

**Western Michigan University – Office of Information Technology & Campus
Planning, Design & Construction**

Design Guidelines for Facilities Construction:

**DESIGN GUIDELINE DG17-11 COMMUNICATIONS SYSTEM TESTING,
STARTUP & COMMISSIONING**

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I. GENERAL

Testing of the communications system is very important in ensuring the overall quality of the system and assuring long-term value and supportability of the system.

II. GENERAL GUIDELINES

A. Testing

Communications systems will be tested in accordance with current standards and practices using high quality test equipment.

- Final testing must be performed on the complete finished system with all equipment installed in the final intended location.
- Test data from tests will be organized and copies supplied to owner. Except where specified elsewhere, four copies in electronic (CD) format is acceptable.
- CD data files may be in Word, Excel, AutoCAD, or Agilent Wirescope format as appropriate.
- The following systems should be tested:
- All pairs and connectors of the UTP copper cable system.

- Horizontal cables must be certified as exceeding EIA/TIA Category 6 performance specifications.
- Riser cables must be certified as meeting EIA/TIA Category 5 performance specifications.
 - All individual fibers and connectors of the fiber cable system.
 - Fibers must be verified for appropriate through-loss levels and lack of defects.
 - Wireless connectivity will be verified for all areas.
 - EDUcable CATV video signal output will be verified at all user outlets.
- WMU has been firm in requiring the use of horizontal copper system components that exceed TIA Category 6 specifications. One problem we have continually dealt with is the lack of widely available criteria to certify that the completed circuits exceed Category 6 performance specifications. If such a criteria becomes available, we would like it applied. Panduit could be a likely source of such criteria, since they have the most to gain as the primary warrantor for our system. Currently, the testing language below encourages installations that exceed Category 6 and invokes the Panduit warranty. Any improvements on this language are encouraged.

B. Documentation

The primary required documentation required includes test data and as-built system drawings. Both should be submitted in a combination of printed and electronic forms.

- Test data should have summaries and full simple tests submitted in printed form. Large quantities of data, such as the test results for the horizontal cables, may be submitted mainly in electronic form. Drawings should be submitted in both printed and electronic formats. Detailed requirements for different systems are given below.

C. Cutover and Training

1. General

Cutover work consists primarily of completing user connections to electronics in the TCs to the extent specified. See Section 17210 for additional cutover specifications.

Formal training is not a significant requirement for the cabling system since owner has significant experience in such systems. Informal training in the form of continuous interaction with owner during installation is required.

- Contractor will be responsible for training of owner on the complete system to the extent of ongoing discussions during installation to assure owner is clear and has questions addressed on all points of the system as built.
- Contractor may be responsible for a limited number to special circuit connections in the copper riser system as directed in drawings or special lists.

2. *Specific Requirements*

a. Products

- Cross-connects punched between building entry system and cross-connect system to rack RJ panels will be completed using 4-pair category 5e grade cross-connect UTP wire.
- All Category 6 horizontal system connections will be completed using Panduit brand Category 6 Plus jumpers.
- Fiber optic connections will be completed using duplex jumpers with fibers and connectors matching fibers being connected.

b. Execution

- Punched connections will be installed using a tool specifically designed for the type of connection being completed.
- UTP RJ connections will be completed with the plug securely seated in the mating jack.
- Fiber optic connections will be completed using techniques that assure all fiber connectors are clean to fiber optic standards and that fiber optic connectors are properly seated and retained.

III. **DESIGN REQUIREMENTS**

A. **Testing**

1. *Backbone system*

a. General

All parts of the backbone system should be tested for mapping, continuity, and quality and test results provided to the owner on completion.

b. Copper

Outside cables

- Test all pairs of exterior entry cable and certify for pair continuity, polarity, and resistance between Main Communications frame or other point of origin designated by owner (OIT) and protector termination block in BEF.

- Any problems found with contractor installation will be corrected. If pair problems are found within existing plant, data demonstrating this will be provided to owner.

Entry cross-connect system

- Test and certify all pairs against Category 5e-level criteria. Allowances may need to be made for short cable effects.

Riser Cables

- Test and certify all pairs against Category 5e-level criteria.

c. Fiber

- Fibers should be tested at 1310 (+/-) nm.
- Fiber Testing
 - Exterior backbone cable fibers will be certified with an OTDR at 1300nm (for 1000Base-LX). Printed loss charts for all fibers will be provided to owner.
- Riser cables should be tested to assure continuity and through loss using either a loss meter set or a good quality OTDR from both ends. Test criteria should be compatible with the requirement for the system to be warranted under the Corning EWP program. Loss data should be provided to the owner on paper, electronically in spreadsheet format, or in Agilent cable database format.

2. *Horizontal System*

a. UTP circuits

Testing

- Test and certify all horizontal WAO connections as exceeding Category 6 specifications. Since all components of the system meet specifications exceeding Category 6, all or most circuits should exhibit a quality margin over basic Category 6 specifications. Testing should be performed in a way that qualifies the data under the required Panduit Warranty Program.
- Tests should be done with Agilent WireScope 350 or newer direct equivalent for consistency with existing WMU horizontal data. Full test data should be supplied to owner in Agilent format on CD.
- For channel tests, sample test jumpers will be used and need not be left with tested jacks.
 - Jumpers will be Panduit TX-6 Plus type.
 - Jumper at CDR end will be 3 ft.
 - Jumper at user end will be 14 ft.

Products

UTP Tester: Agilent Wirescope 350 system.

For Category 6-level certification, both units will be equipped with Panduit Giga-Channel TX6 Link Test Probe or Universal Link SmartProbe

3. *Wireless System*

The finished wireless system should be tested by a walkthrough with a laptop or wireless survey device and have coverage drawings verified/adjusted to produce final as-built documents. WMU OIT will assist in activating and configuring access points to design specifications based on the installer survey.

Fiber outlets

Any horizontal fiber outlets should be tested and certified similarly to riser fibers.

CATV outlets

All individual user RF outlets will be tested and certified to have a signal level of at least +5.0 dbmv for channel 4 and channel 50 as a minimum.

B. Test Result Documentation

The following should be submitted or placed as specified at completion of the project.

Test Data

Backbone test data

Test data for riser system should have one printed copy of appropriate data or summaries placed in a binder in the BEF and one copy provided to WMU OIT. All data from tests should be provided in electronic form.

Horizontal UTP circuits

Full test data in Agilent format for all horizontal copper connections should be provided to owner on CD. Files should work with current version of Agilent ScopeDataPro (or successor) software on a desktop-level Windows-based computer. One copy of printed summary list of test results sorted by jack should be placed in binder (above) in each CDR. Second printed copy of these lists should be provided to WMU OIT.

END OF SECTION