(25 points) Plan and budget for the wiring of the building that includes an estimated total of the cable runs to each room and between the equipment room and the telecommunication closets, along with an estimate of the total amount of cabling needed. Your budget should include the <u>total cost of cabling, costs of RJ45 outlets and wall plates in the classrooms/offices, and patch panels</u> in the equipment room and telecommunication closets. Indicate the sources of your pricing information. Indicate on the floor plan where the equipment room and telecommunication closets will be.

Summary:
- Approximately 15,976 feet of Cat6A cable.
- Require 84 RJ45 connectors.
- Require 84 wall plates
- In the 2nd Floor Equipment Room (MDF), need 1 patch panel.
- For the 1st/3rd/Basement Floor Telecommunications Rooms (IDF), need 1 patch panel for TC-1, TC-2, and TC-3 respectively.

1st Floor: 19 rooms; 38 RJ45 outlets/wall plates; 3,213 feet (includes slack, service loops, and vertical runs for uplink cables)
2nd Floor: 18 rooms; 36 RJ45 outlets/wall plates; 3,550 feet (includes slack, service loops, and vertical runs for uplink cables)
3rd Floor: 19 rooms; 38 RJ45 outlets/wall plates; 3,917 feet (includes slack, service loops, and vertical runs for uplink cables)
Basement: 20 room; 40 RJ45 outlets/wall plates; 5,296 feet (includes slack, service loops, and vertical runs for uplink cables)

Cost Estimates for Materials:
Cat6A Cable: $129.97 per 1000-feet (16,000-feet ordered)
Grand Total: **$2,079.52**

RJ45 Cat6 Outlet / Wall Plate (2-port) (84 required; includes additional 10%)
Connectors: $9.99 each
Grand Total: **$839.16**

Patch Panel: Rapink Patch Panel 48 Port Cat6A with Inline Keystone 10G Support, Coupler Patch Panel STP Shielded
48-port patch panel: $89.99 each (4 required)
Grand Total: **$359.96**

The Total Cost Estimate for all the materials needed is: **<u>$3,278.64</u>**

* Prices as of November 18, 2023

1. Here is a step-by-step for determining cable length. Since the number of rooms/classrooms per floor was manageable, I measured each run individually to the equipment room and/or telecommunication closet.

When the total cable length needed for Floor was totaled an additional buffer was added to account for additional length for slack, service loops, and the vertical distance for uplink cables between each floor.

Cat6A Cable:
First Floor:
- 18 rooms, Estimated Cable: 3,213 feet
Second Floor:
- 18 rooms, Estimated Cable: 3,550 feet
Third Floor:
- 19 rooms, Estimated Cable: 3,917 feet
Basement:
- 20 rooms, Estimated Cable: 5,296 feet

Total Cat6A Cable Required (with buffer): 15,976 feet

RJ45 Outlets / Wall Plates:
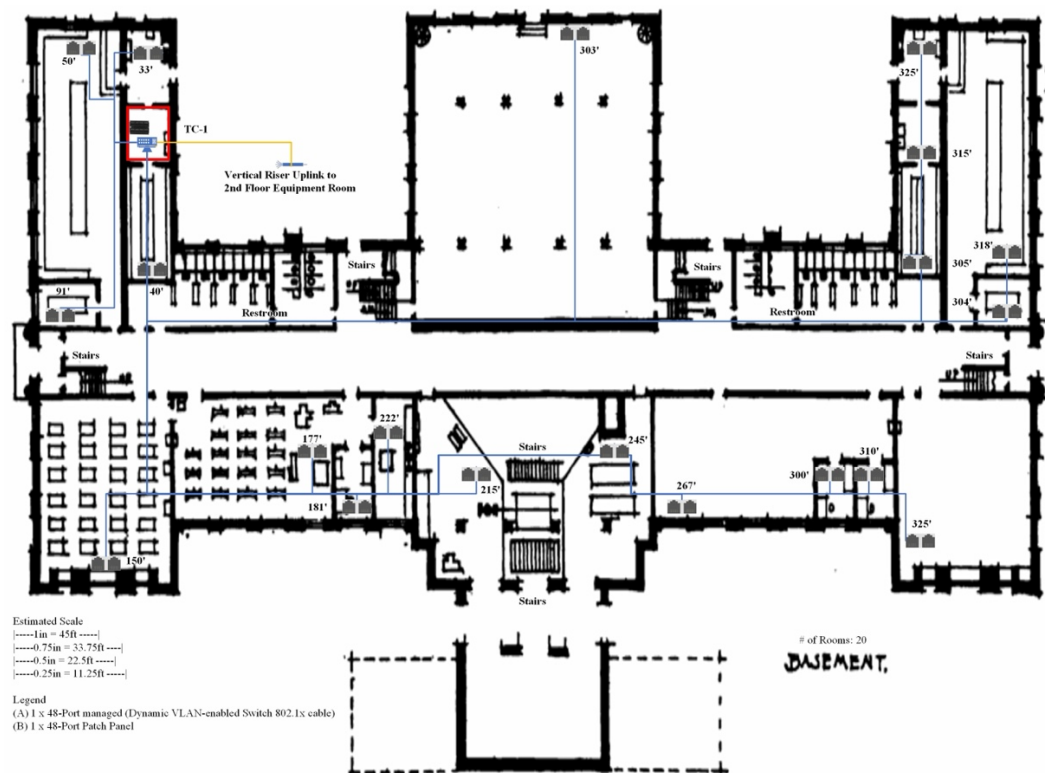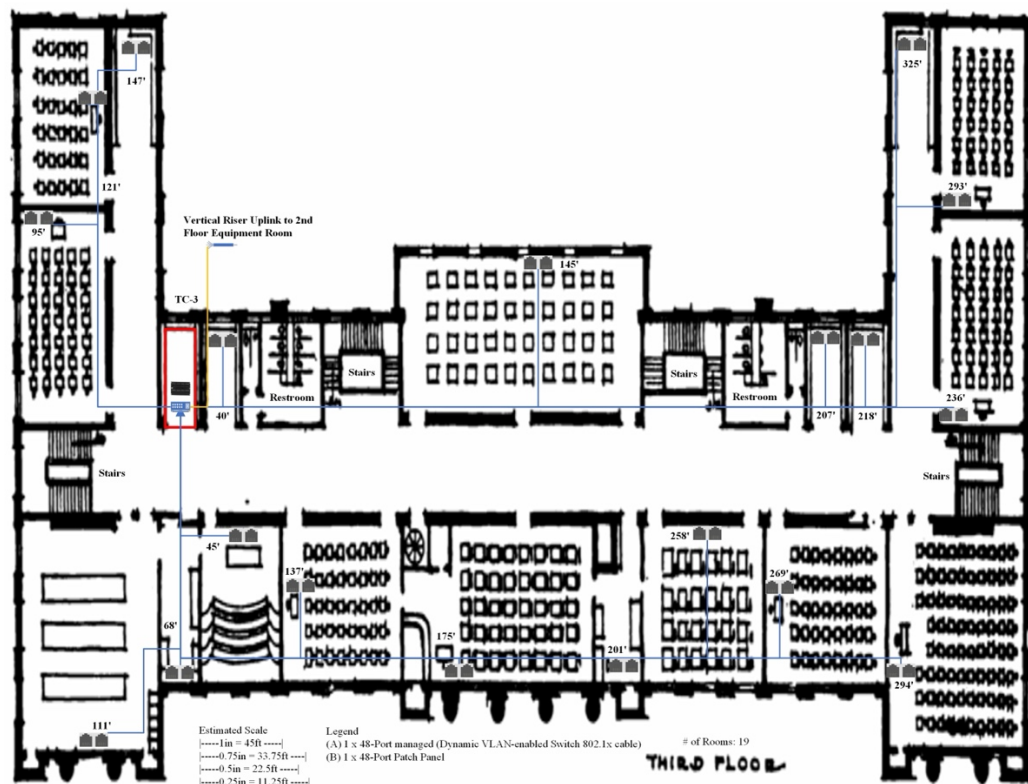- **Total Required: 84 (2 connectors per room for 2 data outlets, includes additional 10%)**

Equipment Room Second Floor:
- **1 x Edge Patch Panel**

Telecommunications Room First Floor/Third Floor/Basement:
- Switches/Patch Panels for TC-1: **1 x 48-port Edge Patch Panel**
- Switches/Patch Panels for TC-2: **1 x 48-port Edge Patch Panel**
- Switches/Patch Panels for TC-3: **1 x 48-port Edge Patch Panel**

First Floor

Vertical Riser Uplink to 2nd Floor Equipment Room

TC-2

116'
101'
82'
20'
Restroom
Stairs
202'
281'
270'
236'
191'
205'
Stairs
Restroom
Stairs
45'
57'
124'
207'
195'
84'
102'
240'
270'
Stairs

Estimated Scale
-----1in = 45ft -----
-----0.75in = 33.75ft -----
-----0.5in = 22.5ft -----
-----0.25in = 11.25ft -----

Legend
(A) 1 x 48-Port managed (Dynamic VLAN-enabled Switch 802.1x cable)
(B) 1 x 48-Port Patch Panel

# of Rooms: 19

FIRST FLOOR

Second Floor

Vertical Riser Uplink to 2nd Floor Equipment Room from Telecommunication Closets

Equipment Room

(C)
(B)
(A)

146'
115'
95'
40'
Restroom
Stairs
305'
289'
207'
218'
236'
Restroom
Stairs
Stairs
137'
68'
258'
274'
201'
135'
175'
303'
78'
Stairs

Estimated Scale
-----1in = 45ft -----
-----0.75in = 33.75ft -----
-----0.5in = 22.5 ft -----
-----0.25in = 11.25ft -----

Legend
(A) 1 x 48-port Distribution Switch; 1 x Authentication Server
(B) 1 x 48-port Patch Panel
(C) 2 x Cisco Firewalls

# of Rooms: 18

SECOND FLOOR

THIRD FLOOR

147'
121'
95'
325'
293'
145'
Vertical Riser Uplink to 2nd Floor Equipment Room
TC-3
40'
236'
207'
218'
Restroom
Stairs
Stairs
Restroom
Stairs
Stairs
45'
258'
137'
269'
68'
175'
201'
294'
111'

Estimated Scale
-----1in = 45ft -----|
-----0.75in = 33.75ft ----|
-----0.5in = 22.5ft -----|
-----0.25in = 11.25ft -----|

Legend
(A) 1 x 48-Port managed (Dynamic VLAN-enabled Switch 802.1x cable)
(B) 1 x 48-Port Patch Panel

# of Rooms: 19

BASEMENT

50'
33'
303'
325'
315'
TC-1
Vertical Riser Uplink to 2nd Floor Equipment Room
91'
40'
318'
305'
304'
Restroom
Restroom
Stairs
Stairs
Stairs
Stairs
177'
222'
245'
Stairs
215'
310'
181'
267'
300'
150'
325'
Stairs

Estimated Scale
-----1in = 45ft -----|
-----0.75in = 33.75ft ----|
-----0.5in = 22.5ft -----|
-----0.25in = 11.25ft -----|

Legend
(A) 1 x 48-Port managed (Dynamic VLAN-enabled Switch 802.1x cable)
(B) 1 x 48-Port Patch Panel

# of Rooms: 20

BASEMENT PLAN, MAURY HIGH SCHOOL   (See next page)

Links to Materials:
-   **Cat6 Cable Shielded STP**

https://www.amazon.com/UbiGear-Shielded-Ethernet-Network-Twisted/dp/B00F0SFRB4/ref=sr_1_4?crid=1EEDNXPJHS4IT&keywords=CAT6%2BSTP%2Bcable%2B1000ft&qid=1695609421&s=pc&sprefix=cat6%2Bstp%2Bcable%2B1000ft%2Ccomputers%2C74&sr=1-4&th=1

-   **RJ45 Cat6 Outlet / Wall Plate (2-port)**

https://www.amazon.com/VCE-Ethernet-Keystone-Coupler-Faceplate/dp/B07BX58Q76/ref=sr_1_2_sspa?crid=UCT8KNGHIV21&keywords=RJ45+outlet&qid=1700536307&refinements=p_n_feature_four_browse-bin%3A24676831011&rnid=24676510011&s=aht&sprefix=rj45+outlet%2Celectronics%2C73&sr=1-2-spons&sp_csd=d2lkZ2V0TmFtZT1zcF9hdGY&psc=1

-   **48-port Patch Panel - Rapink Patch Panel 48 Port Cat6A with Inline Keystone 10G Support, Coupler Patch Panel STP Shielded**

https://www.amazon.com/dp/B0BFRJ5LV9/ref=sspa_dk_detail_0?pd_rd_i=B0BFRJ5LV9&pd_rd_w=6Gdxv&content-id=amzn1.sym.eb7c1ac5-7c51-4df5-ba34-ca810f1f119a&pf_rd_p=eb7c1ac5-7c51-4df5-ba34-ca810f1f119a&pf_rd_r=5S0AZTW1RDB32Z6N8CZY&pd_rd_wg=vxLvu&pd_rd_r=56eba6f3-fb1a-4cee-8387-4d89d45d1b1c&s=pc&sp_csd=d2lkZ2V0TmFtZT1zcF9kZXRhaWw&th=1

(15 points) Plan and budget where and what <u>equipment</u> is <u>needed to support an Ethernet network</u> that connects all of the rooms in Maury High School, <u>including patch cables and managed switches</u>. The total number of Ethernet ports purchased must be at least 10% more than the total number of outlets. Indicate what equipment is to be installed in each equipment room and telecommunication closet. Indicate the sources of your pricing information.

Summary:
- 1st Floor Telecommunication Closet (TC-2): 1 x 48-port managed switch (Dynamic VLAN-enabled 802.1x switch); 48 patch cables
- 2nd Floor Equipment Room: 1 x 48-port distribution switch; 48 patch cables
- 3rd Floor Telecommunication Closet (TC-3): 1 x 48-port managed switch (Dynamic VLAN-enabled 802.1x switch); 48 patch cables
- Basement Telecommunication Closet (TC-1): 1 x 48-port managed switch (Dynamic VLAN-enabled 802.1x switch); 48 patch cables

1st Floor: 19 rooms; 38 ethernet ports
2nd Floor: 18 rooms; 36 ethernet ports
3rd Floor: 19 rooms; 38 ethernet ports
Basement: 20 room; ethernet ports

Cost Estimates for Materials:
Managed Switches (Distribution & Edge): Cisco Catalyst 1000-48FP-4G-L Network Switch, 48 Gigabit Ethernet PoE+ Ports, 740W PoE Budget, 4 1G SFP Uplink Ports, Enhanced Limited (C1000-48FP-4G-L)
48-port switch: $4,800.94 each (4 required)
Grand Total: **$19,203.76**

Patch Panel Cables: 10Gbps 3ft cables
Patch Panel Cable: $19.49 per 10-pack (192 required; 20 packages ordered)
Grand Total: **$389.80**

The Total Cost Estimate for all the materials needed is: **<u>$19,593.56</u>**

* Prices as of November 18, 2023

Links to Materials:
- **48-port Switch – Cisco Catalyst 1000-48FP-4G-L Network Switch, 48 Gigabit Ethernet PoE+ Ports, 740W PoE Budget, 4 1G SFP Uplink Ports, Enhanced Limited (C1000-48FP-4G-L)**
https://www.amazon.com/Cisco-Catalyst-C1000-48FP-Ethernet-Switch/dp/B086C688C2/ref=sr_1_22_sspa?c=ts&keywords=Computer+Networking+Switches&qid=1700538528&refinements=p_89%3ACisco%2Cp_n_feature_keywords_two_browse-bin%3A7306166011&rnid=5102031011&s=pc&sr=1-22-spons&ts_id=281414&sp_csd=d2lkZ2V0TmFtZT1zcF9idGY&psc=1

- **Patch Panel Cable – Cable Matters 10 Gbps 10-Pack Snagless Short Cat 6 Ethernet Cable 3 ft in Black**

https://www.amazon.com/Cable-Matters-10-Pack-Snagless-Ethernet/dp/B00K2E4QZE/ref=sr_1_3?crid=28UKST5J3TDV1&keywords=cat%2B6%2Bpatch%2Bcables%2B5%2Bft&qid=1700542467&s=electronics&sprefix=5%27%2Bpatch%2B%2Celectronics%2C75&sr=1-3&th=1

(10 points) Plan and budget for securing network traffic within Maury and to the Internet, including a <u>firewall that supports 200-300 users</u>. Your plan should include a network diagram with separate subnets/VLANs to separate staff traffic from student traffic. Your firewall should be able to allow and block traffic from any internal subnet or address to any Internet subnet or address. Indicate the sources of your pricing information.

<u>Summary:</u>
- 2nd Floor Equipment Room: 1 x Authentication Server; 2 x Firewalls

<u>Cost Estimates for Materials:</u>
Cisco Secure Firewall: Firepower 1120 Security Appliance with ASA Software, 8-Gigabit Ethernet Ports, 4 SFP Ports, Up to 4.5 Gbps Throughput (FPR1120-ASA-K9))
Firewall: $2,132.69 each (2 required)
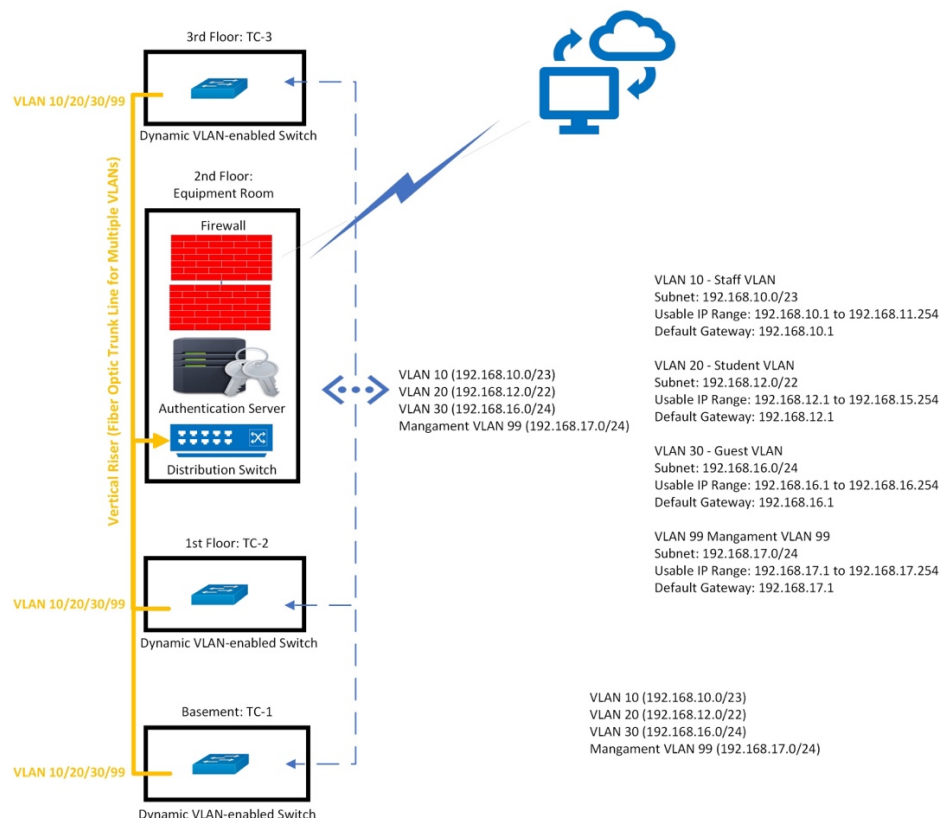Grand Total: **$4,265.38**

Authentication Server: Dell PowerEdge R730 Server 3.20Ghz 16-Core 32GB 2X New 1TB SSD H730
Authentication Server: $2,115.30 each (1 required)
Grand Total: **$2,115.30**

The Total Cost Estimate for all the materials needed is: <u>**$6,380.68**</u>

* Prices as of November 18, 2023

Links to Materials:
- **Cisco Secure Firewall: Firepower 1120 Security Appliance with ASA Software, 8-Gigabit Ethernet Ports, 4 SFP Ports, Up to 4.5 Gbps Throughput, 90-Day Limited Warranty (FPR1120-ASA-K9)**

https://www.amazon.com/Cisco-Systems-Fpr1120-Asa-K9-Network-Device/dp/B085VN9VC8/ref=sr_1_1?crid=3TRYZXIIJ9Q0Z&keywords=Firepower+1120+Security+Appliance+with+ASA+Software%2C+8-Gigabit+Ethernet+Ports%2C+4+SFP+Ports%2C+Up+to+4.5+Gbps+Throughput%2C+%28FPR1120-ASA-K9%29&qid=1700714532&s=electronics&sprefix=firepower+1120+security+appliance+with+asa+software%2C+8-gigabit+ethernet+ports%2C+4+sfp+ports%2C+up+to+4.5+gbps+throughput%2C+fpr1120-asa-k9+%2Celectronics%2C184&sr=1-1

- **Dell PowerEdge R730 Server 3.20Ghz 16-Core 32GB 2X New 1TB SSD H730**

https://www.amazon.com/Dell-PowerEdge-R730-3-20Ghz-16-Core/dp/B0CNJ66V3S/ref=sr_1_4?c=ts&keywords=Computer+Servers&qid=1700713923&refinements=p_89%3ADell%2Cp_n_condition-type%3A2224371011&rnid=2224369011&s=pc&sr=1-4&ts_id=11036071