Cheatham and Associates, P.A.
Consulting Engineers

Updated 8-3-2022

HVAC Infrastructure Assessment - Pender County Schools

School	Site Visit/Observations	Assessment Report and Appendix A - Final Draft
Topsail Middle School	Completed	Completed
Pender High School	Completed	Final Draft Completed
Surf City Elem School	Completed	Final Draft Completed
Surf City Middle School		
C.F. Pope Elementary (former Burgaw Elementary)	Completed	In Progress
Topsail Elementary School	Completed	In Progress
Malpass Corner Elem School	Completed	In Progress
Burgaw Middle School	Completed	In Progress
Cape Fear Elem School	Completed	In Progress
Cape Fear Middle School		
Heide Trask High School	Completed	In Progress
Topsail High School	Completed	In Progress
West Pender Middle School	Completed	In Progress
North Topsail Elem School	Week of August 8th	September 7th
South Topsail Elementary	Week of August 15th	September 7th
Penderlea School	Week of August 22nd	September 14th
Rocky Point Elem School	Week of August 29th	September 21th
PCS Buildings 965 Penderlea Highway	Week of September 5th	September 30th

PCS BOE Meetings Aug. 9th (Hampstead) at 6:00 pm and Sept. 13, 2022

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Cheatham and Associates, P.A.
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HVAC INFRASTRUCTURE ASSESSMENT
TOPSAIL HIGH SCHOOL
PENDER COUNTY SCHOOLS

May 30, 2022

Appendix A – More detailed information found and observed for each HVAC system and area.

General

1. Drawings Available:
   a. 2009 Original Design – Plumbing and Mechanical Record Drawings
   b. 2012 New Team Building - PME Drawings

2. All air handling units have heating and cooling coils served by a 4-pipe hydronic system.

Area A

1. Kitchen:
   a. Exhaust Fans:
      1) F-1 - Dishwashing A14 – Dishwasher Exhaust - 600 CFM
      2) F-2 - Electrical A01 – 1950 CFM
      3) F-4 - Bathroom A02/ Locker Rm A03 /Jan. A06/Jan. A16 – 475 CFM
      4) F-5 - Kitchen A10–Packaged Kitchen Hood Exhaust/Make-Up Air - 3150 CFM (Exhaust)/2240 (Make-up)
      5) F-6 - Kitchen A10-Packaged Kitchen Hood Exhaust/Make-Up Air - 3150 CFM (Exhaust)/2240 (Make-up)
      6) F-7 - Dishwashing A14 – 400 CFM
   b. Kitchen Exhaust/Make Up:
      1) Exhaust/Make-up Air to and from packaged units F-5 and F-6 on roof.
      2) Captive Aire 6024-ND-2 (2) Hood is XXX model XXXX Exhaust/Makeup
      3) Model XXX requires exhaust XXX CFM (based on submittal data)
      4) Model XXX supply air flow XXX (based on submittal data)
      5) Existing Schedule = 3150 CFM Exhaust and 2240 CFM Make-up air per hood (separate units serve each hood).
      6) Double island hood 5’ wide 14’ long
      7) No end walls – open all sides

2. AHU#1 (Mechanical A19) Serves Kitchen A19:
   a. Trane MCCB008 (reheat position) – good condition – HWS pipe slightly rusted
   b. 460V-3Ph
   c. 5 hp fan
   d. Yaskawa VFD model CIMR-E7U43P7 480V-3ph – good condition
   e. 3850 CFM SA scheduled; 1000 CFM OA scheduled with OA economizer.

3. AHU#2 (Mechanical A15) Serves Cafeteria A17:

a. Trane MCCB010 (reheat position) – good condition
b. 460V-3Ph
c. 7-1/2 hp supply air fan
d. Yaskawa VFD model CIMR-E7U43P7 480V-3ph – good condition
e. 4750 CFM SA scheduled; 1650 CFM OA scheduled with OA economizer.

4. AHU#3 (Mechanical A12) Serves Cafeteria A17:
   a. Trane MCCB010 (reheat position) – good condition
   b. 460V-3Ph
   c. 7-1/2 hp supply air fan
   d. Yaskawa VFD model CIMR-E7U45P5 480V-3ph – good condition
   e. 4750 CFM SA scheduled; 1650 CFM OA scheduled with OA economizer.

5. EUH#1 (Mechanical Rm A19) & EUH#2 (Pump Rm A00) & EUH#5 (Mechanical Rm A12):
   a. Trane UHEC-033DACA
   a. 480V-3Ph
   b. 3.3 kW
   c. 24V controls

Boiler Room A11/Service Yard

1. Fans:
   a. F-3 – Boiler Rm A11 – 1000 CFM
2. Boiler#1 & #2: - Boiler 1 was shut down for throwing an alarm. Actuator to be replaced.
   a. Weil-McClain 88 series (1888)
   b. Natural Gas fired
   c. 5845 MBtu/Hr input, 4640 MBtu/Hr output.
   d. XX:X Turndown
   e. 460V-3Ph
   f. Webster JB26-50-RM7802-M20UL-1R1
   g. 5 hp burner
   h. 30A Heavy Duty disconnect – good condition
3. Pump P-1 & P-2 (Chiller Pumps): P-2 is missing guard around shaft, P-1 pan is full of water. Floor drain between P-1 and P-2 is clogged and overflowing.
   a. Bell and Gossett 1510 BF – fair condition
   b. 15 hp
   c. 460V-3Ph
   d. 655 GPM
   e. 30A Disconnect and separate starter – good condition
4. Pump P-3 & P-4 (Chilled Water System Pumps): - P-3 was recently replaced. New P-3 is not labeled. P-3 is sweating. P-4 pan is full of water. P-4 is sweating
   a. Bell & Gossett 1510 BF
   b. 50 hp
   c. 460V-3Ph
   d. 815 GPM
   e. VFD/Disconnect – good condition
5. Pump P-5 & P-6 (Boiler Pumps): P-5 is shut off via Disconnect
   a. Bell & Gossett 1510 BF – fair condition
   b. 7-1/2 hp

c. 460V-3Ph
d. 420 GPM
e. 30A Disconnect and separate starter – good condition

6. Pump P-7 & P-8 (Hot Water System Pumps.):
   a. Bell & Gossett 1510 BF – fair condition
   b. 30 hp
   c. 460V-3Ph
   d. 450 GPM
   e. VFD/Disconnect – good condition

7. EUH#3 & EUH#4 (Boiler Rm A11):
   a. Trane UHEC-103DACA good condition
   b. 480V-3Ph
   c. 10.0 kW
   d. 24V controls

8. Chiller#1 & #2 (CHS and CHR valves in the yard are slightly rusted.):
   a. Trane RTAC 2754 – fair condition
   b. 272.5 nominal tons
   c. 460V-3Ph
   d. 800A Heavy Duty Safety Switch – [Condition]
   e. R134a refrigerant
   f. Short circuit rating: 10,000A
   g. 543 MCA/700 MOCP
   h. 655 GPM

Area B

1. Exhaust Fans:
   a. F-8 – Electrical B12 – 550 CFM
   b. F-9 - Elev. Equip B56 – 600 CFM
   c. F-10 – Area B Admin Toilets – 300 CFM
   d. F-11 – Area B & H Toilets – 2300 CFM
   e. F-12 - Biology B21 – Emergency Exhaust – 2600 CFM
   f. F-13 - Prep B22 – 350 CFM
   g. F-14 – Electrical B23 – 550 CFM
   h. F-15 - Biology B25 – Emergency Exhaust – 2600 CFM
   i. F-49 - Culinary Arts B01 – Packaged Kitchen Hood Exhaust/Make-Up Air - 2760 CFM (Exhaust)/1920 CFM (Make-up)
   j. F-50 - Culinary Arts B01 – Packaged Kitchen Hood Exhaust/Make-Up Air - 3235 CFM (Exhaust)/1880 CFM (Make-up)
   k. F-55 – Comm Rm B11 – 150 CFM

2. Culinary Arts B01 Exhaust/Make Up:
   a. Exhaust/Make-up Air to and from packaged units F-49 and F-50 on roof.
   b. Hood is Captive Aire model 6024-ND-2 Exhaust/Makeup (2 side by side)
   c. Model XXX requires exhaust 2760 and 3235 CFM (based on submittal data)
   d. Model XXX supply air flow 1920 and 1880 CFM (based on submittal data)
   e. Existing Schedule = 2760 CFM Exhaust /1920 CFM Make-up (F-49) & 3235 CFM Exhaust /1880 CFM Make-up (F-50).
   f. Double island hood 5’ wide 12’ long

g. No end walls – open all sides

3. AHU#4 (Mechanical B48) Serves Drafting Classroom B06: - HWS Piping is severely rusted and missing some insulation
   a. Trane MCCB006 – good condition
   b. 460V-3Ph
   c. 3 hp supply air fan
   d. Reheat position
   e. Yaskawa VFD CIMR-E7U42P2 – good condition
   f. 2400 CFM SA scheduled; 300 CFM OA scheduled with OA economizer.
4. AHU#5 (Mechanical B48) Serves Drafting Classroom B07:
   a. Trane MCCB003 – good condition
   b. 460V-3Ph
   c. 3 hp supply air fan
   d. Reheat position
   e. Yaskawa VFD CIMR-E7U42P2 – Condition
   f. 1500 CFM SA scheduled; 225 CFM OA scheduled with OA economizer.
5. AHU#6 (Mechanical B48) Serves Foreign Language Classroom B09:
   a. Trane MCCB003 – good condition
   b. 460V-3Ph
   c. 1-1/2 hp supply air fan
   d. Reheat position
   e. Yaskawa VFD CIMR-E7U42P2 – good condition
   f. 1100 CFM SA scheduled; 225 CFM OA scheduled with OA economizer.
6. AHU#7 (Mechanical B48) Serves Culinary Arts Lab B01: HWS in reheat position is missing insulation and is severely rusted.
   a. Trane MCCB006 – good condition
   b. 460V-3Ph
   c. 3 hp supply air fan
   d. Reheat and preheat position
   e. Yaskawa VFD CIMR-E7U42P2 – good condition
   f. 2400 CFM SA scheduled; 300/2400 CFM OA scheduled with OA economizer.
7. AHU#8 (Mechanical B48) Serves Home Ec. Classroom B04/Math Classroom B13: Some rusting on HWS pipe.
   a. Trane MCCB006 – good condition
   b. 460V-3Ph
   c. 3 hp supply air fan
   d. Yaskawa VFD CIMR-E7U42P2 – good condition
   e. Reheat position
   f. 2800 CFM SA scheduled; 475 CFM OA scheduled with OA economizer.
8. AHU#9 (Mechanical B48) Serves Conf B30, Principal B40, Secy. B41, SRO Office B42, Bookkeeper Office B43, Lounge B44, Counselor B46 & Student Services B47:
   a. Trane MCCB006 – good condition
   b. 460V-3Ph
   c. 3 hp supply air fan
   d. Reheat position
   e. Yaskawa VFD CIMR-E7U42P2 – good condition
   f. 2700 CFM SA scheduled; 200 CFM OA scheduled with OA economizer.

9. AHU#10 & AHU#11 (Mechanical B48) Serves Area B Admin Areas:
    a. Trane MCCB003 – good condition
    b. 460V-3Ph
    c. 3 hp supply air fan
    d. Reheat position
    e. Yaskawa VFD CIMR-E7U42P2 – good condition
    f. 1600 CFM SA scheduled; 200 CFM OA scheduled with OA economizer.
10. AHU#12 (Mechanical B48) Serves Area B Corridors & Lobby:
    a. Trane MCCB006 – good condition
    b. 460V-3Ph
    c. 3 hp supply air fan
    d. Reheat position
    e. Yaskawa VFD CIMR-E7U42P2 – good condition
    f. 2350 CFM SA scheduled; 375 CFM OA scheduled with OA economizer.
11. AHU#13 (Mechanical B26) Serves Math Classroom B20: HWS pipe is rusted/leaking under insulation.
    a. Trane MCCB003 – good condition
    b. 460V-3Ph
    c. 1 hp supply air fan
    d. Reheat position
    e. Yaskawa VFD CIMR-E7U42P2 – good condition
    f. 900 CFM SA scheduled; 225 CFM OA scheduled with OA economizer.
12. AHU#14 (Mechanical B26) Serves Biology Classroom B25 & Workroom B24:
    a. Trane MCCB003 – good condition (2005)
    b. 460V-3Ph
    c. 2 hp supply air fan
    d. Reheat position
    e. Yaskawa VFD CIMR-E7U42P2 – good condition
    f. 1400 CFM SA scheduled; 300 CFM OA scheduled with OA economizer.
13. AHU#15 (Mechanical B48) Serves Biology Classroom B21 & Prep B22:
    a. Trane MCCB003 – good condition
    b. 460V-3Ph
    c. 3 hp supply air fan
    d. Reheat position
    e. Yaskawa VFD CIMR-E7U42P2 – good condition
    f. 1550 CFM SA scheduled; 300 CFM OA scheduled with OA economizer.
14. FC#1 (Stair B14) & FC#2 (Stair B27): No tag on the unit, unable to verify any of these numbers.
    a. [Manufacturer] [Model #] (Date) – good condition
    b. 120V-1Ph
    c. 0.125 kW
    d. 24V controls

Area C

1. Exhaust Fans:
    a. F-16 - Area C & K Toilets – 1750 CFM
    b. F-17 – Communication Room C08 – 150 FCM
    c. F-18 – Electrical C17 – 550 CFM

d. F-19 – Except. Child Bath C23 – 175 CFM
e. F-29 – Science C20 – Emergency Exhaust – 2600 CFM
f. F-51 – Prep C19 – 350 CFM

2. AHU#16 (Mechanical C04) Serves Math Classroom C30, Office C02, Sec C03, Corridor C21:
   a. Trane MCCB003 – good condition
   b. 460V-3Ph
   c. 3 hp supply air fan
   d. Reheat position
   e. Yaskawa VFD CIMR-E7U42P2 – good condition
   f. 1600 CFM SA scheduled; 325 CFM OA scheduled with OA economizer.
3. AHU#17 (Mechanical C04) Serves English Classroom C28 & C29: CHS and CHR have poor insulation wrapped before the AHU. Some of the controls on the CHS/CHR pipes are sweating.
   a. Trane MCCB006 – good condition
   b. 460V-3Ph
   c. 3 hp supply air fan
   d. Reheat position
   e. Yaskawa VFD CIMR-E7U42P2 – good condition
   f. 2000 CFM SA scheduled; 490 CFM OA scheduled with OA economizer.
4. AHU#18 (Mechanical C07) Serves Math Classrooms C05 & C06:
   a. Trane MCCB003 – good condition
   b. 460V-3Ph
   c. 3 hp supply air fan
   d. Reheat position
   e. Yaskawa VFD CIMR-E7U42P2 – good condition
   f. 1800 CFM SA scheduled; 450 CFM OA scheduled with OA economizer.
5. AHU#19 (Mechanical C07) Serves Math Classrooms C1:
   a. Trane MCCB003 – good condition
   b. 460V-3Ph
   c. 1 hp supply air fan
   d. Reheat position
   e. Yaskawa VFD CIMR-E7U42P2 – good condition
   f. 900 CFM SA scheduled; 225 CFM OA scheduled with OA economizer.
6. AHU#20 (Mechanical C07) Serves Math Classroom C14 & Corridor C12: Seems to be a large puddle of water around floor drain, but currently has dried up.
   a. Trane MCCB003 – good condition
   b. 460V-3Ph
   c. 2 hp supply air fan
   d. Reheat position
   e. Yaskawa VFD CIMR-E7U42P2 – good condition
   f. 1400 CFM SA scheduled; 300 CFM OA scheduled with OA economizer.
7. AHU#21 (Mechanical C07) Serves English Classroom C27 & Soc. Studies Classroom C26: Possible slight rusting of the HWS piping.
   a. Trane MCCB006 – good condition
   b. 460V-3Ph
   c. 3 hp supply air fan
   d. Reheat position
   e. Yaskawa VFD CIMR-E7U42P2 – good condition
   f. 2200 CFM SA scheduled; 530 CFM OA scheduled with OA economizer.

8. AHU#22 (Mechanical C07) Serves Science Classroom C20, Science prep C18 & Storage C19:
    a. Trane MCCB003 – good condition
    b. 460V-3Ph
    c. 3 hp supply air fan
    d. Reheat position
    e. Yaskawa VFD CIMR-E7U42P2 – good condition
    f. 1650 CFM SA scheduled; 300 CFM OA scheduled with OA economizer.
9. AHU#23 (Mechanical C25) Serves Exceptional Children's Classroom C22: HWS piping is corroded severely.
    a. Trane MCCB003 – good condition
    b. 460V-3Ph
    c. 3 hp supply air fan
    d. Reheat position
    e. Yaskawa VFD CIMR-E7U42P2 – good condition
    f. 1900 CFM SA scheduled; 400 CFM OA scheduled with OA economizer.
10. FC#3 (Stair C13):
    a. [Manufacturer] [Model #] (Date) [Condition]
    b. 120V-1Ph
    c. 0.125 kW
    d. 24V controls

Areas D

1. Exhaust Fans:
    a. F-20 – Area D Boys Locker Room Area – 3250 CFM
    b. F-21 – Weight Room D29 – 2200 CFM
    c. F-22 – Area D Girls Locker Room Area – 2900 CFM
    d. F-23 – Electrical D36 – 550 CFM
    e. F-24 – Area D Lobby Toilets – 1525 CFM
    f. F-53 – Electrical D22 – 550 CFM
    g. F-56 – Comm Rm D21 – 150 CFM
11. AHU#24 (Mechanical D44) Area D Girls Locker Room Area:
    a. Trane MCCB006
    b. 460V-3Ph
    c. 3 hp supply air fan
    d. Reheat position
    e. Yaskawa VFD CIMR-E7U42P2 – good condition
    f. 2550 CFM SA scheduled; No OA.
12. AHU#25 & AHU#26 (Mechanical D44) Both serve Gymnasium D09:
    a. Trane MCCB021 – good condition
    b. 460V-3Ph
    c. 15 hp supply air fan
    d. Reheat and preheat position
    e. _A Heavy Duty Safety Switch – [Condition]
    f. Yaskawa VFD CIMR-E7U4011 – good condition
    g. 10,000 CFM SA scheduled; 4050 CFM OA scheduled with OA economizer.
13. AHU#27 (Mechanical D44) Serves Weight Room D29:
    a. Trane MCCB006 – good Condition

b. 460V-3Ph
c. 3 hp supply air fan
d. HW reheat
e. Yaskawa VFD CIMR-E7U42P2 – good condition
f. 2000 CFM SA scheduled; No OA.

14. AHU#28 (Mechanical D44) Serves Area D Boys Locker Room Area:
    a. Trane MCCB006 - good Condition
    b. 460V-3Ph
    c. 5 hp supply air fan
    d. HW reheat
    e. Danfoss 17421941 – good condition
    f. 2900 CFM SA scheduled; No OA.
15. AHU#29 (Mechanical D44) Serves Area D Training Room, Storage Rm's & Offices:
    a. Trane MCCB006 - good Condition
    b. 460V-3Ph
    c. 3 hp supply air fan
    d. HW reheat
    e. Yaskawa VFD CIMR-E7U42P2 – good condition
    f. 2800 CFM SA scheduled; 700 CFM OA scheduled with OA economizer.
16. AHU#30 (Mechanical D20) Serves Area D Lobby, Toilets, Concessions & Ticketing:
    a. Trane MCCB008 - good Condition
    b. 460V-3Ph
    c. 7-1/2 hp supply air fan
    d. HW Reheat position
    e. Yaskawa VFD CIMR-E7U47P5 – good condition
    f. 4150 CFM SA scheduled; 1400 CFM OA scheduled with OA economizer.
17. AHU#31 (Mechanical D44) Serves Auxiliary Gymnasium D40:
    a. Trane MCCB014 – good condition
    b. 460V-3Ph
    c. 10 hp supply air fan
    d. HW reheat
    e. Yaskawa VFD CIMR-E7U47P5 – good Condition
    f. 7000 CFM SA scheduled; 1000 CFM OA scheduled with OA economizer.
18. AHU#32 (Mechanical D20) Serves Computer Lan E08:
    a. Trane MCCB003 – good Condition
    b. 460V-3Ph
    c. 2 hp supply air fan
    d. HW reheat
    e. Yaskawa VFD CIMR-E7U42P2 – good Condition
    f. 1350 CFM SA scheduled; 225 CFM OA scheduled with OA economizer.
19. AHU#33 (Mechanical D20) Serves PE Classroom E01, PE Classroom E02 & Foreign Language E03:
    a. Trane MCCB008 – good Condition
    b. 460V-3Ph
    c. 5 hp supply air fan
    d. HW reheat
    e. Yaskawa VFD CIMR-E7U43P7 – good Condition
    f. 3350 CFM SA scheduled; 750 CFM OA scheduled with OA economizer.

6. EUH#6 (Pump Rm D43):
   a. [Manufacturer] [Model #] (Date) [Condition]
   d. 480V-3Ph
   e. 3.3 kW
   f. 24V controls

Area E

1. Exhaust Fans:
   a. F-25 – Biology E28 – Emergency Exhaust – 2600 CFM
   b. F-26 – Prep Rm E27 – 350 CFM
   c. F-27 – Electrical E26 – 550 CFM
   d. F-28 - Biology E24 – Emergency Exhaust – 2600 CFM
   e. F-43 – Women E35 – 100 CFM
   f. F-48 – Area E & J Toilets – 2300 CFM
2. AHU#34 (Mechanical E41) Serves Control Room E05, Office E06, Production Studio E07, Hall E09, Distance Learning E11, Control Room E12, Office E15 & English Classroom E14:
   a. Trane MCCB006 – good Condition
   b. 460V-3Ph
   c. 3 hp supply air fan
   d. HW reheat
   e. Yaskawa VFD CIMR-E7U42P2 – good Condition
   f. 2700 CFM SA scheduled; 550 CFM OA scheduled with OA economizer.
3. AHU#35 (Mechanical E41) Serves Media Center E34 & Corridor E39:
   a. Trane MCCB008 – good Condition
   b. 460V-3Ph
   c. 5 hp supply air fan
   d. HW reheat
   e. Yaskawa VFD CIMR-E7U42P2 – good Condition
   f. 3700 CFM SA scheduled; 575 CFM OA scheduled with OA economizer.
4. AHU#36 (Mechanical E13) Serves media Center E34 & Media Center Offices:
   a. Trane MCCB003 – good Condition
   b. 460V-3Ph
   c. 3 hp supply air fan
   d. HW reheat
   e. Yaskawa VFD CIMR-E7U42P2 – good Condition
   f. 1850 CFM SA scheduled; 275 CFM OA scheduled with OA economizer.
5. AHU#37 (Mechanical E13) Serves Computer Lab E42:
   a. Trane MCCB003 – good Condition
   b. 460V-3Ph
   c. 2 hp supply air fan
   d. HW reheat
   e. Yaskawa VFD CIMR-E7U42P2 – good Condition
   f. 1200 CFM SA scheduled; 225 CFM OA scheduled with OA economizer.
6. AHU#38 (Mechanical E13) Serves Area E Corridor and Toilets:
   a. Trane MCCB003 – good Condition
   b. 460V-3Ph
   c. 2 hp supply air fan

d. HW reheat
e. Yaskawa VFD CIMR-E7U42P2 – good Condition
f. 1200 CFM SA scheduled; 300 CFM OA scheduled with OA economizer.

7. AHU#39 (Mechanical E29) Serves Math Classroom E23:
   a. Trane MCCB003 – good Condition
   b. 460V-3Ph
   c. 1 hp supply air fan
   d. HW reheat
   e. Yaskawa VFD CIMR-E7U42P2 – good Condition
   f. 900 CFM SA scheduled; 225 CFM OA scheduled with OA economizer.
8. AHU#40 (Mechanical E293) Serves Biology Classroom E28:
   a. Trane MCCB003 – good Condition
   b. 460V-3Ph
   c. 2 hp supply air fan
   d. HW reheat
   e. Yaskawa VFD CIMR-E7U42P2 – good Condition
   f. 1400 CFM SA scheduled; 300 CFM OA scheduled with OA economizer.
9. AHU#41 (Mechanical E29) Serves Biology Classroom E24:
   a. Trane MCCB003 – good Condition
   b. 460V-3Ph
   c. 3 hp supply air fan
   d. HW reheat
   e. Yaskawa VFD CIMR-E7U42P2 – good Condition
   f. 1550 CFM SA scheduled; 300 CFM OA scheduled with OA economizer.
10. FC#4 (Stair E17) & FC#5 (Stair E30):
   a. [Manufacturer] [Model #] (Date) [Condition]
   b. 120V-1Ph
   c. 0.125 kW
   d. 24V controls
11. DAHU#1 (Main Comm Rm E32):
   a. Mitsubishi MSZ-GL18NA fair Condition
   b. 208/230V-1Ph
   c. Condensate pump damaged/ removed from wall and condensate not attached to pump
   d. Cooling thermostat (wireless)
   e. R410a Refrigerant
12. DHP#1 (Match with DAHU#1):
   a. [Manufacturer] [Model #] (Date) [Condition]
   b. 208/230V-1Ph
   c. R410a Refrigerant
   d. _A Heavy Duty Safety Switch – [Condition]

Area F

1. Exhaust Fans:

a. F-30 – Kiln F09 – 2400 CFM
b. F-31 – Area F Toilets – 750 CFM
c. F-32 – Men F55 – 400 CFM
d. F-33 – Women F49 – 400 CFM
e. F-34 – Janitor F51 – 100 CFM
f. F-57 – Comm. Room F37 – 150 CFM
g. F-60 – Dimmer Room Area F – 1050 CFM

2. AHU#42 (Mechanical F04) Serves Corr. F01, Sec. F02, Office F03, Resource Classroom F05 & Storage F06:
   a. Trane MCCB003 – good Condition
   b. 460V-3Ph
   c. 2 hp supply air fan
   d. HW reheat
   e. Yaskawa VFD CIMR-E7U42P2 – good Condition]
   f. 1400 CFM SA scheduled; 150 CFM OA scheduled with OA economizer.
3. AHU#43(Mechanical F04) Serves Art Classrooms F11 & F12:
   a. Trane MCCB008 – good Condition
   b. 460V-3Ph
   c. 5 hp supply air fan
   d. HW reheat
   e. Yaskawa VFD CIMR-E7U43P7 – good Condition
   f. 3925 CFM SA scheduled; 600 CFM OA scheduled with OA economizer.
4. AHU#44 (Mechanical F54) Serves Dress F41, Corr. F42, Control Rm. F45, Lobby F48 & Stor. F53:
   a. Trane MCCB006 – good Condition
   b. 460V-3Ph
   c. 5 hp supply air fan
   d. HW reheat
   e. Yaskawa VFD CIMR-E7U43P7 – good Condition
   f. 2900 CFM SA scheduled; 500 CFM OA scheduled with OA economizer.
5. AHU#45 (Mechanical F50) Serves Women F35, Men F36, Dress F38, Corr. F4, Lobby F48 & Ticket F52:
   a. Trane MCCB006 – good Condition
   b. 460V-3Ph
   c. 5 hp supply air fan
   d. HW reheat
   e. Yaskawa VFD CIMR-E7U43P7 – good Condition
   f. 2900 CFM SA scheduled; 500 CFM OA scheduled with OA economizer.
6. AHU#71 & AHU#72 (Mechanical L07) Both Serve Auditorium F46:
   a. Trane MCCB010 – good Condition
   b. 460V-3Ph
   c. 7-1/2 hp supply air fan
   d. HW preheat and reheat
   e. Yaskawa VFD CIMR-E7U45P5 – good Condition
   f. 4500 CFM SA scheduled; 2340 CFM OA scheduled with OA economizer.
7. AHU#73 (Mechanical L07) Serves Instrumental Music Classroom F30:
   a. Trane MCCB006 – good Condition
   b. 460V-3Ph
   c. 3 hp supply air fan

d. HW reheat
e. Yaskawa VFD CIMR-E7U42P2 – good Condition
f. VFD – [Condition]
g. 2750 CFM SA scheduled; 500 CFM OA scheduled with OA economizer.

8. AHU#74 (Mechanical L07) Serves Dance & Drama Classroom F23:
   a. Trane MCCB006 – good Condition
   b. 460V-3Ph
   c. 3 hp supply air fan
   d. HW reheat
   e. Yaskawa VFD CIMR-E7U42P2 – good Condition
   f. 2000 CFM SA scheduled; 300 CFM OA scheduled with OA economizer.
9. AHU#75 (Mechanical L07) Serves Stage F40:
   a. Trane MCCB010 – good Condition
   b. 460V-3Ph
   c. 7-1/2 hp supply air fan
   d. HW reheat
   e. Yaskawa VFD CIMR-E7U45P5 – good Condition
   f. 4500 CFM SA scheduled; 800 CFM OA scheduled with OA economizer.
10. AHU#77 (Mechanical L07) Serves Vocal Music Classroom F28:
    a. Trane MCCB003 – good Condition
    b. 460V-3Ph
    c. 3 hp supply air fan
    d. HW reheat
    e. Yaskawa VFD CIMR-E7U42P2 – good Condition
    f. 1775 CFM SA scheduled; 300 CFM OA scheduled with OA economizer.
11. FC#4 (Stair F16):
    a. [Manufacturer] [Model #] (Date) [Condition]
    b. 120V-1Ph
    c. 0.125 kW
    d. 24V controls

Area G

1. Exhaust Fans:
   a. F-42 – Area G Toilets – 200 CFM
   b. F-52 – Garage G15 – 650 CFM
   c. F-54 – Electrical G18 - 1700
2. WHP#1 (Classroom G01, Office G02, Comp room G08, Storage G09):
   a. Bard CH4S1-C15 – good Condition
   b. 460V-3Ph
   c. 15 kW
   d. 1500 CFM SA scheduled; 300 CFM OA scheduled
3. WHP#2 (Vocational Lab G07 & Corridor G04) & WHP#3 (Machine Technology Shop G11):
   a. Bard CH4S1-C15 – fair Condition damaged casing
   b. 460V-3Ph
   c. 15 kW
   d. 1500 CFM SA scheduled; 250 CFM OA scheduled

4. WHP#4 & WHP#5 (Serves Woodworking Shop G10):
    a. Bard CH4S1-C15 – good Condition
    b. 460V-3Ph
    c. 15 kW
    d. 1500 CFM SA scheduled; 200 CFM OA scheduled
5. EUH#8 (Marine Technology Shop G11):
    a. Trane UHEC – 103DACA good Condition
    b. 480V-3Ph
    c. 10.0 kW
    d. 24V controls
6. EUH#9 & EUH#10 (Woodworking Shop G10):
    a. Trane UHEC – 203DACA good Condition
    b. 480V-3Ph
    c. 20.0 kW
    d. 24V controls

Area H

1. Exhaust Fans:
    a. F-35 – Science H27 – Emergency Exhaust – 2600 CFM
    b. F-36 – Prep H30– 350 CFM
    c. F-37 – Electrical H29 – 925 CFM
    d. F-38 - Science H31 – Emergency Exhaust – 2600 CFM
    e. F-39 – Chemistry H03 – Emergency Exhaust – 2700 CFM
    f. F-40 – Prep Rooms H01 & H04 – 450 CFM
    g. F-41 – Fume Hood H03 – 800 CFM
    h. F-58 – Comm. Rm. H22 – 150 CFM
    i. F-61 – Science H31 – 875 CFM
2. AHU#46 (Mechanical H13) Serves Work Rm. H14, English Classrm H15 & English Classrm H16:
    a. Trane MCCB006 – good Condition
    b. 460V-3Ph
    c. 3 hp supply air fan
    d. HW reheat – HW piping taped at unit connection
    e. Yaskawa VFD CIMR-E7U42P2 – good Condition
    f. 2300 CFM SA scheduled; 550 CFM OA scheduled with OA economizer.
3. AHU#47 (Mechanical H13) Social Studies H11 & H12:
    a. Trane MCCB003 – good Condition
    b. 460V-3Ph
    c. 3 hp supply air fan
    d. HW reheat
    e. Yaskawa VFD CIMR-E7U42P2 – good Condition
    f. 1800 CFM SA scheduled; 450 CFM OA scheduled with OA economizer.
4. AHU#48 (Mechanical H06) Serves Math Classroom H09, H10 & Workroom H07:
    a. Trane MCCB003 – good Condition
    b. 460V-3Phq
    c. 3 hp supply air fan
    d. HW reheat
    e. Yaskawa VFD CIMR-E7U42P2 – good Condition

f. 1900 CFM SA scheduled; 475 CFM OA scheduled with OA economizer.

5. AHU#49 (Mechanical H13) Serves Area H Toilets, Business Office K02 & Resource class H18:
   a. Trane MCCB006 – good Condition
   b. 460V-3Ph
   c. 3 hp supply air fan
   d. HW reheat
   e. Yaskawa VFD CIMR-E7U42P2 – good Condition
   f. 2200 CFM SA scheduled; 300 CFM OA scheduled with OA economizer.
6. AHU#50 (Mechanical H32) Serves Foreign Language Classroom H26:
   a. Trane MCCB003 – good Condition
   b. 460V-3Ph
   c. 1 hp supply air fan
   d. HW reheat
   e. Yaskawa VFD CIMR-E7U42P2 – good Condition
   f. 900 CFM SA scheduled; 225 CFM OA scheduled with OA economizer.
7. AHU#51 (Mechanical H32) Serves Science Classroom H27:
   a. Trane MCCB003 – good Condition
   b. 460V-3Ph
   c. 3 hp supply air fan
   d. HW reheat
   e. Yaskawa VFD CIMR-E7U42P2 – good Condition
   f. 1550 CFM SA scheduled; 300 CFM OA scheduled with OA economizer.
8. AHU#52 (Mechanical H13) Science Classroom H31 & Electrical H29:
   a. Trane MCCB003 – good Condition – sweating on case
   b. 460V-3Ph
   c. 3 hp supply air fan
   d. HW reheat
   e. Yaskawa VFD CIMR-E7U42P2 – good Condition
   f. 1600 CFM SA scheduled; 325 CFM OA scheduled with OA economizer.

Area J

1. Exhaust Fans:
   a. F-44 – Science J13 Emergency Exhaust – 2600 CFM
   b. F-45 – Prep Rm J16 – 350 CFM
   c. F-46 – Electrical J15 – 550 CFM
   d. F-47 - Science J17 Emergency Exhaust – 2600 CFM
2. AHU#53 (Mechanical J09) Serves Assistant Principal H34, Conf. Rm. H33, Lounge H36 & Corridor H37:
   a. Trane MCCB003 – good Condition
   b. 460V-3Ph
   c. 3 hp supply air fan
   d. HW reheat
   e. Yaskawa VFD CIMR-E7U42P2 – good Condition
   f. 1900 CFM SA scheduled; 200 CFM OA scheduled with OA economizer.
3. AHU#54 (Mechanical J09) Serves Chemistry Classroom H03, Storage H04 and H05 & Workroom H02:
   a. Trane MCCB003 – good Condition

b. 460V-3Ph
c. 3 hp supply air fan
d. HW reheat
e. Yaskawa VFD CIMR-E7U42P2 – good Condition
f. 1750 CFM SA scheduled; 300 CFM OA scheduled with OA economizer.

4. AHU#55 (Mechanical J09) Serves Math Classrooms J07 and J08, AHU#56 (Mechanical J04) Serves Social Studies J05 and J06:
   a. Trane MCCB003 – good Condition
   b. 460V-3Ph
   c. 3 hp supply air fan
   d. HW reheat
   e. Yaskawa VFD CIMR-E7U42P2 – good Condition
   f. 1800 CFM SA scheduled; 450 CFM OA scheduled with OA economizer.
5. AHU#57 (Mechanical J04) Serves English Classrooms J01 and J02 & Work Room J03:
   a. Trane MCCB006 – good Condition
   b. 460V-3Ph
   c. 3 hp supply air fan
   d. HW reheat
   e. Yaskawa VFD CIMR-E7U42P2 – good Condition
   f. 2300 CFM SA scheduled; 550 CFM OA scheduled with OA economizer.
6. AHU#58 (Mechanical J04) Serves Area J Toilets, Corridor & Resource Classroom J25:
   a. Trane MCCB003 – good Condition
   b. 460V-3Ph
   c. 3 hp supply air fan
   d. HW reheat
   e. Yaskawa VFD CIMR-E7U42P2 – good Condition
   f. 1700 CFM SA scheduled; 200 CFM OA scheduled with OA economizer.
7. AHU#59 (Mechanical J04) Serves Science Classroom J17:
   a. Trane MCCB003 – good Condition
   b. 460V-3Ph
   c. 3 hp supply air fan
   d. HW reheat
      Yaskawa VFD CIMR-E7U42P2 – good Condition
   e. 1550 CFM SA scheduled; 300 CFM OA scheduled with OA economizer.
8. AHU#60 (Mechanical J04) Serves Science Classroom J13:
      Trane MCCB003 – good Condition]
   a. 460V-3Ph
   b. 3 hp supply air fan
   c. HW reheat
   d. Yaskawa VFD CIMR-E7U42P2 – good Condition
   e. 1600 CFM SA scheduled; 325 CFM OA scheduled with OA economizer.
9. AHU#61 (Mechanical J04) Serves Foreign Language Classroom J18:
   g. Trane MCCB003 – good Condition
   h. 460V-3Ph
   i. 1 hp supply air fan
   j. HW reheat
   k. Yaskawa VFD CIMR-E7U42P2 – good Condition
   l. 900 CFM SA scheduled; 225 CFM OA scheduled with OA economizer.

Area K

1. AHU#62 (Mechanical K03) Serves Social Studies K01:
    a. Trane MCCB003 – good Condition
    b. 460V-3Ph
    c. 1 hp supply air fan
    d. HW reheat
    e. Yaskawa VFD CIMR-E7U42P2 – good Condition
    f. 900 CFM SA scheduled; 225 CFM OA scheduled with OA economizer.

2. AHU#63 (Mechanical K03) Serves Computer Application K19:
    a. Trane MCCB003 – good Condition
    b. 460V-3Ph
    c. 3 hp supply air fan
    d. HW reheat
    e. Yaskawa VFD CIMR-E7U42P2 – good Condition
    f. 1600 CFM SA scheduled; 225 CFM OA scheduled with OA economizer.

3. AHU#64 (Mechanical K07) Serves Keyboarding Classroom K05 & Corridor K04:
    a. Trane MCCB003 – good Condition
    b. 460V-3Ph
    c. 3 hp supply air fan
    d. HW reheat
    e. Yaskawa VFD CIMR-E7U42P2 – good Condition
    f. 1900 CFM SA scheduled; 275 CFM OA scheduled with OA economizer.

4. AHU#65 (Mechanical K03) Serves Keyboarding Classroom K06 & Corridor K04:
    a. Trane MCCB003 – good Condition
    b. 460V-3Ph
    c. 3 hp supply air fan
    d. HW reheat
    e. Yaskawa VFD CIMR-E7U42P2 – good Condition
    f. 1800 CFM SA scheduled; 275 CFM OA scheduled with OA economizer.

5. AHU#66 (Mechanical K14) Serves English Classroom K08 & Corridor K10:
    a. Trane MCCB003 – good Condition
    b. 460V-3Ph
    c. 2 hp supply air fan
    d. HW reheat
    e. Yaskawa VFD CIMR-E7U42P2 – good Condition
    f. 1200 CFM SA scheduled; 275 CFM OA scheduled with OA economizer.

6. AHU#67 (Mechanical K03) Serves English Classroom K11 & K toilets:
    a. Trane MCCB003 – good Condition
    b. 460V-3Ph
    c. 2 hp supply air fan
    d. HW reheat
    e. Yaskawa VFD CIMR-E7U42P2 – good Condition
    f. 1300 CFM SA scheduled; 300 CFM OA scheduled with OA economizer.

7. AHU#68 (Mechanical K03) Serves Health Occupations K17 & Marketing K18:
    a. Trane MCCB006 – good Condition
    b. 460V-3Ph
    c. 5 hp supply air fan
    d. HW reheat
    e. Yaskawa VFD CIMR-E7U43P7 – good Condition
    f. 3100 CFM SA scheduled; 500 CFM OA scheduled with OA economizer.

Area L

1. AHU#69 (Mechanical L04) Serves English Classroom L02:
    a. Trane MCCB003 – good Condition
    b. 460V-3Ph
    c. 1 hp supply air fan
    d. HW reheat
    e. Yaskawa VFD CIMR-E7U42P2 – good Condition
    f. 900 CFM SA scheduled; 225 CFM OA scheduled with OA economizer.

2. AHU#70 (Mechanical K03) Serves Resource Classroom L01:
    a. Trane MCCB003 – good Condition
    b. 460V-3Ph
    c. 1-1/2 hp supply air fan
    d. HW reheat
    e. Yaskawa VFD CIMR-E7U42P2 – good Condition
    f. 1000 CFM SA scheduled; 225 CFM OA scheduled with OA economizer.

3. AHU#76 (Mechanical K03) Serves Classroom L05 & L06:
    a. Trane MCCB006 – good Condition
    b. 460V-3Ph
    c. 3 hp supply air fan
    d. HW reheat
    e. Yaskawa VFD CIMR-E7U42P2 – good Condition
    f. 2800 CFM SA scheduled; 550 CFM OA scheduled with OA economizer.

Fieldhouse

1. Exhaust Fans:
    a. F-1 – Women's 7 – 1000 CFM
    b. F-2 – Men's 8 – 100 CFM
    c. F-3 – Storage 10 – 675 CFM
    d. F-4 – Shower Room A3 – 100 CFM
    e. F-5 – Toilet Room A5 – 150 CFM
    f. F-6 – Toilet Room B6 – 150 CFM
    g. F-7 – Shower Room B4 – 100 CFM
2. WMHP#1 (Team Room A1) & WMHP#2 (Team Room B2):
    a. Bard W48H1DC09 good Condition
    b. 460V-3Ph
    c. 60A Heavy Duty Safety Switch – fair Condition
    d. 1550 CFM SA scheduled; 250 CFM OA scheduled
3. DAHU#1 (Concession 9):

a. FUJITSU ASU24RLF – good Condition
b. 208/230V-1Ph
c. Toggle type disconnect switch
d. Cooling thermostat.
e. R410a Refrigerant

4. DHP#1 (Match with DAHU#1):
   a. FUJITSU AOU24RLXFW – good Condition
   b. 208/230V-1Ph
   c. R410a Refrigerant
   d. 60A Heavy Duty Safety Switch – good Condition
5. DAHU#2A & #2B (Men's 8):
   a. FUJITSU ASU7RLF– good Condition
   b. 208/230V-1Ph
   c. Toggle type disconnect switch
   d. Cooling thermostat.
   e. R410a Refrigerant
6. DHP#2 (Match with DAHU#2A & #2B):
   a. FUJITSU AOU36RLXFZ – good Condition
   b. 208/230V-1Ph
   c. R410a Refrigerant
   d. 60A Heavy Duty Safety Switch – good Condition
7. DAHU#3A & #3B (Women's 7):
   a. Mitsubishi NTXWST18A112AA – fair Condition – leaking from cond. pump, condensing bad
   b. 208/230V-1Ph
   c. Toggle type disconnect switch
   d. Cooling thermostat.
   e. R410a Refrigerant
8. DHP#3 (Match with DAHU#3A & #3B):
   a. Mitsubishi NTXMM36A142AA – good Condition
   b. 208/230V-1Ph
   c. R410a Refrigerant
   d. 60A Heavy Duty Safety Switch – good Condition
9. EBB#1 (Service 11):
   a. [Manufacturer] [Model #] – good Condition
   b. 208V-1Ph
   c. 12.5 kW
   d. 24V controls
10. EBB#2 (Storage 10), EBB#3 (Shower Room B4) & EBB#4 (Shower Room A3):
    a. [Manufacturer] [Model #] - good Condition
    b. 480V-3Ph
    c. 6.0 kW
    d. 24V controls

End of Appendix A

Cheatham and Associates, P.A.
Consulting Engineers

HVAC INFRASTRUCTURE ASSESSMENT
TOPSAIL MIDDLE SCHOOL
PENDER COUNTY SCHOOLS

June 20, 2022

APPENDIX A – More detailed information found and observed for each HVAC system and area.

BUILDING A - Admin/Media/Cafeteria and 6 Grade 600 Wing (1973) & Kitchen (1989)

1. Drawings Available:
   a. 1973 Original Design – M-1B, M-2B
   b. 1994 mechanical drawings AC/Roof insulation, M1-M9.
   c. 2002 Media Center Indoor Air Quality Improvements, M1 and M2.
   d. 2009 Additions and Alterations, M-001, M-101, M-103 and M-601.

2. Meeting Notes 2/4/2022:
   a. AHU-18 remains on 24/7 with exhaust fans on to help with CO2 levels currently.
   b. Locked outside air dampers wide open.
   c. Honeywell Controls – ECS Contractor
   d. HVAC Starplus completed installation of new units for this building.
   e. Owner checking dampers for functionality. ECS has replaced (8) motor operated dampers in Bldg A.
   f. Owner is adding CO2 sensors to each unit's return air.
   g. Original Swamp Cooler for kitchen has been removed. No AC in the kitchen except for runout tapped to the existing Cafeteria supply air ductwork with a motorized damper and thermostat to provide cooling only. (Shuts damper in heating mode)
   h. Media Center has original VAV boxes fed from new AHU.
   i. DOAS units need new sensors.
   j. Matt Squires (ECS) said need sensors in the ductwork.

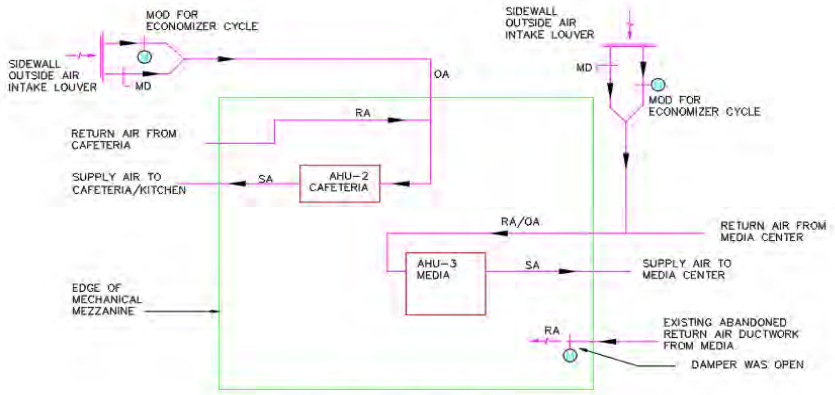
3. Kitchen:
   a. Kitchen workers state no AC or heat in the kitchen, making extreme temperatures make difficult work conditions.
   b. Original electric wall heater in the kitchen bathroom only source of heat and it still works. (poor condition)
   c. Owner confirmed no dedicated unit for the kitchen area. Original installation was a swamp cooler that did not work and was removed long ago. The ductwork from this installation remains above the ceiling.
   d. Owner confirmed that tap in the existing supply air Cafeteria AHU-2 was added for cooling supply air for the kitchen. A motorized damper and thermostat were added to operate the damper to provide cooling only for the kitchen. (This damper closes in heating mode, no heat to the kitchen). This is a very small amount of cooling and does not meet the kitchen needs for cooling.

e. Exhaust Fans:
   1) F-1 Dishwasher – 700 CFM Exhaust
   2) F-2 General Kitchen Exhaust – 3000 CFM
   3) F-3 Air Door – 5100 CFM
   4) F-4 Toilet Exhaust – 250 CFM
   5) F-5 Exterior Water Heater Room – 250 CFM
   6) F-6 Exterior Electrical Room – 340 CFM

f. Kitchen Exhaust/Make Up:
   1) Packaged Unit on the Room
   2) Hood is Captive Aire 4824 R Exhaust/Makeup
   3) Model R requires exhaust 251 CFM/Lin. Ft. Minimum– (based on chart on hood)
   4) Model R supply air flow 216 CFM/Lin Ft. Maximum - (based on chart on hood)
   5) Existing Schedule = 7000 CFM Exhaust and 5600 CFM Make-up air
   6) Double island hood 10’ wide x 12’long
   7) No end walls – open all sides

4. AHU-2 (Cafeteria HP):
   a. Trane TWE18043BAA00A… (4-2018) good condition
   b. 208V/230V-3Ph
   c. Mark on label indicates 29.9 kW 480V-3Ph heater installed.
   d. Original 40”x16” OA duct is being reused and connected to the unit. (Original drawings have min OA at 1400 CFM) for the manual damper. The damper at the exterior wall splits into two parts. One portion of the damper is set for required minimum flow to the AHU-2 (1400 CFM) and the second portion is a motorized damper (for OA Economizer cycle). The damper is new with new controls installed by ECS.
   e. Disconnect switch (good condition)
   f. 6600 CFM SA scheduled; 1400 CFM OA scheduled with OA economizer.

5. HP-2 (Match with AHU-2):
   a. Trane TWA180DDAA00AR… (4-2018) good condition – heat pump
   b. 460V-3Ph
   c. R410a Refrigerant
   d. 60A Heavy duty safety switch – poor condition
   e. Observed insulation is missing from some exterior refrigerant piping.



6. AHU-3 (Media Center HP):
    a. Trane TWE24044BAA00A… (5-2018) good condition
    b. 480v-3Ph
    c. Mark on label indicates 49.8 kW 480V-3Ph heater installed.
    d. OA in the media center existing original connected to return air ductwork for the manual damper. Behind the OA intake is a damper that has two parts to the damper. One portion is a manual damper set for the minimum OA (2000 CFM) and the second portion is a motorized damper (for the OA Economizer). The actuator and damper are new with ECS with AHU-3.
    e. Disconnect switch (good condition)
    f. 9600 CFM SA scheduled, 2000 CFM OA scheduled
    g. AHU supply air ductwork feeds 6 VAV boxes still in use from AHU-3.
        1) VAV-5 (Library Left)
        2) VAV-6 (Library Right)
        3) VAV-7 (Library Left)
        4) VAV-8 (Library Right entry area)
        5) VAV-9 (Library Left and Workroom)
        6) VAV-10 (Library Right and Storage)
    h. VAV boxes with electric heat still serve the Media Center. ECS – Matt Squires confirmed these are the only VAV boxes that are still operational. KMC wall sensors are still located in the library and offices, not sure if they are still active but not controlled by ECS.
    i. Observed VAV-5 box (associated with AHU-3) above ceiling, installed in 2002 (20 years old)
        1) Redd-i, 277V-1Ø, 43.32A.
        2) 24V controls
        3) Minimum air velocity: 582 FPM
    j. Mounted on the wall at the entrance to library is a Honeywell room sensor labeled “LEFT LIB” and the opposite wall is a Honeywell room temperature sensor labeled “RIGHT LIB”. Both look to be in good condition. (Owner states these two sensors in the library average the temp in the media center. (Do these sensors work AHU-1 or do they work VAV boxes – or both?)
    k. Old KMC sensor on wall – abandoned mounted up high on Right side of Library.

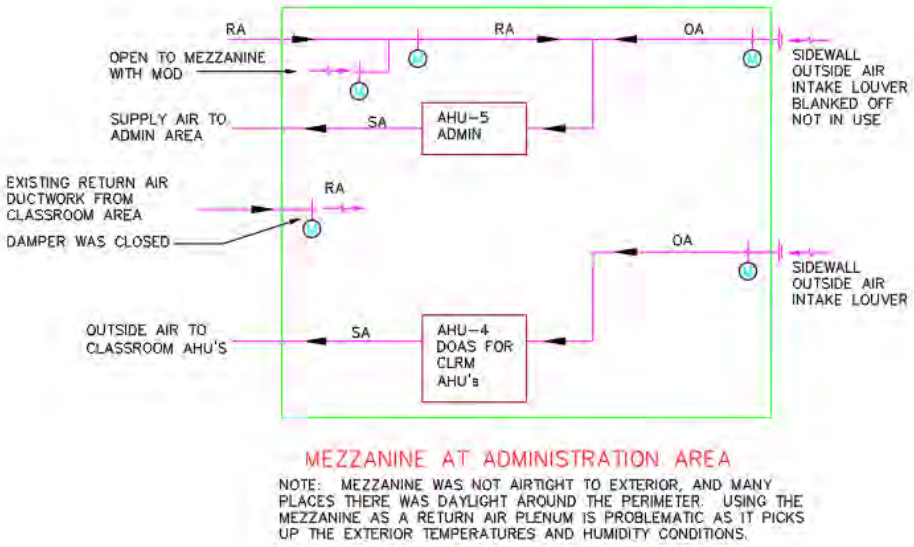
7. HP-3 (Match with AHU-3):
    a. Trane TWA240E40RAB (3-2018) good condition – heat pump
    b. 460V-3Ph
    c. R410a Refrigerant
    d. Heavy duty safety switch unknown size – poor condition
    e. Observed insulation is missing from some exterior refrigerant piping.

8. AHU-4 – 100% outside air unit providing outside air to split system air handling units, from AHU-6 to AHU-13 direct feed to the return air in the back of the units:
    a. Trane controls Morganizer Panel with touchscreen interface. Allows split system to operate as a 100% OA unit with hot gas reheat coil.
    b. Original unit was scheduled to be 9600 CFM (total of 8 SSHP’s supply air is only 8000 CFM). Eric Cassidy – Brady Services confirmed AHU is for 2000 cfm OA. That matches up with what the expected OA for the 8 SSHPs would be.
    c. Mechanical Mezzanine was not sealed tight and visible daylight in many places.
    d. Trane TWE180E300AA (2-2018) good condition

e. 208-230/460V-3Ph
f. R410A Refrigerant
g. Mark on label indicates 29.92 kW 480V-3Ph heater installed. Heater is used only in wintertime to heat air up because system is only split system a/c.
h. 60A Heavy Duty Safety Switch – good condition

9. HP-4 (Match with AHU-4):

a. Trane TTA180H400AA (1-2018) good condition – split system a/c
b. 460V-3Ph
c. R410a Refrigerant
d. 30 Amp Heavy Duty Safety Switch – poor condition



10. AHU-5 (Administrative Area):

a. Designed OA amount is unknown.
b. Outside air louver has been blanked off on the exterior of the building. Currently no outside air to this unit.
c. Mechanical Mezzanine was not sealed tight and visible daylight in many places.
d. Return air ducted from the admin area.
e. A motorized damper with an open duct to the mezzanine was connected to the return air ductwork and was fully open to the space. The Owner's rep closed this damper while onsite.
f. Trane TWE090E300AA (3-2018) good condition
g. 208-230/460V-3Ph
h. R410a Refrigerant
i. 30Amp Heavy Duty Safety Switch – good condition
j. Honeywell temp sensor in the main Admin Area.
k. Per ECS, VAV's are not in use and abandoned in place.

11. HP-5 (Match with AHU-5):

a. Trane TWA090E40RAA (3-2018) good condition – heat pump
b. R-410a Refrigerant

c. 460v-3Ph
d. 30Amp Heavy Duty Safety Switch – good condition

12. AHU-6 (Classroom 607) 2018:

a. Hanging above the corridor ceiling
b. Honeywell sensor

13. HP-6 (Match with AHU-6):

a. Trane 4TWA4036A4000AA (3-2018) good condition – heat pump
b. 460v-3Ph
c. R410a Refrigerant

14. AHU-7 (Classroom 608) 2018:

a. Hanging above the corridor ceiling
b. Honeywell Sensor

15. HP-7 (Match with AHU-7):

a. Trane 4TWA4036A4000AA (3-2018) good condition – heat pump
b. 460v-3Ph
c. R410a Refrigerant

16. AHU-8 (Classroom 605) 2018:

a. HP-8 (Hanging above the corridor ceiling
b. Honeywell Sensor

17. HP-8 (Match with AHU-8):

a. Trane 4TWA4036A4000AA (3-2018) good condition – heat pump
b. 460v-3Ph
c. R410a Refrigerant

18. AHU-9 (Classroom 606) 2018:

a. Hanging above the corridor ceiling
b. Honeywell Sensor

19. HP-9 (Match with AHU-9):

a. Trane 4TWA4036A4000AA (3-2018) good condition – heat pump
b. 460v-3Ph
c. R410a Refrigerant

20. AHU-10 (Classroom 603) 2018:

a. Hanging above the corridor ceiling
b. Honeywell Sensor

21. HP-10 (Match with AHU-10):

a. Trane 4TWA4036A4000AA (3-2018) good condition – heat pump
b. 460v-3Ph

c. R410a Refrigerant

22. AHU-11 (Classroom 604) 2018:

a. Hanging above the corridor ceiling
b. Honeywell Sensor

23. HP-11 (Match with AHU-11):

a. Trane 4TWA4036A4000AA (3-2018) good condition – heat pump
b. 460v-3Ph
c. R410a Refrigerant

24. AHU-12 (Classroom 601) 2018:

a. Hanging above the corridor ceiling
b. Honeywell Sensor

25. HP-12 (Match with AHU-12):

a. Trane 4TWA4036A4000AA (3-3019) good condition – heat pump
b. 460V-3Ph
c. R-410A Refrigerant

26. AHU-13 (Classroom 602) 2018:

a. Hanging above the corridor ceiling
b. Honeywell Sensor

27. HP-13 (Match with AHU-13):

a. Trane 4TWA4036A4000AA (3-2018) good condition – heat pump
b. 460v-3Ph
c. R410a Refrigerant

28. Outdoor HP 6 through 13 are fed from an outdoor panel.

a. 480V-3Ph
b. 15 Amp Breakers each
c. Panel has a main breaker – 225 Amp
d. Square D MEHB2MW, E1 Series, 225 A

29. WHP-1 (Corridor – Main Admin Entry area):

a. Bard QTEC

30. WHP-2 (Labeled Hall Unit 6 - Corridor back hall behind Administrative Area):

a. Bard QTEC

31. WHP-3 (Main Corridor – Across from Library):

a. Bard QTEC

32. WHP-4 (Back Corridor – Behind Library):

a. Bard QTEC

33. WHP-5 (Corridor – Hall 5, mounted on the exterior of the building at 800 building exit door):
    a. Eubank H436B09A4FDS-NBR
    b. 460v-3Ph
    c. R410A Refrigerant

34. AHU## (Rooms 613 & 614).

35. AHU## (Room 615 Computer Lab).

36. AHU## (Room 610).

37. AHU## (Split System heat pump used as an OA DOAS Unit serving AHUs for rooms 610-615).

38. AHU## (Dining Room Extension – Old Classroom) is this still in use?

39. HP## Located outside on west end of building, condensing unit for OA unit serving HVAC units serving four classrooms.
    a. Trane XR 4TWA4060A4000AA (3-2018) good condition – heat pump
    b. 460V-3Ph
    c. R410A Refrigerant
    d. 30A Heavy Duty Disconnect Switch – poor condition ("DO NOT ENERGIZE" is written across the top of the disc. – and it was turned ON – per PCS, disconnect was labeled this way prior to Condensing unit being replaced and is now acceptably functional – signage should be painted over). PCS advised that this condition was noted before the unit was replaced in 2018. PCS advised that it is safe to use now.

40. HP##
    a. Trane XR 4TWR4036G1000AA (5-2018) good condition – heat pump
    b. 208V-1Ph
    c. R410A Refrigerant
    d. Fed from exterior panel?

41. HP##
    a. Trane XR 4TWR4048G1000AA (3-2018) good condition – heat pump
    b. 208V-1Ph
    c. R410A Refrigerant
    d. Fed from exterior panel?

42. HP##
    a. Trane XR 4TWR4036G1000AA (5-2018) good condition – heat pump
    b. 208V-1Ph
    c. R410A Refrigerant
    d. Fed from exterior panel?

43. HP##
    a. Trane XR 4TWR4060G1000AA (5-2018) good condition – heat pump
    b. 208V-1Ph
    c. R410A Refrigerant

d. Fed from exterior panel?

44. Crawl space gravity ventilator over access near ground, adjacent to 5 classroom heat pumps on the opposite side of the cafeteria.

45. Exhaust Building B (all still in use – verify functionality)

a. F1B - 350 CFM (Boy's toilet at Cafeteria)
b. F2B – 1200 CFM (Electrical Room at Cafeteria)
c. F3B – 350 CFM (Girl's toilet at Cafeteria)
d. F4B – 100 CFM (staff toilets at Cafeteria)
e. F5B – 350 CFM (Boy's toilet at Admin)
f. F6B – 1200 CFM (Electrical Room at Admin)
g. F7B – 350 CFM (Girl's toilet at Admin)
h. F8B – 100 CFM (Staff Toilets at Admin)
i. F9B – 100 CFM (Staff Toilets inside Admin Area)
j. Bathroom Exhaust – No information

BUILDING B - 7th Grade 700 Wing (1980 Phase I & 1981 Phase II)

1. Drawings Available:
   a. 1980 TMS Addition Phase 1 – Full set
   b. 1981 TMS Addition Phase 2 - Full set

2. ECS Controls – Honeywell Spyder.

3. Observed diffusers in the hallway ceilings had radiation dampers (diffuser face was off).

4. Observed rust on ceiling grid in several classrooms and in corridor near entrance. Likely the result of condensation forming on steel grid.

5. To help improve conditions with CO2, all AHUs and associated DDC controlled exhaust fans are On 24/7/365. PCS reports this is helping with CO2 levels. PCS is waiting to see if this works during warmer months.

6. Industrial Arts Classroom 705:
   a. B-1 (Bard unit nearest to Band Room Classroom) fair condition. Observed coils partly frozen.
      1) BARD Model W36H1DA05
      2) R410A refrigerant.
      3) 230/208V-1Ø
      4) GE 60A fused disconnect switch (Type 3R)
   b. B-2 (Bard unit nearest to Marine Science Classroom) fair condition. Observed coils partly frozen.
      1) BARD Model W36H1DA05
      2) R410A refrigerant.
      3) 230/208V-1Ø
      4) GE 60A fused disconnect switch (Type 3R)
   c. Dust Collection System has been removed and ductwork capped on the exterior of the building. Abandoned 30 Amp Safety Switch (off) remains.

7. Marine Science Classroom 707:
    a. B-3 BARD Model W36H2-C09 fair condition (Observed coils partly frozen)
    b. R410A refrigerant.
    c. 230/208V-1Ø
    d. 30A Square D Heavy Duty disconnect switch - poor condition

8. Auto Mechanics Classroom 709:
    a. B-4 BARD Model WH361-C fair condition
    b. R22 Refrigerant
    c. 60A Eaton Heavy Duty Disc Switch – fair condition

9. Music Room 701:
    a. Temperature sensor is a blank plate.
    b. Supply air grilles are egg crate type.

10. Classroom 702– observed night low limit sensor and Heat Pump Honeywell sensor (no manual controls).

11. Classroom 704 - DATA racks hanging on the wall.

12. AHU-14 (Classrooms across from Industrial Arts 702-704):
    a. Trane Odyssey TWE18043BAA00A… (4-2018) good condition
    b. R-410A Refrigerant
    c. 12”x10” outside air duct serving unit (outside dimensions – internally insulated) with motor operated damper (MOD). No manual damper (MD).

13. AHU-15 (Music Room 701):
    a. Trane TWE09043AAA00A… (4-2018) good condition
    b. R-410A Refrigerant
    c. Ultra oversized motor marked on unit tag.
    d. 12”x10” OA with MOD to unit. (outside dimensions with lined OA ductwork)

14. AHU-16 (HP-3 on drawings serves Offices for Industrial Area):
    a. Trane TEM4A0C60S51SAA-Vertical (4-2018) good condition
    b. 3/4 HP Motor
    c. 30 Amp Square D Safety Switch
    d. 10”x10” Outside Size OA Ductwork with MOD (No MD). Observed ductwork was internally insulated and insulation was loose and obstructing air flow.

15. AHU-17 (HP-2 on drawings) (Serves Classrooms Exterior Classrooms):
    a. TWE24044BAA00A… (4-2018) good condition
    b. R-410a Refrigerant
    c. Standard Motor
    d. 30A Safety Switch - good condition (277/480V-3Ph)
    e. AHU Starter (Furnas) – was not apparent if still in service
    f. 12”x14” OA duct outside dimensions – internally lined with MOD.

g. 7500 CFM – 500 CFM OA - scheduled

16. HP-17 (match with AHU-17) mounted on roof (2018 - replaced two separate condensing units on the roof with one larger unit) (middle 60A Heavy Duty Disc Switch has been abandoned in place on the roof)

a. Trane Model TWA24044DAA00AR… (6-2018) good condition – heat pump
b. R-410a Refrigerant
c. 60 Amp Heavy Duty Disc Switch – good condition

17. AHU-18 (HP-1 on drawings) (Serves Classrooms 708, 710)

a. TWE12043AAA00A… (4-2018) good condition
b. R-410A Refrigerant
c. 30A Safety Switch - good condition (277/480V-3Ph)
d. AHU Starter (Furnas) - Appears abandoned and not in service
e. 20”x14” OA duct outside dimensions – internally lined with MOD.
f. 5000 CFM – 300 CFM OA – scheduled
g. PCS reports AHU and associates exhaust fan(s) are On 24/7/365 to help with CO2 levels.

18. HP-18 (match with AHU-18) mounted on roof:

a. Trane Odyssey TWA12044AAA0AR… good condition (5-2018) – heat pump
b. R-410a Refrigerant
c. 60 Amp Heavy Duty Disc Switch – good condition

19. Storage Adjacent to Mechanical Room Mezzanine:

a. Trane Electric Unit heater – good condition
b. 30Amp Safety Switch for Unit heater (480V-3Ph)
c. 30 Amp Safety Switch for Duct heater #3 (480V-3ph)
d. Exhaust up to fan on roof, has cardboard over grille on the bottom of the ductwork. This fan also serves restrooms from the first floor.

20. Observed (5) 30” diameter attic ventilation fans locations on roof level (1981 addition):

a. 2425 CFM Exhaust each Scheduled
b. 1/3 HP, 120V-1Ph Scheduled
c. No visible intakes for relief air into the attic for these exhaust fans. Soffits have been sealed shut (could have originally been perforated soffit for intake). No attic fans were running at the time of our observation. No known controls, no known access to these fans.

21. Exhaust Fans:

a. PRV-1 (1981 addition) Janitor’s closet to remain
   1) Dayton “unknown date and information”
   2) 306 CFM Scheduled on existing plans
b. PRV-2 (1981 addition) Boy’s and Girl’s toilets to remain
   1) Dayton Model 5DVP6 – fair condition “unknown date”
   2) 712 CFM scheduled on existing plans
c. PRV-1 (1980 addition) 569 CFM exhaust, 120v-1Ph (Boy’s and Girl’s locker rooms shop area to remain)
d. PRV-2 (1980 addition) 712 CFM exhaust, 120V-1Ph (Men and women toilets to remain)

e. PRV-3 (Two identical fans -1980 addition) 2482 CFM each, 480V-3Ph – remove abandoned fans and provide insulated caps, remove power back to source.
f. PRV-4 (Two identical fans -1980 addition) 2963 CFM each, 480V-3Ph – remove abandoned fans and provide insulated caps, remove power back to source.
    1) Observed duct has cardboard cover loosely over wire on bottom of exhaust ductwork.
g. PRV-5 (Two identical fans - 1980 addition) 4000 CFM each, 480V-3Ph – remove abandoned fans and provide insulated caps, remove power back to source.
h. PRV-6 (1980 addition) 1642 CFM, 120V-1Ph
i. Auto Mechanics – Fan for Carbon Monoxide exhaust fan on roof - remove abandoned fan and provide insulated cap, remove power back to source.
j. Electrical Room – Ceiling exhaust to sidewall louver discharge. 133 CFM to remain.

BUILDING C - 8th Grade 800 Wing (2009)

1. Drawings Available:
    a. 2009 TMS Additions and Alterations

2. Meeting Notes 2/4/2022:
    a. Currently replacing 3 dampers that are not working.
    b. Owner states actuators may need to be replaced.
    c. PCS reports CO2 levels are high in entire building and CO2 levels drop ten minutes after students leave the classrooms; may need more OA to the building.
    d. Computer Lab – CO2 levels are high in this room without kids. Dampers are 100% open.
    e. CO2 sensors have been replaced throughout the building.
    f. Most OA manual dampers are open 100%.
    g. Classrooms are full – 30 kids each.

3. Siemens Controls (only building on site that is not ECS). SSHPs control to space temperature and relative humidity and have dehumidification sequence of operation.

4. Building has a rated corridor cap and rated ceiling in the corridor - based on existing drawings.

5. Existing OA = 225 CFM each classroom (30 students x 7.5 CFM/student).

6. Building Pressurization verified per the existing drawings. Exhaust = 2150 and OA = 3225 (excluding electrical room). Louvered Penthouse is makeup for outside air and exhaust air for electrical room.

7. Main toilet exhaust controls are handled through DDC controls to remain.

8. Fume hood exhaust control is switch on wall.

9. Science Prep exhaust control is ON continuous.

10. Electrical Room 818 has an exhaust fan with a cooling thermostat.
    a. (Connected to LP for intake and separate LP for exhaust 2050 cfm).
    b. (Possibly remove exhaust fan from Electrical room and provide DAHU with DHP for electrical room. This would keep the exhaust fan from backdrafting/drawing air from SSHP's outside air on the same Louvered Penthouse Intake)

c. Simple "Powers" turn cooling thermostat. Grilles in room were in poor condition.

11. UV Lights - All AHUs in 800 wing have UV lights in the return air ductwork. Many were working (the light was on as visible through site glass) and many were not working (the light was not on as visible through the site glass). Verify functionality of all UV lights and replace bulbs as required.

12. Classrooms – Siemens temperature sensor day/night button and separate Siemens sensor (no controls) side by side.

13. Typical Indoor AHU (AHU-1 to AHU-14):

    a. Trane AHU's Model 2TEC3's (Manufactured 2009 – 13 years old) Good condition
    b. UV light in RA ductwork.
    c. MOD and MD in outside air ductwork with access door (typical 10"x10" except AHU-5 was 12"x10" and AHU 6&7 was 8"x8"). Most manual dampers were set to full open even though markings from TAB contractor was less.
    d. Smoke Detector in RA ductwork with access door.
    e. 60A Heavy duty Square D disconnect switch
    f. Some repair work is necessary on insulation around access doors was typical throughout.

14. Typical Outdoor Heat Pump (HP-1 to HP-14 matches with AHU respectively):

    a. Wireway at each side of the building where HP's were located (typical of 2)
    b. Trane HP's Model 2TWA3's (Manufactured 2008-2009) (Fair Condition) – heat pumps
    c. 30A Heavy duty Square D disconnect switch
    d. R22 Refrigerant
    e. Refrigerant piping insulation is deteriorating.

15. Data Room 109A:

    a. DAHU-1 (1-1/2 ton) good condition

16. DHP-1 (Match with DAHU-1):

    a. Mitsubishi - Mr. Slim (fair condition)
    b. R410a Refrigerant
    c. 30A Heavy Duty Square D disconnect switch

17. Siemens control panel in each mechanical room.

18. AHU-9 had water in the Auxiliary condensate drain pan. Needs servicing.

MULTIPURPOSE BUILDING (1992)

1. Drawings Available:

    a. 1992 Multipurpose Building full set.

2. Mech Room has 45KVA Transformer and MDP.

3. ECS Controls (Honeywell).

4. AHU-20 (Drawings Indoor Unit-2) Good condition:

a. RUUD AC Model UHPA-100Z Manufactured 11-1992
b. 208/230V 3PH – 3HP
c. 60A Square D Disc Switch (Electric Heater)
d. 30A Heavy Duty Disc Switch (AHU)
e. R22 Refrigerant
f. Electric Duct heater mounted at the top of the unit.
    1) 480V-3PH
    2) Model 1220-25-3
    3) Control Relay for Compressor and strip heat inside controlled by air flow switch. (noted on the heater)
g. No outside air to this unit.
h. Smoke Detector in RA for AHU

5. AC-20 (Drawings Outdoor Unit-2):
    a. RHEEM (RUUD same manufacturer) Model WC-100DA (11-2004)
    b. R22 Refrigerant
    c. 60A Safety Switch – rusted poor condition

6. AHU-21 (Drawings Indoor Unit-1) Good condition:
    a. RUUD AC Model UHPA-100Z Manufactured 11-1992
    b. 208/230V 3PH – 3HP
    c. R22 Refrigerant
    d. 60A Heavy Duty Disc Switch (Electric Heater)
    e. 30A Heavy Duty Disc Switch (AHU)
    f. Electric Duct heater mounted at the top of the unit.
        1) 480V-3PH
        2) Model 1220-25-3
        3) Control Relay for Compressor and strip heat inside controlled by air flow switch. (noted on the heater)
    g. No outside air to this unit.
    h. Smoke Detector in RA for AHU
    i. Henry Tech S-8068 Refrigerant Receiver (R-22 Refrigerant) Outdoor unit has been replaced and the Owner installed a Refrigerant Receiver to make the system work correctly.

7. AC-21 (Drawings Outdoor Unit-1) Paired with AHU-21 (Mismatch equipment manufacturers):
    a. Goodman Model GSH101204AD (No date)
    b. 460V-3PH
    c. R22 Refrigerant
    d. 60A Safety Switch - rusted - poor condition

8. F-1 Exhaust fan for toilets – existing drawings indicate 1260 CFM: With no outside air to the AHU's this puts the building under negative pressure.

9. AHU-xx (Classroom Indoor Unit-3) did not observe – above ceiling:
    a. Per drawings 1000 CFM, .5 SP, 208V-1Ph, Electric Heat 7.5 KW (208V-1PH)

10. AC-xx (Outdoor Unit-3):

a. RUUD AC Model UPKA-030JAS (10-1992) Fair Condition but very old, no mfg date indicated.
b. 208/230V-1PH
c. R22 Refrigerant
d. 60A Safety Switch - rusted poor condition

GYMNASIUM (1974) and Gym Locker Room Addition (1989)

1. Drawings Available:
   a. 1974 THS Gymnasium full set
   b. 1989 TMS Field House Addition, M-1 and M-2

2. 6 abandoned BARD units mounted in the GYM are rusted in poor condition. (3 each side) Interior of BARD units are infill of a window. The grilles on the interior are bent and in poor condition.

3. 6 abandoned motorized dampers low behind the bleachers on the exterior (3 each side). Owner said they are blocked up on the interior of the building behind the bleachers.

4. Portable HEPA filters were running in the locker room corridors.

5. ECS Controls for this building.

6. HP-1 (Packaged Heat Pump Main Gym Floor) mounted outside with ductwork up the side of the building.
   a. Trane Voyager Model No. WSH240E4RNA0A00B… (12-2015) Good Condition – heat pump
   b. 480V-3Ph
   c. R410a Refrigerant
   d. 200A Heavy Duty Disconnect Switch (Good Condition)
   e. 8000 CFM
   f. With OA Hood (Economizer Damper)

7. HP-2 (Packaged Heat Pump Main Gym Floor) mounted outside with ductwork up the side of the building.
   a. Trane Model No. WSH240E4RNA0A00B… (12-2015) Good Condition – heat pump
   b. 480V-3Ph
   c. R410a Refrigerant
   d. 200A Heavy Duty Disconnect Switch (Good Condition)
   e. 8000 CFM
   f. With OA Hood (Economizer Damper)

8. Matt Squires and Jonathan Fylstra confirmed that ECS DDC does have control of HP-1 and 2, both have dehumidification sequence of operation, and both use their auxiliary electric heat as reheat. The sensors are located above the bleachers on each respective side. They are wired back to ECS controllers, as the BARD units are no longer in operation in the Main Gym.

9. AHU-24 (Labeled HP-1 Boy's Locker Room indoor unit):
   a. Carrier 40BA-009----300---- poor condition (Mfg 7-1989) 33 years old

10. HP-1 (Boy's Locker Room Outdoor unit – Matched with AHU-24)
    a. Carrier Gemini Model 38ARQ008–601-poor condition.
    b. "unknown size" Safety Switch – rusted poor condition (could not read tag)
    c. R-22 Refrigerant
    d. Installed by Pleasant Air – Hampstead
11. AHU-25 (Labeled HP-2 Weight Room Indoor Unit):
    a. Carrier 40AQ02431OBU
    b. 1/4 HP, 208/230V-1PH,
    c. R-22 Refrigerant
12. HP-2 Classroom (Weight Room - Outdoor unit – Matched with AHU-25):
    a. Carrier Model 38YG024300 (very poor condition – Rusted)
    b. R-22 Refrigerant
    c. 30 Amp Safety Switch – rusted poor condition
13. AHU-26 (match with HP-3) Girl's locker room (indoor unit):
    a. Carrier 40BA-009---300 poor condition (Mfg 7-1989) 33 years old
14. HP-3 Girl's Locker Room (Outdoor Unit – Matched with AHU-26):
    a. Goodman G8H100904BB
    b. 460v-3PH
    c. R-22 Refrigerant
    d. 60 Amp Disc Switch "unknown size" Rusted and Very Poor condition.
    e. No outside air found to this unit per the 1989 drawings.
15. Locker Room Areas:
    a. Door Transfer Grilles are damaged and bent.
    b. Observed 2 portable HEPA filters running in the hallways on the Boy's locker room side.
    c. Exhaust from Locker Areas from existing exhaust fans = 8250 cfm (does not include attic exhaust fan or lobby exhaust fan 880 CFM)
    d. Attic exhaust fan 7300 cfm
    e. Large openings around duct penetrations from the attic to inside the building cavity above the ceiling. You can see daylight in many places in the attic and you can see to above the ceilings in the locker rooms below. The building basically has many openings to the outside for temperatures and humidity.
16. Existing fabric ductwork in the Gym – one each HP – one each side. – appeared to be good condition from the ground level.
17. Old Electric heaters have been removed but appear the power disconnects, and conduits remain.
18. 48"x24" high sidewall grilles on the locker room side of the gymnasium are in very poor condition and bent. These are the intakes for the locker room area (single pass).
19. Old thermostats in the gym are abandoned from electric heaters. Remove and provide blank plates.
20. Attic ventilation fan, observed backdraft damper on the exterior wall behind fan as shown on the existing drawings. (No louver).

21. Wall heaters in Girl's and Boy's locker areas, up in lobby area (existing building) – verify functionality and replace if non-functional.

22. HVAC control panel in office (between Boy's locker rooms) – verify functionality – remove and patch wall if not functional or a part of current control system.

23. Exhaust fan lobby area toilets 880 CFM.

24. Two original propeller ventilation fans in the Gym have been removed and openings Blocked off at ridge line of Gym either end.

End of Appendix A

Cheatham and Associates, P.A.
Consulting Engineers

HVAC INFRASTRUCTURE ASSESSMENT
TOPSAIL MIDDLE SCHOOL
PENDER COUNTY SCHOOLS

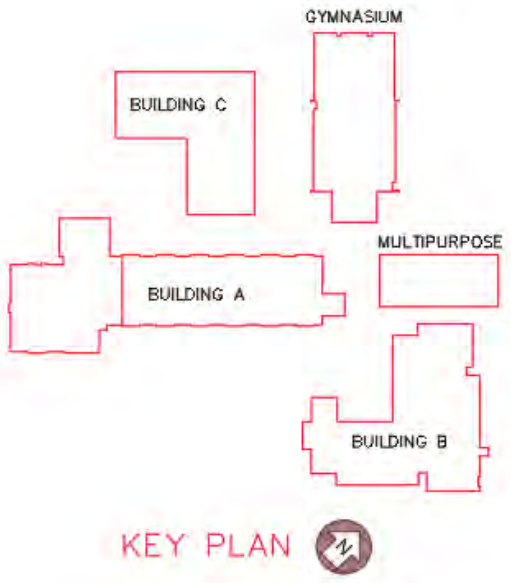
June 20, 2022

Cheatham and Associates (CAPA) is contracted with Pender County Schools (PCS) to provide an assessment of existing HVAC systems based on those conditions that are readily observed. Assessment will include summary of the HVAC systems, their interconnection between buildings, the condition of systems and equipment including age and estimated or typical remaining service life, and recommendations for betterment of control of temperature, relative humidity, and indoor air quality.

The following assessment is for Topsail Middle School (TMS), located at 17445 US Hwy. 17, Hampstead, NC.

TMS is made up of 5 independent buildings, constructed from 1973 to 2009. They are:

- Building A - Admin/Media/Cafeteria and 6 Grade 600 Wing (1973) & Kitchen (1989)
- Building B – 7th Grade 700 Wing (1980 Phase I & 1981 Phase II)
- Building C - 8th Grade 800 Wing (2009)
- Multipurpose Building (1992)
- Gymnasium (1974) and Gym Locker Room Addition (1989)
- Mobile Classroom Units not included in assessment.



HVAC systems are a mix of various types. See attached Appendix A for detailed information of existing HVAC systems and equipment based on CAPA's observations from multiple visits to the site and from multiple meetings.

Costs indicated are CAPA's opinion of probable cost including material, labor, and markup for each recommendation and should be used only for preliminary budgeting purposes.

Delivery times are manufacturer's representative's estimates as of April 14, 2022.

ECS Southeast, LLP provided a report dated January 25, 2022 to Pender County Schools to assess TMS Building B - 7th Grade 700 Wing, Cafeteria, and Gymnasium for mold. ECS' report documented finding of mold spores and in one room (Room 704), elevated levels of carbon dioxide (CO2). Cheatham and Associates' assessment will include recommendations to treat high CO2 levels. Recommendations regarding remediation of mold and mold spores is addressed in ECS' report and is not included in the scope of Cheatham and Associates' services or this assessment.

Indoor Air Quality (IAQ)

Per the US EPA Clean Air in Buildings Challenge – March 2022 and US Department of Education's Improving Ventilation in Schools, Colleges, and Universities to Prevent COVID-19 documents, improving indoor air quality (IAQ) can reduce the risk of exposure to particles, aerosols, and other contaminants, and improve the health of building occupants. Infectious diseases like COVID-19 can spread through the inhalation of airborne particles and aerosols.

Many recommendations that will be made will be regarding betterment of IAQ, including confirming provision of outside air (OA) in a controlled manner and in amounts that the HVAC systems can properly condition, improving filtration in HVAC units, and consideration of air cleaning technologies.

Improving IAQ is an important step that can help prevent elevated counts of mold spores and elevated CO2 levels inside buildings.

If no changes are made to HVAC systems or equipment, all HVAC systems should be tested to determine their supply air, return air, outside air, functionality of outside air dampers, and functionality of any outside air economizers. Testing should be done by an AABC or NEBB certified Test and Balance Company (TAB) in accordance with the Standards of AABC or NEBB. This will allow Pender County Schools to know the condition of each HVAC system with regard to outside air ventilation, a major component of IAQ.

BUILDING A - Admin/Media/Cafeteria and 6th Grade 600 Wing (1973) & Kitchen (1989)

Building A is the Administration Area, 6th Grade Wing, Media Center, and Cafeteria. It has many different types of mechanical systems. See attached Appendix A for detailed information.

Based on observations and values for outside air and exhaust air in the available mechanical documents, Building A overall is under negative pressure. In addition to improved IAQ, more outside air needs to be added to properly pressurize the building. Positive building pressure will help with unconditioned air infiltrating into the building, creating issues with regard to control of temperature and relative humidity.

1. The Administration Area is served by a 7.5-ton Split System Heat Pump (SSHP) AHU-5. Its outside air is closed and blanked off at the outside air louver.

a. Based on age (2018) and apparent functionality, system can remain.

b. Functionality of outside air for ventilation shall be reestablished by removing blank off from outside air intake, confirm operation and DDC control of outside air damper.

c. TAB should occur for systems to confirm supply air, return air, and especially amount of outside air for ventilation and functionality of OA dampers. OA cfm needed is preliminarily estimated to be 400 cfm.

- TAB Cost = $1,700

d. ECS confirmed SSHPs have dehumidification sequence of operation using air handling unit's auxiliary electric heating coil for reheat. Relative humidity (RH) sensor is located in the space. On RH greater than setpoint, suggested as 60%, SSHP operates in cooling to lower space RH and auxiliary electric heat operates in reheat to keep space from overcooling.

e. Replace filters with 2" thick MERV 13 extended surface pleated filters.

- Cost comparison for a standard size filter is $15.00 for 2" MERV 8's and $25.00 for 2" MERV 13's.
- Current PCS schedule for filter replacement is every three months. Changing to higher MERV filters will increase frequency of filter replacements.

f. Add air cleaning technologies in existing unit or ductwork.

- UVC Lamps – Cost = $3,300
- Needle Point Bi-Polar Ionization devices – Cost = $3,000

g. Confirm exhaust fan for restrooms is controlled by ECS and operates on a schedule that coincides with the operation of AHU-5 so that fan is on only when needed and only when outside air dampers are open.

- Cost = $500

2. The (8) 6th Grade Classrooms are each served by a SSHP (AHU-6 through 13) hanging above the ceiling. Outside air to these units is from split system air handling unit AHU-4 used as a Dedicated Outside Air System (DOAS) unit.

a. Based on age (2018) and apparent functionality, all (8) SSHP AHU and outdoor sections system can remain.

b. Getting at least the NC Mechanical Code required ventilation to each of the SSHPs is very necessary. Improved IAQ recommends increasing outside air ventilation to above Code minimums, as long as the HVAC systems can still properly condition the outside air.

c. For these (8) SSHPs, ventilation outside air is provided from split system air conditioning AHU-4 and HP-4 with 15-ton cooling capacity, 29.92 kW electric heat, and Morganizer controller to provide discharge air at a set temperature (current setpoint is 74.0 F). SSAC was replaced in 2018. Eric Cassidy – Brady Trane confirmed system is for 2,000 cfm OA. This corresponds to the NC Mechanical Code minimum required amount of outside air for the (8) SSHPs at 35 students x 7.5 cfm/person = approx. 265 cfm OA per classroom SSHP x 8 classrooms = 2120 cfm OA for AHU-4. SSAC can remain. TAB should occur to confirm amount of outside air for ventilation and functionality of OA dampers for AHU-4 and all (8) SSHPs.

- TAB Cost = $4,500

d. ECS confirmed SSHPs have dehumidification sequence of operation using air handling unit's auxiliary electric heating coil for reheat. Relative humidity (RH) sensor is located in the space. On RH greater than setpoint, suggested as 60%, SSHP operates in cooling to lower space RH and auxiliary electric heat operates in reheat to keep space from overcooling.

e. Replace filters in AHU-4 through 13 with 2" thick MERV 13 extended surface pleated filters.

- Cost comparison for a standard size filter is $15.00 for 2" MERV 8's and $25.00 for 2" MERV 13's.
- Current PCS schedule for filter replacement is every three months. Changing to higher MERV filters will increase frequency of filter replacements.

f. Add air cleaning technologies in existing (8) SSHPs (AHU-6 through 13) or their ductwork. Do not add in AHU-4 because it is not a system that recirculates air.

- UVC Lamps – Cost = $10,000
- Needle Point Bi-Polar Ionization devices – Cost = $8,800

3. Media Center is conditioned by a 20-ton SSHP AHU-3 feeding into (6) VAV boxes with electric reheat. ECS – Matt Squires confirmed these are the only VAV boxes that are still operational. AHU-3 is scheduled on the original drawings at 9600 cfm and 1400 cfm OA with OA economizer. Economizer relief is via a damper into the attic cavity between the two roofs. VAV boxes 5 through 10 are scheduled on the original drawings at 1000 cfm each for a total of 6000 cfm. Nominal airflow for a 20-ton system is 8000 cfm.

a. Based on age (2018) and apparent functionality, SSHP can remain. Insulation on exterior refrigerant piping to HP-3 needs to be replaced.

b. Although ECS advises that the VAV boxes are operational, they are 20-years old. With the Media Center being one common space, the VAV boxes can be removed, and the space would be controlled by averaging the temperature between the two existing Honeywell space sensors. Heat pump compressors and electric auxiliary heat in AHU-3 will heat the space.

c. TAB should occur for systems to confirm supply air, return air, and especially amount of outside air for ventilation and functionality of occupied mode and economizer mode OA dampers. OA cfm needed is preliminarily estimated to be 1500 cfm.

- TAB Cost = $3,500

d. ECS confirmed SSHP has dehumidification sequence of operation using air handling unit's auxiliary electric heating coil for reheat. Relative humidity (RH) sensor is located in the space. On RH greater than setpoint, suggested as 60%, SSHP operates in cooling to lower space RH and auxiliary electric heat operates in reheat to keep space from overcooling.

e. Replace filters with 2" thick MERV 13 extended surface pleated filters.

- Cost comparison for a standard size filter is $15.00 for 2" MERV 8's and $25.00 for 2" MERV 13's.
- Current PCS schedule for filter replacement is every three months. Changing to higher MERV filters will increase frequency of filter replacements.

f. Add air cleaning technologies in existing unit or ductwork.

- UVC Lamps – Cost = $3,300
- Needle Point Bi-Polar Ionization devices – Cost = $3,000

4. Cafeteria is conditioned by a 15-ton SSHP AHU-2. The original drawings schedule AHU-2 as 6600 cfm supply air and 1400 cfm OA with OA economizer. Economizer relief is via a damper into the attic cavity between the two roofs. To provide some cooling to the kitchen, an air duct was tapped into AHU-2s supply with a motor operated damper to open to the kitchen in the cooling mode. Nominal airflow for a 15-ton system is 6000 cfm.
   a. Based on age (2018) and apparent functionality, SSHP can remain. Insulation on exterior refrigerant piping to HP-2 needs to be replaced.
   b. TAB should occur for systems to confirm supply air, return air, and especially amount of outside air for ventilation and functionality of occupied mode and economizer mode OA dampers. OA cfm needed is preliminarily estimated to be 1400 cfm.
      - TAB Cost = $3,000
   c. ECS confirmed SSHP has dehumidification sequence of operation using air handling unit's auxiliary electric heating coil for reheat. Relative humidity (RH) sensor is located in the space. On RH greater than setpoint, suggested as 60%, SSHP operates in cooling to lower space RH and auxiliary electric heat operates in reheat to keep space from overcooling.
   d. Replace filters with 2" thick MERV 13 extended surface pleated filters.
      - Cost comparison for a standard size filter is $15.00 for 2" MERV 8's and $25.00 for 2" MERV 13's.
      - Current PCS schedule for filter replacement is every three months. Changing to higher MERV filters will increase frequency of filter replacements.
   e. Add air cleaning technologies in existing unit or ductwork.
      - UVC Lamps – Cost = $3,300
      - Needle Point Bi-Polar Ionization devices – Cost = $3,000
   f. Confirm exhaust fan for restrooms is controlled by ECS and operates on a schedule that coincides with the operation of AHU-2 so that fan is on only when needed and only when outside air dampers are open.
      - Cost = $500
5. Kitchen has no AC or heat making for difficult working conditions. The only cooling is from an air duct tapped into Cafeteria AHU-2's supply air duct. Motor operated damper at tap opens when AHU-2 is in the cooling mode only. Kitchen hood has a makeup/exhaust fan on the roof. Original drawings indicate 7000 cfm exhaust and 5600 cfm makeup of unconditioned air. The kitchen hood requirements, along with the other exhausts in the kitchen area makes this area under very negative pressure.
   a. To improve working conditions in the kitchen and improve pressurization in Building A, a 2000 cfm DOAS unit can be added to heat and cool the kitchen. The DOAS can recirculate air to heat and cool during unoccupied times and be one pass 100% OA when the kitchen hood is on. This DOAS unit can be mounted on the ground to be easily maintained and ducted to above the ceiling.
      - Cost = $120,000
   b. Any new unit(s) would be connected to ECS's DDC controls and have MERV 13 filters.
   c. Any new unit(s) would not have air cleaning technologies because it is not a system that typically recirculates air.

6. Art Rooms and Classrooms behind the Cafeteria are served by (4) SSHPs with their AHUs located above the ceilings. A separate SSHP with its AHU located above the ceiling provides preconditioned outside air to the return side of the SSHPs.
   a. Based on age (2018) and apparent functionality, all (5) SSHP AHU and outdoor sections system can remain.
   b. TAB should occur for systems to confirm supply air, return air, and especially amount of outside air for ventilation and functionality of OA dampers. OA cfm needed through the OA SSHP is preliminarily estimated to be 1000 cfm.
      - TAB Cost = $2,700
   c. ECS confirmed SSHPs have dehumidification sequence of operation using air handling unit's auxiliary electric heating coil for reheat. Relative humidity (RH) sensor is located in the space. On RH greater than setpoint, suggested as 60%, SSHP operates in cooling to lower space RH and auxiliary electric heat operates in reheat to keep space from overcooling.
   d. Replace filters in AHUs with 2" thick MERV 13 extended surface pleated filters.
      - Cost comparison for a standard size filter is $15.00 for 2" MERV 8's and $25.00 for 2" MERV 13's.
      - Current PCS schedule for filter replacement is every three months. Changing to higher MERV filters will increase frequency of filter replacements.
   e. Add air cleaning technologies in existing (4) SSHPs or their ductwork. Do not add in OA AHU because it is not a system that recirculates air.
      - UVC Lamps – Cost = $5,000
      - Needle Point Bi-Polar Ionization devices – Cost = $4,400
7. Corridors are conditioned by packaged wall mounted units. Four are interior mounted Bard QTEC units and a fifth is exterior mounted Eubanks heat pump.
   a. Age of units are unclear.
   b. Outside air for ventilation should be reopened.
   c. Add five units to ECS controls.
      - Cost = $3,200
8. All abandoned equipment or controls should be removed and walls patched to match existing.
   - Cost = $3,000
9. Overall Building A needs to have the building envelope sealed to the exterior. In many places, daylight from the exterior was observed, especially in the mechanical mezzanines over the group restrooms. From AHUs on these mezzanines, there are large openings around duct penetrations through the original roof to inside the ceiling cavity. Until a project is done to seal penetrations through the original roof, providing sufficient outside air to positively pressure the conditioned space from the attic is the most reasonable way to improve the control of temperature and relative humidity inside the conditioned spaces.

Total budgeting cost for all recommendations for Building A – Admin/Media/Cafeteria and 6th Grade 600 Wing and Kitchen is $167,500 (not including any contingency or design fees).

BUILDING B - 7th Grade 700 Wing (1980 Phase I & 1981 Phase II)

Building B is the 7th Grade classroom wing and Music Room. Building B originally had open spaces for Industrial, Marine, and Auto Shops, but they have been enclosed and are now used as Classrooms. These three Classrooms have Wall Mounted Heat Pumps (WMHP). The remainder of the building has multiple SSHP's serving the rest of the classrooms and common areas.

Based on observations and values for outside air and exhaust air in the available mechanical documents, Building B as originally designed is under negative pressure. In addition to improved IAQ, more outside air needs to be added to properly pressurize the building and the abandoned exhaust fans that served the shops need to be removed and their roof curbs sealed airtight. Positive building pressure will help with unconditioned air infiltrating into the building, creating issues with regard to control of temperature and relative humidity.

ECS advised that problematic Honeywell controllers were the BACnet communicating thermostats that were locking up and not resetting back to their last settings. These were located in Building B only and have all been replaced.

See attached Appendix A for detailed information.

1. Original Shops - now three Classrooms are each served by a dedicated WMHP that hangs on the exterior of the exterior wall. WMHPs are connected to ECS DDC.
    a. Age of WMHPs is unclear.
    b. It is also not clear if existing WMHPs provide outside air for ventilation to the classrooms. If WMHPs are reused, TAB should occur for systems to confirm supply air, return air, and especially amount of outside air for ventilation and functionality of OA dampers.
        - TAB Cost = $2,400
    c. To gain better operation and outside air, replace four existing WMHPs with SSHPs with air handling unit sections located on existing mezzanines above office spaces. Replacement systems will have controls for dehumidification sequence of operation. Relative humidity (RH) sensor can be in return air ductwork upstream of the outside air connection or the better location is in the space. On RH greater than setpoint, suggested as 60%, SSHP operates in cooling and auxiliary electric heat operates in reheat to keep space from overcooling.
        - Cost = $72,000
        - Current delivery time is 18 weeks if not in stock at time of order.
    d. Replace filters with 2" thick MERV 13 extended surface pleated filters.
        - Cost comparison for a standard size filter is $15.00 for 2" MERV 8's and $25.00 for 2" MERV 13's.
        - Current PCS schedule for filter replacement is every three months. Changing to higher MERV filters will increase frequency of filter replacements.
    e. Add air cleaning technologies in existing unit or ductwork.
        - UVC Lamps – Cost = $3,750
        - Needle Point Bi-Polar Ionization devices – Cost = $3,300

f. Where original shop's existing exhaust fans have been abandoned on the roof, remove fans and cover existing roof curb with an insulated curb cap. If needed as part of unit replacements, some of the existing roof curb(s) may be reused for outside air openings.

- Cost = $4,000

g. Observed some of these shop classrooms have insulation on the back of the ceiling tiles and others do not. Recommend adding insulation to the ceilings for all shop classrooms.

- Cost = $3,000

2. Classrooms and Music Room have SSHPs. They are grouped together to have multiple classrooms on 5 separate SSHP's.

ECS Southeast's report dated January 25, 2022 documented measuring elevated levels of carbon dioxide (CO2) in Class 704. This has been a recurring problem. CO2 is generated as off gas from occupants' exhalation. CO2 cannot be filtered out or treated with air cleaning technologies. Treating of CO2 needs to be via dilution by outside air. AHU-14 serving Class 704 needs to be confirmed for proper amount of ventilation outside air and AHU run times.

CO2 sensors have very recently been installed by ECS in AHU-14, 15, 16, 17, and 18. Sensors are for monitoring and trending only.

To help improve conditions with CO2, all AHUs and associated DDC controlled exhaust fans are currently On 24/7/365. PCS reports this is helping with CO2 levels. PCS is waiting to see if this works during warmer months.

a. Based on age (2018) and apparent functionality, all (5) SSHP AHU and outdoor sections system can remain.

b. Ceiling grid is rusted in classrooms and corridor. Possibly related to building negative pressurization and condensation.

c. Rework outside air intakes and ductwork for all AHUs to ensure the supply and control of ventilation air to each unit. Add Manual Dampers (MD and/or Motorized Dampers (MOD) added to each unit as needed. This will give the owner control of how much outside air is being brought into the building and close it in unoccupied times.

- Cost = $8,000

d. TAB should occur for systems to confirm supply air, return air, and especially amount of outside air for ventilation and functionality of OA dampers.

TAB Cost = $4,400

e. Alternatively, to provide OA to SSHP 14, 15, 16, 17, and 18 and pressurize the building, provide two DOAS units; one to provide OA to SSHP 14, 15, and 16, and the second DOAS to provide OA to SSHP 17 and 18.

- Cost = $260,000 including disconnect/reconnect to existing ductwork, controls, and power.
- Current delivery time is 24 weeks if not in stock at time of order.

f. ECS confirmed SSHP 14, 15, 16, 17, and 18 have dehumidification sequence of operation using air handling unit's auxiliary electric heating coil for reheat. Relative humidity (RH) sensor is located in the space. On RH greater than setpoint, suggested as 60%, SSHP

operates in cooling to lower space RH and auxiliary electric heat operates in reheat to keep space from overcooling.

g. Replace filters in AHUs with 2" thick MERV 13 extended surface pleated filters.

- Cost comparison for a standard size filter is $15.00 for 2" MERV 8's and $25.00 for 2" MERV 13's.
- Current PCS schedule for filter replacement is every three months. Changing to higher MERV filters will increase frequency of filter replacements.

h. Add air cleaning technologies in existing SSHPs or their ductwork.

- UVC Lamps – Cost = $6,250
- Needle Point Bi-Polar Ionization devices – Cost = $5,500

3. Attic Fans were installed when the new roof was added. These (5) fans appear to over ventilate for the attic size. The fans were not running the day during our observation.

a. No intakes for air into the attic was observed. Soffits have been sealed shut. Only apparent makeup air path when fans are on is from the conditioned spaces below.

b. Control of fans is not clear. Fan control could be via cooling thermostat(s); it was 40 degrees the day of our observation which could keep them from coming on.

c. Access to these fans is unknown.

d. PCS and ECS advised that they are not aware if these fans are operational.

e. As a first step to confirming fans can be removed and not negatively affect Building B, determine power source circuit breaker and turn off. Roof opening louvers shall have insulated sheetmetal covers temporarily installed over them.

- Cost = $2,500

4. Exhaust Fans for toilets and janitor closets appear to be sized properly.

a. All fans shall have TAB completed with fans adjusted to original design cfm's and fan functionality confirmed.

- Cost = $2,000

b. Confirm exhaust fans are controlled by ECS and operate on a schedule that coincides with the operation of SSHPs so that fans are on only when needed and only when SSHP outside air dampers are open.

- Cost = $800

5. Overall Building B needs to have its envelope sealed to the exterior. In many places, daylight from the exterior was observed, especially above the shop areas where daylight was visible through old fans on the roof. Until a project is done to seal penetrations through the original roof, providing sufficient outside air to positively pressure the conditioned space from the attic is the most reasonable way to improve the control of temperature and relative humidity inside the conditioned spaces.

Total budgeting cost for all recommendations for Building B – 7th Grade 700 Wing is $369,100 (not including any contingency or design fees).

BUILDING C - 8th Grade 800 Wing (2009)

8th Grade 800 Wing is a classroom building with 14 SSHP's, one SSHP for each classroom. AHU sections are located at floor level in Mechanical Rooms. Condensing unit sections are located on the ground. SSHP's are four to five ton cooling capacity. Original design was based on 30 people per classroom with outside air sized accordingly at 7.5 cfm OA/person per the NC Mechanical Code minimum ventilation requirements. Each SSHP AHU has ultraviolet (UV) lights mounted in the return air upstream of the filter section for airstream disinfection.

Building C overall pressurization is positive to the exterior per the original Construction Documents. Outside Air = 3225 cfm and Exhaust = 2150 cfm (excluding Electrical Room because a louvered penthouse provides makeup air for its exhaust).

See attached Appendix A for detailed information.

1. All SSHP's are from 2009 (13 years old) and are in good condition visually. But they are approaching the end of their expected service life (15 years). PCS should budget for these units to be replaced in the near future.
   - Cost = $18,000 per SSHP, including disconnect/reconnect to existing ductwork, controls, and power. For all 14 SSHP's, cost = $252,000.
   - Current delivery time is 18 weeks if not in stock at time of order.
2. Replace filters with 2" thick MERV 13 extended surface pleated filters.
   - Cost comparison for a standard size filter is $15.00 for 2" MERV 8's and $25.00 for 2" MERV 13's.
   - Current PCS schedule for filter replacement is every three months. Changing to higher MERV filters will increase frequency of filter replacements.
3. AHU-9 has water in its auxiliary condensate drain pan – PCS needs to service unit as soon as possible.
4. Some UV lights were working, and some were not based on observation through the site glass mounted on the UV control. Functionality for all shall be confirmed. UV lamps are typically replaced annually due to their degradation.
   - Cost for replacement lamps is $75 per lamp. At 2 lamps per AHU x 14 AHU's = $4,200.
5. Main restroom exhaust fan is controlled through the DDC and should remain.
6. Although not identified as high CO2 in the ECS Southeast report dated January 25, 2022, PCS reports that there is high CO2 throughout the building and that it drops right after students leave the rooms.
7. Original CO2 sensors in the return of each SSHP AHU have been replaced. Sequence of operation was specified to control outside air ventilation based on CO2 readings. Even if functional, recommend deactivating this control. Current recommendations for IAQ are to not reduce outside air for ventilation and building pressurization. Recommend leaving the CO2 sensors active for monitoring purposes only through the DDC controls.
8. Electrical 113 has exhaust controlled by a cooling thermostat for two 112.5 kVA transformers. Makeup air is from an outside air intake that is common with outside air ductwork for the SSHP's. Because CO2 is problematic in the building and CO2 is related to outside air ventilation, to prevent back drafting air through the outside air ducts and the returns of the

SSHP's, recommend removing exhaust and makeup air from common intake and installing a variable capacity 2-ton ductless split system to satisfy the room heat load without exhausting from the building. This will help with the pressurization and ensure the outside air intake remains only for the SSHP's.

- Cost = $17,000 including piping and power and demolition of existing fan.
- Current delivery time is 16 weeks if not in stock at time of order.

9. Building C controls are DDC by Siemens, making it the only building on the site not controlled by ECS controls. SSHPs control to space temperature and relative humidity and have dehumidification sequence of operation. If desired by PCS and when funding allows, convert building controls to ECS DDC.
   - Cost = $57,500 including controllers, sensors, dehumidification sequence, bus/com loop extension to main building Jace, new control enclosures, and new actuators for the OAD's at each unit.
10. TAB should occur for all systems including registers, diffusers, grilles, dampers, and fans to confirm supply air, return air, exhaust air, and especially amount of outside air for ventilation and functionality of OA dampers.
    - Cost = $7,700

Total budgeting cost for all recommendations for Building C - 8th Grade 800 Wing is $338,400 (not including any contingency or design fees).

MULTIPURPOSE BUILDING (1992)

Multipurpose Building is a small Gymnasium with a Classroom at the toilet end of the building. Most of the equipment is original (30 years old) and beyond expected service life and all contain obsolete R-22 refrigerant.

Building currently does not have any outside air for ventilation and the building is very negative pressure resulting in greater difficulty to control temperature, relative humidity, and IAQ.

See attached Appendix A for detailed information.

1. Gym units are two 10-ton capacity 1992 split system air conditioning (SSAC) units, each with electric heater mounted in discharge ductwork.
   a. Both SSAC's are original 1992 (with one AHU section replaced in 2004) and uses obsolete R-22 refrigerant. Recommend replacing both units with two new 10-ton cooling capacity each heat pumps. Units could be split system similar to the original with sections mounted where existing or could be packaged units on the ground, both reconnected to existing ductwork.
      - Cost = $72,000 including disconnect/reconnect to existing ductwork, controls, and power.
      - Current delivery time is 20 weeks if not in stock at time of order.
   b. New units shall have outside air included for ventilation and building pressurization with manual and motorized dampers for TAB and control. Based on NC Mech Code ventilation required for 100 people in the space, outside air would be 450 cfm per unit for a total of 900

cfm OA (design outside air for 200 people in the space would require the cooling capacity of both split systems to increase to 12.5 to 15 tons each).

- TAB Cost = $1,100

c. ECS confirmed existing SSACs have dehumidification sequence of operation using air handling unit's electric heating coil for reheat. Relative humidity (RH) sensor is located in the space. Existing programming shall be connected to the replacement units so that on RH greater than setpoint, suggested as 60%, SSAC operates in cooling to lower space RH and electric heat operates in reheat to keep space from overcooling.

d. New units will have 2" thick MERV 13 extended surface pleated filters. Higher MERV filters will increase frequency of filter replacements.

e. Include air cleaning technologies in units or ductwork.

- UVC Lamps – Cost = $6,000
- Needle Point Bi-Polar Ionization devices – Cost = $6,000

f. Connect new temperature and relative humidity sensors for new units to existing ECS Honeywell controls.

- Cost = $2,000

2. Classroom unit is a 2.5-ton capacity 1992 SSAC with AHU section above the ceiling and outdoor section on the ground. AHU is indicated to have electric heat.

a. SSAC is original 1992 and uses obsolete R-22 refrigerant. Recommend replacing with new SSHP, 3.5-ton cooling capacity with indoor and outdoor sections mounted where existing and reconnected to existing ductwork.

- Cost = $18,000 including disconnect/reconnect to existing ductwork, controls, and power.
- Current delivery time is 18 weeks if not in stock at time of order

b. New units shall have outside air included for ventilation and building pressurization with manual and motorized dampers for TAB and control. Based on NC Mech Code ventilation required for classroom space, outside air would be 250 cfm.

- TAB Cost = $500

c. New AHU shall have auxiliary electric heat in the reheat position. Heater shall have sequence of operation to provide auxiliary heating when necessary and reheat for dehumidification sequence.

d. New unit will have 2" thick MERV 13 extended surface pleated filters. Higher MERV filters will increase frequency of filter replacements.

e. Include air cleaning technologies in units or ductwork.

- UVC Lamps – Cost = $1,500
- Needle Point Bi-Polar Ionization devices – Cost = $1,200

f. Connect new temperature and relative humidity sensors for new unit to existing ECS Honeywell controls.

- Cost = $700

3. Restrooms are exhausted via one roof mounted exhaust fan.

a. Confirm exhaust fan is controlled by ECS and operates on a schedule that coincides with the operation of one of the SSHP's in the building so that fan is on only when needed and only when outside air dampers are open.

   - Cost = $500

b. TAB should occur for existing exhaust fan system. Reduce exhaust airflows to match requirements of current NC Mech Code.

   - Cost = $400

Adding outside air to all three HVAC systems will provide ventilation air for IAQ and positively pressurize the building.

Total budgeting cost for all recommendations for Multipurpose Building is $102,700 (not including any contingency or design fees).

GYMNASIUM (1974) and Gym Locker Room Addition (1989)

Gymnasium Building has a mix of mechanical systems and abandoned mechanical equipment. Some equipment has been added and are in good shape, other equipment for the locker rooms is very old with obsolete R-22 refrigerant.

Building overall pressurization is unknown. Original construction documents indicate 8250 cfm exhaust air but although outside air can be seen to the Gym and Locker Room units, their cfm's are not indicated.

See attached Appendix A for detailed information.

1. Gymnasium has two newer 20-ton capacity packaged heat pump units (2015) mounted on the ground outside with their ductwork up the side of the building. This ductwork transitions into fabric ductwork down each side of the Gym.

   No design information is available for these units but evident by the intake hood these units do have outside air to each one. Based on NC Mech Code for a basketball game type event, outside air required for ventilation is 2,100 cfm per unit for a total of 4,200 cfm OA. Design of outside air for 800 people based on entire school population in the space would require the cooling capacity of both split systems to increase to 35 tons each but any redesign of this space would have to consider if it was prudent to design the HVAC system for a rarely seen peak load.

   a. Based on age and apparent functionality of both systems, they can remain.

   b. TAB should occur for systems to confirm supply air, return air, and especially amount of outside air for ventilation and functionality of OA dampers.

      - TAB Cost = $1,100

   c. Confirm functionality and control of outside air economizers. Economizers should operate only when outside air conditions are suitable to substitute for cooling and not negatively effect the humidity in the building.

   d. ECS confirmed they are controlling HP-1 and HP-2. PCS/ECS to confirm unit's outside air dampers are open when the space is scheduled to be occupied and closed otherwise.

   e. Matt Squires and Jonathan Fylstra confirmed that ECS DDC does have control of HP-1 and 2, both have dehumidification sequence of operation, and both use their auxiliary electric heat

as reheat. The sensors are located above the bleachers on each respective side. They are wired back to ECS controllers, as the BARD units are no longer in operation in the Main Gym.

f. Replace filters with 2" thick MERV 13 extended surface pleated filters.

- Cost comparison for a standard size filter is $15.00 for 2" MERV 8's and $25.00 for 2" MERV 13's.
- Current PCS schedule for filter replacement is every three months. Changing to higher MERV filters will increase frequency of filter replacements.

g. Add air cleaning technologies in existing units or ductwork.

- UVC Lamps – Cost = $7,000
- Needle Point Bi-Polar Ionization devices – Cost = $8,000

h. Confirm exhaust fan for restrooms is controlled by ECS and operates on a schedule that coincides with the operation of HP-1 and HP-2 so that fan is on only when needed and only when outside air dampers are open.

- Cost = $500

i. Six existing abandoned WMHP's located in the upper windows are old and rusted and could be considered a hazard. These units should be removed and windows infilled.

- Cost = $6,000

j. Six existing abandoned louver openings low behind the bleachers should be removed and openings infilled.

- Cost = $6,000

k. Abandoned heaters and controls should be removed and walls patched to match existing.

- Cost = $2,000

2. Locker Room Area has a split system heat pump (SSHP) for the girls' side of the locker room area and a separate SSHP for the boys' side of the locker room area. These units pull conditioned air from the Gymnasium and supply it to the locker room areas. The locker rooms then have all the air exhausted directly to the outside, making the locker rooms single pass systems. Outside air was added at some point to each of these units but the ductwork and any control dampers could not be observed.

a. Both SSHP's are original (1989 = 33 years old) and use obsolete R-22 refrigerant. Recommend replacing both units with two dedicated DOAS units, each mounted on the ground for ease of maintenance. Location can be in location of existing heat pump outdoor sections with ductwork routed up the side of the building and into ceiling cavity to connect to existing or new ductwork. The DOAS units will provide conditioned and dehumidified air that will be supplied to the locker rooms.

- Cost = $290,000 including disconnect/reconnect to existing ductwork, controls, and power.
- Current delivery time is 24 weeks if not in stock at time of order.

b. Condition the locker rooms at night/unoccupied by having DOAS units recirculate for return air and no outside air.

c. DOAS units will have 2" thick MERV 13 extended surface pleated filters. Higher MERV filters will increase frequency of filter replacements.

d. New DOAS units shall be connected to ECS system. Confirm exhaust fans for locker rooms and restrooms are controlled by ECS and operate on a schedule that coincides with the operation of new DOAS units so that fans are on only when needed and only when outside air dampers are open.

- Cost = $2,000

e. Include air cleaning technologies in units or ductwork.

- UVC Lamps – Cost = $7,000
- Needle Point Bi-Polar Ionization devices – Cost = $8,000

f. TAB should occur for existing exhaust fan systems. Reduce exhaust airflows to match requirements of current NC Mech Code.

- Cost = $2,750

g. Sidewall propeller fan and backdraft damper (no louver) observed northwest side of exterior. Existing 1989 drawings indicate fan as 7300 cfm cooling thermostat controlled attic ventilation fan, but there is no apparent makeup air source. PCS and ECS do not know functionality of fan. Per NC Mech Code 406.1, attic space shall be ventilated but ventilation rate can be greatly reduced and be controlled by relative humidity sensor in the attic. Replace fan with louver and motor operated damper.

- Cost = $3,500

h. That portion of Locker Rooms that was originally built in 1974 has large openings around duct penetrations through the original roof to inside the ceiling cavity. Standing on the original roof in the attic, daylight/exterior can be seen in multiple places. Until a project is done to seal penetrations through the original roof, providing sufficient outside air to positively pressure the conditioned space from the attic is the most reasonable way to improve the control of temperature and relative humidity inside the conditioned spaces.

3. Weight Room Area has a SSHP with no outside air for room ventilation. Recommend this unit being replaced and outside air added to the unit. Current usage of the space was not able to be determined.

a. SSHP is (1989 = 33 years old) and is R-22 refrigerant. Recommend replacing unit and connect to the DOAS unit serving the Boy's Locker Room. DOAS unit will provide conditioned and dehumidified air supplied to the Weight Room with the two exhaust fans remaining as is. Cost is included in DOAS for Locker Room.

b. Add temperature and relative humidity sensor in Weight Room to work in conjunction with Locker Room temperature and relative humidity sensor to average space conditions and control DOAS unit.

c. Confirm exhaust fans controlled by ECS and operate on a schedule that coincides with the operation of new DOAS unit so that fans are on only when needed and only when outside air dampers are open.

- Cost = $500

d. TAB should occur for existing exhaust fan systems. Reduce exhaust airflows to match requirements of current NC Mech Code.

- Cost = $400

Total budgeting cost for all recommendations for Gymnasium Building including Locker Rooms is $330,750 (not including any contingency or design fees).

SUMMARY

Topsail Middle School is a group of buildings constructed between 1973 to 2009 with various renovations occurring since being occupied. The HVAC systems are a mix of system types with most being renovated or replaced 2015.

See assessment for each building and area or system for specific suggestions and recommendations. Generally, the HVAC systems and their controls appear to be in good condition. Pender County Schools' operations and maintenance staff have done an extremely commendable job with keeping operational these many different HVAC systems, including those that are of age approaching or are beyond expected typical service life.

Several spaces or areas have been determined to be problematic for high CO2 levels and elevated mold spore counts (ECS report dated January 25, 2022) but improving Indoor Air Quality (IAQ) can help with these problems. Addressing specific mold spore issues is not a part of this assessments scope because that is being addressed by ECS' Report. Paths to improving IAQ are confirming operation of HVAC systems, increasing outside air for ventilation (but if to existing HVAC equipment, increase only to within limits of what the existing HVAC equipment can still properly cool and remove moisture), providing higher efficiency/MERV rated filters, and potential air cleaning technologies including UVC lamps or Needle Point Bi-Polar Ionization devices. Note that Building C – 8th Grade Wing has existing UVC lamps in each HVAC system.

If no changes are made to HVAC systems or equipment, PCS should:

1. Follow the recommendations of ECS' Report(s).
2. Continue to use portable spot filtration units for problematic spaces.
3. All HVAC systems should be tested to determine their supply air, return air, outside air, functionality of outside air dampers, and functionality of any outside air economizers. Testing should be done by an AABC or NEBB certified Test and Balance Company (TAB) in accordance with the Standards of AABC or NEBB. This will confirm to Pender County Schools the condition of each HVAC system and amount of outside air ventilation for IAQ.

- TAB Cost for all buildings = $39,000

Building A - Administration Area, 6th Grade Wing, Media Center, and Cafeteria: HVAC equipment and operation appears to be in good condition but building is overall negative pressure due to insufficient outside air for ventilation. Building envelope in attic space between original roof and newer roof needs to have openings sealed up. The Kitchen needs air conditioning and conditioned makeup air for hood exhausts.

Building B - 7th Grade Classroom Wing and Music Room: HVAC equipment and controls appear to be in condition, but building's negative pressure coupled with CO2 issues means more outside air (OA) is needed for ventilation. So as to not overload recently replaced HVAC systems, additional OA must be

conditioned with DOAS units before it can be supplied into the building. Replacing Shop Area Classroom HVAC units and reworking attic ventilation fans will improve overall functionality of Building B.

Building C - 8th Grade 800 Wing is the newest building on campus. HVAC equipment and controls appear to be functioning properly, but the (18) split system heat pumps are approaching the end of their expected service life (within the next five years). To address CO2 issues in this building, TAB should occur to confirm outside air amounts and sequence of operation functionality should be confirmed for all systems.

Multipurpose Building includes a small gym and a classroom. HVAC equipment needs replacement due to age and use of obsolete refrigerant in the existing equipment. Building does not have any outside air for ventilation.

Gymnasium Building: Gymnasium has newer HVAC units and controls that appear to be in good condition. Locker Room portion of the building has 1989 vintage HVAC equipment that needs replacement due to age and use of obsolete refrigerant in the existing equipment.

To accomplish all the recommendations in this assessment, our opinion of probable cost including a contingency and designer fees is approximately $1,635,000.00.

If it is determined to focus on the assessment recommendations just for air flow testing and balancing (TAB) for the entire campus, Building B - 7th Grade Classroom Wing, and the Multipurpose Building as the items of most immediate need, our opinion of probable cost including a contingency and designer fees is approximately $632,000.00.

Cheatham and Associates appreciates the opportunity to provide this assessment to Pender County Schools as assistance in the decision making process related to HVAC in their buildings. For questions or comments, please contact us.

Prepared by:
Cheatham and Associates, PA

Kenneth Lynch, PE

Attachment – Appendix A

Cheatham and Associates, P.A.
Consulting Engineers

HVAC INFRASTRUCTURE ASSESSMENT
BURGAW MIDDLE SCHOOL
PENDER COUNTY SCHOOLS

July 13, 2022

APPENDIX A – More detailed information found and observed for each HVAC system and area.

General:

1. Drawings Available: (limited drawings available for this project)
   a. Little Architecture (2016) Adm/Science and Band
   b. Ballard, McKim and Sawyer AIA – Administrative & Classroom Addition Burgaw Middle School (1979)
   c. Optima Engineering PA – Burgaw Middle School (1997)

2. Controls:
   a. Siemens Controls and thermostats
   b. Barber-Colman controls (1980 addition)
   c. Trane TR200 VFDs

3. Piping appears to have failed in mechanical rooms with corrosion and rust. Needs to be replaced.

4. All CFMs for each unit were not field verified; they are from the original schedules from the available drawings.

100 Building – Admin/Science and Band

1. Fans:
   a. F-1 – 150 CFM – Toilet 107; Health toilet 109
   b. F-2 – 1,200 CFM – Emergency switch operated (science?)
   c. F-3 – 1,200 CFM - Emergency switch operated (science?)
   d. F-4 – 275 CFM – Toilets 122 & 124

2. SS-1 Split system heat pump: (07/2016)
   a. Trane model TAM7A0C36H - good condition
   b. 1,260 CFM
   c. 200 OA CFM
   d. 1 hp
   e. 208V-3ph

3. CU-1 (Match with SS-1)
   a. Trane model 4TWA7036A – good condition
   b. 208V-3ph
   c. R-410a Refrigerant
   d. 30A disconnect – good condition

4. SS-2 Split system heat pump:
   a. Trane model TAM7A048H - good condition
   b. 1,575 CFM
   c. 200 OA CFM
   d. 1 hp
   e. 208V-3ph

5. CU-2 (Match with SS-2)
   a. Trane model 4TWA7048A – good condition
   b. R-410a Refrigerant
   c. 208V-3ph
   d. 30A disconnect – good condition

6. SS-3:
   a. Trane Performance Climate Changer (2016) CSAA017 – good condition
   b. 4,000 CFM
   c. 2,025 OA CFM
   d. 10 hp supply fan
   e. 5 hp exhaust fan
   f. Natural gas input: 400 MBH max, 66 MBH min.
   g. Natural gas output: 320 MBH max, 53 MBH min.
   h. Burner: 115V-1ph
   i. 208V-3ph
   j. VFD – 208V-3ph - good condition

7. CU-3 (Match with SS-3) (9-2016)
   a. Trane TTA300J300AA - good condition
   b. 410A Refrigerant
   c. 208V-3ph
   d. 200A HD disconnect

8. SS-4:
   a. Trane Performance Climate Changer (2016) CSAA008 – good condition
   b. Unknown CFM (4,000 CFM scheduled DD)
   c. Unknown CFM (2,025 OA CFM DD)
   d. 7.5 hp supply fan
   e. 3 hp exhaust fan
   f. Natural gas input: 250 MBH max, 66 MBH min.
   g. Natural gas output: 200 MBH max, 53 MBH min.

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h. UV light (outlet with UV light labeled – not observed)
i. 208V-3ph
j. VFD – 208V-3ph - good condition

9. CU-4 (Match with SS-4)
   a. Trane TTA150H300AA (2-2016) - good condition
   b. R-410A Refrigerant
   c. 208V-3ph
   d. 100A HD disconnect – good condition

10. SS-5 (DSSHP):
   a. Trane (Mitsubishi) model PKA-A24KA6 (06/2016) - good condition
   b. R-410A Refrigerant
   c. 208V-1ph

11. CU-5 (Match with SS-5) good condition
   a. Trane (Mitsubishi) model PUZ-A24NHA6 (06/2016)
   b. R-410A Refrigerant
   c. 208V-1ph
   d. 30A HD disconnect – good condition

12. ERV-1
   a. MicroMetl EVEGEEA24YKA0BAEFG-A (2016) – good condition
   b. 2250 CFM scheduled
   c. 3.75 hp relief fan
   d. 3.75 hp supply fan
   e. Wheel motor 0.05 HP
   f. 30 A General Duty Safety Switch - good condition
   g. 208V-3ph

13. UH-1
   a. Marley WHB1202FC (2017) – good condition
   b. 208V-1ph
   c. 1.5 KW

200 Building (6th Grade): The AHU for room 202 was leaking severely and had ruined the ceiling tile underneath it. There was a trashcan collecting the falling condensate in the hallway. No air is being supplied in the hallway; cooling must come from the classrooms.

1. SSHP-1 (Room 1)
   a. Radco FB4ANF036 – fair condition
   b. 208/230V-1ph
   c. 1/3 hp fan motor
   d. R-22 refrigerant
   e. Heat pack KFAEH040 installed for reheat

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2. CU-1 (matched with SSHP-1)
   a. Carrier 38YCC036 – poor condition
   b. 208/230V-3ph
   c. 1/4 hp fan motor
   d. R-22 refrigerant
   e. 30A disconnect – poor condition

3. SSHP-2 (Room 2)
   a. Radco FB4ANF036 – fair condition
   b. 208/230V-1ph
   c. 1/3 hp fan motor
   d. R-22 refrigerant
   e. Heat pack KFAEH040 installed for reheat

4. CU-2 (matched with SSHP-2)
   a. Carrier 38YCC036 – poor condition
   b. 208/230V-3ph
   c. 1/4 hp fan motor
   d. R-22 refrigerant
   e. 30A disconnect – poor condition

5. SSHP-3
   a. Radco FB4ANF036 – fair condition
   b. 208/230V-1ph
   c. 1/3 hp fan motor
   d. R-22 refrigerant
   e. Heat pack KFAEH040 installed for reheat

6. CU-3 (matched with SSHP-3)
   a. Carrier 38YCC036 – poor condition
   b. 208/230V-3ph
   c. 1/4 hp fan motor
   d. R-22 refrigerant
   e. 30A disconnect – poor condition

7. SSHP-4
   a. Radco FB4ANF036 – fair condition
   b. 208/230V-1ph
   c. 1/3 hp fan motor
   d. R-22 refrigerant
   e. Heat pack KFAEH040 installed for reheat

8. CU-4 (matched with SSHP-4)
   a. Carrier 38YCC036 – poor condition
   b. 208/230V-3ph
   c. 1/4 hp fan motor

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d. R-22 refrigerant
e. 30A disconnect – poor condition

9. SSHP-5
   a. Radco FB4ANF036 – fair condition
   b. 208/230V-1ph
   c. 1/3 hp fan motor
   d. R-22 refrigerant
   e. Heat pack KFAEH040 installed for reheat

10. CU-5 (matched with SSHP-5)
   a. Carrier 38YCC036 – poor condition
   b. 208/230V-3ph
   c. 1/4 hp fan motor
   d. R-22 refrigerant
   e. 30A disconnect – poor condition

11. SSHP-6
   a. Radco FB4ANF036 – fair condition
   b. 208/230V-1ph
   c. 1/3 hp fan motor
   d. R-22 refrigerant
   e. Heat pack KFAEH040 installed for reheat

12. CU-6 (matched with SSHP-6)
   a. Carrier 38YCC036 – poor condition
   b. 208/230V-3ph
   c. 1/4 hp fan motor
   d. R-22 refrigerant
   e. 30A disconnect – poor condition

13. SSHP-7
   a. Radco FB4ANF036 – fair condition
   b. 208/230V-1ph
   c. 1/3 hp fan motor
   d. R-22 refrigerant
   e. Heat pack KFAEH040 installed for reheat

14. CU-7 (matched with SSHP-7)
   a. Carrier 38YCC036 – poor condition
   b. 208/230V-3ph
   c. 1/4 hp fan motor
   d. R-22 refrigerant
   e. 30A disconnect – poor condition

15. SSHP-8

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a. Radco FB4ANF036 – fair condition
b. 208/230V-1ph
c. 1/3 hp fan motor
d. R-22 refrigerant
e. Heat pack KFAEH040 installed for reheat

16. CU-8 (matched with SSHP-8)
    a. Carrier 38YCC036 – poor condition
    b. 208/230V-3ph
    c. 1/4 hp fan motor
    d. R-22 refrigerant
    e. 30A disconnect – poor condition

17. Exhaust Fan toilets

300 Building (7th and 8th Grade):

1. Fans:
    a. F-6 – 250 CFM

2. AHU-3 (H&AC unit 3) – HW Pipes have virtually no insulation and are severely rusted to unit.
    a. Trane Climate Changer CCDA123BLA – poor condition very rusted
    b. 5,800 CFM (scheduled)
    c. 500 OA CFM (scheduled)
    d. 208V-3ph
    e. 5 hp supply fan (belt driven)
    f. 150A breaker for Fan Switch 3 120/208V
    g. R-22 refrigerant
    h. Fan Starter 3 – reset switch?

3. AC-3 (Match with AHU-3)
    a. Trane RAUB-1503-A – poor condition
    b. 208V-3ph
    c. R-22 Refrigerant
    d. 150A MCP
    e. 200A disconnect – poor condition (No definitive picture of disconnect, assumed to be 200A.)

4. DAHU Art Room: (good condition)
    a. (2) DAHU's in room both same
        a. Mitsubishi MSZ-GE09NA, one labeled "A" and one labeled "B"
        b. 208/230V-1ph
        c. 15A disc switch
    b. 208V-1ph

c. R-410a refrigerant

5. DHP Art Room: (fair condition)
   a. Mitsubishi MXZ-2B20NA
   b. 208V-1ph
   c. R-410a refrigerant
   d. 60A safety switch

6. AHU-4 (H&AC unit 4)
   a. Trane Climate Changer CCDA123BLA – poor condition
   b. 5,850 CFM (scheduled)
   c. 500 OA CFM (scheduled)
   d. 200V-3ph
   e. R-22 Refrigerant
   f. 5 hp supply fan (belt driven)
   g. 150A breaker Fan Switch 4
   h. Fan Starter 4 – reset switch?

7. AC-4 (Match with AHU-4) (9-2006)
   a. Trane Odyssey TTA180C300GA – poor condition
   b. 208V-3ph
   c. R-22 refrigerant
   d. 200A disconnect
   e. MCA: 62.7A
   f. MOCP: 80A

Cafeteria/Kitchen: No drawings for this building except boiler room renovation 1979.

We were informed that the school turns off the Bard units during the nighttime and the floor gets wet due to condensation overnight. Signs with adhesive tape fall off the walls probably due to heat and humidity, and the ceiling tiles are sagging.

1. Bard unit #1
   a. WH361-A10 – poor condition
   b. 230/208V-1ph
   c. R-22 refrigerant

2. Bard unit #2
   a. WH361-A0Z – poor condition
   b. Heater pkg WMCB-06A
   c. 230/208V-1ph
   d. R-22 refrigerant

3. Bard unit #3
   a. WH361-A00 – poor condition
   b. 208V-1ph

c. R-22 refrigerant

4. Bard unit #4
   a. WH361-A00 – fair condition
   b. 208V-1ph
   c. R-22 refrigerant

5. Four steam fan coil units (abandoned??? – no steam available anymore – converted to HW in boiler room 1979)
   a. All four units have steam and condensate piping but are not running. They are all in poor condition.

6. 3/4" hot water make-up water station replaced in 1979 addition.

7. Boiler-1 – Poor condition - severely rusted (This steam boiler was converted to HW system for the 1979 addition). (Steam boiler/HW converter/oil to boiler and natural gas to boiler)
   a. Weil McLain 1394 Steam Boiler
   b. 2-pass HW converter to deliver 98 GPM of 180-200 degree water temp with 2 psi steam pressure. (2-1/2" to addition, 2-1/2" capped HWS and HWR lines in boiler room for future) information per 1979 drawings and appear to be fairly accurate from pictures
   c. Gas MBH: 4.330
   d. Gross MBH output: 3,480
   e. Dual fuel burner: No. 2 fuel oil/natural gas
      i. Webster JB2C-20-RM7896C-LL (06/2013) – good condition
      ii. 115V-1ph
      iii. Oil pump: Westinghouse, 115v-1ph with daytank and oil pump. (If not used – remove)
      iv. Natural gas has been installed to the boiler.

8. Hot water pump (fair condition)
   a. Taco FI1509E2EAH (05/2017)
   b. GPM (scheduled 37 GPM)
   c. Ft. Head (scheduled 49 ft head)
   d. 9.25" impeller diameter
   e. Motor is 115V/203V-1ph, 3hp
   f. Pump relay for disconnect

9. HP – Kitchen (matched with Kitchen AHU)
   a. Goodman condenser – no tag on the outside of unit – poor condition

10. Air Handler Unit - Kitchen
    a. Alumacoil ASPT61D14AB – fair condition
    b. 208/230V-1ph
    c. R-410A refrigerant

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d. No heat kit
e. 1hp motor

11. Kitchen exhaust/make-up unit on roof – no information.

Gymnasium:

1. AHU – Gymnasium
   a. TWE240E300BB – (03/2018) – good condition
   b. Electric heat?
   c. 208V-3ph
   d. 5 hp
   e. 30A disconnect (fair condition)
   f. R-410a Refrigerant
   g. Electric duct heater in Gym with disconnect
   h. Honeywell thermostat

2. CU – Gymnasium (need pictures)
   a. Unable to open gate to obtain information from tag – (presumably 03/2018)– good condition

3. Storage room:
   a. Window unit: Friedrich EP18G33B – fair condition
   b. 208V-1ph
   c. R-410a refrigerant

4. Bard unit: (Health Room)
   a. WH301-A10– fair condition
   b. 230V/208V-1ph
   c. R-22 refrigerant

5. Locker rooms
   a. Heat??
   b. Exhaust??
   c. AC??

Building 400 - Media and Offices:

1. F-5 – 349 CFM
2. AHU-1 (H&AC unit 1): hot water piping to unit is extremely rusted with little to no insulation on piping. Controls look to be very old.
   a. Trane CCDA063BLA – (1980) – poor condition, still makes cold air. Bottom of unit is rusted away.
   b. 2,150 CFM (scheduled)
   c. 350 OA CFM (scheduled)

d. 208V-3ph
e. 1.5 hp
f. 30 A disconnect (poor condition)
g. Outside air intake is sealed off at the louver.
h. Belt driven fan.
i. R-22 Refrigerant

3. A-C Unit #1 (Match with AHU-1)
   a. Trane RAUC-506-B – poor condition
   b. 208V/230V-3ph
   c. 60A disconnect – poor condition

4. AHU-2 (H&AC unit 2) Piping to unit is extremely rusted with little to no insulation around piping. Unit is very rusted as well.
   a. Trane CCDA103BLA – poor condition, bottom of unit is rusted away.
   b. 4,300 CFM (scheduled)
   c. 400 OA CFM (scheduled)
   d. 208V-3ph
   e. 3 hp
   f. Belt driven fan.
   g. R-22 refrigerant.
   h. Fairly new 3-way valve
   i. OA louver in good condition.
   j. Fan switch on wall with reset

5. A-C Unit #2 (Match with AHU-2) – Poor condition and rusted.
   a. Trane RAUB-C113-A (1980)
   b. 208V/230V-3ph
   c. 100A disconnect – poor condition

ASP Building:

1. AHU-1 (In small closet detached from building, services room 117 of ASP building) – There is a hole in the roof above the AHU and a large tarp covering AHU. Potential water dripping on the disconnect as well. Disconnect is rusted on top. The supply duct going through the wall is uninsulated and is sweating in the closet it is going through.
   a. Ruud UBHA-17J0NUCA (01/2006)– poor condition
   b. 208V-1ph
   c. 1/4 hp supply fan
   d. 7.2kW heating
   e. 60A disconnect – poor condition and rusted
   f. Old dial type thermostat

2. HP-1 (Match with AHU-1 in ASP building)
   a. Ruud UPMD-036JAZ (01/2006) – poor condition
   b. 208V-1ph
   c. R22 refrigerant
   d. 60A disconnect – poor condition

3. AHU-2 (In room 118) AHU is exposed in the corner of the room.
   a. Ameristar M4AH4P36B1B00AA – good condition
   b. 208V-1ph
   c. 1/2 hp supply fan
   d. 10.0kW electric heating
   e. 60A disconnect – good condition
   f. R-410a Refrigerant
   g. No outside air

4. HP-2 (Match with AHU-2 in ASP building)
   a. Ameristar M4HP4036A1000AB – good condition
   b. 208V-1ph
   c. R-410a refrigerant
   d. 60A disconnect – poor condition

5. AHU-3 (In room 116 of ASP building) – AHU is exposed in the room – nothing hiding AHU. Thermostat is attached to side of AHU.
   a. Ameristar M4AH4P48B1000AA – good condition
   b. 208V-1ph
   c. 1/2 hp supply fan
   d. 10.0kW heating
   e. 60A disconnect – good condition
   f. R-410a refrigerant
   g. No outside air

6. HP-3 (Match with AHU-3 in ASP building)
   a. Ameristar M4HP4048A1000AA – good condition
   b. 208V-1ph
   c. R-410a refrigerant
   d. 60A disconnect – poor condition

Storage Building:

1. Bard unit (inaccessible – could not get to to read tag)
2. Rheem Condensing unit RAKA-060JAZ (9-2002) 30 years old
   a. 208V-1ph
   b. 2hp fan
   c. R-22 refrigerant
   d. 60A disconnect – fair condition

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Mobile units:

1. Room T-2
   a. Bard unit – tag illegible –fair condition

2. Room T-3
   a. Bard unit – tag illegible – fair condition

3. Room T-4
   a. Bard unit WH361-A00 – fair condition
   b. 208V/-1ph
   c. R-22 refrigerant
   d. 60A disconnect – fair condition

4. Room T-5
   a. Bard unit 3AWH7-A10 – fair condition
   b. 208V/-1ph
   c. R-22 refrigerant
   d. 60A disconnect – fair condition

5. Room T-6
   a. Bard Unit WH361-A00 – fair condition
   b. 208V-1ph
   c. R-22 refrigerant

6. Room T-7
   a. Window Unit FAS25ER2A (2009) – good condition
   b. 208V/230V-1ph
   c. 9.4 EER

7. Room T-8
   a. Bard Unit WH301-A00 – fair condition
   b. 208V/230V-1ph
   c. R-22 refrigerant
   d. 60A disconnect – very poor condition

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HVAC INFRASTRUCTURE ASSESSMENT
CAPE FEAR ELEMENTARY AND MIDDLE SCHOOL
PENDER COUNTY SCHOOLS

July 14, 2022

APPENDIX A – More detailed information found and observed for each HVAC system and area.

General:

1. Drawings Available:
   a. Little Architecture - (2016) Cape Fear Elementary and Middle School Classroom Additions
   b. Little Architecture – (1999) Cape Fear Elementary and Middle School

2. Controls:
   a. Siemens-Apogee 1999

Elementary School Classroom Wing (1999): Nearly every fan coil unit is dripping condensate from the refrigerant pipes. The ceiling tiles directly under each FCU has a brown wet spot on it. Condensates from FCU's go to dry wells.

1. Fans:
   a. F-1 – 2,270 CFM – Toilet 145&146, 1st grade & kindergarten toilets
   b. F-2 – 500 CFM – Electrical room
   c. F-3 – 360 CFM – Janitor, kiln, staff toilet

2. Fan Coil Unit – A (Serving rooms: 143, 151)
   a. Carrier model 42CFA06FRFY
   b. 400 CFM (Scheduled)
   c. 40 OA CFM (Scheduled)
   d. 220W supply fan (Scheduled)
   e. 277V-1 ph
   f. Toggle type disconnect

3. Fan Coil Unit – C (Serving rooms: 310, 409, 510, 153)
   a. Carrier model 42DCA10KRFY
   b. 800 CFM (Scheduled)
   c. 90 OA CFM (Scheduled)
   d. 1/2hp supply fan (Scheduled)
   e. 277V-1 ph
   f. Toggle type disconnect

4. Fan Coil Unit – D (Serving rooms: 309, 410, 509)
    a. Carrier model 42DCA12KRFY
    b. 1,000 CFM (Scheduled)
    c. 90 OA CFM (Scheduled)
    d. 3/4hp supply fan (Scheduled)
    e. 277V-1 ph
    f. Toggle type disconnect

5. Fan Coil Unit – E (Serving rooms: 501-508)
    a. Carrier model 42DCA16KRFY
    b. 1,300 CFM (Scheduled)
    c. 225 OA CFM (Scheduled)
    d. 3/4hp supply fan (Scheduled)
    e. 277V-1 ph
    f. Toggle type disconnect

6. Fan Coil Unit – F (Serving rooms: 152, 158, 301-308, 400-408)
    a. Carrier model 42BHB16QF3
    b. 1,600 CFM (Scheduled)
    c. 225 OA CFM (Scheduled)
    d. 3/4hp supply fan (Scheduled)
    e. 277V-1 ph
    f. Toggle type disconnect

Central Core (1999): Butterfly handles on piping are in poor condition.

1. Fans:
    a. F-7 – 1,240 CFM – Elementary school toilets
    b. F-8 – 1,360 CFM – Middle school toilets
    c. F-9 – 1,180 – Boy's locker room area
    d. F-10 – 1,240 CFM – Girl's locker room area
    e. F-11 – 3,550 CFM – Boiler room 281
    f. F-12 – 1,000 CFM – Main electrical room 283
    g. F-13 – 8,260 CFM – Kitchen hood exhaust
    h. F-14 – 5,780 CFM – Kitchen hood make up
    i. F-15 – 600 CFM – Dishwasher hood exhaust
    j. F-16 – 125 CFM – Janitor 289
    k. F-17 – 125 CFM – Kitchen toilet 278
    l. F-18 – 500 CFM – Electrical exhaust 252

2. Fan Coil Unit – A (Serving rooms: data 218, data 230, 254)
    a. Carrier model 42CFA06FRFY
    b. 400 CFM (Scheduled)
    c. 40 OA CFM (Scheduled)
    d. 220W supply fan (Scheduled)
    e. 277V-1 ph

f. Toggle type disconnect

3. Fan Coil Unit – B (Serving room: media conference room 220, guidance 250, and office 251)
   a. McQuay model SHB-081B (Scheduled, probably Carrier.)
   b. 600 CFM (Scheduled)
   c. 60 OA CFM (Scheduled)
   d. 1/4W supply fan (Scheduled)
   e. 277V-1 ph
   f. Toggle type disconnect

4. Fan Coil Unit – D (Serving room AV studio 221)
   a. Carrier model 42DCA12KRFY
   b. 1,000 CFM (Scheduled)
   c. 90 OA CFM (Scheduled)
   d. 3/4hp supply fan (Scheduled)
   e. 277V-1 ph
   f. Toggle type disconnect

5. Fan Coil Unit – E (Serves rooms: media work room 223, and office 224)
   a. Carrier model 42DCA16KRFY
   b. 1,300 CFM (Scheduled)
   c. 225 OA CFM (Scheduled)
   d. 3/4hp supply fan (Scheduled)
   e. 277V-1 ph
   f. Toggle type disconnect

6. Fan Coil Unit – F (Serves rooms: Boy's locker area, girls locker area)
   a. Carrier model 42BHB16QF3
   b. 1,600 CFM (Scheduled)
   c. 225 OA CFM (Scheduled)
   d. 3/4hp supply fan (Scheduled)
   e. 277V-1 ph
   f. Toggle type disconnect

7. Fan Coil Unit – G (Serves rooms: (2) in corridor 271, 201, elementary school media support area, middle school media support area, (2) in corridor 227, (3) in kitchen, M.P. stage 270)
   a. Carrier model 42BHB20KF3
   b. 1,900 CFM (Scheduled)
   c. 225 OA CFM (Scheduled)
   d. 1hp supply fan (Scheduled)
   e. 277V-1 ph
   f. Toggle type disconnect

8. Fan Coil Unit – H (Serves room: gymnasium stage 263) – Unreachable; too high above ceiling to obtain tag information.
    a. McQuay model SHB-201B (Scheduled, probably Carrier)
    b. 2,400 CFM (Scheduled)
    c. 300 OA CFM (Scheduled)
    d. 1hp supply fan (Scheduled)277V-1 ph
    e. Toggle type disconnect

9. Fan Coil Unit – J (2) Serves Dishwasher area - Unreachable; too high above ceiling to obtain tag information.
    a. McQuay model SHB-201B (Scheduled, probably Carrier)
    b. 800 CFM (Scheduled)
    c. No scheduled OA CFM
    d. 370W supply fan (Scheduled)
    e. 277V-1 ph
    f. Toggle type disconnect

10. Fan Coil Unit – K (Receiving storage - kitchen area) – Unreachable; no tag on the outside of unit, not able to move furniture out of the way to open FCU. Slightly rusted on the outside of unit.
    a. McQuay model SHB-201B (Scheduled, probably Carrier)
    b. 300 CFM (Scheduled)
    c. No scheduled OA CFM
    d. 150W supply fan (Scheduled)
    e. 277V-1 ph
    f. Toggle type disconnect

11. Air Hander Unit – 1 (Serves elementary school media center 219) – 4 pipe
    a. Carrier model 39LF15BA – good condition
    b. 5,625 CFM (Scheduled)
    c. 750 OA CFM (Scheduled)
    d. 5hp supply fan (Scheduled)
    e. Electric duct heater for dehumidification control
        i. 25kW
        ii. 460V-3ph
    f. 460V-3 ph (Scheduled, not found on unit)
    g. HW is in reheat position
    h. 30A disconnect, VFD - good condition

12. Air Hander Unit – 2 (Serves Media Center 228)
    a. Carrier model 39LF15BA – good condition
    b. 5,625 CFM (Scheduled)
    c. 750 OA CFM (Scheduled)
    d. 5hp supply fan (Scheduled)
    e. Electric duct heater for dehumidification control
        i. 25kW

ii. 460V-3ph
f. 460V-3 ph (Scheduled, not found on unit)
g. Reheat position
h. 30A disconnect, VFD - good condition

13. Air Hander Unit – 3 (Serves Gymnasium 264): CHW and HW piping to unit is severely rusted along with the valves to the unit.
    a. Carrier model 39TVVVAP – 4 pipe – fair condition: Condensate is pouring profusely from bottom of the unit into the mechanical room. Water puddled up all around back of unit. This needs immediate attention.
    b. 12,500 CFM (Scheduled)
    c. 4,000 OA CFM (Scheduled)
    d. 15hp supply fan (Scheduled)
    e. 460V-3 ph (Scheduled, not found on unit)
    f. HW is in reheat position
    g. 60A disconnect and VFD – good condition

14. Air Hander Unit – 4 (Serves Cafeteria 280): CHW and HW piping to unit is rusted and slightly corroded. Valves to unit are rusted as well.
    a. Carrier model 39LF18KA – 4 pipe – good condition
    b. 7,500 CFM (Scheduled)
    c. 1,500 OA CFM (Scheduled)
    d. 7.5hp supply fan (Scheduled)
    e. 460V-3 ph (Scheduled, not found on unit)
    f. HW is in reheat position
    g. 30A disconnect and VFD– good condition

15. Air Hander Unit – 5 (Serves Multipurpose 269): Insulation around piping is coming apart and has been partially put back together. Rusted to unit as well.
    a. Carrier model 39LF18KA – 4 pipe – good condition
    b. 7,500 CFM (Scheduled)
    c. 1,500 OA CFM (Scheduled)
    d. 7.5hp supply fan (Scheduled)
    e. 460V-3 ph (Scheduled, not found on unit)
    f. HW is in reheat position
    g. 30A HD Safety Switch disconnect and VFD – good condition

16. Air Hander Unit – 6 (Serves Cafeteria 272): CHW and HW piping to unit is rusted and slightly corroded. Valves to unit are rusted as well. Refrigerant insulation is coming off at the unit.
    a. Carrier model 39LF18KA – 4 pipe – good condition
    b. 7,500 CFM (Scheduled)
    c. 1,500 OA CFM (Scheduled)
    d. 7.5hp supply fan (Scheduled)
    e. 460V-3 ph (Scheduled, not found on unit)
    f. HW is in reheat position

g. 30A HD Safety Switch disconnect and VFD – good condition

17. IDU – 1 (Serves Admin area near elementary side of building)
    a. Carrier model FB4ANF060 – good condition
    b. 2,000 CFM (Scheduled)
    c. 200 OA CFM (Scheduled)
    d. No heat pack added
    e. 208V-3 ph
    f. R-22 refrigerant
    g. 3/4 hp fan motor
    h. 60A HD Safety Switch disconnect – good condition

18. HP- 1 (Match with IDU - 1)
    a. Carrier model 38YCC060 – poor condition
    b. R-22 Refrigerant
    c. 208V-3 ph
    d. 30A HD Safety Switch disconnect – poor condition

19. IDU – 2 (Serves Admin area near elementary side of building)
    a. Carrier model FB4ANF030 – good condition
    b. 1,000 CFM (Scheduled)
    c. 100 OA CFM (Scheduled)
    d. No heat pack added
    e. 208V-3 ph
    f. R-22 refrigerant
    g. 60A HD Safety Switch disconnect – good condition

20. HP - 2 (Match with IDU - 2)
    a. Carrier model 38YCC030 – poor condition
    b. R-22 Refrigerant
    c. 208V-3 ph
    d. 30A HD Safety Switch disconnect – poor condition

21. IDU – 3 (Serves Admin area near middle school side of building)
    a. Carrier model FB4ANF024 – fair condition, but very old
    b. 800 CFM (Scheduled)
    c. 80 OA CFM (Scheduled)
    d. 10.3kW heat
    e. 1/4 hp fan motor
    f. R-22 refrigerant
    g. 208/230V-1ph
    h. 60A HD Safety Switch disconnect – good condition

22. HP - 3 (Match with IDU - 3): Refrigerant insulation is cracked and deteriorating.
    a. Carrier model 38YCC024 – poor condition
    b. R-22 Refrigerant

c. 208/230V-1 ph
d. 30A HD Safety Switch disconnect – poor condition

23. IDU – 4 (Serves Admin area near middle school side of building)
    a. Carrier model FB4ANF060 – fair condition, but very old
    b. 2,000 CFM (Scheduled)
    c. 200 OA CFM (Scheduled)
    d. 13.5kW heat
    e. R-22 refrigerant
    f. 3/4 hp fan motor
    g. 208/230V-3 ph
    h. 60A HD Safety Switch disconnect – good condition

24. HP - 4 (Match IDU - 4) Refrigerant insulation is cracked and deteriorating. There was some attempt to tape up insulation.
    a. Carrier model 38YCC060 – poor condition
    b. R-22 Refrigerant
    c. 208/230V-3 ph
    d. 30A HD Safety Switch disconnect – good condition: has been replaced since HP installation.

Chiller Yard:

1. Chiller #1 (06/06/2017)
    a. York model YLAA0200HE – good condition
    b. R-410a refrigerant
    c. 189 Tons (Scheduled)
    d. 380 GPM
    e. 460V-3 ph
    f. 600A HD safety switch – poor condition

2. Chiller #2
    a. Trane RTAC 2004 U1GN
    b. R134a refrigerant
    c. 189 Tons (Scheduled)
    d. 380 GPM
    e. 460V-3 ph
    f. 600A HD safety switch – fair condition

3. Cooling tower: some of the refrigerant insulation is cracking. One valve is partially closed.
    a. Baltimore Aircoil Company model 15201
    b. Warrick controls
    c. 460V-3 ph
    d. 30A HD Safety Switch disconnect – fair condition
    e. Fair condition

4. 10,000-gallon oil storage tank
    a. Above grade
    b. Currently in use

Boiler room: Chilled water air separator was sweating profusely though it was insulated. Chilled water piping is sweating and mildewed. Butterfly valves are in very poor condition. Exhaust fan to louver above door. Chemical feeder in fair condition. Remove day tank (Only if not using oil for burners).

1. Boiler #1
    a. Weil McLain model 788 – poor condition
    b. 1,632 MBH Gross output, 1,419 MBH net output
    c. 2,049 MBH input
    d. Burner
    e. Dual fuel oil fired burner:
        i. Webster model JBIC-07 (08/14/2015) – good condition
        ii. 3/4 hp motor
        iii. 115V-1 ph

2. Boiler #2
    a. Weil McLain model 788 – poor condition
    b. 1,632 MBH Gross output, 1,419 MBH net output
    c. 2,049 MBH input
    d. Burner
    e. Dual fuel oil fired burner:
        i. Webster model JBIC-07 (08/14/2015) – good condition
        ii. 3/4 hp motor
        iii. 115V-1 ph

3. P-1 Chilled water system pump (parallel with P-2)
    a. Bell & Gossett 1510-3E
    b. 380 GPM
    c. 110’ head
    d. 20hp
    e. 460V-3 ph
    f. 60A HD Safety Switch disconnect and VFD – fair condition

4. P-2 Chilled water system pump (parallel with P-1)
    a. Bell & Gossett 1510-3E
    b. 380 GPM
    c. 110’ head
    d. 20hp
    e. 460V-3 ph
    f. 60A HD Safety Switch disconnect and VFD– fair condition

5. P-3 Chiller#1 water pump

a. Bell & Gossett 1510-4AC
b. 380 GPM
c. 35’ head
d. 1,800 RPM
e. 7.5hp
f. 460V-3 ph
g. 30A HD Safety Switch disconnect and VFD– fair condition

6. P-4 Chiller#2 water pump
   a. Bell & Gossett 1510-4AC
   b. 380 GPM
   c. 35’ head
   d. 1,800 RPM
   e. 7.5hp
   f. 460V-3 ph
   g. 30A HD Safety Switch disconnect and VFD– fair condition

7. P-5 Cooling tower pump – (Economizer)
   a. Bell & Gossett 1510-4AC – fair condition
   b. 300 GPM
   c. 1,800 RPM
   d. 32’ head
   e. 5hp
   f. 460V-3 ph
   g. VFD only – fair condition

8. P-6 Hot water system pump (in parallel with P-7)
   a. Bell & Gossett 1510-3EB
   b. 200 GPM
   c. 105’ head
   d. 15hp
   e. 460V-3 ph
   f. 60A HD Safety Switch disconnect and VFD– fair condition (on-off-hand)

9. P-7 Hot water system pump (in parallel with P-6)
   a. Bell & Gossett 1510 – Tag broken
   b. 200 GPM
   c. 105’ head
   d. 15hp
   e. 460V-3 ph
   f. 60A HD Safety Switch disconnect – fair condition

10. P-8 Hot water boiler#1 pump
    a. Bell & Gossett 80 – 3x3x7B
    b. 200 GPM
    c. 18’ head

d. 2hp
e. 1,800 RPM
f. 460V-3 ph
g. 30A HD Safety Switch disconnect and VFD– fair condition

11. P-9 Hot water boiler#2 pump
    a. Bell & Gossett 80 – 3x3x7B
    b. 200 GPM
    c. 18’ head
    d. 2hp
    e. 1,800 RPM
    f. 460V-3 ph
    g. 30A HD Safety Switch disconnect and VFD– fair condition

12. HX-1 – heat exchanger (As scheduled)
    a. Plate and frame
    b. Max heat transfer: 1,500 MBH
    c. Condenser side:
        i. 300 GPM
        ii. 25 ft head
        iii. 44°F EWT
        iv. 54°F LWT
    d. Chilled water:
        i. 300 GPM
        ii. 25 ft head
        iii. 58°F EWT
        iv. 48°F LWT

13. Unit Heater - 1 (Serves Boiler room) – poor condition, rusty
    a. Sterling model HS-36S
    b. 480 CFM
    c. 115V-1 ph
    d. 1/47 hp motor
    e. Toggle type disconnect
    f. 26,100 BTUH

Middle School Classroom Wing:

1. Fans:
    d. F-4 – 1,550 CFM – Exceptional children and MS toilets 310, 336, 337
    e. F-5 – 500 CFM – Electrical 335
    f. F-6 – 360 CFM – MS staff toilets 343, 344 348

2. Fan Coil Unit – A
    a. Carrier model 42CFA06FRFY (Serves rooms: data 334, AP office 340)
    b. 400 CFM (Scheduled)

c. 40 OA CFM (Scheduled)
d. 220W supply fan
e. 277V-1 ph

3. Fan Coil Unit – C (Serves rooms: 301, 313, 324, 341)
   a. Carrier model 42DCA10KRFY
   b. 800 CFM (Scheduled)
   c. 90 OA CFM (Scheduled)
   d. 1/2hp supply fan
   e. 277V-1 ph

4. Fan Coil Unit – D (Serves rooms: 300, 314, 325)
   a. Carrier model 42DCA12KRFY
   b. 1,000 CFM (Scheduled)
   c. 90 OA CFM (Scheduled)
   d. 3/4hp supply fan
   e. 277V-1 ph

5. Fan Coil Unit – E (Serves rooms: 302, 303, 304, 305, 309, 307, 308, 315, 316, 317, 318, 319, 320, 321, 326, 327, 328, 329, 330, 331, 332)
   a. Carrier model 42DCA16KRFY
   b. 1,300 CFM (Scheduled)
   c. 225 OA CFM (Scheduled)
   d. 3/4hp supply fan
   e. 277V-1 ph

6. Fan Coil Unit – F (Serves rooms: 309, 345, 346)
   a. Carrier model 42BHB16QF3
   b. 1,600 CFM (Scheduled)
   c. 225 OA CFM (Scheduled)
   d. 3/4hp supply fan
   e. 277V-1 ph

7. Fan Coil Unit – G (Serves room: 322, 333)
   a. Carrier model 42BHB20kF3
   b. 1,900 CFM (Scheduled)
   c. 225 OA CFM (Scheduled)
   d. 1hp supply fan
   e. 277V-1 ph

Elementary Wing Addition:

1. IDU-1 – Ductless split system heat pump (Electrical 180)
   a. Mitsubishi model PKA-A24KA6
   b. 700 CFM (Scheduled)
   c. No OA CFM (Scheduled)

d. 208/230V-1 ph
e. Toggle type disconnect
f. Condensate pump added

2. HP-1 (Match with IDU-1 in Elem wing addition) (06/2016)
   a. Mitsubishi model PUZ-A24NHA6
   b. R-410a refrigerant
   c. 208/230V-1 ph
   d. 30A disconnect

3. IDU-2 – Ductless split system heat pump (Services Data 188)
   a. Mitsubishi model PKA-A24KA4
   b. 700 CFM (Scheduled)
   c. No OA CFM (Scheduled)
   d. 208V-1 ph
   e. Toggle type disconnect

4. HP-2 (Match with IDU-2 in Elem wing addition) (06/2016)
   a. Mitsubishi model PUZ-A24NHA6
   b. R-410a refrigerant
   c. 208/230V-1 ph
   d. 30A disconnect

5. SS-1 – Variable volume indoor unit with ERV – Considerable sweating on the unit
   a. Trane CSAA030 – good condition
   b. 14,000 CFM (Scheduled)
   c. 6,000 OA CFM (Scheduled)
   d. 20hp Supply fan motor (Direct drive)
   e. 20hp Relief fan motor (Belt drive)
   f. 1/4hp ERV fan motor, 200V-3ph
   g. 480V-3 ph
   h. VFD's:
      i. Supply: 480V-3ph
      ii. ERV: 208V-3ph
      iii. Exhaust: 480V-3ph
   i. Possible UV light
   j. Natural Gas input: 700MBH max
   k. Natural Gas output: 560MBH max
   l. Input and burner voltage: 115V-1ph

6. CU-1 (Match with SS-1)
   a. Trane RAUJC404BC1300 – good condition
   b. 460V-3 ph
   c. R410a Refrigerant
   d. 100A disconnect – good condition

7. Fan Coil Unit – 1 (Serves room: Cafeteria addition 272A) Inaccessible – above a 20 ft lay in ceiling. Unable to verify numbers.
    a. Carrier 42BHE (Scheduled)
    a. 3,000 CFM (Scheduled)
    b. 1,150 OA CFM (Scheduled)
    c. 3/4hp supply fan
    d. 208V-3 ph

8. VAV Boxes (connected to SS-1)
    a. 10 VAV Boxes in corridor
    b. 480V-3 ph
    c. Electric reheat

9. UH-1
    a. TPI Corporation model E322012RPW
    b. 208V-1 ph
    c. 2,000W
    d. Toggle type disconnect

10. UH-2
    a. model F30522T22DWB
    b. 208V-1 ph
    c. 2,250W
    d. Toggle type disconnect

Middle School Wing Addition:

1. Fans:
    a. EF-2 – 325 CFM (Science lab prep)
    b. EF-1 – 1,250 CFM (Science lab)

2. IDU-3 – Ductless split system heat pump (Electrical 380)
    a. Mitsubishi model PKA-A24KA6 – good condition
    b. 700 CFM (Scheduled)
    c. No OA CFM (Scheduled)
    d. 208V-1 ph
    e. Toggle type disconnect

3. HP-3 (Match with IDU-3 in Middle wing addition) (06/2016)
    a. Mitsubishi model PUZ-A24NHA6 – good condition
    b. R-410a refrigerant
    c. 208/230V-1 ph
    d. 30A disconnect

4. IDU-4 – Ductless split system heat pump (Services Data 388)
    a. Mitsubishi model PKA-A24KA6

b. 700 CFM (Scheduled) – good condition
c. No OA CFM (Scheduled)
d. 208V-1 ph
e. Toggle type disconnect

5. HP-4 (Match with IDU-4 in Middle wing addition) (07/2016)
   a. Mitsubishi model PUZ-A24NHA6 – good condition
   b. R-410a refrigerant
   c. 208/230V-1 ph
   d. 30A disconnect

6. SS-2 – Variable volume indoor unit with ERV
   a. Trane CSAA030 – good condition
   b. 14,000 CFM (Scheduled)
   c. 6,000 OA CFM (Scheduled)
   d. 20hp Supply fan motor (Direct drive)
   e. 20hp Relief fan motor (Belt drive)
   f. 1/4hp ERV fan motor
   g. 480V-3 ph
   h. VFD's:
      i. Supply: 480V-3 ph
      ii. ERV: 208V-3 ph
      iii. Exhaust: 480V-3 ph
   i. Has UV light
   j. Natural Gas input: 700MBH max
   k. Natural Gas output: 560MBH max
   l. Input and burner voltage: 115V-1 ph

7. CU-2 (Match with SS-2)
   a. RAUJC404BC1300
   b. 480V-3 ph
   c. R410a Refrigerant
   d. 100A disconnect

8. Fan Coil Unit – 2 (Serves room: Cafeteria addition 272A) Inaccessible – above a 20 ft lay in ceiling. Unable to verify numbers.
   b. Carrier 42BHE (Scheduled)
   c. 3,000 CFM (Scheduled)
   d. 1,150 OA CFM (Scheduled)
   e. 3/4hp supply fan
   f. 208V-3 ph

9. VAV Boxes
   a. 11 VAV boxes in corridor
   b. 480V-3 ph
   c. Electric reheat

10. UH-3 – Inaccessible, not able to verify numbers.

11. UH-4 – Inaccessible, not able to verify numbers.

12. Future heat recovery units: (from original drawings) Space allotted for HRU's and relief air ductwork.

Cheatham and Associates, P.A.
Consulting Engineers

HVAC INFRASTRUCTURE ASSESSMENT
C.F. POPE ELEMENTARY SCHOOL
PENDER COUNTY SCHOOLS

August 2, 2022

APPENDIX A – More detailed information found and observed for each HVAC system and area.

BUILDING A – Classrooms, Cafeteria & Kitchen

1. Drawings Available:
   a. 2005 – Burgaw Elementary School Addition & Renovations – Cheatham and Associates PA

2. Controls are Siemens Apogee DDC installed in 2005.
   a. System is becoming outdated and obsolete with replacement parts getting difficult to find.

3. Field Notes 5/5/2022:
   a. No longer able to obtain replacement actuator motors for fan coil units.
   b. In the classrooms, the Fan coil units (FCUs) thermostats have no exact temperature readings; "Off -Low-Med-High" fan speed settings.
   c. Only a few added sensors throughout building that average the temperature to call for HVAC.
   d. Principal's office unit: in the summer when the central plants are off, the principals' thermostat triggers the boiler and/or chiller to run. The school is requesting a split system heat pump for his office area to avoid energizing boiler and chiller plant to save energy.

4.

Classrooms

1. All split system heat pump AHUs are in good condition. Except where noted for HP-19, all split system heat pump outdoor sections are in fair condition.

2. AHU-1 (Classroom 101 - Manufactured May 2006):
   a. Trane 2TEC3F48A1000AA
   b. R-22 refrigerant
   c. 208V-3ph
   d. 60A Heavy Duty Disconnect – good condition

3. HP-1 (Match with AHU-1, May 2006):
   a. Trane 2TWA3048A4000AA
   b. 460V-3ph
   c. R-22 refrigerant
   d. 30A Heavy Duty Safety Switch – fair condition

4. AHU-2 (Classroom 102 - installed May 2006):
   a. Trane 2TEC3F48A1000AA

b. R-22 refrigerant
c. 208V-3ph
d. 60A Heavy Duty Disconnect – good condition

5. HP-2 (Match with AHU-2, May 2006):
   a. Trane 2TWA3048A4000AA
   b. 460V-3ph
   c. R-22 refrigerant
   d. 30A Heavy Duty Safety Switch – fair condition

6. AHU-3 (Classroom 104 - Manufactured May 2006):
   a. Trane 2TEC3F48A1000AA
   b. 208V-3ph
   c. R-22 refrigerant
   d. 60A Heavy Duty Safety Switch – good condition

7. HP-3 (Match with AHU-3, May 2006):
   a. Trane 2TWA304A4000AA
   b. 460V-3ph
   c. R-22 refrigerant
   d. 30A Heavy Duty Safety Switch – fair condition

8. AHU-4 (Classroom 103 - Manufactured February 2006):
   a. Trane 2TEC3F42A1000AA
   b. 208V-3ph
   c. R-22 refrigerant
   d. 60A Heavy Duty Safety Switch – good condition

9. HP-4 (Match with AHU-4, February 2006):
   a. Trane 2TWA3042A4000AA
   b. 460V-3ph
   c. R-22 refrigerant
   d. 30A Heavy Duty Safety Switch – fair condition

10. AHU-5 (Classroom 105 - Manufactured May 2006):
    a. 208V-3ph
    b. R-22 refrigerant
    c. 60A Heavy Duty Safety Switch – good condition
    d. Trane 2TEC3F48A1000AA

11. HP-5 (Match with AHU-5, May 2006):
    a. Trane 2TWA3048A4000AA
    b. 460V-3ph
    c. R-22 refrigerant
    d. 30A Heavy Duty Safety Switch – fair condition

12. AHU-6 (Classroom 106 - Manufactured May 2006):
    a. Trane 2TEC3F24A1000AA
    b. 208V-3ph

c. R-22 refrigerant
d. 60A Heavy Duty Safety Switch – good condition

13. HP-6 (Match with AHU-6, May 2006):
    a. Trane 2TWA3024A4000AA
    b. 460V-3ph
    c. R-22 refrigerant
    d. 30A Heavy Duty Safety Switch – fair condition

14. AHU-7 (Classroom 107 - Manufactured November 2005):
    a. Trane 2TEC3F42A1000AA
    b. 208V-3ph
    c. R-22 refrigerant
    d. 60A Heavy Duty Safety Switch – good condition

15. HP-7 (Match with AHU-7, November 2005):
    a. Trane 2TWA3042A4000AA
    b. 460V-3ph
    c. R-22 refrigerant
    d. 30A Heavy Duty Safety Switch – fair condition

16. AHU-8 (Classroom 109 - Manufactured May 2006):
    a. Trane 2TEC3F48A1000AA
    b. 208V-3ph
    c. R-22 refrigerant
    d. 60A Heavy Duty Safety Switch – good condition

17. HP-8 (Match with AHU-8, May 2006):
    a. Trane 2TWA3048A4000AA
    b. 460V-3ph-60Hz
    c. R-22 refrigerant
    d. 30A Heavy Duty Safety Switch – fair condition

18. AHU-9 (Classroom 108 - Manufactured May 2006):
    a. Trane 2TEC3F48A1000AA
    b. 208V-3ph
    c. R-22 refrigerant
    d. 60A Heavy Duty Safety Switch – good condition

19. HP-9 (Match with AHU-9, May 2006):
    a. Trane 2TWA3048A4000AA
    b. 460V-3ph
    c. R-22 refrigerant
    d. 30A Heavy Duty Safety Switch – fair condition

20. AHU-10 (Classroom 110 - Manufactured May 2006):
    a. Trane 2TEC3F48A1000AA
    b. 208V-3ph
    c. Refrigerant?

d. 60A Disconnect is older type– originally disconnect possibly failed and was replaced with older disconnect – fair condition

21. HP-10 (Match with AHU-10, May 2006):
    a. Trane 2TWA3048A4000AA
    b. 460V-3ph
    c. R-22 refrigerant
    d. 30A Heavy Duty Safety Switch – fair condition

22. AHU-11 (Classroom 111 - Manufactured February 2006):
    a. Trane 2TEC3F42A1000AA
    b. 208V-3ph
    c. R-22 refrigerant
    d. 60A Heavy Duty Safety Switch – good condition

23. HP-11 (Match with AHU-11, February 2006):
    a. Trane 2TWA3042A4000AA
    b. 460V-3ph
    c. R-22 refrigerant
    d. 30A Heavy Duty Safety Switch – fair condition

24. AHU-12 (Classroom 113 - Manufactured May 2006):
    a. Trane 2TEC3F48A1000AA
    b. 208V-3ph
    c. R-22 refrigerant
    d. 60A Heavy Duty Safety Switch – good condition

25. HP-12 (Match with AHU-12, May 2006):
    a. Trane 2TWA3048A4000AA
    b. 460V-3ph
    c. R-22 refrigerant
    d. 30A Heavy Duty Safety Switch – fair condition

26. AHU-13 (Classroom 112 - Manufactured May 2006):
    a. Trane 2TEC3F48A1000AA
    b. 208V-3ph
    c. R-22 refrigerant
    d. 60A Heavy Duty Safety Switch – good condition

27. HP-13 (Match with AHU-13, May 2006):
    a. Trane 2TWA3048A4000AA
    b. 460V-3ph
    c. R-22 refrigerant
    d. 30A Heavy Duty Safety Switch – fair condition

28. AHU-14 (Classroom 112 - Manufactured May 2006):
    a. Trane 2TEC3F48A1000AA
    b. 208V-3ph
    c. R-22 refrigerant

d. 60A Heavy Duty Safety Switch – good condition

29. HP-14 (Match with AHU-14, May 2006):
    a. Trane 2TWA3048A4000AA
    b. 460V-3ph
    c. R-22 refrigerant
    d. 30A Heavy Duty Safety Switch – fair condition

30. AHU-20 (Classroom 118 - Manufactured April 2006):
    a. Trane 2TEC3F42A1000AA
    b. 208V-3ph
    c. R-22 refrigerant
    d. 60A Heavy Duty Safety Switch – good condition

31. HP-20 (Match with AHU-20):
    a. Trane 2TWA3042A4000AA
    b. 460V-3ph
    c. R-22 refrigerant
    d. 30A Heavy Duty Safety Switch – fair condition

32. AHU-22 (Classroom 119 - Manufactured April 2006):
    a. Trane 2TEC3F36A1000AA
    b. 208V-3ph
    c. R-22 refrigerant
    d. 60A Heavy Duty Safety Switch – good condition

33. HP-22 (Match with AHU-22, April 2006):
    a. Trane 2TWA3036A4000AA
    b. 460V-3ph-60Hz
    c. R-22 refrigerant
    d. 30A Heavy Duty Safety Switch – fair condition

34. AHU-23 (Classroom 121- Manufactured April 2006):
    a. Trane 2TEC3F36A1000AA
    b. 208V-3ph
    c. R-22 refrigerant
    d. 60A Heavy Duty Safety Switch – good condition

35. HP-23 (Match with AHU-23, April 2006):
    a. Trane 2TWA3036A4000AA
    b. 460V-3ph
    c. R-22 refrigerant
    d. 30A Heavy Duty Safety Switch – fair condition

36. AHU-24 (Classroom 123 - Manufactured April 2006):
    a. Trane 2TEC3F36A1000AA
    b. 208V-3ph
    c. R-22 refrigerant
    d. 60A Heavy Duty Safety Switch – good condition

37. HP-24 (Match with AHU-24, April 2006):
    a. Trane 2TWA3036A4000AA
    b. 460V-3ph
    c. R-22 refrigerant
    d. 30A Heavy Duty Safety Switch – fair condition

38. AHU-25 (Classroom 125 - Manufactured April 2006):
    a. Trane 2TEC3F36A1000AA
    b. 208V-3ph
    c. R-22 refrigerant
    d. 60A Heavy Duty Safety Switch – good condition

39. HP-25 (Match with AHU-25, April 2006):
    a. Trane 2TWA3036A4000AA
    b. 460V-3ph
    c. R-22 refrigerant
    d. 30A Heavy Duty Safety Switch – fair condition

40. AHU-26 (Classroom 127 - Manufactured April 2006):
    a. Trane 2TEC3F36A1000AA
    b. 208V-3ph
    c. R-22 refrigerant
    d. 60A Gen Duty Disconnect – good condition

41. HP-26 (Match with AHU-26, April 2006):
    a. Trane 2TWA3036A4000AA
    b. 460V-3ph
    c. R-22 refrigerant
    d. 30A Heavy Duty Safety Switch – fair condition

42. AHU-15 (Entry/Asst. Principal/Reception – Manufactured December 2005):
    a. Trane 2TEC3F42A1000AA
    b. 208V-3ph
    c. R-22 refrigerant
    d. 60A Heavy Duty Safety Switch – good condition

43. HP-15 (Match with AHU-15, December 2005):
    a. Trane 2TWA3042A4000AA
    b. 460V-3ph
    c. R-22 refrigerant
    d. 30A Heavy Duty Safety Switch – fair condition

44. AHU-18 (Resource Rooms - Manufactured March 2006):
    a. Trane 2TEC3F60A1000AA
    b. 208V-3ph
    c. R-22 refrigerant
    d. 60A Heavy Duty Safety Switch – good condition

45. HP-18 (Match with AHU-18, March 2006):
    a. Trane 2TWA3060A4000AA
    b. 460V-3ph
    c. R-22 refrigerant
    d. 30A Heavy Duty Safety Switch – fair condition

46. AHU-21 (Teacher Workroom - Manufactured April 2006):
    a. Trane 2TEC3F18A1000AA
    b. 208V-3ph
    c. R-22 refrigerant
    d. 60A Heavy Duty Safety Switch – good condition

47. HP-21 (Match with AHU-21, April 2006):
    a. Trane 2TWA3018A4000AA
    b. 230V-1ph
    c. R-22 refrigerant
    d. 30A Heavy Duty Safety Switch – fair condition

48. Ductless mini split system – Data A146 - (DAHU-1):
    a. Condition?

49. DHP-1 (Match with DAHU-1)
    a. Enviromaster LLC SHC180F0000AA0A
    b. 208V-1ph
    c. R-22 refrigerant
    d. Condition?
    e. 30A Heavy Duty Safety Switch

Cafeteria/Kitchen

1. AHU-16 (Cafeteria - Manufactured May 2006):
    a. Trane TWE180B400EL
    b. 208V-3ph
    c. R-22 refrigerant
    d. 60A Heavy Duty Safety Switch – good condition

2. HP-16 (Match with AHU-16, May 2006):
    a. Trane TWA180B400FB – fair condition
    b. 460V-3ph
    c. R-22 refrigerant
    d. 60A Heavy Duty Safety Switch – fair condition

3. AHU-17 (Cafeteria - Manufactured April 2006):
    a. Trane TWE180B400EL
    b. 480V-3ph
    c. R-22 refrigerant
    d. 60A Heavy Duty Safety Switch – fair condition

4. HP-17 (Match with AHU-17, April 2006):
   a. Trane TWA180B400FB – fair condition
   b. 460V-3ph
   c. R-22 refrigerant
   d. 60A Heavy Duty Safety Switch – fair condition

5. AHU-19 (Kitchen - Manufactured April 2006):
   a. Trane TWE090A300EL
   b. 208V-3ph
   c. R-22 refrigerant
   d. 60A Heavy Duty Safety Switch – fair condition

6. HP-19 (Match with AHU-19):
   a. Trane TWA090A30RGA
   b. 208V-3ph
   c. R-22 refrigerant
   d. Poor condition.
   e. 30A Heavy Duty Safety Switch – fair condition

Fans – Building A

1. F-1 – Toilet A103 – 75 CFM
2. F-2 – Toilet A107 – 75 CFM
3. F-3 – Toilet A108 – 75 CFM
4. F-4 – Toilet A113 – 75 CFM
5. F-5 – Toilet A114 – 75 CFM
6. F-6 – Toilet A119 – 75 CFM
7. F-7 – Toilet A120 – 75 CFM
8. F-8 – Toilet A127 – 75 CFM
9. F-9 – Toilet A128 – 75 CFM
10. F-10 – Toilet A129 – 75 CFM
11. F-11 – Toilet A133 – 100 CFM
12. F-12 – Toilet A177 – 75 CFM
13. F-13 – Toilet A175 – 75 CFM
14. F-14 – Toilet A141 – 75 CFM
15. F-15 – Toilet A142 – 75 CFM
16. F-16 – Electrical A151 – 1,000 CFM
17. F-17 – Group toilets – 1,200 CFM
18. F-18 – Kitchen toilets – 300 CFM
19. F-19 – Kitchen hood – 4,950 CFM (exhaust) – 3,590 CFM (make up)
20. F-20 – Dishwasher – 500 CFM
21. F-21 – Dishwasher - 600 CFM
22. Condition?

Electric Unit Heaters

1. EUH – 400 CFM – Water heater A150
2. Condition?

BUILDING B – Classrooms & Media Center

1. Available Drawings:
   a. Six Classroom Addition (1960) Leslie Boney
   b. Two Classroom Addition (1962) Leslie Boney
   c. SUD Associates, PA (1994) As Builts – HVAC Equipment Renovations
   d. Optima Engineering PA (1997) – Media Center Addition and Admin Renovation

2. No outside air to this building – appears to be just operable windows.

3. Fan Coil Unit D1 (EC Classroom 13-18) All are the same size:
   a. 1200 CFM
   b. 7.6 GPM dual temperature coil
   c. 1-1/4" runout size
   d. 370 Watt motor
   e. Condition?

4. Schneider Controls Inet system in classrooms with one zone sensor (#6) to central HVAC plant.
   a. Controls cannot be viewed from PCS Central Office.
   b. Replacement control boards cannot be purchased anymore.
   c. Unable to obtain actuators for the fan coil units anymore.
   d. Fan coil units (FCUs) thermostats have no exact temperature readings; "Off -Low-Med-High" fan speed settings.

5. Controls for Media Center are Siemens Apogee DDC installed in 2005.
   a. Can be viewed and controlled from PCS Central Office.
   b. Added HP in Workroom not on DDC.

Media Center

1. Dual Temperature Fan Coil Units for each room in the Media Center.

2. Fan Coil Unit A (Media classroom)
   a. 1400 CFM (OA = 200 CFM)
   b. 7.5 GPM
   c. 1-1/4" runout size
   d. 120V-1ph
   e. 1/2 Hp motor

3. Fan Coil Unit B (Media center)
   a. 1140 CFM (OA = 140 CFM)
   b. 6.0 GPM
   c. 1" runout size
   d. 120V-1ph

4. Fan Coil Unit C (Media workroom and offices)
   a. 870 CFM (OA = 120 CFM)
   b. 4.7 GPM
   c. 1" runout size
   d. 120V-1ph

e. 1/3 Hp motor

5. Fan Coil Unit D (Media center)
   a. 1600 CFM (OA = 220 CFM)
   b. 8.6 GPM
   c. 1-1/4" runout size
   d. 120V-1ph
   e. 1/2 Hp motor

6. Fan Coil Unit E (Room XXXX)
   a. 350 CFM (OA = 50 CFM)
   b. 2.0 GPM
   c. 3/4" runout size
   d. 120V-1ph
   e. 250W motor

7. Fan Coil Unit F (Restrooms/Hallway)
   a. 530 CFM (OA = 100 CFM)
   b. 2.8 GPM
   c. 3/4" runout size
   d. 120V-1ph
   e. 290W motor

8. SSHP above the ceiling in Media Workroom
   a. Info?
   b. Condition?

9. HP-Media (match with SSHP Media Wkrm) (fair condition 1-2001)
   a. Weatherking A/C 12PJA4801
   b. R-22 Refrigerant
   c. 208-230V-1ph
   d. Disc Switch fair condition

Fans

a. F-1 (Media center)
b. F-1 –1/4 hp – 120V-1ph – 800 CFM
c. Condition?

BUILDING C – Classrooms, Administration, Gymtorium, and HVAC Central Plant

1. Available drawings:
   a. A.G. Shop and Revised Lobby C.F. Pope HS – Leslie Boney (1956)
   b. C.F. Pope Elementary Gymtorium – Leslie Boney (1956)
   c. Kitchen Café Addition (1969)
   d. Air Conditioning and Energy Renovations – SUD Associates PA (1994 As Builts)
   e. Renovation of Existing Classroom Building – Chatham and Associates (2007)

2. No outside air to this building.

3. Schneider Controls Inet system with (5) zone sensors to central HVAC plant.

a. Controls cannot be viewed from PCS Central Office.
b. Replacement control boards cannot be purchased anymore
c. Unable to obtain actuators for the fan coil units anymore.
d. Fan coil units (FCUs) thermostats have no exact temperature readings; "Off -Low-Med-High" fan speed settings.

4. Gymtorium (1982) – Three (3) Dual Temperature Fan Coil Units in structure (1994)
   a. 3200 CFM
   b. No OA
   c. 24.5 GPM
   d. 2" Runout size
   e. Belt driven 2,000W motor
   f. 82,200 BTU sensible
   g. 123,300 BTU latent

4. Fan Coil Unit G (Principal's Office)
   a. 460 CFM (OA = 50 CFM)
   b. 2.5 GPM
   c. 3/4" runout size
   d. 120V-1ph
   e. 250W motor
   f. In the summer when the central plants are off, the principals' thermostat triggers the boiler and/or chiller to run.

5. Fan Coil Unit H (Office Area)
   a. 470 CFM (OA = 50 CFM)
   b. 2.5 GPM
   c. 3/4" runout size
   d. 120V-1ph
   e. 250W motor

6. Pleasant Aire contractor is installing 2-ton capacity SSHP for Admin Offices. FCUs will remain as backup.

7. H1/H.P.-A (Match with H1-AHU on plans – no pictures of AHU):
   a. Carrier 38YCC03632O – poor condition
   b. 208V-3ph
   c. R-22 refrigerant
   d. Heavy Duty Safety Switch – poor condition – cannot read

Gymtoruim Restrooms and former Cafeteria/ASP Classrooms

1. Two (2) Dual Temp Fan Coil units - A2 (not used anymore, has been shut off) old restrooms (new storage area):
   a. 300 CFM
   b. 1.8 GPM
   c. 3/4" runout size
   d. 70 Watt motor
   e. Heating only units with circuit setter

2. Former Cafeteria/ASP Classroom AHUs hanging underneath lay-in ceiling, disconnects are hanging next to AHUs. No ductwork, AHU blows air directly from the fan. No OA for these units, operable windows may take the place of OA requirements.

3. Teacher's workroom AHU-H2/AH-A:
   a. 1570 CFM
   b. 230V-1ph (heating strip 203V-3ph, 9kW) - scheduled
   c. 100A Disconnect switch
   d. 3/4 hp motor
   e. R-22 refrigerant
   f. VERY LOUD in the Classroom.

4. HP- H2/AH-A (Match with AHU-H2/AH-A ~ 2004)
   a. Carrier Model 38YCC048300 – poor condition
   b. R-22 refrigerant
   c. 208/203V-1ph
   d. 1/4 hp fan
   e. 60A disconnect switch – poor condition

5. ASP classroom XXXX AHU-H2/AH-B:
   a. 1570 CFM
   b. 208V-1ph (heating strip 230V-3ph, 9kW) – scheduled
   c. 100A disconnect switch
   d. 3/4 hp motor
   e. R-22 refrigerant
   f. VERY LOUD in the Classroom.

6. HP- H2/AH-B (Match with AHU-H2/AH-B ~ 2008)
   a. Payne Model PH10JA048 – fair condition
   b. R-22 refrigerant
   c. 208/203V-1ph
   d. 1/4 hp fan
   e. disconnect switch – poor condition – could not read

7. ASP Office XXXX AHU-H2/AH-C:
   a. 1570 CFM
   b. 230V-1ph (heating strip 203V-3ph, 9kW) – scheduled
   c. 3/4 hp motor
   d. R-22 refrigerant
   e. VERY LOUD in the Classroom.

8. HP- H2/AH-C (Match with AHU-H2/AH-C~ 2004)
   a. Payne Model 38YCC048300 – fair condition
   b. R-22 refrigerant
   c. 208/203V-1ph
   d. 1/4 hp fan
   e. 60A disconnect switch – poor condition

9. Art Classroom – VRF system

a. Three (3) ductless VRF indoor units
b. One (1) VRF outdoor unit – Fujitsu AOU33RML
c. Six (6) refrigerant lines
d. 230V-1ph
e. R410A refrigerant
f. 30A fused safety switch

Boiler Room

1. Schneider Controls:
   a. Automatic based on Zone sensors
   b. Averages 6 zone sensors and determines what the DT system will do based on the averaging temperature.
   c. Plant changeover from cooling to heating and back takes time because of system temperature changes from hot water for heating to chilled water for cooling or cooling to heating.
   d.

2. Boiler No.1 (Closest to door) – Hot Water boiler: (good condition)
   a. Weil McLean model 988
   b. Webster dual fuel burner model JB2C-10-RM7896C-HH.10-UL (August 2012)
   c. Fueled by natural gas/No.2 fuel oil
   d. Max MBH – 2737 – 1.8" WC – 18.8 GPH – 290 PSIG
   e. Min MBH – 1610 - .63" WC – 11.0 GPH – 100 PSIG

3. Boiler No.2 – Hot water boiler: (good condition)
   a. Weil McLean model 988
   b. Webster dual fuel burner model JB2C-10-RM7896C-HH.10-UL (August 2012)
   c. Fueled by natural gas/No.2 fuel oil
   d. Max MBH – 2737 – 1.8" WC – 18.8 GPH – 290 PSIG
   e. Min MBH – 1610 - .63" WC – 11.0 GPH – 100 PSIG

4. Dual temperature system pump: (poor condition)
   a. Armstrong
   b. Dayton motors
   c. X hp
   d. 200 GPM
   e. 75 Ft Head
   f. ** Already have a replacement pump and frame (no motor) sitting in the room. Reuse if possible **

5. Boiler No.1 pump: (good condition)
   a. Bell & Gossett model LQD56B17D116K
   b. 1 hp
   c. 115V-1ph (also 230V?)
   d. 1725 RPM
   e. XXX GPM
   f. XX Ft. Head

6. Boiler No.2 pump: (good condition)
   a. Bell & Gossett model RQE56B17D116K

b. 1-3/4 hp
c. 115V/208V-1ph
d. 1725 RPM
e. XXX GPM
f. XX Ft. Head

7. Chiller pump: (poor condition)
   a. Armstrong Pump model (3X2.5X8) 4030
   b. Marathon Motor 184TTDB6026 – 230/460V-3ph
   c. 200 GPM – 30 Ft Hd
   d. 5 hp
   e. 1800 RPM
   f. Imp Dia 6.5

Chiller

a. Trane CGAM090A2Q02 (good condition)
b. 208V-3ph
c. R-410A refrigerant
d. Air cooled scroll
e. 90 nominal tons
f. 600A Safety Switch

Enclosed Connector

1. Ventilated via multiple thermostat controlled exhaust fans at roof with intake louvers down low.
   a. F-22 – Canopy C001 – 550 CFM
   b. F-23 – Canopy C001 – 550 CFM
   c. F-24 – Canopy C001 – 550 CFM

2. Louvers have motor operated dampers? Dampers functional?

3. Thermostats appear to working fans in opposite of what they should be.

4. Some thermostats were missing.

Notes from PCS

1. Dual temperature system piping is very old.

2.

End of Appendix A

Cheatham and Associates, P.A.
Consulting Engineers

HVAC INFRASTRUCTURE ASSESSMENT
HEIDE TRASK SENIOR HIGH SCHOOL
PENDER COUNTY SCHOOLS

July 18, 2022

APPENDIX A – More detailed information found and observed for each HVAC system and area.

General:

1. Drawings Available:
   a. Heide Trask Senior High School (1999)
   b. Auditorium Addition (2010)

2. Controls:
   a. Siemens – Apogee
   b. 2" filter frames (Typical)
   c. All CFM listed are from the existing schedules.

3. AHU's hot water coils in the reheat position. (good for dehumidification)

4. Building is positive pressure by 2960 CFM. (including all fume hood exhausts and all electrical rooms exhaust pulling air from inside the building are on.)

Area A – Classrooms: CHW and HW mains into loft A showing rust at butterfly valves. No AHUs in area A showing significant rust.

1. Fans:
   a. F-1 – Toilet A17 – 100 CFM
   b. F-2 – A16 Electrical – 750 CFM

2. AHU#1 (Drafting room A09)
   a. Trane MCCA006 – Fair condition – piping to unit is slightly rusted – controls look good.
   b. 2,600 CFM
   c. 300 OA CFM
   d. 3 hp fan
   e. 460V-3ph
   f. 17.0 GPM cooling coil, 1-1/2" runout size
   g. 8.5 GPM heating coil, 1-1/4" runout size
   h. 30A combination starter/disconnect switch – good condition

3. AHU#2 (Tech education room A08)

a. Trane MCCA006 – Fair condition – piping to unit is moderately rusted – controls look good.
b. 3,200 CFM
c. 300 OA CFM
d. 5 hp fan
e. 460V-3ph
f. 20.0 GPM cooling coil, 1-1/2" runout size
g. 10 GPM heating coil, 1-1/4" runout size
h. 30A combination starter/disconnect switch– good condition

4. AHU#3 (Business tech A12)
   a. Trane MCCA006 – Fair condition – piping to unit is slightly rusted – controls look good.
   b. 2,300 CFM
   c. 300 OA CFM
   d. 3 hp fan
   e. 460V-3ph
   f. 15.0 GPM cooling coil, 1-1/4" runout size
   g. 7.5 GPM heating coil, 1-1/4" runout size
   h. 30A combination starter/disconnect switch – good condition
   i. DPT on both hot water and chilled water

5. AHU#4 (Business tech A09)
   a. Trane MCCA006 – Fair condition – piping to unit is slightly rusted – controls look good.
   b. 2,300 CFM
   c. 300 OA CFM
   d. 3 hp fan
   e. 460V-3ph
   f. 15.0 GPM cooling coil, 1-1/4" runout size
   g. 7.5 GPM heating coil, 1-1/4" runout size
   h. 30A combination starter/disconnect switch – good condition

6. AHU#5 (Health occupations A13)
   a. Trane MCCA006 – Fair condition – CHW piping to unit is significantly rusted – controls look good.
   b. 2,200 CFM
   c. 300 OA CFM
   d. 3 hp fan
   e. 460V-3ph
   f. 15.0 GPM cooling coil, 1-1/4" runout size
   g. 7.5 GPM heating coil, 1-1/4" runout size
   h. 30A combination starter/disconnect switch – good condition

7. AHU#6 (Resource A19 and Social studies A20)

a. Trane MCCA006 – Fair condition – piping to unit is slightly rusted – controls look good.
b. 3,100 CFM
c. 550 OA CFM
d. 5 hp fan
e. 460V-3ph
f. 24.0 GPM cooling coil, 2" runout size
g. 11.0 GPM heating coil, 1-1/4" runout size
h. 30A combination starter/disconnect switch – good condition

8. AHU#7 (Home econ A03 and Social studies A02)
   a. Trane MCCA008 – Fair condition – piping to unit is showing minimal rust – controls look good.
   b. 3,700 CFM
   c. 600 OA CFM
   d. 5 hp fan
   e. 460V-3ph
   f. 27.0 GPM cooling coil, 2" runout size
   g. 13.0 GPM heating coil, 1-1/4" runout size
   h. 30A combination starter/disconnect switch – good condition

Area B – Lobby, Classrooms, Kitchen, Cafeteria, Administration, Mechanical Room/Chiller Yard: Hot water air separator in mech room B37 is uninsulated. Very hot to the touch. The insulation around the refrigerant piping is deteriorated on the exterior of the building.

1. AHU#8 (Social studies B38 and Social studies B39)
   a. Trane MCCA006 – Fair condition – piping to unit is slightly rusted – controls look good. – Insulation has been intentionally removed around HW/CHW piping.
   b. 2,300 CFM
   c. 600 OA CFM
   d. 3 hp fan
   e. 460V-3ph
   f. 20.0 GPM cooling coil, 1-1/2" runout size
   g. 9.5 GPM heating coil, 1-1/4" runout size
   h. 30A combination starter/disconnect switch – good condition

2. AHU#9 (Social studies B33 and Social studies B34)
   a. Trane MCCA006 – Fair condition – piping to unit is significantly rusted – controls look good. – Insulation has been intentionally removed around HW/CHW piping.
   b. 2,300 CFM
   c. 600 OA CFM
   d. 3 hp fan
   e. 460V-3ph
   f. 20.0 GPM cooling coil, 1-1/2" runout size
   g. 9.5 GPM heating coil, 1-1/4" runout size
   h. 30A combination starter/disconnect switch – good condition

3. AHU#10 (Lobby B01 and Corridor B02)
   a. Trane MCCA003 – Fair condition – piping to unit is slightly rusted – controls look good. – Insulation has been intentionally removed around HW/CHW piping.
   b. 1,800 CFM
   c. 200 OA CFM
   d. 3 hp fan
   e. 460V-3ph
   f. 11.5 GPM cooling coil, 1-1/4” runout size
   g. 6 GPM heating coil, 1” runout size
   h. 30A combination starter/disconnect switch – good condition

4. AHU#11 (Kitchen/Dishwashing)
   a. Trane MCCA006 – Fair condition – piping to unit is slightly rusted – controls look good.
   b. 3,000 CFM
   c. 750 OA CFM
   d. 5 hp fan
   e. 460V-3ph
   f. 20.0 GPM cooling coil, 1-1/2” runout size
   g. 10 GPM heating coil, 1-1/4” runout size
   h. 30A combination starter/disconnect switch – good condition

5. AHU#12 (Serving area/Cafeteria)
   a. Trane MCCA010 – Fair condition – piping to unit is slightly rusted – controls look good.
   b. 4,500 CFM
   c. 1875 OA CFM
   d. 5 hp fan
   e. 460V-3ph
   f. 50.0 GPM cooling coil, 2-1/2” runout size
   g. 21.5 GPM heating coil, 1-1/2” runout size
   h. 30A combination starter/disconnect switch – good condition

6. AHU#13 (Cafeteria and Communications B43)
   a. Trane MCCA010 – Fair condition – controls look good.
   b. 4,500 CFM
   c. 1875 OA CFM
   d. 5 hp fan
   e. 460V-3ph
   f. 50.0 GPM cooling coil, 2-1/2” runout size
   g. 21.5 GPM heating coil, 1-1/2” runout size
   h. 30A combination starter/disconnect switch – good condition

7. AHU#14 (Corridor B35, Toilets B46 and 47)

a. Trane MCCA003 – Fair condition – piping to unit is slightly rusted – controls look good.
b. 800 CFM
c. 200 OA CFM
d. 1 hp fan
e. 460V-3ph
f. 6.0 GPM cooling coil, 1” runout size
g. 3.25 GPM heating coil, 3/4” runout size
h. 30A combination starter/disconnect switch – good condition

8. ACAHU#1 (Guidance center B23, B24 and B32) – 07-2001
   a. Trane TWE060 – Fair condition – Refrigerant and hot water piping - controls look good.
   b. 2,000 CFM
   c. 200 OA CFM
   d. 3/4 hp fan
   e. 460V-3ph
   f. 6.5 GPM heating coil, 1” runout size
   g. 30A heavy duty combination starter/disconnect switch – good condition

9. AC#1 (Match with ACAHU#1) – 07-2001
   a. Trane TTA060 – Fair condition – controls look good.
   b. 460V-3ph
   c. R-22 refrigerant
   d. 30A heavy duty disconnect – poor condition

10. ACAHU#2 (Admin B03, B04, B05, B06, B07, B12, B13, B16, B25 & Hall B11) – 07-2001
    a. Trane TWE060 – Fair condition – Refrigerant and hot water piping - controls look good.
    b. 2,000 CFM
    c. 200 OA CFM
    d. 3/4 hp fan
    e. 460V-3ph
    f. 6.5 GPM heating coil, 1” runout size
    g. 30A heavy duty combination starter/disconnect switch – good condition

11. AC#2 (Match with ACAHU#2) – 06-2009
    a. Trane TTA060 – Fair condition
    b. 460V-3ph
    c. R-22 refrigerant
    d. 30A heavy duty disconnect – poor condition

12. ACAHU#3 (B08, B09, B14, B15, B19, B27, B28) – 07-2001
    a. Trane TWE090 – Fai condition – Refrigerant and hot water piping - controls look good.

b. 3,000 CFM
c. 250 OA CFM
d. 1-1/2 hp fan
e. 460V-3ph
f. 9.5 GPM heating coil, 1-1/4" runout size
g. 30A heavy duty combination starter/disconnect switch – good condition

13. AC#3 (Match with ACAHU#3) – 07-2001
    a. Trane 2TTA3060 – poor condition – considerable rusted.
    b. 460V-3ph
    c. R-22 refrigerant
    d. 30A heavy duty disconnect – poor condition

14. CHW expansion tank mounted on floor – fair condition

15. CHW chemical feeder tank – good condition

16. Hot water air separator is completely uninsulated. – Fair condition, signs of leaking on top.

Chiller Yard:

1. Chiller #1 (replaced 2018)
    a. Trane RTAC 2004 U1GN
    b. 197.5 ton capacity
    c. 45°F leaving water temperature (scheduled)
    d. 480 GPM
    e. 144,320 CFM
    f. 460V-3ph
    g. EER 9.2 (scheduled)
    h. 600A heavy duty disconnect – fair condition – 480/277V – 3ph

2. Chiller #2 (replaced 2018)
    a. Trane RTAC 2004 U1JN (replaced 2018)
    b. 197.5 ton capacity
    c. 45°F leaving water temperature (scheduled)
    d. 480 GPM
    e. 144,320 CFM
    f. 460V-3ph
    g. EER 9.2 (scheduled)
    h. 600A heavy duty disconnect – fair condition – 480/277V – 3ph

3. 10,000 gallon above ground oil storage tank (abandoned).

Mechanical Room 213:

1. P-1 (Chilled Water System Pump) Bell & Gossett
    a. Model 1510 CK0730
    b. ??? GPM (1,165 scheduled)
    c. 40 hp
    d. 460V-3ph
    e. Emmerson motor D40P2B
    f. Controls
        i. Bell & Gossett technologic VSP Controller
        ii. Bell & Gossett automatic bypass
        iii. VFD pump DCHWP1
        iv. ???? head

2. P-2 (Chiller #1 Pump) Bell & Gossett
    a. Model AD80A
    b. ??? GPM (480 scheduled)
    c. 10 hp
    d. 460V-3ph
    e. ??? head

3. P-3 (Chiller #2 Pump) Bell & Gossett
    a. Model R352B
    b. ??? GPM (480 scheduled)
    c. 10 hp
    d. 208-230/460V-3ph
    e. ??? head
    f. Butterfly valve handles have broken off.

4. P-4 (Hot Water System Pump) Bell & Gossett
    a. Model AD80A
    b. ??? GPM (620 scheduled)
    c. 20 hp
    d. 460V-3ph
    e. ??? head

Boiler Room 250: Very hot in boiler room. There is an exhaust fan in there; unsure if this fan works.

1. P-5 (Boiler Pump) Bell & Gossett
    a. Model R352B
    b. ??? GPM (450 scheduled)
    c. 5 hp
    d. 460V-3ph
    e. Model R352B
    f. ??? head

2. Boiler: original

a. Weil McLain 1888 Dual fuel burner – low end of fair condition
b. Oil fired – 40.5 GPH
c. 5,845 Gas MBH input
d. 4,640 MBH output
e. Boiler H.P. – 138.6
f. Burner – Webster model JB2C–50–RM7840L 5hp, 460V-3ph – fair condition
g. Oil pump – Marathon Electric model D392 - 3/4 hp, 460V-3ph – fair condition
h. 30A heavy duty disconnect – good condition
i. Chilled water valves coming into the boiler room are in poor condition; very rusted.

3. Unit Heater – Boiler room
   a. Trane UHEC-073DACA
   b. 480V-3ph
   c. 7.5 kW, 9.3A

Unit Heaters:

1. Unit Heater – General Storage (HW supply and return disconnected, still in room. Box has been stripped but is still hanging.):
   a. 1,100 CFM
   b. 3.0 GPM
   c. 3/4" runout size
   d. 115V-1ph

2. Fans:
   a. F-3 – Dishwasher Exhaust – 600 CFM
   b. F-4 – Dishwasher Room Exhaust – 400 CFM
   c. F-5 – Fly Fan – 2550 CFM
   d. F-6 – Kitchen Toilets – 200 CFM
   e. F-8 – Kitchen Hood – 5400 CFM Exhaust, 3250 CFM make up air
   f. F-9 – Kitchen Hood – 4850 CFM Exhaust, 2900 CFM make up air
   g. F-10 – B63 Electrical – 2050 CFM
   h. F-11 – B37 Mechanical – 800 CFM
   i. F-12 – B64 Boiler Room – 1000 CFM
   j. F-13 – Administration Toilets – 300 CFM

Area C – Classrooms & Media Center:

1. AHU#15 (Language C15 and Language C16)
   a. Trane MCCA006 – Fair condition – piping to unit shows minimal rust – cabinet looks good - controls look good.
   b. 2,300 CFM
   c. 600 OA CFM
   d. 3 hp fan
   e. 460V-3ph
   f. 20.0 GPM cooling coil, 1-1/2” runout size

g. 9.5 GPM heating coil, 1-1/4" runout size
h. 30A combination starter/disconnect switch – good condition

2. AHU#16 (Computer lab C14)
   a. Trane MCCA006 – Fair condition – piping to unit shows minimal rust – cabinet looks good - controls look good.
   b. 2,300 CFM
   c. 300 OA CFM
   d. 3 hp fan
   e. 460V-3ph
   f. 15.0 GPM cooling coil, 1-1/4" runout size
   g. 7.5 GPM heating coil, 1-1/4" runout size
   h. 30A combination starter/disconnect switch – good condition

3. AHU#17 (Language C17)
   a. Trane MCCA003 – Fair condition – piping to unit shows minimal rust – cabinet looks good - controls look good.
   b. 1,150 CFM
   c. 300 OA CFM
   d. 1-1/2 hp fan
   e. 460V-3ph
   f. 10.0 GPM cooling coil, 1-1/4" runout size
   g. 4.75 GPM heating coil, 1" runout size
   h. 30A combination starter/disconnect switch – good condition

4. AHU#18 (Corridor C20, Asst Principal E35, Toilets C22 and C23)
   a. 800 CFM
   b. 200 OA CFM
   c. 1 hp fan
   d. 460V-3ph
   e. 6.0 GPM cooling coil, 1" runout size
   f. 3.25 GPM heating coil, 3/4" runout size
   g. 30A combination starter/disconnect switch – good condition

5. AHU#19 (Tech office C07, Media center C02, MC office C09, Production C10, Equipment C11)
   a. Trane MCCA006 – Fair condition – HW piping to unit shows significant rust – cabinet looks good - controls look good.
   b. 3,000 CFM
   c. 575 OA CFM
   d. 5 hp fan
   e. 460V-3ph
   f. 22.0 GPM cooling coil, 1-1/2" runout size
   g. 11.0 GPM heating coil, 1-1/4" runout size
   h. 30A combination starter/disconnect switch – good condition

6. AHU#20 (Media center C02)
   a. Trane MCCA006 – Fair condition – HW piping to unit show minimal rust – cabinet looks good - controls look good.
   b. 3,000 CFM
   c. 575 OA CFM
   d. 5 hp fan
   e. 460V-3ph
   f. 22.0 GPM cooling coil, 1-1/2" runout size
   g. 11.0 GPM heating coil, 1-1/4" runout size
   h. 30A combination starter/disconnect switch – good condition

7. AHU#21 (Conference C03, Work room C04, Storage C05)
   a. Trane MCCA006 – Fair condition – HW piping to unit shows significant rust – cabinet looks good - controls look good
   b. 1,700 CFM
   c. 150 OA CFM
   d. 3 hp fan
   e. 460V-3ph
   f. 10.5 GPM cooling coil, 1-1/2" runout size
   g. 5.5 GPM heating coil, 1-1/4" runout size
   h. 30A combination starter/disconnect switch – good condition

8. DAHU#1 (Main comm.)
   a. 500 CFM
   b. 115V-1ph

9. DAC#1
   a. 208V-1ph
   b. 18 MBH

10. Fans – Area C:
    a. F-14 – Media center toilet – 100 CFM
    b. F-15 – Electrical room C25 – 375 CFM (Actual fan over area E)

Area E – Gymnasium and Locker Rooms:

1. AHU#22 (Lobby E01, Tickets E02, Concessions E06 and Toilets E04 and E05)
   a. Trane MCCA006 – Fair condition – HW piping to unit shows significant rust – CW piping insulation has mold on it – cabinet looks good - controls look good
   b. 2,300 CFM
   c. 400 OA CFM
   d. 3 hp fan
   e. 460V-3ph
   f. 16.5 GPM cooling coil, 1-1/2" runout size
   g. 8.25 GPM heating coil, 1-1/4" runout size
   h. 30A combination starter/disconnect switch – good condition

2. AHU#23 (Corridor E17, Office E25, E22, Toilet E25)
   a. Trane MCCA003 – Fair condition – piping to unit shows moderate rusting – controls look good
   b. 1,550 CFM
   c. 150 OA CFM
   d. 2 hp fan
   e. 460V-3ph
   f. 9.0 GPM cooling coil, 1-1/4" runout size
   g. 5.0 GPM heating coil, 1" runout size
   h. 30A combination starter/disconnect switch – good condition

3. AHU#24 (Gymnasium E06) – Rusting on the bottom of AHU – poor condition
   a. Trane MCCA021 – Fair/poor condition – was told the connections between the AHU boxes underneath the AHU were separating and leaking condensate onto the slab. This has rusted the AHU where the condensate leaks – brand new Siemens control valve on HW piping – significant rust shown on piping to unit – controls look good.
   b. 10,000 CFM
   c. 6,000 OA CFM
   d. 15 hp fan
   e. 460V-3ph
   f. 130.0 GPM cooling coil, 4" runout size
   g. 56.0 GPM heating coil, 2-1/2" runout size
   h. 60A combination starter/disconnect switch – good condition

4. AHU#25 (Gymnasium E06)
   a. Trane MCCA021 – Fair condition – piping to unit shows significant rust – brand new Siemens control valve on HW piping – controls look good
   b. 10,000 CFM
   c. 6,000 OA CFM
   d. 15 hp fan
   e. 460V-3ph
   f. 130.0 GPM cooling coil, 4" runout size
   g. 56.0 GPM heating coil, 2-1/2" runout size
   h. 60A combination starter/disconnect switch – good condition

5. AHU#26 (Girl's locker room E28 and E32)
   a. Trane MCCA008 – Fair condition – piping to unit shows moderate rust – controls look good
   b. 4,000 CFM
   c. No OA
   d. 5 hp fan
   e. 460V-3ph
   f. 14.0 GPM heating coil, 1-1/4" runout size
   g. 30A combination starter/disconnect switch – good condition

6. AHU#27 (Weight room E28)
   a. Trane MCCA006 – Fair condition – piping to unit shows significant rust – controls look good
   b. 3,000 CFM
   c. No OA
   d. 3 hp fan
   e. 460V-3ph
   f. 11.0 GPM heating coil, 1-1/4" runout size
   g. 30A combination starter/disconnect switch – good condition

7. AHU#28 (Storage E11, E12, E14, Mech E13, Laundry E15, Training room E18)
   a. Trane MCCA003 – Fair condition – piping to unit shows significant rust – controls in fair condition
   b. 1,550 CFM
   c. 150 OA CFM
   d. 2 hp fan
   e. 460V-3ph
   f. 9.0 GPM cooling coil, 1-1/4" runout size
   g. 5.0 GPM heating coil, 1" runout size
   h. 30A combination starter/disconnect switch – good condition

8. AHU#29 (Boys locker room E24 and E20)
   a. Trane MCCA008 – Fair condition – piping to unit shows significant rust – controls look good
   b. 4,000 CFM
   c. No OA
   d. 5 hp fan
   e. 460V-3ph
   f. 14.0 GPM heating coil, 1-1/4" runout size
   g. 30A combination starter/disconnect switch – good condition

9. Fans – Area E:
   a. F-7 – E19 electrical – 375 CFM
   b. F-16 – Girl's locker room – 4,650 CFM
   c. F-17 – NOT USED
   d. F-18 – Weight room – 3,500 CFM
   e. F-19 – Boys locker room – 4,650 CFM
   f. F-20 – Gym lobby toilets – 1,300 CFM

Area F – Classrooms, Art & Music:

1. AHU#30 (Health/PE F25, Music F23)
   a. Trane MCCA006 – Fair condition – piping to unit shows moderate rust – controls look good
   b. 3,225 CFM
   c. 600 OA CFM

d. 5 hp fan
e. 460V-3ph
f. 24.0 GPM cooling coil, 2” runout size
g. 11.5 GPM heating coil, 1-1/4” runout size
h. Missing HWS/R insulation near AHU
i. 30A combination starter/disconnect switch – good condition

2. AHU#31 (Health/PE F02, Exceptional ed F03)
   a. Trane MCCA006 – Fair condition – piping to unit shows slight rust – controls look good
   b. 3000 CFM
   c. 600 OA CFM
   d. 5 hp fan
   e. 460V-3ph
   f. 23.0 GPM cooling coil, 1-1/2” runout size
   g. 11.0 GPM heating coil, 1-1/4” runout size
   h. Missing HWS/R insulation near AHU
   i. 30A combination starter/disconnect switch – good condition

3. AHU#32 (Resource class F06, F11, Lounge F07, Workroom F10)
   a. Trane MCCA006 – Fair condition – piping to unit shows slight rust – controls look good
   b. 2,800 CFM
   c. 500 OA CFM
   d. 5 hp fan
   e. 460V-3ph
   f. 20.0 GPM cooling coil, 1-1/2” runout size
   g. 10.0 GPM heating coil, 1-1/4” runout size
   h. Missing HWS/R insulation near AHU
   i. 30A combination starter/disconnect switch – good condition

4. AHU#33 (Music F16, F17, Office F19, Music storage F21, F22, Toilet F24)
   a. Trane MCCA008 – Fair condition – piping to unit shows slight rust – controls look good
   b. 3,850 CFM
   c. 650 OA CFM
   d. 5 hp fan
   e. 460V-3ph
   f. 27.0 GPM cooling coil, 2” runout size
   g. 13.5 GPM heating coil, 1-1/4” runout size
   h. Missing HWS/R insulation near AHU
   i. 30A combination starter/disconnect switch – good condition

5. AHU#34 (Visual arts F12, Kiln F14, Storage F13, Office F15)
   a. Trane MCCA006 – Fair condition – piping to unit shows moderate rust – controls look good

b. 2,500 CFM
c. 800 OA CFM
d. 3 hp fan
e. 460V-3ph
f. 22.0 GPM cooling coil, 1-1/2" runout size
g. 11.0 GPM heating coil, 1-1/4" runout size
h. Missing HWS/R insulation near AHU
i. 30A combination starter/disconnect switch – good condition

6. Fans – Area F:
   a. F-21 – Electrical F09 – 375 CFM
   b. F-22 – Kiln F14 – 1,500 CFM
   c. F-23 – Area F toilets – 350 CFM
   d. F-40 – Toilet F24 – 225 CFM
   e. Missing HWS/R insulation

Area G – Science Classrooms, Teacher's Lounge, Classrooms:

1. AHU#35 (Corridor G12, G31, Bathrooms G32, G34, Resource class G36)
   a. Trane MCCA006 – Fair condition – piping to unit shows significant rust – controls look good
   b. 2,200 CFM
   c. 175 OA CFM
   d. 2 hp fan
   e. 460V-3ph
   f. 12.5 GPM cooling coil, 1-1/4" runout size
   g. 6.75 GPM heating coil, 1" runout size
   h. Unable to open disconnect – probably a 30A combination starter/disconnect switch in good condition

2. AHU#36 (English class G01, G02)
   a. Trane MCCA006 – Fair condition – piping to unit shows minimal rust – controls look good
   b. 2,300 CFM
   c. 600 OA CFM
   d. 3 hp fan
   e. 460V-3ph
   f. 20.0 GPM cooling coil, 1-1/2" runout size
   g. 9.5 GPM heating coil, 1-1/4" runout size
   h. 30A combination starter/disconnect switch – good condition

3. AHU#37 (English class G04, G05) MMN
   a. Trane MCCA006 – Fair condition – piping to unit shows moderate rust – controls look good
   b. 2,300 CFM
   c. 600 OA CFM

d. 3 hp fan
e. 460V-3ph
f. 20.0 GPM cooling coil, 1-1/2" runout size
g. 9.5 GPM heating coil, 1-1/4" runout size
h. 30A combination starter/disconnect switch – good condition

4. AHU#38 (Prep G25, Biology G26)
   a. Trane MCCA006 – Fair condition – piping to unit shows significant rust – controls look good
   b. 2,200 CFM
   c. 300 OA CFM
   d. 3 hp fan
   e. 460V-3ph
   f. 15.0 GPM cooling coil, 1-1/4" runout size
   g. 7.5 GPM heating coil, 1-1/4" runout size
   h. 30A combination starter/disconnect switch – good condition

5. AHU#39 (Biology G22, Workroom G23)
   a. Trane MCCA006 – Fair condition – piping to unit shows slight rust – controls look good
   b. 2,200 CFM
   c. 300 OA CFM
   d. 3 hp fan
   e. 460V-3ph
   f. 15.0 GPM cooling coil, 1-1/4" runout size
   g. 7.5 GPM heating coil, 1-1/4" runout size
   h. 30A combination starter/disconnect switch – good condition

6. AHU#40 (English class G27)
   a. Trane MCCA003 – Fair condition – piping to unit shows slight rust – controls look good
   b. 1,150 CFM
   c. 300 OA CFM
   d. 1-1/2 hp fan
   e. 460V-3ph
   f. 10.0 GPM cooling coil, 1-1/4" runout size
   g. 4.75 GPM heating coil, 1" runout size
   h. 30A combination starter/disconnect switch – good condition

7. AHU#41 (English class G06, G07)
   a. Trane MCCA006 – Good condition – piping to unit shows minimal rusting
   b. 2,400 CFM
   c. 600 OA CFM
   d. 3 hp fan
   e. 460V-3ph
   f. 21.0 GPM cooling coil, 1-1/2" runout size

g. 9.5 GPM heating coil, 1-1/4" runout size
h. 30A combination starter/disconnect switch – good condition

8. AHU#42 (Math class H02, H03)
   a. Trane MCCA006 – Fair condition – piping to unit shows slight rust – controls look good
   b. 2,300 CFM
   c. 600 OA CFM
   d. 3 hp fan
   e. 460V-3ph
   f. 20.0 GPM cooling coil, 1-1/2" runout size
   g. 9.5 GPM heating coil, 1-1/4" runout size
   h. 30A combination starter/disconnect switch – good condition

9. AHU#43 (Chemistry lab G12, Storage G10, G11, Workroom G14) MMN
   a. Trane MCCA006 – Fair condition – piping to unit shows significant rust – controls look good
   b. 2,300 CFM
   c. 300 OA CFM
   d. 3 hp fan
   e. 460V-3ph
   f. 15.0 GPM cooling coil, 1-1/4" runout size
   g. 7.5 GPM heating coil, 1-1/4" runout size
   h. 30A combination starter/disconnect switch – good condition

10. AHU#44 (Corridor G15, Conference G17, Lounge G15, Asst. principal G18)
   a. Trane – MCCA006 – Fair condition – piping to unit shows significant rust – controls look good
   b. 2,000 CFM
   c. 200 OA CFM
   d. 2 hp fan
   e. 460V-3ph
   f. 12.0 GPM cooling coil, 1-1/4" runout size
   g. 6.5 GPM heating coil, 1" runout size
   h. 30A combination starter/disconnect switch – good condition

11. Fans – Area G:
   a. F-24 – Ares B&G toilets – 2,225 CFM
   b. F-25 – Biology G26 – 2,500 CFM
   c. F-26 – Prep G-25 – 350 CFM
   d. F-27 – Electrical G-24 – 375
   e. F-28 – Biology G22 – 2,500 CFM
   f. F-29 – Elev. Equipment room B22 – 600 CFM
   g. F-30 – Prep and storage G11 & G13 – 300 CFM
   h. F-31 – Chemistry G-12 – 2,500 CFM
   i. F-32 – Fume hood G12 – 1,000 CFM

Area H – Science Classrooms, Classrooms: HWS/R and CHS/R valves in mechanical room H07 have only one handle – presumably can take off handle to use on all four valves.

1. AHU#45 (Computer lab H18) MMN
   a. Trane MCCA006 – Fair condition – piping to unit shows slight rust – controls look good
   b. 2,300 CFM
   c. 300 OA CFM
   d. 3 hp fan
   e. 460V-3ph
   f. 15.0 GPM cooling coil, 1-1/4" runout size
   g. 7.5 GPM heating coil, 1-1/4" runout size
   h. 30A combination starter/disconnect switch – good condition

2. AHU#46 (Corridor H04, Physical sci H23, Workroom H20) MMN
   a. Trane MCCA006 – Fair condition – piping to unit shows moderate rust – controls look good
   b. 2,200 CFM
   c. 300 OA CFM
   d. 3 hp fan
   e. 460V-3ph
   f. 15.0 GPM cooling coil, 1-1/4" runout size
   g. 7.5 GPM heating coil, 1-1/4" runout size
   h. 30A combination starter/disconnect switch – good condition

3. AHU#47 (Physical sci. H19)
   a. Trane MCCA006 – Fair condition – piping to unit shows significant rust – controls look good
   b. 2,200 CFM
   c. 300 OA CFM
   d. 3 hp fan
   e. 460V-3ph
   f. 15.0 GPM cooling coil, 1-1/4" runout size
   g. 7.5 GPM heating coil, 1-1/4" runout size30A disconnect – good condition
   h. 30A combination starter/disconnect switch – good condition

4. AHU#48 (Corridor H04 H10, Toilets H13, H14, Resource class H11)
   a. Trane MCA006 – Fair condition – piping to unit shows moderate rust – controls look good
   b. 2,200 CFM
   c. 175 OA CFM
   d. 2 hp fan
   e. 460V-3ph
   f. 12.5 GPM cooling coil, 1-1/4" runout size
   g. 6.75 GPM heating coil, 1" runout size
   h. 30A combination starter/disconnect switch – good condition

5. AHU#49 (Math class H08, H09)
   a. Trane MCCA006 – Fair condition – piping to unit shows significant rust – controls look good
   b. 2,300 CFM
   c. 600 OA CFM
   d. 3 hp fan
   e. 460V-3ph
   f. 20.0 GPM cooling coil, 1-1/2" runout size
   g. 9.5 GPM heating coil, 1-1/4" runout size
   h. 30A combination starter/disconnect switch – good condition

6. AHU#50 (Math class H05, H06)
   a. Trane MCCA006 – Fair condition – piping to unit shows significant rust – controls look good
   b. 2,300 CFM
   c. 600 OA CFM
   d. 3 hp fan
   e. 460V-3ph
   f. 20.0 GPM cooling coil, 1-1/2" runout size
   g. 9.5 GPM heating coil, 1-1/4" runout size
   h. 30A combination starter/disconnect switch – good condition

7. Fans – Area H:
   a. F-33 – Physical Science H23 – 2,500 CFM
   b. F-34 – Fume hood – 1,000 CFM
   c. F-35 – Prep H22 – 350 CFM
   d. F-36 – Electrical H21 – 375 CFM
   e. F-37 – Fume hood – H19 – 1,000 CFM
   f. F-38 – Physics H19 – 2,500 CFM
   g. F-39 – C&H toilets – 2,175 CFM
   h. F-40 – Toilets F24 – 225 CFM

Area J, K &L – Fieldhouse, Concessions & Ticket Booth:

1. Fans – Area J & K:
   a. F-41 – Concessions – 650 CFM
   b. F-42 – Women's toilet – 1,200 CFM
   c. F-43 – Men's toilet – 1,200 CFM
   d. F-44 Ticket booth – 250 CFM
   e. F-45 – Concessions K01 – 400 CFM

2. Electric Ceiling Heaters:
   a. EH-1 – Women's toilet – 425 CFM
   b. EH-2 – Women's toilet – 425 CFM
   c. EH-3 – Women's toilet – 425 CFM

d. EH-4 – Men's toilet – 425 CFM
e. EH-5 – Men's toilet – 425 CFM
f. EH-6 – Men's toilet – 425 CFM
g. EH-7 – Concessions – 425 CFM
h. EH-8 – Concessions – 425 CFM
i. EH-9 – Storage – 425 CFM
j. EH-10 – Concessions L01 – 425 CFM

3. Electric Baseboard Heaters:
   a. EBB-1 – Ticket booth K01 – 1,000 W, 240V-1ph
   b. EBB-2 – Concession storage L02 – 1,000 W, 240V-1ph
   c. EBB-3 – Concession Mech L03 – 500 W, 240V-1ph

Auditorium & Auxiliary Gymnasium:

1. Drawings Available:
   a. Heide Trask Senior High School – Cheatham and Associates (2009)
   b. Siemens controls

2. Note: All outdoor refrigerant piping insulation is in poor condition and should be replaced.

3. AHU#1 (Dress 121, 122, Toilet 123, 124) – 10/2010
   a. Trane 4TEC3F30B1000AA – Good condition
   b. 1,000 CFM
   c. 175 OA CFM
   d. 1/3 hp fan
   e. 208/230V-3ph
   f. UV lights installed in duct
   g. 60A heavy duty disconnect – good condition
   h. 7.2 kW electric heat
   i. R-410A refrigerant

4. HP#1 (Match with AHU#1) – 9/2010
   a. Trane 4TWA3030A4000BA – Fair condition
   b. 460V-3ph
   c. R-410A refrigerant
   j. 30A disconnect – good condition

5. AHU#2 (Stage 117)
   a. Trane TWE090D300AA – good condition
   b. 3,000 CFM
   c. 525 OA CFM
   d. 3 hp fan
   e. 208-230V/460V-3ph
   f. UV lights installed in duct

g. 60A heavy duty disconnect – good condition
h. 9.2 kW electric heat

6. HP#2 (Match with AHU#2) – 9/2010
   a. Trane TWA090D40RAA – good condition
   b. 460V-3ph
   c. R-410A refrigerant
   d. 30A disconnect – good condition

7. AHU#3 (Auditorium 116) – 10/2010
   a. Trane TWE120D300AA – good condition
   b. 4,000 CFM
   c. 2,650-300 OA CFM (higher number is max CFM, lower number is min CFM)
   d. 3 hp fan
   e. 460V-3ph
   f. UV lights installed in duct
   g. 60A heavy duty disconnect – good condition – 480V-3ph
   h. 24.92 kW electric heat
   i. 410A refrigerant

8. HP#3 (Match with AHU#3)
   a. Trane TWA120D40RAA – fair condition
   b. 460V-3ph
   c. R-410A refrigerant
   d. 30A heavy duty disconnect – good condition

9. AHU#4 (Auditorium 116) – 10/2010
   a. Trane TWE120D300AA – good condition
   b. 4,000 CFM
   c. 2,650-300 OA CFM (higher number is max CFM, lower number is min CFM)
   d. 3 hp fan
   e. 208-230V/ 460V-3ph
   f. UV lights installed in duct
   g. 60A disconnect – good condition
   h. 24.92 kW electric heat – 460V-3ph

10. HP#4 (Match with AHU#4)
    a. Trane TWA120D40RAA – good condition
    b. 460V-3ph
    c. 11.0 EER (Not listed)
    d. R-410A refrigerant
    e. 30A heavy duty disconnect – good condition

11. AHU#5 (Auxiliary Gymnasium 108) – 10/2010
    a. Trane TWE120D300AA – good condition
    b. 4,000 CFM

c. 1,530-330 OA CFM (higher number is max CFM, lower number is min CFM)
d. 3 hp fan
e. 208-230V/ 460V-3ph
f. UV lights installed in duct
g. 60A disconnect – good condition
h. 24.92 kW electric heat – 460V-3ph

12. HP#5 (Match with AHU#5) – 11/2010
    a. Trane TWA120D40RAA – good condition
    b. 460V-3ph
    c. R-410A refrigerant
    d. 30A disconnect – good condition

13. AHU#6 (Auxiliary Gymnasium 108) – 11/2010
    a. Trane TWE120E300AA – good condition
    b. 6,000 CFM
    c. 2,300-500 OA CFM (higher number is max CFM, lower number is min CFM)
    d. 3 hp fan
    e. 208-230V/ 460V-3ph
    f. UV lights installed in duct
    g. 60A heavy duty disconnect – good condition – 480V-3ph
    h. 29.92 kW electric heat
    i. R-410A refrigerant

14. HP#6 (Match with AHU#6) – 11/2010
    a. Trane TWA180E40RAA – good condition
    b. 460V-3ph
    c. R-410A refrigerant
    d. 30A disconnect – good condition

15. AHU#7 (Lobby 109, Storage 110, 113,114A, Control 114, Toilets 111) SSHP – 10/2010
    a. Trane TWE120D300AA – good condition
    b. 4,000 CFM
    c. 1,000-650 OA CFM (higher number is maximum CFM, lower number is minimum CFM)
    d. 2 hp fan
    e. 460V-3ph
    f. UV lights installed in RA duct - functional
    g. 60A heavy duty disconnect – good condition
    h. R-410A refrigerant

16. HP#7 (Match with AHU#7) – refrigerant piping in fair condition
    a. Trane TWA120D40RAA – low end of good condition
    b. 460V-3ph
    c. R-401A refrigerant
    d. 30A heavy duty disconnect switch – good condition

17. AHU#8 (Corridor 103, Toilets 104, Lobby106) SSHP - (09/2010)
    a. Trane TWE120D300AA – good condition
    b. 4,000 CFM
    c. 1,000-650 OA CFM (higher number is maximum CFM, lower number is minimum CFM)
    d. 2 hp fan
    e. 460V-3ph
    f. UV lights installed in duct - functional
    g. 60A heavy duty disconnect – good condition

18. HP#8 (Match with AHU#8) – refrigerant piping in fair condition
    a. Trane TWA120D40RAA – low end of good condition
    b. 460V-3ph
    c. 11.0 EER
    d. R-410A refrigerant
    e. 30A heavy duty disconnect – good condition

19. Fans – Aux Gym:
    a. F-1 – Electrical room 126 – 2,050
    b. F-2 – Toilets 124 - 100
    c. F-3 –Toilets 123 - 100
    d. F-4 – Women 111 – 450 – Old, fair condition
    e. F-5 – Men 105 – 450 – New, good condition
    f. F-6 – Electrical room 116B – 600

Outside Air Preconditioning Units – Aux Gym:

1. OAPU#1:
    a. Trane CSAA012 – great condition
    b. 5,300 CFM supply air
    c. 4,700 CFM exhaust air
    d. 1/4 hp energy recovery wheel
    e. 460V-3ph
    f. 10 hp supply fan
    g. 7-1/2 hp exhaust fan
    h. SA/EA fan disconnect – good condition
    i. Recovery wheel starter/disconnect – good condition

2. PU#1 (Match with OAPU#1): - (08/2010)
    a. Trane TTA240E400AA – fair condition
    b. 460V-3ph
    c. R-410A refrigerant
    d. 60A disconnect – fair condition

3. OAPU#2:

a. Trane CSAA010
b. 3,830 CFM supply air
c. 3,000 CFM exhaust air
d. 1/6 hp energy recovery wheel
e. 460V-3ph
f. 7-1/2 hp supply fan
g. 5 hp exhaust fan
h. SA/EA fan disconnect – good condition
i. Recovery wheel starter/disconnect – good condition

4. PU#2 (Match with OAPU#2):
   a. Trane TTA180E400AA – fair condition
   b. 460V-3ph
   c. R-410A refrigerant
   d. 60A heavy duty disconnect – fair condition

5. UH-1 (Sprinkler room 120):
   a. 400 CFM
   b. 480V-3ph
   c. 11,200 BTU/hr

Cheatham and Associates, P.A.
Consulting Engineers

HVAC INFRASTRUCTURE ASSESSMENT
MALPASS ELEMENTARY SCHOOL
PENDER COUNTY SCHOOLS

June 27, 2022

APPENDIX A – More detailed information found and observed for each HVAC system and area.

General:

1. Drawings Available:
   a. Malpass Corner Elementary School – David N. Shultz and Associates (1992) – 30 years old.
   b. No additions or renovations drawings found.

2. Controls:
   a. Schneider controls, very old and cannot get replacement cards anymore. Replace all controls.

3. Site visit notes:
   a. June 28th site visit (hot, humid day) All AHUs, FCUs, boiler, chillers and equipment were off with the exception of the Admin split system AHU's (3). Building was humid, musty and had an unpleasant odor and the ceiling tiles in many rooms were bowed from excessive moisture.
   b. A 4 pipe system, one oil fired cast iron boiler and 2 air cooled chillers.
   c. Classrooms are 4 pipe FCU's with HW in preheat or reheat position, look above a ceiling and take pictures of a FCU.
   d. 3 - AHU's are 4 pipe with HW coil in preheat position. (Orig drawings have reheat position on the control diagram)
   e. Summer – boiler is off, chillers are off, AHU's are off. No air movement in the building except Admin area. Probably set up through Synergistics.
   f. Admin area SSHP's are on a schedule 5am to 5pm. Otherwise, they are off.

4. Wayne Keen's notes:
   a. School is not setup to dehumidify.
   b. No duct heaters anywhere.
   c. Schneider controls very old and obsolete, replace.
   d. Chillers – cannot see in controls – can only see pipe temps.
   e. Chillers are 2018 and set up for controls, just need BACNet to chillers so they can see them at central office.

f. All AHU's are off and set to come on at 85 degrees inside. (Not sure if chiller plant comes on or not with AHUs).
g. Admin units set to 75 degree cooling and 55 degree heating.
h. Library – unit off in summer. They have set up a dehumidifier in the room pumped to a sink drain temporarily. (need to lift the unit to be above the drain line, no water being pumped out when we were there)
i. Library – School system wants to add dehumidifier located above the ceiling. Need CAPA to verify size and location for HVAC Starplus.

5. Information for Units/FCU's and Exhaust Fans - CFM's, etc are from the original design.
6. Ken – original design was 12 degree delta T at the chillers, the new chillers are now 10 degree delta T.
7. Ken – CW original GPM designed is (2) 200 GPM pumps. Replacement pumps in 2006 were (2) 260 GPM pumps. We added all the GPM's up for the building and it equaled 380 GPM. Thoughts???
8. Ken – HW original GPM designed is (2) 60 GPM pumps.We added all the GPM's for the building and it equaled 184 GPM. Thoughts???

Core - Lobby/Administration/Media Area:

1. Fans:
   a. F-4 – 850 CFM (Core toilets – near admin)
   b. F-5 – 300 CFM (Electrical 12)
   c. F-6 – 870 CFM (Core toilets – near media ctr)
   d. F-14 – 400 CFM (Elect 29A)

2. AHU#3 (Cafeteria 18) Hanging high up above ceiling 20+ feet A.F.F. (difficult to service)
   a. Information from original design schedules
   b. 5000 CFM
   c. 1000 OA CFM
   d. 5 hp fan
   e. 460V-3ph
   f. ?? A disconnect

3. SSAHU-1 (Indoor Unit #1 – above ceiling Guidance Center 10)
   a. Make/Model:
   b. 600 CFM
   c. No OA
   d. Refrigerant R-22
   e. 208V-1ph
   f. 3.75kW electric heat
   g. ?? A disconnect

4. Outdoor Unit #1 (Match with SSAHU-1) Fair condition
   a. Carrier Model 25HBR318A330 (05-2008)

b. R-22 Refrigerant
c. 208V-1ph
d. 30 A HD Sq D disconnect – fair condition

5. SSAHU-2 (Indoor Unit #2 – Admin Area) - good condition
   a. Trane A4AH4P18A1B60BA (12-2021)
   b. Mounted on the Floor in Mech Room 64
   c. 600 CFM
   d. OA 6" dia. from OAI-2 - ?? CFM (no balancing damper)
   e. Heater BAYHTR1505 (3.6KW)
   f. Refrigerant R410a
   g. 208V-1ph
   h. 3.75kW electric heat
   i. 30A HD Sq D disconnect good condition

6. Outdoor Unit #2 (Match with SSAHU-2) good condition
   a. Trane A4HP4018A1000BA (12-2021)
   b. R-410a Refrigerant
   c. 208V-1ph
   d. 30 A HD disconnect – Poor

7. SSAHU-3 (Indoor Unit #3 – Admin Area) good condition
   a. Trane TEM6A0C36H31SBA (11-2021)
   b. Mounted on the Floor in Mech Room 64
   c. 1200 CFM
   d. Refrigerant R-410a
   e. Heater BAYHTR1510 (7.2 KW)
   f. OA 6" dia. from OAI-2 - ?? CFM (no balancing damper)
   g. 208V-1ph
   h. 3.75kW electric heat
   i. 100A Sq D disconnect (not listed as HD) good condition

   (could it possibly matched with an exterior 100 amp panel what has a generator hook ups?)

8. Outdoor Unit #3 (Match with Indoor Unit #3) good condition

a. Trane 4TWR4036G1000AB (08-2021)
b. 208V-1ph
c. Refrigerant R-410a
d. 60A disconnect – Poor condition

9. Outside Air Intake #4 (AHU-3 Cafeteria)
   a. 1000 CFM
   b. Motorized damper

10. Outside Air Intake – 5 (Elect Rm makeup)
    a. 300 CFM
    b. Motorized damper

11. Fan Coil Unit E (Exceptional Children 114)
    a. 1200 CFM
    b. 7" dia. OA duct

12. Fan Coil Unit E (Write to Read Lab 113)
    a. 1200 CFM
    b. 7" dia. OA duct

13. Fan Coil Unit B (Faculty Wkrm 116)
    a. 610 CFM
    b. 7" dia. OA duct

14. Fan Coil Unit F (Media Conf Rm 17)
    a. 400 CFM
    b. No OA

15. Fan Coil Unit G (Media Wkrm 15)
    a. 790 CFM
    b. No OA

16. Fan Coil Unit A (AV Storage 14)
    a. 400 CFM
    b. No OA

Kindergarten and First Grade Area: All FCUs are listed from bottom of plan to top of plan

1. Fans:
   a. F-1 – 975 CFM (K & 1st Gr Clrm Toilets)

2. Fan Coil Unit – E (K* 1st Gr Clrms 104, 105, 106, 107, 108, 109, and 111)
   a. 1200 CFM
   b. 7" dia. OA duct

3. Fan Coil Unit – E (K & 1st Gr. Clrms 101, 102 & 103)
   a. 1200 CFM
   b. 7" dia. OA duct
   c. With 3-way control valves at FCUs
4. Fan Coil Unit – F (K & 1st Gr Entry Hall)
   a. 400 CFM
   b. 5" dia. OA duct

5. Fan Coil Unit – B (Resource 110 & 112)
   a. 610 CFM
   b. 7" dia. OA duct

6. Outside Air Intake #1
   a. 1570 CFM Serves (12 Clrms, Hall, and 3 Resource Rms) Approx. 115 per CLRM, 50 CFM per Resource Room, 40 CFM Hall
   b. 18"x18" Duct to LP on roof

2nd and 3rd Grade Area: (All FCU's are listed from left to right)

1. Fan Coil Unit – B (Resource Rooms 210 & 211)
   a. 610 CFM
   b. 5" dia OA duct

2. Fan Coil Unit – E (2nd and 3rd Gr Clrms 204, 205, 206, 207, 208, 209 and 211)
   a. 1200 CFM
   b. 7" dia. OA duct

2. Fan Coil Unit – E (2nd and 3rd Gr Clrms 201, 202 and 203)
   a. 1200 CFM
   b. 7" dia. OA duct
   c. With 3-way control valves at FCUs

3. Fan Coil Unit – F (2nd and 3rd Gr Entry Hall)
   a. 400 CFM
   b. No OA ??? (other wings do have a 5" dia OA on Hall unit)

4. Outside Air Intake #2
   a. 1,640 CFM (10 Clrms, Hall and 2 Resource Rooms) - Approx. 133 CFM per Clrm, 60 CFM per Resource Rm and 40 CFM Hall.
   b. 18"x18" throat

4th and 5th Grade Area: (All FCU's area listed from left to right)

1. Fan Coil Unit D: (4th and 5th Gr Clrms 304, 305, 306, 307, 308, 309, and 310)
   a. 1,000 CFM

b. 7" dia. OA duct

2. Fan Coil Unit E: (Computer Room 311)
   a. 1200 CFM
   b. 7" dia. OA duct

3. Fan Coil Unit D: (4th and 5th Gr 301, 302 and 303)
   a. 1,000 CFM
   b. 7" dia. OA duct
   c. With 3-way control valves

4. Fan Coil Unit B: (Resource Rooms 312 & 313)
   a. 610 CFM
   b. 6" dia. OA duct

5. Fan Coil F: (4th and 5th Gr Corridor)
   a. 400 CFM
   b. 5" dia OA duct

6. Outside Air Intake #3 (serving 11 Clrms and 2 Resource Clrms)
   a. 1,280 CFM (Approx. 107 CFM per Clrm and 54 CFM per Resource Clrm)
   b. 18"x18" throat

Vocation Wing/Kitchen and Multipurpose Area:

1. AHU#1 (Multipurpose/Dance Drama room) fair condition
   a. McQuay (no tags for model numbers)
   b. 10,000 CFM
   c. 1500 OA CFM
   d. 7.5 hp fan scheduled
   e. 460V-3ph
   f. ____A disconnect

2. AHU#2 (Media Center) fair condition
   a. No tags
   b. 3-way at HW and CW
   c. 10,000 CFM
   d. 1500 OA CFM
   e. 7.5 hp fan scheduled
   f. 460V-3ph
   g. 30A HD Sq D disconnect switch with starter (Hand-Off-Auto)

3. Fan Coil Unit E: (Music 402 & Art Clrm 404)
   a. 1200 CFM
   b. 7" dia. OA duct

4. Fan Coil Unit B (Custodial Room 403 and Office 407)
   a. 610 CFM
   b. 7” dia. OA duct

5. Kitchen Supply Unit – Evaporative Cooler (as scheduled) No AC in kitchen
   a. 3300 CFM OA Supply
   b. 1/2 HP
   c. 120V-1ph

6. Fans – Area F:
   a. F-2 – 750 CFM (1/4 hp, 120V-1ph)
   b. F-7 – Dishwasher exhaust – 600 CFM (1/4 hp, 120V-1ph)
   c. F-8 – Kitchen hood exhaust – 6,325 CFM (3hp, 460V-3ph)
   d. F-9 – Kitchen hood supply – 4,325 CFM (2hp, 460V-3ph)
   e. F-10 – Kitchen supply unit – 2,075 CFM (1/4 hp, 120V-1ph)
   f. F-11 – 800 CFM (1/4 hp, 120V-1ph)
   g. F-12 – 1000 CFM (1/4 hp, 120V-1ph)
   h. F-13 – 400 CFM (1/4 hp, 120V-1ph)

Chiller Yard:

1. Chiller #1 – Trane (good condition)
   a. 89.9 ton capacity, 10.38 EER, IPLV 15.41
   b. R-410A
   c. 44°F LWT, 54°F EWT (original design 42-54 water temps)
   d. 260 GPM (Pump P-1)
   e. 460V-3ph
   f. 400 A HD Sq D Disconnect Switch
   g. 95 degree Ambient
   h. 4” CHR, common 6” CHS
   i. Butterfly valves rusted and poor condition

2. Chiller #2 – Daiken (waiting to hear back from Chris Cimino) good condition
   a. 99.7 ton capacity
   b. 42°F LWT, 54°F EWT (scheduled)
   c. 260 GPM (Pump P-2)
   d. 460V-3ph
   e. 400 A HD Sq D disconnect switch
   f. 95 degree Ambient
   g. 4” CHR, common 6” CHS
   h. Butterfly valves rusted and in poor condition

3. 10,000 Gallon underground oil tank 8'dia x 26'-7" long in use. Located fill lines next to parking lot. Leak detection panel inside boiler room.

Pumps:

1. P-1: for Chiller-1 (operated in Parallel with P-2) – (poor condition - rusty)
   a. Taco F12508E2FAJ1L0A (08/2006 16 yrs old)
   b. 260 GPM
   c. 460V-3ph
   d. 60' of head
   e. 7.9 impeller diameter
   f. Baldor Motor 7.5 HP
   g. Pump, motor appear to be original – poor condition.
   h. Pump pan rusted through.
   i. 30A HD Sq D Disconnect Switch with starter (Hand-Off-On)
   j. Piping taped at valve – appears to be leaking and now duct taped to preventing leak.

2. P-2: for Chiller-2 (operates in parallel with P-1) – (poor condition - rusty)
   a. Taco F12508E2FAJ1L0A (08/2006 16 yrs old)
   b. 260 GPM
   c. 460V-3ph
   d. 60' of head
   e. 7.9 impeller diameter
   f. Baldor Motor 7.5 HP
   g. Pump, motor appear to be original – poor condition.
   h. Pump pan rusted through.
   i. 30A HD Sq D Disconnect Switch with starter (Hand-Off-On)

3. P-3: Boiler Pump (operates in parallel with P-4 - hanging) (poor condition – rusty)
   a. Taco Model ???
   b. 60 GPM scheduled
   c. Onimount 125 Motor
   d. 3 hp, 1750 RPM
   e. 460V-3ph
   f. 55' head scheduled
   g. 30A HD Sq D Disconnect with starter (Hand-Off-On)
   h. Look for pump information (GPM – Ft Head)

4. P-4: Boiler Pump (operates in parallel with P-3 hanging) (poor condition – rusty)
   a. Taco Model ???
   b. 60 GPM scheduled
   c. Onimount 125 Motor
   d. 3 hp, 1750 RPM
   e. 460V-3ph
   f. 55' head scheduled
   g. 30A HD Sq D disconnect with starter (Hand-Off-On)

h. Look for pump information (GPM-Ft Head)

5. GPM totals from the drawings:
   i. Chilled Water = 379.5 total
   j. Hot Water = 183.9 total

Boiler Room:

1. Boiler: (good condition)
   a. Weil McLain 788 (one side the jackets have been removed, is there an issue with it? Ask Wayne)
   b. Oil fired – 40.5 GPH (No gas available but has dual fuel burner)
   c. Webster gas-oil fired Burner - #2 Fuel oil used, 3/4 hp burner motor, 115V-1ph
   d. ? A heavy duty disconnect – good condition
   e. 3-way control valve at HWS
2. Fans:
   a. F-3 – 1650 CFM (Boiler Room sidewall) linked with MOD at sidewall intake louver.
3. Air Separator HW – poor condition – uninsulated
4. Air Separator CW – insulated could not see (no leaks visible)
5. Chemical Feed HW – fair condition (with gate valves)
6. Chemical Feed CW – poor condition (with gate valves)
7. Make up water stations (side by side – with gate valves) fair condition
8. The clevis hangers in room are rusted.
9. Butterfly valves in room are rusted, and handles are in poor condition.
10. Isolation butterfly valves where piping enters Mechanical Room from building.
11. ESI control panels (3)
    a. UCI-6 Fan Coil Units
    b. CP-05 Boiler/Chiller system
    c. DCU-5 Boiler/Chiller system
12. Veeder-Root leak detect system Model TLS-250 (assume this is for underground oil storage tank).
13. (2) Expansion tanks hanging above piping.

Unit Heaters: (location(s)? possibly boiler room? How many? Could not locate

1. Unit Heater – A
   a. Make/Model
   b. 2.5 GPM
   c. 580 CFM
   d. 120V-1ph

Cheatham and Associates, P.A.
Consulting Engineers

HVAC INFRASTRUCTURE ASSESSMENT
PENDER HIGH SCHOOL
PENDER COUNTY SCHOOLS

June 29, 2022

APPENDIX A – More detailed information found and observed for each HVAC system and area.

MECHANICAL GENERAL NOTES

1. Pender High School (PHS) – 8 buildings.

2. Ductwork at the school has not been cleaned since 2005, notes on the 2005 drawings required the SA to be cleaned in Building A & C (return ductwork was new).

3. Meeting Notes 3/3/2022:
   a. Dehumidification does not work when outside air temp is above 90 degree F.
   b. The maximum OA dampers have been sealed off to allow dehumidification in summer. The dampers have been secured to supply the minimum OA required. They currently remain set to the minimum requirement.
   c. Cafeteria – uses auxiliary electric heat.
   d. Units were moving too much air with motors at 3400 RPM including pulling condensate off of their cooling coils. Motors were slowed 2400 RPM to slow down the air flow.
   e. Bldg A Auditorium – Has had humidity issues. They increased the electric heat for humidity control – need to update controls to maintain satisfactory temp and humidity.
   f. Bard Units – need replaced – issue with HGRH and exp valves going bad (talk with Matt Garrett with Bard regarding this).
   g. Original swamp cooler for Kitchen has been removed.
   h. Taps from the Cafeteria HVAC unit have been made to provide cooled air to the kitchen to temper the conditions. Not large enough for the kitchen and need to review.
   i. School follows the traditional calendar. (Summer construction/shut-down maybe possible)
   j. VAV boxes are working OK, sometimes need to reset electric heat.
   k. AHUs in attic space need to move out of the attic. Extremely difficult to access, service and the attic is not a healthy place for maintenance personal. Insulation particles are thick in the air.
   l. New Concessions/Field House building is not working. No dehumidification, not sure the electric heat is large enough to dehumidify.
   m. PCS considering converting oil fired water heater and boiler to natural gas (this school ??? and other schools THS, NTES, STES, TES, TMS, THS and Surf City K-8).
   n. Schneider Controls for most of the campus are old and cannot get replacement parts. Control system needs updated. Does the Owner want the control pieces and parts when replaced for spare parts for other schools?
   o. Building C – Owner to advise if any additional rooms/areas need to have air conditioning added.

p. No current water treatment for the HW system serving the Gymtorium. Pender Schools currently uses Sky Treatment Company for Cape Fear and North Topsail. If treatment is added, PCS should contract with Sky to include PHS.
q. OA temps to operate dampers – need sensors to let BAS know where the dampers are set.
r. Any units moved to the exterior of the building with ductwork exposed needs to be neatly covered to look good.
s. Discussed possibilities to reduce airborne aerosols transmissions:
    1) Bipolar ionization: need to specify a brand this does not create ozone, can be difficult to tell if working or not, low to no maintenance (brush or tube type will need to be cleaned, needle type does not).
    2) UV Lights works great. Lights need to be replaced yearly = relatively short life, expensive to replace the bulbs, treats only where it shines, problematic as it deteriorates inside of HVAC equipment including wiring, plastic parts, etc.
    3) Better filtration - MERV 13 filters are more expensive, easy to go back to less filtration to reduce costs after the initial project is complete.

BUILDING A – Classroom/Admin/Cafeteria/Auditorium

1. Drawings Available:
    a. 1973 Original Design - Mechanical Drawings M1a (of 3) M2 and M3 not available.
    b. 1974 Classroom Addition - Mechanical Drawing M4a – 6
    c. 1994 AC-Reroofing and Energy Renovations M-1 to M9
    d. 2005 PHS renovations
    e. Drawings for the Entry Addition and SSHP above the ceiling are in the New Concessions Building drawings 2016.

2. TAC Controls (1994).

3. Electric Reheat VAV boxes were replaced in 1994 (28 years old). They are the primary heat for Building A Classrooms/Offices.

4. Majority of supply air (SA) and exhaust air (ExA) ductwork in the building is original from 1973.

5. Majority of return air (RA) ductwork in the building is from 2005.

6. Majority of diffusers and grilles were replaced in 2005.

7. Ductwork was indicated to be cleaned as part of 2005 renovations.

8. Equipment in attic is difficult to access and service.

9. Four Bard QTEC PHP units are conditioning the hallways.
    a. TAC controls at each unit.

10. AHU-1 (Dining) located in attic (2005 – 17 years old)
    a. Trane TWE240B400BB
    b. With auxiliary electric heat

11. HP-1 poor condition (pair with AHU-1) 3/2005:

a. American Standard Trane TWA240B400FB – 20 ton nominal cooling capacity
b. R-22 Refrigerant
c. 60A Disc Switch – poor condition.

12. AHU-2

13. HP-2 – fair condition (05/2005):

a. American Standard TWA240B400FB – 20 ton nominal cooling capacity
b. R22 Refrigerant
c. 60A Heavy Duty Disc Switch – fair condition

14. AHU-3

15. HP-3 good condition 10/2018:

a. Trane TWA12044AAB00 – 10 ton nominal cooling capacity
b. 30A Heavy Duty Disc Switch
c. R410A Refrigerant

16. AHU-4

17. HP-4 poor condition (pair with AHU-4) 3/1993:

a. American Standard Trane TWA240B400FB – 20 ton nominal cooling capacity
b. R-22 Refrigerant

18. AHU-5

a. Trane TWE180B400BB
b. With auxiliary electric heat

19. HP-5 poor condition (pair with AHU-5) 3/1993:

a. American Standard Inc TWA180B400BA – 15 ton nominal cooling capacity
b. R-22 Refrigerant

20. AHU-6

21. HP-6 poor condition (pair with AHU-6) 3/1993:

a. American Standard TWA180B400BA – 15 ton nominal cooling capacity
b. R-22 refrigerant
c. 60A Disc Switch – poor condition

22. AHU-7

23. HP-7 – poor condition (pair with AHU-7) 07/1993:

a. American Standard TWA240B400BA – 20 ton nominal cooling capacity
b. R-22 Refrigerant
c. 60 A Heavy Duty Disc Switch – fair condition

24. AHU-8

25. HP-8 poor condition (pair with AHU-8) 5/2005:
    a. Meeting stated this unit is not working and new unit ordered. New unit will be a packaged HP and not just a condensing unit. It will be located on the ground where the HP-8 is now located and ducted into the attic.
    b. Trane TWA240B400FB - – 20 ton nominal cooling capacity
    c. R22 Refrigerant
    d. 60A Heavy Duty Disc Switch – good condition

26. AHU-9

27. HP-9 Trane TWA180B400BA 07/1993
    a. 15 ton nominal cooling capacity split system heat pump

28. AHU-10
    a. Trane TWE036P130B0
    b. With auxiliary electric heat

29. HP-10 fair condition (pair with AHU-10) 7/2005:
    a. Trane 2TWA2036A3000AB – 3SS ton nominal cooling capacity
    b. HD 30 Amp Disconnect Switch – fair condition
    c. R-22 Refrigerant

30. AHU-1-Entry (2016 Addition of Entry):
    a. 4 ton SSHP (scheduled)
    b. Siemens Controls this unit only in Building A

31. HP-1-Entry – good condition (pair with AHU in Entry Addition) 7/2016:
    a. Trane 4TWA7048A3000AA – 4 ton nominal cooling capacity
    b. 30 A General Duty Disc Switch

32. Ductless DAHU (Outdoor Café – new – in the process of being installed)

33. Ductless DHP (pair with outdoor Café – new – in the process of being installed)

BUILDING B – 6 Classroom Building

1. Drawings Available:
    a. Original Drawings not available.
    b. 2005 PHS renovations replaced all 6 Wall Heat Pumps

2. WHP-1 thru WHP-6 Bard (Wall Mount Heat Pump) SH381DC09UP – 3 ton nominal cooling capacity:
    a. R22 Refrigerant
    b. All in Fair Condition

BUILDING C – Shop Building

1. Drawings Available:
   a. Original Drawings not available.
   b. 2005 PHS renovations

2. Ductwork appears to have been cleaned as part of 2005 renovations (observed access panels in ductwork).

3. TAC controls.

4. AC-AHU-1
   a. Split system A/C with electric heat in ductwork
   b. CO2 sensor in RA
   c. Located on mezzanine

5. AC-1 (pair with AC-AHU-1) poor condition
   a. Carrier 38AKS012---601--
   b. R-22 refrigerant
   c. 10 ton nominal cooling capacity
   d. Mounted high on exterior platform area, very difficult to service, accessible only from ladder.

6. AC-AHU-2
   a. Split system A/C with electric heat in ductwork
   b. CO2 sensor in RA.
   c. Located on mezzanine

7. AC-2 (pair with AC-AHU-2) poor condition
   a. Carrier 38AQS012---630--
   b. R-22 refrigerant
   c. 10 ton nominal cooling capacity
   d. Mounted high on exterior platform area, very difficult to service, accessible only from ladder.

8. PHP-C-1 good condition (11/2018):
   a. Trane WSC120H4RGA03A0B1 – 10 ton nominal cooling capacity
   b. R-410A Refrigerant
   c. 60A Heavy Duty Disc Switch – fair condition

9. SSAHU (Interior Classroom) hanging above ceiling (not replaced in 2005)
   a. No OA to AHU.

10. SSHP poor condition (pair with SSAHU):
    a. York E1FD048S25C – 4 ton nominal cooling capacity
    b. R22 Refrigerant
    c. 30A General Duty Disc Switch

11. Fan C-13 – fair condition

12. Original UH's (4) – very old, poor condition (outside storage areas)

13. 2005 unit heaters (8) – fair condition

14. C-2 (mezzanine) fair condition.

15. (Relief) Vents to the roof – unable to verify.

16. C-7 Exhaust Fan – original.

17. C-8 Exhaust Fan – 2005

18. C-11 Sawdust collection utility set fan – fair condition.

19. **South end of mezzanine has a large hole through the exterior wall where refrigerant piping goes through the wall and needs to be fixed.**

20. Radiant heat?? Controls on the mezzanine level. Where? Abandoned?

BIBBY HALL– ROTC/Music/Arts

1. Drawings Available:
   a. Only original architectural drawing 1977.
   b. No mechanical drawings.
   c. 2005 PHS renovations replaced controls.
   d. No drawings architectural or mechanical for the addition.

2. TAC Controls for the building located in the Janitor Closet.

3. PHP-1 Rooftop – new condition (8/2018) (Music Area):
   a. Trane WCS090H3RGA02A – 7.5 ton nominal cooling capacity
   b. R410A Refrigerant
   c. Has OA hood, no OA economizer hood.

4. PHP-2 Rooftop – new condition (8/2018) (Arts Area):
   a. Trane WSC090H3RGA02A – 7.5 ton nominal cooling capacity
   b. R410A Refrigerant
   c. Has OA hood, no OA economizer hood.

5. PHP-3 Rooftop – new condition (*** unit needs serviced – was frozen solid *** Robert PCS turned the unit off to thaw out frozen condenser coil) (ROTC Area):
   a. Trane WSC120H3RKA02A – 10 ton nominal cooling capacity
   b. R410A Refrigerant (8/2018)
   c. Disc Switch
   d. Has OA hood, no OA economizer hood.

6. PHP-4 Rooftop - new condition (8/2018) (Classroom Area Addition):
   a. Trane WSC036H3REA01A0 – 3 ton nominal cooling capacity
   b. R410 Refrigerant

c. Disc Switch poor condition
d. Has OA hood, no OA economizer hood.

BUILDING Gymtorium

1. Drawings Available:
   a. Original Drawings 1982
   b. 2005 PHS renovations replaced controls.

2. TAC Controls for building installed in 2005.

3. Boiler Room - for hot water reheat to the AHU's:
   a. Weil McLain 688 Cast Iron Boiler good condition
   b. Webster JB2O-07-RM7897C-6-UL/IRI oil fired burner good condition
   c. Taco Pump Fl1509E2EAH10C (9/14) 9.25" impeller diameter – has been replaced, no date. Good condition.
   d. Pump motor – Baldor 5hp
   e. Boiler Make up water station PRS appears it has been replaced.
   f. Old boiler panel in room – could not access.
   g. Fuel type #2 oil – existing 10,000 gallon underground oil storage tank from 1982 drawings.
   h. No chemical treatment observed connected to the HW system.
   i. New bladder type floor mounted expansion tank, existing 120 gallon hanging exp tank abandoned in place.
   j. Boiler E-stop is installed at the door exit.

4. H&AC Unit -1 – poor condition - Split AC with hot water reheat coil (almost impossible to service – hanging over classroom, accessed from second level mezzanine level). Poor condition.
   a. Trane Climate Changer Draw Thru with electric preheat
   b. R-22 Refrigerant
   c. HW piping was rusted where it is exposed at unit.
   d. 30A Disc Switch
   e. Ducted OA.

5. Condenser 1 (paired with H&AC-1) (9/1984) poor condition.
   a. Trane BTA060D400A0 – 5 ton nominal capacity.
   b. R22 refrigerant

6. H&AC Unit 2 - poor condition - Split AC with hot water reheat coil (almost impossible to service – hanging over classroom, accessed from second level mezzanine level). Poor condition.
   a. Trane Climate Changer Draw Thru with electric preheat
   b. R-22 Refrigerant
   c. HW piping was rusted where it is exposed at unit.
   d. 30A Disc Switch
   e. Ducted OA

7. Condenser 2 (paired with H&AC-2) – poor condition (10/1984, 38 years old):
   a. Trane BTA060D400A0 – 5 ton nominal capacity
   b. R22 Refrigerant

c. 30A Disc Switch – poor condition

8. H&AC Unit 3 - poor condition:

a. Climate Control draw thru CCDB06ABPC
b. 30A Disc Switch
c. R-22 Refrigerant
d. HW piping was rusted where it is exposed at unit
e. No OA

9. Condenser 3 (paired with H&AC-3) (8/2001) poor condition:

a. Trane TTA060D400A1 – 5 ton nominal capacity
b. R22 Refrigerant

10. H&AC Unit 4 – poor condition:

a. Climate Control draw thru CCDB06ABPC
b. HW piping was rusted where it is exposed at unit
c. Spring isolators are rusted under the unit
d. 30A Disc Switch
e. No OA
f. *** domestic pec (red plastic) piping attached to the HW piping to the unit and is used for hot water at the concessions sink. This is a health hazard and needs to be disconnected immediately. ***

11. Condenser 4 (paired with H&AC-4) (very old) poor condition:

a. Trane RAUE B504-a – 5 ton nominal capacity
b. R-22 Refrigerant

12. H&AC Unit 5 – new good condition:

a. Daikin CAH036GDAM
b. 60A Disc Switch
c. Ducted OA, no OA economizer.

13. Condenser 5 (paired with H&AC-5) new – good condition:

a. Daikin RCS050DYYYY-F – 50 ton nominal capacity
b. R410A Refrigerant
c. 200A Disc Switch – poor condition

14. H&AC Unit 6 – new good condition:

a. Daikin CAH036GDAM
b. Ducted OA, no OA economizer
c. No disc switch – panel in the room.

15. Condenser 6 (paired with H&AC-6) new – good condition:

a. Daikin RCS050DYYYY-F – 50 ton nominal capacity
b. R410A Refrigerant
c. 200A disc switch – poor condition

WEIGHT ROOM BUILDING

1. Drawings Available: NONE

2. WHP-1 poor condition (no date):
   a. Bard WM361-C07 – 3 ton cooling capacity
   b. R22 Refrigerant
   c. 30A Heavy Duty Disc Switch poor condition

3. WHP-2 poor condition (no date):
   a. Bard WM361-C07 – 3 ton cooling capacity
   b. R22 Refrigerant
   c. 30A Heavy Duty Disc Switch poor condition

ORIGINAL CONCESSIONS BUILDING

1. Drawings Available: NONE

2. Packaged Unit:
   a. Carrier Weathermaster 50HJQ008 – 7.5 ton capacity package heat pump
   b. R22 Refrigerant
   c. 100A Heavy Duty Disc Switch very poor condition

3. PTAC unit – did not see from inside building:
   a. Outside Vent very bent and old.

4. Sidewall louver – wood and in poor condition, not sure what this is for.

NEW CONCESSIONS BUILDING - 2016

1. Drawings Available: Mechanical 2016

2. Siemens Controls for this building. PCS confirmed connected to campus' DDC.

3. No TAB Report available from 2016 project.

4. IDU-1 and HP-1 (located in Building A – New Entry unit)

5. IDU-2 (Men's Restroom side):
   a. 100% OA through ERV-1 to Locker Rooms
   b. 100% EX A through ERV-1 from Locker Rooms
   c. No RA
   d. No dehumidification
   e. 3.6 kW auxiliary electric heat

6. HP-2 (paired with IDU-2 and ERV-1) (7-2016) good condition:
   a. Trane XR17 4TWA7060A30000AA – SSHP 5 ton nominal cooling capacity

b. R410A Refrigerant
c. 60A Disc Switch

7. ERV-1 (with Desiccant Wheel) single pass OA and EX A

8. IDU-3 (Women's Restroom side):

a. 100% OA through ERV-2 to Locker Rooms
b. 100% EX A through ERV-2 from Locker Rooms
c. No RA
d. No dehumidification
e. 3.6 kW auxiliary electric heat

9. HP-3 (paired with IDU-3 and ERV-2) (7-2016) good condition:

a. Trane XR17 4TWA7060A3000AA – SSHP 5 ton nominal cooling capacity
b. R410A Refrigerant
c. 60A Disc Switch

10. ERV-2 (with Desiccant Wheel) single pass OA and EX A

11. IDU-4 (Electrical Room):

a. Ductless unit on wall above door.

12. HP-4 (paired with IDU-4) (6-2016) good condition:

a. Mitsubishi PUZ-A24NHA6 – Ductless SSHP 2 ton nominal cooling capacity
b. 30A Disc Switch
c. R410 Refrigerant

End of Appendix A

Cheatham and Associates, P.A.
Consulting Engineers

HVAC INFRASTRUCTURE ASSESSMENT
PENDER HIGH SCHOOL
PENDER COUNTY SCHOOLS

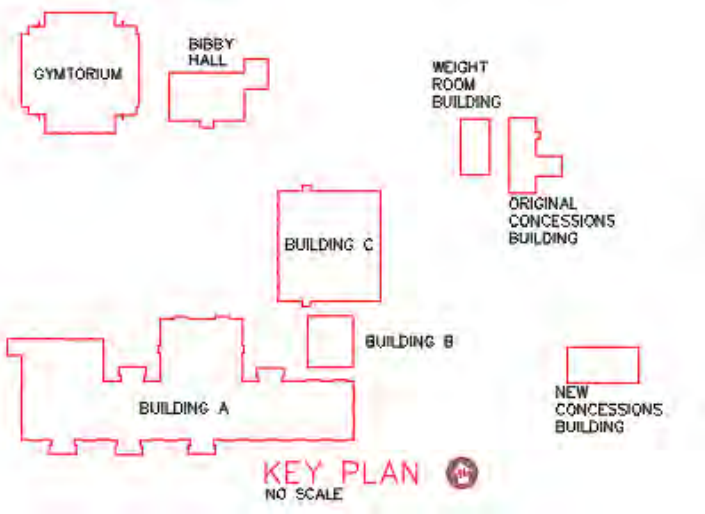
June 29, 2022

Cheatham and Associates (CAPA) is contracted with Pender County Schools (PCS) to provide an assessment of existing HVAC systems based on those conditions that are readily observed. Assessment will include summary of the HVAC systems, their interconnection between buildings, the condition of systems and equipment including age and estimated or typical remaining service life, and recommendations for betterment of control of temperature, relative humidity, and indoor air quality.

The following assessment is for Pender High School (PHS), located at 5380 NC Highway 53 West, Burgaw, NC.

PHS is made up of 8 independent buildings, constructed from 1973-2016. They are:

- Building A – Classroom/Admin/Cafeteria/Auditorium/Media Center (1973)
- Building B – Six Classroom Building (Unknown date of original building)
- Building C – Shop Building (Unknown date of original building)
- Bibby Hall – ROTC/Music/Arts (1977)
- Gymtorium (1982)
- Weight Room Building (unknown date of original building)
- Original Concessions Building (unknown date of original building)
- New Concessions Building (2016)
- Mobile Classroom Units not included in assessment.



HVAC systems are a mix of various types. See attached Appendix A for detailed information of existing HVAC systems and equipment based on CAPA's observations from multiple visits to the site and from multiple meetings.

Costs indicated are CAPA's opinion of probable cost including material, labor, and markup for each recommendation and should be used only for preliminary budgeting purposes.

Delivery times are manufacturer's representative's estimates as of June 3, 2022.

Indoor Air Quality (IAQ)

Per the US EPA Clean Air in Buildings Challenge – March 2022 and US Department of Education's Improving Ventilation in Schools, Colleges, and Universities to Prevent COVID-19 documents, improving indoor air quality (IAQ) can reduce the risk of exposure to particles, aerosols, and other contaminants, and improve the health of building occupants. Infectious diseases like COVID-19 can spread through the inhalation of airborne particles and aerosols.

Many recommendations that will be made will be regarding betterment of IAQ, including confirming provision of outside air (OA) in a controlled manner and in amounts that the HVAC systems can properly condition, improving filtration in HVAC units, and consideration of air cleaning technologies.

Improving IAQ is an important step that can help prevent elevated counts of mold spores and elevated CO2 levels inside buildings.

If no changes are made to HVAC systems or equipment, all HVAC systems should be tested to determine their supply air, return air, outside air, functionality of outside air dampers, and functionality of any outside air economizers. Testing should be done by an AABC or NEBB certified Test and Balance Company (TAB) in accordance with the Standards of AABC or NEBB. This will allow Pender County Schools to know the condition of each HVAC system with regard to outside air ventilation, a major component of IAQ.

BUILDING A – Classroom/Admin/Cafeteria/Auditorium/Media Center (1973)

Building A is the Administration Area, Classrooms, Auditorium, Cafeteria, and Media Center.

Based on observations and values for outside air and exhaust air in the available mechanical documents, Building A overall pressurization is very negative pressure. In addition to improved IAQ, more outside air needs to be added to properly pressurize the building. Positive building pressure will help with unconditioned air infiltrating into the building, creating issues with regard to control of temperature and relative humidity.

See attached Appendix A for detailed information.

1. Original design for the Classroom Area, Administrative Area, and Media Center all had Rooftop Units supplying air to VAV boxes with electric reheat. The area above the ceiling cavity was used as a return air plenum to the units. 1994 re-roofing and renovation project removed the rooftop units and replaced them with split system heat pumps (SSHPs) with the air handling sections located inside the new attic on the original roof with their outdoor condensing units on the ground. The original attic space continued to be used as a return air plenum. The 2005 renovation added

return air ductwork to from the spaces back to the SSHPs and to the VAV boxes to be able to recirculate the building air as needed.

2. The Auditorium is served by a 15 ton capacity SSHP-5 mounted in the attic area. PCS advised that area has had humidity problems.
3. Cafeteria corridor is served by a 3 ton capacity SSHP-10 mounted in the attic area.
4. The Cafeteria is served by a 20 ton capacity SSHP-1 mounted in the attic area. Owner says it is using unit's auxiliary electric heat for heating the Cafeteria.
5. Duct penetrations from the attic space above the original roof and into the above ceiling cavity appear to be reasonably sealed up.

SSHPs range in age from 1993 (29 years old) to 2005 (17 years old) and are in poor to just fair condition. Most use obsolete R-22 refrigerant. AHU sections located in the attic area between the original roof and the new roof are extremely difficult to access by an extension ladder and once in the attic are difficult to maintain. Although functioning, recommend replacing SSHPs-1, 2, 4, 5, 6, 7, 9, and 10 with packaged heat pumps (PHPs) located on the ground with supply air and return air ducted into the attic space to existing duct locations.

- Cost = $720,000 including hot gas reheat for dehumidification, outside air (OA) economizers, IAQ enhancement of MERV 13 filters and NP bipolar ionization or UVC lights, testing and balancing airflows (TAB), ductwork with insulation, and supporting electrical work.
- Current delivery time is 30 weeks if not in stock at time of order.

a. SSHP-3 serving the Admin area is new from 2018 and appears to be in good condition, system can remain.
    - Cost = $4,700 for TAB and IAQ enhancement of MERV 13 filters and NP bipolar ionization or UVC lights.
b. SSHP-8 serving classroom area is already being replaced by Pleasant Air Company for PCS. Replacement system is going to be 20 ton nominal cooling capacity packaged heat pump with SA and RA ducted into the attic space connecting to existing ductwork.
c. Entry Lobby is served by a 4 ton capacity SSHP-1 above the ceiling with outside air from a gravity ventilator on the roof balanced at 180 cfm. System was installed in 2016 and appears to be in good condition, system can remain.
    - Cost = $2,200 for TAB and IAQ enhancement of MERV 13 filters and NP bipolar ionization or UVC lights.

6. VAV boxes with electric reheat serving the classrooms and Admin areas were replaced in 1994 (28 years old). They are the primary heat and reheat for these spaces. Although functioning, due to age relative to expected service life, recommend replacement.
    - Cost = $80,000 for (40) VAVs with electric reheat including TAB.
7. Return air ductwork was added new in 2005. It is unclear if existing supply air ductwork (installed in 1973) was cleaned as indicated on the 2005 renovation documents. As a minimum, clean interior of all reused SA and RA ductwork according to NADCA ACR 2006 or most current version.
    - Cost = $64,000
8. The Kitchen is not air conditioned or heated making for difficult working conditions. The only cooling is from an air duct tapped into Cafeteria AHU-1's supply air duct. Motor operated damper

at tap opens when AHU-1 is in the cooling mode only but does not provide enough air to condition the kitchen, just temper it.

a. The kitchen hood exhaust is through 2 exhaust fans on the roof. We do not see where there is any make air for this exhaust on any of the plans. There are at least 6-7 rooftop fans from the kitchen area and no apparent make-up air.

b. To improve working conditions in the kitchen and improve pressurization in Building A, a 2000 cfm DOAS unit can be added to heat and cool the kitchen. The DOAS can recirculate air to heat and cool during unoccupied times and be one pass 100% OA when the kitchen hood is on. This DOAS unit can be mounted on the ground to be easily maintained and ducted to above the ceiling.

- Cost = $125,000 including TAB, ductwork with insulation, and supporting electrical work.
- Current delivery time is 26 weeks if not in stock at time of order.

9. Classroom Corridors are being conditioned by (4) interior wall mounted heat pump (WMHP - BARD type) units. Although functioning, due to age relative to expected service life and expansion valve issues, recommend replacement.

- Cost = $108,000 including hot gas reheat for dehumidification, IAQ enhancement of MERV 13 filters and NP bipolar ionization or UVC lights, TAB, and supporting electrical work.
- Current delivery time is 22 weeks if not in stock at time of order.

10. The controls for all the buildings are TAC controls from 1994. These controls are obsolete and replacement parts are difficult to find. Recommend replace controls.

- Cost = $142,000 including main building Jace, controllers, sensors, dehumidification sequence, bus/com loop, new control enclosures, and new actuators for the OAD's at each unit.

Building should be checked for outside air cfm's required and the proper pressurization. Equipment changes may be required to meet the positive pressure requirements for the building and as the TAB is being completed for each building fans may need to be replaced. TAB should occur for systems to confirm supply air, return air, and especially amount of outside air for ventilation and functionality of OA dampers.

Total budgeting cost for all recommendations for Building A – Classroom, Admin, Cafeteria, Auditorium, and Media Center is $1,245,900 (not including any contingency or design fees).

BUILDING B – Six Classroom Building (Unknown date of original building)

Building B is six classrooms. The rooms are conditioned by wall mounted heat pumps (WMHP), one for each classroom. The WMHPs do not have ducted supply air, just sidewall SA and RA grilles at the unit. These units were replaced in 2005 (17 years old). The units use obsolete R-22 refrigerant. New controls should be added for the owner to monitor the building.

Based on observations and values for outside air and exhaust air in the available mechanical documents, Building B overall pressurization is positive pressure to the exterior.

See attached Appendix A for detailed information.

1. Although functioning and appear to be in fair condition, due to age relative to expected service life and expansion valve issues, recommend replacement.

- Cost = $111,000 including hot gas reheat for dehumidification, IAQ enhancement of MERV 13 filters and NP bipolar ionization or UVC lights, TAB, and supporting electrical work.
- Current delivery time is 26 weeks if not in stock at time of order.

2. The controls for the building are from 2005. These controls are obsolete and replacement parts are difficult to find. Recommend replace controls.
   - Cost = $19,000 including connecting the main building's Jace, controllers, sensors, dehumidification sequence, bus/com loop, new control enclosures, and new actuators for the OAD's at each unit.

Building should be checked for outside air cfm's required and the proper pressurization. Equipment changes may be required to meet the positive pressure requirements for the building and as the TAB is being completed for each building fans may need to be replaced. TAB should occur for systems to confirm supply air, return air, and especially amount of outside air for ventilation and functionality of OA dampers.

Total budgeting cost for all recommendations for Building B – Six Classroom Building is $130,000 (not including any contingency or design fees).

BUILDING C – Shop Building (Unknown date of original building)

Building C is the Shops and Classrooms building. Classrooms have full HVAC. Shop spaces are heated and ventilated. PCS has not advised of any additional spaces or areas that need air conditioning added. New controls should be added for the owner to monitor the building.

Based on observations and values for outside air and exhaust air in the available mechanical documents, Building C overall pressurization for the classrooms and associated spaces is negative pressure. In addition to improved IAQ, more outside air needs to be added to properly pressurize the building. Positive building pressure will help with unconditioned air infiltrating into the building, creating issues with regard to control of temperature and relative humidity.

See attached Appendix A for detailed information.

1. Shop Classroom (North Side) is served by a 10 ton capacity PHP replaced in 2018 mounted outside on the ground. The unit appears to be in functionally good condition, system can remain.
   - Cost = $4,200 for TAB and IAQ enhancement of MERV 13 filters and NP bipolar ionization or UVC lights.
2. Classrooms (West Side) are served by (2) SSA/Cs with electric heat in the ductwork. These units were replaced in 2005 (17 years old). The units use obsolete R-22 refrigerant. AHU sections are located on the mezzanines. A/C outdoor sections are located on exterior roof platforms accessible only via ladders. Although functioning, recommend replacing both SSA/Cs with packaged units located on the ground with supply air and return air ducted into the attic space to existing duct locations and reusing existing duct mounted electric heaters.
   - Cost = $130,000 including hot gas reheat for dehumidification, outside air (OA) economizers, IAQ enhancement of MERV 13 filters and NP bipolar ionization or UVC lights, testing and balancing airflows (TAB), ductwork with insulation, and supporting electrical work.
   - Current delivery time is 30 weeks if not in stock at time of order.

3. Interior classroom is served by a 4 ton capacity SSHP that is in very poor condition, uses obsolete R-22 refrigerant, does not have any OA for occupant ventilation, and is of unknown age. Recommend replacing with SSHP and adding ductwork with motor operated damper for OA for ventilation of classroom.
    - Cost = $16,000 including auxiliary electric heat for reheat for dehumidification, IAQ enhancement of MERV 13 filters and NP bipolar ionization or UVC lights, testing and balancing airflows (TAB), and supporting electrical work.
    - Current delivery time is 18 weeks if not in stock at time of order.
4. Shop mezzanine has building envelope issues with openings not sealed to the exterior, especially where the refrigerant piping penetrates the exterior wall. PCS to repair/seal wall penetrations weathertight to improve the control of temperature and relative humidity inside the conditioned spaces.
5. Shops are heated via electric unit heaters and ventilated via multiple fans. Age of heaters and fans vary. Functionality of heaters and fans should be verified and replaced as necessary.
6. The controls for the building are from 2005. These controls are obsolete and replacement parts are difficult to find. Recommend replace controls.
    - Cost = $70,000 including connecting the main building's Jace, controllers, sensors, dehumidification sequence, bus/com loop, new control enclosures, and new actuators for the OAD's at each unit.

Building should be checked for outside air cfm's required and the proper pressurization. Equipment changes may be required to meet the positive pressure requirements for the building and as the TAB is being completed for each building fans may need to be replaced. TAB should occur for systems to confirm supply air, return air, and especially amount of outside air for ventilation and functionality of OA dampers.

Total budgeting cost for all recommendations for Building C – Shop Building is $220,200 (not including any contingency or design fees).

BIBBY HALL– ROTC/Music/Arts (1977)

Bibby Hall is used for ROTC, Music, and Arts programs. The rooms are conditioned by four roof mounted packaged heat pumps (PHPs). PHPs were replaced in 2018. Pressurization of building is not known due to unknown data for installed systems. Controls are original TAC.

See attached Appendix A for detailed information.

1. PHPs replaced in 2018 appear to be in functionally good condition, systems can remain.
    - Cost = $8,500 for TAB including OA to each PHP and IAQ enhancement of MERV 13 filters and NP bipolar ionization or UVC lights.
2. TAC DDC controls are obsolete and replacement parts are difficult to find. Recommend replace controls.
    - Cost = $30,000 including connecting the main building's Jace, controllers, sensors, dehumidification sequence, bus/com loop, new control enclosures, and new actuators for the OAD's at each unit

Building should be checked for outside air cfm's required and the proper pressurization. Equipment changes may be required to meet the positive pressure requirements for the building and as the TAB is being completed for each building fans may need to be replaced. TAB should occur for systems to confirm supply air, return air, and especially amount of outside air for ventilation and functionality of OA dampers.

Total budgeting cost for all recommendations for Bibby Hall– ROTC/Music/Arts is $38,500 (not including any contingency or design fees).

GYMTORIUM (1982)

Gymtorium is the Gym with Locker Rooms, support spaces, and classrooms. All spaces have HVAC.

Based on observations and values for outside air and exhaust air in the available mechanical documents, outside air cfm is slightly more than exhaust air cfm but there is not enough excess outside air to make the Gymtorium overall pressurization positive. In addition to improved IAQ, more outside air needs to be added to properly pressurize the building. Positive building pressure will help with unconditioned air infiltrating into the building, creating issues with regard to control of temperature and relative humidity.

See attached Appendix A for detailed information.

1. Classrooms are conditioned by two split system air conditioning units (SSA/Cs) with hot water heating coils (HC-1 & HC-2). Air handling sections are hanging in the ceiling cavity above the classrooms in which they serve and are accessed from the mezzanine level of the Gymtorium. These units are extremely difficult and dangerous to service because they can barely be reached from the mezzanine level as they hang over the classrooms. Outdoor A/C sections are located on the ground in fenced areas. Indoor and outdoor sections are 1984 equipment (38 years old) and are in very poor condition. The units use obsolete R-22 refrigerant. Due to their condition and age relative to expected service life, recommend replacing with SSA/Cs with hot water heating coils but locating AHU sections in more accessible location and connecting to existing SA, RA, and OA ducts.
    - Cost = $45,000 including HW coil for heat and reheat for dehumidification, IAQ enhancement of MERV 13 filters and NP bipolar ionization or UVC lights, testing and balancing airflows (TAB), and supporting electrical work.
    - Current delivery time is 18 weeks if not in stock at time of order.
2. Lobby, Toilets and Concessions are conditioned by two split system air conditioning units (SSA/Cs) with hot water heating coils (HC-3 & HC-4). Air handling sections are located in closets at floor level. Units do not have any OA for ventilation. Outdoor A/C sections are located on the ground in fenced areas. Indoor and outdoor sections are 1984 equipment (38 years old) and are in very poor condition. The units use obsolete R-22 refrigerant. Due to their condition and age relative to expected service life, recommend replacing with SSA/Cs with hot water heating coils and connecting to existing SA, RA, and OA ducts.
    - Cost = $45,000 including HW coil for heat and reheat for dehumidification, IAQ enhancement of MERV 13 filters and NP bipolar ionization or UVC lights, testing and balancing airflows (TAB), and supporting electrical work.
    - Current delivery time is 18 weeks if not in stock at time of order.
3. Gym is conditioned by two brand new (2021) 50 ton nominal cooling capacity split system air conditioning units (SSA/Cs) with hot water heating coils (HC-5 & HC-6). Air handling sections

are located in mechanical rooms on the mezzanine level. Units have OA for ventilation but economizers were deleted as part of the replacement. Outdoor A/C sections are located on the ground in fenced areas. System refrigerant is R-410A. No deficiencies or issues noted, systems can remain.

- Cost = $12,500 for TAB and IAQ enhancement of MERV 13 filters and NP bipolar ionization or UVC lights.

4. Electric heaters and exhaust fans for Locker Rooms and Restrooms are original from 1982. Recommend replace due to age relative to expected service life.
   - Cost = $14,000
5. Hot water for heating is provided by cast iron Weil McLain 688 boiler with oil fired Webster burner located in Boiler Room at back of building. Boiler, burner, HW pump, makeup water, and expansion tank are all in relatively new condition and well maintained. System can remain.
   a. HW system does not have a chemical feeder to provide water treatment into the HW piping system. PCS shall work with their water treatment vender, Sky Treatment Company, to correct this at PHS.
   b. If natural gas is readily available, PCS should consider replacing the boiler's oil fired burner with a burner firing natural gas. At that point, PCS could contract for abatement/removal of the existing underground fuel oil storage tank. Underground fuel oil storage tanks require monitoring and annual checks for leakage. Another option is to install a dual-fuel burner that fires natural gas and uses fuel oil from existing underground tank.
6. TAC DDC controls are 2005. Recommend replace controls.
   - Cost = $78,000 including connecting the main building's Jace, controllers, sensors, dehumidification sequence, bus/com loop, new control enclosures, and new actuators for the OAD's at each unit.

Building should be checked for outside air cfm's required and the proper pressurization. Equipment changes may be required to meet the positive pressure requirements for the building and as the TAB is being completed for each building fans may need to be replaced. TAB should occur for systems to confirm supply air, return air, and especially amount of outside air for ventilation and functionality of OA dampers.

Total budgeting cost for all recommendations for Gymtorium is $194,500 (not including any contingency or design fees).

WEIGHT ROOM BUILDING (unknown date of original building)

The Weight Room building is a single open space conditioned by two wall mounted heat pumps (WMHPs). Age of units is not known but they are in poor condition and use obsolete R-22 refrigerant. Pressurization of building is not known due to unknown data for installed systems.

See attached Appendix A for detailed information.

1. Due to their condition, recommend replacement.
   - Cost = $38,000 including hot gas reheat for dehumidification, IAQ enhancement of MERV 13 filters and NP bipolar ionization or UVC lights, TAB, and supporting electrical work.

- Current delivery time is 26 weeks if not in stock at time of order.

2. Recommend replace/add controls.
   - Cost = $12,600 including connecting the main building's Jace, controllers, sensors, dehumidification sequence, bus/com loop, new control enclosures, and new actuators for the OAD's at each unit.

Building should be checked for outside air cfm's required and the proper pressurization. Equipment changes may be required to meet the positive pressure requirements for the building and as the TAB is being completed for each building fans may need to be replaced. TAB should occur for systems to confirm supply air, return air, and especially amount of outside air for ventilation and functionality of OA dampers.

Total budgeting cost for all recommendations for Weight Room Building is $50,600 (not including any contingency or design fees).

ORIGINAL CONCESSIONS BUILDING (unknown date of original building)

The Original Concessions Building is conditioned by one 7.5 ton cooling capacity package heat pump mounted on the ground and one through-the-wall PTAC unit. Ages of units are not known but they are in poor condition and use obsolete R-22 refrigerant. Pressurization of building is not known due to unknown data for installed systems.

See attached Appendix A for detailed information.

1. Due to their condition, recommend replacement.
   - Cost = $40,000 including hot gas reheat for dehumidification, IAQ enhancement of MERV 13 filters and NP bipolar ionization or UVC lights, TAB, and supporting electrical work.
   - Current delivery time is 30 weeks if not in stock at time of order.
2. Recommend replace/add controls.
   - Cost = $12,600 including connecting the main building's Jace, controllers, sensors, dehumidification sequence, bus/com loop, new control enclosures, and new actuators for the OAD's at unit.

Building should be checked for outside air cfm's required and the proper pressurization. Equipment changes may be required to meet the positive pressure requirements for the building and as the TAB is being completed for each building fans may need to be replaced. TAB should occur for systems to confirm supply air, return air, and especially amount of outside air for ventilation and functionality of OA dampers.

Total budgeting cost for all recommendations for Original Concessions Building is $52,600 (not including any contingency or design fees).

NEW CONCESSIONS BUILDING - 2016

The New Concessions Building includes restrooms and team locker rooms. Spaces are cooled and heated by two 5 ton nominal cooling capacity SSHPs with no return air but 100% outside air from Energy Recovery Ventilators (ERV) with a desiccant wheel. The ERVs provide the exhaust for the spaces and the air stream to exchange energy with for the SSHPs OA. PCS advises that building's HVAC does not work well to

maintain satisfactory temperature and relative humidity conditions inside the spaces. Existing systems as installed do not provide positive dehumidification or have the capability as installed to provide positive dehumidification.

Existing Siemens DDC controls in the building are confirmed by PCS to be connected to the campus' DDC system.

Based on observations and values for outside air and exhaust air in the available mechanical documents, total outside air cfm is slightly more than total exhaust air cfm but there is not enough excess outside air to make the New Concessions Building overall pressurization positive. In addition to improved IAQ, more outside air needs to be added to properly pressurize the building. Positive building pressure will help with unconditioned air infiltrating into the building, creating issues with regard to control of temperature and relative humidity.

See attached Appendix A for detailed information.

1. Recommendation Option 1:
    a. Adjusting/reducing exhaust air cfm's through ERV for better positive pressurization of the building.
    b. Confirm operation and setpoints for ERV and SSHPs.
    c. Add duct connecting ERV SA to SSHP and ExA before ERV. Add motor operated dampers in all three ducts. Add sequence of operation for when in Unoccupied mode (most of the time for this building), ERV is off, two NO dampers in ERV ducts are closed, NC damper in connector duct is open acting as return air/recirculating air path, and SSHP operates as recirculating system to maintain space temperature setpoint (can be same setpoint as setpoint for Occupied).
    d. Replace auxiliary electric heaters and power circuitry to each SSHP for higher kW heaters and program in a dehumidification sequence for SSHP to be able to cool when not needed to maintain space temp and reheat via auxiliary electric heaters back to space neutral temperature as necessary whether SSHP is in Occupied mode or recirculating Unoccupied mode.
        - Cost = $19,000
        - Equipment is readily available.
2. Recommendation Option 2 is replacing SSHPs and ERVs with (2) 1750 cfm DOAS units with the capability of conditioning and dehumidifying 100% outside air based on temperature and relative humidity sensors in each Locker Room. The exhaust will be direct to the exterior. A return air duct system would be added so that the DOAS unit can recirculate and maintain temperature and humidity during unoccupied times.
    - Cost = $260,000
    - Current delivery time is 16 weeks if not in stock at time of order.
    - Consideration of Option 2 must also consider locations of new DOAS units on the building's exterior. Building is surrounded by sidewalks for athlete and patron access.
3. Electrical Room 157 has a split system ductless heat pump provided for the IT rack and equipment located in the space. But the room doesn't have a ceiling, so any cooling or heating provided by the heat pump is lost into the attic space. Recommend adding lay-in ceiling to the space.
    - Cost = $1,000

Building should be checked for outside air cfm's required and the proper pressurization. Equipment changes may be required to meet the positive pressure requirements for the building and as the TAB is being completed for each building fans may need to be replaced. TAB should occur for systems to confirm supply air, return air, and especially amount of outside air for ventilation and functionality of OA dampers.

Total budgeting cost for all recommendations for New Concessions Building is $20,000 using Option 1 that renovates existing HVAC and is $261,000 using Option 2 and replacing the HVAC (not including any contingency or design fees).

SUMMARY

Pender High School is a group of buildings constructed between 1973-2016 with various renovations occurring since being occupied. The HVAC systems are a mix of system types with most being renovated or replaced through the years.

See assessment for each building and area or system for specific suggestions and recommendations. Generally, the HVAC systems and their controls appear to be in good condition. Pender County Schools' operations and maintenance staff have done an extremely commendable job with keeping operational these many different HVAC systems, including those that are of age approaching or are beyond expected typical service life.

If no changes are made to HVAC systems or equipment, PCS should:

1. Use portable spot cooling, dehumidifying, and/or filtration units for any problematic spaces.
2. All HVAC systems should be tested to determine their supply air, return air, outside air, functionality of outside air dampers, and functionality of any outside air economizers. Testing should be done by an AABC or NEBB certified Test and Balance Company (TAB) in accordance with the Standards of AABC or NEBB. This will confirm to Pender County Schools the condition of each HVAC system and amount of outside air ventilation for IAQ.
    - TAB Cost for all buildings if a standalone work item = $41,900

Entire Campus: Existing DDC controls are obsolete with replacement parts difficult to find. Except for New Concessions Building, controls need to be replaced with a new BAS DDC system.

Building A– Classroom/Admin/Cafeteria/Auditorium/Media Center: Except for several newer replaced systems, the HVAC systems are from 1993 and 2005. They are at or beyond their expected service life and use obsolete R-22 refrigerant. Although currently functioning, these HVAC systems need replacement in a way that provides better equipment locations for servicing and maintenance. The Kitchen needs air conditioning and conditioned makeup air for hood exhausts.

Building B – Six Classroom Building: HVAC units are from 2005. They are at or beyond their expected service life and use obsolete R-22 refrigerant. Although currently functioning, these HVAC systems need replacement.

Building C – Shop Building: The HVAC systems are from original construction (date unknown) and 2005. They are at or beyond their expected service life and use obsolete R-22 refrigerant. Although currently functioning, these HVAC systems need replacement in a way that provides better equipment locations for servicing and maintenance.

Bibby Hall – ROTC/Music/Arts: The HVAC systems new systems installed in 2018 and are not recommended to be replaced. They can be enhanced for IAQ by changing to higher MERV filters, adding ionization air cleaning devices, or adding UVC lights.

Gymtorium: HVAC systems for the Gym space are new systems installed in 2021/2022 are not recommended for replacement. Boiler system providing hot water for building is also not recommended for replacement. Split systems serving the classrooms, lobby, concessions, and restrooms are from 1984. Although currently functioning, these HVAC systems need replacement.

Weight Room Building: Age of HVAC units is unknown but based on their condition and use of obsolete R-22 refrigerant, these HVAC systems need replacement.

Original Concessions Building: Age of HVAC units is unknown but based on their condition and use of obsolete R-22 refrigerant, these HVAC systems need replacement.

New Concessions Building: Building and HVAC are new built in 2016, but HVAC systems do not properly maintain desired temperatures and relative humidities inside the building. Two recommendation options are presented with one renovating the existing heat pumps and ERVs and a second with replacing the entire systems.

To accomplish all the recommendations in this assessment, our opinion of probable cost including a contingency and designer fees is approximately $2,440,375.

Cheatham and Associates appreciates the opportunity to provide this assessment to Pender County Schools as assistance in the decision making process related to HVAC in their buildings. For questions or comments, please contact us.

Prepared by:

Cheatham and Associates, PA

Kenneth Lynch, PE

Seal

Attachment – Appendix A

Cheatham and Associates, P.A.
Consulting Engineers

HVAC INFRASTRUCTURE ASSESSMENT
SURF CITY K-8
PENDER COUNTY SCHOOLS

July 26, 2022

Appendix A – More detailed information found and observed for each HVAC system and area.

General

1. K-8 school built new in 2018, 165,120 total sf, with Elementary School on one side, Middle School on other side, and common Kitchen, Cafeteria, Multipurpose, and Gymnasium in the middle.

2. HVAC system:
   a. 4-pipe chilled (CH) water and hot water (HW) system from a central common plant with multiple air cooled chillers and boilers feeding air handling units (AHU) and blower coil air handling units (BCAHU) located on a continuous mezzanine.
   b. Multiple CH and HW pumps are piped in a primary-secondary pumping arrangement for each system.
   c. AHUs and BCAHUs have hot water coils in reheat position to provide reheating during dehumidification operation.
   d. Separate Admin Areas are conditioned by multiple split system heat pumps.
   e. Each IT space is conditioned by a dedicated split system ductless heat pump (DAHU/DHP).
   f. Control system is DDC Siemens Apogee BACnet MS/TP. Need photos of panels and controllers

3. Drawings Available: 2018 Original Design – PME Record Drawings.

4. Cheatham and Associates (CAPA) has original test and balance (TAB) report.

5. Items or issues noted by Pender County Schools (PCS)?
   a.

6. General items or issues noted by CAPA:
   a. Split system heat pump air handling units are Trane model GAM5 units and general leak excessive amount of conditioned air from their cabinets. PCS should work to seal up air leaks with tape, etc.
   b. Mechanical mezzanine concrete floors have ongoing cracking. Noted throughout. PCS has been caulking cracks to seal; PCS should continue this process.
   c. Although they are coated with UV protective paint, insulation is cracking and failing on most refrigerant lines on the exterior of the building.

Area A – Kitchen/Serving and Central Plant Area

1. Kitchen:
   a. Exhaust Fans:
      1) F-1 Can Wash A110 – 75 CFM
      2) F-2 Restroom A109A – 100 CFM
      3) F-3 Locker A109 – 75 CFM
      4) F-4 Kitchen A100 – 3570 CFM (Kitchen Hood Exhaust)
      5) F-5 Kitchen A100 – 2850 CFM (Kitchen Hood Make-Up)
      6) F-13 Exterior Electrical Room A113 – 2900 CFM
      7) F-14 Mechanical Room A106 – 1000 CFM
   b. Kitchen Hood Exhaust/Make Up:
      1) Exhaust is to upblast type ventilator F-4 mounted in sidewall configuration.
      2) Make-up is from inline fan F-5 located in Area-A mechanical platform. Air is taken from sidewall outside air louver located in Area-A mechanical platform.
      3) Hood is Captive Aire model 6624 ND-2WI-PSP-FB Exhaust/Makeup
      4) Model 6624 requires exhaust 3564 CFM (based on submittal data)
      5) Model 6624 supply air flow 2851 (based on submittal data)
      6) Existing Schedule = 3570 CFM Exhaust and 2850 CFM Make-up air
      7) Double island hood 7.5’ wide x 13’long with no end walls – open all sides

2. AHU-1 (Kitchen):
   a. Trane CSAA008UA (2017) good condition
   b. PCS advised that a year ago drain clogged and condensate leaked out of AHU cabinet. Does not appear to be a reoccurring issue.
   c. 460V-3Ph
   d. 5 hp supply air fan
   e. 3 hp return air fan
   f. Disconnect switch and VFD – Good condition
   g. 4000 CFM SA scheduled; 1000 CFM OA scheduled with OA economizer.

3. UH#2 (Sprinkler A112):
   a. Markel model P3P5103CA1N (2017) good condition
   b. 480V-3Ph
   c. 3.3 kW
   d. 24V controls

4. UH#3 (Mechanical Platform A200)
   a. Markel model P3P5107CA1N (2017) good condition
   b. 480V-3Ph
   c. 7.5 kW
   d. 24V controls

5. DAHU#1 (IT Closet A201)
   a. Trane model PKA-A24KA7 (2017) good condition, but cabinet needs cleaned.
   b. 208/230V-1Ph
   c. Toggle type disconnect switch
   d. Cooling thermostat.
   e. R410a Refrigerant

6. DHP#1 (Match with DAHU#1):
   a. Trane model PUZ-A24NHA7 (2017) good condition
   b. 208/230V-1Ph
   c. R410a Refrigerant
   d. 30A Heavy Duty Safety Switch – good condition

Mechanical Room A106/Service Yard A116

1. Boiler#1, #2 & #3:
   a. Lochinvar Crest model FBN2001 (2017) good condition
   b. LP gas fired – schedule for natural gas installation to site/building?
   c. 2,000,000 Btu/Hr input, 1,924,000 Btu/Hr output each boiler.
   d. 25:1 Turndown
   e. 120V-1Ph
2. Pump P-1 & P-2: variable volume CH water system building/secondary pumps – parallel operation.
   a. Bell & Gossett model e-1510-4GC base mount (2017) good condition
   b. Each pump: 495 gpm, 30 hp, 230/460V-3Ph
   c. Each pump has a dedicated VFD – good condition
   d. Chemical feeder tank at P-2 is cold to touch and condensating on outside indicating that it is left open to the CH system flow. If it is to be left open to CH flow, tank needs to be insulated.
   e. Pump suction diffusers, ports, etc. that are open need to be insulated to prevent condensation and resulting corrosion.
3. Pump P-3 & P-4: constant volume chiller/primary pumps – one pump per chiller.
   a. Bell & Gossett model e-1510-4AD base mount (2017) good condition
   b. Each pump: 480 gpm, 7.5 hp, 230/460V-3Ph
   c. Pump suction diffusers, ports, etc. that are open need to be insulated to prevent condensation and resulting corrosion.
4. Pump P-5 & P-6: variable volume HW system building/secondary pumps – parallel operation.
   a. Bell & Gossett model e-1510-2EB base mount (2017) good condition
   b. Each pump: 170 gpm, 15 hp, 208-230/460V-3Ph
   c. Each pump has a dedicated VFD – good condition
   d. Chemical feeder at P-6 is covered in HW and/or chemicals. Top needs to be confirmed it is not leaking and repaired as necessary. Tank needs to be cleaned up.
   e. Did the pipe bridge get installed to make HW system primary-secondary?
5. Pump P-7, P-8 & P-9: constant volume boiler/primary pumps – one per boiler.
   a. Bell & Gossett model e-80 vertical inline (2017) good condition
   b. Each pump: 130 gpm, 2 hp, 230/460V-3Ph
   c. PCS advised that seals were changed recently on pump P-7 – no observed evidence of current leaking.
   d. Pump P-8 is leaking slightly, PCS is getting ready to replace its seals.
6. CAPA to investigate further open copper piping below HW system air separator -see photo. Relief valve removed – see photo?
7. HW system water clean? Any recurring buildup or cleaning needed?
8. UH#1:
   a. Markel model P3P5107CA1N (2017) good condition
   b. 480V-3Ph

c. 7.5 kW
d. 24V controls

9. Chiller#1 & #2:
   a. Trane RTAC250 SE Air-Cooled Rotary Screw Chiller (2017) good condition
   b. 250 nominal tons each chiller
   c. 460V-3Ph
   d. 600A Heavy Duty Safety Switch – good condition
   e. R134a refrigerant
   f. Short circuit rating: 65,000A
   g. CHS and CHR valve handles are rusting and need cleaning and repainting.

Area B – Cafeteria/Multipurpose and Music Area

1. Exhaust Fans:
   a. F-15 - Staff Toilet B109/Jan B106 – 175 CFM
   b. F-20 - Janitor B115 – 75 CFM
   c. F-21 - Janitor B101 – 75 CFM

2. AHU#2 (6-8 Cafeteria B116A) & AHU#4 (K-5 Cafeteria B116B) (Located in loft A):
   a. Trane CSSA014UA (2017) good condition
   b. 460V-3Ph
   c. 7.5 hp supply air fan
   d. 5 hp return air fan
   e. Disconnect switch, supply VFD and return VFD (good condition)
   f. 6700 CFM SA scheduled; 750-3900 CFM OA scheduled with OA economizer.

3. AHU#3 (Multipurpose B113) (Located in loft A):
   a. Trane CSSA014UA (2017) good condition
   b. 460V-3Ph
   c. 7.5 hp supply air fan
   d. 5 hp return air fan
   e. Disconnect, supply VFD and return VFD (good condition)
   f. 6900 CFM SA scheduled; 750-4100 CFM OA scheduled with OA economizer.

4. BCAHU#1 (K-5 Music/Band B114):
   a. Trane BCHD054G2 (2017) good condition
   b. 460V-3Ph
   c. 1 hp motor
   d. 15A Heavy Duty Safety Switch – good condition
   e. 1300 CFM SA scheduled; 420 CFM OA scheduled.

5. BCAHU#2 (Resource B107):
   a. Trane BCHD036G2 (2017) good condition
   b. 460V-3Ph
   c. 1 hp motor
   d. 30A Heavy Duty Safety Switch – good condition
   e. 1050 CFM SA scheduled; 320 CFM OA scheduled.

6. BCAHU#3 (Resource B105):
   a. Trane BCHD018G2 (2017) good condition
   b. 460V-3Ph

c. 1/2 hp motor
d. 30A Heavy Duty Safety Switch – good condition
e. 500 CFM SA scheduled; 190 CFM OA scheduled.

7. BCAHU#4 (6-8 Music/Band B102):
   a. Trane BCHD054G2 (2017) good condition
   b. 460V-3Ph
   c. 1 hp motor
   d. 30A Heavy Duty Safety Switch – good condition
   e. 1550 CFM SA scheduled; 510 CFM OA scheduled.

8. HPAHU#1 (6-8 Computer B112):
   a. Trane GAM5B0C60M51EA (2017) good condition
   b. 208V-3Ph
   c. 10.8 kW electric heat
   d. 60A Heavy Duty Safety Switch – good condition
   e. 1900 CFM SA scheduled; 320 CFM OA scheduled.

9. HP#1 (Match with HPAHU#1):
   a. Trane model 4TWA3060B4000A (2017) good condition
   b. 460V-3Ph
   c. R410a Refrigerant
   d. 30A Heavy Duty Safety Switch – good condition

10. HPAHU#2 (B.I.T. B104):
    a. Trane GAM5B0C60M51EA (2017) good condition
    b. 208V-3Ph
    c. 10.8 kW electric heat
    d. 60A Heavy Duty Safety Switch – good condition
    e. 1900 CFM SA scheduled; 290 CFM OA scheduled.

11. HP#2 (Match with HPAHU#2):
    a. Trane model 4TWA3060B4000A (2017) good condition
    b. 460V-3Ph
    c. R410a Refrigerant
    d. 30A Heavy Duty Safety Switch – good condition

12. HPAHU#3 (B.I.T. B103):
    a. Trane GAM5B0C60M51EA (2017) good condition
    b. 208V-3Ph
    c. 10.8 kW electric heat
    d. 60A Heavy Duty Safety Switch – good condition
    e. 1900 CFM SA scheduled; 280 CFM OA scheduled.

13. HP#3 (Match with HPAHU#3):
    a. Trane model 4TWA3060B4000A (2017) good condition
    b. 460V-3Ph
    c. R410a Refrigerant
    d. 30A Heavy Duty Safety Switch – good condition

Area C - Middle School Classrooms

1. Exhaust Fans:
   a. F-16 - Area C Toilets – 1000 CFM
2. DAHU#2 (IT Closet C201)
   a. Trane model MSZ-GL18NA-U1 (2017) good condition
   b. 208/230V-1Ph
   c. Toggle type disconnect switch
   d. Cooling thermostat.
   e. R410a Refrigerant
3. DHP#2 (Match with DAHU#2):
   a. Trane model MUZ-GL18NA-U1 (2017) good condition
   b. 208/230V-1Ph
   c. R410a Refrigerant
   d. 30A Heavy Duty Safety Switch – good condition
   e. Room temp was 72°F when thermostat was set at 67°F. Unit functionality and refrigerant charge needs to be checked.
4. BCAHU#7 (Classroom C110):
   a. Trane BCHD024G2 (2017) good condition
   b. 460V-3Ph
   c. 1 hp motor
   d. 30A Heavy Duty Safety Switch – good condition
   e. 800 CFM SA scheduled; 260 CFM OA scheduled.
5. BCAHU#8 (Classroom C109):
   a. Trane BCHD036G2 (2017) good condition
   b. 460V-3Ph
   c. 1 hp motor
   d. 30A Heavy Duty Safety Switch – good condition
   e. 1100 CFM SA scheduled; 275 CFM OA scheduled.
6. BCAHU#9 (Classroom C107) & BCAHU#14 (Classroom C103):
   a. Trane BCHD024G2 (2017) good condition
   b. 460V-3Ph
   c. 1 hp motor
   d. 30A Heavy Duty Safety Switch – good condition
   e. 750 CFM SA scheduled; 260 CFM OA scheduled.
7. BCAHU#10 (Classroom C105), BCAHU#15 (Classroom C101) & BCAHU#16 (Classroom C102):
   a. Trane BCHD036G2 (2017) good condition
   b. 460V-3Ph
   c. 1 hp motor
   d. 30A Heavy Duty Safety Switch – good condition
   e. 950 CFM SA scheduled; 300 CFM OA scheduled.
8. BCAHU#11(Classroom C108), BCAHU#12 (Classroom C106) & BCAHU#13 (Classroom C104):
   a. Trane BCHD024G2 (2017) good condition
   b. 460V-3Ph
   c. 1 hp motor
   d. 30A Heavy Duty Safety Switch – good condition

e. 800 CFM SA scheduled; 260 CFM OA scheduled.

9. HPAHU#4 (K-5 Computer C112):
   a. Trane GAM5B0C60M51EA (2017) good condition
   b. 208V-3Ph
   c. 10.8 kW electric heat
   d. 60A Heavy Duty Safety Switch – good condition
   e. 1900 CFM SA scheduled; 270 CFM OA scheduled.

10. HP#4 (Match with HPAHU#4):
   a. Trane model 4TWA3060B4000A (2017) good condition
   b. 460V-3Ph
   c. R410a Refrigerant
   d. 30A Heavy Duty Safety Switch – good condition

Areas D1 & D2 - Middle School Classrooms

1. Exhaust Fans:
   a. F-7 - Science D114 - Emergency Exhaust– 1200 CFM
   b. F-8 - Science Storage D112 – 250 CFM
   c. F-9 - Science D110 - Emergency Exhaust – 1200 CFM
   d. F-10 - Science D108 - Emergency Exhaust – 1200 CFM
   e. F-17 - Area D1 – Toilets – 1000 CFM
   f. F-22 - Area D2 Toilets – 475 CFM

2. DAHU#3 (IT Closet D202):
   a. Trane model MSZ-GL18NA-U1 (2017) good condition
   b. 208/230V-1Ph
   c. Toggle type disconnect switch
   d. Cooling thermostat.
   e. R410a Refrigerant
   f. Room temp was 77°F when thermostat was set at 67°F. Unit functionality and refrigerant charge needs to be checked.

3. DHP#3 (Match with DAHU#3):
   a. Trane model MUZ-GL18NA-U1 (2017) good condition
   b. 208/230V-1Ph
   c. R410a Refrigerant
   d. 30A Heavy Duty Safety Switch – good condition

4. DAHU#4 (IT Closet D201):
   a. Trane model MSZ-GL18NA-U1 (2017) good condition
   b. 208/230V-1Ph
   c. Toggle type disconnect switch
   d. Cooling thermostat.
   e. R410a Refrigerant
   f. Room temp was 79°F when thermostat was set at 67°F. Unit functionality and refrigerant charge needs to be checked.

5. DHP#4 (Match with DAHU#4):
   a. Trane model MUZ-GL18NA-U1 (2017) good condition
   b. 208/230V-1Ph

c. R410a Refrigerant
d. 30A Heavy Duty Safety Switch – good condition

6. BCAHU#17 (Resource D126):
   a. Trane BCHD036G2 (2017) good condition
   b. 460V-3Ph
   c. 1 hp motor
   d. 30A Heavy Duty Safety Switch – good condition
   e. 1100 CFM SA scheduled; 275 CFM OA scheduled.

7. BCAHU#18 (Classroom D125):
   a. Trane BCHD024G2 (2017) good condition
   b. 460V-3Ph
   c. 1 hp motor
   d. 30A Heavy Duty Safety Switch – good condition
   e. 750 CFM SA scheduled; 260 CFM OA scheduled.

8. BCAHU#19 (Classroom D117) & BCAHU#22 (Science D114):
   a. Trane BCHD036G2 (2017) good condition
   b. 460V-3Ph
   c. 1 hp motor
   d. 30A Heavy Duty Safety Switch – good condition
   e. 1050 CFM SA scheduled; 320 CFM OA scheduled.

9. BCAHU#20 (Classroom D115), BCAHU#23 (Classroom D113), BCAHU#24 (Classroom D111), BCAHU#27 (Classroom D109), BCAHU#28 (Classroom D107), BCAHU#29 (Classroom D103) & BCAHU#30 (Classroom D101):
   a. Trane BCHD024G2 (2017) good condition
   b. 460V-3Ph
   c. 1 hp motor
   d. 30A Heavy Duty Safety Switch – good condition
   e. 800 CFM SA scheduled; 260 CFM OA scheduled.

10. BCAHU#21 (Self-Contained D116):
    a. Trane BCHD036G2 (2017) good condition
    b. 460V-3Ph
    c. 1 hp motor
    d. 30A Heavy Duty Safety Switch – good condition
    e. 900 CFM SA scheduled; 220 CFM OA scheduled.

11. BCAHU#25 (Science D110) & BCAHU#31 (Resource D102):
    a. Trane BCHD054G2 (2017) good condition
    b. 460V-3Ph
    c. 1 hp motor
    d. 30A Heavy Duty Safety Switch – good condition
    e. 1300 CFM SA scheduled; 370 CFM OA scheduled.

12. BCAHU#26 (Science D108):
    a. Trane BCHD036G2 (2017) good condition
    b. 460V-3Ph
    c. 1 hp motor
    d. 30A Heavy Duty Safety Switch – good condition
    e. 950 CFM SA scheduled; 300 CFM OA scheduled.

Area D3 - Middle School Classrooms

1. Exhaust Fans:
   a. F-40 – Boys D128A/Girls D128B– 1050 CFM
2. BCAHU#74 (Classroom D127), BCAHU#75 (Classroom D129), BCAHU#76 (Classroom D131), BCAHU#78 (Classroom D132), BCAHU#79 (Classroom D134), BCAHU#80 (Classroom D136) & BCAHU#81 (Classroom D133):
   a. Trane BCHD024G2 (2017) good condition
   b. 460V-3Ph
   c. 1 hp motor
   d. 30A Heavy Duty Safety Switch – good condition
   e. 800 CFM SA scheduled; 260 CFM OA scheduled.
3. BCAHU#77 (Classroom D130):
   a. Trane BCHD036G2 (2017) good condition
   b. 460V-3Ph
   c. 1 hp motor
   d. 30A Heavy Duty Safety Switch – good condition
   e. 1050 CFM SA scheduled; 320 CFM OA scheduled
4. BCAHU#82 (Classroom D135):
   a. Trane BCHD036G2 (2017) good condition
   b. 460V-3Ph
   c. 1 hp motor
   d. 30A Heavy Duty Safety Switch – good condition
   e. 950 CFM SA scheduled; 300 CFM OA scheduled

Area E - Middle School Administration/Art and Media Center

1. Exhaust Fans:
   a. F-11 – Kiln E131– 1800 CFM
   b. F-24 – Area E Admin Toilets – 250 CFM
   c. F-25 – Area E Media Toilet – 100 CFM
   d. F-26 - Area E Media Toilet – 100 CFM
2. BCAHU#32 (Classroom E134):
   a. Trane BCHD024G2 (2017) good condition
   b. 460V-3Ph
   c. 1 hp motor
   d. 30A Heavy Duty Safety Switch – good condition
   e. 850 CFM SA scheduled; 260 CFM OA scheduled.
3. BCAHU#33 (Art E133):
   a. Trane BCHD054G2 (2017) good condition
   b. 460V-3Ph
   c. 1 hp motor
   d. 30A Heavy Duty Safety Switch – good condition
   e. 1550 CFM SA scheduled; 385 CFM OA scheduled.
4. BCAHU#34 (Workroom E125):
   a. Trane BCHD018G2 (2017) good condition

b. 460V-3Ph
c. 1/2 hp motor
d. 30A Heavy Duty Safety Switch – good condition
e. 500 CFM SA scheduled; 60 CFM OA scheduled.

5. BCAHU#35 (Conference E129):
   a. Trane BCHD012G2 (2017) good condition
   b. 460V-3Ph
   c. 1/2 hp motor
   d. 30A Heavy Duty Safety Switch – good condition
   e. 300 CFM SA scheduled; 75 CFM OA scheduled.
6. BCAHU#36 (Media Center E123):
   a. Trane BCHD054G2 (2017) good condition
   b. 460V-3Ph
   c. 1-1/2 hp motor
   d. 30A Heavy Duty Safety Switch – good condition
   e. 1900 CFM SA scheduled; 760 CFM OA scheduled.
7. HPAHU#5 (Principal E109/Office E110/ Guidance E111):
   a. Trane GAM5B0B36M21EA (2017) good condition
   b. 208V-3Ph
   c. 10.8 kW electric heat
   d. 60A Heavy Duty Safety Switch – good condition
   e. 1100 CFM SA scheduled; 80 CFM OA scheduled.
8. HP#5 (Match with HPAHU#5)
   a. Trane model 4TWA3036A4000C (2017) good condition
   b. 460V-3Ph
   c. R410a Refrigerant
   d. 30A Heavy Duty Safety Switch – good condition
9. HPAHU#6 (Breakroom E115/Occupational Therapy E113/Resource E114/ A.P. E116) & HPAHU#8 (Mail Workroom E117/Nurse E121/Admin Toilets):
   a. Trane GAM5B0B36M31EA (2017) good condition
   b. 208V-3Ph
   c. 10.8 kW electric heat
   d. 60A Heavy Duty Safety Switch – good condition
   e. 1100 CFM SA scheduled; 145 CFM OA scheduled.
10. HP#6 (Match with HPAHU#6) HP#8 (Match with HPAHU#8):
    a. Trane model 4TWA3036B4000A (2017) good condition
    b. 460V-3Ph
    c. R410a Refrigerant
    d. 30A Heavy Duty Safety Switch – good condition
11. HPAHU#7 (Attend E105/ Counc. E106/ Office E107/ Secretary E108):
    a. Trane GAM5B0A24M21EA (2017) good condition
    b. 208V-3Ph
    c. 7.2 kW electric heat
    d. 30A Heavy Duty Safety Switch – good condition
    e. 750 CFM SA scheduled; 80 CFM OA scheduled.

12. HP#7 (Match with HPAHU#7):
    a. Trane model 4TWR4024G1000A (2017) good condition
    b. 208V-31Ph
    c. R410a Refrigerant
    d. 30A Heavy Duty Safety Switch – good condition
13. HPAHU#9 (Conference E104) & HPAHU#10 (Admin. E103):
    a. Trane GAM5B0A24M21EA (2017) good condition
    b. 208V-3Ph
    c. 7.2 kW electric heat
    d. 30A Heavy Duty Safety Switch – good condition
    e. 750 CFM SA scheduled; 75 CFM OA scheduled.
14. HP#9 (Match with HPAHU#9) & HP#10 (Match with HPAHU#10):
    a. Trane model 4TWR4024G1000A (2017) good condition
    b. 208V-1Ph
    c. R410a Refrigerant
    d. 30A Heavy Duty Safety Switch – good condition
15. HPAHU#11 (Vestibule E100/ Concessions):
    a. Trane GAM5B0B36M31EA (2017) good condition
    b. 208V-3Ph
    c. 10.8 kW electric heat
    d. 60A Heavy Duty Safety Switch – good condition
    e. 1100 CFM SA scheduled; 150 CFM OA scheduled.
16. HP#11 (Match with HPAHU#11):
    a. Trane model 4TWA3036B4000A (2017) good condition
    b. 460V-3Ph
    c. R410a Refrigerant
    d. 30A Heavy Duty Safety Switch – good condition

Area F - Gymnasium/Main Vestibule and Locker Rooms

1. Exhaust Fans:
    a. F-6 – Locker Rooms/Gym Toilets – 2850 CFM
2. AHU#5 (Gymnasium F104):
    a. Located in Area E Mechanical Loft
    b. Trane CSSA025UA (2017) good condition
    c. 460V-3Ph
    d. 15 hp supply air fan
    e. 10 hp return air fan
    f. 60A Disconnect switch, supply and return VFD - (good condition)
    g. 11,400 CFM SA scheduled; 3000-6500 CFM OA scheduled with OA economizer.
3. BCAHU#5 (Men F108A/Women F108B) & BCAHU#6 (Women F105A/Men F105B):
    a. Located in Area B Mechanical Loft
    b. Trane BCHD054G2 (2017) good condition
    c. 460V-3Ph
    d. 1 hp motor
    e. 30A Heavy Duty Safety Switch – good condition

f. 1400 CFM SA scheduled; 15 CFM OA scheduled.

Area G - Elementary School Administration/Art and Media Center

1. Exhaust Fans:
   a. F-12 – Kiln G130 – 1800 CFM
   b. F-23 – Area G Admin Toilets – 250 CFM
   c. F-27 – Toilet G125A – 100 CFM
   d. F-28 – Toilet G125B – 100 CFM
2. BCAHU#37 (Media Center G122):
   a. Trane BCHD054G2 (2017) good condition
   b. 460V-3Ph
   c. 1-1/2 hp motor
   d. 30A Heavy Duty Safety Switch – good condition
   e. 1900 CFM SA scheduled; 760 CFM OA scheduled.
3. BCAHU#38 (Conference G128):
   a. Trane BCHD012G2 (2017) good condition
   b. 460V-3Ph
   c. 1/2 hp motor
   d. 30A Heavy Duty Safety Switch – good condition
   e. 300 CFM SA scheduled; 75 CFM OA scheduled.
4. BCAHU#39 (Workroom G124):
   a. Trane BCHD018G2 (2017) good condition
   b. 460V-3Ph
   c. 1/2 hp motor
   d. 30A Heavy Duty Safety Switch – good condition
   e. 500 CFM SA scheduled; 60 CFM OA scheduled.
5. BCAHU#40 (Art G132):
   a. Trane BCHD054G2 (2017) good condition
   b. 460V-3Ph
   c. 1 hp motor
   d. 30A Heavy Duty Safety Switch – good condition
   e. 1550 CFM SA scheduled; 385 CFM OA scheduled.
6. BCAHU#41 (Classroom G133):
   a. Trane BCHD024G2 (2017) good condition
   b. 460V-3Ph
   c. 1 hp motor
   d. 30A Heavy Duty Safety Switch – good condition
   e. 800 CFM SA scheduled; 260 CFM OA scheduled.
7. HPAHU#12 (Vestibule G100/ Vestibule F100):
   a. Trane GAM5B0B36M31EA (2017) good condition
   b. 208V-3Ph
   c. 10.8 kW electric heat
   d. 60A Heavy Duty Safety Switch – good condition
   e. 1100 CFM SA scheduled; 150 CFM OA scheduled.
   f. Considerable amount of dirt around floor drain.

8. HP#12 (Match with HPAHU#12):
    a. Trane model 4TWA3036B4000A (2017) good condition
    b. 460V-3Ph
    c. R410a Refrigerant
    d. 30A Heavy Duty Safety Switch – good condition
9. HPAHU#13 (Admin G103) & HPAHU#14 (Conference G104):
    a. Trane GAM5B0A24M21EA (2017) good condition
    b. 208V-3Ph
    c. 7.2 kW electric heat
    d. 30A Heavy Duty Safety Switch – good condition
    e. 750 CFM SA scheduled; 75 CFM OA scheduled.
10. HP#13 (Match with HPAHU#13) & HP#14 (Match with HPAHU#14):
    a. Trane model 4TWR4024G1000A (2017) good condition
    b. 208V-1Ph
    c. R410a Refrigerant
    d. 30A Heavy Duty Safety Switch – good condition
11. HPAHU#15 (Attend G105/ Counc. G106/ Office G107/ Secretary G108):
    a. Trane GAM5B0A24M21EA (2017) good condition
    b. 208V-3Ph
    c. 7.2 kW electric heat
    d. 30A Heavy Duty Safety Switch – good condition
    e. 750 CFM SA scheduled; 80 CFM OA scheduled.
12. HP#15 (Match with HPAHU#15):
    a. Trane model 4TWR4024G1000A (2017) good condition
    b. 208V-1Ph
    c. R410a Refrigerant
    d. 30A Heavy Duty Safety Switch – good condition
13. HPAHU#16 (Principal G109/Office G110/ Guidance G111):
    a. Trane GAM5B0B36M21EA (2017) good condition
    b. 208V-3Ph
    c. 10.8 kW electric heat
    d. 60A Heavy Duty Safety Switch – good condition
    e. 1100 CFM SA scheduled; 80 CFM OA scheduled.
14. HP#16 (Match with HPAHU#16)
    a. Trane model 4TWA3036A4000C (2017) good condition
    b. 460V-3Ph
    c. R410a Refrigerant
    d. 30A Heavy Duty Safety Switch – good condition
15. HPAHU#17 (Mail Workroom G118/Nurse G120/Admin Toilets) & HPAHU#18 (Breakroom G114/ Resource G113):
    a. Trane GAM5B0B36M31EA (2017) good condition
    b. 208V-3Ph
    c. 10.8 kW electric heat
    d. 60A Heavy Duty Safety Switch – good condition
    e. 1100 CFM SA scheduled; 145 CFM OA scheduled.

16. HP#17 (Match with HPAHU#17) HP#18 (Match with HPAHU#18):
    a. Trane model 4TWA3036B4000A (2017) good condition
    b. 460V-3Ph
    c. R410a Refrigerant
    d. 30A Heavy Duty Safety Switch – good condition
17. DAHU#9 (MDF G127)
    a. Trane model PCA-A42KA6 (2017) good condition
    b. 208/230V-1Ph
    c. Toggle type disconnect switch
    d. Cooling thermostat.
    e. R410a Refrigerant
18. DHP#9 (Match with DAHU#9):
    a. Trane model PUZ-A42NKA7 (2017) good condition
    b. 208/230V-1Ph
    c. R410a Refrigerant
    d. 60A Heavy Duty Safety Switch – good condition
    e. Room temp was 68°F when thermostat was set at 68°F

Areas H1 & H2 - Elementary School Classrooms

1. Exhaust Fans:
    a. F-18 – Boys H103/Girls H104/Jan H105 – 925 CFM
    b. F-19 – Boys H121/Girls H122/Women H127/Men H128/Toilet H132 – 1375 CFM
    c. F-29 – Toilet H113 – 75 CFM
    d. F-30 - Toilet H117 – 100 CFM
    e. F-39 - Toilet H136 – 75 CFM
2. BCAHU#42 (Classroom H101) & BCAHU#53 (Classroom H119):
    a. Trane BCHD036G2 (2017) good condition
    b. 460V-3Ph
    c. 1 hp motor
    d. 30A Heavy Duty Safety Switch – good condition
    e. 1200 CFM SA scheduled; 280 CFM OA scheduled.
3. BCAHU#43 (Classroom H102):
    a. Trane BCHD024G2 (2017) good condition
    b. 460V-3Ph
    c. 1 hp motor
    d. 30A Heavy Duty Safety Switch – good condition
    e. 700 CFM SA scheduled; 370 CFM OA scheduled
4. BCAHU#44 (Classroom H107), BCAHU#45 (Classroom H110), BCAHU#46 (Resource H109), BCAHU#48 (Classroom H114), BCAHU#49 (Classroom H115), BCAHU#50 (Classroom H118) & BCAHU#54 (Classroom H120):
    a. Trane BCHD024G2 (2017) good condition
    b. 460V-3Ph
    c. 1 hp motor
    d. 30A Heavy Duty Safety Switch – good condition

e. 750 CFM SA scheduled; 260 CFM OA scheduled

5. BCAHU#51 (3-5 Self Contained H111) & BCAHU#52 (K-2 Self Contained H116):
   a. Trane BCHD024G2 (2017) good condition
   b. 460V-3Ph
   c. 1 hp motor
   d. 30A Heavy Duty Safety Switch – good condition
   e. 800 CFM SA scheduled; 260 CFM OA scheduled.
6. BCAHU#55 (Classroom H126), BCAHU#56 (Classroom H130) & BCAHU#57 (Classroom H133):
   a. Trane BCHD024G2 (2017) good condition
   b. 460V-3Ph
   c. 1 hp motor
   d. 30A Heavy Duty Safety Switch – good condition
   e. 650 CFM SA scheduled; 210 CFM OA scheduled.
7. BCAHU#58 (Classroom H137):
   a. Trane BCHD036G2 (2017) good condition
   b. 460V-3Ph
   c. 1 hp motor
   d. 30A Heavy Duty Safety Switch – good condition
   e. 950 CFM SA scheduled; 260 CFM OA scheduled.
8. BCAHU#59 (Kindergarten H131):
   a. Trane BCHD054G2 (2017) good condition
   b. 460V-3Ph
   c. 1 hp motor
   d. 30A Heavy Duty Safety Switch – good condition
   e. 1550 CFM SA scheduled; 385 CFM OA scheduled.
   f. Condensation had been forming on ductwork underneath insulation and dripping on floor. Floor opening and crack has been sealed. No condensation or wet floor observed by CAPA.
9. BCAHU#60 (Kindergarten H135):
   a. Trane BCHD024G2 (2017) good condition
   b. 460V-3Ph
   c. 1 hp motor
   d. 30A Heavy Duty Safety Switch – good condition
   e. 800 CFM SA scheduled; 225 CFM OA scheduled.
10. DAHU#6 (IT Closet H201) & DAHU#7 (IT Closet H202):
   a. Trane model PKA-A24KA7 (2017) good condition
   b. 208/230V-1Ph
   c. Toggle type disconnect switch
   d. Cooling thermostat.
   e. R410a Refrigerant
   f. DAHU#6 is showing an error code. Has system been reset/repaired? Unit functionality and refrigerant charge needs to be checked.
11. DHP#6 (Match with DAHU#6) & DHP#7 (Match with DAHU#7):
   a. Trane model MUZ-GL18NA-U1 (2017) good condition
   b. 208/230V-1Ph
   c. R410a Refrigerant
   d. 30A Heavy Duty Safety Switch – good condition

Area H3 - Elementary School Classrooms

1. BCAHU#68 (Classroom H138), BCAHU#69 (Classroom H140) & BCAHU#72 (Classroom H143):
   a. Trane BCHD024G2 (2017) good condition
   b. 460V-3Ph
   c. 1 hp motor
   d. 15A Heavy Duty Safety Switch – good condition
   e. 700 CFM SA scheduled; 210 CFM OA scheduled.
2. BCAHU#70 (Classroom H139) & BCAHU#71 (Classroom H141):
   a. Trane BCHD024G2 (2017) good condition
   b. 460V-3Ph
   c. 1 hp motor
   d. 30A Heavy Duty Safety Switch – good condition
   e. 650 CFM SA scheduled; 210 CFM OA scheduled.
3. BCAHU#73 (Classroom H142):
   a. Trane BCHD036G2 (2017) good condition
   b. 460V-3Ph
   c. 1 hp motor
   d. 30A Heavy Duty Safety Switch – good condition
   e. 950 CFM SA scheduled; 260 CFM OA scheduled.

Area H4 - Elementary School Classrooms

1. Exhaust Fans:
   a. F-41 – Area H4 Toilets/Janitor– 1025 CFM
2. BCAHU#83 (Classroom H144) & BCAHU#88 (Classroom H150):
   a. Trane BCHD036G2 (2017) good condition
   b. 460V-3Ph
   c. 1 hp motor
   d. 30A Heavy Duty Safety Switch – good condition
   e. 950 CFM SA scheduled; 300 CFM OA scheduled.
3. BCAHU#84 (Classroom H146), BCAHU#86 (Classroom H151) & BCAHU#87 (Classroom H148):
   a. Trane BCHD024G2 (2017) good condition
   b. 460V-3Ph
   c. 1 hp motor
   d. 30A Heavy Duty Safety Switch – good condition
   e. 800 CFM SA scheduled; 260 CFM OA scheduled
4. BCAHU#85 (Kindergarten H147):
   a. Trane BCHD054G2 (2017) good condition
   b. 460V-3Ph
   c. 1 hp motor
   d. 30A Heavy Duty Safety Switch – good condition
   e. 1300 CFM SA scheduled; 370 CFM OA scheduled

Area J - Elementary School Classrooms

1. Exhaust Fans:
   a. F-31 – Toilet J104 – 75 CFM
   b. F-32 – Toilet J106 – 75 CFM
   c. F-33 – Toilet J109 – 75 CFM
   d. F-34 - Toilet J111 – 75 CFM
   e. F-35 - Toilet J114 – 75 CFM
   f. F-36 - Toilet J116 – 75 CFM
   g. F-37 - Toilet J119 – 75 CFM
   h. F-38 - Toilet J121 – 75 CFM
2. BCAHU#47 (Kindergarten J117) & BCAHU#65 (1St Grade J113):
   a. Trane BCHD024G2 (2017) good condition
   b. 460V-3Ph
   c. 1 hp motor
   d. 30A Heavy Duty Safety Switch – good condition
   e. 800 CFM SA scheduled; 260 CFM OA scheduled.
3. BCAHU#62 (1st Grade J107) & BCAHU#66 (1St Grade J108):
   a. Trane BCHD024G2 (2017) good condition
   b. 460V-3Ph
   c. 1 hp motor
   d. 30A Heavy Duty Safety Switch – good condition
   e. 800 CFM SA scheduled; 225 CFM OA scheduled.
12. BCAHU#61 (1st Grade J103):
   a. Trane BCHD036G2 (2017) good condition
   b. 460V-3Ph
   c. 1 hp motor
   d. 30A Heavy Duty Safety Switch – good condition
   e. 1200 CFM SA scheduled; 280 CFM OA scheduled.
13. BCAHU#63 (Kindergarten J122):
   a. Trane BCHD054G2 (2017) good condition
   b. 460V-3Ph
   c. 1 hp motor
   d. 30A Heavy Duty Safety Switch – good condition
   e. 1300 CFM SA scheduled; 325 CFM OA scheduled.
14. BCAHU#64 (Kindergarten J118):
   a. Trane BCHD024G2 (2017) good condition
   b. 460V-3Ph
   c. 1 hp motor
   d. 30A Heavy Duty Safety Switch – good condition
   e. 750 CFM SA scheduled; 230 CFM OA scheduled.
15. BCAHU#67 (1st Grade J112):
   a. Trane BCHD036G2 (2017) good condition
   b. 460V-3Ph
   c. 1 hp motor
   d. 30A Heavy Duty Safety Switch – good condition

e. 950 CFM SA scheduled; 215 CFM OA scheduled.

16. DAHU#8 (IT Closet J201)
    a. Trane model MSZ-GL18NA-U1 (2017) good condition
    b. 208/230V-1Ph
    c. Toggle type disconnect switch
    d. Cooling thermostat.
    e. R410a Refrigerant

17. DHP#8 (Match with DAHU#8):
    a. Trane model MUZ-GL18NA-U1 (2017) good condition
    b. 208/230V-1Ph
    c. R410a Refrigerant
    d. 30A Heavy Duty Safety Switch – good condition
    e. Room temp was 78°F when thermostat was set at 65°F. Unit functionality and refrigerant charge needs to be checked.

End of Appendix A

Cheatham and Associates, P.A.
Consulting Engineers

HVAC INFRASTRUCTURE ASSESSMENT
SURF CITY ELEMENTARY AND MIDDLE SCHOOLS (SSK8)
PENDER COUNTY SCHOOLS

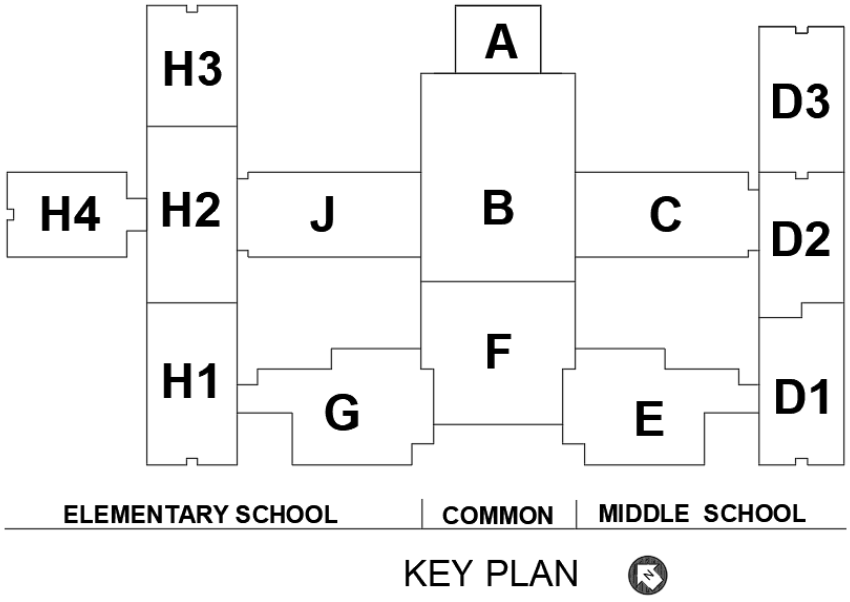
July 26, 2022

Cheatham and Associates (CAPA) is contracted with Pender County Schools (PCS) to provide an assessment of existing HVAC systems based on those conditions that are readily observed. Assessment will include summary of the HVAC systems, their interconnection between buildings, the condition of systems and equipment including age and estimated or typical remaining service life, and recommendations for betterment of control of temperature, relative humidity, and indoor air quality.

The following assessment is for Surf City Elementary located at 12345-A Literacy Lane and Middle Schools (SSK8) located at 12345-B Literacy Lane, Hampstead, NC.

SSK8 is one building, 165,120 total sf, constructed in 2018 with Elementary School on one side, Middle School on other side, and common Kitchen, Cafeteria, Multipurpose, and Gymnasium in the middle.

- Area A: Kitchen/Serving and Central Plant Area
- Area B: Cafeteria/Multipurpose and Music Area
- Area C, D1, D2 and D3: Middle School Classrooms
- Area E: Middle School Administration/Art and Media Center
- Area F: Gymnasium/Main Vestibule and Locker Rooms
- Area G: Elementary School Administration/Art and Media Center
- Area H1, H2, H3, H4 and J: Elementary School Classrooms



HVAC system is:

- 4-pipe chilled (CH) water and hot water (HW) system from a central common plant with multiple air cooled chillers and boilers feeding air handling units (AHU) and blower coil air handling units (BCAHU) located on a continuous mezzanine.
- Multiple CH and HW pumps are piped in a primary-secondary pumping arrangement for each system.
- AHUs and BCAHUs have hot water coils in reheat position to provide reheating during dehumidification operation.
- Separate Admin Areas are conditioned by multiple split system heat pumps.
- Each IT space is conditioned by a dedicated split system ductless heat pump (DAHU/DHP).
- Control system is DDC Siemens Apogee BACnet MS/TP.

See attached Appendix A for detailed information of existing HVAC systems and equipment based on CAPA's observations from visits to the site and from meetings.

Costs indicated are CAPA's opinion of probable cost including material, labor, and markup for each recommendation and should be used only for preliminary budgeting purposes.

Delivery times are manufacturer's representative's estimates as of July 2022.

Indoor Air Quality (IAQ)

Per the US EPA Clean Air in Buildings Challenge – March 2022 and US Department of Education's Improving Ventilation in Schools, Colleges, and Universities to Prevent COVID-19 documents, improving indoor air quality (IAQ) can reduce the risk of exposure to particles, aerosols, and other contaminants, and improve the health of building occupants. Infectious diseases like COVID-19 can spread through the inhalation of airborne particles and aerosols.

Many recommendations that will be made will be regarding betterment of IAQ, including confirming provision of outside air (OA) in a controlled manner and in amounts that the HVAC systems can properly condition, improving filtration in HVAC units, and consideration of air cleaning technologies.

Improving IAQ is an important step that can help prevent elevated counts of mold spores and elevated CO2 levels inside buildings.

If no changes are made to HVAC systems or equipment, all HVAC systems should be tested to determine their supply air, return air, outside air, functionality of outside air dampers, and functionality of any outside air economizers. Testing should be done by an AABC or NEBB certified Test and Balance Company (TAB) in accordance with the Standards of AABC or NEBB. This will allow Pender County Schools to know the condition of each HVAC system with regard to outside air ventilation, a major component of IAQ.

Cheatham and Associates has the certified Test and Balance Report dated August 7, 2018 from the project's completion.

SSK8 – All equipment is as installed when the school was built in 2017-2018. Maintenance of systems appears to be very good. Except where noted below, all systems appear to be in functionally good condition and can remain. Most items noted below are maintenance items and do not include probable costs.

1. (3) LP gas fired boilers, (5) hot water pumps and accessories for the hot water central plant are in good condition.
   a. When natural gas is available to the site, boilers and any other gas fired equipment should be converted to natural gas firing. Natural gas is a less expensive fuel source than LP gas.
   b. Open copper piping below HW system air separator
   c. Chemical feeder at P-6 is covered in HW and/or chemicals. Top needs to be confirmed it is not leaking and repaired as necessary. Tank needs to be cleaned up.
   d. HW system water clean?
   e. Boiler pump P-8 is scheduled to have its seals replaced to stop leak.
2. (2) packaged air cooled chillers, (4) chilled water pumps and accessories for the chilled water central plant are in good condition.
   a. Either insulate the CH system chemical feeder tank or close valves to it to stop condensation and resulting corrosion.
   b. Pump suction diffusers, ports, etc. that are open need to be insulated to prevent condensation and resulting corrosion.
   c. Valves at both chillers need cleaning and repainting to stop corrosion.
3. (9) split system ductless heat pumps serving IT spaces are in good condition.
   a. DAHU#2 (IT Closet C201) Room temp was 72°F when thermostat was set at 67°F. Unit functionality and refrigerant charge needs to be checked.
   b. DAHU#3 (IT Closet D202) Room temp was 77°F when thermostat was set at 67°F. Unit functionality and refrigerant charge needs to be checked.
   c. DAHU#4 (IT Closet D201) Room temp was 79°F when thermostat was set at 67°F. Unit functionality and refrigerant charge needs to be checked.
   d. DAHU#6 (IT Closet H201) Showing an error code. Has system been reset/repaired? Unit functionality and refrigerant charge needs to be checked.
   e. DHP#8 (Match with DAHU#8) Room temp was 78°F when thermostat was set at 65°F. Unit functionality and refrigerant charge needs to be checked.
   f. Although they are coated with UV protective paint, insulation is cracking and failing on most refrigerant lines on the exterior of the building.
4. (18) split system heat pumps serving the Administration Areas for the Elementary and Middle School are in good condition.
   a. Although they are coated with UV protective paint, insulation is cracking and failing on most refrigerant lines on the exterior of the building.
   b. Split system heat pump air handling units are Trane model GAM5 units and general leak excessive amount of conditioned air from their cabinets. Seal up air leaks with tape, etc.

c. For IAQ enhancement of replacing filters to be MERV 13 and adding either NP bipolar ionization or airflow disinfection UVC lights.
   - Cost comparison for a standard size filter is $15.00 for 2" MERV 8's and $25.00 for 2" MERV 13's. Current PCS schedule for filter replacement is every three months. Changing to higher MERV filters will increase frequency of filter replacements.
   - Cost = $19,800 for Needle Point Bi-Polar Ionization devices installed in each SSAHU.
   - Cost = $64,800 for UVC light system installed in ductwork to each SSAHU for airflow disinfection, including ductwork revisions to achieve 500 fpm max air velocity.

5. (5) air handling units (AHU) serving the Kitchen, Cafeteria, Multipurpose Room and Gymnasium are in good condition.
   a. No issues noted.
   b. For IAQ enhancement of replacing filters to be MERV 13 and adding either NP bipolar ionization or airflow disinfection UVC lights.
      - Cost comparison for a standard size filter is $15.00 for 2" MERV 8's and $25.00 for 2" MERV 13's. Current PCS schedule for filter replacement is every three months. Changing to higher MERV filters will increase frequency of filter replacements.
      - Cost = $11,000 for Needle Point Bi-Polar Ionization devices installed in each AHU.
      - Cost = $36,000 for UVC light system installed in ductwork to each AHU for airflow disinfection, including ductwork revisions to achieve 500 fpm max air velocity.

6. (88) blower coil air handling units (BCAHU) serving Classrooms are in good condition.
   a. No issues noted.
   b. For IAQ enhancement of replacing filters to be MERV 13 and adding either NP bipolar ionization or airflow disinfection UVC lights.
      - Cost comparison for a standard size filter is $15.00 for 2" MERV 8's and $25.00 for 2" MERV 13's. Current PCS schedule for filter replacement is every three months. Changing to higher MERV filters will increase frequency of filter replacements.
      - Cost = $96,800 for Needle Point Bi-Polar Ionization devices installed in each BCAHU.
      - Cost = $316,800 for UVC light system installed in ductwork to each BCAHU for airflow disinfection, including ductwork revisions to achieve 500 fpm max air velocity.

7. Based on observations and values for outside air and exhaust air in the available mechanical documents, building's overall pressurization is positive pressure to the exterior.

   In addition to improved IAQ, more outside air needs to be added to properly pressurize the building. Positive building pressure will help with unconditioned air infiltrating into the building, creating issues with regard to control of temperature and relative humidity.

8. TAB for entire building should occur for all systems to confirm supply air, return air, and especially amount of outside air for ventilation and functionality of occupied mode and economizer mode (where applicable) OA dampers.
   - Cost = $60,350

9. Mechanical mezzanine concrete floors have ongoing cracking. Noted throughout. PCS has been caulking cracks to seal them; PCS should continue this process.

SUMMARY

Surf City Elementary and Middle Schools (SSK8) is a building that was constructed new in 2018. No renovations have occurred since initial construction. HVAC systems are as installed when the school was built.

Maintenance of systems appears to be very good. Except for the few additional maintenance items noted in the assessment, all systems appear to be in functionally good condition and can remain.

If no changes are made to HVAC systems or equipment, PCS should:

1. Use portable spot cooling, dehumidifying, and/or filtration units for any problematic spaces.
2. All HVAC systems should be tested to determine their supply air, return air, outside air, functionality of outside air dampers, and functionality of any outside air economizers. Testing should be done by an AABC or NEBB certified Test and Balance Company (TAB) in accordance with the Standards of AABC or NEBB. This will confirm to Pender County Schools the condition of each HVAC system and amount of outside air ventilation for IAQ.
    - TAB Cost for all buildings if a standalone work item = $60,350

For IAQ enhancement of existing air handling systems, replace filters to be MERV 13 and/or add either NP bipolar ionization or airflow disinfection UVC lights.

- Cost = $127,600 for Needle Point Bi-Polar Ionization devices installed in each AHU, BCAHU, and SSAHU.
- Cost = $417,600 for UVC light system installed in ductwork to each AHU, BCAHU, and SSAHU for airflow disinfection, including ductwork revisions to achieve 500 fpm max air velocity.

We suggest including a 15% contingency for costs and an additional 10% cost for designer fees if needed.

Cheatham and Associates appreciates the opportunity to provide this assessment to Pender County Schools as assistance in the decision making process related to HVAC in their buildings. For questions or comments, please contact us.

Prepared by:
Cheatham and Associates, PA
Kenneth Lynch, PE

Seal

Attachment – Appendix A

Cheatham and Associates, P.A.
Consulting Engineers

HVAC INFRASTRUCTURE ASSESSMENT
TOPSAIL ELEMENTARY SCHOOL
PENDER COUNTY SCHOOLS

August 1, 2022

APPENDIX A – More detailed information found and observed for each HVAC system and area.

General

1. Topsail Elementary School (TES):
   a. Topsail Elementary School – Original Building – No drawings from original design (year unknown).
   b. Topsail Elementary School Addition – David N. Schultz Associates (1991)
      1) 5" chilled water (CH) and 3" hot water (HW) piping are capped outside the building (they were for a future Middle School that was not built).
      2) In the existing original TES building, the portion that was wall mounted heat pumps (WMHPs) had valves with caps added from the new CH and HW piping for future replacement of classroom WMHPs to be 4-pipe fan coil units (FCUs).
   c. Overall total square footage = sf
   d. HVAC system:
      1) 4-pipe chilled (CH) water and hot water (HW) system from a central common plant with multiple air cooled chillers and single boiler feeding air handling units (AHU) and fan coil units (FCUs) for classrooms.
      2) One pump pumps CH through the chillers and all of the chilled water coils.
      3) One pump pumps HW through the boiler and all of the hot water coils.
      4) AHU HW coils are in reheat position.
      5) FCU HW coil position? Reheat or preheat? FCUs are shown on the existing control diagram to have the HW coil in the reheat position.
      6) Original building has original WMHPs. WMHPs are mounted hanging on the exterior of the building.
      7) Admin Area is conditioned by multiple split system heat pumps.
   e.
2. Notes:
   a. Building controls are CSI DDC by Schneider that PCS has identified as needing replacement and have received bids for replacement date – from 1991 project?. Central Office's remote ability is only to see space temperatures but no remote adjustments?
   b. 2" filter frames (typical)
   c. All CFM data for both outside air and supply air are from the mechanical schedules of the 1991 drawings. Actual CFM in the field is unknown.

d.

Chiller Yard

1. PCS advised that main switch at Chiller #1 and Chiller #2 does not control the chillers for operation. Chiller#1 and Chiller#2 operate automatically via the DDC as either/or, but both chillers do not operate at the same time.

2. Chiller #1 (date)
   a. Trane CGAFC504AHA
   b. 162.9 ton capacity
   c. 42°F LWT; 54°F EWT
   d. 325 GPM
   e. 460V-3ph
   f. R-22 Refrigerant
   g. Condition of chiller?
   h. 200A HD disconnect – fair condition

3. Chiller #2 (date)
   a. Trane RTAC 1704 UR0N
   b. 170 ton nominal capacity
   c. Data for EWT/LWT & gpm
   d. 460V-3ph
   e. R134A Refrigerant
   f. Condition of chiller?
   g. 400A HD disconnect – fair condition – 480/277V – 3ph

4. No emergency connections at the chillers, chillers are piped together.

5. 20,000-gallon underground oil fuel tank (1991) 10’ diameter. Issues?

Boiler Room - Poor condition

1. Boiler room set up for future boiler, additional CH pump, and additional HW pump.

2. Boiler flue is capped for future boiler.

3. Boiler No. 1 – Weil McLain 788 (1991)
   a. Water - MBH 1419
   b. Webster MP-2221 dual fuel burner – oil/gas (check to see if gas has been installed – could not tell by pictures, appears oil is still in service)
   c. Condition of boiler and burner?
   d. Schedule for natural gas installation to site/building?

4. Boiler No. 2 (space for future) - not installed at this time.

5. Pump Hot Water System Pump P-1 (need nameplate information) (space for future P-2)
   a. B&G
   b. Baldor Motor M3313T -10HP (original motor) (5HP scheduled)

c. 100 GPM Scheduled
d. 105' Head Scheduled
e. 1750 RPM
f. 208V-3ph (460V-3ph scheduled)
g. Primary constant volume pumping only – all HW goes through boiler (no secondary observed).
h. Condition of pump and starter

6. Pump Chilled Water System pump (need nameplate information) (space for future pump?)
a. B&G
b. Dayton 208 & 230V – 20 HP (replaced motor) (15 HP Scheduled)
c. 325 GPM Scheduled
d. 120' Head Scheduled
e. 1770 RPM
f. 460V-3ph Scheduled
g. Primary constant volume pumping only – all CH goes through chillers (no secondary observed).
h. Condition of pump and starter?

7. Unit Heater – Modine HS47S01 (very old) Hot water with wall thermostat – condition?

8. F-8 (Boiler Room) with wall thermostat - 3000 CFM – condition?

Original Building – 4th and 5th Grade Classrooms:

Assume no outside air into this wing of the building - unknown if WMHPs have outside air for ventilation or pressurization - no equipment schedules available for these units.

There are two units labeled HP-12 in the field. HP-11 is shut off and presumably not working.

1. AHU-3 (1991)
a. Carrier Model 39ED08
b. 3-way control valve CH and HW piping (where piping not insulated, very rusted)
c. Scheduled 3000 CFM with 300 OA (does have motor operated damper on OA)
d. 480V-3ph HD Disc Switch with separate starter (Hand-off-auto)
e. Unit is in poor condition

2. Mech Room with AHU-3 does have future 5" CH piping and 3" HW piping for future down through the floor below grade to 5' outside building. All valves are closed.

3. Fans:
a. F-7 – Girls/Boys toilet & janitor closet – 700 CFM
b. F-16 – Art room - Kiln – 400 CFM
c. condition?

4. Ductless Split System Heat Pump (paired with DAHU-1, DAHU-2, and DAHU-3)
a. Mitsubishi model MXZ-4C36NA2 – good condition
b. 208/230V-1ph
c. R-410A refrigerant

5. DAHU-1 – Boy's toilets
   a. Mitsubishi model MSZ-GE12NA – good condition
   b. R410A Refrigerant
   c. 208/230V-1ph

6. DAHU-2 – Girl's toilets
   a. Mitsubishi model MSZ-GE12NA – good condition
   b. R410A Refrigerant
   c. 208/230V-1ph

7. DAHU-3 – Above hall entrance doors
   a. Mitsubishi model MSZ-GE12NA – good condition
   b. R410A Refrigerant
   c. 208/230V-1ph
   d. Has a condensate pump

8. WMHP-1 (HP-1) – Art room (1991 existing to remain.)
   a. Bard W36H1DA05 – slightly rusted - Fair condition
   b. 208/230V-1ph
   c. R-410A Refrigerant
   d. 60A disconnect switch – 480V-3ph – poor condition

9. WMHP-2 (HP-1A) – Art room (1991 existing to remain.)
   a. Bard W36H1DA05 – slightly rusted - Fair condition
   b. 208/230V-1ph
   c. R-410A Refrigerant
   d. 60A disconnect switch – 480V-3ph – poor condition

10. WMHP-3 (HP-3) – Resource room (1991 existing to remain.)
    a. Bard W36H1DA05 – slightly rusted - Fair condition
    b. 208/230V-1ph
    c. R-410A Refrigerant
    d. 60A disconnect switch – 480V-3ph – poor condition

11. WMHP-4 (HP-4) – Resource room (1991 existing to remain.)
    a. Bard W36H1DA05 – slightly rusted - Fair condition
    b. 208/230V-1ph
    c. R-410A Refrigerant
    d. 60A disconnect switch – 480V-3ph – poor condition

12. WMHP-5 (HP-5) – 5th Grade classroom (1991 existing to remain.)
    a. Bard W36H1DA05 – slightly rusted - Fair condition
    b. 208/230V-1ph
    c. R-410A Refrigerant
    d. 60A disconnect switch – 480V-3ph – poor condition

13. WMHP-6 (HP-6) – 5th Grade classroom (1991 existing to remain.)
    a. Bard W36H1DA05 – slightly rusted - Fair condition
    b. 208/230V-1ph
    c. R-410A Refrigerant

d. 60A disconnect switch – 480V-3ph – poor condition

14. WMHP-7 (HP-7) – 5th Grade classroom (1991 existing to remain.)
    a. Bard W36H1DA05 – slightly rusted - Fair condition
    b. 208/230V-1ph
    c. R-410A Refrigerant
    d. 60A disconnect switch – 480V-3ph – poor condition

15. WMHP-8 (HP-8) – 4th Grade classroom (1991 existing to remain.)
    a. Bard W36H1DA05 – slightly rusted - Fair condition
    b. 208/230V-1ph
    c. R-410A Refrigerant
    d. 60A disconnect switch – 480V-3ph – poor condition

16. WMHP-9 (HP-9) – 4th Grade classroom (1991 existing to remain.)
    a. Bard W36H1DA05 – slightly rusted - Fair condition
    b. 208/230V-1ph
    c. R-410A Refrigerant
    d. 60A disconnect switch – 480V-3ph – poor condition

17. WMHP-10 (HP-10) – 4th Grade classroom (1991 existing to remain.)
    a. Bard W36H1DA05 – slightly rusted - Fair condition
    b. 208/230V-1ph
    c. R-410A Refrigerant
    d. 60A disconnect switch – 480V-3ph – poor condition

18. WMHP-12 (HP-12) – Resource room (1991 existing to remain.)
    a. Bard W36H1DA05 – slightly rusted - Fair condition
    b. 208/230V-1ph
    c. R-410A Refrigerant
    d. 60A disconnect switch – 480V-3ph – poor condition

19. WMHP-11 (HP-11) – Resource room (1991 existing to remain.)
    a. Bard unit – rusted – poor condition
    b. Unit tag on side is unreadable
    c. 60A disconnect switch – 480V-3ph – poor condition – unit is shut off via the disconnect

20. WMHP-12 (HP-12) – Resource room (1991 existing to remain.)
    a. Bard W36H1DA05 – slightly rusted - Fair condition
    b. 208/230V-1ph
    c. R-410A Refrigerant
    d. 60A disconnect switch – 480V-3ph – poor condition

21. Are WMHPs are connected to controls?

22. FCU-1 – Music classroom (1991)
    a. McQuay – TSC-121F
    b. 1200 CFM
    c. No OA
    d. condition?

23. Fans:
    a. F-7 (4th and 5th Gr Toilets) - 700
    b. F-9 (Electrical Room) with wall thermostat – 3000 CFM
    c. F-16 (Kiln) – 400
    d. condition?

Administration and 2nd and 3rd Grade Classrooms:

No identification tags on FCUs. All numbers are based on the 1991 construction document's equipment schedule.

1. FCU-2 to FCU-4 and FCU-7 (Admin Lobby Area)
    a. McQuay – TCS-081F
    b. 790 CFM
    c. No OA to units
    d. condition?

2. FCU-5 – Speech therapy
    a. McQuay – TCS – 121F
    b. 1200 CFM
    c. OA duct in back of FCU
    d. condition?

3. FCU-6 to FCU-13 – 2nd and 3rd Grade classrooms
    a. McQuay – TCS – 121F
    b. 1200 CFM
    c. OA duct in back of FCU – indicated on existing drawings as 130 CFM per FCU – too low for a classroom.
    d. condition?

4. FCU-14 – Book Storage
    a. McQuay – TCS – 041F
    b. 400 CFM
    c. No OA
    d. condition?

5. IAHU-1 and IAHU-3 information from schedules (1991)
    a. What is an IAHU?
    b. Carrier 40YR036 SSHP
    c. Above ceiling – did not see
    d. 1200 CFM – no scheduled OA
    e. 11.25 KW Electric Heat
    f. condition?

6. OU-1 (pair with IAHU-1) Carrier unit – poor condition (rusted) 1991
    a. Disc Switch (could not read)
    b. Nameplate
    c. Refrigerant type?

7. IAHU-2 information from schedules (1991)

a. Carrier 40YR024
b. Above ceiling did not see
c. 800 CFM – no scheduled OA
d. 6.0 Kw Electric Heat

8. OU-2 (pair with IAHU-2) Carrier unit – poor condition (rusted) 1991
   a. 60A HD Disc
   b. 480V-3ph
   c. Nameplate
   d. Refrigerant type?

9. OU-3 (pair with IAHU-3)
   a. Visit site and get information
   b. Refrigerant type?
   c. condition?

10. Fans:
   a. F-2 – Admin bathroom exhaust – 1000 CFM
   b. F-3 – Electrical room – 500 CFM
   c. F-17 – Behind book Storage – 150 CFM
   d. condition?

11. OAI -2 (2nd & 3rd Gr Wing) – 1040 CFM roof-mounted gravity outside air intake for FCUs.

Kindergarten and First Floor Wing:

1. FCU-15 and FCU-16 (3rd Grade classrooms)
   a. McQuay – TCS – 121F
   b. 1200 CFM
   c. OA duct in back of FCU – indicated on existing drawings as 75 CFM per FCU – too low for a classroom.
   d. condition?

2. FCU-17 and FCU-19 (AV Storage and Library Storage)
   a. McQuay-TCS-041F
   b. 400 CFM
   c. OA duct in back of FCU
   d. condition?

3. FCU-18 (Library Workroom and Office)
   a. McQuay-TCS-081F
   b. 790 CFM
   c. OA duct in back of FCU – indicated on existing drawings as 75 CFM per FCU – too low for a classroom.
   d. condition?

4. FCU 20 to FCU – 28 (K and 1st Gr Classrooms and Reading Lab)
   a. McQuay-TCS-121F
   b. 1200 CFM

c. OA duct in back of FCU – indicated on existing drawings as 75 CFM per FCU – too low for a classroom.
d. condition?

5. OAI-1 ((K & 1st Gr Wing) 1720 CFM roof-mounted gravity outside air intake for FCUs.

6. Fans:
   a. F-1 (K & 1st Gr Toilets) 600 CFM
   b. F-4 (Faculty Toilet) 100 CFM
   c. F-6 (Elect 42A) 400 CFM
   d. F-10 (Mech 42) 400 CFM
   e. condition?

Multipurpose Building (1991)

1. AHU-1 Cafeteria (per schedules) 1991 – could not reach to see
   a. 4 pipe – scheduled as HW coil is in the reheat position for dehumidification
   b. 4600 CFM SA/700 CFM OA
   c. 460v-3Ph
   d. 3 HP Fan
   e. No economizer
   f. AHU is above Cafeteria lay-in ceiling – ceiling is 17'-0" above the floor making AHU extremely difficult to service.

2. AHU-2 Multipurpose Room and Lobby (per schedules) 1991
   a. 4 pipe - scheduled as HW coil is in the reheat position for dehumidification
   b. 9000 CFM SA/1000 CFM OA
   c. 460V-3ph
   d. 7.5 HP Fan
   e. No economizer
   f. condition?

3. OAI-3 1000 CFM roof-mounted gravity outside air intake for AHU-2

4. OAI-4 = 700 CFM roof-mounted gravity outside air intake for AHU-1

5. Fans:
   a. F-5 (Lobby Toilets) - 850 CFM
   b. F-11 (Dishwasher) – 600 CFM
   c. F-12 (Kitchen Hood Exhaust) – 6325 CFM
   d. F-13 (Kitchen Hood Supply – no conditioning) 4325 CFM
   e. F-14 (Kitchen Area Exhaust) – 2075 CFM
   f. F-15 (Water Heater Rm Ex – sidewall) – 800 CFM
   g. F-18 (Stage Storage) – 400 CFM
   h. condition?

6. Kitchen Supply Air Unit (Scheduled)
   a. 3300 CFM
   b. 120v-1Ph
   c. 1/2 HP

d. Switch operated, with water pump, float switch
e. Evaporative cooling unit (swamp cooler) still installed and operating?
f. condition?
g. No other cooling observed for kitchen.
h. Heat?

End of Appendix A