# SECTION 27 05 00 (16050) - COMMON WORK RESULTS FOR COMMUNICATIONS

## PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Supporting Devices for Communication Components.
2. Concrete Equipment Bases.
3. Cutting and Patching For Communication Construction.
4. Touchup Painting.

B. Related Sections:

1. Section 03 30 00 (03300) - Cast-In-Place Concrete.
2. Section 07 84 00 (07840) - Firestopping.
3. Section 09 90 00 (09900) - Painting.
4. Division 26 and 28 Sections

1.02 REFERENCES

A. ASTM International (ASTM) Publications: (Former American Society for Testing and Materials)

1. A53 "Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless"

B. American Welding Society (AWS) Publications:

1. D1.1 "Structural Welding Code - Steel"

C. National Fire Protection Association (NFPA) Publications:

1. 70 "National Electric Code"

D. U.S. Architectural & Transportation Barriers Compliance Board:

1. Americans with Disabilities Act (ADA)

1.03 SUBMITTALS

A. Submit “Letter of Conformance” in accordance with Section 01 33 00 (01330) indicating specified items selected for use in Project with the following supporting data:

1. Product Data: For electricity-metering equipment.
2. Shop Drawings: Dimensioned plans and sections or elevation layouts of electricity-metering equipment.
3. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

1.04 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

C. All work to be in accordance with latest requirements of NFPA 70 and all other applicable codes and regulations of authorities having jurisdiction over the work.

1.05 COORDINATION

A. Coordinate chases, slots, inserts, sleeves, and openings with general construction work and arrange in building structure during progress of construction to facilitate the communication installations that follow.

1. Set inserts and sleeves in poured-in-place concrete, masonry work, and other structural components as they are constructed.

B. Sequence, coordinate, and integrate installing communication materials and equipment for efficient flow of the Work. Coordinate installing large equipment requiring positioning before closing in the building.

C. Coordinate communication service connections to components furnished by utility companies.

1. Comply with requirements of authorities having jurisdiction and of utility company providing electrical power and other services.

D. Coordinate location of access panels and doors for communication items that are concealed by finished surfaces. Access doors and panels are specified in Section 08 31 00 (08310) - "Access Doors."

E. Coordinate all work with Division 26.

F. All communication drawings are to be read in conjunction with the Project specifications and all other related drawings.

G. The contractor shall examine the site and observe the conditions under which the work will be done or other circumstances which will affect the contemplated work. No allowance will be made subsequently in the connection for any error or negligence on the contractor's part.

H. The contractor shall verify exact location, size and extent of all existing utilities, obstructions and/or other conditions which may affect the proposed work under the project. The contractor shall take every precaution to prevent damage to existing work and shall repair any damage as a result of this Work.

I. The contractor shall verify all door swings in the field and mount switches on knob side of doors or as approved by the Owner's Representative.

J. The contractor shall carefully examine all contract drawings/specifications and be responsible for the proper fittings of materials and equipment at each location as indicated without substantial alteration. The drawings are generally diagrammatic and because of the small scale of the drawings, it is not possible to indicate all offsets, fittings and accessories which may be required. Furnishing such fittings that are required to meet such conditions shall be furnished and installed at no cost.

## PART 2 PRODUCTS

2.01 SUPPORTING DEVICES

A. Material: Cold-formed steel, with corrosion-resistant coating acceptable to authorities having jurisdiction.

B. Metal Items for Use Outdoors or in Damp Locations: Hot-dip galvanized steel.

C. Slotted-Steel Channel Supports: Flange edges turned toward web, and 9/16-inch diameter slotted holes at a maximum of 2 inches o.c., in webs.

1. Channel Thickness: Selected to suit structural loading.

2. Fittings and Accessories: Products of the same manufacturer as channel supports.

D. Raceway and Cable Supports: Manufactured clevis hangers, riser clamps, straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring-steel clamps or click-type hangers.

E. Pipe Sleeves: ASTM A53, Type E, Grade A, Schedule 40, galvanized steel, plain ends.

F. Cable Supports for Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug for non-armored electrical cables in riser conduits. Plugs have number and size of conductor gripping holes as required to suit individual risers. Body constructed of malleable-iron casting with hot-dip galvanized finish.

G. Expansion Anchors: Carbon-steel wedge or sleeve type.

H. Toggle Bolts: All-steel springhead type.

2.02 CONCRETE BASES

A. Concrete Forms and Reinforcement Materials: As specified in Section 03 30 00 (03300) - "Cast-in-Place Concrete."

2.03 TOUCHUP PAINT

A. For Equipment: Equipment manufacturer's paint selected to match installed equipment finish.

B. Galvanized Surfaces: Zinc-rich paint recommended by item manufacturer.

## PART 3 EXECUTION

3.01 ELECTRICAL EQUIPMENT INSTALLATION

A. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide the maximum possible headroom.

B. Materials and Components: Install level, plumb, and parallel and perpendicular to other building systems and components, unless otherwise indicated.

C. Equipment: Install to facilitate service, maintenance, and repair or replacement of components. Connect for ease of disconnecting, with minimum interference with other installations.

D. Right of Way: Give to raceways and piping systems installed at a required slope.

E. Coordinate work with other trades and install conduit and boxes to clear embedded ducts, openings, etc. and all structural features.

F. Unless otherwise noted, mounting heights, as shown, are from finished floor to top of panelboard and to centerline of other equipment. Coordinate all mounting heights with contract drawings, local code requirements, and all ADA.requirements.

1. Toggle (snap) switch: 4’-0”.
2. Enclosed circuit breaker: 5’-0”
3. Disconnect (safety) switch: 5’-0”.
4. Motor starter: 5’-0”.
5. Panelboard: 6’-6”.

3.02 COMMUNICATION SUPPORTING DEVICE APPLICATION

A. Damp Locations, Pool Equipment Rooms, Storage Rooms and Outdoors: Hot-dip galvanized materials or nonmetallic, U-channel system components.

B. Dry Locations: Steel materials.

C. Support Clamps for PVC Raceways: Click-type clamp system.

D. Selection of Supports: Comply with manufacturer's written instructions.

E. Strength of Supports: Adequate to carry present and future loads, times a safety factor of at least four; minimum of 200-lb design load.

3.03 SUPPORT INSTALLATION

A. Install support devices to securely and permanently fasten and support communication components.

B. Install individual and multiple raceway hangers and riser clamps to support raceways. Provide U-bolts, clamps, attachments, and other hardware necessary for hanger assemblies and for securing hanger rods and conduits.

C. Support parallel runs of horizontal raceways together on trapeze- or bracket-type hangers.

D. Size supports for multiple raceway installations so capacity can be increased by a 25 percent minimum in the future.

E. Support individual horizontal raceways with separate, malleable-iron pipe hangers or clamps.

F. Install 1/4-inch- diameter or larger threaded steel hanger rods, unless otherwise indicated.

G. Spring-steel fasteners specifically designed for supporting single conduits or tubing may be used instead of malleable-iron hangers for 1-1/2-inch and smaller raceways serving lighting and receptacle branch circuits above suspended ceilings and for fastening raceways to slotted channel and angle supports.

H. Arrange supports in vertical runs so the weight of raceways and enclosed conductors is carried entirely by raceway supports, with no weight load on raceway terminals.

I. Simultaneously install vertical conductor supports with conductors.

J. Separately support cast boxes that are threaded to raceways and used for fixture support. Support sheet-metal boxes directly from the building structure or by bar hangers. If bar hangers are used, attach bar to raceways on opposite sides of the box and support the raceway with an approved fastener not more than 24 inches from the box.

K. Install metal channel racks for mounting cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices unless components are mounted directly to structural elements of adequate strength.

L. Install sleeves for cable and raceway penetrations of concrete slabs and walls unless core-drilled holes are used. Install sleeves for cable and raceway penetrations of masonry and fire-rated gypsum walls and of all other fire-rated floor and wall assemblies. Install sleeves during erection of concrete and masonry walls.

M. Securely fasten communication items and their supports to the building structure, unless otherwise indicated. Perform fastening according to the following unless other fastening methods are indicated:

1. Wood: Fasten with wood screws or screw-type nails.
2. Masonry: Toggle bolts on hollow masonry units and expansion bolts on solid masonry units.
3. New Concrete: Concrete inserts with machine screws and bolts.
4. Existing Concrete: Expansion bolts.
5. Steel: Welded threaded studs or spring-tension clamps on steel.
    a. Field Welding: Comply with AWS D1.1.

 

6. Welding to steel structure may be used only for threaded studs, not for conduits, pipe straps, or other items.

7. Light Steel: Sheet-metal screws.

8. Fasteners: Select so the load applied to each fastener does not exceed 25 percent of its proof-test load.

3.04 FIRESTOPPING

A. Apply firestopping to cable and raceway penetrations of fire-rated floor and wall assemblies to achieve fire-resistance rating of the assembly. Firestopping materials and installation requirements are specified in Section 07 84 00 (07840) “Firestopping."

3.05 CONCRETE BASES

A. Construct concrete bases of dimensions indicated, but not less than 4 inches larger, in both directions, than supported unit. Follow supported equipment manufacturer's anchorage recommendations and setting templates for anchor-bolt and tie locations, unless otherwise indicated. Use 3000-psi 28-day compressive-strength concrete and reinforcement as specified in Section 03 30 00 (03300) "Cast-in-Place Concrete."

3.06 CUTTING AND PATCHING

A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces required to permit electrical installations. Perform cutting by skilled mechanics of trades involved.

B. Repair and refinish disturbed finish materials and other surfaces to match adjacent undisturbed surfaces. Install new fireproofing where existing firestopping has been disturbed. Repair and refinish materials and other surfaces by skilled mechanics of trades involved.

3.07 FIELD QUALITY CONTROL

A. Inspect installed components for damage and faulty work, including the following:

1. Supporting devices for communication components.

2. Concrete bases.

3. Cutting and patching for communication construction.

4. Touch up painting.

3.08 REFINISHING AND TOUCHUP PAINTING

A. Refinish and touch up paint. Paint materials and application requirements are specified in Section 09 90 00 (09900) - "Painting."

3.09 CLEANING AND PROTECTION

A. On completion of installation, including outlets, fittings, and devices, inspect exposed finish. Remove burrs, dirt, paint spots, and construction debris.

B. Protect equipment and installations and maintain conditions to ensure that coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

## END OF SECTION

# SECTION 27 10 00 (16710) - STRUCTURED CABLING

## PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Premises Wiring For Telephone Distribution, Including Installations For Service By Local Telephone Exchange Carrier.

B. Related Sections:

1. Section 26 05 26 (16060) - Grounding and Bonding for Electrical Systems.
2. Section 26 05 33 (16130) - Raceways and Boxes for Electrical Systems.
3. Section 26 05 53 (16075) – Identification for Electrical Systems.
4. Section 27 20 00 (16740) - Communication and Data Processing Equipment.

1.02 REFERENCES

A. American National Standards Institute / Insulated Cable Engineers Association, Inc. (ANSI/ICEA) Publications:

1. ANSI/ICEA S-80-576 ”Category 1 & 2 Individually Unshielded Twisted Pair Indoor Cables for Use in Communications Wiring Systems”

B. National Fire Protection Association (NFPA) Publications:

1. 70 "National Electric Code"

C. Telecomunications Industry Association" (TIA) Publications:

1. 569-B “Commercial Building Standard for Telecommunication Pathways and Spaces”
2. 570-B “Residential Telecommunications -- Infrastructure Standard”

D. Underwriter's Laboratories, Inc. (UL) Standards:

1. 486A “Standard For Wire Connectors and Soldering Lugs for Use with Copper Conductors”
2. 486B “Standard for Wire Connectors for Use with Aluminum Conductors”

1.03 DEFINITIONS

A. Local Exchange Carrier: Telephone utility or other entity that provides an access line from a local exchange into the premises.

B. Exchange Access Line: Circuit carrying telephone service into the premises.

C. Distribution Circuit: Circuit from the network interface device to a distribution device, such as a terminal block or junction box.

D. Station Circuit: Circuit from a distribution device to a telecommunications outlet.

E. Telecommunications Outlet: Telephone jack for connecting equipment to communication circuits.

1.04 SUBMITTALS

A. Submit “Letter of Conformance” in accordance with Section 01 33 00 (01330) indicating specified items selected for use in Project.

1.05 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.

B. Comply with TIA 570-B.

C. Comply with NFPA 70.

1.06 PROJECT CONDITIONS

1.07 COORDINATION

A. Coordinate premises wiring with requirements of local telephone exchange carrier.

B. Coordinate premises wiring with requirements of telephone equipment supplier.

## PART 2 PRODUCTS

2.01 COMPONENTS

A. Comply with TIA 570-B.

B. Telecommunications and Auxiliary Disconnect Outlets: Four-position modular, latching, plug-type, jack-in, flush-mounting wall plate, unless otherwise indicated.

C. Wall Plates: Designed for telephone service. Match those indicated for power receptacle outlets in same spaces for materials and finish. For wall telephone units, include provision for support of unit.

*Note: Edit paragraph below to suit Project requirements*

D. Distribution and Station Cable: Category [5e][6], Four-pair, No. 24 AWG, solid-copper, unshielded, twisted-pair construction in PVC sheath.

1. Comply with ANSI/ICEA S-80-576.

2. Plenum cable is listed for use in plenums.

E. Cabinets: Comply with Section 26 05 33 "Raceways and Boxes for Electrical Systems." Furnish cabinets with backboard.

F. Backboard: 3/4-inch fireproofed interior grade plywood. Where installed in wire closet, height and width shall cover entire wall up to 96 inches above floor, unless otherwise indicated.

## PART 3 EXECUTION

3.01 INSTALLATION

A. Telephone Service: Comply with local telephone exchange carrier's requirements for details of telephone service.

B. Install outlet boxes and telecommunications outlets.

C. Install cable without damaging conductors and jacket.

1. Do not bend cable to a smaller radius than minimum recommended by manufacturer.

D. Install premises wiring in raceways, where raceway is in an accessible location, otherwise premises wiring shall be plenum rated and installed per manufacturer’s instructions.

1. Install cables in walls unless walls are solid or filled with insulation. In solid walls, install in raceway and terminate raceway with a bushing in ceiling space above outlet.

2. Install cables without raceway where concealed in accessible ceiling space, unless otherwise indicated.

 

3. Use pulling methods that will not damage cable or raceway, including fish tape, cable, rope, and wire-cable grips. Do not exceed manufacturer's recommended pulling tensions.

4. Pull cables simultaneously where more than one is being installed in the same raceway or at the same location.

5. Conceal raceway, except in unfinished spaces and as indicated.

E. Install exposed cable parallel or perpendicular to surfaces or exposed structural members and follow surface contours where possible.

F. Secure cable to independent supports at intervals as required to prevent sagging between supports.

G. Separation of Wires: Comply with TIA 569-B rules for separating unshielded copper communication and data-processing equipment cables from potential EMI sources, including electrical power lines and equipment.

3.02 CONNECTIONS

A. Ground equipment.

1. Install ground terminal at local exchange carrier service location and connect according to Section 26 05 26 "Grounding and Bonding for Electrical Systems."

2. Tighten electrical connectors and terminals according to manufacturers published torque-tightening values. If manufacturers torque values are not indicated, use those specified in UL 486A and UL 486B.

3.03 IDENTIFICATION

A. Identify components and circuits according to Section 26 05 53 - "Identification for Electrical Systems."

B. Identify telephone system backboards and cabinets with the legend "Telephone."

C. Identify terminals at terminal strips, telecommunications outlets, and pull-and-junction boxes with approved designations.

3.04 FIELD QUALITY CONTROL

A. Testing: Perform the following field quality-control testing:

1. Test continuity of each circuit pair loop.

## END OF SECTION

# SECTION 27 20 00 (16740) - COMMUNICATION AND DATA-PROCESSING EQUIPMENT

## PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Wire, Cable, Connecting Devices, Installation, And Testing For Wiring Systems To Be Used As Signal Pathways For Voice And High-Speed Data Transmission.

a. Mounting Elements

b. Twisted-Pair Cables, Connectors, and Terminal Equipment

c. Fiber-Optic Cables, Connectors, and Terminal Equipment

B. Related Sections include the following:

1. Section 26 05 26 (16060) - Grounding and Bonding for Electrical Systems.

2. Section 26 05 33 (16130) - Raceways and Boxes for Electrical Systems.

3. Section 26 05 53 (16075) – Identification for Electrical Systems.

4. Section 26 05 36 (16139) - Cable Trays for Electrical Systems.

5. Section 27 10 00 (16710) – Structured Cabling.

1.02 REFERENCES

A. InteNational Electrical Testing Association (NETA) Publications:

1. ATS “Standard for Acceptance Testing Specifications”

B. National Fire Protection Association (NFPA) Publications:

1. 70 "National Electric Code"

C. Telecomunications Industry Association" (TIA) Publications:

1. 568-A “Commercial Building Wiring Standard”

2. 568-B “Commercial Building Telecommunications Cabling Standards - Parts 1, 2, 3 Complete”

3. 569-B “Commercial Building Standard for Telecommunication Pathways and Spaces”

4. TSB-67 “Transmission Performance Specifications for Field Testing of Unshielded Twisted-Pair Cabling Systems”

1.03 DEFINITIONS

A. EMI: Electromagnetic interference.

B. IDC: Insulation displacement connector.

C. LAN: Local area network.

D. PVC: Polyvinyl chloride.

E. STP: Shielded twisted pair.

F. UTP: Unshielded twisted pair.

1.04 SUBMITTALS

A. Submit “Letter of Conformance” in accordance with Section 01 33 00 (01330) indicating specified items selected for Project with the following supporting data:

1. Shop Drawings: Include dimensioned plan and elevation views of components. Show access and workspace requirements.

a. System labeling schedules, including electronic copy of labeling schedules, as specified in Part 3, in software and format selected by Owner.

2. Product Certificates: Signed by manufacturers of cables, connectors, and terminal equipment certifying that products furnished comply with requirements.

3. Qualification Data: For firms and persons specified in "Quality Assurance" Article. Provide evidence of applicable registration or certification.

4. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

5. Maintenance Data: For products to include in maintenance manuals specified in Division 01.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is a registered communication distribution designer certified by the Building Industry Consulting Service International.

B. Comply with NFPA 70.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.06 COORDINATION

A. Coordinate Work of this Section with Owner's telephone switch, telephone instrument, workstation, and LAN equipment suppliers. Coordinate service entrance arrangement with local exchange carrier.

1. Meet jointly with representatives of above organizations and Owner's representatives to exchange information and agree on details of equipment arrangements and installation interfaces.

2. Record agreements reached in meetings and distribute record to other participants.

3. Adjust arrangements and locations of distribution frames, patch panels, and cross connects in equipment rooms and wiring closets to accommodate and optimize arrangement and space requirements of telephone switch and LAN equipment.

## PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Avendra, LLC Preferred Manufacturers:

1. Cable:

a. None.

2. Terminal and Connector Components, and Distribution Racks:

a. Leviton Mfg. Co., Inc. (800-323-8920)

B. Approved Manufacturers:

1. Cable:

a. Belden, Inc. (800-235-3361)

b. Draka Communications (800-879-9862)

c. Superior Essex Inc.; (800-551-8948)

d. Alcatel-Lucent; (908-508-8080)

e. Mohawk, a Division of Belden Networking, Inc. (978-537-9961)

f. Panduit Corp. (800-777-3300)

2. Terminal and Connector Components, and Distribution Racks:

a. Hubbell, Inc. (800-288-6000)

b. Alcatel-Lucent; (908-508-8080)

c. Panduit Corp. (800-777-3300)

d. Thomas & Betts Corp. (800-816-7809)

2.02 SYSTEM REQUIREMENTS

A. General: Coordinate the features of materials and equipment so they form an integrated system. Match components and interconnections for optimum future performance.

B. Expansion Capability: Unless otherwise indicated, provide spare fibers and conductor pairs in cables, positions in patch panels, cross connects, and terminal strips, and space in backbone cable trays and wireways to accommodate 50 percent future increase in active station pairs.

2.03 MOUNTING ELEMENTS

A. Cable Trays: Comply with Section 26 05 36 "Cable Trays for Electrical Systems."

B. Raceways and Boxes: Comply with Section 26 05 33 "Raceways and Boxes for Electrical Systems."

C. Backboards: 3/4-inch interior-grade, fire-resistive-treated plywood.

D. Distribution Racks: Freestanding and wall-mounting, modular-steel units designed for telecommunications terminal support and coordinated with dimensions of units to be supported.

1. Approximate Module Dimensions: 84 inches high by 22 inches wide.

2. Finish: Baked-polyester powder coat.

2.04 TWISTED-PAIR CABLES, CONNECTORS, AND TERMINAL EQUIPMENT

A. Listed as complying with Category 6 of TIA 568-A. Telephone branch cable shall be Category [Category 6. Data branch cable shall be Category 6.

1. Insulation Color: Blue

B. Conductors: Solid copper.

C. UTP Cable: Comply with TIA 568-A. Four thermoplastic-insulated, individually twisted pairs of conductors; No. 24 AWG, color-coded; enclosed in PVC jacket.

1. Jacket Color:

a. Telephone: White

b. Cata Cable: Blue

D. STP Workstation Cable: Comply with TIA 568-B. Two thermoplastic-insulated, individually twisted pairs of conductors; No. 22 AWG, color-coded, overall aluminum and polyester shield and No. 22 AWG tinned-copper drain wire; enclosed in PVC jacket.

E. UTP Plenum Cable: Listed for use in air-handling spaces. Features are as specified above, except materials are modified as required for listing.

F. UTP Cable Connecting Hardware: Comply with TIA 568-A. IDC type, using modules designed for punch-down caps or tools.

1. IDC Terminal Block Modules: Integral with connector bodies, including plugs and jacks where indicated.

2. IDC Connecting Hardware: Consistent throughout Project.

G. STP Cable Connecting Hardware: Comply with TIA 568-A for connectors, plugs, and jack assemblies.

H. Cross-Connect Panel: Modular array of IDC terminal blocks arranged to terminate building cables and permit interconnection between cables.

1. Number of Terminals per Field: One for each conductor in assigned cables.

2. Mounting: Backboard or rack as indicated.

I. Patch Panel: Modular panels housing multiple, numbered jack units with IDC-type connectors at each jack for permanent termination of pair groups of installed cables.

*Note: Edit the two paragraphs below to suit Project.*

1. Number of Jacks per Field: [One for each four-pair UTP cable indicated] [One for each four-pair conductor group of indicated cables, plus spares and blank positions adequate to satisfy specified expansion criteria].

2. Mounting: [Backboard] [Rack].

J. Jacks and Jack Assemblies for data circuit UTP Cable: Modular, color-coded, RJ-45 receptacle units with integral IDC-type terminals.

K. Jacks and Jack Assemblies for telephone circuit UTP Cable: Modular, color-coded, RJ-11/RJ-45 receptacle units with integral IDC-type terminals. Color coded: white/blue, white/orange, white/green, white/brown.

L. UTP Patch Cords: Four-pair cables in 48-inch lengths, terminated with RJ-11 plug at each end.

M. STP Patch Cords: Two-pair cables in 48-inch lengths, terminated with STP plug connectors at both ends. Match plug connectors with patch-panel connectors.

N. Workstation Outlets: Dual jack-connector assemblies mounted in single or multigang faceplate.

1. Faceplate: High-impact plastic; color as selected by Owner representative.

2. Mounting: Flush, unless otherwise indicated.

3. Legend: Factory label top jack, "Voice" and bottom jack, "Data"; by silk-screening or engraving.

2.05 FIBER-OPTIC CABLES, CONNECTORS, AND TERMINAL EQUIPMENT

A. Cables: Factory fabricated, jacketed, low loss, glass type, fiber optic, multimode, graded index, operating at 850 and 1300 nm.

1. Backbone, Strands per Cable: 12, unless otherwise indicated.

2. Dimensions: 62.5-micrometer core diameter, 125-micrometer cladding diameter.

3. Maximum Attenuation: Minus 3.75 dB/km at 850 nm; minus 1.5 dB/km at 1300 nm.

4. Minimum Modal Bandwidth: 160 MHz/km at 850 nm; 500 MHz/km at 1300 nm.

5. Operating Temperature Range: Minus 20 to plus 70 deg C.

B. Plenum Cable: Listed for use in plenums.

C. Cable Connectors: Quick-connect, simplex- and duplex-type SC couplers with self-centering, axial alignment mechanisms. Insertion loss not more than 0.7 dB.

D. Patch Panel: Modular panels housing multiple-numbered duplex cable connectors.

1. Permanent Connection: Permanently connect one end of each connector module to installed cable fiber.

2. Number of Connectors per Field: One for each fiber of cable or cables assigned to field, plus spares and blank positions adequate to satisfy specified expansion criteria.

*Note: Edit the paragraph below to suit Project.*

3. Mounting: [Backboard] [Rack].

E. Patch Cords: Dual fiber cables in 36-inch lengths.

1. Terminations: Two duplex connectors arranged to mate with patch-panel connectors, one at each end of each fiber in cord.

2.06 IDENTIFICATION PRODUCTS

A. Comply with Section 26 05 53 - Identification for Electrical Systems" and the following:

1. Cable Labels: Self-adhesive vinyl or vinyl-cloth wraparound tape markers, machine printed with alphanumeric cable designations.

## PART 3 EXECUTION

3.01 EXAMINATION

A. Examine pathway elements intended for cable. Check raceways, cable trays, and other elements for compliance with space allocations, installation tolerances, hazards to cable installation, and other conditions affecting installation. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 APPLICATION OF MEDIA

A. Backbone Cable for Data Service: Use UTP cable complying with Category 6 of TIA 568-A, fiber-optic cable for runs between equipment rooms and wiring closets and for runs between wiring closets if over 100 meters.

B. Backbone Cables for Voice Service: Use UTP cable complying with Category 6 of TIA 568-A for runs between equipment rooms and wiring closets and for runs between wiring closets.

C. Horizontal Cables for Data Service: Use UTP cable complying with Category 6 of TIA 568-A for runs between wiring closets and workstation outlets.

D. Horizontal Cables for Voice Service: Use UTP cable complying with Category 6 of TIA 568-A for runs between wiring closets and workstation outlets.

3.03 INSTALLATION

A. Wiring Method: Install wiring in raceway where raceway is in an accessible location and cable tray except within consoles, cabinets, desks counters and above accessible ceilings where plenum wiring method may be used. Conceal raceway and wiring except in unfinished spaces.

B. Install cable using techniques, practices, and methods that are consistent with Category 5e rating of components and that ensure Category 5e performance of completed and linked signal paths, end to end.

C. Install cable without damaging conductors, shield, or jacket.

D. Do not bend cable in handling or in installing to smaller radii than minimums recommended by manufacturer.

E. Pull cables without exceeding cable manufacturer's recommended pulling tensions.

1. Pull cables simultaneously if more than one is being installed in the same raceway.

2. Use pulling compound or lubricant if necessary. Use compounds that will not damage conductor or insulation.

3. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage media or raceway.

F. Secure and support cable at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.

G. Wiring within Wiring Closets and Enclosures: Provide adequate length of conductors. Train conductors to terminal points with no excess. Use lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.

H. Separation of Wires: Comply with TIA 569 rules for separating unshielded copper communication and data-processing equipment cables from potential EMI sources, including electrical power lines and equipment.

I. Make splices, taps, and terminations only at indicated outlets, terminals, and cross-connect and patch panels.

J. Use splice and tap connectors compatible with media types.

K. Install a pull wire in each and every empty conduit.

L. For each guest room that contains more than one telephone location, all telephones are to be served by one cable that is daisy-chained or looped from the first outlet to the second and third, etc. all guest rooms must be provided with a discrete cable for that room, no common wiring between guest rooms.

M. Each cable shall be terminated and labeled with the room number for the purpose of identification.

N. Each administrative telephone location is to be served by one discrete four pair cable.

O. Connections of all telephone jacks should follow the USOC wiring standard.

3.04 GROUNDING

A. Comply with Section 26 05 26 (16060) “Grounding and Bonding for Electrical Systems.”

 

B. Ground cable shields, drain conductors, and equipment to eliminate shock hazard and to minimize ground loops, common-mode returns, noise pickup, cross talk, and other impairments.

C. Bond shields and drain conductors to ground at only one point in each circuit.

D. Signal Ground Terminal: Locate in each equipment room and wiring closet. Isolate from power system and equipment grounding.

E. Signal Ground Bus: Mount on wall of main equipment room with standoff insulators.

F. Signal Ground Backbone Cable: Extend from signal ground bus to signal ground terminal in each wiring closet and equipment room.

3.05 INSTALLATION IN EQUIPMENT ROOMS AND WIRING CLOSETS

A. Line walls with plywood backboards, floor to ceiling.

B. Mount patch panels, terminal strips, and other connecting hardware on backboards, unless otherwise indicated.

C. Group connecting hardware for cables into separate logical fields.

D. Use patch panels to terminate cables entering the space, unless otherwise indicated.

3.06 IDENTIFICATION

A. Identify system components complying with applicable requirements in Section 26 05 53 (16075) “Identification for Electrical Systems” and the following Specifications.

B. System: Use a unique, three-syllable alphanumeric designation for each cable, and label cable and jacks, connectors, and terminals to which it connects with the same designation. Use logical and systematic designations for facility's architectural arrangement.

1. First syllable identifies and locates wiring closet or equipment room where cable originates.

2. Second syllable identifies and locates cross-connect or patch-panel field in which cable terminates.

3. Third syllable designates type of media (copper or fiber) and position occupied by cable pairs or fibers in the field.

C. Workstation: Label cables within outlet boxes.

D. Distribution Racks and Frames: Label each unit and field within that unit.

E. Within Connector Fields, in Wiring Closets and Equipment Rooms: Label each connector and each discrete unit of cable-terminating and connecting hardware. Where similar jacks and plugs are used for both communication and data-processing equipment, use a different color for jacks and plugs of each service.

F. Cables, General: Label each cable within 4 inches of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.

G. Exposed Cables and Cables in Cable Trays and Wire Troughs: Label each cable at intervals not exceeding 15 feet.

H. Cable Schedule: Post in prominent location in each wiring closet and equipment room. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Provide electronic copy of final comprehensive schedules for Project, in software and format selected by Owner.

3.07 FIELD QUALITY CONTROL

A. Testing: On installation of cable and connectors, demonstrate product capability and compliance with requirements. Test each signal path for end-to-end performance from each end of all pairs installed. Remove temporary connections when tests have been satisfactorily completed.

1. Copper Cable Procedures: Inspect for physical damage and test each conductor signal path for continuity and shorts. Use Class 2 bidirectional Category 5e tester. Test for faulty connectors, splices, and terminations. Test according to TIA TSB 67, "Transmission Performance Specifications for Field Testing of Unshielded Twisted-Pair Cabling Systems." Link performance for UTP cables must meet minimum criteria of TIA 568-A.

2. Fiber-Optic Cable Procedures: Perform each visual and mechanical inspection and electrical test, including optional procedures, stated in NETA ATS, Section 7.25. Certify compliance with test parameters and manufacturer's written recommendations. Test optical performance with optical power meter capable of generating light at all appropriate wavelengths.

B. Correct malfunctioning units at Project site, where possible, and retest to demonstrate compliance; otherwise, remove and replace with new units and retest.

3.08 CLEANING

A. After completing system installation, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finish, including chips, scratches, and abrasions.

3.09 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain systems.

1. Conduct training as specified in Section 01 79 00 (01820) "Training".

2. Train Owner's maintenance personnel on procedures and schedules for starting and stopping, troubleshooting, servicing, and maintaining equipment and schedules.

3. Train designated personnel in cable-plant management operations, including changing signal pathways for different workstations, rerouting signals in failed cables, and extending wiring to establish new workstation outlets.

## END OF SECTION

# SECTION 27 41 16 (16850) - TELEVISION EQUIPMENT

## PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Master Antenna Television Systems Using An Internal Antenna System, and a Satellite Earth-Station System of the Receive-Only Type As the Signal Source.

B. Related Sections:

1. Section 03 30 00 (03300) - Cast-in-Place Concrete.
2. Section 05 12 00 (05120) - Structural Steel.
3. Section 07 31 13 (07311) – Asphalt Shingles
4. Section 07 53 23 (07530) - Ethylene-Propylene-Diene-Monomer (EPDM) Roofing.
5. Section 07 61 00 (07610) - Sheet Metal Roofing
6. Section 26 05 53 (16075) – Identification for Electrical Systems.
7. Section 26 35 33 (16280) - Power Factor Correction Equipment

1.02 DEFINITIONS

A. CATV: Community antenna television.

B. MATV: Master antenna television.

C. NTSC: National television system committee.

D. RF: Radio frequency.

1.03 SUBMITTALS

A. Product Data: Include detailed manufacturer's specifications for each component specified. Include data on features, ratings, and performance.

B. Shop Drawings: For television equipment. Include plans, elevations, sections, details, and attachments to other Work.

1. Design Calculations: Calculate requirements and perform structural analysis for installed products including selection of seismic restraints, signed and sealed by the qualified professional engineer responsible for their preparation.
2. Include dimensioned plan and elevation views of components and enclosures, and details of control panels. Show access and workspace requirements.
3. Wiring Diagrams: Power, signal, and control wiring. Differentiate between manufacturer-installed and field-installed wiring.

C. Product Certificates: Signed by manufacturers of television equipment and components certifying that products furnished comply with requirements.

D. Installer Certificates: Signed by manufacturer certifying that installers comply with requirements.

E. Field Test Reports: Indicate and interpret test results for compliance with performance requirements of installed systems.

F. Maintenance Data: For television equipment and components to include in maintenance manuals specified in Section 01 78 23 “Operating and Maintenance Data”. In addition to requirements specified in Section 01 77 00 "Contract Closeout," include the following:

1. Detailed operating instructions covering operation under both normal and abnormal conditions.

2. Routine maintenance requirements for system components.

3. Lists of spare parts and replacement components recommended to be stored at the site for ready access.

G. Warranties: Special warranties specified in this Section.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is an authorized representative of the television equipment manufacturer, for both installation and maintenance of units required for this Project, to supervise installation of the system.

B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of seismic controls for electrical and electronic equipment that are similar to those indicated for this Project in material, design, and extent.

C. Testing Agency Qualifications: Testing agency that is a member company of the InterNational Electrical Testing Association and that is acceptable to authorities having jurisdiction.

1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association or the National Institute for Certification in Engineering Technologies, to supervise on-site testing specified in Part 3.

D. Product Options: Drawings indicate size, profiles, and dimensional requirements of television equipment and are based on the specific system indicated.

E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

F. Comply with NFPA 70.

G. Comply with 47 CFR 15, 17, and 76.

1.05 PROJECT CONDITIONS

A. Environmental Limitations: System components are equipped and rated for the environments where installed.

1. Service Conditions for Outdoor Equipment: Rate equipment for continuous operation under the following environmental conditions, unless otherwise indicated:

a. Temperature: Minus 22 deg F to plus 122 deg F

b. Relative Humidity: 5 to 100 percent.

c. Weather: Enclosure housings to prevent entry of moisture due to melting ice build-up or driven rain or snow.

 

2. Service Conditions for Indoor Equipment: Rate equipment for continuous operation under the following environmental conditions, unless otherwise indicated:

   a. Temperature: 32 deg F to 122 deg F

   b. Relative Humidity: 0 to 95 percent.

1.06 COORDINATION

A. Coordinate layout and installation of television equipment and suspension system components with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression-system components, and partition assemblies.

B. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and form work requirements are specified in Section 03 30 00 "Cast-in-Place Concrete."

C. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Section 07 53 23 “Ethylene-Propylene-Diene-Monomer (EPDM) Roofing” Section 07 61 00 “Sheet Metal Roofing”.

D. Coordinate work with antenna system supplier and provide the following:

1. PVC conduit with pull rope:

   a. Satellite antenna to head end conduit.

   b. Building to building conduit.

   c. Local antenna to head end conduit.

2. Building attic access.

3. Suite electrical (TV) boxes.

4. Empty conduit

1.07 WARRANTY

A. Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

1. Special Warranty for Television System and Components: Written warranty, signed by manufacturer and Installer agreeing to correct system deficiencies and replace components that fail in materials or workmanship within specified warranty period when installed and used according to manufacturer's written instructions. This warranty shall be in addition to, and not limiting, other rights Owner may have under other provisions of the Contract Documents.

## PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Avendra, LLC Preferred Manufacturers:

1. MATV System Components:

   a. None

B. Approved Manufacturers:

1. MATV System Components:

a. On Command Video (720-873-3200)

b. Substitution as approved by Marriott.

2.02 TELEVISION SYSTEMS

A. Components: Modular plug-in, heavy-duty, industrial- or commercial-grade units.

B. Equipment: Silicon-based, solid-state, integrated circuit devices.

C. Power Supply Characteristics: Devices shall be within specified parameters for ac supply voltages within the range of 105 to 130 V.

D. Protect signal cables and connected components against transient-voltage surges by suppressors and absorbers designed specifically for the purpose.

E. RF and Video Impedance Matching: Signal-handling components, including connecting cable, shall have end-to-end impedance-matched signal paths. Match and balance devices used at connections where it is impossible to avoid impedance mismatch or mismatch of balanced circuits to unbalanced circuits.

2.03 MATV EQUIPMENT

A. Description: Signal-source components, signal-processing and amplifying equipment, distribution components, and interconnecting wiring. System shall receive signals from sources, amplify and process them, and distribute them to outlets for receiving sets. UHF channels indicated to be received are translated to VHF channels before distribution to outlets.

B. Identification of Signal Sources and Channels Distributed:

C. MATV System Functional Description: System shall receive signals from sources, amplify and process them, and distribute them to outlets for receiving sets. UHF channels indicated to be received are translated to VHF channels before distribution to outlets.

2.04 MATV ANTENNAS

A. Satellite Earth-Station Antennas: Variable-alignment, receive-only, prime-focus, paraboloidal type.

1. Materials: Corrosion resistance, suitable for marine and moderate industrial environments.

2. Mount Configuration and Finish: Integral type with epoxy-powder coating finish.

3. Operating Frequency: 3.7 to 12.2 GHz.

4. Survival Wind Velocity: 100 mph, minimum.

5. Feed Horn: Dual C and K(u) bands, dual-polarization type.

B. Steerable-Satellite Earth-Station Antenna: Programmable motorized variable alignment throughout entire satellite coverage range.

C. Low-Noise Block Converter, K(u) Band: Weatherproof, with integral protection from surge voltages and an input frequency range to suit signals specified to be received.

 

D. Antenna-Support Structures: Prefabricated, hot-dip galvanized steel units.

1. Strength of Structure and Attachments: Adequate to withstand 100-mph winds while supporting installed antennas.
2. Comply with TIA 222 and 47 CFR 17.
3. Comply with FAA AC 70/7460-1.

2.05 MATV COMPONENTS

A. Satellite Receivers for Use with Steerable-Satellite Earth-Station Antennas: Include the following features:

1. C and K(u) band ready.
2. Automatic, programmable antenna positioning control and receiver tuning for a minimum of 40 channels, with manual override/fine tuning.
3. Intermediate frequency bandwidth individually adjustable per channel in increments from 17 to 36 MHz.
4. Stereo audio reception.
5. Manual and automatic, programmable channel selection.
6. Programmable timer for unattended system operation.
7. Digital indication of antenna position, channel selection, and signal strength.
8. Baseband video and stereo audio signal outputs.
9. Suitable for 19-inch electronic equipment rack mounting.

B. Signal-Path Adaptation Components: Units consistent with specified levels of overall system performance. Include the following where necessary for indicated functional requirements whether shown in system diagrams or not:

1. Modulators.
2. Demodulators.
3. Processors.
4. Descramblers.
5. Decoders.
6. Converters.

C. Preamplifiers: Coaxial-down-lead-broadband or single-channel type, inherently protected against lightning and voltage surges and enclosed in weatherproof housings. Use antenna cable for power supply from external source.

D. Head-End Equipment: Include filters, processors, broadband and single-channel amplifiers combining networks, power supplies, and other equipment as required to provide specified performance. House units in standard 19-inch electronic equipment cabinet.

E. Signal Power Splitters and Isolation Taps: Metal-enclosed directional couplers with brass connector parts. Where installed in signal circuits used to supply cable-powered amplifiers, power throughput capacity shall exceed load by 25 percent minimum.

F. Signal Traps: Packaged filters tuned to interference frequencies encountered in Project.

G. Attenuators: Fixed to balance signal levels.

H. Terminating Resistors: Enclosed units rated 0.5 W and matched for coaxial impedance.

I. Outlets: Flush, female type with metallic parts of anodized brass, beryllium copper, or phosphor bronze.

1. Wall Plates: Match materials and finish of power outlets in the same space.

2. Attenuation: Less than 0.1 dB.

3. Voltage Standing Wave Ratio: Less than 1.15 to 1.

2.06 SIGNAL TRANSMISSION COMPONENTS

A. Cable: Coaxial cable elements have 75-ohms nominal impedance and are 100 percent factory-sweep tested to meet or exceed requirements of NFPA 70, Articles 725, 800, and 820. Cables run in environmental air spaces are listed for use in plenums.

1. Satellite Antenna Cable: (2) two RG-11/U; cellular-polyethylene dielectric, tinned-copper braid shield with 100 percent shielding factor, No. 18 AWG solid copper conductor; and PVC jacket. From Head-end to satellite dish.

2. MATV Indoor Trunk Cable: RG-11/U; cellular-polyethylene dielectric, tinned-copper braid shield with 100 percent shielding factor, No. 18 AWG solid copper conductor; and PVC jacket. From Head-end room to the roof top, as directed by system manufacturer.

3. MATV Public area Indoor Branch Cable: (1) one RG-6/U; cellular-polyethylene dielectric, bare-copper braid shield with 95 percent minimum shielding factor, No. 18 AWG solid copper-clad-steel conductor; and PVC jacket run to designated TV Outlet in “Public Area”, and “Hearth Room”.

4. Guest Room MATV Indoor Branch Cable: (1) One RG-6/U; cellular-polyethylene dielectric, bare-copper braid shield with 95 percent minimum shielding factor, No. 18 AWG solid copper-clad-steel conductor; and PVC jacket, plenum rated, to Guest Room TV Outlet.

B. MATV Coaxial Cable Connectors: Type F, 75 ohms.

## PART 3 EXECUTION

3.01 EXAMINATION

A. Examine pathway elements intended for cable. Check raceways, cables trays, and other elements for compliance with space allocations, installation tolerances, hazards to cable installation, and other conditions affecting installation.

B. Examine roughing-in for antenna to verify actual locations of cable connections before antenna installation.

C. Examine walls, floors, roofs, equipment bases, and roof supports for suitable conditions where television equipment is to be installed.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Outdoor Installation: Comply with ANSI C2, "National Electrical Safety Code."

B. Install surge suppressors where ac-power-operated devices are not protected against voltage transients by integral surge suppressors specified in UL 1449. Install surge suppressors at the devices' power-line terminals. Comply with Section (26 35 33) 16280 “Power Filters And Conditioners”.

C. Support and anchor antenna towers, masts, and mountings.

 

1. Concrete Foundations: Reinforced concrete complying with Section (03 30 00) 03300 "Cast-in-Place Concrete."

2. Steel Anchorage Components: Galvanized-steel shapes and plates complying with Section (05 12 00) 05120 "Structural Steel."

D. All entry conduits shall have a 200 lb. Pull rope provided with a 24” length extending at both ends of conduit terminations.

E. Complete trim-out of system to include fitting cutting, installation of directional couplers, antennas and wall plates. Tag cable routing.

F. Satellite dish location, must be approved by Architect prior to installation.

G. Wiring Method: Install cables in raceways, except in accessible indoor ceiling spaces and attics, in hollow gypsum board partitions, and as otherwise indicated. Conceal raceways and wiring except in unfinished spaces.

H. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

I. Pulling Cable: Do not exceed manufacturer's recommended pulling tensions. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.

J. Exposed Cable: Install parallel to building lines, follow surface contours, and support the cable according to manufacturer's written instructions. Do not run adjacent and parallel to power or data cables.

K. Equalizing Video Signals: Where system performance may be degraded in certain operating modes, revise component connections and install video distribution amplifiers and attenuators as required to provide a balanced signal across the system.

L. Splices, Taps, and Terminations: For power and control wiring, use numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

M. Grounding: Provide independent signal circuit grounding recommended by manufacturer.

3.03 CABLING

A. Coaxial cables should have approximately 3 feet of slack in the ceiling fur-down areas and 6” to 1’ slack in the guest room wall junction boxes.

B. Cables shall be tested for continuity prior to and after sheet-rocking of the walls and ceiling areas.

C. Recommended conduit sizes and junction boxes will be provided by and installed by the subcontractor and must meet or exceed N.E.C. and Local City codes.

D. Cabling will be provided by On Command Video.

E. Cabling shall be ringed-out and labeled accordingly.

F. Cabling should not have a bend in routing of less than 90 degrees. It should also be free of cuts, scraps, splices and barreling techniques.

G. Guest corridor/trunk cabling, i.e. RG-11 Plenum, shall be anchored every 6 feet between J-boxes via zip ties or clamps.

H. Fireproof caulking material must be used when cutting any holes into sheet rocked walls when routing cables from the guest corridors into the first floor guest room wall junction boxes.

I. Cabling entering the MATV Equipment Room should have a minimum of 10 feet slack and all centrally located in that room on the west wall.

J. Cable installation methods must meet or exceed N.E.C. and Local City Codes.

3.04 MATV INSTALLATION

A. Head-End Equipment: Mount in electronic equipment the types of cabinets recommended by manufacturer. Group related items in methodical sequence.

B. Satellite Receivers: Mount in head-end equipment racks.

C. Arrange equipment to facilitate access for maintenance and to preserve headroom and passage space.

D. MATV Antennas: Align antenna elements to achieve maximum signal level and quality.

E. MATV Antenna-Supporting Structure: Increase antenna height as required to obtain signal strength needed for specified system performance.

1. Attachment to Building: Use 0.375-inch- minimum expansion anchors for masonry and place anchors clear of grout or mortar joints.

2. Attachment to Building: Use 0.375-inch- minimum lag bolts for attachment to wood.

3. Grounding: Comply with NFPA 780, "Installation of Lightning Protection Systems," unless more stringent requirements are indicated.

F. Antenna Cable Entrance: Use entrance fittings and seal and waterproof penetrations of the building envelope.

3.05 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals according to Section 26 05 53 " Identification for Electrical Systems."

3.06 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled components and equipment installation and supervise pre-testing, testing, and adjusting of television equipment.

B. Inspection: Verify that units and controls are properly installed, connected, and labeled and that interconnecting wires and terminals are identified.

C. Pre-testing: Align and adjust system and pretest components, wiring, and functions to verify that they comply with specified requirements. Replace malfunctioning or damaged items. Retest until satisfactory performance and conditions are achieved. Prepare television equipment for acceptance and operational testing as follows:

1. Off-Air, Mast-Mounted Antenna Sources: Connect the receiver to the down lead of a 10-element, single-channel antenna, tuned and oriented to optimize reception for the channel and placed at the system antenna's location. Alternatively, connect the receiver to a single-channel video amplifier connected to the down lead of the above single-channel antenna.

2. CATV Sources: Connect the receiver to an agile demodulator or CATV set-top converter at the CATV service entrance to the facility.

3. Satellite Earth-Station System Sources: Adapt the receiver to the output of the satellite-TV receiver.

 

D. Test Schedule: Schedule tests after pre-testing has successfully been completed and system has been in normal functional operation for at least 14 days. Provide a minimum of 10 days' notice of test schedule.

E. Operational Tests: Perform operational system tests to verify that system complies with Specifications. Include all modes of system operation. Test equipment for proper operation in all functional modes.

F. MATV System Acceptance Tests: Include the following, performed according to NCTA-02:

1. Instrumentation: Use a field-strength meter rated for minus 40-dB mV measuring sensitivity and a frequency range of 54 to 812 MHz, minimum. Provide documentation of recent calibration against recognized standards.

2. Signal Level: Use a field-strength meter to measure signal levels at MATV system outlets. Readings on each of the channels designated to be received must be within specified limits.

3. Signal-to-Noise-Ratio Test: Use a field-strength meter to make a sequence of measurements at the output of the last distribution amplifier or of another agreed-upon location in system. With system operating at normal levels, tune meter to the picture carrier frequency of each of the designated channels in turn and record the level. With signal removed and input to corresponding head-end amplifier terminated at 75 ohms, measure the level of noise at the same tuning settings. With meter correction factor added to last readings, differences from first set must not be less than 45 dB.

4. Picture-Quality Test: Connect a standard TV receiver to each system outlet and observe picture quality on designated channels. No evidence of cross-channel inter-modulation, ghost images, or beat interference should appear.

G. Qualitative and Quantitative Performance Tests: Demonstrate reception quality of color-television program transmissions at each system outlet from each designated channel and source. Quality shall be equal to or superior than that obtained with performance checks specified below, using a standard, commercial, cable-ready, color-television receiver. Level and quality of signal at each outlet and from each designated channel and source shall comply with the following Specifications when tested according to NCTA-02 or 47 CFR 76:

1. RF Video Carrier Level: Between 3 and 12 dB mV.

2. Relative Video Carrier Level: Within 3 dB to adjacent channel.

3. Carrier Level Stability, Short Term: Level does not change more than 0.5 dB during a 60-minute period.

4. Carrier Level Stability, Long Term: Level does not change more than 2 dB during a 24-hour period.

5. Broadband Frequency Response: More than the 54- to 220-MHz frequency range, signal amplitude is plus or minus 3 dB, maximum.

6. Channel Frequency Response: Across any 6-MHz channel in the 54- to 220-MHz frequency range, referenced to video carrier, signal amplitude is plus or minus 1 dB, maximum, unless otherwise indicated.

7. Carrier-to-Noise Ratio: 45 dB or more, unless otherwise indicated.

8. RF Visual Signal-to-Noise Ratio: 43 dB or more.

9. RF FM Carrier Level: 13 to 17 dB below video carrier level.

10. FM Frequency Response: More than the 88- to 108-MHz frequency range, signal amplitude is plus or minus 0.75 dB, maximum.

11. FM Carrier-to-Noise Ratio: More than 24 dB.

H. Record test results.

I. Retest: Correct deficiencies identified by tests and observations and retest until specified requirements are met.

3.07 CLEANING

A. Clean installed items using methods and materials recommended by manufacturer.

B. Clean MATV system components, including antennas and supports, head-end equipment, distribution components, and outlets.

3.08 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain television equipment.

1. Conduct training as specified in Section 01 79 00 "Training".

2. Train Owner's maintenance personnel on procedures and schedules for troubleshooting, servicing, and maintaining equipment.

3. Demonstrate methods of determining optimum alignment and adjustment of components and settings for system controls.

4. Demonstrate programming and tuning of satellite receivers.

3.09 ON-SITE ASSISTANCE

A. Occupancy Adjustments: When requested by Owner within one year of date of Substantial Completion, provide on-site assistance in tuning and adjusting the system to suit actual occupied conditions and to optimize performance. Provide up to two adjustments at Project site for this purpose, without additional cost.

## END OF SECTION

 