RCIT Cable Certification Testing Revised 10/2017

General Testing Criteria
(Applies to all cable certification testing)

1. RCIT reserves the right to be present during any or all cable testing procedures. The Contractor shall obtain authorization from the RCIT Project Engineer prior to commencing testing. RCIT reserves the right to require retesting of any cables tested prior to the Contractor authorization for test commencement at no additional cost to RCIT.
2. All cabling not tested strictly in accordance with these procedures shall be retested at no additional cost to RCIT.
3. 100 percent of the installed cable shall be tested.
4. All Category 6 UTP Cable, Multimode, and Single Mode Fiber Optic Cable tests shall be performed using the **Fluke DSX 5000 Versiv CableAnalyzer**, no substitute testers are allowed. The Contractor shall verify the **Fluke LinkWare** software revision installed on the test equipment is the most current available from the cable tester manufacturer (see Fluke Networks Website; http://www.flukenetworks.com) prior to commencing any final cable tests for record.
5. Fluke DSX 5000 Versiv Cable Analyzer and associated modules shall have been calibrated within the previous 12 months.
6. All cables, Horizontal, Intrabuilding Backbone Cable, and Interbuilding Backbone Cable, shall be tested <u>prior</u> to the cutover of voice and data systems to the new cable plant, unless otherwise directed by the RCIT Project Engineer. Complete test results by cable type, including a Summary Report shall be presented to RCIT Project Engineer within three working days.
7. Test results shall be provided in electronic report format using the **Fluke LinkWare Cable Test Management Software** on a USB Flash Drive. Handwritten test reports are not acceptable. Paper print-outs of complete, individual cable tests are not required unless previously requested in the RCIT Scope of Work. Electronic reports must be accompanied by a Certificate signed and stamped by an authorized RCDD representative of the Contractor warranting the truth and accuracy of the electronic report data. The certificate must reference traceable cable/fiber numbers that match the electronic record.
8. Test reports shall include the following information for each permanent Cat 6 copper cable link or permanent optical fiber link (MM and/or SM) tested:
   - 8.1. Tester manufacture, model, main unit serial number, remote unit serial number, main unit adapter type, remote unit adapter type, software version, calibration date and operator.
   - 8.2. Cable identifier and project/job name.
   - 8.3. Auto test specification used.
   - 8.4. Date and time of test.

8.5. Overall pass/fail indication.
8.6. Wire map results that indicate the permanent cable link tested has no shorts, opens, miss-wires, split, reversed or crossed pairs, and end-to-end connectivity is achieved.
8.7. One copy of the test results will be provided in electronic format on USB Flash Drive. The Summary Report provided by the **LinkWare Cable Test Management** software program, for both Copper and Fiber tests are the only portion of the test results required in paper format.
8.8. Any individual test that fails a relevant performance parameter shall be marked as a FAIL and the Contractor shall indicate the action taken to correct the problem.
8.9. Overall PASS/FAIL indication for the cable or fiber tested.

Category 6 Data Cable Certification Testing

1. All testing shall be performed in conformance with EIA/TIA 568-C.2 using the permanent link test setup. Cabling shall meet the performance specifications for Category 6 specific to TIA/EIA 568 C.2

   1.1. The following equipment is required to perform Category 6 Data Cable Testing with the Fluke DSX-5000 Versiv CableAnalyzer:
   - 1.1.1. DSX-5000 Versiv CableAnalyzer Main and Remote
   - 1.1.2. DSX-5000 CableAnalyzer Modules
   - 1.1.3. (2) Cat6/Class E Permanent Link Adapters

   1.2. The DSX-5000 Versiv Cable Analyzer profile will be configured as follows:

   - **1.2.1.** Select **Home** Tab
   - **1.2.2.** Select **Project** Tab
   - **1.2.3.** Select **CHANGE PROJECT** Tab
   - **1.2.4.** Select **NEW PROJECT** Tab
     - 1.2.4.1. Enter **Project Name (Department/Address)** Verify with RCIT Project Engineer for Assistance.
   - **1.2.5.** Select **Operator** Tab
   - **1.2.6.** Select **New Test** Tab
   - **1.2.7.** Select Module: **DSX-5000 CableAnalyzer**
   - **1.2.8.** Select Cable Type: **Berk-Tek LANmark-1000 CMP/CMR**
     - **1.2.8.1. Verify CNP NVP = 68.0%**
     - **1.2.8.2. Verify CMR NVP = 69%**
   - **1.2.9.** Select Test Limit: **TIA CAT 6 Perm. Link**
   - **1.2.10.** Select Store Plot Data: **On**
   - **1.2.11.** Select HDTDR/HDTDX: **Fail/Pass* Only**
   - **1.2.12.** Select Outlet Configuration: **T568B**
   - **1.2.13.** Select AC Wire Map: **Off**
   - **1.2.14.** Select **Save**
   - **1.2.15.** Select **New ID Set** Tab
     - **1.2.15.1. First ID: 1A-001A**
     - **1.2.15.2. Last ID: 1A-***B (Last Location #)**
     - **1.2.15.3.** Select **Done**
     - **1.2.15.4.** Select **Media: Copper**
     - **1.2.15.5.** Select Review: **Verify ID's are correct**
     - **1.2.15.6.** Select **Save**

   1.3. Set Reference
   - **1.3.1.** Select **Home** Button
   - **1.3.2.** **Select Tools** Tab
   - **1.3.3.** Select **Set Reference** Tab

1.3.3.1. Connect Main and Remote with Permanent Link and Channel Adapter. (Turn on Main and Remote 5 minutes before the setting reference.

1.3.3.2. Select **Test** Tab

1.3.3.3. Select **Done** Tab

1.3.3.4. Select **Back Arrow** to Exit Tools

Category 6A Wireless Cable Certification Testing

2. All testing shall be performed in conformance with EIA/TIA 568-C.2 using the permanent link test setup. Cabling shall meet the performance specifications for Category 6 specific to TIA/EIA 568 C.2

   2.1. The following equipment is required to perform Category 6 Data Cable Testing with the Fluke DSX-5000 Versiv CableAnalyzer:
   - 2.1.1. DSX-5000 Versiv CableAnalyzer Main and Remote
   - 2.1.2. DSX-5000 CableAnalyzer Modules
   - 2.1.3. (2) Cat6/Class E Permanent Link Adapters

   2.2. The DSX-5000 Versiv Cable Analyzer profile will be configured as follows:

   - **2.2.1.** Select **Home** Tab
   - **2.2.2.** Select **Project** Tab
   - **2.2.3.** Select **CHANGE PROJECT** Tab
   - **2.2.4.** Select **NEW PROJECT** Tab
     - 2.2.4.1. Enter **Project Name (Department/Address)** Verify with RCIT Project Engineer for Assistance.
   - **2.2.5.** Select **Operator** Tab
   - **2.2.6.** Select **New Test** Tab
   - **2.2.7.** Select Module: **DSX-5000 CableAnalyzer**
   - **2.2.8.** Select Cable Type: **Berk-Tek LANmark-10G CMP/CMR**
     - **2.2.8.1. Verify CNP NVP = 72.6%**
     - **2.2.8.2. Verify CMR NVP = 69.2%**
   - **2.2.9.** Select Test Limit: **TIA CAT 6 Perm. Link**
   - **2.2.10.** Select Store Plot Data: **On**
   - **2.2.11.** Select HDTDR/HDTDX: **Fail/Pass* Only**
   - **2.2.12.** Select Outlet Configuration: **T568B**
   - **2.2.13.** Select AC Wire Map: **Off**
   - **2.2.14.** Select **Save**
   - **2.2.15.** Select **New ID Set** Tab
     - **2.2.15.1. First ID: 1A-701A**
     - **2.2.15.2. Last ID: 1A-7**B (Last Location #)**
     - **2.2.15.3.** Select **Done**
     - **2.2.15.4.** Select **Media: Copper**
     - **2.2.15.5.** Select Review: **Verify ID's are correct**
     - **2.2.15.6.** Select **Save**

   2.3. Set Reference
   - **2.3.1.** Select **Home** Button
   - **2.3.2.** **Select Tools** Tab
   - **2.3.3.** Select **Set Reference** Tab

2.3.3.1. Connect Main and Remote with Permanent Link and Channel Adapter. (Turn on Main and Remote 5 minutes before the setting reference.

2.3.3.2. Select **Test** Tab

2.3.3.3. Select **Done** Tab

2.3.3.4. Select **Back Arrow** to Exit Tools

Copper Feed Certification Testing

1. All copper backbone cables shall be tested for shorts, opens, miswires, split, reversed or crossed pairs, and end-to-end connectivity using the Fluke DSX-5000 Versiv CableAnalyzer.

   1.1. The Tester should be connected to a commercially available test adapter T568B that allows the connection of the RJ-45 modular plug on the Fluke DSX-5000 Versiv CableAnalyzer to either a 110 termination block, or 66M1-50 termination block as appropriate. Suggested adapter components are:

   1.2. Independent Technologies 110 Block Adapter, Independent Technologies Part Number: ITC-3002B, or equal.

   1.3. Independent Technologies Universal 66 Block Adapter, Independent Technologies Part Number: ITC-3002C, or equal.

   1.4. Testing will verify that all pairs in 4 pair increments for all the pairs in the copper feed cable.

   2.4. The following equipment is required to perform Category 3 Data Cable Testing with the Fluke DSX-5000 Versiv CableAnalyzer:
      2.4.1. DSX-5000 Versiv CableAnalyzer Main and Remote
      2.4.2. DSX-5000 CableAnalyzer Modules
      2.4.3. (2) DSX-PC6A CAT 6A Patch Cord Adapter

   2.5. The DSX-5000 Versiv Cable Analyzer profile will be configured as follows:

      2.5.1. Select **Project** Tab
      2.5.2. Select **CHANGE PROJECT** Tab
      2.5.3. Select **NEW PROJECT** Tab
         2.5.3.1. Enter **Project Name (Department/Address) Verify with RCIT Project Engineer for Assistance.**
      2.5.4. Select **Operator** Tab
         2.5.4.1. Select **Name** or Select **New Operator**
      2.5.5. Select **New Test** Tab
      2.5.6. Select Module**: DSX-5000 CableAnalyzer**
      2.5.7. Select Cable Type: **Cat 3 U/UTP**
      2.5.8. Select Test Limit: **Measure All (1200 Mhz)**
      2.5.9. Select Store Plot Data: **On**
      2.5.10. Select HDTDR/HDTDX: **Fail/Pass* Only**
      2.5.11. Select Outlet Configuration: **T568B**
      2.5.12. Select AC Wire Map: **Off**
      2.5.13. Select **Save**

2.5.14. Select **New ID Set**

- **2.5.14.1.** **First ID: 1A/2A-01 Pairs 1-4**
- **2.5.14.2.** Select **Save**
- **2.5.14.3.** Select **Home**

2.5.15. Save all tests (ex. 1A/2A-01 PAIRS 1-4, 1A/2A-01 PAIRS 5-8, 1A/2A-01 PAIRS 9-12, 1A/2A-01 13-16, 1A/2A-01 PAIRS 17-20, 1A/2A-01 PAIRS 21-24, 1A/2A-01 PAIRS 22-25 for a 25 pair cable)

Fiber Certification Testing

1. The Contractor shall be responsible for testing every strand of each Intrabuilding and Interbuilding fiber optic backbone cable.
    - 1.1. RCIT typically does not specify installations that leave fibers unterminated, (dark fibers) therefore, all strands in each cable shall be terminated, mounted in a fiber distribution/patch panel, labeled and tested.
    - 1.2. The installed fiber link(s), each consisting of two (2) fibers/strands (Tx and Rx). Multimode fiber will be tested as specified by TIA/EIA-568.3-D and ANSI/TIA/EIA 526-14-C Method A. Singlemode fiber will be tested as specified by TIA/EIA-568-B.1.7.1 and ANSI/TIA/EIA 526-7 Method A.1.

      NOTE:
      Method A – Encircled Flux one jumper reference using Fluke TRC's.

    - 1.3. The following tests apply for both multimode and single mode fiber cables.
    - 1.4. The testing procedure for each fiber optic strand is as follows:
    - 1.5. Perform end-to-end, bi-directional power loss tests at 850nm and 1300nm wavelengths for multimode, and 1310nm and 1550nm for singlemode fibers.

      NOTE:
      The Fluke DSX-5000 Versiv CertiFiber Pro is capable of testing fiber links in both directions from one termination location. The CertiFiber Pro will prompt the Operator to switch cable connectors (at the panel connector adapter/bulkhead) at the Near End and Far End Testing when the Tester is ready for Far End to Near End testing to be accomplished.

    - 1.6. The following maximum allowable Loss budgets apply for cable and connectors:
        - 1.6.1. Fusion Splices: Maximum allowable Loss (attenuation) per spliced strand: 0.2dB
        - 1.6.2. Connectors: Maximum allowable Loss per mated connector pair: 0.50dB
        - 1.6.3. Fiber: Maximum allowable attenuation for each fiber strand shall not exceed the calculated maximum Loss rating based on performance as stated by manufacturer of the cable under test.
    - 1.7. If a fiber strand of a cable run exceeds the calculated maximum power loss, as measured by the Fiber Loss tests, the fiber strand shall then be tested with the Tester configured with the Fluke DSX-OTDR Module to

determine whether it is the fiber strand, fusion splice(s) or the connector, that exceeds the power loss margin.

1.8. If the connector exceeds the power loss margin, then re-terminate the connector and repeat the testing procedures above.

1.9. If the fusion splice exceeds the power loss margin, break the splice, re-splice and retest.

1.10. If a fiber strand in the cable exceeds the specified power loss budget, then the contractor shall notify the RCIT Project Engineer as soon as possible to determine the impact of cable replacement on the Project Schedule. RCIT and the Contractor will devise a plan to procure new materials and replace the faulty cable.

1.11. Record and document the length and power loss readings in relative decibels (dB) for every strand. Indicate as part of the testing documentation those runs that exceeded the power loss margins and the action taken (re-pulling the cable, re-polishing or re-terminating the connector).

2. The following equipment is required to perform Fiber Optic Cable Testing with the Fluke DSX-5000 Versiv CableAnalyzer:

2.1.1. DSX-5000 Versiv CableAnalyzer Main and Remote

2.1.2. (2) DSX-5000 CertiFiber Quad Pro OLTS Modules

2.1.3. (2) USB Fiber Inspection Video Probe

2.2. The DSX-5000 Versiv Cable Analyzer profile will be configured as follows:

2.2.1. Select **HOME** Button

2.2.2. Select **PROJECT** Tab

2.2.3. Select **CHANGE PROJECT** Tab

2.2.4. Select **NEW PROJECT** Tab

2.2.4.1. Enter **Project Name (Department/Address)** Verify with RCIT Project Engineer for Assistance**.**

2.2.5. Select **Operator** Tab

2.2.5.1. Select **Name** or Select **New Operator**

2.2.6. Select **New Test** Tab

2.2.7. Select Module: **Certifiber Pro-Quad**

2.2.8. Select Test Type: **Smart Remote**

2.2.9. Select Bi-Directional: **On**

2.2.10. Select Fiber Type:

2.2.11. Select More:

2.2.12. Select More:

2.2.13. Select Manufacturers:

2.2.14. Select Corning:

2.2.14.1. Berk-Tek Tight Buffered Armored – OM3 MM Indoor/Outdoor = **GIGAlite 10-EB-OM3**

2.2.14.2. Berk-Tek Tight Buffered Armored – OS2 SM Indoor/Outdoor = **Single-Mode – AB – OS1/2**

2.2.14.3. RC3 - Corning Pretium Edge PNP Trunk = **ClearCurve Multimode OM3**

2.2.14.4.

2.2.15. Select Test Limit:

2.2.15.1. OM3 MM Indoor/Outdoor = **TIA-568.D Multimode (STD Grade)**

2.2.15.2. OS1/2 SM Indoor/Outdoor = **TIA-568.D Singlemode OSP (STD Grade)**

2.2.15.3. RC3 Data Center Pretium PNP Trunk = **100GBASE-SR4**

2.2.16. Select Reference Method: **Verify 1 Jumper Reference**

2.2.17. Select Connector Type: **SC, LC**

2.2.18. Select No. of Connectors/Splices: **Verify # of Total Connections (Mated Pairs, RC3 Cassette = (1) Mated Pair) The # of mated pairs will change the total loss budget and change the test limits of the cable under test.**

2.2.19. Select: **Save**

2.2.20. Select **New ID** Tab

2.2.20.1. Enter First ID: **1A-A1-A/1B-A1-A:01**

2.2.20.2. Enter Last ID: **1A-A1-A/1B-A1-A:24 (Last Location #)**

2.2.20.3. Select **Done**

2.2.20.4. Media: **Fiber**

2.2.20.5. FiberInspector: **No**

2.2.20.6. Loss/Length: **Check**

2.2.20.7. Select Review: **Verify ID's are correct**

2.2.20.8. Select **Save**

2.2.21. Select **Home** Button

2.2.22. Select **Set Reference** Tab

2.2.22.1. Clean Fiber Connectors on TRC (Test Reference Cords) with fiber cleaning wand for appropriate connector type

2.2.22.2. Connect Fiber Inspector to USB Port and inspect TRC (Test Reference Cord) verify fiber connectors are clean.

2.2.22.3. Select Run Wizard

2.2.22.4. Follow directions on screen

2.2.22.5. Connect a TRC (Test Reference Cord) to each output port Red connector connects to output port (Use TRC for patch panel type ST, SC or LC. If required change output port to required connector type SC or LC.

2.2.22.6. Select Next

2.2.22.7. Select Set Reference

2.2.22.8. Select Next

2.2.22.9. Follow directions and install 2nd TRC cord to input ports with SM Reference Couplers

2.2.22.10. Select Next

2.2.22.11. Verify TRC cords pass TRC Verification (if not clean and retest)