

McFARLAND UNIFIED SCHOOL DISTRICT

GENERAL SPECIFICATIONS

1.1 OUTSIDE PLANT UNDERGROUND CONDUIT

- 1.1.1. Contractor will include the cost for a USA survey of entire trench path to be dug as part of the bid amount. Contractor is responsible for notifying all utility companies prior to start of work. Trench will not exceed 18" in width and a minimum of 24" depth. Contractor will be responsible for the correct depth in areas where conduit must be installed below the frost line. All grass to be removed will be neatly cut in squares and neatly stacked so it can be replaced over the completed trench path. Contractor to provide all safety equipment needed to totally block off open trench while work is in progress. Owner to be alerted prior to start of work.**
- 1.1.2. Saw cutting of concrete or blacktop areas will need prior approval of Owner. Area will be returned to as close to existing as possible. Finished grade area to be inspected by Owner with Contractor for acceptance, and signed off as completed.**
- 1.1.3. After conduit has been placed, trench to be filled with 6" of dirt and compacted to 90 psi. Trench to be completely filled, using this formula every six inches for the entire depth. Auto traffic areas on Owners property under concrete or blacktop will be compacted to 95 psi, every six inches of fill.**
- 1.1.4. Contractor will be responsible for cost of obtaining all needed permits and inspection fees. Code violation penalties or lawsuits that occur from trenching across a public road, private property or easements will hold the Owner harmless and be the sole liability of the Contractor. Contractor to investigate, and be responsible for adhering to all City, County, State or Federal requirements, laws, codes, regulations and ordinances concerning this project.**
- 1.1.5. Boring is an acceptable and desired method for underground conduit placement, with trench requirements stated above for all potholes dug.**
- 1.1.6. Contractor to use only schedule 80, trade size 2" PVC or larger for all underground conduit placement. Owner to determine number of conduits to be placed.**
- 1.1.7. Christy type boxes to be placed in trench path are to be done in the following manner. Hole dug, a 3" bed of "P" gravel evenly distributed and compacted in bottom of hole and box placed on bed. Top of box to finish 2" above grade. Dirt to be compacted to slope away from top edge to grade, all four sides. Christy type boxes to be placed in concrete or blacktop areas must have finished grade start at top rim of box and slope away from opening on all four sides. All boxes placed will have traffic rated lids, and be marked "SIGNAL". NO ELECTRICAL CIRCUIT WILL RUN THROUGH A COMMUNICATION BOX OR CONDUIT IN ANY PART OF THE**

UNDERGROUND OR HORIZONTAL CONDUIT SYSTEM.

2.1 OUTSIDE PLANT CONDUIT ABOVE GRADE

- 2.1.1 The transition point will be a maximum of four inches above finished grade from underground PVC to above grade vertical conduit runs. ONLY COMPRESSION TYPE FITTINGS WILL BE USED ON ALL VERTICAL CONDUIT RUNS ABOVE FINISHED GRADE AND ALL HORIZONTAL CONDUIT RUNS.**
- 2.1.2 Nema rated 3R and 4 watertight boxes are to be used in every outdoor application. Standard required size is 8" x 8" x 4" when one trade size 2" conduit is used in conduit run. Two trade size 2" conduits in the conduit run require a minimum of a 12" x 12" x 6" box. Any deviation or additional requirements can be found in section marked outside plant requirements.**
- 2.1.3 All coastal and snow areas will require the use of 0 Cal type conduit (coated inside and out) to delay the rusting process caused by the salt air. When using this type conduit, all compression fittings must also be of this type.**
- 2.1.4 Vertical conduit runs, attached to banding walls must be supported with unistrut and conduit clamps of matching size within 6" of transition point and every five feet for entire span of run. Unistrut edges must be ground, filed or sanded to eliminate any sharp edges. Plastic caps are also acceptable.**

3.1 HORIZONTAL CONDUIT ROOF SYSTEM

- 3.1.1 All horizontal roof conduit systems will be installed with minimum trade size 2" conduit; compression fittings and Nema rated watertight boxes with same specifications as stated above. No less than two trade size 2" minimum conduits will be installed in any horizontal conduit system.**
- 3.1.2 All Nema rated water tight pull boxes used in the horizontal conduit system will be a minimum of 24" x 24" x 8", unless otherwise specified. All conduit penetrations into boxes will be weather sealed inside and outside the box.**
- 3.1.3 Redwood 2" x 4" blocks will be cut to lengths to allow four inches of block available, measured out from last conduit installed to block edge on both sides. Blocks will be placed three inches from compression fittings and at center point of conduit length. Redwood blocks will be permanently attached to roof with construction cement, or Owner approved method. Any method of anchoring blocks to roof that requires penetrating roof will require weather proofing at each penetration point. Conduits to be secured to redwood blocks using correctly sized conduit straps and screws.**
- 3.1.4 In cases where a building wall penetration is above the height of the main horizontal conduit system, the following will apply. Conduit will leave pull box straight to wall. A minimum forty-five sweep over one foot to transition vertically up wall will be used. A**

Redwood block is to be installed to roof at beginning of forty-five sweep, with unistrut and clamps installed to wall at the end of the forty-five sweep. Conduit to run vertically up wall to Nema rated watertight box. **THE CONDUIT SYSTEM WILL NOT CONTAIN "LB'S" AT ANY POINT.** Wall penetration into the building will be made through the back of the pull box, and water sealed around the wall penetration, inside and outside. The conduit penetrating the back of the pull box will also be water sealed, inside the box.

3.1.5 CONTRACTOR WILL SEAL ALL CONDUITS AFTER CABLE PLACEMENT AND ALL SPARES NOT IN USE. THIS APPLIES TO ALL THE FOLLOWING AND AFORE MENTIONED CONDUIT SYSTEMS.

4.1 AERIAL OUTSIDE PLANT

- 4.1.1. Contractor to obtain approval of Owner prior to submitting bid on any planned aerial cable runs.**
- 4.1.2. Contractor will span a maximum of one hundred feet, measured point to point including drip loops. Cable to be lashed to insure lowest point in span has sixteen foot clearance, measured from the ground up. This will apply to all areas.**
- 4.1.3. Contractor to supply and install only grade A wood poles for cable spans greater than one hundred feet in length. Pole to be buried a minimum of eight feet in the ground. Metal poles may also be an option. Contractor to get approval from Owner on which pole should be used, prior to submitting bid.**
- 4.1.4. Mast poles for weather heads or supports will be of sufficient strength to withstand wind shear minimums of one hundred miles per hour. Guy wires to be installed with clamps that have two nuts and bolts. Guy wires are to be used in three directions and in sufficient numbers to meet the one hundred mile per hour wind shear factor. **MAST POLE TO BE GROUNDED USING AWG #6 SOLID COPPER WIRE.****
- 4.1.5. Weather heads should allow for number of cables being installed, with a minimum of one additional hole for growth.**
- 4.1.6. Roof penetration for installation of weather heads is always the least desirable method. Contractor will assume responsibility and liability for any water damage that may occur from improper weather sealing around roof penetrations made during installation.**
- 4.1.7. All aerial cable spans installed will use messenger wire for support. No aerial cable to be installed will be attached to any existing aerial cable spans.**
- 4.1.8. Contractor will be responsible for obtaining all needed permits, or paying any inspection fees. Code violation penalties or lawsuits that may occur from any outside plant installed by Contractor will hold the Owner harmless and will be the**

Contractors sole liability. Contractor to investigate and be responsible for adhering to all City, County, State or Federal requirements, laws, codes, regulations and ordinances concerning this project.

5.1 FIBER OPTIC CABLE

- 5.1.1. Contractor will supply and install 6 multi-mode/6 single mode, 10 Gigabit rated, 62.5/125 fiber optic backbone cable, home run from MC to all IC closets, unless otherwise specified. All fiber optic connectors, patch cords and station outlet connectors will be 10 Gigabit rated by the manufacture. Manufacture's technical specification submittals are required on all materials to be installed as part of the bid package. FAXED COPIES OF TECHNICAL SPECIFICATIONS ARE NOT ACCEPTABLE.**
- 5.1.2 Contractor will supply and install 10 Gigabit rated LC style connectors and Gigabit rated patch cables with LC connectors for the MC and all IC 's unless otherwise specified. Station locations will use Gigabit rated cable with Gigabit rated LC style connectors also, unless otherwise specified.**
- 5.1.3 Indoor/Outdoor fiber optic cable is acceptable for underground conduit systems. Loose tube configuration with center strength member is also acceptable. Tight buffered fiber optic cable should be used indoors on vertical runs of more than three stories between floors.**
- 5.1.4 Direct buried fiber is the least desirable method for outdoor use. If required by Owner, Contractor will supply and install gel filled, armored fiber optic cable with center strength member. This type of fiber optic cable will require bonding and grounding on both ends.**
- 5.1.5 Fiber optic cable runs in underground conduit systems will require a minimum of five feet of slack, neatly coiled in the bottom of each Christy style yard box, hand hole or man hole in the system. Pre-printed labels (black letters on yellow field preferred) that read "Caution, Fiber Optic Cable" are to be attached at entry point and exit point. Attachment should be done so label can be read when cover or lid is opened.**
- 5.1.6 Contractor will leave a minimum of ten feet of fiber optic cable with the jacket in place, neatly coiled in ceiling, cabinet, etc. A minimum of three feet of stripped fiber optic cable, in factory made breakout kit to be neatly installed in each MC and IC termination cabinet locations.**
- 5.1.7 Contractor will place a pre-printed consecutively numbered label on each fiber within one inch of the connector, on both ends of the cable. Number pattern should start at the number one and stay consecutive through both multi-mode and single mode fibers. EXAMPLE: M3 or S6.**

5.1.8 PLASTIC FIBER OPTIC CABLE WILL NOT BE ACCEPTABLE FOR ANY

APPLICATION ON THIS PROJECT.

5.1.9. Contractor to obtain Owners approval for any part of design that may include a consolidation point, prior to submitting bid.

5.1.10. Fiber optic patch panel, L.I.U., etc. used for backbone termination and patch cord transition point will be identified in the following manner. A preprinted, permanently marked label stating destination of fiber. EXAMPLE: At MC location: IC #5 - BLDG #6 or IC #5 - Room#23. IC locations: MCBLDG B or MC - Room #10. Each LC connector port on the termination panel will be labeled with pre-printed, permanently marked label corresponding to consecutively numbered fiber described in paragraph 5.1.7 above.

5.1.11 Contractor will support fiber optic cable every four feet when cable tray is not an option, or existing. Cable path above everything existing in attic space or drop ceiling is always preferred method of placement. CABLES WILL NOT BE ATTACHED TO ANY DROP CEILING WIRES, CONDUIT SUPPORT WIRES OR BRACKETS, ELECTRICAL CONDUIT OR ANY OR ANY OTHER EXISTING STRAPS OR EQUIPMENT. Any of the following suggested methods are acceptable for establishing a cable path:

- a. ECH/FR-L hangers (Hilti)
- b. Bridle Rings (Erico)
- c.
- d. "D" rings
- e. Shoot ceiling wire with "Caddy Clips" (Erico)
- f. Beam clamps (Erico)

"J" hooks (Er

6.1.12 Contractor will strictly adhere to all ANSI/EIA/TIA 568B.2, 569, TSB 72 standards and manufactures recommendations on cable pulling tensile strength and bend radius for fiber optic cable placement. National Electrical Code (2002 edition) Article 770.3 (B) (Article 300.22 (C) FPN:) will also apply.

6.1 CATEGORY 5e (GIGABIT) UTP, FOUR PAIR SOLID COPPER CABLES.

6.1.1. Contractor to supply and install 4 pair, Category 5e, Gigabit rated, UTP, 24 AWG, copper cable for Voice, Data and Video over twisted pair station cable drops, unless otherwise noted. Manufacture's specifications to be submitted with bid. FAXED COPIES ARE NOT ACCEPTABLE.

6.1.2. Contractor to supply and install (if required) proposed Category 5e patch cables for MC, all Ic's and for every Data and Video over twisted pair station cable if specified to do so. Manufacture's specifications to be submitted with bid. FAXED COPIES ARE NOT ACCEPTABLE.

6.1.3. Manufactures recommended pulling limitations and bend radius must be adhered to during the installation phase of copper cable placement.

6.1.4. Contractor will supply a different color for each media installation, and maintain that color through out the project. All Data cables to be as specified- Red for crossover cables, Green for connections between devices not requiring a crossover cable (ie. Access Points), blue for patch cables to computers, Yellow for connections to servers and Orange for monitoring devices. All Telephone cables to be grey, and Video over twisted pair cables to be white, unless otherwise specified.

6.1.5 Contractor will strictly adhere to ANSI/EIA/TIA standards 5688.1, 569, NEC 800.52 (B) and 800.53 (A) for cable placement and/or design. Copper cable bundles are to be supported every four feet for entire length of run, if cable tray is not an option or existing. Conduit will not be an option in attics or drop ceiling spaces unless specified by Owner. The following suggested methods are acceptable for cable bundle support:

- a. ECH/FR-L Hangers (Hilti)**
- b. Bridle Rings (Erico)**
- c. "J" Hooks (Erico)**
- d. "D" Rings**
- e. Shoot ceiling wires with "Caddy Clips" (Erico)**
- f. Beam Clamps (Erico)**

6.1.6 CONTRACTOR WILL NOT INSTALL DATA COPPER CABLES WITH TELEPHONE, VIDEO TWISTED PAIR CABLES, COAX OR ANY OTHER FORM OF CABLE IN ANY OF THE ESTABLISHED DATA CABLE PATHS.

6.1.7 Cable bundles that are not Data to be installed into MC or IC's WILL NOT CROSS DATA COPPER CABLES.

6.1.8. Copper four pair station cables for any media type will be outdoor rated when used in underground conduit system. This is the least desirable method for four pair installation, and should be considered only as a last resort. (To be noted on test documentation if used).

6.1.9. Voice, Data and Video over twisted pair station cables will be terminated on RJ45 to 110 style, Category 5e, Gigabit rated, 5688 pin out jacks unless otherwise specified. Voice, Data and Video over twisted pair station cables will be terminated on Category 5e, Gigabit rated RJ45 to 110 style, 5688 pin out patch panels in sufficient port count to allow for termination of all cables installed, with twenty-five percent port growth. This will be the standard for MC and all IC's unless otherwise specified.

6.1.10. Jacks and patch panels to be marked in the following manner:

- a. Pre- printed, permanently marked labels will be used.**
- b. Data jacks and patch panel ports will be marked with the letter D, followed by an M if coming out of the Mdf. Jacks terminated in an IC will be marked D with following letter or number identifying le. EXAMPLE: DM-10, (D = data, M = MC, 10 = consecutively marked cable number ten). DA-05, (D = data, A =**

IC A, 05 = consecutively marked cable number 05.) D3-02 (D = data 3 = IC #3, 02 = consecutively marked cable number 02.)

- c. Telephone station cable drops will have a T as the first letter. EXAMPLE: T3-14 (T = telephone, 3 = IC #3, 14 = consecutively marked cable number 14).
- d. Video over twisted pair station cable drops will be marked with the letter V first.
EXAMPLE: V2 - 03. (V = Video, 2 = IC #2, 03 = consecutively marked cable number 3).

6.1.11 Typical configuration unless otherwise specified would be dual data drops, or dual data drops with one telephone drop. Cables are to be installed so dual data drops have numbers that are consecutive. This means data cable 7 would not be in the same faceplate as data cable 20. Telephone station cable drops will be run consecutively, but may not correspond to data cable jacks in the same faceplate. EXAMPLE: T3-02 in same faceplate as 03-05/03-06. Numbering pattern is to stay consecutive throughout the entire project. EXAMPLE: Room #1, West Side of building 03-01/03-02, T3-01/03-03/0304. Room #2, West Side of building 03-05/03-06, T3-02/03- 07/03-08.

7.1 TELEPHONE BACKBONE FEED CABLES

7.1.1 Telephone feed cables will be Category 3, unless otherwise specified. Pair counts run to each IC are to allow twenty-five percent growth.

7.1.2 Telephone feed cables that are to be installed in underground conduit system will be gel filled, and armored. Cables will be bonded and grounded with AWG #6, solid copper wire on both ends of cable.

7.1.3 Telephone feed cables that are to be installed aerially can be Aircore or gel filled, but must be bonded and grounded with AWG #6, solid copper wire at both ends of the cable.

7.1.4 All telephone feed cables will be terminated on solid-state protectors on both ends of cable. If multiple protectors are used in the MC, each protector should be permanently marked with a consecutive number or letter that would identify which IC the other end of cable will be terminated in.

7.1.5 Protectors must be marked with pre-printed, permanently marked labels that specify where other end of cable is terminated. EXAMPLE: In MC label would read IC #3-Bldg #6 or IC #3-Room #12. In the IC label would read MC-Bldg #1 - Protector #3 or MC-Room#10 - Protector #3.

7.1.6 Telephone feed cables should be permanently marked on both ends of cable using pre-printed labels with the letter T, and consecutive number or letter that would correspond with the IC cable is installed to. EXAMPLE: Feed cable installed to IC #3 would read T-3.

7.1.7 Telephone station cables, home run from MC or IC to jack locations will be 4 pair, Category 5e, 24 AWG, UTP, solid copper unless specified differently.

8.1 COAX VIDEO DISTRIBUTION CABLE PLANT

8.1.1 Two types of Video Distribution Systems are to be explained in the following paragraphs. First type is being referred to as loop-in/loop-out, second type is backbone feed to station cable drops. Both Systems require all taps/sputters to be fully populated with cables or terminators and fully balanced to produce 7db loss at each connector in the system, plus or minus 1. Contractor will establish with Owner where Head End equipment will be located, prior to design being formulated.

8.1.2 Loop-in/loop-out systems are generally used in a smaller environment and best used when only Cable/Satellite Television Distribution is the Owners choice. (Contractor to confirm with Owners service provider that db loss requirement stated above is correct). Only shielded coax cables are to be used in all cases. (Traditionally RG-58 used for this type system). COAX CABLE WILL NOT SHARE OR CROSS ANY EXISTING DATA STATION CABLE PATHS. Coax cable to be installed so cable is independently supported and suspended without using anything existing in the ceiling for support. Cables are to be supported every four feet. COAX CABLES WILL NOT SHARE ANY EXISTING CABLE TRAY DATA STATION CABLES OCCUPIED, CONDUITS WITH EXISTING DATA STATION CABLES OR DATA STATION CABLE PATHS OR SUPPORTS THAT ARE EXISTING.

8.1.3 Backbone/Station cable Video Distribution Systems are generally used for larger environments where several services are to be shared and balancing the system can be done much more efficiently. Backbone cables may reach extreme sizes beginning at the Head End equipment and be split in several branches running in different directions. The backbone may reach a tap or splitter location where cable size is reduced in a continuing pattern of loopin/loop-out of taps that reduce in size as they continue down the run. Station cables of a smaller size are then installed at each tap location ensuring terminators occupy any unused tap position. Contractor to use shielded/braided coax cables in this type system (Traditionally" 500", RG-II, RG-6 used in this type system). Same rules apply as paragraph 8.1.1 above for support and Data Station Cable proximity.

8.1.4 Contractor will supply plenum rated cable in all cases where cable paths in ceilings are not encased in conduit or specified differently by Owner.

9.1 TESTING AND DOCUMENTATION

9.1.1. All fiber optic cables installed, are to be terminated, tested and documented using OTDR (preferred) or Power Meters that produce documentation that may be downloaded to 8 1/2" x 11" sheets for each test. Multi-mode fiber to be tested at 850 nms from one end and 1300 nms from the opposite end. Single mode fibers to be

tested at 1310 nms from one end and 1550 nms at opposite end. **NO FIBER WILL BE ACCEPTABLE WITH GREATER THAN 2.Odb LOSS.** Test results to reflect date tested, name of person testing, location/number of fiber being tested, speed test was conducted at and graphic scan of test.

- 9.1.2 All Category 6, Gigabit rated, 4 pair, 24AWG, solid copper Data/Telephone/Video cables installed to be tested at 350MHz or greater, using a hand held tester that has been factory calibrated within the last six months and produces test results that can be down loaded to 8 1/2" x 11" sheets. Contractor may be requested by Owner to produce documentation verifying the calibration period. All cables, all pairs installed to be terminated, tested and documented. A minimum of+10 "headroom" or margin is required on each wire tested for all N.E.X.T. perimeters.
- 9.1.3 All Telephone Category 3 feed cables, all pairs to be tested and documented to ensure connectivity. Suggested test speed at 100 MHz.
- 9.1.4 Contractor to submit two sets of test documentation in three ring loose leaf binder with dividers for MC, each IC for all fiber optic cables installed all Data/ Telephone/ Video 4 pair cables installed and Telephone feeder cables installed if applicable. Each type of test should also be separated with dividers for quick ready reference. Contractor to also submit in each binder 8 1/2" x 11" CAD/Visio drawings. One drawing showing fiber optic cable paths, MC/IC, sizes of each fiber cable (multi-mode, single mode count) and cable identification number. One drawing showing Data/Telephone/Video station cable locations/numbers, MC/IC locations. One drawing, if applicable of Telephone feed cables, MC/IC locations, cable identification numbers and size of cable (pair count).
- 9.1.5 Contractor to submit one "D" size Cad as built drawing that includes all information contained in 8 1/2" x 11" drawings described above. Contractor to submit one CD with all the aforementioned requirements.
- 9.1.6 Contractor to submit all requested documentation and drawings with Letter of Completion. Contractor and Owner will together do a site walk through of the entire project, review all test documentation and establish the as built drawing is correct. If the Owner notes any discrepancies, Contractor will schedule with Owner time corrections will be completed. Contractor and Owner will together check all discrepancies for Owner's approval and acceptance of the project. Owner may release final payment at this time.
- 9.1.7 Contractors Letter of Completion to contain the following statement: I hereby certify the completed cable plant installation at (XYZ School) adheres to all City, County, State or Federal requirements, laws, codes, regulations and ordinances. I further certify that all applicable Project Standards, ANSI/EIA/TIA 568A-5, B.I B.2, 8.3, 569A, 606, 607, 526-14A, Annex B & C, 526-7, Method A.I ANSI/TIA/EIA 598 A, 758-1999 and ANSI/NECA/BICSI 568-2001 standards, and all applicable National Electrical Codes NFPA 70 codes have been adhered to.