DESIGN AND CONSTRUCTION CRITERIA AND GUIDELINES
METROPOLITAN GOVERNMENT OF NASHVILLE AND DAVIDSON COUNTY
DEPARTMENT OF GENERAL SERVICES

April 29, 2015

ADDENDA #2

27 00 00	Communication Systems [REPLACE "ITS Wiring Policy" in FULL]
27A	ITS General Requirements for UPS, ATS, TVSS and Generators [Incorporated into the 27 00 00 Section]
27B	ITS SOP low voltage- new construction [No Revisons, Attached for Reference]
27C	ITS Approved Cable Vendors [No Revisons, Attached for Reference]

How to use the Design and Construction Criteria and Guidelines Document:

This document is updated frequently to identify criteria and issues that arise from the design, construction and management of buildings under Metro General Services. This document identifies project process/ construction/maintenance procedural items as well as materiality criteria to be consider for all projects. The document shall be a guide for the Design-Builder Team, to help identify criteria unique to Metro General Services Projects. The Design-Builder Team shall follow the criteria within this document when preparing drawings and specifications, reviewing criteria with Metro as noted in the document.

Identifying Changes from Previous Issuance:

- Text that has a strike-through has been deleted since the previous issuance and will be deleted from the document at the next issuance.
- *Italic text* has been added or modified since the previous issuance and will be "un-italicized" for the next issuance.
- Punctuation, grammer and spelling corrections are not indicated.
- Numbering Revisons can occur between issuances due to other modifcations.

Additions and Revisions:

Metro Project Managers can propose additions and revisions via the "Amendment Form." Proposed Amendments will be collected by the Manager of Design and Construction, reviewed as necessary, at staff meetings with all Metro Project Managers and delivered to the Assistant Director of General Services for signature approval or recommendation. Once approved, the amendments will be incorporated into the next issuance. If any proposed amendment will effect projects currently in design and construction, a "Directive Memo" will be issued to all project teams.

Division 27	COMMUNICATION SYSTEMS	Attachment
270000.	*GENERAL: Include complete sections in the specifications for this division of the Work, in addition to notes indicated on drawings. The Design-Build Team is responsible for complete coordination of statements in the specifications and the notes on the drawings.*	
270500.	***PATHWAYS AND SPACES***	
270500.1	*Equipment Room (ER) / Telecommunication Room (TR)*	
270500.1.1	*The typical preferred dimensions of the ER / TR are 10'x10'. Any ER / TR smaller than 10'x10' must be submitted to Metro ITS for review and approval.*	
270500.1.2	*The ER / TR shall be dedicated to the telecommunications function and related support facilities and not to be shared with electrical or HVAC installations that are not dedicated to the function of the ER / TR. Water pipes, ductwork, pneumatic tubing, etc. shall not pass over or through the ER / TR. Avoid spaces that limit expansion such as elevator areas, core, and outside walls.*	
270500.1.3	*A minimum of two (2) walls shall be covered with (3/4 inch) AC grade plywood, painted with fire retardant paint. These walls will be reviewed and approved by Metro ITS prior to installation.*	
270500.1.4	*A minimum of two (2) dedicated 120 VAC 20A non-switched AC duplex electrical outlet receptacles, each on a separate branch circuit with a dedicated neutral, shall be provided for equipment. In addition, convenience duplex outlets shall be placed at 1.8 m (6 ft.) intervals around the perimeter walls. Specific outlet locations shall be submitted to Metro ITS for review and approval prior to installation.*	
270500.1.5	*The ER / TR shall have 18-inch ladder rack mounted to all four (4) walls continually from end to end using the appropriate manufacturers angle brackets and fasteners.*	
270500.1.6	*A ground bar shall be provided with the (#6) ground wire running back to the electrical supply panel that is tied to the main building ground for the dedicated circuits in the ER / TR.*	
270500.1.7	*A Lenel OnGuard Professional series Access Control System processor and card reader interface, standard iClass card reader, electronic lock with integrated request to exit switch, and a door monitoring contact are required for every ER / TR, to be tied to Metro's existing Lenel System.*	
270500.2	*ENTRANCE FACILITY (EF)*	
270500.2.1	*The entrance facility (EF) consists of the telecommunications service entrance to the building. All carriers and telecommunications providers involved in providing services to the building shall be contacted to establish their requirements. The EF shall occupy a room solely for the purpose of telecommunications provider entry only and shall not be shared with others. At some locations it may be required for the EF to share the same space as other facilities. In this case, the EF must be reviewed and approved by Metro ITS prior to installation.*	
270500.2.2	*A minimum of three (3), four (4)-inch trade size conduits for large multi-pair telephone cables, optical fiber, and/or CATV cables shall be provided. These should be turned upward as they enter the building to prevent water ingress. Innerduct or Maxcell may be required based on design of the building.*	

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270526.	***GROUNDING AND BONDING***	
270526.1	*The grounding and bonding specification is derived from a combination of the NFPA NEC Article 250 and ANSI/TIA/-607-B.*	
270526.2	*Ancillary telecommunications components that shall be grounded include the demarcation circuit protectors, all racks, cable trays, conduits and shielded cabling components. The minimum gauge wire of the grounding system shall be (#6) AWG, but can get as large as 3/0 AWG.*	
270529.	***HORIZONTAL AND BACKBONE CABLE SUPPORT***	
270529.1	*The primary means of supporting or protecting cable in horizontal pathways is conduit, cable trays, in ceiling or any combination of these and may include pull boxes. Workstation conduit shall be a minimum of ¾ inch.*	
270529.2	*Conduit should be used through floor sleeves, ground wire protection, in-wall stub-ups for outlets, or as required by local codes.*	
270529.3	*Cable trays are required in all horizontal pathways in office buildings/space over 20,000 sq. ft. A minimum of 12 inches of headroom shall be provided and maintained above the cable tray. Cable tray dimensions shall be a minimum 12" W x 2" H.*	
270529.4	Size of pathways will be determined by quantity, size, and bend radius of cables to meet Cat5e requirements with allowance for growth of at least 50%.	
270529.5	Hilti type cable hangers or "J" hooks are an acceptable means for horizontal and backbone pathways and shall be installed every 36-48 inches where cable tray and conduit are not required.	
270529.6	***FIRE STOPPING***	
270529.6.1	*Hilti Speed Sleeves or equivalent shall be installed in the main backbone and horizontal pathways.*	
270529.6.2	*Fire stopping is required based on Metro codes.*	
270529.6.3	*New Construction – responsibility of the General Contractor.*	
270529.6.4	*Existing Construction – if vendor uses any existing wiring path (conduit, core drill, etc.), the vendor must reseal or replace fire stop material.*	
270553.	***IDENTIFICATION FOR COMMUNICATIONS SYSTEMS***	
270553.1	***Component Identification and Cable Numbering***	
270553.1.1	*The panel in the highest position will be designated "A", with subsequently lower panels designated "B", "C", "D" thru "Z", then "AA", "AB", "AC", etc. in 1.75" increments. Upon installation in a cabinet, the position of the top edge will determine its designation letter. Panel positions must be clearly labeled on both the right and left side (front only) upon cabinet installation.*	
270553.1.2	*All designations and labels shall be machine generated. No hand written labels are allowed. All labels shall be white background with black letters.*	
270553.1.3	*Cabinet labels must have a 3/8 inch minimum character height. The label must be affixed to the front of the cabinet at the highest possible location.*	
270553.1.4	*Panel labels must have a ¼ inch minimum character height and be affixed to the front of the panel in a location that is not obstructed by cables or wire management devices.*	

Division 27	COMMUNICATION SYSTEMS	Attachment
270553.1.5	*Wall plate labels must have a ¼ inch minimum character height and be affixed to the most suitable location on the face of the wall plate.*	
270553.1.6	*Conduit and vault labeling must follow ANSI/TIA/-606-B standards and be approved by Metro ITS prior to installation.*	
270800.	***COMMISSIONING OF COMMUNICATIONS***	
270800.1	***FIELD TESTING***	
270800.1.1	*Based on examples within ANSI/TIA/-606-B, a complete set of records will be provided, documenting initial installation and changes. The records shall include the test results, where it is installed (description and floor plan location), and a basic block diagram. These records shall include the personnel, dates, building name and/or street address. Only permanent link testing will be required.*	
270800.1.2	*Test instruments shall be field calibrated before testing begins and whenever a break from testing of over an hour occurs. The test instrument shall be adjusted to the NVP of the particular manufacturer's installed cable type. Factory calibration and certification is required at least once every year. Acceptance testing will not be approved using test instruments with expired calibration certifications.*	
270800.1.3	*Horizontal and centralized optical fiber cabling links need only be tested at one wavelength 850 or 1300nm for multimode fiber in one direction for acceptance testing, however, testing in both directions and both wavelengths will be necessary if lack-of-performance indicates. Horizontal testing will be in accordance with TIA/-526.14-B.*	
270800.1.4	*Backbone single-mode optical fiber testing shall be performed at both 1310 and 1550 nm in one direction in accordance with TIA/-526.7. Backbone multimode optical fiber testing shall be performed at both 850 and 1300nm in accordance with TIA/-526.14-B.*	
271116.	***COMMUNICATION EQUIPMENT ROOM FITTINGS***	
271116.1	*EQUIPMENT CABINETS*	
271116.1.1	*The ER / TR shall have APC floor mount cabinets installed. Part number AP3140.*	
271116.1.2	*The ER / TR cabinet shall have APC PDU's installed. Part number AP7800.*	
271116.1.3	*All equipment cabinets will have a Lenel OnGuard Professional series Access Control System processor and card reader interface; standard iClass card reader, electronic locks and door monitoring switches for front and rear doors, to be tied to Metro's existing Lenel System.*	
271116.2	*EQUIPMENT CORDS*	
271116.2.1	*WORK STATION: Work station patch cords shall be CommScope, Cat5e, 10' in length. BLACK in color is to be used at desktop/work area (non-booted).*	
271116.2.2	*COMMUNICATION ROOM: Communications Room patch cords shall be CommScope, Cat5e, 1' in length. BLUE in color is to be used at the patch panel (non-booted).*	
271116.2.3	*COMMUNICATION ROOM: Life Safety patch cords shall be CommScope, Cat5e, 10' in length. RED in color is to be used (non-booted).*	

Division 27	**COMMUNICATION SYSTEMS**	**Attachment**
271300.	***BACKBONE CABLING***	
271313.	*COPPER CABLE*	
271313.1	*Pair count will be determined during the design phase.*	
271313.2	*Each cable shall be a complete run without splices.*	
271313.3	*Multi-pair copper feeders shall be terminated on a wall mounted 110 style termination blocks with C-5 connectors then extended into the network cabinet and terminated on a patch panel.*	
271323.	*FIBER CABLE*	
271323.1	*All fiber cabling shall be Corning. Strand count will be determined during the design phase.*	
271323.2	*Each cable shall be a complete run without splices.*	
271323.3	*OPTICAL FIBER CABLE*	
271323.3.1	*All optical fiber cables shall terminate using Corning SFF (small form factor) of LC design.*	
271500.	***HORIZONTAL CABLING***	
271500.1	*COPPER CABLE: All copper cabling shall be CommScope, Cat5e, BLUE in color. There may be an occasion where the cable color needs to match an open ceiling if no acoustical ceiling is installed. Coordination with Metro ITS and the Contractor will be needed should this occur.*	
271500.2	*COPPER CABLE: Horizontal cabling must be installed in a star topology. Each cable shall be a homerun without splices.*	
271500.3	*JACKS: Each 4-pair cable shall be terminated with a CommScope, Cat5e jack, BLUE in color. Pin/pair assignments shall follow the T568B convention.*	
271500.4	*FACEPLATES: Each faceplate must be, at minimum, a CommScope, 4-port with ID labels. Color will be decided prior to installation.*	
271500.5	*PATCH PANELS: All horizontal cabling shall be terminated on CommScope Cat5e, 48-port patch panels.*	
276000.	***REFERENCE MATERIALS:*** *- ANSI/TIA/-568-C.0 Generic Telecommunications Cabling for Customer Premises* *- ANSI/TIA/-568-C.1 Commercial Building Telecommunications Cabling Standards* *- ANSI/TIA/-568-C.2 Commercial Building Telecommunications Cabling Standards* *- ANSI/TIA/-568-C.3 Optical Fiber Cabling Components Standard* *- ANSI/TIA/-569-C Telecommunications Pathways and Spaces* *- ANSI/TIA/-606-B Administration Standard for the Telecommunications Infrastructure* *- ANSI/TIA/-607-B Generic Telecommunications Bonding and Grounding for Customer Premises* *- ANSI/TIA-758-B Customer-Owned Outside Plant Telecommunications Cabling* *- TIA-526.14-B Optical Power Loss Measurements of Installed Multi-Mode Fiber Cable Plant* *- BICSI Telecommunications Distribution Methods Manual (TDMM)* *- NFPA 70 Codes, National Electrical Code (NEC)*	

Division 27	COMMUNICATION SYSTEMS	Attachment
277000.	***Requirements for UPS, ATS, TVSS, Generators***	
277000.1	***UPS – Uninterruptable Power System***	
277000.1.1	*Must be purchased from Metro's contract UPS vendor.*	
277000.1.2	*Must have an External Maintenance Bypass for all units 10kVA or larger.*	
277000.1.3	*Must have a remote Enunciator Panel for all units 10kVA or larger.*	
277000.1.4	*Must have a SNMP Communication Card.*	
277000.1.5	*All voltage transformation must be done external to the UPS. The transformers should not be located in the IT equipment rooms. Exceptions to this must be approved by Metro.*	
277000.1.6	*The input Wiring, Breakers, and Transformer should be sized to handle the maximum UPS capacity, (e.g. a 225kVA that is brought in at the startup 150kVA level should have the above sized for the 225kVA).*	
277000.1.7	*The room where the UPS is installed must have a controlled climate meeting the manufacturer's requirements.*	
277000.1.8	*The room where the UPS is installed must allow for the required service access areas.*	
277000.1.9	*The UPS, ATS, and Generator must be coordinated to ensure a transfer to generator if the UPS can no longer use the utility power because of its quality or quantity.*	
277000.2	***TVSS – Transient Voltage Surge Suppressor:***	
277000.2.1	*TVSS devices should be external to allow for replacement without requiring a complete panel outage.*	
277000.2.2	*There must be a TVSS installed on the Main Panel feeding utility power into the building.*	
277000.2.3	*There must be a TVSS installed on the ATS.*	
277000.2.4	*There must be a TVSS installed on the panel the feeds the UPS.*	
277000.2.5	*All TVSS devices must have enunciator lights indicating that all phases are protected.*	
277000.3	***ATS – Automatic Transfer Switch:***	
277000.3.1	*Must have the capability of programmed Engine Exercise Routines, both with and without load. Metro may require more runs with load, but our Minimum Standard for this is as follows:*	
277000.3.1.1	*Once a week for the first three weeks of the month, start and run for 1 minute with No Load, and then run for a 5 minute cool-down period.*	
277000.3.1.2	*Once a month, start and run for 1 hour With Load, and then run for a 5 minute cool-down period.*	
277000.3.2	*The ATS must have an appropriate sized External TVSS.*	
277000.3.3	*The ATS should not be fed directly from the utility line. There must be a Main Panel breaker / Service Disconnect.*	
277000.3.4	*The ATS must have an operator panel / screen for programming*	
277000.3.5	*The ATS must have password protection capability*	
277000.3.6	*The ATS must have indicators as to the active power source*	
277000.3.7	*The ATS must have an "Immediate Transfer" switch that will start the generator and transfer the load*	

Division 27	**COMMUNICATION SYSTEMS**	**Attachment**
277000.4	***Generator:***	
277000.4.1	*Must have a Remote Enunciator Panel, the placement to be decided by Metro.*	
277000.4.2	*The Fuel Oil must be a Winter Blend.*	
277000.4.3	*The fuel capacity should provide for 12 hours run time at 80% load.*	
277000.4.4	*The initial load should be not less than 20% or more than 70%. Exceptions to this require Metro's approval.*	

Standard Operating Procedure

Low voltage cabling in new construction or building re-model projects

This document identifies the guidelines for General Services (GS), Metro ITS, architects, and general contractors for design, procurement, and installation of low voltage cabling and Metro ITS telecommunications rooms. These guidelines are to be used for all new construction and substantial building remodeling projects. Any situation or project not covered in this SOP should be submitted to Metro ITS for interpretation.

I. **Project Type 1** – General Services has obtained an architect to design a new Metro facility. Construction documents are then submitted to numerous general contractors for proposals.
   a. Schematic Design Phase
      i. Metro ITS project manager will provide architect with a copy of the Metro ITS Low Voltage Specification Standards. If architect prefers to convert these standards to a new format (i.e. Division 27) then Metro ITS must review before final document is released for bid.
      ii. Metro ITS will work with General Services' representative and architect for ITS telecommunications room(s) size and location.
   b. Design Development Phase
      i. The preliminary locations of low voltage outlets should be obtained by the architect. Then, Metro ITS will review and adjust as needed.
      ii. Metro ITS project manager should identify all needed electrical, UPS, and HVAC requirements for the Metro ITS closets. (supported by Metro ITS Low Voltage Specification Standards)
   c. Construction Document Phase
      i. Metro ITS will provide a Low Voltage Wiring Request package with a list of approved certified CommScope Uniprise vendors to architect to include in final CDs.
      ii. Architect should note, in overall bid-package, that General Contractor may utilize any vendor to "price" low voltage package, but low voltage vendor will <u>NOT</u> be awarded until general contractor, General Services, and Metro ITS complete LV bid process (see section "e").
   d. Procurement – Contractor for overall construction project is awarded.
   e. Construction Administration
      i. Awarded general contractor, General Services, and Metro ITS agree on schedule (timeline) to submit Low Voltage Request to vendors.

ii. Metro ITS will conduct final update/review of the Low Voltage Wiring Request. Then, Metro ITS submits the low voltage wiring request to general contractor for bidding to Metro approved low voltage vendors.
iii. General contractor will manage bidding process (i.e. meetings, bidder's conferences, questions, etc.)
iv. General contractor will review final low voltage proposals with General Services and Metro ITS before low voltage contract is awarded.
v. Awarded low voltage contractor will be managed and contractually obligated to the general contractor. Any changes, requests, etc. from Metro ITS will be submitted to GS / general contractor.
vi. Metro ITS low voltage vendors may be aligned as a subcontractor of the general contractor or the electrical subcontractor.

II. **Project Type 2** – General Services has submitted a request to qualified bidders to design AND build a new Metro facility.

a. Pre-bidding Phase
   i. Metro ITS will provide General Services with Low Voltage Specification Standards and the list of approved certified CommScope Uniprise vendors.
   ii. General Services should note, in overall bid-package, that general contractor or architect may utilize any vendor to "price" low voltage package, but low voltage vendor will NOT be awarded until a later date.
   iii. General Services should consult with Metro ITS if a RCDD (Registered Cable Distribution Designers) should be included in bid.
b. Architect or general contractor for overall project is awarded.
c. Schematic Design Phase
   i. Awarded architect or general contractor, General Services, and Metro ITS agree on schedule (timeline) to submit low voltage request to vendors.
   ii. Metro ITS will work with General Services representative and architect for ITS telecommunication room(s) size and location.
d. Design Development Phase
   i. The preliminary locations of low voltage outlets should be obtained by architect. Then, Metro ITS will review and adjust as needed.
   ii. Metro ITS project manager should identify all needed electrical, UPS, and HVAC requirements for the Metro ITS closets. (supported by Metro ITS Low Voltage Specification Standards)
e. Construction Document Phase
   i. Metro ITS provides a preliminary Low Voltage Wiring Request package to architect to include in final CDs.
f. Construction Administration
   i. Metro ITS conducts final update/review of the Low Voltage Wiring Request. Then, Metro ITS submits the Low Voltage Wiring Request to general contractor for bidding to Metro approved low voltage vendors.

ii. General contractor will manage bidding process (i.e. meetings, bidder's conferences, questions, etc.)
iii. General contractor will review final low voltage proposals with General Services and Metro ITS before low voltage contract is awarded.
iv. Awarded low voltage contractor will be managed and contractually obligated to the general contractor. Any changes, requests, etc. from Metro ITS will be submitted to GS / general contractor.
v. Metro ITS low voltage vendors may be aligned as a subcontractor of the general contractor or the electrical subcontractor.

Inside Outside Wiring Contractors for ITS ONLY

Contractors Name	Contact Person	Vendor #	Contract#	Office Phone	Fax	Cell Phone	E-mail
Stansell Electric	Cheri Viar	214574	335701	369-4123	320-5236	542-6178	cviar@stansellelectric.com
	Tom Bennett			369-4122	320-5236	512-9770	tbennett@stansellelectric.com
Alternate	Mike Wooten			369-4116	642-9581	394-5136	mwooten@stansellelectric.com
	Jeff Brown			369-4127	574-8270		jbrown@stansellelectric.com
Day-to-day	Tracey Bratcher			369-4137	642-9581		tbratcher@stansellelectric.com
Pro Systems	Josh Cooper	174059	335703	259-2185	726-1417	948-1906	jcooper@prosystemsinc.net
Alternate	Mark Smith			259-2185		948-2033	msmith@prosystemsinc.net
	James Mason			259-2185		948-7248	jmason@prosystemsinc.net
Beacon	Billy Quinn	174059	335705	724-2307	301-5023	484-9595	bquinn@beacontech.net
Alternate	Lloyd Whipple			301-5020	301-5023	516-1132	lwhipple@beacontech.net