

**STATE OF NEW JERSEY  
BUREAU OF ITS ENGINEERING  
DEPARTMENT OF TRANSPORTATION  
TRENTON, NEW JERSEY 08625**

**MATERIAL SPECIFICATIONS FOR ETHERNET SWITCH**

Ensure Ethernet Switches are compatible with existing architecture.

**A. Standards and Certifications**

- IEEE 802.3: 10 Base T
- IEEE 802.3u: 100 Ethernet Base TX, 100 Base FX
- IEEE 802.3ab: 1000 Base T
- IEEE 802.3z : 1000 Base LX
- IEEE 802.3x: Flow Control
- IEEE 802.1q: Virtual Local Area Network (VLAN) tagging
- IEEE 802.1d: Spanning Tree Algorithm
- IEEE 802.1w: Rapid Spanning Tree Algorithm
- IEEE 802.1x: Port Based Network Access Control
- IEEE 802.1p: Quality of Service (QOS), 8 level transmission priorities.
- IP Multicast: Filtering through Internet Group Management Protocol (IGMP) Snooping.
- Product Safety: Underwriters Laboratories (UL) Standard 1950 or 60950.
- Electromagnetic Emissions: Federal Communication Commission (FCC) Part 15, Class A.
- Environmental: National Electrical Manufacturers Association (NEMA) TS1/TS 2 – Environmental Requirements only.
- IP Routing (Type A Switch) Inter-VLAN IP routing for full Layer 3 routing between two or more VLANs. IP Unicast routing protocols including v6 – Static, RIP, RIPng, OSPF, IGRP, EIGRP, PIM, BGP, PBR, HSRP, Supports 1000 multicast groups, VRF, DHCP Snooping

**B. Functional Requirements**

- Minimum of 12K Media Access Control (MAC) addresses for Type Hub configuration (Type A Switch)
- Minimum of 8K MAC addresses for Type Field configuration (Type B Switch)\*\*\*
- Port Mirroring
- MAC Based Port Trunking
- Store-and-forward Switching Method

Non-blocking full wire speed forwarding rate:

- 10 mbps: 14,880 pps (packets per second)
- 100 mbps: 148,800 pps (packets per second)
- 1000 mbps: 1,488,000 pps (packets per second)

**C. Management**

- Direct console port access via RS-232
- Management Application available through HTML Web Browser
- Remote configuration by Telnet

- SNMP v1, v2, v3 - Bridge Management Information Base (MIB), VLAN MIB, Private MIB, RMON MIB - for alarm monitoring & diagnostic.
- IGMP v1, v2, v3 (IGMP Snooping)
- Security ACL's

D. Interface and Connectors

Designation	Typical Distance	Nominal Wavelength	Fiber Type	Connector	Optical Budget
1000Base-LX	40km	1310 nm	10/125 SM	LC/SFP	20 dB
1000Base-LX	70km	1550 nm	10/125 SM	LC/SFP	15 dB
100Base-FX	40km	1310 nm	10/125 MM	SC/SFP	34 dB
100Base-FX	60km	1310 nm	10/125 SM	SC/SFP	33 dB
10Base-T	300'	N/A	N/A	RJ-45	N/A
100Base-TX	300'	N/A	N/A	RJ-45	N/A
1000Base-T	300'	N/A	N/A	RJ-45	N/A

Number of ports and port specifications are to be as specified in the bid documents.

Provide connectors as follows:

- Copper: RJ-45 F Female 8 Position 8 Contact (8P8C)
- Fiber: SC, LC

E. Indicators

- LED Indicator showing Power Status.
- LED Indicators showing status and activity of each port.

F. Mechanical Specifications

- Maximum Dimension: 19" (W) X 10" (D) X 10" (H)
- Maximum Weight : 15 lbs
- Ensure unit is capable of being mounted in standard 19" rack without custom modifications.
- Contractor to ensure that the switch fits in the cabinet.

G. Environmental Specifications

Meet or exceed the following criteria as specified in NEMA TS2. Values listed below for reference only, as excerpted from most recent version of NEMA TS2.

- Operating Voltage: 120 VAC  $\pm$  5VAC
- Operating Frequency: 60 Hz  $\pm$  3 Hz
- Power Interruption: Comply with NEMA TS2
- Storage Temperature: -50°F to +185°F
- Operating Humidity: 10% to 95% relative humidity non-condensing
- Transients, Input/Output: Comply with NEMA TS2
- Non-destruct Transient Immunity: Comply with NEMA TS2
- Vibration: Comply with NEMA TS2
- Shock: Comply with NEMA TS2

H. Electrical Power

Equip the power supply with a minimum of a six (6) foot power cord terminating in a standard three (3) prong line plug. Maximum power requirement must not exceed 80 watts for each unit. Two (2) power supplies are required for Type A switches.

I. Software

Provide Software License(s) with each unit.

J. Identification

Identify Ethernet Switch with a metal plate containing the serial number with bar code identification. Provide phenolic nameplate with switch designation shown on Contract Documents. Provide manuals and training documentation, and electronic version of custom configurations on compact disc media.

K. Standard Configuration

Unless otherwise specified in the contract plans, use the following port configuration:

Switch Type	Switch Function	Minimum # of Required Ports			Temperature	
		10 Base-T 100 Base -TX	100 Base-FX	1000 Base-LX	Operating Range	Storage Range
Type A	HUB*	12	12	1	32 °F to 104 °F	-40 °F to 167 °F
Type B	Field**	4	4	0	-40 °F to 167 °F	-13 °F to 167 °F

T/TX ports to have user-selectable speed setting (10/100 Mbps).

\* Cisco Product Only

\*\* Cisco or Etherwan Only

\*\*\*When Type B switch has a layer 3 configuration including IP routing requirements; it shall have a minimum 2K MAC addresses

L. List of Equipment

Provide the following with each Ethernet Switch:

- Documentation
- External power supply (if required)
- All required custom connections
- Mounting brackets/shelf (if required)