SECTION 271005 – COMMON CLAUSES FOR STRUCTURED CABLING SYSTEM

1.1 DESCRIPTION

A. The following specifications sections are preliminary to communicate the design intent and not to be used for construction/procurement purposes.

B. The provided design is conceptual and shall be developed by the Contractor at the next design stage.

C. This section defines the scope and extent of the Telecommunications works for the project and highlights the various applicable codes, standards and essential guidelines and design criteria that shall be followed in the preparation of the detailed design drawings and documents.

D. The objective of this Project is to provide a complete communications structured cabling infrastructure system installation including, but not limited to: fiber optic backbone, horizontal cabling with associated terminations, mounting equipment, cable pathway and management systems, testing and other items/materials, as specified in drawings, these specifications, and Contract Documents.

E. The Structured Cabling Solution shall be designed and installed to enable flexible point to point patching of the telecommunications services to allow for simple Moves, Adds & Changes, (MAC's) without frequent rewiring of locations.

F. The communications channel shall be capable of supporting the provision of power to the Data Terminal Equipment as specified in IEEE 802.3bt "Power over Ethernet" standard.

G. The Contractor shall comply with the latest NEOM IT and standards, guidelines and equipment specifications to ensure complying with the standardization being implemented by NEOM.

H. The contractor shall comply with the following NEOM standards and guidelines:

1. NEOM_SDD_Passive_Network_Technical_Specifications_Document

1.2 REFERENCE STANDARDS

A. Codes and Standards: All materials, installation and workmanship shall comply with the applicable requirements and standards addressed within the latest edition of the following references:

1. ANSI/TIA-568-D, Commercial Building Telecommunications Wiring Standard.
    a. ANSI/TIA-568-D.0, Generic Telecommunications Cabling for Customer Premises.
    b. ANSI/TIA-568-D.1, Commercial Building Telecommunications Cabling Standard.
    c. ANSI/TIA-568-D.2, Balanced Twisted-Pair Telecommunications Cabling and Components Standards.
    d. ANSI/TIA-568-D.3, Optical Fiber Cabling Components Standard.
    e. ANSI/TIA-568-D.4, Broadband Coaxial Cabling and Components Standard.
2. ANSI/TIA-569-E, Telecommunications Pathways and Spaces.
3. ANSI/TIA-598-D + Addendum 1&2, Optical Fiber Cable Color Coding.
4. ANSI/TIA-606-C, Administration Standard for Commercial Telecommunications Infrastructure.
5. ANSI/TIA-607-D, Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises
6. ANSI/TIA-758-B, Customer-Owned Outside Plant Telecommunications Infrastructure Standard.

7. EIA/TIA-492AAAD, Detail Specification for 850-nm Laser- Optimized, 50-µm Core Diameter/125-µm Cladding Diameter Class la Graded-Index Multimode Optical Fibers; Suitable for manufacturing OM4 Cabled Optical Fiber.
8. EIA/TIA-492AAAC, Detail Specification for 850-nm Laser-Optimized 50- µm Core Diameter/125- µm Cladding Diameter Class Ia Graded-Index Multimode Optical Fibers.
9. EIA/TIA-492CAAB, Detail Specification for Class IVa Dispersion-Unshifted Single-Mode Optical Fibers with Low Water Peak.
10. ANSI/TIA-1152, Requirements for Field Test Instruments and Measurements for Balanced Twisted-Pair Cabling.
11. BICSI: Comply with the most current editions of the following BICSI manuals:

    a. Telecommunications Distribution Methods Manual (TDMM) – Volumes 1 & 2.
    b. Information Technology Systems Installation Methods Manual (ITSIMM).
    c. Outside Plant Design Reference Manual.
    d. Electronic Safety and Security Design Reference Manual.
    e. ANSI/BICSI 008-2018, Wireless Local Area Network (WLAN) Systems Design and Implementation Best Practices
12. Local regulations and standards, where enforced and relevant, are to have precedence over the Standards including Communications and Information Technology Commission (CITC) and Saudi Telecom Company (STC) standards
13. Neom Standards including:
    a. NEOM_SDD_Passive_Network_Technical_Specifications_Document (Latest version)

1.3 SCOPE OF WORK

A. The specification sections shall be read conjunction with the design documentation (Specifications, reports, drawings, etc.) of the remaining packages (infrastructure package, utility building, etc.). The contractor shall ensure that all procured components are fully integrated, compatible and interoperable across all packages, and deliver a fully functional system as per the specified performance.

B. Contractor shall ensure that all selected equipment models, brands, finished, etc. are coordinated with and approved by all involved stakeholders' (e.g. NEOM, concerned authorities, etc.) standards, guidelines, and requirements.

C. This section establishes a communications infrastructure to be used as signal pathways for voice, video and high-speed data transmission. Contractor shall:
1. Provide a structured cabling system as described hereafter that includes, but is not limited to, supplying, installing, labeling and testing of: Backbone and horizontal cabling subsystems, cable connectors, communications outlets and terminations, and equipment racks/cabinets for networking hardware and patch panels.
2. Furnish all labor, materials, tools, equipment and services for the installation described herein. All requirements and specifications will be enforced.
3. Cable pathways and runs to individual outlets are not shown in their entirety, but shall be provided as if shown in their entirety.
4. Verify that conduit routing does not cause cabling to exceed specified length.
5. Follow industry standard installation procedures for communications cable to assure that the mechanical and electrical transmission characteristics of this cable plant and equipment are maintained.

D. Works of this section cover a complete installation of both permanent and channel links for a data, voice and video communications network utilizing copper and fiber transmission media. The Contractor shall:

1. Provide and install Innerduct, rated appropriately for the fiber optic backbone installation environment – whether outdoor or indoor.

2. Provide, install, terminate, test, label and document all campus backbone, building backbone and horizontal cables.
3. Provide and place all termination devices such as modular patch panels, termination blocks, telecommunication outlets (jacks and plates), phone jacks, fiber optic distribution panels, bulkheads, connectors, and fiber optic fan out kits.
4. Provide in quantities specified or deemed appropriate interconnect components such as copper patch cords, fiber optic patch cables and data station cables.
5. Verify lengths and counts of twisted pair and optical fiber patch cords with the Engineer and/or Employer prior to purchase.
6. Provide and place horizontal and vertical cable support devices such as rack and wall-mounted horizontal and vertical cable management, cable runway, telecommunications cable runway, and all required mounting hardware, unless otherwise noted.
7. Provide and install all equipment mounting racks, cabinets and/or brackets.
8. Provide and install approved firestopping systems in all communication pass-throughs, conduits and cable trays, and ceiling, wall and floor penetrations in coordination with other trades.
9. Provide all appropriate consumable items, fittings and accessories, whether or not specified, as required for a complete installation and a proper, safe and reliable operation of the system.
10. Provide grounding and bonding in telecommunications rooms.

1.4 PRODUCTS

A. Seismic Performance Requirements: Supports and seismic restraints for equipment cabinets and racks, and components shall withstand the effects of earthquake motions, as needed, based on NEOM seismic categorization and the structural engineer's seismic design considerations.

END OF SECTION 271005

SECTION 271055 - IDENTIFICATION FOR COMMUNICATIONS SYSTEMS

1.1 LABELING GENERAL REQUIREMENTS

A. All components of the telecommunications infrastructure and pathway system shall be labeled according to the applicable Standard (TIA/EIA-606) described herein and in coordination with the Employer and Engineer including but not limited to:

1. Copper and fiber optic cables and patch cords.
2. Outlets faceplates and individual outlet connectors.
3. Termination panels, blocks, trays.
4. Telecommunications Room entry and exit pathways.
5. Racks, cabinets, and equipment.
6. Fiber optic cables.
7. Grounding and bonding system for telecommunications.
8. Telecommunications cable tray and conduit pathways:

B. All labels shall be machine-manufactured by a labeling machine. Handwritten labels will not be accepted for final labeling.

C. Labels shall meet the legibility, defacement, exposure and adhesion requirements of ANSI/UL969.

D. Labels should be resistant to the environmental conditions at the point of installation (such as moisture, heat, or ultraviolet light), and should have a design life equal to or greater than that of the labeled component.

E. Labels shall be accessible and, where necessary, able to be modified.

F. The Contractor shall comply with the latest NEOM IT standards, guidelines and equipment specifications to ensure complying with the standardization being implemented by NEOM.

G. The contractor shall comply with the following NEOM standards and guidelines:
1. NEOM_SDD_Passive_Network_Technical_Specifications_Document

1.2 PRODUCTS

A. Cable Labels:
1. Cable markers (RINGS): for copper cables labeling on each endpoint (wall jack and patch panel).

B. Flat-surface labels:
1. Self-adhesive vinyl or vinyl-cloth labels, machine printed with alphanumeric designations.

C. Cable Ties:
1. Plenum-rated cable ties.

D. Stainless steel printed labels: for conduits hosting fiber cables and backbone copper cables.

END OF SECTION 271055

SECTION 271105 - COMMUNICATIONS EQUIPMENT ROOM FITTINGS

1.1 QUALITY ASSURANCE

A. Installer Qualifications: Layout, supervision, and inspection by BICSI-registered personnel.

B. The Contractor shall comply with the latest NEOM IT and security standards, guidelines and equipment specifications to ensure complying with the standardization being implemented by NEOM.

C. The contractor shall comply with the following NEOM standards and guidelines:

1. NEOM_SDD_Passive_Network_Technical_Specifications_Document

1.2 DESCRIPTION

A. The following specifications sections are preliminary to communicate the design intent and not to be used for construction/procurement purposes.

B. The provided design is conceptual and shall be developed by the Contractor at the next design stage.

1.3 MATERIALS

A. Backboards: Plywood, fire-retardant treated.

B. Wall mounted cabinets:
1. Wall mounting.
2. Three-part, swing-out design allows access and service to the front and rear of equipment
3. Materials: Steel or aluminum.
   a. Height: varies to accommodate a range of rack mounting spaces from 12 RU and up to 26 RU.
4. Equipment load bearing capacity: not less than 136 kg (300 lb) static load when the load is evenly distributed.
5. Lockable front plexiglass door.
6. Louvered side panels.
7. Vented top panels.
8. Cable access provisions top and bottom.

C. Cable management for equipment frame:
1. For each 2RU of equipment in the rack there shall be a corresponding 1 RU cable management panel which is deep enough to support 48 patch cords.

D. Power Strips:
1. In wall mounted cabinet

E. Grounding:
1. Comply with ANSI/TIA-606.

F. Identification: Computer-printed labels for Class 3 level of administration, including optional identification.

END OF SECTION 271105

SECTION 271305 - COMMUNICATIONS BACKBONE CABLING

1.1 PERFORMANCE REQUIREMENTS

A. Transmission Standards: TIA-568-D.

1.2 QUALITY ASSURANCE

A. Testing Agency Qualifications: An NRTL with a field supervisor certified by BICSI as an RCDD.

B. Quality Standards:

1. For Telecommunications Pathways and Spaces: TIA-569.
2. Grounding: TIA-607.

C. Products: NRTL listed and labeled.

D. The Contractor shall comply with the latest NEOM IT and security standards, guidelines and equipment specifications to ensure complying with the standardization being implemented by NEOM.

E. The contractor shall comply with the following NEOM standards and guidelines:

1. NEOM_SDD_Passive_Network_Technical_Specifications_Document

1.3 Description

A. The following specifications sections are preliminary to communicate the design intent and not to be used for construction/procurement purposes.

B. The provided design is conceptual and shall be developed by the Contractor at the next design stage.

C. Single-mode fiber optic (F.O.) cables are used as backbone cabling.

D. The usage of backbone cabling shall include the following:

1. Connections between the server room and the site wide network switches (pole mounted and cabinets within the utility yard and security kiosks).

2. Connections between the server room and Telecom / demarcation room.

3. Connections between the nearest manholes to the Telecom / demarcation room.

1.4 MATERIALS

A. Single mode optical Fiber Cabling:

1. Category OS2 (TIA 492CAAB).
2. Tight buffered for indoor use and loose tube for outdoor use.
3. Armored where required.
4. With Aramid yarn for strength.
5. Type: OFNR/OFNP as per application requirement.
6. Connectors: Type LC connectors.

B. Optical Fiber Patch Bays.

C. Patch Cords in lengths to suit application and routing requirements.

1.5 INSTALLATION

A. Wiring Method: In raceways.

B. Identification: TIA-606-B Class 3 level of administration including optional identification requirements of this standard.

1.6 FIELD QUALITY CONTROL

A. Testing Agency: Contractor engaged.

END OF SECTION 271305

SECTION 271505 - COMMUNICATIONS HORIZONTAL CABLING

1.1 PERFORMANCE REQUIREMENTS

A. Transmission Standards: TIA-568-D.

1.2 QUALITY ASSURANCE

A. Testing Agency Qualifications: A testing laboratory with a field supervisor certified by BICSI as an RCDD.

B. Quality Standards:

1. Telecommunications Pathways and Spaces: TIA-569.
2. Grounding: TIA-607.

C. Products: NRTL listed and labeled.

D. The Contractor shall comply with the latest NEOM IT and security standards, guidelines and equipment specifications to ensure complying with the standardization being implemented by NEOM.

E. The contractor shall comply with the following NEOM standards and guidelines:

1. NEOM_SDD_Passive_Network_Technical_Specifications_Document

1.3 Description

A. The following specifications sections are preliminary to communicate the design intent and not to be used for construction/procurement purposes.

B. The provided design is conceptual and shall be developed by the Contractor at the next design stage.

C. Cat6a shall mostly be used for horizontal cabling.

D. The cabling which extends from the patch panel to the end devices within the utility building or the site (poles) that would require data, video or voice services, within a maximum running distance of 90m.

1.4 MATERIALS

A. Balanced U/UTP (UTP) Category 6A Cable Description:
1. 100-ohm, 23 AWG copper conductor, four-pair UTP (unshielded twisted pair cable), Thermoplastic insulation and covered with a blue color, thermoplastic jacket.

B. Balanced S/FTP (S-STP) Category 6A Cable Description:
1. 100-ohm, 23 AWG copper conductor, four-pair S-STP, Screened Shielded twisted pair Cable (braided screened overall, individually foil shielded twisted pairs cable), foam skin PE insulation and covered with a blue color, thermoplastic sheath and provided with a drain wire. Used in areas subject to EMI.

C. Single mode optical Fiber Cabling:

1. Category OS2 (TIA 492CAAB).
2. Tight buffered for indoor use.
3. Armored where required.
4. With Aramid yarn for strength.
5. Type: OFNR/OFNP as per application requirement.
6. Connectors: Type LC connectors.

D. Patch Panel:
1. Modular panels housing multiple-numbered jack units for termination of installed cables.
2. Number of Jacks per Field: One for each four-pair conductor group of indicated cables, plus spares and blank positions adequate to suit specified expansion criteria.

E. Patch cords:
1. In lengths to suit application and routing requirements
2. Terminated with 8-position RJ45 modular plug at each end.
3. Patch cables shall be performance and impedance matched with respective horizontal cables and provided by the same manufacturer of the horizontal cable.
4. Exceed ANSI/TIA-568-D Category 6A transmission performance.
5. Patch cords shall have bend-relief-compliant boots.

F. Other components:

1. Connecting hardware.
2. Jacks and Jack Assemblies: Modular, color-coded, eight-position RJ45 modular receptacle units with integral IDC-type terminals.
3. Media Converters.

1.5 INSTALLATION

A. Wiring Method: In raceways.

B. Identification: TIA/EIA-606 Class 3 level of administration, including optional identification requirements of this standard.

1.6 FIELD QUALITY CONTROL

A. Testing Agency: Contractor engaged.

END OF SECTION 271505

SECTION 271800 – COMMON CLAUSES FOR IT AND SECURITY SYSTEMS

1.1 DESCRIPTION

A. This section includes common requirement for IT and security systems construction.

B. The following specifications sections are preliminary to communicate the design intent and not to be used for construction/procurement purposes.

C. The provided design is conceptual and shall be developed by the Contractor at the next design stage.

D. All the requirements presented in this Section shall be complimentary to and shall apply to the following SYSTEMS except where a particular SYSTEM Specification calls for otherwise. In this case, the individual SYSTEM Specification shall have precedence.

1. IT Systems
    1) Section 271005 - Common Clauses For Structured Cabling
    2) Section 271055 - Identification For Communications Systems
    3) Section 271105 - Communications Room Fittings
    4) Section 271305 - Communication Backbone Cabling
    5) Section 271505 - Communication Horizontal Cabling
    6) Section 271800 - Common Clauses For IT and Security Systems
    7) Section 272000 - Data Communications
    8) Section 272133- Wireless Data Network
    9) Section 273123 - IP-Based Telephony Communication System (TEL)
2. Security Systems
    1) Section 281300 - Access Control System (ACS)
    2) Section 282300 - Visual Surveillance System (VSS)
3. Fire Detection System
    1) Section 283111 – Digital Addressable Fire Alarm System

E. Outline specifications for all Sections are provided for Concept Design.

F. The Contractor shall comply with the latest NEOM IT and standards, guidelines and equipment specifications to ensure complying with the standardization being implemented by NEOM.

G. The Contractor shall comply with the following NEOM standards and guidelines:

1. NEOM_SDD_Passive_Network_Technical_Specifications_Document

2. NEOM Physical Security Standards

3. NEOM Security Systems Requirements

1.2 REFERENCE STANDARDS

A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.

B. Specific reference in specifications to codes, rules, regulations, standards, manufacturer's instructions, or requirements of regulatory agencies shall mean reference to the latest printed edition of each.

C. Codes and Standards: All materials, installation and workmanship shall comply with the applicable requirements and standards addressed within the following references:

1. Comply with the latest issue of several material and test standards, which have been developed and published by Institute of Electrical and Electronics Engineers (IEEE) for data communications industry, but not limited to:

   a. 802.1 – LAN/MAN Bridging and Management,
   b. 802.2 – Logical Link Control Group,
   c. 802.3 – Carrier Sense Multiple Access/Collision Detection Access Methods (Ethernet),
   d. 802.6 – Metropolitan Area Networking Group,
   e. 802.7 – Broadband Technical Advisory Group,
   f. 802.8 – Optic Fiber Technical Advisory Group,
   g. 802.9 – Integrated Voice and Data LAN Working Group,
   h. 802.10 – LAN Security Working Group,
   i. 802.11 – Carrier Sense Multiple Access/Collision Avoidance Access Methods (Wireless LAN's),
   j. 802.12 – Fast Ethernet.

2. IEEE 610.12, IEEE Standard Glossary of Software Engineering Terminology.

3. Comply with the latest issue of several material and test standards, which have been developed and published by Network Equipment Building System (NEBS). Level 1, Level 2, and Level 3 are applicable to this Section:

   a. SR-3580: NEBS: Criteria Levels.
   b. GR-63-Core: NEBS: Physical Protection.
   c. GR-1089-Core: NEBS: EMC and Electronic Safety.
   d. GR-3160: Data Centers.

4. Internet Engineering Task Force (IETF).

5. International Organization for Standardization (ISO).

6. Electrical equipment, devices and components shall comply with the requirements of EMC:
   a. EN 61000-6-1, Electromagnetic compatibility (EMC). Generic standards. Immunity for residential, commercial and light-industrial environments.
   b. EN 61000-6-3, Electromagnetic compatibility (EMC). Generic standards. Emission for residential, commercial and light-industrial environments.

7. Information Technology equipment, devices and components shall comply with the requirements of:

   a. EN 55022, Information technology equipment. Radio disturbance characteristics. Limits and methods of measurement.
   b. EN 55024, Information technology equipment. Immunity characteristics. Limits and methods of measurement.

8. Code of Federal Regulations

   a. 47 CFR - Telecommunication, Chapter I - Federal Communications Commission, Part 15 - "Radio Frequency Devices."

9. All electrical works shall comply with the local Electricity Regulations. Refer also to Division 26 Section "Basic Electrical Materials and Methods".

10. Functional Safety
    a. IEC 61508, Functional safety of electrical/electronic/programmable electronic safety-related systems.

11. Product Safety
    a. IEC 62368-1, Audio / video, information and communication technology equipment. Safety requirements.
    b. IEC 62368-3, Audio / video, information and communication technology equipment. Safety aspects for DC power transfer through communication cables and ports.
    c. IEC 60950-1, Information technology equipment. Safety. General Requirements.
    d. IEC 60950-22, Information technology equipment. Safety. Equipment to be installed outdoors.

12. Cyber Security: all installations shall meet:
    a. IEC 62443, Security for industrial automation and control systems.

D. System software, terminology, and modeling of Integration Systems shall be compliant with ANSI/ISA-95 (S95).

E. Local regulations and standards, where enforced and relevant, are to have precedence over the Standards.

F. All applicable Neom standards

1.3 SCOPE OF WORK

A. The specification sections shall be read conjunction with the design documentation (Specifications, reports, drawings, etc.). The contractor shall ensure that all procured components are fully integrated, compatible and interoperable across all packages, and deliver a fully functional system as per the specified performance.

B. Contractor shall ensure that all selected equipment models, brands, finished, etc. are coordinated with and approved by all involved stakeholders' (e.g. NEOM, concerned authorities, etc.) standards, guidelines, and requirements.

C. The contractor shall provide, the equipment, software, material, labor and services required to construct and install the SYSTEMS as specified herein including:
1. All design services, drawings and specifications, equipment, software, materials, labor and services which may be necessary to complete the installation, configuration, and integration of the SYSTEM.
2. Hardware as specified for the SYSTEM and any hardware that is specific to the proposed system.
3. Software applications and any other software that may be required to make the SYSTEM fully operational as specified including the provision of network management software, IP addresses, setup and configuration and any other required configuration.
4. Installation and setup of the system hardware and software as specified in the SYSTEM specifications and as required by the Manufacturer and the site-specific conditions associated with the Project.
5. Coordination with the Service Providers of interfaced systems.
6. Integration of the SYSTEM with other systems and in coordination with the Employer.
7. Delivery of the "Interface Control Documents - ICD" including functional and technical documents, in accordance with the requirements of Submittal Requirements.
8. Final connection of hardware to power, infrastructure termination and patch cords connecting system equipment to the data outlets and other network communication equipment.

9. Documentation: Licenses, Shop drawings, Specifications, As-built drawings, user's manual, operation and maintenance manuals, test reports, and other submittals as specified in this specification and the SYSTEM specifications.
10. Handover manufacturer's recommended spare parts (along with current unit prices) for all major components in the system as required by the Contract.
11. Provide list of manufacturer's recommended test equipment and tools (along with current unit prices) required for system maintenance.
12. Testing and commissioning as specified herein and in the SYSTEM Specification Sections.
13. Warranty as specified herein.
14. Training as specified herein.
15. Maintenance and support as specified herein.

D. Supply the licenses for all software, programs and modules provided for the works including those developed and modified by the contractor. The appropriate licenses supplied by the contractor shall enable the Employer to

1.4 PRODUCTS

A. Seismic Performance Requirements: Supports and seismic restraints for control consoles, equipment cabinets and racks, and components shall withstand the effects of earthquake motions, as needed, based on NEOM seismic categorization and the structural engineer's seismic design considerations.

B. All products shall be fully compatible with related headend equipment.

END OF SECTION 271800

SECTION 272000 - DATA COMMUNICATIONS

1.1 QUALITY ASSURANCE

A. Materials and equipment shall conform to the latest issue of referenced industry standards, publications, or regulations referenced in this Section, as applicable.

B. These specifications represent the prevailing technology at the time of design. However, during construction, and because the technology may be rapidly evolving, the Contractor is required to propose an upgrade of the specified systems to the latest technology available, so as to bring the specified items to the prevailing technology at the time of construction.

C. It is the Contractor's responsibility to amend, as deemed necessary, any other systems affected by the upgraded submission so as to allow for the complete and proper functionality of all submitted state-of-the-art systems, equipment and relevant products.

D. The Contractor shall comply with the latest NEOM IT and security standards, guidelines and equipment specifications to ensure complying with the standardization being implemented by NEOM.

E. The contractor shall comply with the following NEOM standards and guidelines:

1. NEOM_SDD_Passive_Network_Technical_Specifications_Document

2. NEOM Physical Security Standard

1.2 Description

A. The following specifications sections are preliminary to communicate the design intent and not to be used for construction/procurement purposes.

B. The provided design is conceptual and shall be developed by the Contractor at the next design stage.

C. The proposed data networks in the project shall comply with the Employer's network requirements.

D. Dedicated separate network shall be provided for security assets.

E. The scope of this package will be limited to the edge switches within the infrastructure package, for both the ICT and the security networks.

1.3 PRODUCTS.

A. The NMS services shall be provided for:
1. Metro Infrastructure and MPLS equipment
2. Voice services equipment
3. Video and IPTV services equipment
4. Wireless communications services equipment
5. Third-Party integrated equipment and any other network service devices hosted by the present network.
6. Active network equipment (switches, router, etc.)

B. Provide complete PON solution for the community segment of the ICT network, including ONU's, OLT, etc., as indicated in the design documentation.
   1. Optical Line Terminal-OLT
      a. Providing a unified carrying platform for multiple services over one fiber network, such as broadband, wireless, video, etc.
      b. Chassis based modular design with a minimum of 7 service slots
      c. Distributed architecture: control and forwarding services are isolated
      d. Redundant (dual) control boards
      e. Redundant (dual) power boards
      f. Dual uplink protection
      g. Minimum Switching capacity of control board: 3.6Tbps
      h. Minimum bandwidth per service slot: 100Gbps
   2. Optical Network Unit-(ONU)
      a. Delivering high speed data, voice, and television to each residential unit, related technical areas and other spaces as indicated in the design documentation
      b. Mounted at Low Voltage Junction Box (LVJB) within the unit.
      c. Downlink/user Ports: 8, 16 or 24 FE ports, supporting PoE, as per design requirements.
      d. One uplink port supporting GPON upstream transmission.
      e. Layer 2 management features including MAC address management, VLAN management, forwarding policies
      f. Layer 3 features including IPv6, VLAN Layer 3 interface, DHCP client, Address Resolution Protocol (ARP), DNS Client, Static route
      g. WiFi functionality where required:
         1) Shall be 802.11ax (Wi-Fi 6) complaint.
         2) WLAN Technology: Certified Wi-Fi IEEE 802.11 a/b/g/n/ac and IEEE 802.11ax.
   3. Operating Requirements
      a. Temperature: -40°C to +55°C
      b. Humidity: 5% to 90% RH, non-condensing

C. The collapsed core/distribution shall be chassis based modular devices.

D. Chassis based devices shall have the capability to accommodate the following:

Module Feature
Individually Configurable
Hot Swappable
Interchangeable within Series
10/40Gbps Fibre Connectivity
1Gbps Fibre Connectivity
100Mbps Fibre Connectivity
10/100/1000Mbps Copper Connectivity
WAN Connectivity
Integrated WAN Connectivity (OC3-OC48)
PSTN/Gateway Connectivity (T1/E1/T3/E3/FXS)
DWDM Connectivity
CWDM Connectivity
Metro Ethernet Connectivity
Wireless LAN Services Module
IP Security VPN Module
SSL/TLS Module

E. The Core, Distribution and Access devices shall have the capability to provide the following functionalities:

Functionality
Layer 2 Switching (MAC)
Layer 3 Switching (IP Address)
Layer 4 Switching (TCP/UDP Port)
Layer 2 CoS
Layer 3 QoS
Rapid Spanning Tree Protocol
Multiple Spanning Tree Protocol
Per VLAN Spanning Tree
Multiple VLAN Support
VLAN Trunking
IEEE 802.1Q Tunneling
L2-L4 Jumbo Frame Support
IEEE 802.3x Flow Control
IEEE 802.3bt PoE
MPLS
MPLS-VPN – Layer 2
MPLS-VPN – Layer 3
Ethernet over MPLS
Support for WAN protocols Frame Relay, ATM, PPP & HDLC
Link Aggregation
Layer 3 rapid convergence OSPF/HSRP/EIGRP
IP Multicast
Compatible with IPv6
IEEE 802.1X Security/Port Control
IP Sec
MAC Address security/lockdown (Port Security)
Denial of Service protection capabilities
RADIUS Authentication
Layers 2, 3, 4 and 7 ACLs
Network Address Translation (NAT)
Network & Device Management via SNMP/RMON I & II/MIB
SDN Support
VXLAN Support
NETCONF (YANG)

F. Outdoor Industrial Switch Requirements (As Applicable)

1. Industrial grade ruggedized outdoor switch. Suitable for Din-rail mounting or built into the equipment they serve. Refer to drawings for installation details and locations of switches.
2. The switch shall be capable of operating in an extended temperature range. It shall also have vibration, shock, surge, and noise immunity ratings complying to specifications for outdoor environments.
3. Compact form factor.
4. Managed, non-blocking wire-line speed, four 10/100 /1000 Mbps ports.
5. Supported Protocols and Standards (as a minimum): IEEE802.1s, IEEE802.1w, IEEE802.1X, IEEE802.3af, IEEE802.3at, IEEE802.1D, IEEE802.3, IEEE802.3u,

Dynamic ARP Inspection, IP Source-Guard, ACLs, IGMP snooping, MAC address port locking, broadcast storm control.

6. Supports self-healing ring topology.
7. Management Controls: SDN Controller, CLI, RMON I and II standards, SNMPv3.

G. Routers

H. Firewalls and Intrusion Detection System

1.4 INSTALLATION

A. Installation shall be performed in accordance with the applicable standards, requirements, manufacturers' guidelines and any authorities having jurisdiction.

B. During installation, consideration shall be given to operational efficiency as well as the overall aesthetic factors.

1.5 FIELD QUALITY CONTROL

A. Testing Agency: Contractor engaged.

END OF SECTION 272000

SECTION 272133 - WIRELESS DATA NETWORK

1.1 QUALITY ASSURANCE

A. Materials and equipment shall conform to the latest issue of referenced industry standards, publications, or regulations referenced in this Section, as applicable.

B. These specifications represent the prevailing technology at the time of design. However, during construction, and because the technology may be rapidly evolving, the Contractor is required to propose an upgrade of the specified systems to the latest technology available, so as to bring the specified items to the prevailing technology at the time of construction.

C. It is the Contractor's responsibility to amend, as deemed necessary, any other systems affected by the upgraded submission so as to allow for the complete and proper functionality of all submitted state-of-the-art systems, equipment and relevant products.

D. The Contractor shall comply with the latest NEOM IT and security standards, guidelines and equipment specifications to ensure complying with the standardization being implemented by NEOM.

E. The contractor shall comply with the following NEOM standards and guidelines:

1. NEOM_SDD_Passive_Network_Technical_Specifications_Document

1.2 Description

A. The following specifications sections are preliminary to communicate the design intent and not to be used for construction/procurement purposes.

B. The provided design is conceptual and shall be developed by the Contractor at the next design stage.

C. All internal and external areas shall be provided with wireless coverage.

D. The wireless access point shall be connected to the relative access switches

E. The wireless controllers shall be located in the server room.

1.3 PRODUCTS

A. Licensing.

B. Wireless Access Point (WAP):
1. The wireless access point shall be 802.11ax (Wi-Fi 6) complaint.
2. WLAN Technology: Certified Wi-Fi IEEE 802.11 a/b/g/n/ac and IEEE 802.11ax.
3. Dual-radio concurrent 2.4 & 5 GHz, internal adaptive antenna.
4. Support minimum of 8 spatial streams multiuser MIMO technology.
5. The Wi-Fi access point shall support IoT technologies.
6. It shall be fully compatible with related controllers and servers located in NIC data centers

1.4 INSTALLATION

A. Installation shall be performed in accordance with the applicable standards, requirements, manufacturers' guidelines and any authorities having jurisdiction.

B. During installation, consideration shall be given to operational efficiency as well as the overall aesthetic factors.

1.5 FIELD QUALITY CONTROL

A. Testing Agency: Contractor engaged.

END OF SECTION 272133

SECTION 272231 - COMPUTERS & RELATED PERIPHERALS

1.1 QUALITY ASSURANCE

A. Materials and equipment shall conform to the latest issue of referenced industry standards, publications, or regulations referenced in this Section, as applicable.

B. These specifications represent the prevailing technology at the time of design. However, during construction, and because the technology may be rapidly evolving, the Contractor is required to propose an upgrade of the specified systems to the latest technology available, so as to bring the specified items to the prevailing technology at the time of construction.

C. It is the Contractor's responsibility to amend, as deemed necessary, any other systems affected by the upgraded submission so as to allow for the complete and proper functionality of all submitted state-of-the-art systems, equipment and relevant products.

D. The Contractor shall comply with the latest NEOM IT and security standards, guidelines and equipment specifications to ensure complying with the standardization being implemented by NEOM.

E. The contractor shall comply with the following NEOM standards and guidelines:

1. NEOM_SDD_Passive_Network_Technical_Specifications_Document

1.2 DESCRIPTION

A. The following specifications sections are preliminary to communicate the design intent and not to be used for construction/procurement purposes.

B. The provided design is conceptual and shall be developed by the Contractor at the next design stage.

C. Section Includes:

1. Computers and related peripherals including but not limited to computer workstations, TV displays, video-walls and printers.

2. Servers and related ancillaries.

1.3 PRODUCTS

A. Workstations: For system operators/system workstations, suitable for control rooms workstations
B. LED Displays: Workstation 24-inch curved LED Display
C. Display Screen (TV): Display Sizes 43”-65” diagonal viewable image size
D. Video Wall: provide a video wall in the security control room
E. Servers
F. Storage Area Network (SAN)

1.4 INSTALLATION

A. Installation shall be performed in accordance with the applicable standards, requirements, manufacturers' guidelines and any authorities having jurisdiction.

B. During installation, consideration shall be given to operational efficiency as well as the overall aesthetic factors.

1.5 FIELD QUALITY CONTROL

A. Testing Agency: Contractor engaged.

END OF SECTION 272231

SECTION 273123 - IP-BASED TELEPHONY COMMUNICATION SYSTEM

1.1 QUALITY ASSURANCE

A. Materials and equipment shall conform to the latest issue of referenced industry standards, publications, or regulations referenced in this Section, as applicable.

B. These specifications represent the prevailing technology at the time of design. However, during construction, and because the technology may be rapidly evolving, the Contractor is required to propose an upgrade of the specified systems to the latest technology available, so as to bring the specified items to the prevailing technology at the time of construction.

C. It is the Contractor's responsibility to amend, as deemed necessary, any other systems affected by the upgraded submission so as to allow for the complete and proper functionality of all submitted state-of-the-art systems, equipment and relevant products.

D. The Contractor shall comply with the latest NEOM IT and security standards, guidelines and equipment specifications to ensure complying with the standardization being implemented by NEOM.

E. The contractor shall comply with the following NEOM standards and guidelines:

1. NEOM_SDD_Passive_Network_Technical_Specifications_Document

1.2 Description

A. The following specifications sections are preliminary to communicate the design intent and not to be used for construction/procurement purposes.

B. The provided design is conceptual and shall be developed by the Contractor at the next design stage.

C. The IP phone handsets shall be connected to the nearest ICT switch through related data outlet.

D. All the IP phones will be powered through the CAT6a structured cabling infrastructure using Power over Ethernet (PoE or PoE+).

E. All IP phones shall be fully compatible with the headend equipment.

1.3 PRODUCTS

A. Call Processing Unit and software.

B. Gateways.

C. Signaling Servers.

D. Voice Mail and Unified Messaging System

E. Applications and network management.

F. The below specifications of the various telephone types represent the minimum required specifications.
1. Type 1: Wall mounted IP telephones shall have the following additional characteristics:

a. Navigation keys and Interactive soft keys
b. 10/100/1000 Mbps built-in switch port
c. Multi-line display with intuitive features and calling information
d. Support of Extensible Markup Language (XML)

2. Type 2: Standard IP telephones shall have the following characteristics:
   a. Interactive programmable (soft) keys
   b. 10/100/1000 Mbps built-in switch port
   c. Display screen minimum 5-inch display
   d. Support of Extensible Markup Language (XML)
   e. Hands-free full duplex speakerphone operation, during which the audible dual tone multifrequency (DTMF) tones are masked
   f. Built-in handset jack with wideband support and the handset shall be hearing Aid-Compatible and meeting Federal Communications Commission (FCC) loudness requirements for the Americans with Disabilities Act (ADA).
   g. Interfaces shall include audio ports, USB ports (2Nos), ethernet connectivity, Bluetooth, WiFi, etc.
3. Type 3: Standard IP telephones shall have the following characteristics:
   a. Interactive programmable (soft) keys
   b. 10/100/1000 Mbps built-in switch port
   c. Display screen minimum 5-inch display
   d. Support of Extensible Markup Language (XML)
   e. Hands-free full duplex speakerphone operation, during which the audible dual tone multifrequency (DTMF) tones are masked
   f. Built-in handset jack with wideband support and the handset shall be hearing Aid-Compatible and meeting Federal Communications Commission (FCC) loudness requirements for the Americans with Disabilities Act (ADA).
   g. Interfaces shall include audio ports, USB ports (1Nos), ethernet connectivity, Bluetooth, etc.
4. Type 4: Standard IP telephones shall have the following characteristics:
   a. Programmable (soft) keys
   b. 10/100/1000 Mbps built-in switch port
   c. Display screen minimum 3.5-inch display
   d. Support of Extensible Markup Language (XML)
   e. Hands-free full duplex speakerphone operation, during which the audible dual tone multifrequency (DTMF) tones are masked
   f. Built-in handset jack with wideband support and the handset shall be hearing Aid-Compatible and meeting Federal Communications Commission (FCC) loudness requirements for the Americans with Disabilities Act (ADA).
5. Type 5: Wireless IP telephone shall have the following characteristics:
   a. Navigation and soft-key button operation
   b. IEEE 802.11 a/b/g/n/ac/ax compliant
   c. IEEE 802.11e defining QoS for delay sensitive application such as VoWLAN.
   d. IP 67 rated, for protection against dust, splash and water and shock resistant
   e. Enterprise-grade, voice-optimized security
   f. Built-in speakerphone for hands-free operation
   g. Desktop charger
6. Type 6: Reception IP telephone
   a. Interactive programmable (soft) keys
   b. built-in Gigabit Ethernet switch
   c. Large display: minimum 5-inch display enabling 720p HD video
   d. Support of Extensible Markup Language (XML)
   e. Audio features shall include: Automatic Gain Control, Comfort noise generation, silence suppression/Voice Activity Detection, Acoustic Echo Cancellation (AEC) and Dynamic Noise Reduction
   f. Hands-free full duplex speakerphone operation, during which the audible dual tone multifrequency (DTMF) tones are masked
   g. Built-in headset jack with wideband support and the headset shall be hearing Aid-Compatible and meeting Federal Communications Commission (FCC) loudness requirements for the Americans with Disabilities Act (ADA).

h. Interfaces shall include audio ports, USB ports, ethernet connectivity, Bluetooth, WiFi, etc.

7. Expansion Modules for additional line/feature buttons, as required. The module to add a minimum of 14 physical keys with access to 14 additional keys, using the page keys, for a total of 28 additional keys.

1.4 INSTALLATION

A. Installation shall be performed in accordance with the applicable standards, requirements, manufacturers' guidelines and any authorities having jurisdiction.

B. During installation, consideration shall be given to operational efficiency as well as the overall aesthetic factors.

1.5 FIELD QUALITY CONTROL

A. Testing Agency: Contractor engaged.

END OF SECTION 273123

SECTION 274100 - INTEGRATED AUDIOVISUAL SYSTEMS

1.1 QUALITY ASSURANCE

A. Materials and equipment shall conform to the latest issue of referenced industry standards, publications, or regulations referenced in this Section, as applicable.

B. These specifications represent the prevailing technology at the time of design. However, during construction, and because the technology may be rapidly evolving, the Contractor is required to propose an upgrade of the specified systems to the latest technology available, so as to bring the specified items to the prevailing technology at the time of construction.

C. It is the Contractor’s responsibility to amend, as deemed necessary, any other systems affected by the upgraded submission so as to allow for the complete and proper functionality of all submitted state-of-the-art systems, equipment and relevant products.

D. The Contractor shall comply with the latest NEOM IT and security standards, guidelines and equipment specifications to ensure complying with the standardization being implemented by NEOM.

E. The contractor shall comply with the following NEOM standards and guidelines:

1. NEOM_SDD_Passive_Network_Technical_Specifications_Document

1.2 DESCRIPTION

A. The following specifications sections are preliminary to communicate the design intent and not to be used for construction/procurement purposes.

B. The provided design is conceptual and shall be developed by the Contractor at the next design stage.

C. General: Provide audiovisual systems design, engineering, and installation within designated spaces of the Project as shown on Drawings. Systems shall include all devices, equipment, installation, programming and commissioning in accordance with requirements of the contract documents and drawings.

1.3 PRODUCTS

A. Background Music Distribution System (BMDS).
B. Mixer/Audio Digital Signal Processors (mixer)
C. Local Media/Music player
D. Sound system for Mosque
E. Sound System for meeting rooms
F. Microphones and Accessories
G. Displays
H. Interactive boards
I. Conferencing System
J. Control Devices
K. Equipment Rack
L. All related cabling

1.4 INSTALLATION

A. Installation shall be performed in accordance with the applicable standards, requirements, manufacturers' guidelines and any authorities having jurisdiction.

B. During installation, consideration shall be given to operational efficiency as well as the overall aesthetic factors.

1.5 FIELD QUALITY CONTROL

A. Testing Agency: Contractor engaged.

END OF SECTION 275123

SECTION 274132 – IP-BASED TELEVISION SYSTEM (IPTV)

1.1 QUALITY ASSURANCE

A. Materials and equipment shall conform to the latest issue of referenced industry standards, publications, or regulations referenced in this Section, as applicable.

B. These specifications represent the prevailing technology at the time of design. However, during construction, and because the technology may be rapidly evolving, the Contractor is required to propose an upgrade of the specified systems to the latest technology available, so as to bring the specified items to the prevailing technology at the time of construction.

C. It is the Contractor's responsibility to amend, as deemed necessary, any other systems affected by the upgraded submission so as to allow for the complete and proper functionality of all submitted state-of-the-art systems, equipment and relevant products.

D. The Contractor shall comply with the latest NEOM IT and security standards, guidelines and equipment specifications to ensure complying with the standardization being implemented by NEOM.

E. The contractor shall comply with the following NEOM standards and guidelines:

1. NEOM_SDD_Passive_Network_Technical_Specifications_Document

1.2 DESCRIPTION

A. The following specifications sections are preliminary to communicate the design intent and not to be used for construction/procurement purposes.

B. The provided design is conceptual and shall be developed by the Contractor at the next design stage.

C. Section includes an IP-Based Television System accessed from networked computers and from set-back boxes. The system shall be capable of providing the following services via an IP-based streaming media system over Ethernet:

1. Satellite television
2. Internet connectivity
3. Video on Demand (VOD)

1.3 PRODUCTS

A. The IPTV system shall consist of the following main components:

1. Integrated Receiver/Decoder (IRD)
2. 4K and HD Processor/Streamer
3. Audio/Video Monitor
4. Video-On-Demand Server/Multimedia Server

5. Encoding Station
6. Middleware server
7. System Controller PC: IPTV Supervision Workstation
8. Satellite dish antenna
9. DiSEqC Multi-switch
10. DVB-T Receiver
11. IPTV 4K/HD Set-Back Boxes
12. Cables

1.4 INSTALLATION

A. Installation shall be performed in accordance with the applicable standards, requirements, manufacturers' guidelines and any authorities having jurisdiction.

B. During installation, consideration shall be given to operational efficiency as well as the overall aesthetic factors.

1.5 FIELD QUALITY CONTROL

A. Testing Agency: Contractor engaged.

END OF SECTION 274132

SECTION 275123 - IP-BASED INTERCOM SYSTEM

1.1 QUALITY ASSURANCE

A. Materials and equipment shall conform to the latest issue of referenced industry standards, publications, or regulations referenced in this Section, as applicable.

B. These specifications represent the prevailing technology at the time of design. However, during construction, and because the technology may be rapidly evolving, the Contractor is required to propose an upgrade of the specified systems to the latest technology available, so as to bring the specified items to the prevailing technology at the time of construction.

C. It is the Contractor’s responsibility to amend, as deemed necessary, any other systems affected by the upgraded submission so as to allow for the complete and proper functionality of all submitted state-of-the-art systems, equipment and relevant products.

D. The Contractor shall comply with the latest NEOM IT and security standards, guidelines and equipment specifications to ensure complying with the standardization being implemented by NEOM.

E. The contractor shall comply with the following NEOM standards and guidelines:

1. NEOM_SDD_Passive_Network_Technical_Specifications_Document

1.2 DESCRIPTION

A. The following specifications sections are preliminary to communicate the design intent and not to be used for construction/procurement purposes.

B. The provided design is conceptual and shall be developed by the Contractor at the next design stage.

C. The IP-enabled Video Intercom System shall consist of a Security Video Communication Node/Exchange and intercom stations at the project entrances and connected to the Project Data Communications Network.

D. System design shall take into consideration Project requirements in terms of end users special needs, regulations, system planning, operation, changes and maintenance.

E. The Security Video Communication system shall utilize the Project Data Communication Network.

F. The system shall integrate with access control system, Parking Control Equipment and CCTV system.

G. System shall be suitable for critical communications over IP (CCoIP®) to ensure the delivery of instant and secure voice and data services.

1.3 PRODUCTS

A. Intercom System Headend.

B. IP-Based Intercom Station

1. Loudspeaker and microphone protected by tamper and vandal proof grid.
2. POE powered
3. Can be integrated with security systems as/if needed
4. Multiple user interfaces

1.4 INSTALLATION

A. Installation shall be performed in accordance with the applicable standards, requirements, manufacturers' guidelines and any authorities having jurisdiction.

B. During installation, consideration shall be given to operational efficiency as well as the overall aesthetic factors.

1.5 FIELD QUALITY CONTROL

A. Testing Agency: Contractor engaged.

END OF SECTION 275123

SECTION 275313 - MASTER CLOCK SYSTEM (MCS)

1.1 QUALITY ASSURANCE

A. Materials and equipment shall conform to the latest issue of referenced industry standards, publications, or regulations referenced in this Section, as applicable.

B. These specifications represent the prevailing technology at the time of design. However, during construction, and because the technology may be rapidly evolving, the Contractor is required to propose an upgrade of the specified systems to the latest technology available, so as to bring the specified items to the prevailing technology at the time of construction.

C. It is the Contractor’s responsibility to amend, as deemed necessary, any other systems affected by the upgraded submission so as to allow for the complete and proper functionality of all submitted state-of-the-art systems, equipment and relevant products.

D. The Contractor shall comply with the latest NEOM IT and security standards, guidelines and equipment specifications to ensure complying with the standardization being implemented by NEOM.

E. The contractor shall comply with the following NEOM standards and guidelines:

1. NEOM_SDD_Passive_Network_Technical_Specifications_Document

1.2 DESCRIPTION

A. The following specifications sections are preliminary to communicate the design intent and not to be used for construction/procurement purposes.

B. The provided design is conceptual and shall be developed by the Contractor at the next design stage.

1.3 PRODUCTS

A. A GNSS and an Ethernet Synchronized PTP grandmaster clock system, with NTP client and server functionality.

B. GNSS antenna.

C. Network-based IP synchronized clocks.

D. Interfaces with other systems.

E. System wire and cable.

1.4 INSTALLATION

A. Installation shall be performed in accordance with the applicable standards, requirements, manufacturers’ guidelines and any authorities having jurisdiction.

B. During installation, consideration shall be given to operational efficiency as well as the overall aesthetic factors.

1.5 FIELD QUALITY CONTROL

A. Testing Agency: Contractor engaged.

END OF SECTION 275313