SECTION 27 08 13
TESTING OF COPPER CABLES

PART 1 – GENERAL

1.01 DESCRIPTION

A. The work covered by this section of the Specifications includes all labor necessary to perform and complete such construction, all materials and equipment incorporated or to be incorporated in such construction and all services, facilities, tools and equipment necessary or used to perform and complete such construction. The work of this section shall include, but is not limited to, the following:

1. Cable testing for copper cables.

2. Providing test results in accordance within these specifications.

1.02 QUALITY ASSURANCE

A. Refer to Section 27 00 00 for general details.

1.03 CODES, STANDARDS AND GUIDELINES

A. Except as modified by governing codes and by the Contract Documents, comply with the applicable provisions and recommendations in Section 27 00 00.

1.04 SUBMITTALS

A. Refer to Section 27 00 00 for general details.

B. Shop Drawings:

1. None Required

C. Submit Manufacturer’s Cut Sheets for the following:

1. Any products not specifically listed in the PRODUCTS section shall require a submittal of the manufacturer’s cut sheets.

D. List of test equipment to be used with the last calibration date and list of technicians certified for use.

E. A sample of test data shall be provided to the campus representative prior to testing.

F. Contractor’s personnel performing testing shall have received factory training and have current certification.

G. Submit the proposed schedule for testing at least 2 weeks prior to the start of testing.

H. Campus Representatives can elect to observe testing and may request previously performed tests to be repeated for comparative analysis.
1.05 IDENTIFICATION
   A. Test results shall match final permanent cable, faceplate, and wall field numbering system.
   B. Test results shall match campus numbering system standards.
   C. Refer to Section 27 05 53 for general details.

1.06 DEFINITIONS
   A. N/A

1.07 WARRANTY
   A. Refer to Section 27 00 00 for general details.
PART 2 – PRODUCTS

2.01 CATEGORY 3 UTP CABLE TESTER
   A. Testing for all cables 25 pair or larger are to use a tester that tests 25 pair at a time.
   B. The field tester must meet the requirements of ANSI/TIA/EIA-568.
   C. Make and model at Contractor's discretion.

2.02 CATEGORY 6A UTP CABLE TESTER
   A. The field tester must be a Level IV or greater.
   B. The field tester must meet the requirements of ANSI/TIA/EIA-568-C.2
   C. Tester must be able to export test results to Microsoft Excel.
   D. Make and model at Contractor's discretion.

2.03 MULTIMETER
   A. Make and model at Contractor's discretion.
PART 3 – EXECUTION

3.01 GENERAL

A. The Contractor shall test, as described below, all metallic cables installed under these specifications.

B. Visually inspect all cables, cable reels, and shipping cartons to detect cable damage incurred during shipping and transport. Return visibly damaged items to the manufacturer.

C. Where post-manufacturer test data has been provided by the manufacturer on the reel or shipping carton: submit copies to the campus representative prior to installing cables.

D. Test fully completed systems only. Piecemeal testing is not acceptable.

E. Testing shall not be performed until after all hardware is installed and attached, and all labeling and identification has been completed.

F. Any cable that does not pass all required testing shall be removed, replaced, and retested.

G. Remove and replace any defective cables from pathways system. Do not abandon cables in place.

H. For 100 pair or smaller replace entire cable if a pair or conductor fails a required test. For larger pair count cables, replace if more than 2% of pairs fail a required test.

I. The campus telecommunications representative reserves the right to observe all portions of the testing process.

J. The campus telecommunications representative further reserves the right to conduct “Proof of performance testing”, using Contractor equipment and labor, a random re-test of up to ten percent (10%) of the cable plant to confirm documented test results.

K. Perform all tests as required by the manufacturer in support of the structured cabling system warranty.

L. Perform all tests as prescribed by the manufacturer of the testing equipment, including the use of reference cords where required.

3.02 QUANTITIES

A. N/A

3.03 INSTALLATION

A. N/A

3.01 GROUNDING & BONDING

A. All grounding and bonding is to be complete before any system testing is to begin.

3.02 TESTING

A. All test results are to be defined as acceptable / unacceptable by the requirements of ANSI/TIA/EIA-568 C.2.

B. Copper Cables – General Requirements
1. After terminating and splicing the cables. Test all cable pairs for:
   a. Continuity to the remote end.
   b. Shorts between any 2 or more conductors or ground
   c. Transposed pairs
   d. Reversed Pairs
   e. Split Pairs
   f. Crossed Pairs
   g. Wire map
   h. Length
   i. Shield Continuity (If Shielded)
   j. Continuity to Grounding (If Shielded)

2. Using a multimeter, test continuity to ground (TGB or TMGB) for a maximum resistance of 1Ω, see section 27-05-26 for additional detail.

C. Indoor Riser or OSP Copper Cable
   1. After terminating and splicing the cables. Test all cable pairs for:
      a. DC Loop Resistance for any 2 conductors in the cable.

D. Category 6A Copper Station Cables:
   1. Contractor is to perform a three connector permanent link test.
   2. After terminating both ends of all 4-pair cables, but before any cross-connects are installed, test these cables for the following:
      a. Return Loss
      b. Insertion Loss
      c. NEXT (near-end crosstalk)
      d. PSNEXT (power sum near-end crosstalk)
      e. FEXT (far end crosstalk)
      f. ACR-F (attenuation to crosstalk ratio)
      g. PSACR-F (power sum attenuation to crosstalk ratio)
      h. TCL (transverse conversion loss)
i. ELTCTL (equal level transverse conversation transfer loss)

j. Propagation delay

k. Coupling attenuation

l. Propagation delay skew

m. PSANEXT (power sum alien near-end crosstalk loss)

n. Average PSANEXT (average power sum alien near-end crosstalk loss)

o. PSAFEXT (power sum alien far-end crosstalk loss)

p. PSAACRF (power sum alien attenuation to crosstalk ratio far-end)

3.03 ACCEPTANCE

A. All test results for Cat 3 cable are to be documented and submitted in Microsoft Excel or .csv format to the campus telecommunications representative within five (5) working days of test completion.

B. All test results for Cat 6A cable are to be documented and submitted in Microsoft Excel to the campus telecommunications representative within five (5) working days of test completion.

C. Test result shall be recorded per cable and identical copies placed on three removable media devices (CD, DVD, or Flash drive) for delivery to the campus project manager and campus telecommunications representative.

D. Each test report shall contain the following general information:

1. Date of Preparation
2. Date of Test
3. Project Name
4. Contractor’s Name
5. Make, Model and Serial Number of test equipment used
6. Date of Last Calibration
7. Names of Test Crew

E. In addition to the results of the specific tests specified, reports shall also include:

1. Building (backbone cabling to/from)
2. Room (Telecommunication room)
3. Room (Jack location)
4. Cable Number
5. Cable Type
6. Pair or Conductor Count
7. Individual Pair or Conductor Numbers
8. Results of Each Test for Each Pair or Conductor
9. Total Number of Serviceable Pairs or Conductors in Cable
10. Ground Resistance Measurements
11. Loop Resistance
12. Total Length
13. NVP (Nominal Value of Propagation)

F. Once the testing has been completed and the campus telecommunications representative is satisfied that all work is in accordance with the Contract Documents, the representative will notify the Contractor and/or campus project manager in writing or via email.

3.04 RECORD (ASBUILT) DRAWINGS

A. Refer to Section 27 00 00 for general details.

END OF SECTION
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