**TERMS OF REFERENCE – UP OPEN UNIVERSITY FIBER OPTIC PROJECT**

1. **Overview**

These Terms of Reference (TOR) call for the supply and installation of a Fiber Optic network, with related construction/fabrication and civil works, between key buildings in UP Open University Campus, notably:

**UPOU Community Hub Bldg.** and **IRRI-RPC Bldg.** (1,500 meters 12 cores singlemode fiber optic cable)

This shall include the supply, installation and testing of high-quality fiber optic cable (FOC), related cabling hardware, outlets, cable trays, racks, interconnect hardware, or any applicable or necessary materials, supplies or hardware, as well as construction, fabrication, restoration or other works necessary to undertake and complete the installation to the satisfaction of the End-User.

**II. Breakdown of Required Materials & Labor**

1. **Fiber Optic Cable**
   1. **Length:** 1,500 meters
   2. **Features**: suitable for outdoor duct/buried installation, water-blocking, single-jacket/single metallic armor, polyethylene (PE) sheath or Low Smoke, Zero Halogen (LSZH) with fire-retardant sheath, steel wire or Fiber Reinforced Plastic (FRP) as central dielectric strength member.
   3. **Optical Characteristics:** Singlemode fiber 9μm; Attenuation: @1310nm ≦0.4dB/kilometers, @1550nm ≦0.3dB/kilometers; Cladding Diameter 125 ± 1μm; Coating Diameter:245± 5μm
   4. **Mechanical Characteristics:**
      1. Fiber Count: 12 cores
      2. Buffer Tube Count: 6 per loose buffer tube, should be stranded around dielectric central member using reverse oscillation or S-Z stranding process.
      3. Tight Buffer Fiber Diameter: Ф900μm
      4. Messenger Wire Steel Wire (if applicable): Ф1.2mm
      5. Sheath Material: LSZH / PE
      6. Maximum Allowable Pulling Force: 2700 Newtons (Installation), 890 Newtons (Operation long-term). Must meet or exceed ISO 11808, ICEA-640 or Telcordia GR-20 standards
      7. Cable Jacket: marked with manufacturer's name, month and year of manufacture, sequential meter markings, telecommunications handset as required by Section 350G of US National Electrical Safety Code (NESC), fiber count, fiber type and PROPERTY OF THE UNIVERSITY OF THE PHILIPPINES on the label.
   5. **Additional Characteristics:**
      1. All fibers shall be 100% attenuation-tested, with tests provided at cable reel.
      2. Cable manufacturer must be ISO 9001-registered
2. **Optical Distribution Frame, 12 Ports SC**
   1. **Features**: can be mounted on an EIA 19-inch 1RU Rack, uses UPC SC duplex ports; slide-out (or swivel) front panel/tray with fixed rear tray for mounting and support; grounding facility on housing; white or black powder-coated finish.
3. **Singlemode Fiber Optic Patch Cords (SC-LC)**
   1. Length: 2 meters
   2. Fiber Compatibilty: 9/125μm
   3. Fiber Type: Singlemode
   4. Fiber Cable Type: Jacketed
   5. Fiber Cable Size: 3 millimeters diameter
   6. Cable Color: Yellow
   7. Cable Type: Duplex
   8. End Configuration: UPC-SC to LC
   9. Fiber Count: 2
   10. Flammability Rating: Riser (OFNR)
   11. Insertion Loss Test: 0.15dB typical. Test results should be noted at cable packaging.
4. **Media Converters**

4.1 Industry Standards: IEEE 802.3z 1000BASE-LX/LH

4.2 Fiber Operating Mode: Half/Full-Duplex

4.3 Max Transfer Distance: 15 km (9.3 mi)

4.4 Maximum Data Transfer Rate: 1000 Mbps (1Gbps)

4.5 Wavelength: 1310nm

4.6 Local Unit Connectors: 1 - RJ-45 Female / Remote Unit Connectors: 1 - Fiber Optic SC Duplex Female

1. **Roughing-ins**
   1. Conduits (outdoor): 4-inch diameter PVC Pipes
   2. Fittings: to match conduit and material, corner sweeps should use long radius elbow.
   3. Pull Box with Cover: 500 millimeter x 300 millimeter x 150 millimeter, gauge # 14, powder-coated, gray in color (for corners)
2. **Labor**
   1. Cable Laying and Pulling
   2. SC-Type Splicing and Termination
   3. Installation, restoration and Roughing-ins of cable runways, pipes, clips, etc.
   4. Installation of Fiber Optic Housing Hardware, LIU’s and other related equipment.
   5. Testing and Documentation
3. **Codes and Standards**
   1. Work shall be installed according to the latest Philippine Electric Code (PEC), Plumbing Code, National Structural Code of the Philippines, Fire Code of the Philippines,, the National Building Code and the “Compilation of Building Telecommunication Cabling Systems for Philippine Standards by BICSP”.
   2. Minimum technical standards covering the inter-building fiber-optic cable system shall adhere to, but are not limited to the following standards:
      1. Optical Fiber Optic Cabling and Components:
         1. ANSI/TIA/EIA-568-C.0, Generic Telecommunications Cabling for Customer Premises
         2. ANSI/TIA/EIA-568-C.1, Commercial Building Telecommunications Cabling Standard
         3. ANSI/TIA/EIA-568-C.3, Optical Fiber Cabling Components
      2. Telecommunication Pathways
         1. ANSI/TIA/EIA-568-B, Commercial Building Standard for Telecommunications Pathways and Spaces
      3. Grounding and Bonding
         1. Philippine Electrical Code
         2. ANSI J/STD-607-A-2002, Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications
      4. Administration and Labeling
         1. ANSI/TIA/EIA-606A-2002, Administration Standard for Commercial Telecommunications Infrastructure
   3. Contractor must have at least a (C / B / A / AA / AAA) - Category License issued by the Philippine Contractors Accreditation Board (PCAB), classified under SP-CF (Specialty - Communication Facilities).

**III. FOC INSTALLATION, DOCUMENTATION AND TESTING**

1. **Setup and Execution:**
   1. Contractor shall perform all items of work under the terms of reference; all equipment, labor, machinery, materials, tools, supplies, transportation and incidental expenses necessary to prosecute the work to completion shall be shouldered by the Contractor.
   2. Safety Measures: contractor is required to install warning signs and barricades for the safety of the general public. All workers shall wear the necessary safety devices to ensure safety and proper identification throughout the project.
   3. Identification and campus ingress/egress: contractors are required to submit the list of the names of their workers, machinery and vehicles that will be entering campus premises to the Office of the Vice Chancellor for Community Affairs, UP Police or offices of similar nature.
   4. Contractor shall observe proper pulling and bending of fiber optic cable at all times during installation to prevent kinking, damaging or shortening the life of the cable. The minimum bend radius for both inside and outside the cable is 20 times the cable outside diameter while the maximum tensile load during installation is 2,700 Newtons.
   5. Cable Slack: A minimum of three (3) meters (or 10 feet) slack should be provided in both ends. The slack should be neatly organized and stored in an extended loop.
   6. Singlemode fiber optic backbone cable shall be spliced through the electric arc fusion splicing method, using proper protection sleeves and enclosures to protect the splices. The maximum splice loss must not exceed 0.5dB.
   7. Singlemode fiber optic backbone cables shall be terminated into 568SC connector by splicing a factory-made “pigtail” onto the fiber. The connector must exhibit a maximum insertion loss of 0.75dB
   8. Labeling: All cables and hardware shall be identified and properly labeled using machine­ printed labels. All fiber cables additionally shall be tagged with semi­-rigid plastic tabs, attached using cable ties and labeled with the name of the building on the remote­ end termination. The fiber optic housing hardware shall be labeled with the Contractor's name, contact address and number, date of installation of the system, and the duration of the system warranty.
2. **Testing Procedures:**

Testing of cable channels shall be performed prior to system cut over. Length shall be tested using an OTDR, optical length test measurement device or sequential cable measurement markings. Attenuation shall be tested at 1310 nm and 1550 nm for single mode fiber in at least one direction using the 1-jumper test procedure as specified in ANSI/TIA/EIA-526-14A and ANSI/EIA/TIA-526-7.

1. **Submittals:**

The contractor shall submit the following for approval:

* 1. Site Map and inter-building connectivity locations
  2. Technical data of system components;
  3. Cable routing and terminations
  4. Fiber conduit plan
  5. Floor plan showing placement of cable trays, LIUs and other major components.

Furthermore, the contractor shall provide three (3) sets of the following, upon project turn-over:

* 1. Operation Manual(s) (if applicable)
  2. Fiber Optic Cable Test Reports; and
  3. As-Built Plan