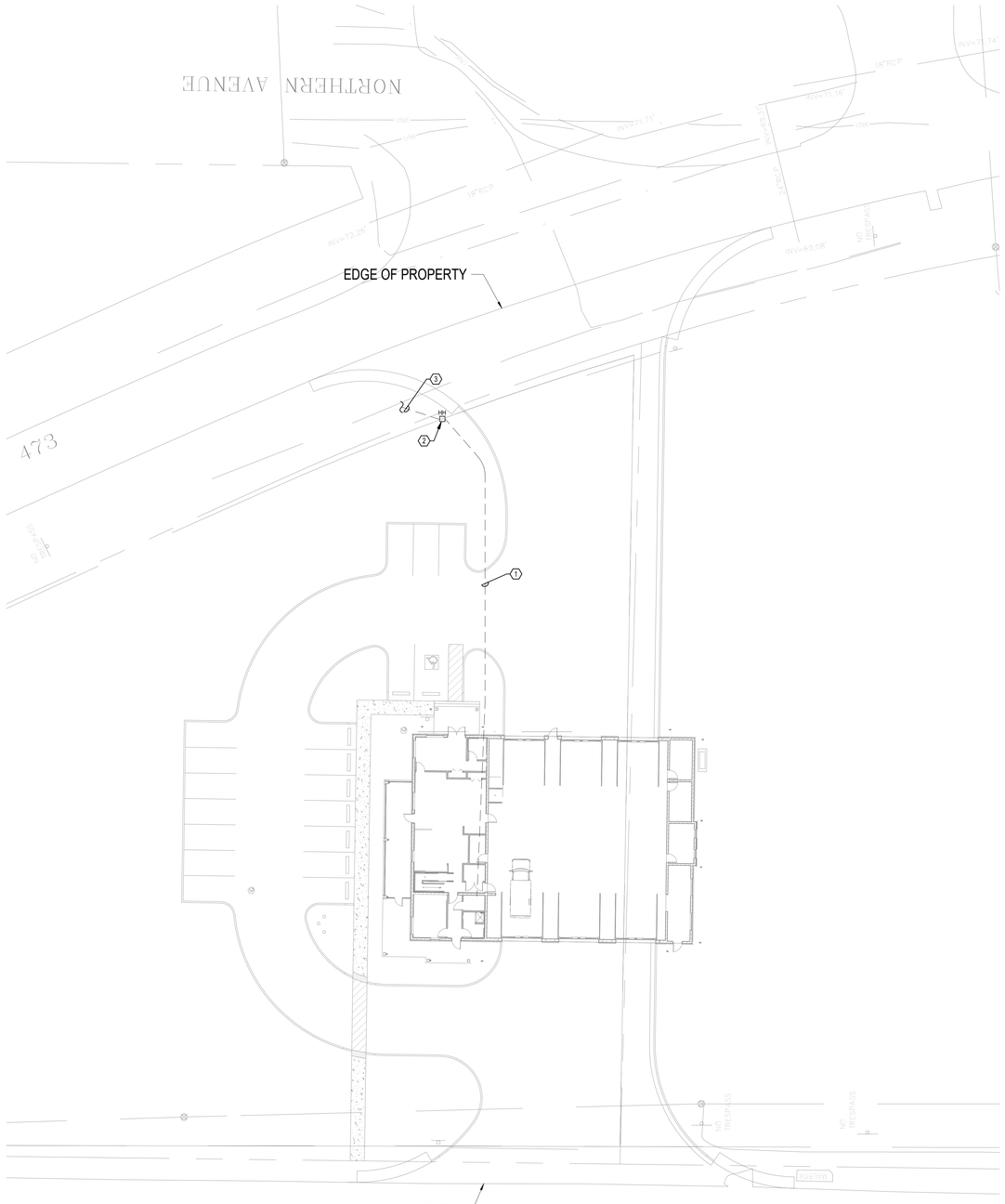
## GENERAL NOTES:

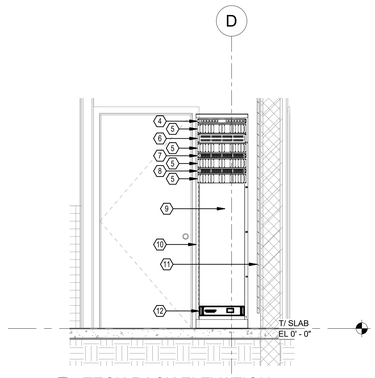
1. UNLESS OTHERWISE NOTED, ALL CONDUIT ROUTED ON SITE SHALL BE 1" MINIMUM.
2. ALL RISERS SHALL BE PVC COATED RIGID GALVANIZED STEEL (RGS) ALL ELBOWS BELOW GRADE SHALL BE PVC COATED RIGID GALVANIZED STEEL (RGS). PROVIDE WITH PVC TO STEEL ADAPTERS AS NECESSARY. THIS DOES NOT APPLY TO LIGHT FIXTURE POLE BASES.
3. ALL ELECTRICAL WORK AND FEES ASSOCIATED WITH UTILITIES SHALL BE VERIFIED AND COORDINATED WITH LOCAL SERVICE PROVIDER PRIOR TO BID.
4. CONTRACTOR SHALL REFERENCE ALL RELATED CONTRACT DOCUMENTS, SITE SURVEY, AND OTHER RESOURCES FOR POSSIBLE CONFLICTS WITH OTHER UNDERGROUND UTILITIES AND AT UTILITY CROSSINGS. CONTRACTOR SHALL VERIFY UTILITY DEPTHS AND COORDINATE CONDUIT ROUTING AS NECESSARY.
5. CONTRACTOR SHALL VERIFY AND COORDINATE EXISTING SITE CONDITIONS OF PROJECT SITE AND AFFECTED SURROUNDING AREA PRIOR TO BID.

## KEYED NOTES:

1. PROVIDE (2) 4" CONDUITS, EACH WITH (1) 4" 3-CELL MESH INNER-DUCT, WITH PULL ROPE IN EACH.
2. PROVIDE 24" x 36" x 24" DEEP OPEN BOTTOM COMPOSITE HAND-HOLE BY NEW BASIS OR APPROVED EQUAL. PROVIDE WITH BOLT-ON COMPOSITE LID RATED FOR HEAVY TRAFFIC WITH "TELECOM" CAST INTO LID. CONDUITS SHALL ENTER SIDE WALL OF ENCLOSURE.
3. CONTRACTOR SHALL EXTEND CONDUITS TO SERVICE PROVIDER LOCATION AND CONNECT TO SERVICE PROVIDER ENCLOSURE PER THEIR REQUIREMENTS. CONTRACTOR SHALL COORDINATE INSTALLATION OF SERVICE PROVIDER CABLING WITH SERVICE PROVIDER AND EXTEND SERVICE CABLING INTO BUILDING TO ELECTRICAL ROOM FOR TERMINATION.
4. PROVIDE 1RU FIBER OPTIC PATCH PANEL, INTERCONNECTION WITH S.P. EQUIPMENT.
5. PROVIDE 2RU HORIZONTAL CABLE MANAGER.
6. PROVIDE 2RU CAT. 6 48-PORT PATCH PANEL.
7. 1RU OWNER PROVIDED AND INSTALLED SWITCH.
8. PROVIDE 1RU RACK MOUNTED PA SYSTEM AP BY BOGEN.
9. SPACE PROVIDED FOR OWNER PROVIDED EQUIPMENT.
10. PROVIDE FLOOR MOUNTED 2-POST RACK.
11. PROVIDE PLYWOOD MOUNTED TO WALL.
12. 2RU OWNER PROVIDED AND INSTALLED UPS.




1 T1.1 TECHNOLOGY SITE PLAN
1" = 20'-0"




2 T1.1 TECH RACK ELEVATION
1/2" = 1'-0"

0 1' 2' 4' 6'
1/2" = 1'-0"

0 10' 20' 40' 60'
1" = 20'-0"

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LAKE COUNTY
FIRE STATION NO.71
TECHNOLOGY SITE PLAN

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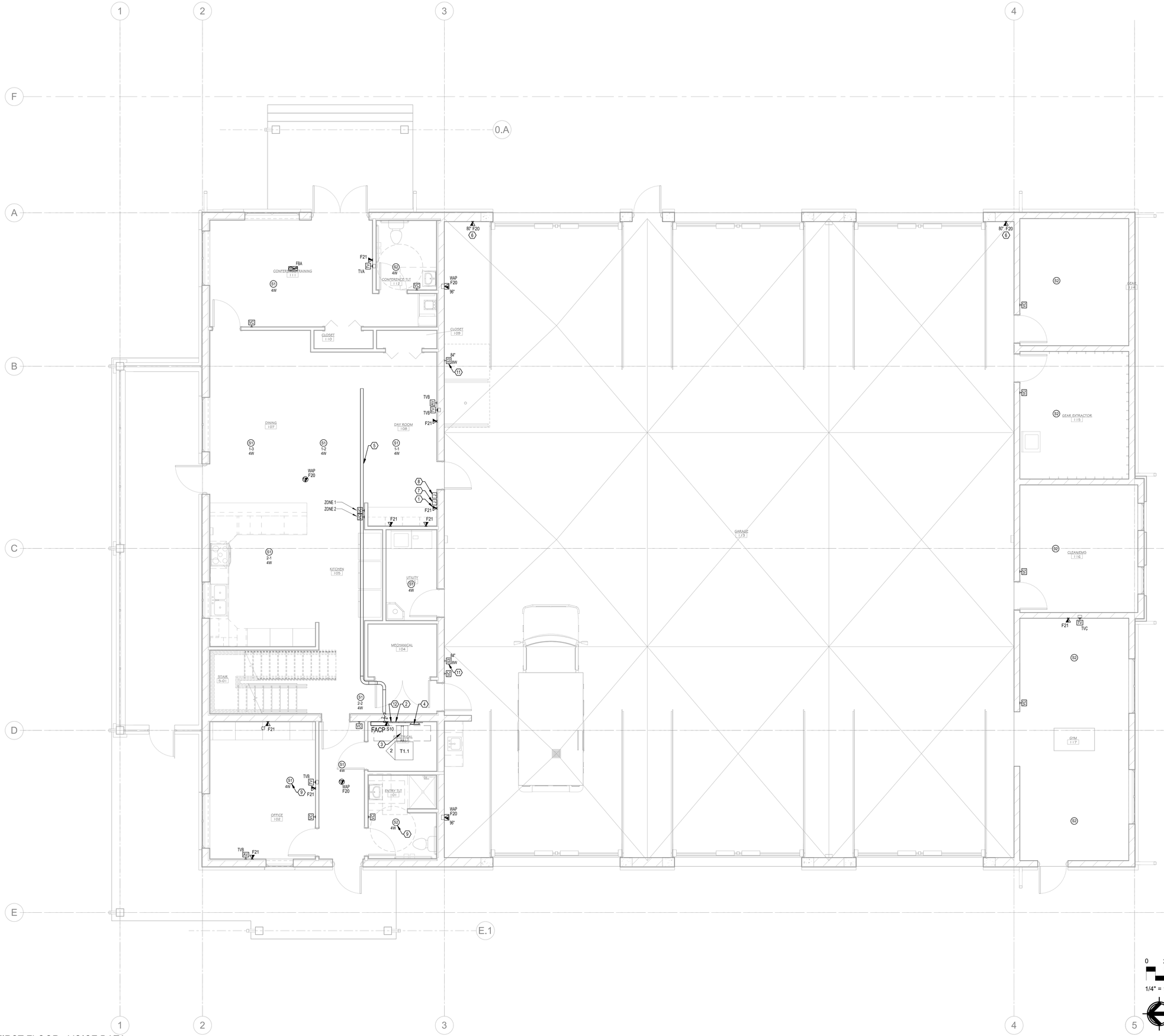


## GENERAL NOTES:

1. CONDUIT AND OUTLET BOXES LOCATED IN RATED WALLS OR CEILINGS SHALL BE CONSTRUCTED OF NON-COMBUSTIBLE MATERIALS.
2. A GROUND CONDUCTOR SIZED PER ANSI-TIA 607-A IS REQUIRED TO BE INSTALLED IN EACH CABLE TRAY, OR CABLE TRAY SHALL BE CONNECTED TO ENSURE THAT ALL CABLE TRAYS ARE ELECTRICALLY CONTINUOUS THROUGHOUT BUILDING.
3. ALL CATEGORY (CAT.) CABLING SHALL BE CONTINUOUS FROM OUTLET IN WALL TO OUTLET AT PATCH PANEL AND SHALL BE NO LONGER THAN 90-METERS (295-FEET). CABLING SHALL BE MOUNTED IN TECHNOLOGY RACEWAY SYSTEM (CONDUIT/J-HOOKS/CABLE TRAY) FROM OUTLET TO OUTLET. CABLING SHALL NOT BE ROUTED IN FREE AIR OR ON ANY OTHER BUILDING SYSTEM.

## KEYED NOTES:

1. MOUNT DATA DEVICE FOR RADIO SYSTEM ABOVE SHELF. COORDINATE EXACT LOCATION WITH ARCHITECTURAL PLANS.
2. PROVIDE 3/4" x 4'-0" x 8'-0" A-C GRADE PLYWOOD MOUNTED BEHIND CABINET. MOUNT SUCH THAT "A" SIDE IS EXPOSED TO ROOM. PAINT ALL SIX (6) SIDES OF PLYWOOD WITH TWO (2) COATS OF FIRE-RESISTANT LIGHT GRAY PAINT, LEAVING THE "A" STAMP EXPOSED FOR VISUAL INSPECTION. BACKBOARD SHALL BE READY SPEC #RB-AD4896-NPG.
3. PROVIDE BLACK FLOOR MOUNTED TELECOMMUNICATIONS 45RU 2-POST RACK EQUAL TO GREAT LAKES CABINET #GLRR-19084-BB. SECURE TO FLOOR PER MANUFACTURER'S RECOMMENDATION AFTER LOCATION IS CONFIRMED WITH LAKE COUNTY IT DEPARTMENT.
4. PROVIDE UL LISTED TELECOMMUNICATIONS MAIN GROUND BUSBAR (TMGB) MOUNTED AT 84" AFF. TMGB SHALL BE SIZED PER DETAILS AND SPECIFICATIONS.
5. PROVIDE 4" WIDE BY 2" DEEP WIRE MESH BASKET-STYLE TELECOMMUNICATIONS CABLE TRAY. MOUNT CABLE TRAY SUCH THAT BOTTOM OF CABLE TRAY IS A MINIMUM OF 6" ABOVE TOP OF CEILING STRUCTURE.
6. PROVIDE (1) 1-1/4" CONDUIT FROM DEVICE TO ELECTRICAL ROOM 103 FOR CABLE ROUTING.
7. PROVIDE FLUSH MOUNTED JUNCTION BOX AT RADIO EQUIPMENT AND CONNECT TO ENCLOSURE AT RADIO ANTENNA VIA (1) 1-1/4" CONDUIT. SEE SHEET T1.3 FRO ADDITIONAL INFORMATION.
8. PROVIDE (1) 3/4" CONDUIT FROM RADIO LOCATION TO PA SYSTEM AMP LOCATED IN ELECTRICAL ROOM 103 FOR AMP/SPEAKER WIRE CABLING.
9. PROVIDE BOGEN #HFCS1LP QYRGARD CEILING MOUNTED SPEAKER, TYPICAL FOR ALL "S2" SPEAKERS.
10. PROVIDE BOGEN #CSD2X2LU LAY-IN CEILING MOUNTED SPEAKER, TYPICAL FOR ALL "S1" SPEAKERS.
11. PROVIDE BOGEN #ASTWHT WALL MOUNTED SPEAKER, TYPICAL FOR ALL "S3" SPEAKERS.
12. PROVIDE WALL MOUNTED 110-TYPE BLOCK FOR TERMINATION OF ALL GREEN VOICE CABLES.

0 2' 4' 8' 12'

1/4" = 1'-0"

1 / T1.2 FIRST FLOOR - VOICE DATA
1/4" = 1'-0"

| NO. | DESCRIPTION | DATE |
|---|---|---|

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PE License #60046

STATE OF FLORIDA PROFESSIONAL ENGINEER No. 60046

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FIRE STATION NO.71
TECHNOLOGY LEVEL 1 PLAN

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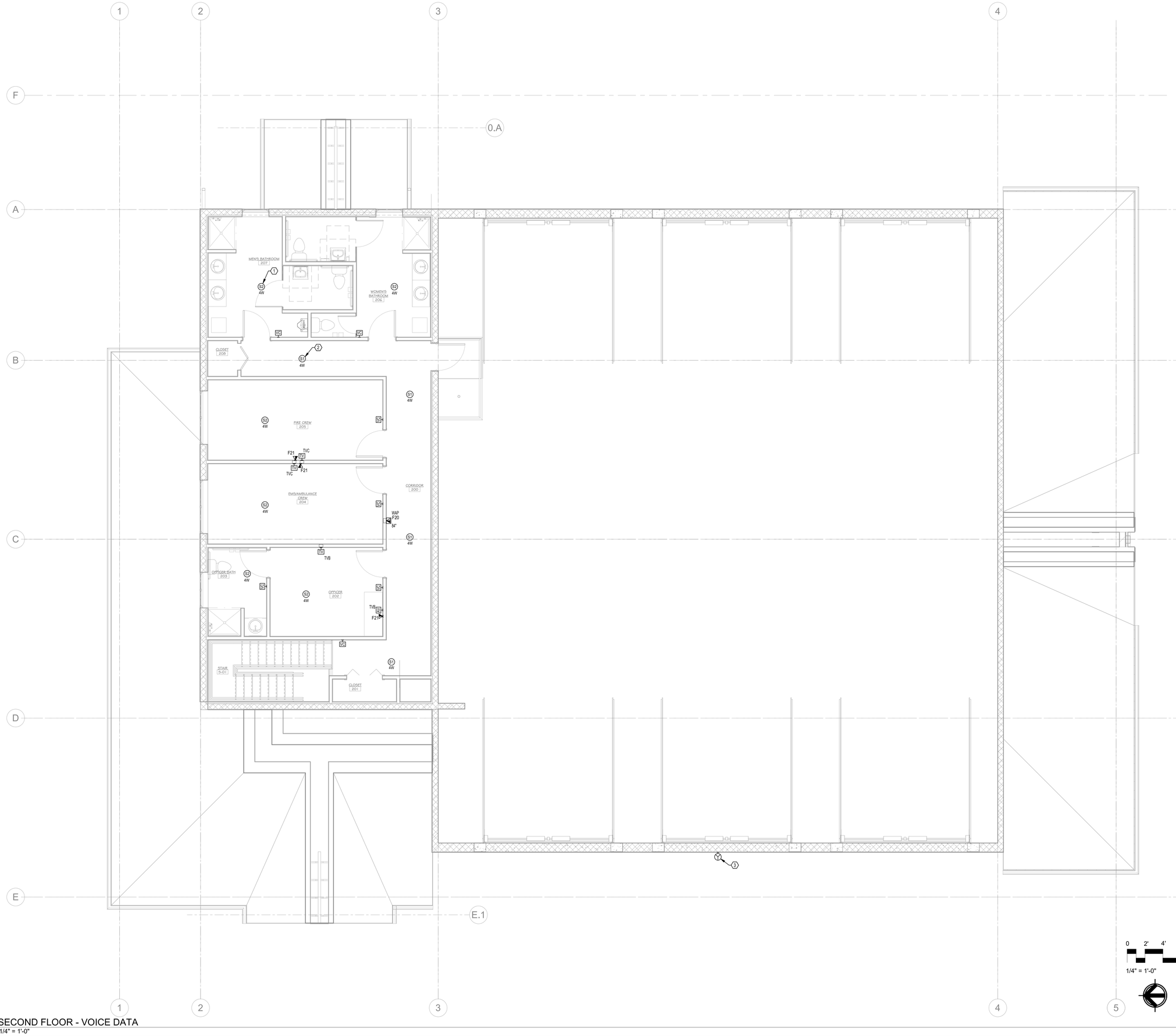


1 T1.3 SECOND FLOOR - VOICE DATA
1/4" = 1'-0"

0 2' 4' 8' 12'
1/4" = 1'-0"

## GENERAL NOTES:

1. CONDUIT AND OUTLET BOXES LOCATED IN RATED WALLS OR CEILINGS SHALL BE CONSTRUCTED OF NON-COMBUSTIBLE MATERIALS.
2. A GROUND CONDUCTOR SIZED PER ANSI-TIA 607-A IS REQUIRED TO BE INSTALLED IN EACH CABLE TRAY, OR CABLE TRAY SHALL BE CONNECTED TO ENSURE THAT ALL CABLE TRAYS ARE ELECTRICALLY CONTINUOUS THROUGHOUT BUILDING.
3. ALL CATEGORY (CAT.) CABLING SHALL BE CONTINUOUS FROM OUTLET IN WALL TO OUTLET AT PATCH PANEL AND SHALL BE NO LONGER THAN 90-METERS (295 FEET). CABLING SHALL BE MOUNTED IN TECHNOLOGY RACEWAY SYSTEM (CONDUIT/J-HOOKS/CABLE TRAY) FROM OUTLET TO OUTLET. CABLING SHALL NOT BE ROUTED IN FREE AIR OR ON ANY OTHER BUILDING SYSTEM.
4. ALL RACEWAYS FOR ALL DEVICES ON THIS SHEET SHALL BE ROUTED DOWN TO 1ST FLOOR CEILING CAVITY. CABLES SHALL ROUTED IN CABLE TRAY LOCATED IN 1ST FLOOR CEILING CAVITY.

## KEYED NOTES:

1. PROVIDE BOGEN #HFCS1/LP GYPBOARD CEILING MOUNTED SPEAKER, TYPICAL FOR ALL "S2" SPEAKERS.
2. PROVIDE BOGEN #CSD2CX2LU LAY-IN CEILING MOUNTED SPEAKER, TYPICAL FOR ALL "S1" SPEAKERS.
3. PROVIDE ANTENNA SUPPORTS AND MOUNTING POLE PER INFORMATION ON SHEET T0.5. ALL SUPPORTS AND 2" CONDUIT FOR ANTENNA MOUNTING SHALL BE GALVANIZED FOR PROTECTION. PROVIDE 12" BY 10" BY 6" DEEP EXTERIOR WALL MOUNTED NEMA-4X STAINLESS STEEL ENCLOSURE WITH WATER SHED TOP EQUAL TO HOFFMAN #WS1210SSS. CENTER OF BOX SHALL BE MOUNTED AT APPROXIMATELY 30'-0" AFG. AND BE LOCATED VERTICALLY BETWEEN THE WALL MOUNTED SUPPORTS FOR THE ANTENNA MOUNTING CONDUIT. ENCLOSURE SHALL BE PROVIDE WITH (3) FLEXIBLE MEMBRANE CABLE GROMMETS EVENLY SPACED ON THE BOTTOM OF THE ENCLOSURE, CONFIRM SIZE OF GROMMETS WITH OWNER PRIOR TO ORDERING. ANTENNA MOUNTING CONDUIT SHALL EXTEND ABOVE THE PEAK OF THE ROOF A MINIMUM OF 24". PROVIDE (1) 1-1/4" CONDUIT WITH PULL ROPE FROM ENCLOSURE TO RADIO LOCATION IN DAY ROOM 108. PROVIDE CONNECTION TO BUILDING LIGHTNING PROTECTION SYSTEM. CONTRACTOR SHALL PROVIDE ALL ANTENNA MOUNTING, ENCLOSURE, AND GROUNDING/BONDING. OWNER TO PROVIDE AND INSTALL ALL CABLING AND ANTENNAS.

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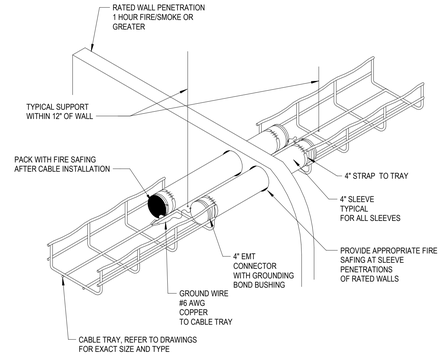
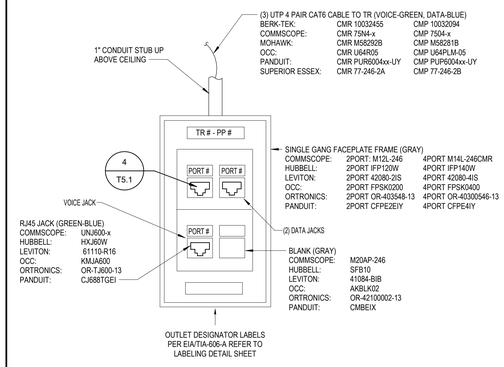


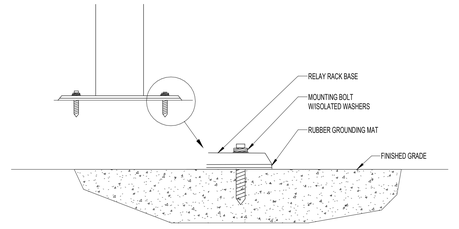

PROVIDE NUMBER OF SLEEVE AS REQUIRED
TO MATCH CABLE TRAY CROSS SECTIONAL
AREA.
UL W-L 3112

## CABLE TRAY WALL PENETRATION — 6
No Scale

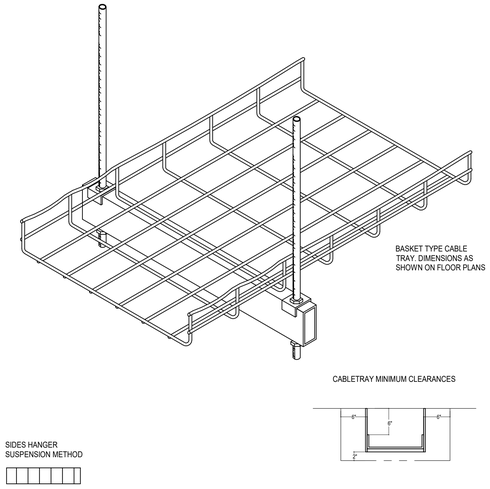



F12

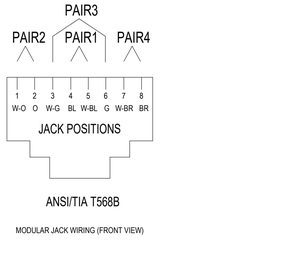
## WALL OUTLET - VOICE/DATA — 3
No Scale




## FLOOR RACK MOUNTING — 1
No Scale

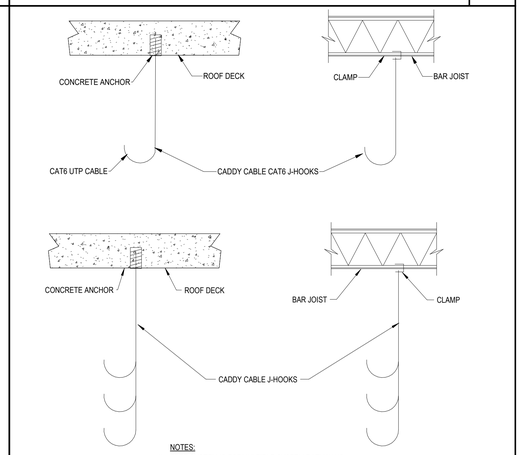



## CABLE TRAY TRAPEEZE MOUNTING — 7
No Scale



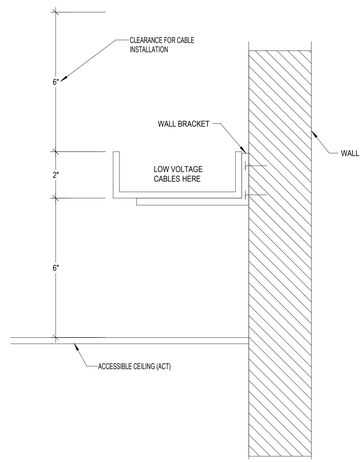

MODULAR JACK WIRING (FRONT VIEW)

## MODULAR JACK WIRING — 4
No Scale

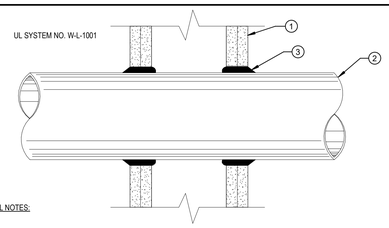



NOTES:
1) TREE SYSTEM IS FORMULTIPLE SYSTEM PATHWAYS. DOUBLE AND SINGLE TREES MAYBE USED AS REQUIRED. CABLE J-HOOK SYSTEM CAN BE SECURED TO METAL STUDS, WHERE PERMISSIBLE.

## CABLE HANGER (J-HOOK) — 2
No Scale




## CABLE TRAY WALL MOUNTING — 8
No Scale




DETAIL NOTES:

1. WALL ASSEMBLY - THE 1, 2, 3, OR 4 HOUR FIRE RATED GYPSUM WALLBOARD WALL ASSEMBLY SHALL BE CONSTRUCTED OF THE MATERIALS AND IN THE MANNER DESCRIBED IN THE INDIVIDUAL U300 OR U400 SERIES WALL OR PARTITION DESIGNS IN THE UL FIRE RESISTANCE DIRECTORY.
2. CONDUIT - NOM 4" DIAMETER OR SMALLER STEEL ELECTRICAL METALLIC TUBING. A MAXIMUM OF ONE CONDUIT IS PERMITTED IN THE FIRE STOP SYSTEM. CONDUIT TO BE INSTALLED NEAR CENTER OF STUD CAVITY WIDTH AND TO BE RIGIDLY SUPPORTED ON BOTH SIDES OF WALL ASSEMBLY.
3. FILL VOID OR CAVITY MATERIAL - CAULK FILL MATERIAL BEARING THE UL CLASSIFICATION MARKING INSTALLED TO COMPLETELY FILL ANNULAR SPACE BETWEEN PIPE OR CONDUIT AND GYPSUM WALLBOARD AND WITH A MIN. 1/4" DIAMETER BEAD OF CAULK APPLIED TO PERIMETER OF CONDUIT AT ITS EGRESS FROM THE WALL. CAULK INSTALLED SYMMETRICALLY ON BOTH SIDES OF WALL ASSEMBLY. THE HOURLY F RATING OF THE FIRE STOP SYSTEM IS DEPENDENT UPON THE HOURLY FIRE RATING OF THE WALL ASSEMBLY IN WHICH IT IS INSTALLED, AS SHOWN IN THE FOLLOWING TABLE. THE HOURLY T RATING OF THE FIRE STOP SYSTEM IS DEPENDENT UPON THE TYPE OR SIZE OF THE CONDUIT AND THE HOURLY FIRE RATING OF THE WALL ASSEMBLY IN WHICH IT IS INSTALLED, AS TABULATED BELOW:

| MAXIMUM CONDUIT DIAMETER IN INCHES | ANNULAR SPACE IN INCHES | FIRE RATING IN HOURS | T RATING IN HOURS |
|---|---|---|---|
| 1 | 0 TO 3/16 | 1 OR 2 | 0, 1 OR 2 |
| 1 | 1/4 TO 1/2 | 3 OR 4 | 3 OR 4 |
| 4 | 0 TO 1-1/2 | 1 OR 2 | 0 |
| 6 | 1/4 TO 1/2 | 3 OR 4 | 0 |
| 12 | 3/16 TO 3/8 | 1 OR 2 | 0 |

## CONDUIT PENETRATION OF FIRE WALL — 5
No Scale

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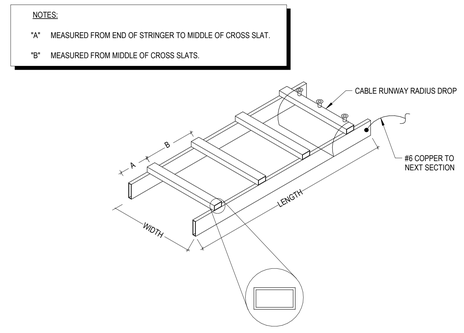
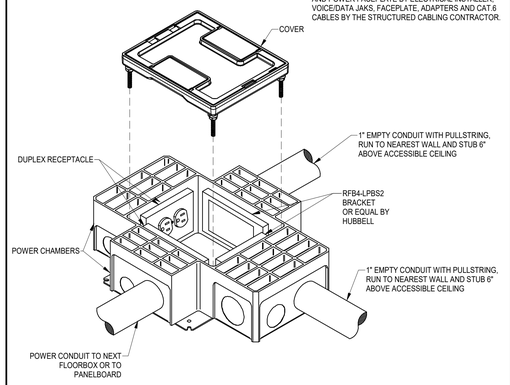
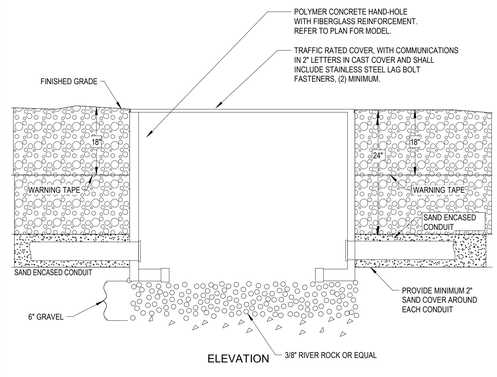



UNIVERSAL TUBULAR RUNWAY SYSTEM

## TUBLAR RUNWAY-STYLE LADDER TRAY — 9
No Scale

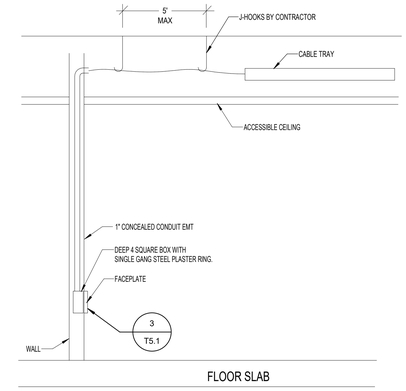



## POWER/VOICE/DATA A-V FLOOR BOX — 6
No Scale



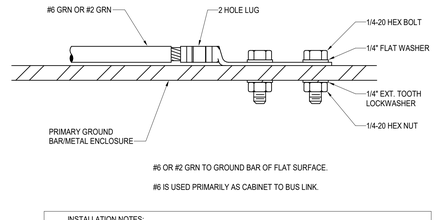

ELEVATION

## COMMUNICATIONS HAND-HOLE — 3
No Scale




FLOOR SLAB

## TYPICAL FLUSH OUTLET ACCESSIBLE CEILING — 1
No Scale

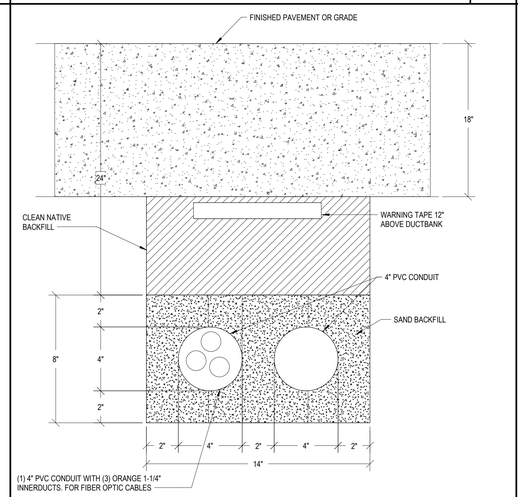



#6 OR #2 GRN TO GROUND BAR OF FLAT SURFACE.

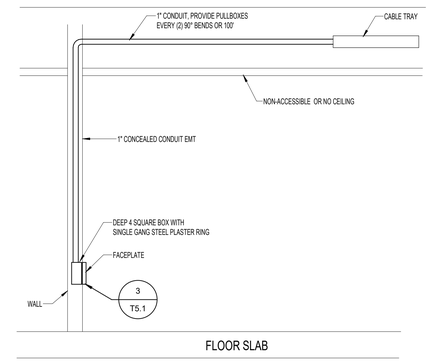
#6 IS USED PRIMARILY AS CABINET TO BUS LINK.

INSTALLATION NOTES:
A. SELECT BOLT LENGTH TO PROVIDE A MINIMUM OF TWO EXPOSED THREADS.
B. BURNISH MOUNTING SURFACE TO REMOVE PAINT IN THE AREA OF LUG CONTACT.
C. APPLY ANTI-OXIDANT COMPOUND TO MATING SURFACE OF LUG AND WIPE CLEAN EXCESS COMPOUND.
D. USE SOLID COPPER WIRE AND MECHANICAL 2-HOLE LUG FOR ALL EXTERIOR GROUNDING.

## GROUND BAR 2-LUG TERMINATION — 7
No Scale

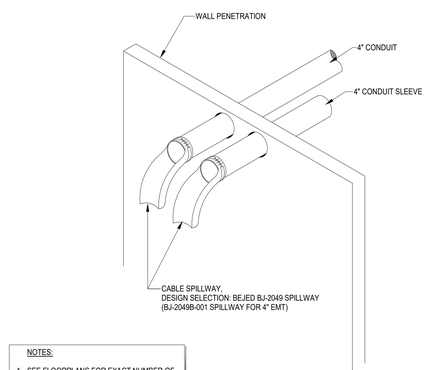



## 2-WAY 4" COMM DUCT-BANK — 4
No Scale



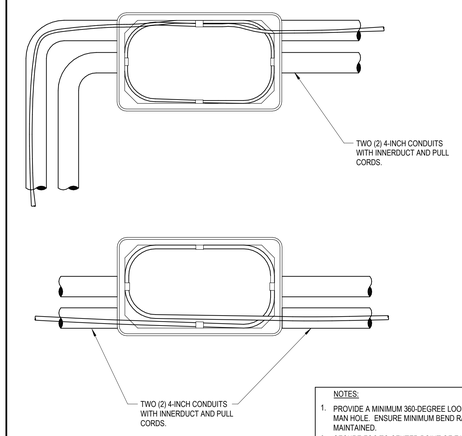

FLOOR SLAB

## TYPICAL FLUSH OUTLET NON-ACCESSIBLE CEILING — 2
No Scale




NOTES:
1. SEE FLOORPLANS FOR EXACT NUMBER OF CONDUITS & CONDUIT SLEEVES.
2. REFER TO HORIZONTAL/VERTICAL FIRE RATED PENETRATION DETAIL FOR FIRE RATING REQUIREMENTS.

## CONDUIT SPILLWAY — 8
No Scale




NOTES:
1. PROVIDE A MINIMUM 360-DEGREE LOOP IN EACH MAN HOLE. ENSURE MINIMUM BEND RADIUS IS MAINTAINED.
2. SECURE FOC TO CENTER POINT OF EACH END/SIDE WALL USING CLICK FASTENERS.

## COMMUNICATIONS HAND-HOLE LOOP — 5
No Scale

DATE | DESCRIPTION | NO.

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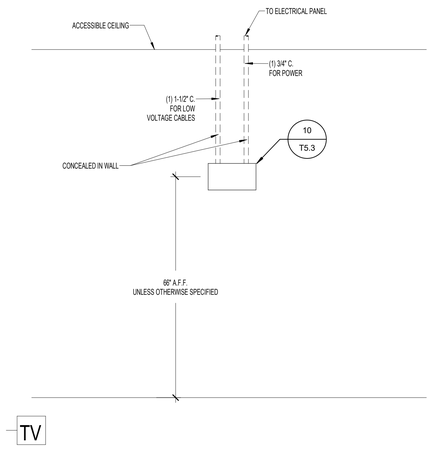
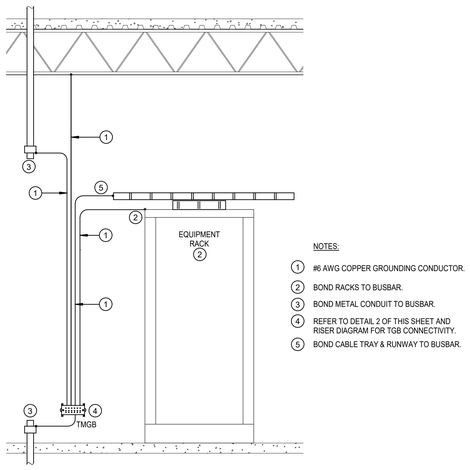
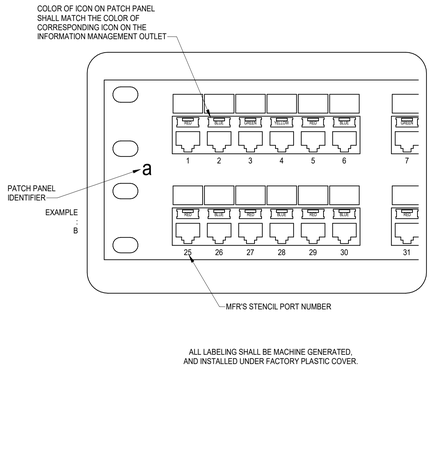


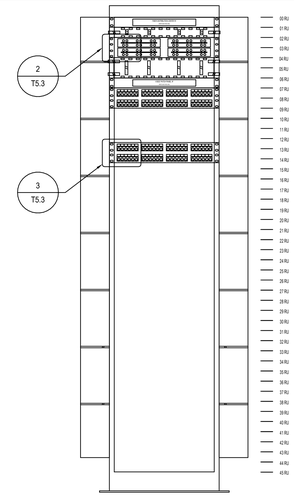

## DISPLAY MOUNTING FRONT ELEVATION
No Scale — 9



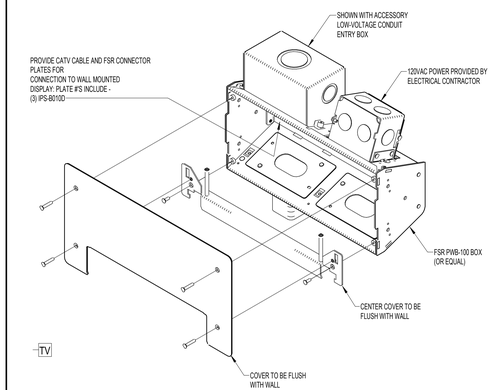

## TYPICAL GROUNDING-BONDING ELEVATION
No Scale — 6



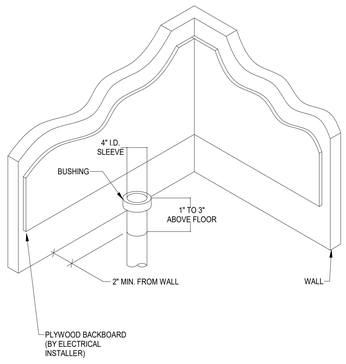

## TYPICAL COPPER PATCH PANEL LABEL
No Scale — 3



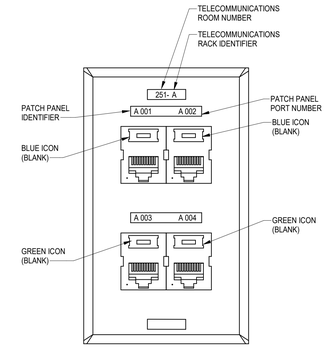

## TYPICAL RACK LABELING ELEMENTS3
No Scale — 1



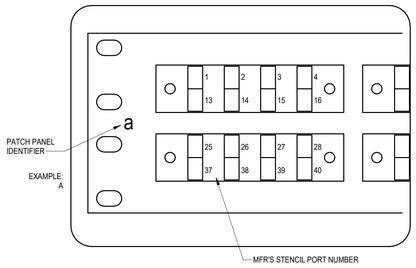

## DISPLAY BACK-BOX
No Scale — 10



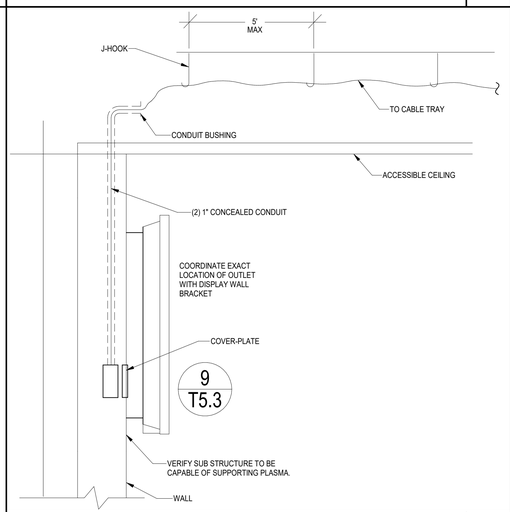

## TYPICAL THROUGH FLOOR PENETRATION
No Scale — 7



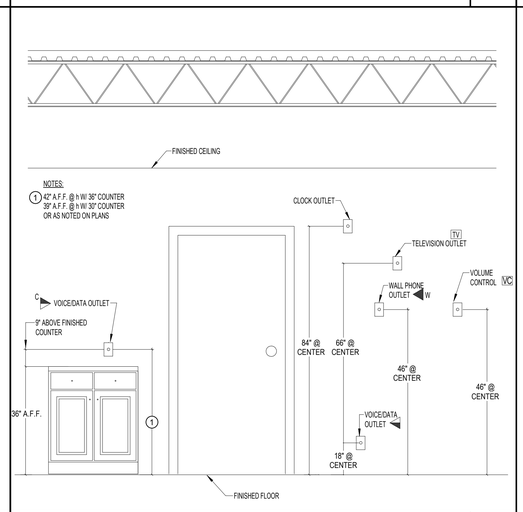

## TYPICAL WORK AREA OUTLET LABEL
No Scale — 4




## TYPICAL FIBER OPTIC PATCH PANEL LABEL
No Scale — 2




## DISPLAY MOUNTING ELEVATION
No Scale — 8




## TYPICAL TECH MOUNTING HEIGHTS
No Scale — 5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