

## **ATTACHMENT B3.21.1**

### **FIBER SPLICING, TESTING, AND ACCEPTANCE STANDARDS AND PROCEDURES**

#### **Standard expectations of all splicing**

1. Splicing documentation should be included in all invoices and should include splice case or enclosure ID along with location.
2. All fiber connectors shall be scoped and cleaned every time the connector is inserted, placed, moved, or changed. Any fault discovered due to failure to clean or scope shall be remedied at the sole expense of the Contractor
3. A reasonable effort should be made to contact an Ideatek employee to notify them of any plant faults that make the completion of their work impossible within 24 hours of identifying such faults

#### **Detailed Procedures**

##### **1. End-To-End Testing**

###### **A. After Splicing Contractor shall**

- perform bi-directional Optical Time Domain Reflectometer ("OTDR") end-to-end tests to record splice loss measurements,
- test continuity to confirm that no fibers have been "frogged" or crossed at any splice points, and
- record loss measurements using a light source and a power meter.

Contractor shall provide IdeaTek with a copy of the test deliverables for such Route.

- ###### **B.**
- All splices shall be fusion splices. When a fiber has been spliced, the objective for each splice is a loss of 0.15 dB or less in any one direction, with an averaged 0.08 dB bi-directional loss or less (sum of loss of both directions / 2). If, after two additional attempts, an averaged value of less than or equal to 0.08 dB is not achievable, then the splice will be marked as out-of-spec ("OOS") on the data sheet. Each splicing attempt shall be documented on the data sheet. At fiber termination points, the fiber bulkhead loss shall be less than 0.3 dB, and the reflection level at such termination points shall be less than -50 dB.

- ###### **C.**
- Contractor shall perform bi-directional OTDR end-to-end testing at both 1310 nm and 1550 nm, provided that 1310 nm OTDR tests are not required (i) for spans longer than 64 kilometers or (ii) where the fiber being

tested is not manufactured to support 1310 nm optical signals. The results of such tests for any given span shall not be deemed within specification unless showing loss measurements between fiber distribution panels at each end of such span in accordance with the loss specifications set forth by the cable manufacturers specifications for dB per kilometer loss as shown in the fiber specifications set forth in the applicable IRU Route Order. Contractor shall measure and verify losses for each splice point in both directions and average the loss values. Contractor shall mark any splice points as OOS that have an average loss value, based on bi-directional OTDR testing, in excess of 0.08 dB. Any such splice points shall be subject to Section 2, below.

## **2. Out-of-Spec Splices**

OOS splices shall be noted, but shall not preclude acceptance of a fiber if the OOS condition does not affect transmission capability (based on use of then-prevailing telecommunications industry standards applicable to equipment generally used with the relevant type of fiber) or create a significant possibility of an outage. In the event IdeaTek is later able to reasonably establish that the OOS splice affects service, Contractor shall take necessary action to bring the splice into compliance at Contractor's cost and expense with the applicable specifications under Section 1B above.

## **3. OTDR Equipment and Settings**

Contractor shall use OTDR equipment and settings that are, in its reasonable opinion, suitable for performing accurate measurements of the fiber installed. Contractor shall provide equipment calibration and/or certifications to IdeaTek upon request.

## **4. Acceptance Test Deliverables**

Contractor shall provide electronic copies containing the following information for the relevant fibers and cable segments:

- A. Verification of end-to-end fiber continuity with power level readings for each fiber taken with a stable light source and power meter.
- B. Verification that the loss at each splice point is either (i) in accordance with Subsection 1.B above or (ii) in accordance with the requirements of Section 2 above.
- C. The final bi-directional OTDR test data, with distances.

- D. Cable manufacturer, cable type (buffer/ribbon), fiber type, cable reel number, number of fibers, number of fibers per tube, fiber sequential per location, and distance of each section of cable between splice points.
- E. All mechanical connectors shall be fiber scoped and screen shot to prove that connector passed software test. Results will be labeled, saved and provided to the client electronically.

## **5. General Testing Procedures And Acceptance**

- A. As soon as Contractor determines that the IdeaTek Fibers for the Route meet the Acceptance Standards such that there is fiber connectivity between all fiber distribution panels (FDPs) along such Route or connectivity to IdeaTek requested spliced off-net location, it shall provide the deliverables set forth in Section 4 of this Attachment. IdeaTek shall have fifteen (15) days after receipt of test deliverables for the Route to provide Contractor written notice of any bona fide determination that the IdeaTek Fibers on such Route do not meet the Acceptance Standards. Such notice shall identify the specific data that indicate a failure to meet the Acceptance Standards.
- B. Upon receiving written notice pursuant to Subsection 5.A of this Attachment, Contractor shall either:
  - (i) expeditiously take such action as shall be reasonably necessary to cause such portion of the IdeaTek Fibers to meet the Acceptance Standards and then re-test the IdeaTek Fibers in accordance with the provisions of this Attachment; or
  - (ii) provide IdeaTek written notice that Contractor disputes IdeaTek' determination that the IdeaTek Fibers do not meet the Acceptance Standards.

After taking corrective actions and retesting the IdeaTek Fibers, Contractor shall provide IdeaTek with a copy of the new test deliverables and IdeaTek shall again have all rights provided in this Attachment with respect to such new test deliverables. The cycle described above of testing, taking corrective action and re-testing shall take place until the IdeaTek Fibers meet the Acceptance Standards.

- C. If Contractor provides notice to IdeaTek pursuant to Subsection 5.B(ii), IdeaTek shall within five (5) days of such notice, designate by written notice to Contractor, the names and addresses of three reputable and independent fiber optic testing companies. Contractor shall designate one of such companies to conduct an independent re-test of the IdeaTek

Fibers for the relevant Route. If, after such re-testing, the testing company determines that the IdeaTek Fibers

- (i) meet the Acceptance Standards, then IdeaTek shall pay the testing company's charges for performing the testing and the Acceptance Date for the relevant Route shall be ten (10) days after Contractor provided its test deliverables.
- (ii) do not meet the Acceptance Standards, then Contractor shall pay the testing company's charges for performing the testing and shall perform the corrective action and re-testing set forth in Subsection 5B(i).

D. Unless IdeaTek provides a written objection pursuant to Subsection 5.A, the Acceptance Date of the Route shall occur on the fifteenth (15<sup>th</sup>) business day after Contractor provides the test deliverables for that Route, or, if earlier, the date IdeaTek provides written acceptance of such Route. IdeaTek' acceptance (pursuant to this Subsection or Subsection 5C) shall constitute "Acceptance" of the IdeaTek Fibers for such Route.

E. Deviations to this document of procedures is only permitted if such deviations are documented in writing and approved by IdeaTek

**Pursuant to Article 2 of the MASTER CONSTRUCTION AND INSTALLATION SERVICES AGREEMENT ("Agreement") between IdeaTek Telcom, LLC, and Contractor executed on: \_\_\_\_\_ this Attachment shall be made part of the Agreement.**

**Acceptance by Contractor to abide by and be bound to these specifications and agreement to the Amendment to the Agreement:**

\_\_\_\_\_  
("Contractor")

By: \_\_\_\_\_

Print Name: \_\_\_\_\_

Its: \_\_\_\_\_

Dated: \_\_\_\_\_