

CHAPTER 5 FACILITIES: ELECTRICAL

ELECTRICAL BUILDING SYSTEMS EXISTING CONDITIONS, DEFICIENCIES, AND RECOMMENDED UPGRADES

Blackwell Library

Blackwell Library, built in 1958, is a 67,125 square foot building. Blackwell Library utilizes a 277/480 volt 3 phase, 4 wire electrical distribution system installed in 1972. Electrical service for the library is derived from a 500 KVA pad-mounted transformer located on the exterior of the building 80' from the Main Electrical Room.

The secondary feeder from the exterior pad-mounted 500 KVA transformer consists of two sets of four 500 KCMIL + #3 ground wire in two 4" conduits and terminates at a main 3P 800 Amp circuit breaker serving an 800 Amp switchboard. The switchboard contains a distribution section serving ten branch feeder circuits, which feed panelboards and mechanical equipment. The switchgear has been in service for 27 years and is in fair condition.

Primary service is derived from an S & C PMH-6 sectionalizing switch located in the main electrical room. The primary 25 KV feeder from the PMH-6 sectionalizing switch feeds the exterior 500 KVA transformer. The medium voltage PMH-6 and the 500 KVA transformer have been in service for 27 years and are in fair condition.

The medium voltage and low voltage switchgear are reaching the end of their life expectancy and should be replaced in the next ten years.

The building is equipped with a hardwired fire alarm system. This system is in fair condition and appears to be in good working order.

The Commons Dining Hall

The Commons Dining Hall, built in 1997, is a 124,589 square foot building. The Commons Dining Hall utilizes a 277/480 volt, 3 phase, 4 wire electrical distribution system. The Commons Dining Hall has one 2500 KVA transformer located on the exterior of the building 91' from the Main Electrical Room.

The secondary feeder from the exterior pad-mounted 2500 KVA transformer consists of ten sets of four 600 KCMIL + #350 KCMIL ground wire in ten 4" conduits, and terminates in a 3P 4000 Amp main circuit breaker serving a 277/480 volt, 3 phase, 4 wire main switchboard. The switchboard serves panelboards, two chillers, and a fire pump. The switchgear has been in service for seven years and is in excellent condition.

Primary service is derived from an S & C exterior pad-mounted PMH-9 25 KV sectionalizing switch. The primary feeder terminates in the exterior pad-mounted 2500 KVA transformer. The PMH-9 sectionalizing switch and the 2500 KVA have been in service for seven years and are in excellent condition.

The building is equipped with an addressable fire alarm system. This system is in excellent condition.

Caruthers Hall

Caruthers Hall, built in 1955 (renovated in 1979), is a 52,523 square foot classroom building. Caruthers Hall utilizes a 277/480 volt, 3 phase, 4 wire electrical distribution system. Electrical service for Caruthers Hall is derived from a 750 KVA transformer located in the Main Electrical Room.

The secondary feeder from the indoor 750 KVA transformer consists of three sets of four 350 KCMIL + # 1 ground wire in three 4" conduits, and terminates in a 3P – 1200 Amp main circuit breaker serving a 277/480 volt, 3 phase, 4 wire main switchboard. The switchboard serves panelboards and mechanical equipment throughout the building. The switchgear has been in service for 24 years and is in fair condition.

Primary service is derived from an S & C exterior pad-mounted PMH-9 sectionalizing switch. The primary 25 KV feeder from the PMH-9 sectionalizing switch feeds the exterior 750 KVA transformer. The medium voltage switch and the 750 KVA transformer have been in service for 24 years and are in fair condition. The medium and low voltage switchgear are reaching the end of their life expectancy and should be replaced in the next ten years.

The building is equipped with a hardwired fire alarm system. The system is in fair condition and appears to be in good working order.

Choptank Hall

Choptank Hall, built in 1972, is a 48,118 square foot residence hall. Choptank Hall utilizes a 120/208 volt, 3 phase, 4 wire electrical distribution system. Choptank Hall has one 750 KVA transformer located on the exterior of the building 8' from the Main Electrical Room.

Secondary service feeders from the exterior pad-mounted 750 KVA transformer feed two 1200 Amp switchboards; both feeders are four sets of 500 KCMIL + # 1 ground wire in four 4" conduits. The switchboard feeds panelboards and mechanical equipment throughout the building. The switchgear has been in service for 31 years and is in fair condition.

Primary service is derived from an S & C PMH-9 pad-mounted sectionalizing switch located at Nanticoke Hall. The primary 25 KV feeder from the PMH-9 sectionalizing switch feeds the 750 KVA transformer. The PMH-9 sectionalizing switch and the 750 KVA transformer have been in service for 33 years and all in fair condition.

The building is equipped with a hardwired fire alarm system. The system is in fair condition and appears to be in good working order.

Chesapeake Hall

Chesapeake Hall, built in 1977, is a 45,116 square foot residence hall. Chesapeake Hall utilizes a 277/480 volt, 3 phase, 4 wire, electrical distribution system. Chesapeake Hall has one 1000 KVA dry type transformer located in the Main Electrical Room.

The secondary feeder from the indoor 1000 KVA transformer consists of four sets of four 500 KCMIL + #3 ground wire in four 4" conduits, and terminates in a 3P – 2000 Amp main circuit breaker serving a 277/480 volt, 3 phase, 4 wire 2000 Amp main switchboard.

Primary service is derived from an S & C interior PMH-6 sectionalizing switch. The primary 25KV feeder from the PMH-6 sectionalizing switch feeds the interior 1000 KVA transformer. The medium voltage switch and the 1000 KVA transformer have been in service for 28 years and are in fair condition. The medium voltage and low voltage switchgear are reaching the end of their life expectancy and should be replaced within the next ten years.

The building is equipped with a hardwired fire alarm system. The system is in fair condition and appears to be in good working order.

Chester Hall

Chester Hall, built in 1974, is a 48,118 square foot residence hall. Chester Hall utilizes a 120/208 volt, 3 phase, 4 wire electrical distribution system. Chester Hall has one 500 KVA transformer located on the exterior of the building 16' from the Main Electrical Room.

The secondary feeder from the exterior pad mounted 500 KVA transformer consists of four sets of four 500 KCMIL + #3 ground wire in four 4" conduits, that terminate in a 3P 2000 Amp main circuit breaker serving a 277/480 volt, 3 phase, 4 wire, 2000 Amp main switchboard. The switchboard serves panelboards and mechanical equipment throughout the building. The switchgear has been in service for 29 years and is in fair condition.

Primary service is derived from an S & C exterior pad-mounted PMH-6 sectionalizing switch. The primary 25 KV feeder from the PMH-6 sectionalizing switch feeds the exterior 500 KVA transformer. The medium voltage switch and the 500 KVA transformer have been in service for 17 years and are in good condition.

The building is equipped with a hardwired fire alarm system. The system is in fair condition and appears to be in good working order.

Devilbiss Science Hall

Devilbiss Science Hall, built in 1967, is a 59,886 square foot academic building. Devilbiss Science Hall utilizes a 277/480 volt, 3 phase, 4 wire electrical distribution system. Devilbiss Science Hall has one 750 KVA transformer located on the exterior of the building 11 feet from the Main Electrical Room.

The secondary feeder from the exterior pad-mounted 750 KVA transformer consists of two sets of four 600 KCMIL + #1 ground in two 4" conduits that terminate in a 3P – 1200 Amp main fused switch serving a 277/480 volt, 3 phase, 4 wire main switchboard. The switchboard serves panelboards and mechanical equipment throughout the building. The switchgear has been in service for 36 years and is in fair condition.

Primary service is derived from an S & C exterior pad-mounted PMH-9 sectionalizing switch located at the University center. The primary 25 KV feeder from the PMH-9 sectionalizing switch feeds the exterior 750 KVA transformer. The medium voltage switch and transformer have been in service for 13 years and are in good condition. The main switchboard has been in service for 36

years and is reaching the end of its life expectancy and should be replaced within the next ten years.

The building is equipped with a hardwired fire alarm system. The system is in fair condition and appears to be in good working order.

Fulton Hall

Fulton Hall, built in 1991, is a 95,000 square foot academic building. Fulton Hall utilizes a 277/480 volt, 3 phase, 4 wire electrical distribution system. Fulton Hall has one 2000 KVA transformer located on the exterior of the building 16 feet from the Main Electrical Room.

The secondary feeder from the exterior pad-mounted 2000 KVA transformer consists of six sets of 750 KCMIL + #350 KCMIL ground in six 4" conduits that terminate in a 3P – 2500 Amp main circuit breaker serving a 277/480 volt, 3 phase, 4 wire 2500 Amp main switchboard. The switchboard serves panelboards and mechanical equipment throughout the building. The switchboard has been in service for twelve years and is in excellent condition.

Primary service is derived from an S & C exterior pad-mounted PMH-6 sectionalizing switch. The primary 25 KV feeder from the PMH-6 sectionalizing switch feeds the exterior pad-mounted 2000 KVA transformer. The medium voltage switch and the transformer have been in service for twelve years and are in excellent condition.

The building is equipped with a hardwired fire alarm system. The system is in fair condition and appears to be in good working order.

Guerrieri University Center

Guerrieri University Center, built in 1988, is a 72,718 square foot student activity center and snack bar. Guerrieri University Center utilizes a 277/480 volt, 3 phase, 4 wire electrical distribution system. Guerrieri University Center has one 1000 KVA transformer located in the Main Electrical Room.

The secondary feeder from the indoor 1000 KVA transformer consists of four sets of four 500 KCMIL + #1 ground in four 4" conduits that terminate in a 3P – 1600 Amp main circuit breaker serving a 277/480 volts, 3 phase, 4 wire switchboard. The switchboard serves panelboards and mechanical equipment throughout the building. The switchgear has been in service for fifteen years and is in good condition.

Primary service is derived from an S & C exterior pad-mounted PMH-9 sectionalizing switch. The primary 25 KV feeder from the PMH-9 sectionalizing switch feeds the indoor transformer. The medium voltage switch has been in service for seven years and is in good condition. The 1000 KVA indoor transformer has been in service for fifteen years and is in good condition.

The building is equipped with a hardwired fire alarm system. The system is in fair condition and appears to be in good working order.

Henson Science Hall

Henson Science Hall, built in 2002, is a 145,000 square foot academic building. Henson Science Hall utilizes a 277/480 volt, 3 phase, 4 wire electrical distribution system. Henson Science Hall has three 1500 KVA transformers located on the exterior of the building 240', 220', and 210' from the Main Electrical Room.

The Science Center has three secondary services. All three secondary feeders are six sets of four 500 KCMIL + #1 ground in six 4" conduits. The secondary feeders serve three 277/480 volt, 3 phase 4 wire 4000 Amp switchboards located in the main electrical room. The feeders terminate in 3000 AMP main circuit breakers in each switchboard. The switchboards serve panelboards and mechanical equipment throughout the building. The switchgear has been in service for two years and is in excellent condition.

Primary service for two of the 1500 KVA exterior pad-mounted transformers is derived from an exterior pad-mounted PMH-9 sectionalizing switch. The primary 25 KV feeders from the PMH-9 sectionalizing switch feed the two 1500 KVA transformers. The remaining 1500 KVA exterior pad-mounted transformer is fed from an exterior pad-mounted PMH-6 sectionalizing switch. The PMH-9 and the PMH-6 sectionalizing switches have been in service for two years and are in excellent condition. The three 1500 KVA transformers have been in service for two years and are in excellent condition.

The building is equipped with an addressable fire alarm system, which is in excellent condition.

Holloway Hall

Holloway Hall, built in 1924, is a 118,127 square foot main administration building. Holloway Hall utilizes a 277/480 volt, 3 phase, 4 wire electrical distribution system.

There are two dry type 750 KVA transformers located in the main electrical room. The transformers serve a double ended 277/480 volt, 3 phase, 4 wire, 2500 Amp switchboard. The switchboard is equipped with a 1200 Amp tie circuit break with key interlocks. Both secondary feeders from the dry type transformers are three sets of four 600 KCMIL + #1 ground in 4" conduits. The switchboard serves panelboards and mechanical equipment throughout the building. The switchboard has been installed within the last ten years and is in excellent condition.

Primary service is derived from an indoor pad-mounted PMH-9 sectionalizing switch located in the main electrical room. Two 25 KV feeders from the PMH-9 sectionalizing switch feed each 750 KVA dry type transformer. The medium voltage switch has been in service for thirty years and is reaching the end of its life expectancy, and should be replaced in the next ten years.

The building is equipped with a hardwired fire alarm system. The system is in good condition and appears to be in good working order.

Maintenance/Physical Plant Building

The Maintenance/Physical Plant Building, built in 1980, is a 24,949 square foot building. The Physical Plant Building utilizes a 120/208 volt, 3 phase, 4 wire electrical distribution system. The Physical Plant Building has one 300 KVA transformer located on the exterior of the building 85' from the Main Electrical Room.

The secondary feeder from the outdoor pad-mounted 300 KVA transformer consists of three sets of four 500 KCMIL + #1 ground in three 4" conduits, and terminates in a 3P, 600 Amp main circuit breaker serving a 120/208 volt, 3 phase, 4 wire main switchboard. The switchboard serves panelboards and mechanical equipment throughout the building. The switchboard has been in service for 23 years and is in fair condition.

Primary service is derived from an S & C exterior pad-mounted PMH-6 sectionalizing switch. The primary 25 KV feeder from the PMH-6 sectionalizing switch feeds the exterior pad-mounted 300 KVA transformer. The 300 KVA transformer and medium voltage switch have been in service for twenty four years and are in fair condition. The medium and low voltage switchgear and the 300 KVA transformer are reaching the end of their life expectancy and should be replaced in the next ten years.

Maggs Physical Activities Center

Maggs Physical Activities Center, built in 1977, is a 113,904 square foot gymnasium. Maggs Physical Activities Center utilizes a 277/480 volt electrical distribution system. Maggs Physical Activities Center has one 1000 KVA transformer located in the Main Electrical Room.

The secondary feeder from the indoor 1000 KVA transformer consists of three sets of four 500 MCM + #1 ground in three 4" conduits, and terminates in a 3P 1200 Amp fused main switch serving a 277/480 volt, 3 phase, 4 wire, 1600 Amp main switchboard. The switchboard serves panelboards and mechanical equipment throughout the building. The switchboard has been in service for 26 years and is in fair condition.

Primary service is derived from an S & C interior pad-mounted PMH-6 sectionalizing switch, located in the main electrical room. The primary 25 KV feeder from the PMH-6 sectionalizing switch feeds the 1000 KVA transformer. The medium voltage switch the 1000 KVA transformer, and the low voltage switchboard have been in service for 26 years and are in fair condition. The 1000 KVA transformer, and the medium and low voltage switchgear are reaching the end of its life expectancy and should be replaced in the next ten years.

The building is equipped with a hardwired fire alarm system. The system is in fair condition and appears to be in good working order.

Manokin Hall

Manokin Hall, built in 1964, is a 21,735 square foot residence hall. Manokin Hall utilizes a 120/208 volt, 3 phase, 4 wire electrical distribution system. Manokin Hall has one 150 KVA dry type transformer located in the Main Electrical Room.

There are two secondary feeders serving the building. The first secondary feeder is four 350 KCMIL + #3/0 ground in 4" conduit and terminates in a 3P - 200 Amp main circuit breaker serving a 120/208 volt, 3 phase, 4 wire panelboard. The second secondary feeder consists of four 350 KCMIL + # 3/0 ground in 4" conduit and terminates in a 3P – 200 Amp main circuit breaker serving a 120/208 volts, 3 phase, 4 wire panelboard serving the building's air conditioning system.

Primary service is derived from a gas medium voltage switch located in the main electrical room. The primary 25 KV feeder from the gas medium voltage switch feeds the 150 KVA transformer.

The gas medium voltage switch has been in service for 13 years and is in good condition. The 150 KVA transformer has been in service for 20 years and is in fair condition. The low voltage panelboards have been in service for 20 years and are in good condition.

The building is equipped with a hardwired fire alarm system. The system is in fair condition and appears to be in good working order.

Nanticoke Hall

Nanticoke Hall, built in 1968, is a 36,290 square foot residence hall. Nanticoke Hall utilizes a 120/208 volt, 3 phase, 4 wire electrical distribution system. Nanticoke Hall has one 300 KVA transformer located in the Main Electrical Room.

The secondary feeder from the indoor 300 KVA transformer consists of three sets of 580 KCMIL + #1 ground in three 4" conduits, and terminates in a 3P – 800 Amp main circuit breaker serving a 120/208 volt, 3 phase, 4 wire, 800 Amp switchboard. The switchboard serves panelboards and mechanical equipment throughout the building. The switchboard has been in service for 26 years and is in fair condition.

Primary service is derived from an S & C exterior pad-mounted PMH-9 sectionalizing switch. The primary 25 KV feeder from the PMH-9 sectionalizing switch feeds the interior 300 KVA transformer. The medium voltage switch has been in service for 13 years and is in good condition. The 300 KVA transformer has been in service for 26 years and is in fair condition. The 800 Amp switchboard and the 300 KVA transformer are reaching the end of their life expectancy and should be replaced within the next ten years.

The building is equipped with a hardwired fire alarm system. The system is in fair condition and appears to be in good working order.

Pocomoke Hall

Pocomoke Hall, built in 1967, is a 21,735 square foot residence hall. Pocomoke Hall utilizes a 120/208 volt, 3 phase, 4 wire electrical distribution system. Pocomoke Hall has one 150 KVA dry type transformer located in the Main Electrical Room.

There are two secondary feeders from the interior 150 KVA transformer. The first feeder consists of four 500 KCMIL + #1 ground in 4" conduit and terminates in a 120/208 volts, 3 phase, 4 wire main distribution panelboard. The second feeder consists of four 350 KCMIL + #2 ground in 4" conduit and terminates in a 3P – 300 Amp unit circuit breaker serving Chiller M7. The main distribution panelboard and the unit circuit breaker are in fair condition.

Primary service is derived from an interior gas switch located in the main electrical room. The primary 25 KV feeder from the gas switch feeds the 150 KVA transformer. The gas switch has been in service for 13 years and is in good condition. The estimated time of service for the 150 KVA dry type transformer is 20 years; it is in fair condition.

The building is equipped with a hardwired fire alarm system. The system is in fair condition and appears to be in good working order.

Power Professional Building

The Power Professional Building, built in 1989, is a 30,695 square foot classroom and office building.

There are eighteen 200 Amp, 120/240 volt, 1 phase separately metered, electrical services serving this building. There are three meter distribution locations on the building exterior. Each meter distribution location contains six 200 Amp 120/240 volt single phase electrical services. Apparently this building has tenants with separate electrical meters and bills from Conectiv. All secondary service are derived from a 500 KVA 120/240 volt single phase exterior pad-mounted transformer, owned and maintained by Conectiv. The transformer and 200 Amp services are in fair condition.

The building is not equipped with a fire alarm system.

St. Martin Hall

St. Martin Hall, built in 1986, is a 54,205 square foot residence hall. St. Martin Hall utilizes a 277/480 volt electrical system. St. Martin Hall shares a 1000 KVA transformer which is located in the Main Electrical Room of Chesapeake Hall.

The secondary feeder from the 1000 KVA transformer consists of three sets of four 500 KCMIL + 1 ground in three 4" conduits, and terminates in a 3P – 800 Amp main circuit breaker serving an 800 Amp main distribution panelboard. The main distribution panelboard serves panelboards and mechanical equipment throughout the building. The switchgear has been recently replaced and is in excellent condition.

The building is equipped with a hardwired fire alarm system. The system is in fair condition and appears to be in good working order.

Severn Hall

Severn Hall, built in 1990, is a 48,118 square foot residence hall. Severn Hall utilizes a 120/208 volt, 3 phase, 4 wire electrical distribution system. Severn Hall has one 500 KVA transformer located in the Main Electrical Room.

The secondary feeder from the 500 KVVA transformer consists of four sets of four 500 MCM + #1 ground in four 4" conduits, and terminates in a 3P – 1600 Amp main circuit breaker serving a 120/208 volts, 1600 Amp 3 phase, 4 wire main switchboard. The switchboard serves panelboards and mechanical equipment throughout the building. The switchboard has been in service for 13 years and is in good condition.

Primary service is derived from an S & C exterior mounted PMH-6 sectionalizing switch. The primary 25 KV feeder from the PMH-6 sectionalizing switch feeds the interior 500 KVA transformer located in the main electrical room. The medium voltage switch has been in service for 17 years and is in good condition. The 500 KVA transformer has been in service for 13 years and is in good condition.

The building is equipped with a hardwired fire alarm system. The system is in good condition and appears to be in good working order.

University Police

The University Police building, built in 1965, is a 6,050 square foot building.

The building is fed from a 120/240 volt – 400 Amp single phase electrical service from Conectiv. It is not a part of the campus distribution system. The building is also served by an emergency generator. Secondary feeders terminate in a 120/240 volt single phase, 3 wire, 400 Amp panelboard. The panelboard serves a 2P, 200 Amp automatic transfer switch for the emergency generator. The switchgear and emergency generator have been in service for 37 years and are in fair condition. The switchgear and generator are reaching the end of their life expectancy and should be replaced in the next 10 years.

Wicomico Hall

Wicomico Hall, built in 1951, is a 21,735 square foot residence hall. Wicomico Hall utilizes a 120/208 volt, 3 phase, 4 wire electrical distribution system. Wicomico Hall has one 225 KVA dry type transformer located in the Main Electrical Room.

There are three secondary feeders from the 225 KVA interior dry type transformer. The first secondary feeder consists of two sets of four 500 KCMIL + #1 ground in two 4" conduits and feeds a 3P – 400 Amp unit circuit breaker serving panelboards. The second feeder consists of two sets of four 500 KCMIL + #1 ground in two 4" conduits and serves a second 3P 400 Amp unit circuit breaker serving panelboards. The third secondary feeder consists of two sets of three 350 KCMIL + #3 ground and feeds a 3P – 600 Amp unit circuit breaker that serves chiller MI5. The switchgear and transformer have been recently installed and are in excellent condition.

The building is equipped with a hardwired fire alarm system. The system is in fair condition and appears to be in good condition.

ELECTRICAL SYSTEM RECOMMENDATIONS

Medium Voltage Distribution System

After reviewing the report prepared by Shah & Associates, Inc. in August of 2002, the addition of the new Science Building has increased the load on the existing 25 KV medium voltage loop system to approximately 5% over the system's capacity. The system should be upgraded to accommodate any future buildings on campus.

There are two options to consider for the medium voltage system upgrade:

1. Remove the existing three conductor # 1 AWG campus standard 25 KV feeders and install new three conductor 350 KCMIL 25 KV feeders, upgrading fuses in Conectiv's medium voltage sectionalizing switches, and the University's sectionalizing switches as required by design and the National Electrical Code.
2. Provide a new two feeder 25 KV loop system geographically located to serve the new Science Building, and future buildings in accordance with the Ten Year Master Plan. Design and construction of the 25 KV medium voltage system upgrade should begin immediately to accommodate any future construction.

Switchgear and Transformers

The report prepared by Shah & Associates indicates ten transformers on campus that did not meet minimum recommended standards in accordance with NEMA TR27.

These transformers should be replaced and the distribution design should be reviewed and redesigned to accommodate the causes of the transformer failures. Deterioration may occur due to overloading, and overheating, over voltage under reduced load conditions (spring break, winter holiday season, etc.) due to the fixed capacitor bank serving the incoming utility feeders. Oil filled transformer's cooling oil may contain unacceptable levels of moisture content, resulting from defective fittings or gaskets exposing the oil to air and moisture. The University should employ a bi-annual transformer testing program to be performed by a certified electrical testing company. All existing transformers exceeding 25 years of service should be scheduled for replacement immediately.

The medium voltage sectionalizing switches (PMH-6 and PMH-9) along with the medium voltage gas switches, all appear to be in fair to good condition. All existing medium voltage switches exceeding 25 years of service should be scheduled for replacement within the next ten years.

Low Voltage Distribution

The low voltage distribution switchboards, main distribution panelboards, panelboards, and load centers serving the buildings are in fair to good condition throughout the campus. All low voltage distribution equipment that exceeds 30 years in service should be replaced within the next ten years.

Fire Alarm Systems

Most of the buildings on campus are equipped with hardwired fire alarm systems that are not in compliance with the latest National Fire Protection Association (NFPA), Americans with Disabilities Act (ADA) and Life Safety Codes and Regulations. All buildings should be provided with new addressable fire alarm systems in accordance with NFPA, ADA and Life Safety Codes. All buildings should have the capability of communicating fire alarm to one central station on campus that should also be monitored off site by a local fire alarm monitoring company. Today's wireless technology allows this communication to the central station without providing hardwired connections from each building to the central station.