SECTION 27 08 11
COMMUNICATIONS TWISTED PAIR TESTING
Construction Specification

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Testing of Communications Twisted Pair Cabling (both Backbone and Horizontal Cabling subsystems).

B. Related Sections

1. Comply with the Related Sections paragraph of Section 270000.

2. Section 271313 - Communication Backbone ISP Twisted Pair Cabling

3. Section 271314 - Communication Backbone OSP Twisted Pair Cabling

4. Section 271513 - Communication Horizontal Twisted Pair Cabling

1.2 REFERENCES

A. Comply with the References requirements of Section 270000.

1. In addition to the References of Section 270000, the following references apply to this specification:

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

1.3 DEFINITIONS

A. Refer to Definitions of Section 270000, Section 271313, Section 271314, and Section 271513.

B. In addition to those Definitions of Section 270000, the following list of terms as used in this specification defined as follows:

1. “CAT6A”: Shall mean Category 6A cabling, per ANSI/TIA-568-C.2

2. “Channel”: Shall mean a testing configuration which includes the Permanent Link and the line cord (at the workstation), the equipment cord, and, if a full crossconnection is implemented, a patch cord and the crossconnect termination/connecting apparatus.

3. “Connect”: Shall mean install all required patch cords, equipment cords, cross-connect wire, etc. to complete an electrical or optical circuit.

4. “Cord”: Shall mean a length of cordage having connectors at each end. The term “Cord” is synonymous with the term “Jumper” and “Lead”.

5. “Permanent Link”: Shall mean the ‘permanent’ portion of the Horizontal cabling to each outlet with the test cords de-embedded from the measurements; this

includes cable, consolidation point (if used), termination/connecting apparatus in the IDF and the connector at the outlet.

6. “System Cord”: Shall mean the cord used in the operating transmission circuit.

7. “Test Cord”: Shall mean the cord certified for use in testing, as described in this section.

1.4 SYSTEM DESCRIPTION

A. Refer to Section 270000, Section 271313, Section 271314, and Section 271513 for addition system description information.

B. Work Provided Under Other Sections

1. Backbone twisted pair cabling

2. Horizontal twisted pair cabling

C. Base Bid Work

1. Testing of a completed communication infrastructure cabling system, which includes:

a. Submittals

b. Testing of the twisted pair cabling as follows:

Table 270811-1.1: Tests For UTP Cabling

Subsystem	Type	Test	Configuration	Notes
Backbone	OSP	*see “Notes”	-	Wire map & length
Backbone	ISP/Riser	*see “Notes”	-	Wire map & length
Horizontal	CAT6A	Category 6A	Permanent Link	Per TIA-568-C.2, 6.3

c. Record Documents, including test results.

1.5 SUBMITTALS

A. Comply with the Submittal requirements of Section 270000.

B. Submittal Requirements at Start Of Construction:

1. Testing Procedures Submittal, describing step-by-step procedures used by the field technicians.

2. Product Submittal, including cut sheets of testing equipment to be used (note all software/ firmware versions as applicable).

3. Schedule Submittal, consisting of proposed schedule of work. This schedule may be combined with the schedule developed for Division 27.

C. Submittal Requirements at Closeout:

1. Record Documents:

a. Submit one soft copy of test reports, including all tested parameters. This may be combined with the reports of Section 270821.

b. Soft copy shall include native format of the test equipment (ie *.FLW from Fluke equipment)

c. Clearly indicate the results with the following information:

1. Client Name

2. Project Name and Address

3. Date of Submittal – date format: <month> <day>, <year> (e.g., “January 1, 2023”)

4. Contractor Name

1.6 QUALITY ASSURANCE

A. Comply with the Quality Assurance requirements of Section 270000.

B. Under no circumstances shall any cable’s and/or conductor’s test results be substituted for another’s. If an instance of falsification is confirmed, the Contractor is liable for a complete retest of the cabling system at no additional cost to the Owner. This includes the retaining the services of a neutral party to observe all retesting.

1.7 WARRANTY

A. Warrant the validity of the test results.

PART 2 PRODUCTS

2.1 BACKBONE TWISTED PAIR CABLING TESTER

A. Areas of Test Measurement (minimum): Wire Map (continuity, opens, shorts, crossed pairs, split pairs):

B. Equipment:

1. Siemon #MT-5000 test unit, with 25-pair adapter

2. Or equal.

2.2 CATEGORY 6A HORIZONTAL CABLE TESTER

A. Equipment shall be independently verified to meet ANSI/TIA-1152 requirements, including Level III minimum accuracy. Equipment shall meet ISO/IEC Class C, D, and E.

B. Test Standards (minimum): ANSI/TIA-568-C.2 Category 6A; ISO/IEC 11801 Class C and D; ISO/IEC 11801-2000 Class C and D, 1000Base-T, 100Base-TX; IEEE 802.3 10Base-T; ANSI TP-PMD; IEEE 802.5

C. Areas of Test Measurement (minimum): test areas listed under ANSI/TIA568-C.2, 6.3

D. Equipment:

1. Fluke Networks

a. #DSX2-8000 (main unit, remote unit, CAT6A permanent link adapters, CAT6A channel adapters, accessories), loaded with the latest firmware version

b. “LinkWare” reporting and latest version of documentation software

2. Or equal

PART 3 EXECUTION

3.1 SCHEDULING

A. Prepare a construction schedule based on the schedule developed in sections 271513 and 271523 for the testing activities. Update testing schedule when changes in the cabling schedules occur.

3.2 FIELD QUALITY CONTROL

A. Calibrate test sets and associated equipment per the manufacturers printed instructions at the beginning of each day’s testing and after each battery charge. Fully charge the test sets prior to each day's testing to ensure proper operation.

B. Ensure test equipment and test cords are clean and undamaged during testing activities. Per the Engineer’s discretion, halt testing activity and clean testing equipment, test cords, and related apparatus.

3.3 BACKBONE TWISTED PAIR CABLING TESTING REQUIREMENTS AND PROCEDURES

A. Precautions

1. Adhere to the equipment manufacturer’s instructions during all testing.

2. Prior to any testing activity or any measurements taken, ensure the test equipment is at room temperature – approximately 70 degrees F (e.g., if necessary, bring the test equipment in from outdoors and let it set for about 15 minutes or for however long it takes to bring the test equipment to reach room temp).

3. Fully charge power sources before each day’s testing activity

B. Testing Requirements

1. Test backbone multipair cabling per “Base Bid Requirements” in Part 1 of this Section.

2. The installation will be accepted when testing has indicated availability of 100% terminated pairs.

C. Testing Procedures

1. Test continuity and wire map for all pairs.

2. Test length for 2% of pairs of each cable. Pairs shall be from different 25-pair binder groups.

D. Acceptable Test Result Measurements

1. Overall:

a. Links which report a Fail, Fail* or Pass* for any of the individual tests shall result in an overall link Fail. All individual test results must result in a Pass to achieve an overall Pass.

b. Any reconfiguration of a link components required as a result of a test Fail, must be re-tested for conformance.

c. Remove and replace any cabling links failing to meet the criteria described in this specification, at no cost to the Owner, with cables that prove, in testing, to meet the minimum requirements.

2. Length

3. Wire Map: Provide continuous cable link and terminate all pairs correctly at both ends. No exceptions accepted.

E. Record Documents:

1. Permanently record test results.

2. Cable and pair identifiers of the test reports shall match the identifiers as labeled in the field – i.e., use the same ID on the cable label/termination label as what appears on the test reports.

3. Measurements shall carry a precision through no significant decimal place.

4. Each test report shall contain the following information (not necessarily in this order):

a. Project name

b. Cable identifier, pair number(s)

c. Date measurement were obtained

d. Operator (company and name)

e. Test equipment model and serial number(s)

f. Measurement results

3.4 HORIZONTAL CATEGORY 6A TESTING PROCEDURES

A. Precautions

1. Adhere to the equipment manufacturer’s instructions during all testing.

2. Prior to any testing activity or any measurements taken, ensure the test equipment is at room temperature – approximately 70 degrees F (e.g., if necessary, bring the test equipment in from outdoors and let it set for about 15 minutes or for however long it takes to bring the test equipment to reach room temp).

3. Fully charge power sources before each day's testing activity

B. Test Equipment Set Up

1. Set up the tester to perform a full CAT6A test, as a Permanent Link configuration.

2. If the tester has the capability, set the cable type as product-specific setting. If not, set as generic CAT6A.

3. Set the tester to save the full test results (all test points, graphs, etc.).

4. Save the test results with the associated cable link identifier.

5. Calibrate the test set per the manufacturer's instructions.

C. Acceptable Test Result Measurements

1. Overall Test Results:

a. The Owner shall accept only individual test results that result in a Pass.

b. Links which report a Fail, Fail* or Pass* for any of the individual tests shall result in an overall link Fail.

c. Any reconfiguration of link components required as a result of a test Fail, must be re-tested for conformance.

d. Remove and replace any cabling links failing to meet the criteria described in this specification, at no cost to the Owner, with cables that prove, in testing, to meet the minimum requirements.

2. Wire Map: Correctly terminate all pairs of the cabling link at both ends. Provide only continuous pairs. No exceptions.

3. Length: Ninety-four meters is the maximum acceptable electrical length measurements for any cabling link measured under a Permanent Link configuration, including test cords.

4. Insertion Loss: The acceptable insertion loss measurements for any CAT6A cabling link is that which is no greater than that listed in ANSI/EIA-568-C.2, 6.3.

5. Worst Pair-to-Pair Near End CrossTalk (NEXT) Loss: The acceptable worst pair-to-pair NEXT loss for any Category 6A cable is that which is no greater than that listed in ANSI/EIA-568-C.2, 6.3.

6. Power Sum NEXT Loss: The acceptable power sum PS-NEXT loss for any CAT6A cable is that which is no greater than that as listed in ANSI/EIA-568-C.2, 6.3.

7. Worst Pair-to-Pair ELFEXT and FEXT Loss: The acceptable worst pair-to-pair ELFEXT and loss for any CAT6A cable is that which is no greater than that listed in ANSI/EIA-568-C.2, 6.3.

8. Power Sum ELFEXT and FEXT Loss: The acceptable PS-ELFEXT and loss for any CAT6A cable is that which is no greater than that listed in ANSI/EIA-568-C.2, 6.3.

9. Return Loss: The acceptable return loss measurements for any CAT6A cable is that which is no greater than that listed in ANSI/EIA-568-C.2, 6.3.

10. Propagation Delay and Delay Skew: The acceptable propagation delay and delay skew measurements for any CAT6A cable is that which is no greater than that listed in ANSI/EIA-568-C.2, 6.3.

D. Record Documents:

1. Permanently record test results.

2. Export all of the numerical test results to a single spreadsheet in Microsoft Excel® 2003 (*.xls) or 2007 (*.xlsx) file format.

3. Submit test results at the conclusion of the testing to the Engineer for approval. Engineer will check these test reports for a format acceptable to the Owner, or Owner's Representative.

4. For each Horizontal CAT6A test, record the following information:

a. Project name and address

b. Testing Company's and Operator's name

c. Date of measurement

d. Test equipment, including the following:

1. Manufacturer, model, and serial number

2. Date and time of last calibration

e. Identification number of cable

f. Overall test result

END OF SECTION