SECTION 27 08 20

COPPER TESTING

PART 1 - GENERAL

1.1 SUMMARY

A. Test measurements shall be taken for all balanced-twisted pair cabling, including horizontal and backbone copper cables and wall-to-rack cables. Test all category cables in accordance with current TIA measurement specifications for that category of cabling with a field-test instrument meeting or exceeding Level IV accuracy. Provide test measurement results (in electronic format) a minimum of three weeks prior to substantial completion.

1.2 RELATED DOCUMENTS

A. The latest versions of the following codes, standards, and guidelines shall be followed. Bring to ITS' immediate attention where construction documents or conditions differ from requirements in codes, standards, guidelines and specifications.

B. The following standards:

1. ANSI/TIA-568-C.2 –Balanced Twisted-Pair Telecommunications Cabling and Components Standard

2. ANSI/TIA-1152 – Requirements for Field Test Instruments and Measurements for Balanced Twisted-Pair Cabling

C. The following guidelines:

1. BICSI, Telecommunications Distribution Methods Manual (TDMM)

2. BICSI, Information Transport Systems Installation Methods Manual (ITSIMM)

1.3 QUALITY ASSURANCE

A. All testing procedures and field-test instruments shall comply with applicable requirements of:

1. ANSI/TIA-568-C.2

2. ANSI/TIA-1152

B. Test measurements shall be performed by trained technicians who have successfully attended manufacturer training or BICSI Installer 2 copper training.

C. The Owner or the ITS Representative shall be invited to witness, review or both witness and review field-testing.

1. Notify ITS Representative and Design Engineer of the testing start date, five (5) business days before testing commences.

2. After final test measurements have been completed and submitted, the ITS Representative or Design Engineer will select a random sample of up to 10% of the installed links that the telecommunications contractor is to retest at no cost to the Owner. If more than 2% of the sample results differ in terms of the pass/fail determination, the contractor, under supervision of the ITS Representative, shall repeat 100% of the testing at no cost to the Owner.

1.4 SUBMITTALS

A. The following submittals are due at the Pre-Construction Phase, in accordance with submittal requirements in Section 27 00 00 Communications:

1. Names of individuals that will be performing the testing and their training certificates (from BICSI or manufacturer).
2. Manufacturer's cutsheet or specifications sheet for the field-test instrument to be used, along with calibration data sheet.
3. Sample Test Report, which shall show that the field-test instrument software and firmware is up-to-date (the most recent version). This sample test report shall also show all required test parameters as required by the referenced standards.

B. The following submittals are due a minimum of three weeks prior to substantial completion, in accordance with the submittal requirements in Section 27 00 00 Communications:

1. Complete test measurement results indicating that all cable permanent links have passed. Submit (2) electronic versions on (2) CD/DVD-R or USB Flash Drive (one for the ITS Representative and one for the Design Engineer):
    a) Microsoft Excel 2007 (Manifest)
    b) Test measurement results in their native format and the manufacturer's PC software to read test results.

C. The following submittals are due Post-Construction, in accordance with the submittal requirements in Section 27 00 00 Communications:

1. On final electronic file submittal (CD/DVD-R or USB Flash Drive), which is to include record drawings, O&M manuals, etc., also include files for all valid test results (as submitted previously).

PART 2 - PRODUCTS

2.1 FIELD-TEST INSTRUMENT

A. The field-test instrument shall:

1. Be within the calibration period recommended by the manufacturer.
2. Contain the most recent software and firmware provided by the manufacturer prior to testing.
3. Be a Level IV accuracy (Or greater)

B. Administration

1. The test measurement result information for each link shall be recorded in the memory of the field-test instrument upon completion of the test.
2. The test result records saved within the field-test instrument shall be transferred into a Windows™-based database utility that allows for the maintenance, inspection and archiving of these test records.

C. Manufacturer shall be:

1. Agilent
2. Fluke
3. Or Approved Equivalent

PART 3 - EXECUTION

3.1 GENERAL

A. All outlets, cables, patch panels and associated components shall be fully assembled and labeled prior to field-testing. Any test measurements performed on incomplete systems shall be redone on completion of the work.

B. The records for each cable test measurement shall be provided to the owner a minimum of three weeks prior to substantial completion in Excel format (manifest) and the native format to the field-test instrument. The Owner can supply an Excel spreadsheet template (manifest) upon request for the contractor's use.

C. The installed twisted-pair links shall be tested from the telecommunications room to the telecommunication wall outlet in the work area for compliance with the "Permanent Link" performance specification.

D. One hundred percent of the installed cabling links shall pass the requirements of the referenced standards. Any failing link shall be diagnosed and corrected. The corrective action shall be noted and followed with a new test measurement to prove that the corrected link meets the performance requirements. The final and passing result of the tests for all links shall be provided in the test measurements results documentation.

E. Trained technicians who have successfully attended an appropriate training program and have obtained a certificate as proof thereof shall execute the tests. The test equipment (tester) shall comply with the accuracy requirements for Level IV field-test instruments as defined in ANSI/TIA-1152. The field test instrument, including the appropriate interface adapter, shall meet Level IV accuracy requirements. The accuracy requirements for the permanent link test configuration (baseline accuracy plus adapter contribution) are specified in Table 2 of ANSI/TIA-1152 (Table 2 in this TIA document also specifies the accuracy requirements for the Channel configuration).

F. The Pass or Fail condition for the link-under-test is determined by the results of the required individual tests. Any Fail or Fail* result yields a Fail for the link-under-test. In order to achieve an overall Pass condition, the results for each individual test parameter must Pass or Pass*. The "*" shall not be turned off on the test instrument.

G. A Pass or Fail result for each parameter is determined by comparing the measured values with the specified test limits for that parameter. The test result of a parameter shall be marked with an asterisk (*) when the result is closer to the test limit than the accuracy of the field tester. The field-test instrument manufacturer must provide documentation as an aid to interpret results marked with asterisks. To which extent '*' results shall determine approval or disapproval of the element under test shall be defined in the relevant detail specification, or agreed on as a part of a contractual specification.

3.2 PERFORMANCE TEST PARAMETERS

A. Test parameters for category 3 Cables:

1. Wire map
2. Length
3. Insertion loss
4. Pair-to-pair near-end crosstalk (NEXT) loss
5. Propagation delay

6. Delay skew

B. Test parameters for category 5e cables (up to 100MHz) and category 6 cables:

1. Wire Map
2. Length
3. Insertion Loss
4. NEXT loss
5. PSNEXT
6. ACRF
7. PSACRF
8. Return Loss
9. Propagation Delay
10. Delay Skew

C. Test parameters for other cables:

1. Continuity to the remote end;
2. Shorts between any two or more conductors;
3. Crossed pairs;
4. Reversed pairs;
5. Split pairs; and,
6. Any other mis-wiring.

3.3 ADMINISTRATION

A. Test results documentation

1. Test results saved within the field-test instrument shall be transferred into a Windows™-based database utility that allows for the maintenance, inspection and archiving of the test records. These test records shall be uploaded to the PC unaltered, i.e., “as saved in the field-test instrument”.
2. The test results documentation shall be available for inspection by the Owner or the Owner’s representative during the installation period. The contractor shall retain a copy to aid preparation of as-built information.
3. The records for each test shall be provided to the owner a minimum of three weeks prior to substantial completion in Excel format and the native format to the test instrument. The Owner can supply an Excel spreadsheet template upon request for the contractors use.
4. Circuit IDs reported by the field-test instrument shall match the label ID specified by the Owner.
5. The detailed test results documentation data is to be provided in an electronic database for each tested link and shall contain the following information
    a) The identification of the customer site as specified by the end-user
    b) The name of the standard selected to execute the stored test results
    c) The name of the test personnel

d) The date and time the test results were saved in the memory of the tester

e) The manufacturer, model and serial number of the field-test instrument

f) The version of the test software and the version of the test standards database held within the test instrument

g) The copper identification number

h) The length for each copper cable

i) The overall Pass/Fail evaluation of the channel test.

END OF SECTION