February 2017

Contract #15-047, Detention Center Building Condition Assessment

Final Assessment

RMF Engineering
Reliability. Efficiency. Integrity.

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Division 1– Mechanical and Electrical

GEORGETOWN COUNTY DETENTION CENTER

EXECUTIVE SUMMARY

RMF has determined the following:

- The air handling system providing conditioned air to the building violates the mechanical code because the air handlers do not provide code required outside ventilation air to the building.
- The air handling system is sub-cooling the building to space temperatures that are well below the original design intent resulting in low dew point temperatures. In the summer, the space temperatures were measured at approximately 10°F below the design intent and often in the low 60°F's.
- There is uncontrolled infiltration in the building through existing poorly sealed louvers. The unconditioned outside air is being pulled into the building by the exhaust. This uncontrolled infiltration combined with the low space temperatures is resulting in condensation forming on cold surfaces when the dew point is met. The condensation is leading to visible condensation on surfaces in the building and an overall pervasive moisture issue. Microbial growth is resulting throughout the facility.
- The air handling systems are not configured properly to provide code required ventilation air to the facility to control moisture.
- The rooftop air handling systems are nearing the end of their anticipated service life, and in some cases in very poor condition.
- The split system air conditioning units are in poor condition or inoperable and in need of immediate replacement
- The air handling systems are located on the roof where maintenance access is difficult due to the location and size of the access hatch.
- The kitchen and food preparation area is not conditioned and is only tempered. Space temperatures in the kitchen were measured by RMF at above 90°F on multiple occasions.
- Many of the air devices in the facility are blocked, painted over, or obstructed.
- A gas shut-off valve has not been provided at the exterior of the facility in an accessible location.
- Many plumbing fixtures are not proper penal type.
- The fire protection system is corroded and lacks penal type heads in some locations.
- The lightning protection system is not performing properly.
- Many electrical system components are worn, missing, or improper for penal institutions.

RMF recommends the following:

- Provide a new HVAC system for the facility that properly introduces code required ventilation air.
- Replace the louvers that are allowing for uncontrolled infiltration.
- Provide permanent roof access from the secure side exterior of the facility to allow for proper maintenance access.
- Provide HVAC to the kitchen.
- Replace vitreous china plumbing fixtures with penal type.
- Perform coordination and arc flash studies. The results of the coordination study will aid in eliminating circuit breaker nuisance tripping. The results of an arc flash study will provide information on safe operating and maintenance for the electrical distribution equipment.
- Replace the safety switches and raceways for the mechanical equipment on the roof. There is a significant amount of rust corrosion and failing conduits and connectors that contribute to an unsafe work environment for maintenance.
- Replace the lightning protection system. The current system does not appear to be functioning. Coastal South Carolina has a high density of lightning strikes per year. It is critical that this building not be crippled by such a strike.
- Provide a Transient Voltage Surge Suppressor (TVSS) at the electrical service entrance. A TVSS will is another measure that will protect the electrical distribution equipment in the event of a possible lightning strike.

SECTION 1 – EXISTING CONDITIONS

EXISTING SYSTEMS AND EQUIPMENT – GENERAL

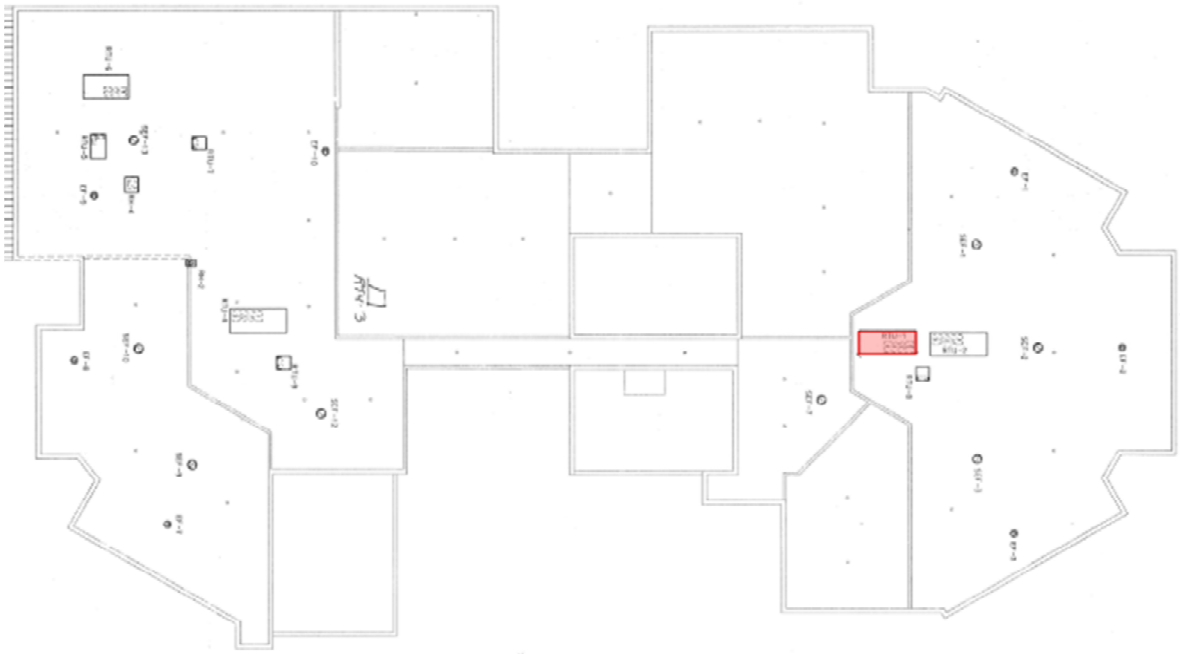
The detention center was constructed in 1996 and was designed to house up to 212 inmates. The building has approximately 56,000 square feet of occupied space and is 2 stories tall. The building is made up of the following space types: administrative, booking, visitation, food service, housing, medical, control rooms, and mechanical/electrical equipment rooms. The occupancy classification is listed as Group 1 Restrained Occupancy Use, Condition 4 on the existing drawings.

AIR HANDLING SYSTEMS (RTU'S) - GENERAL

The existing air handling units were manufactured from 2006-2015 by Trane. The existing equipment is capable of cooling and heating. The units are equipped with gas fired heating, but do not have reheat capabilities. There are 9 Direct Expansion (DX) air handlers and all are located on the roof. Two of the units use R-22 as the working refrigerant. The other 7 units utilize R-410A as the refrigerant. There is no central building automation control system installed for the mechanical equipment.

RTU-1 (UNIT 4)

RTU-1 is a DX unit with gas heat that serves E and F blocks.



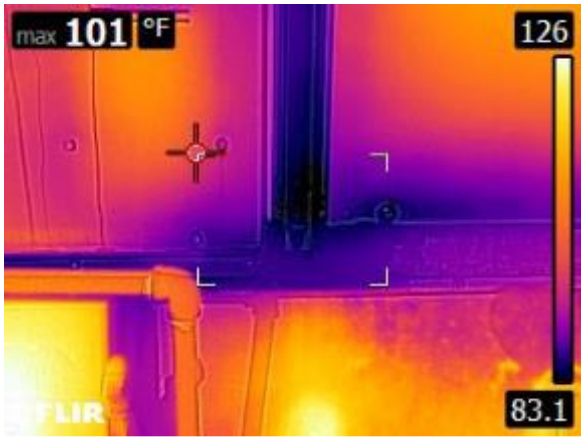
RTU-1 is highlighted on the roof plan above in red.

Designation	Building Service (pods)	Cooling Capacity (Tons)	Refrigerant	Manufacturing Date	Manufacturer/Model	Serial Number
RTU-1	E,F	30	R22	4-2007	Trane/ YCD360	C07C03159

The unit is 9 years old and in poor condition. There is rust and microbial growth visible on the exterior of the unit. Condensation within the unit has allowed the unit to corrode in a short amount of time, and has caused the insulation inside the unit to delaminate. Where the insulation is damaged, more condensation will occur, resulting in more rust. Areas with delaminated or saturated insulation have visible microbial growth. Temperature readings from the FLIR show the rooftop unit's surface temperature is above dew point.

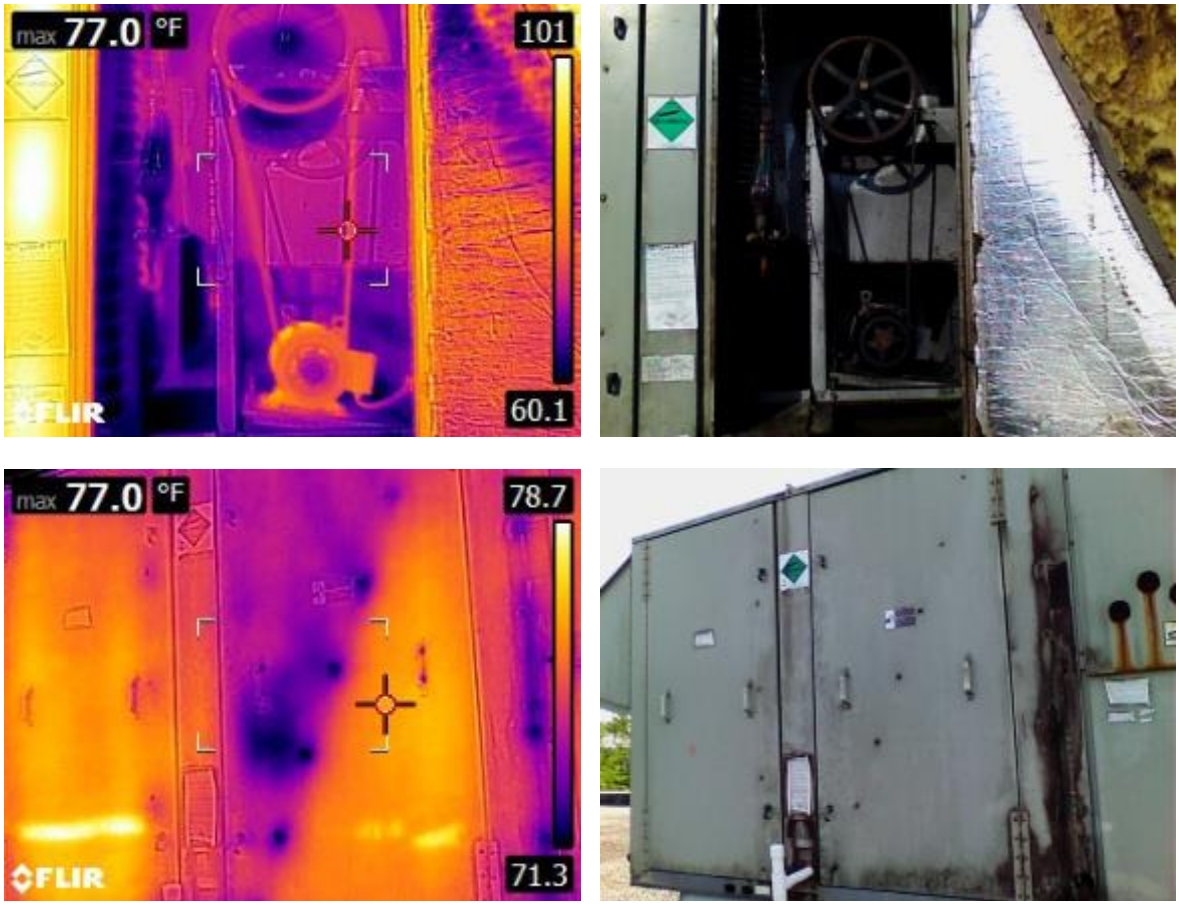
RTU-1 has rust and microbial growth.

Temperature readings were recorded using the FLIR. The temperature readings on the exterior of the unit vary by about 40°F due to sunlight in addition to insulation delamination. The temperature of the unit should be uniform on the exterior and above the dew point. The moisture, microbial growth, and rust are occurring at the coldest parts of the unit.



Above are side by side comparisons of the unit.

The insulation jacket is missing on half of the unit's access door. Microbial growth is occurring where the jacket is missing.



Above are side by side comparisons of the unit.

The roof curb adaptor is sized appropriately for the unit, but it is rusted. Rusted electrical disconnects are attached to the roof curb. The gas piping penetrations enter the building by pitch pockets.

There is visible rust on the RTU-1 roof curb.

The bird screen is torn on the intake side of the unit.

The bird screen is torn on the intake side of the unit.

The unit has the capability of bringing in outside air through louvers. However, the louvers have been blanked-off completely; therefore they do not bring in any outside air.

Pictured above are blanked-off louvers to RTU-1.

The condensate piping is disconnected and is dispensing directly on the roof.

Condensate piping is disconnected.

RTU-2 (UNIT 5)

RTU-2 is a DX unit with gas heat that serves G, H, and I blocks.

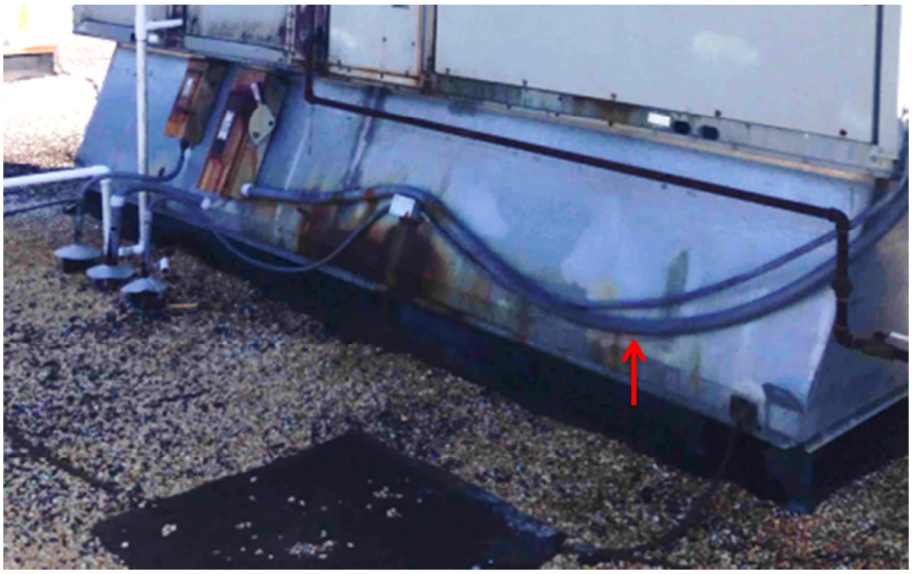
RTU-2 is highlighted on the roof plan above in red.

Designation	Building Service	Cooling Capacity (Tons)	Refrigerant	Manufacturing Date	Manufacturer/Model	Serial Number
RTU-2	G,H,I	30	R410A	7-2006	Trane/ YCD360	C06F06300

The unit is 10 years old and in poor condition. There is rust and microbial growth visible on the exterior of the unit. Condensation within the unit has allowed the unit to corrode in a short amount of time, and has caused the insulation inside the unit to delaminate. The condensation has caused the insulation to delaminate. Where the insulation is damaged, more condensation can occur, resulting in more rust. Areas with delaminated or saturated insulation have visible microbial growth.


RTU-2 has rust and microbial growth.

The roof adaptor curb is sized appropriately for the unit, but is rusted. Rusted electrical disconnects are attached to the roof curb. The gas piping penetrations enter the building by pitch pockets.



There is visible rust on the RTU-2 roof curb and conduit is not properly supported.

The unit has the capability of bringing in outside air through louvers. However, the louvers have been blanked-off completely; therefore they do not bring in any outside air. The conduit on the unit is not properly supported.

RTU-3 (UNIT 6)

RTU-3 is a DX unit with gas heat that serves the Nursing area of the building.

RTU-3 is highlighted on the roof plan above in red.

Designation	Building Service	Cooling Capacity (Tons)	Refrigerant	Manufacturing Date	Manufacturer/Model	Serial Number
RTU-3	Nursing	10	R410A	2-2015	Trane/ YSC120	150810868L

The unit was installed on June 8, 2015. The new unit was placed on the existing roof curb, which is oversized and corroded. The roof curb is likely not seismically braced/restrained.

RTU-3 was placed on the existing roof curb.

The original, rusted electrical disconnects are being reused and are mounted on wood next to the unit.

The corroded disconnects are mounted to wood.

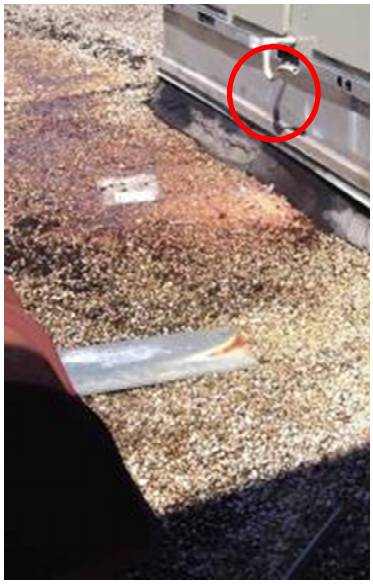
The gas piping penetration enters the building by a pitch pocket.

This is an example of a correct gas pipe penetration.

The unit does not have louvers to bring in outside air; therefore, no outside air is entering RTU-3.

No outside air is entering RTU-3.

The condensate is not piped to a roof drain and is dispensing directly on the roof.



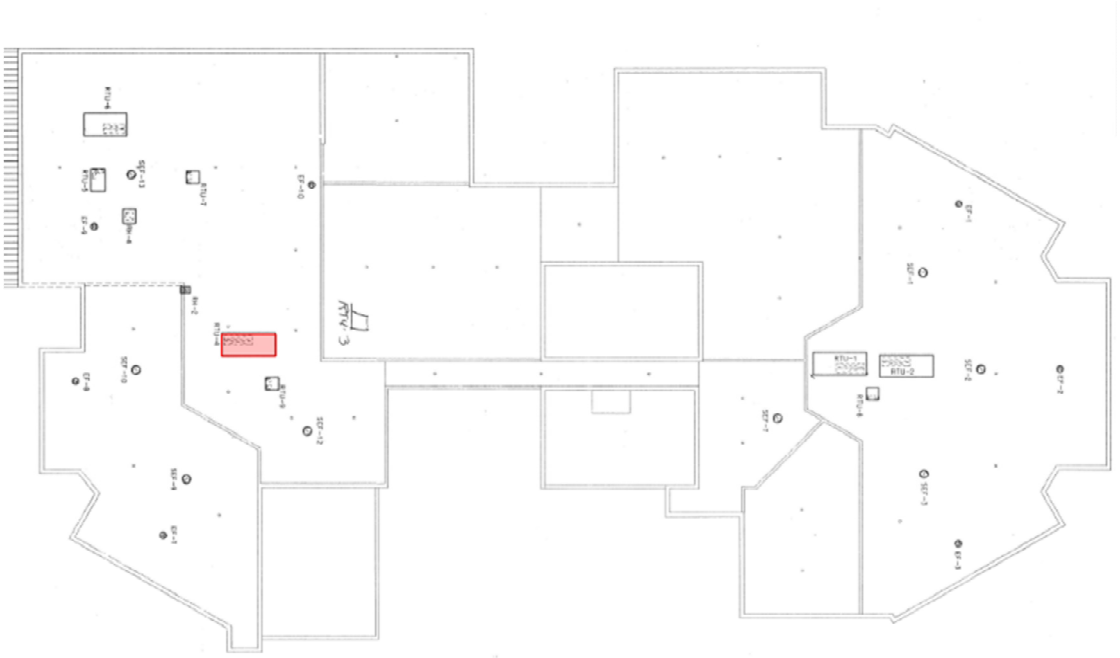
Condensate is not piped to a roof drain.

The electrical conduit is not properly supported and is resting on the roof.

Electrical conduit is resting on the roof.

RTU-4 (UNIT 3)

RTU-4 is a DX unit with gas heat that serves A, B, C, and D blocks.



RTU-4 is highlighted on the roof plan above in red.

Designation	Building Service	Cooling Capacity (Tons)	Refrigerant	Manufacturing Date	Manufacturer/Model	Serial Number
RTU-4	A,B,C,D	30	R410A	12-2009	Trane/ YCD360	C09M03987

The unit is 7 years old and in poor condition. There is rust and microbial growth visible on the exterior of the unit. The rooftop equipment has been installed on the original roof curb without proper modifications. When the new equipment was installed, the supply and return air ductwork connections did not align with the existing curb. A rusted electrical disconnect is attached to the unit. Condensation within the unit has allowed the unit to corrode in a short amount of time, and has cause the insulation inside the unit to delaminate. The condensation has caused the insulation inside the unit to delaminate. Where the insulation is damaged, more condensation can occur, resulting in more rust. Areas with delaminated or saturated insulation have visible microbial growth.

RTU-4 has rust and microbial growth.

Temperature readings were recorded using the FLIR. Temperature readings from the FLIR show the rooftop unit's surface temperature is above dew point. The temperature readings on the exterior of the unit vary by about 20°F due to sunlight in addition to insulation delamination. The temperature of the unit should be uniform on the exterior and below dew point. The moisture, microbial growth, and rust are occurring at the coldest parts of the unit.

Above is a side by side comparison of the unit.

Corrugated metal gas piping is used to connect to the rooftop unit. The gas piping penetrations enter the building by pitch pockets. Gas piping has been routed through lifting lugs, which is an incorrect installation.

The gas piping is piped through the lifting lugs which is an incorrect installation.

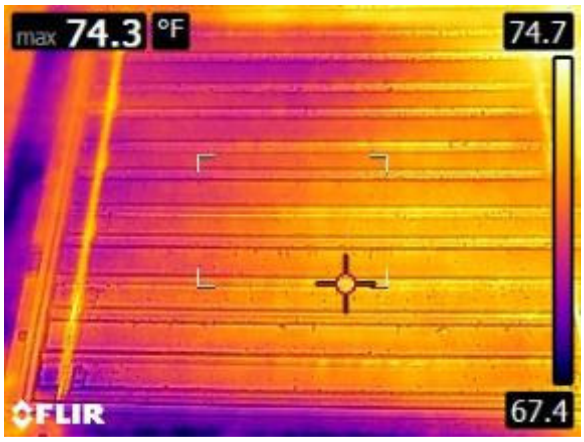
The fins are torn and delaminating.

The fins are torn and delaminating.

The unit has the capability of bringing in outside air through louvers. However, the louvers have been closed; therefore they do not bring in any outside air.

Pictured above are closed louvers to RTU-4.

Temperature readings were recorded on the closed louver using the FLIR.



Above is a side by side comparison of the closed louver.

RTU-5 (UNIT 2)

RTU-5 is a DX unit with gas heat that serves the booking area.

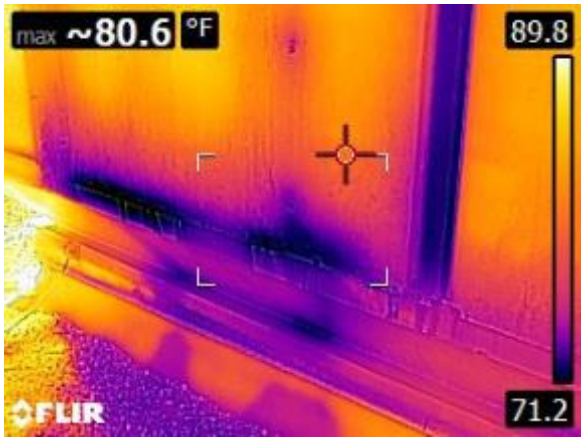
RTU-5 is highlighted on the roof plan above in red.

Designation	Building Service	Cooling Capacity (Tons)	Refrigerant	Manufacturing Date	Manufacturer/Model	Serial Number
RTU-5	Booking	12.5	R410A	1-2010	Trane/ YCD151	100110021D

The unit is 6 years old and in poor condition. There is rust and microbial growth visible on the exterior of the unit. The rooftop equipment has been installed on the existing roof curb, which is rotting. Condensation within the unit has allowed the unit to corrode in a short amount of time, and has cause the insulation inside the unit to delaminate. The condensation has caused the insulation to delaminate. Where the insulation is damaged, more condensation can occur, resulting in more rust. Areas with delaminated or saturated insulation have microbial growth.

RTU-5 has rust and microbial growth.

Temperature readings were recorded using the FLIR. The temperature readings on the exterior of the unit vary by about 20°F due to sunlight in addition to insulation delamination. The temperature of the unit should be uniform on the exterior and below dew point. Temperature readings from the FLIR show the rooftop unit's surface temperature is above dew point. The moisture, microbial growth, and rust are occurring at the coldest parts of the unit.



Above is a side by side comparison of the unit.

The roof curb temperature is about 120°F, much hotter than the rest of the unit.

The roof curb temperature is about 120˚F.

The original, rusted electrical disconnects are being reused and are mounted on wood next to the unit.

The corroded disconnects are mounted to wood.

Corrugated metal gas piping is used to connect to the rooftop unit. The gas piping penetration enters the building by a pitch pocket. The pitch pocket is damaged.

The pitch pocket is damaged.

The fins are torn and delaminating.

The fins are torn and delaminating.

The unit has the capability of bringing in outside air through louvers. However, the louvers have been blanked-off completely; therefore they do not bring in any outside air.

The electrical conduit is not properly supported and is resting on the roof.

Electrical conduit is resting on the roof.

RTU-6 (UNIT 1)

RTU-6 is a DX unit with gas heat that serves the main office.

RTU-6 is highlighted on the roof plan above in red.

Designation	Building Service	Cooling Capacity (Tons)	Refrigerant	Manufacturing Date	Manufacturer/Model	Serial Number
RTU-6	Main Office	20	R22	2-2006	Trane/ YCD240	607101564D

The unit is 10 years old and in poor condition. There is rust and microbial growth visible on the exterior of the unit. Condensation within the unit has allowed the unit to corrode in a short amount of time, and has caused the insulation inside to delaminate. Where the insulation is damaged, more condensation can occur, resulting in more rust. Areas with delaminated or saturated insulation have visible microbial growth.

RTU-6 has rust and microbial growth.

The roof curb is sized appropriately for the unit, but is rusted.

There is visible rust on the RTU-6 roof curb.

The rusted electrical disconnect is mounted on wood next to the unit.

The corroded disconnect is mounted to wood.

The gas piping penetrations enter the building by pitch pockets.

The unit does not have the capability of bringing in outside air through louvers. If it did the opening shown would not be sealed. No outside air is entering RTU-6.

No outside air is entering RTU-6.

The condensate is not piped to a roof drain and is dispensing directly on the roof. Additionally, the condensate is not trapped properly.

Condensate is not piped to a roof drain.

The electrical conduit is not properly supported and is resting on the roof.

Electrical conduit is resting on the roof.

RTU-7 (UNIT 7)

RTU-7 is a DX unit with gas heat that serves the main control tower.

RTU-7 is highlighted on the roof plan above in red.

Designation	Building Service	Cooling Capacity (Tons)	Refrigerant	Manufacturing Date	Manufacturer/Model	Serial Number
RTU-7	Main Control Tower	1.5	R410A	7-2008	Trane/ 4YCC3018	82920909H

The unit is 8 years old and in poor condition. There is rust and microbial growth visible on the exterior of the unit. Condensation within the unit has allowed the unit to corrode in a short amount of time, and has cause the insulation inside the unit to delaminate. The condensation has caused microbial growth.

RTU-7 has rust and microbial growth.

The rooftop unit has been installed on the original roof curb without proper modifications and a roof adaptor curb. When the new equipment was installed, the supply and return air ductwork connections did not align with the existing curb. In lieu of a roof curb, wood blocks are currently being used under the unit. This does not meet code requirements. Wood is never considered a proper support.

RTU-7 was placed on the existing roof curb.

A rusted electrical disconnect is attached to the unit.

The corroded disconnect is attached to the rooftop unit.

The gas piping penetration enters the building by a pitch pocket.

This is an example of a correct gas pipe penetration.

The condensate is not piped to a roof drain and is dispensing directly on the roof.

Condensate is not piped to a roof drain.

RTU-8 (UNIT 9)

RTU-8 is a DX unit with gas heat that serves Tower 2.

RTU-8 is highlighted on the roof plan above in red.

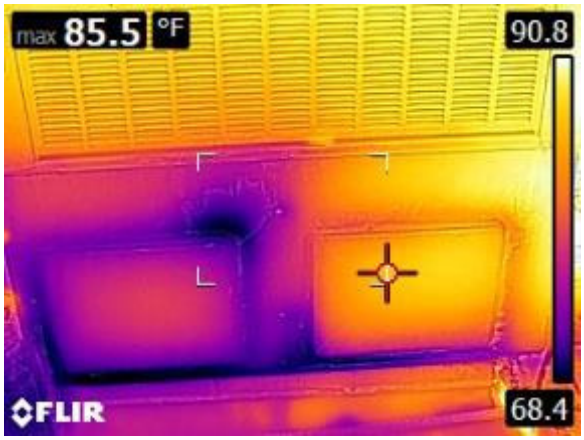
Designation	Building Service	Cooling Capacity (Tons)	Refrigerant	Manufacturing Date	Manufacturer/Model	Serial Number
RTU-8	Tower 2	1.5	R410A	3-2008	Trane/ 4YCC3018	8101M299H

The unit is 8 years old and in poor condition. There is rust and microbial growth visible on the exterior of the unit. Condensation within the unit has allowed the unit to corrode in a short amount of time, and has cause the insulation inside the unit to delaminate. The condensation has caused microbial growth.

RTU-8 has rust and microbial growth.

Temperature readings were recorded using the FLIR. The temperature readings on the exterior of the unit vary by about 20°F due to sunlight in addition to insulation delamination. The temperature of the unit should be uniform on the exterior and below dew point. The moisture, microbial growth, and rust are occurring at the coldest parts of the unit.

Above is a side by side comparison of the unit.



The left would be the relief opening and the right would be the intake.

The rooftop unit has been installed on the original roof curb without proper modifications and a roof adaptor curb. When the new equipment was installed, the supply and return air ductwork connections did not align with the existing curb. In lieu of a roof curb, wood blocks are currently being used under the unit. This does not meet code requirements. Wood is never considered a proper support.

RTU-8 was placed on the existing roof curb.

The gas piping penetration enters the building by a pitch pocket.

The unit does not have the capability of bringing in outside air through louvers. If it did the openings shown would not be sealed. No outside air is entering RTU-8.

No outside air is entering RTU-8.

The condensate piping is not properly supported. Additionally, the unit is surrounded by standing water.

RTU-8 is surrounded by standing water.

RTU-9 (UNIT 8)

RTU-9 is a DX unit with gas heat that serves Tower 1.

RTU-9 is highlighted on the roof plan above in red.

Designation	Building Service	Cooling Capacity (Tons)	Refrigerant	Manufacturing Date	Manufacturer/Model	Serial Number
RTU-9	Tower 1	1.5	R410A	6-2008	Trane/ 4YCC3018	8244K3B9H

The unit is 8 years old and in poor condition. There is rust and microbial growth visible on the exterior of the unit. Condensation within the unit has allowed the unit to corrode in a short amount of time, and has cause the insulation inside the unit to delaminate. The condensation has caused microbial growth. Temperature readings from the FLIR show the rooftop unit's surface temperature is above dew point.

RTU-9 has rust and microbial growth.

Temperature readings were recorded using the FLIR. The temperature readings on the exterior of the unit vary by about 20°F due to sunlight in addition to insulation delamination. The temperature of the unit should be uniform on the exterior and below dew point. The moisture, microbial growth, and rust are occurring at the coldest parts of the unit.

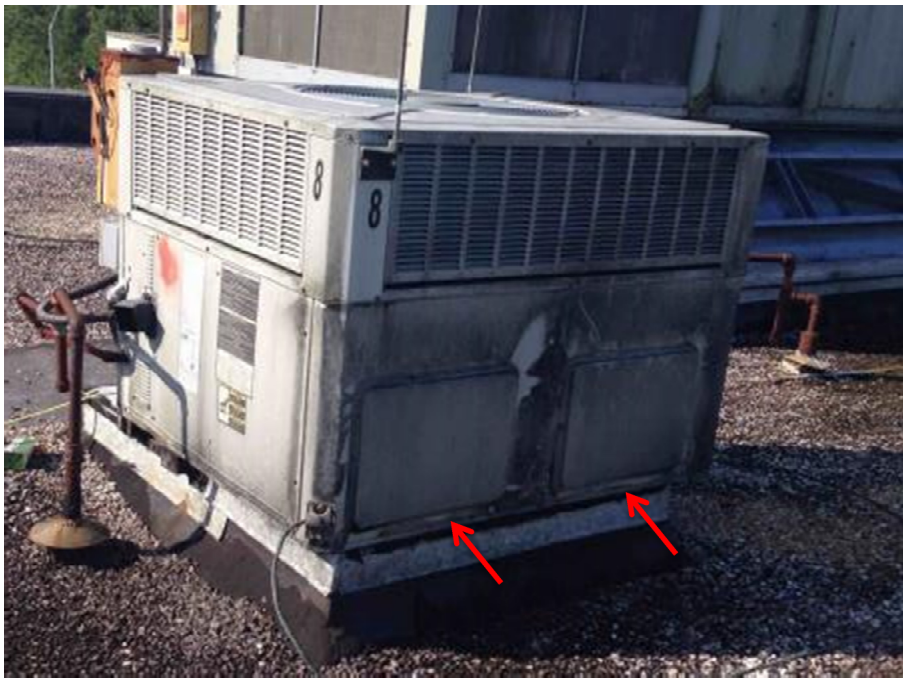
Above is a side by side comparison of the unit.

The rooftop unit has been installed on the original roof curb without proper modifications and a roof adaptor curb. When the new equipment was installed, the supply and return air ductwork connections did not align with the existing curb. In lieu of a roof curb, wood blocks are currently being used under the unit. This does not meet code requirements. Wood is never considered a proper support.

RTU-9 was placed on the existing roof curb.

The gas piping penetration enters the building by a pitch pocket.

The unit does not have the capability of bringing in outside air through louvers. If it did the openings shown would not be sealed. No outside air is entering RTU-9.



No outside air is entering RTU-9.

The condensate is not piped to a roof drain and is dispensing directly on the roof.

Condensate is not piped to a roof drain.

INTERIOR OF ROOFTOP UNITS

It appears the inside of the rooftop units have never been cleaned. There is visible microbial growth on the air handler and rust. The units are poorly insulated. Condensation is occurring which has allowed microbial growth to happen.

This is the interior condition of a rooftop unit.

MAKEUP AIR UNITS

There are 3 makeup air units located on the roof. The makeup air units serve the kitchen, kitchen hood, and laundry room. Currently, the makeup air units only provide heating and do not have any cooling capabilities. Additionally, there is no other equipment used to provide cooling in the kitchen or laundry room.

MAU-1

Model: HRPBI75-S2J

Serial: EAUB66M9L09530

Manufacturer: Renzor

Manufacturing Date: 2-1995

CFM: 3610

Building Service: Laundry 145

The unit is 21 years old and is rusting on the exterior. The existing roof curb is rotting. The total CFM for MAU-1 is scheduled as 3,600 CFM. At this time 2 UniMac commercial dryers are installed in the laundry room and rough-in connections exist for up to 2 more dryers. The existing makeup air unit is appropriately sized for up to 4 UniMac 55 pound clothes dryers exhausting 700 CFM apiece.

MAU-1 has rust on the exterior of the unit.

A rusted electrical disconnect is attached to the unit. Conduit has been routed through lifting lugs, which is an incorrect installation.

The corroded disconnect is attached to the makeup air unit.

MAU-2

Model: Unknown

Serial: Unknown

Manufacturer: Renzor

Manufacturing Date: Unknown

CFM: 7660/3830

Building Service: Food Service 140

The unit's age is unknown as there is not a nameplate on the unit. MAU-2 has a two speed motor so the total CFM for MAU-2 is scheduled as 7660/3830 CFM. The minimum exhaust rate, as defined by ASHRAE Standard 62.1 (2007), is 0.70 CFM/SF for a commercial kitchen. The approximate kitchen load is 45 MBH. MAU-2 is providing makeup air for the following exhaust fans: EF-6 (515 CFM), EF-15 (3,880 CFM), and EF-17 (1400 CFM). The existing makeup air unit is appropriately sized for the existing kitchen.

MAU-2 serves Food Service 140.

The roof curb is sized appropriately for the unit, but is rusted. The gas piping penetration is not protected by a pitch pocket. The gas vent to MAU-2 is very sooty which indicates combustion issues.

The gas vent to MAU-2 has visible soot.

The electrical disconnect is mounted to the unit.

The electrical disconnect is mounted on the unit.

MAU-3

Model: KSU-115-B-2-50

Serial: 95A15606

Manufacturer: Greenheck

Manufacturing Date: 1-1995

CFM: 5670

Building Service: Kitchen Hood

The unit is 21 years old and is rusting on the exterior. The total CFM for MAU-3 is scheduled as 5,670 CFM. The area of the hood is approximately 180 square feet. The exhaust fan used with the kitchen hood, EF-16, exhausts 8100 CFM. Additional air is pulled from MAU-2, which serves the kitchen.

MAU-3 has rust on the exterior of the unit.

The gas piping penetration is not protected by a pitch pocket. The gas has been turned off to MAU-3.

The gas valve serving MAU-3 is in the off position.

SPLIT SYSTEMS

There are 2 split systems on the lower roof. Neither split system is equipped with tie downs for wind or seismic support. The mini split serving the elevator machine room is inoperable. Parts have been removed from the split system serving the elevator machine room to replace parts on the running split system. The running split system serves Telecomm 156.

Split systems are currently installed without wind or seismic supports.

EXHAUST

The exhaust system is used frequently to relieve spaces of odors.

There are 15 Greenheck roof mounted, belt driven, upblast exhaust fans labeled on the existing drawings as “EF-X”. Exhaust rates vary by unit and range from 515cfm to 8100cfm. The units are aged and corroded.

Model: Cube

Manufacturer: Greenheck

Manufacturing Date: January/February 1995

The roof mounted Greenheck exhaust fans are aged and corroded.

There are 12 Greenheck roof mounted exhaust fans. The units appear to be worn and corroded due to age. The existing drawings label these units as “SEF-X” to stand for supply or exhaust fans. During field investigation, these fans appeared to be functioning as exhaust fans. Further, they were confirmed to be exhaust fans by identifying their model number.

Model: TAUB-24H-20, TAUB-24H-30, TAUB-30H-30, TAUB-30H-50

Manufacturer: Greenheck

Manufacturing Date: January/February 1995


The roof mounted Greenheck exhaust fans are worn and corroded.

The damaged roof curb temperature is about 113°F, much hotter than the rest of the unit.

The roof curb temperature is about 113°F.

Conditioned air is exiting the building through 5 roof hoods that are dispersed throughout the roof.

Roof Hoods

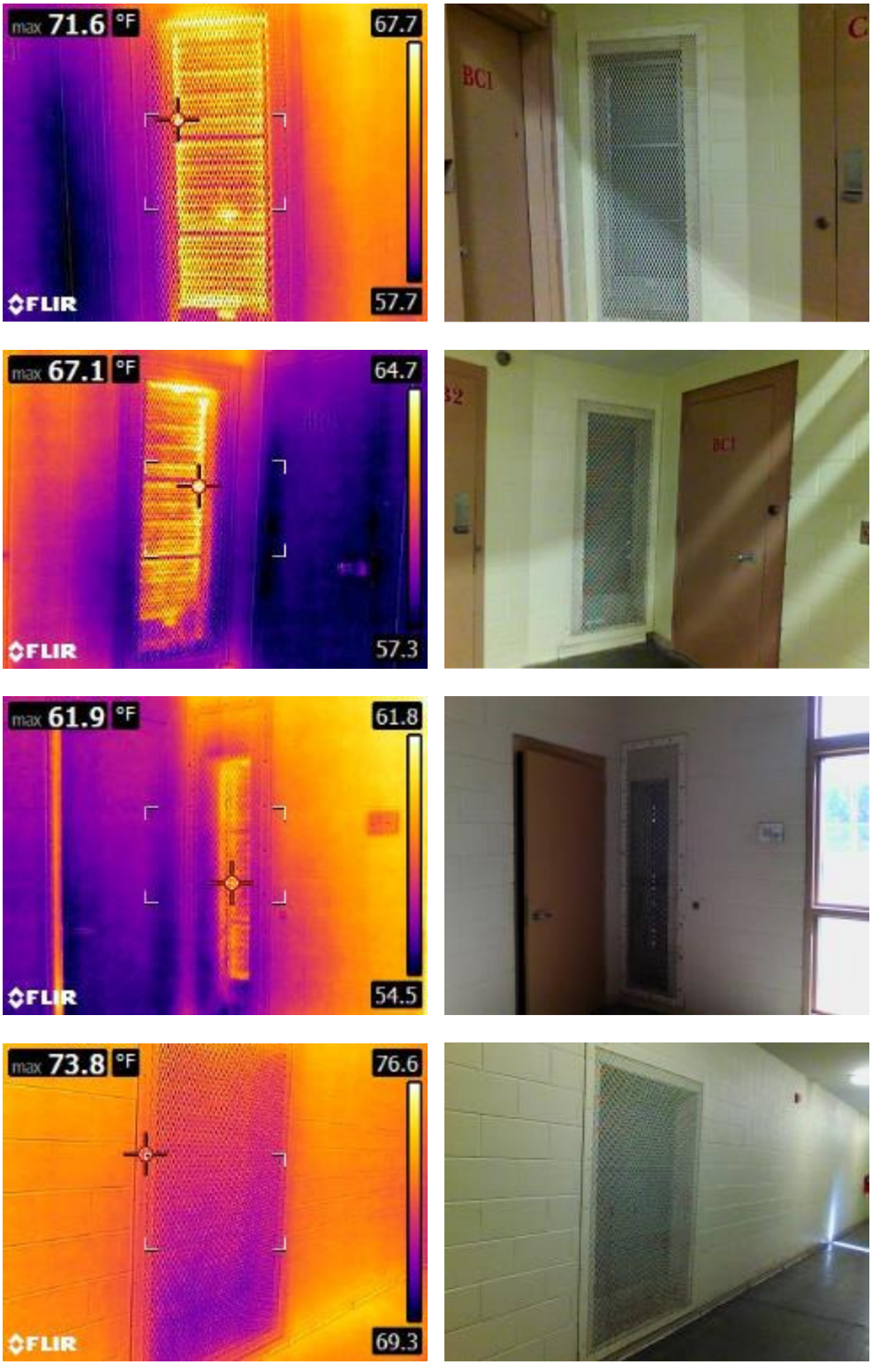
DISTRIBUTION

There are large, uninsulated, louvers in the housing blocks allowing uncontrolled infiltration. Unconditioned, humid air enters through the louvers frequently when the exhaust system is running. These large outdoor air louvers are used frequently to pull in raw outside air when the general exhaust system is operating to remove odors from the space.

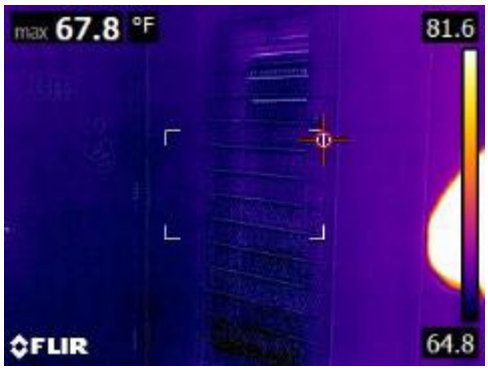
There is uncontrolled infiltration through the louver in the laundry room.

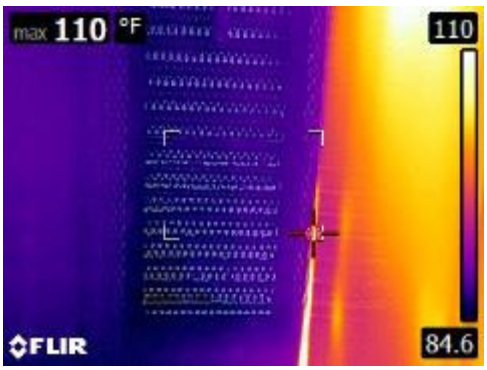



There is uncontrolled infiltration through the large louvers in the housing blocks.



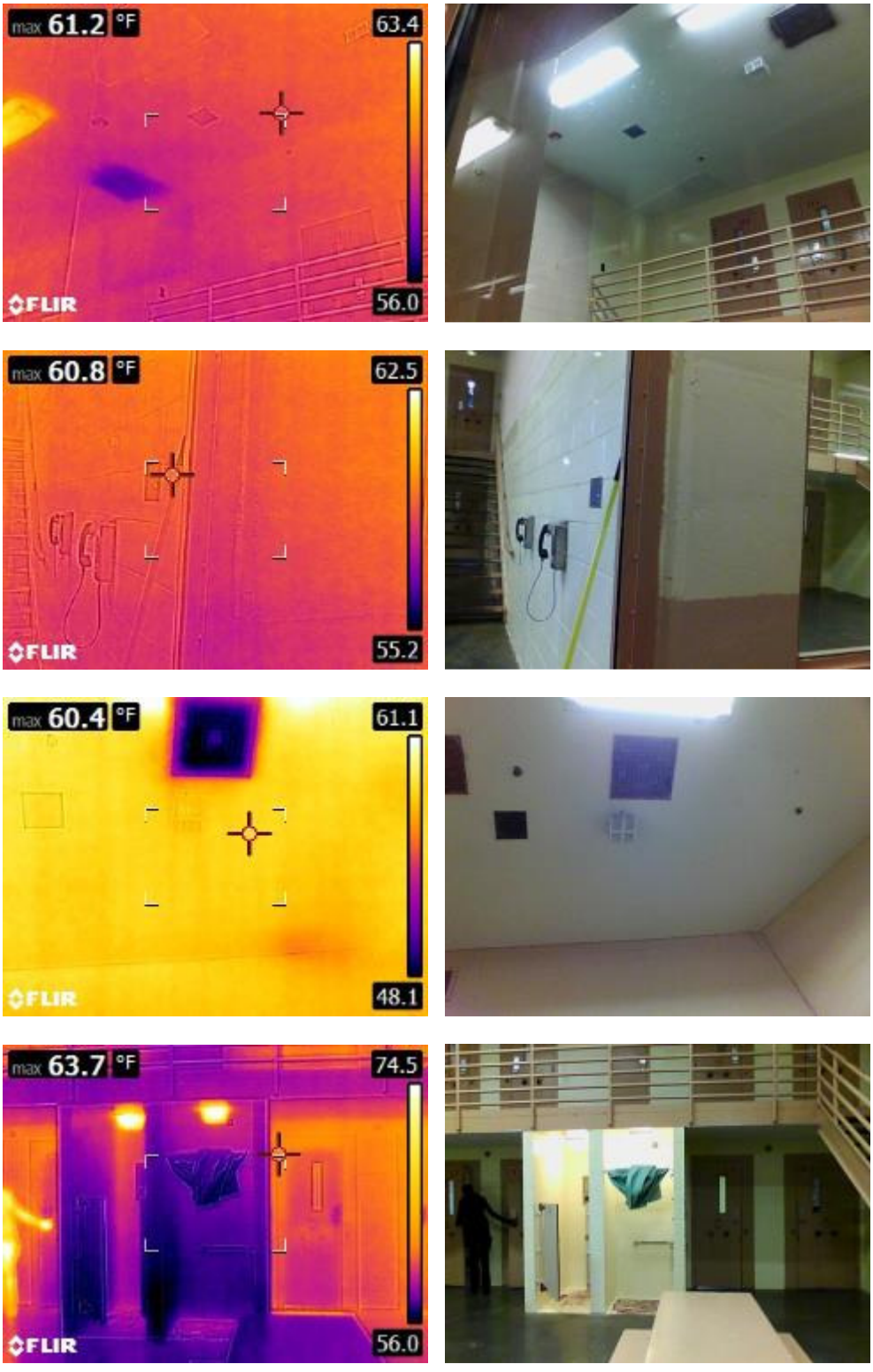
These are uninsulated outdoor air intakes (louvers).





These are uninsulated outdoor air intakes (louvers).

The housing units have temperatures as low as 50°F.



Above are temperature recordings throughout the housing units.

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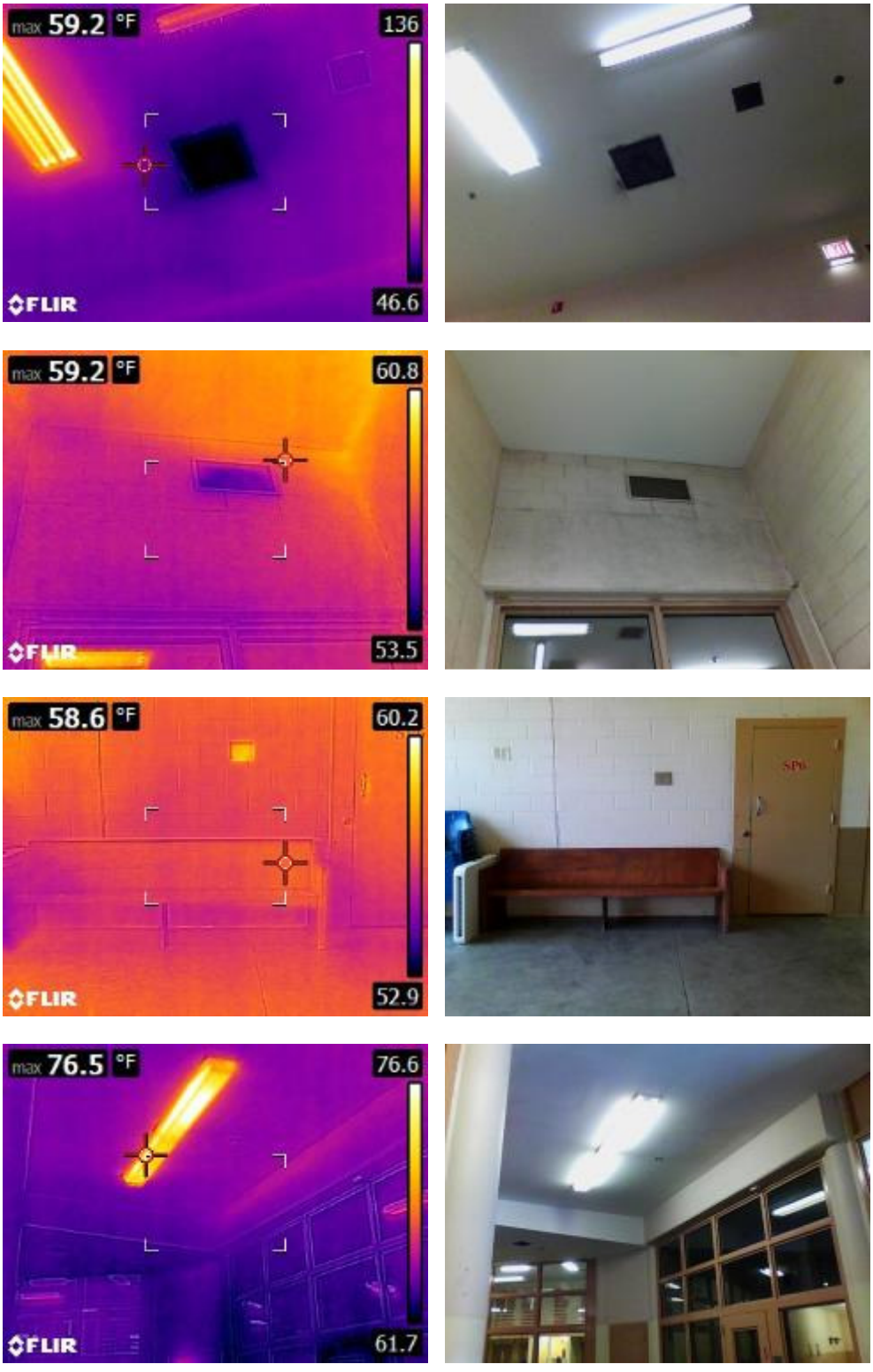
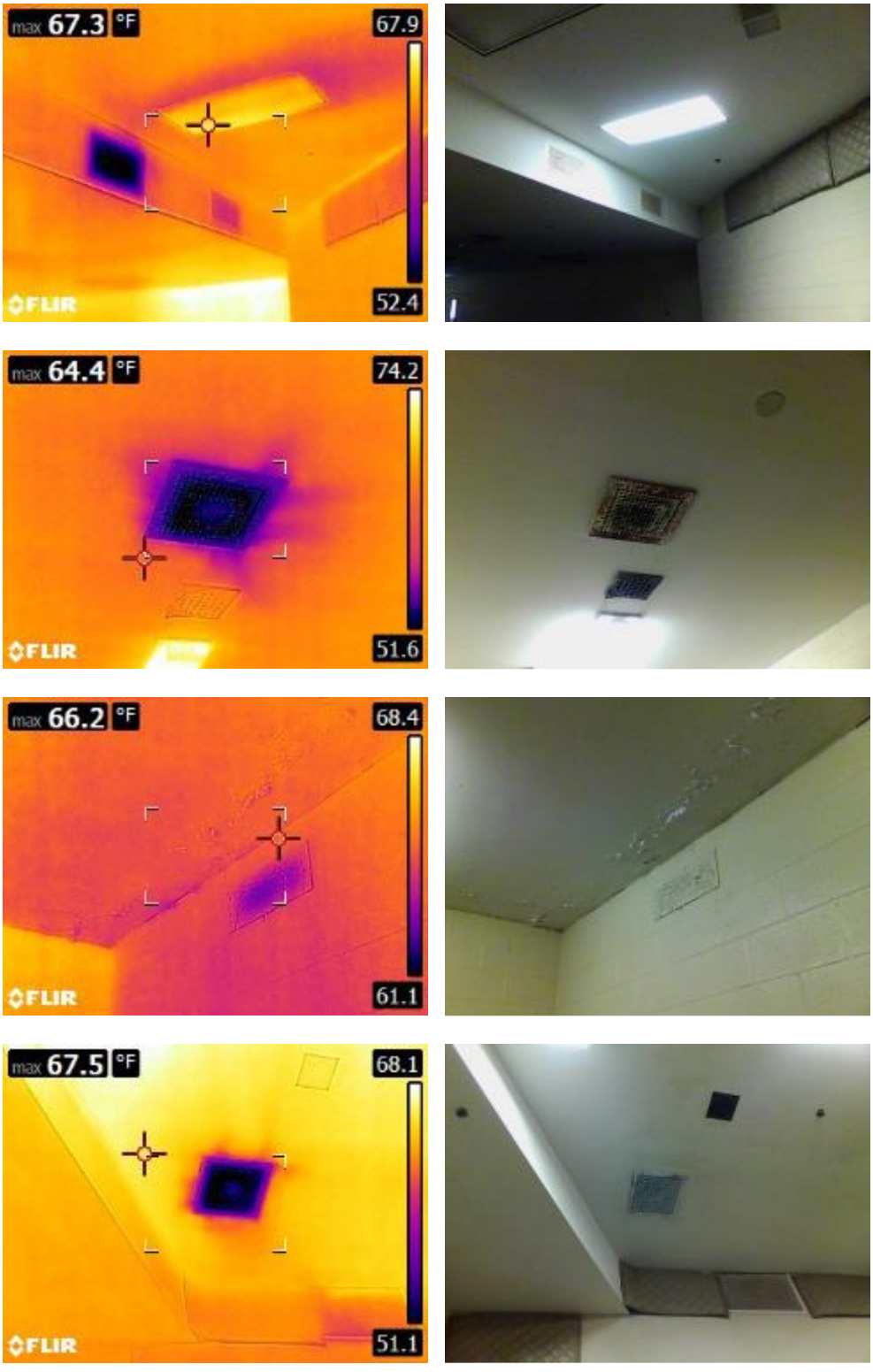
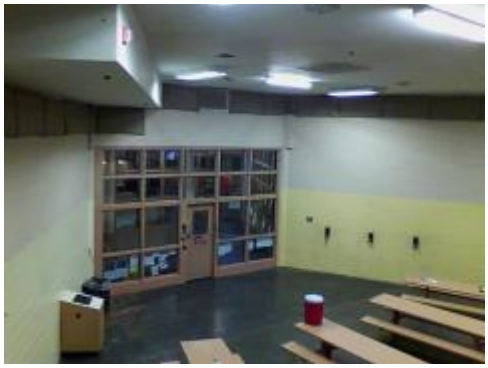


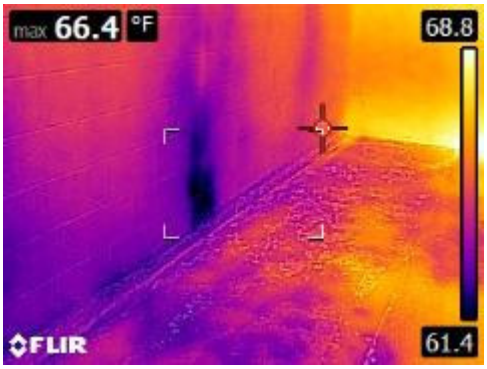
Above are temperature recordings throughout the housing units.



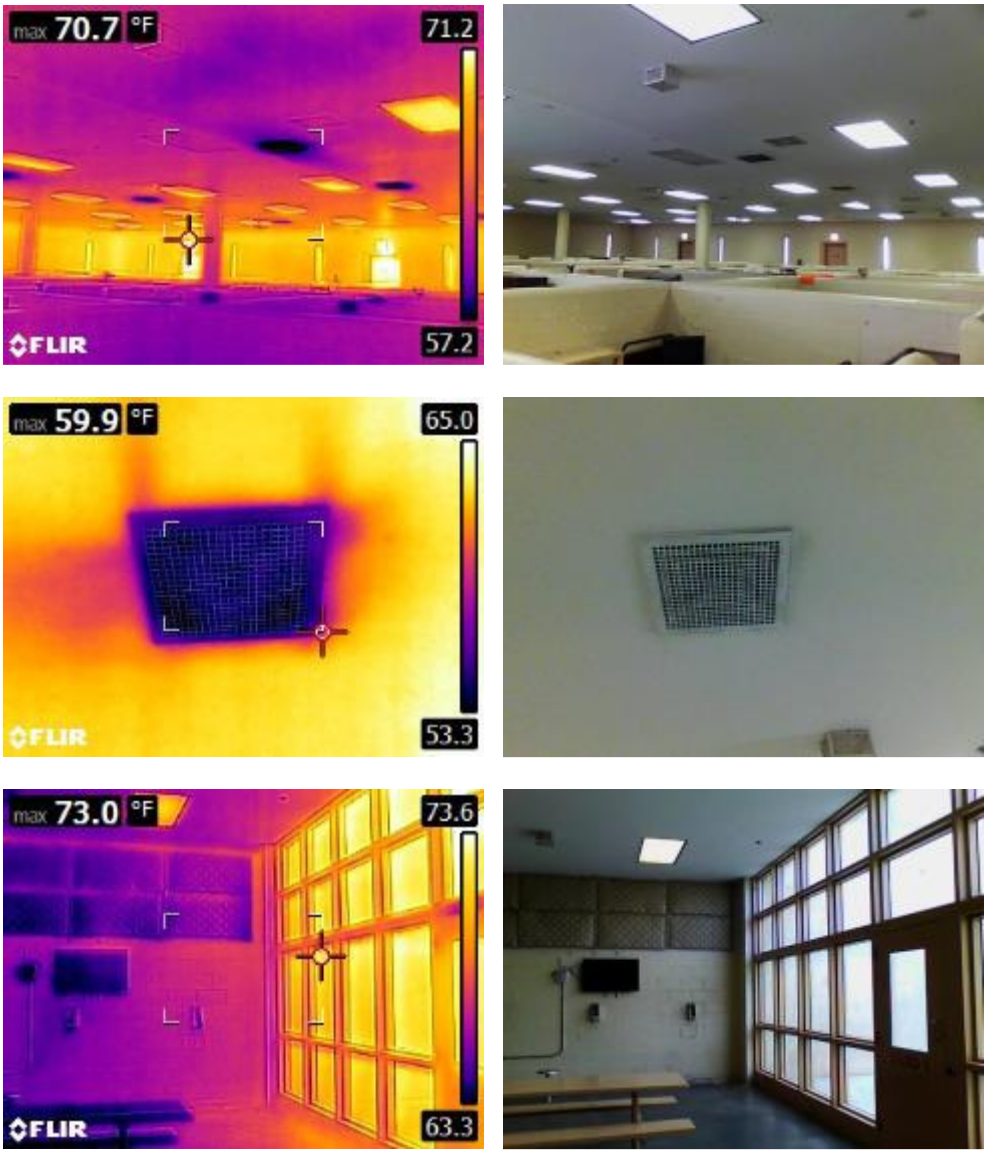
Above are temperature recordings throughout the housing units.



Above are temperature recordings throughout the housing units.

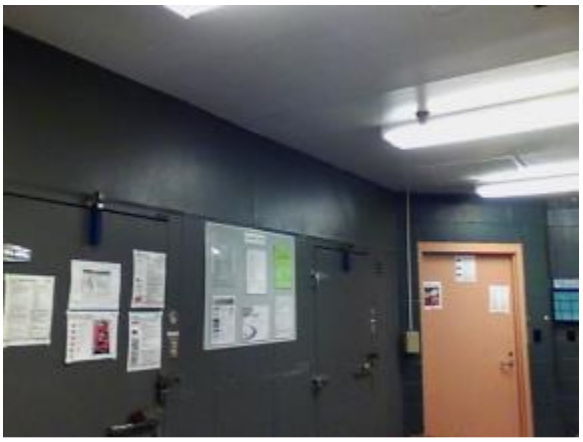


Above are temperature recordings throughout Room F102 and Room F103.



Above are temperature recordings throughout Dormitory Dayroom F100.

There is currently no cooling in the kitchen area and the space is uncomfortable for occupants. The makeup air systems that serve the kitchen space only provide heating. Recorded temperature readings were extremely high in this area.

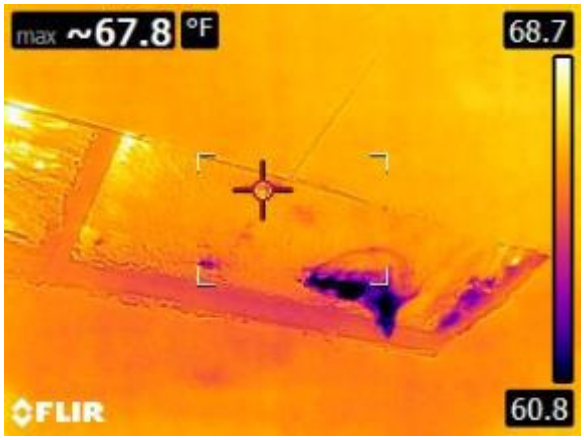


Above are temperature recordings from the kitchen.

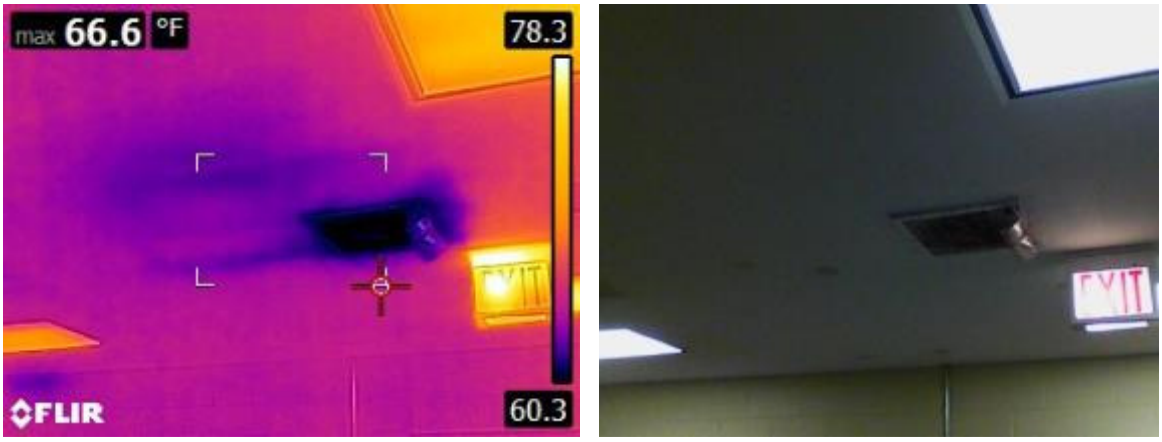
MOISTURE

There is evidence of moisture and water damage in multiple locations. Temperature readings are as low as 54°F in some spaces. Condensation is causing a need to replace ductwork and/or insulation that has become saturated and damaged. The dark spots shown by the FLIR images indicate current water issues that exist or places where water damage could occur in the future.

The ceiling in Intake 103 in the booking area shown above has microbial growth.



The drywall is being replaced due to condensation. The ductwork also has microbial growth.



There is wet drywall (the shaded blue area) under the ductwork leading to the air device located in Intake 103 due to condensation on the ductwork above the ceiling.

The ceiling in Booking Area 114 has microbial growth.

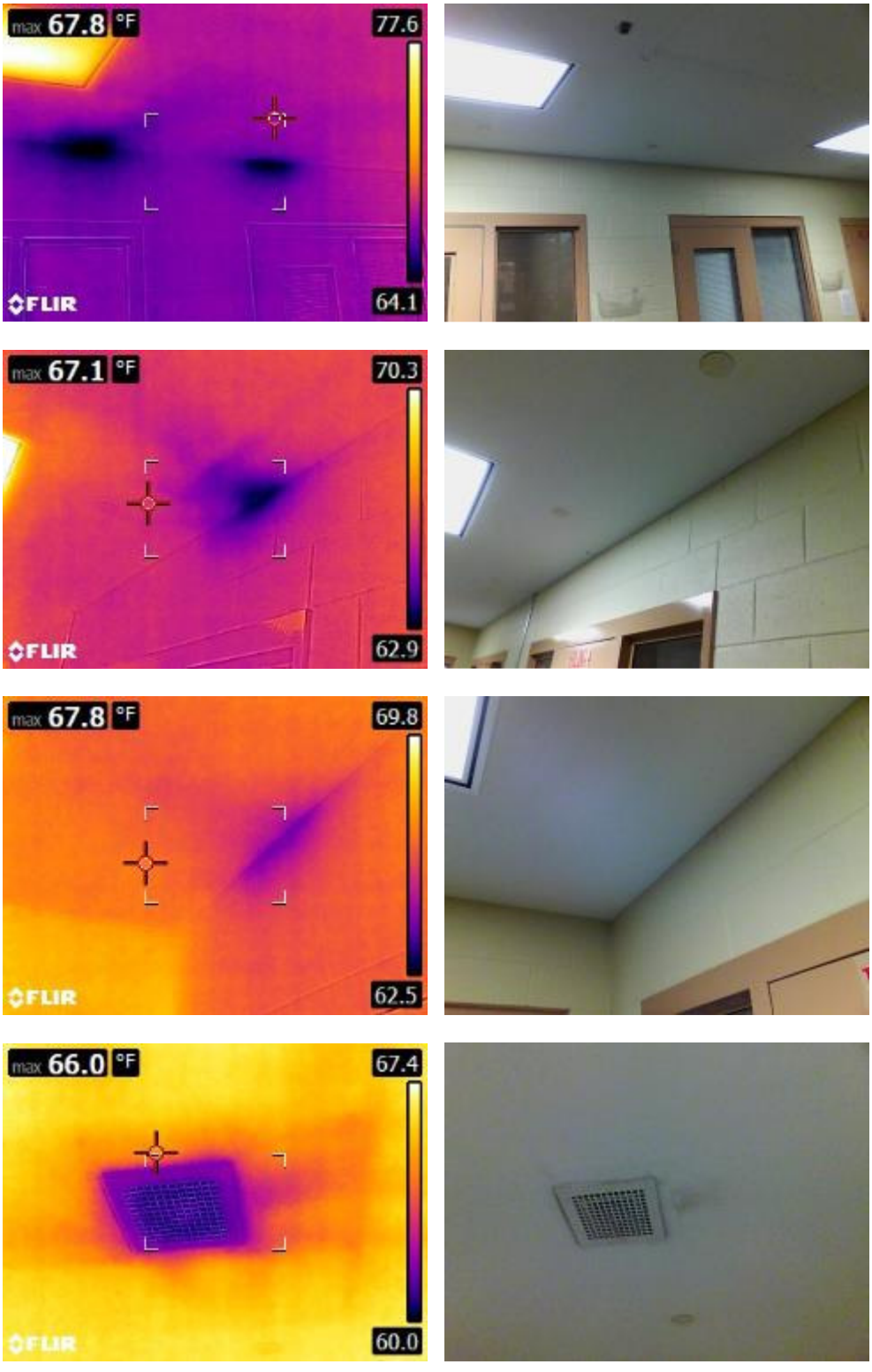
There is visible damage in the ceiling of Nurse 164.

There is visible damage in the ceiling of the Segment A office area on the first floor.

There is visible damage in the ceiling of Waiting/Visitor Area 201.

There is visible damage in the ceiling of Corridor 250.

There is water damage to the floor below the water closet used by staff in Room 113 in the booking area.



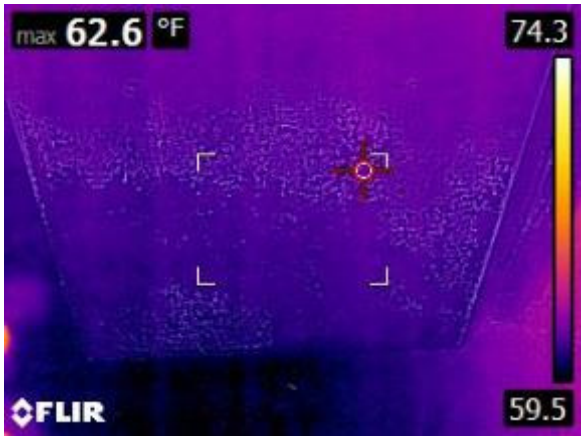
The dark spots in the images above indicate a water issue in the booking area. The supply air temperature is 60°F.

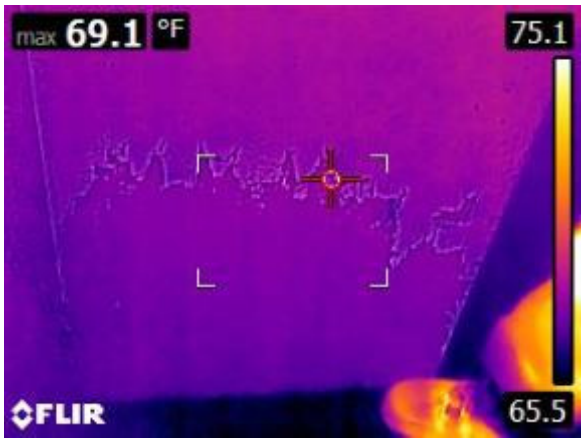
This is an overall view of the temperature difference in the booking area.

There is excessive corrosion on the ductwork in the housing unit chases.

There is surface rust on cast iron piping in the housing unit chases.

There is rust on the doors in the housing units.





The area rusting on the doors to the plumbing chases is the coldest part of the door suggesting water intrusion.

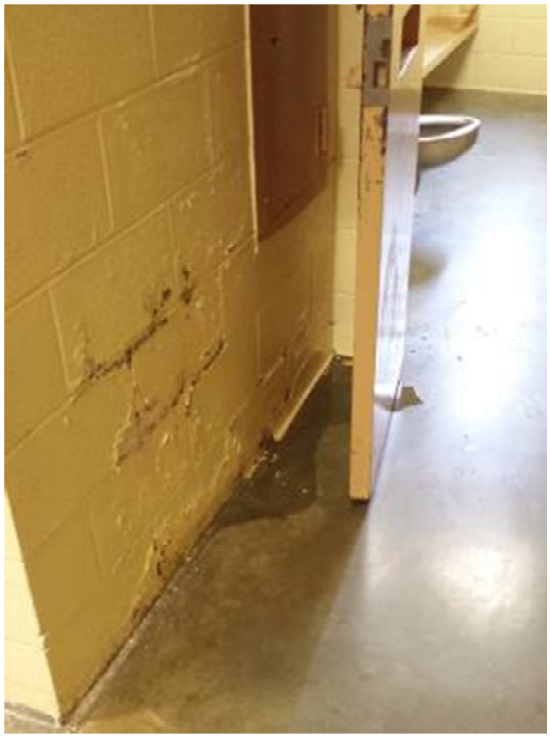
There is corrosion on the gates outside of the booking area.

There is a corroded sprinkler head in the shower.

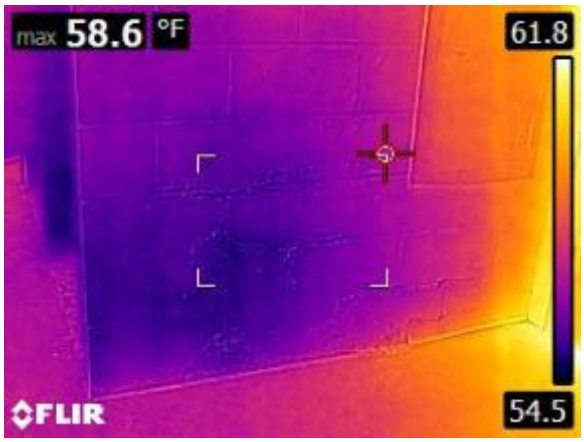
The paint is coming off the drywall at the boiler room entrance.

The glass is sweating in the door of the corridor connecting to the kitchen.

The paint is delaminating due to apparent migration moisture from the CMU block.



The paint is delaminating and there is standing water below.

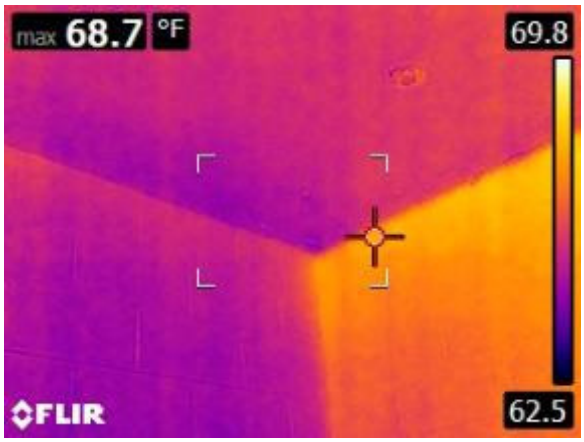


The paint is delaminating due to apparent migration moisture from the CMU block. Temperatures at this wall are as low as 54.5°F.

The paint is delaminating due to apparent migration moisture from the CMU block. Temperatures at this wall are as low as 57°F.

There is rust on the exterior of the building.

The FLIR temperature reading from the group restroom in the Dormitory Dayroom indicates the building is not insulated. The exterior walls are hot and the interior walls are cold.

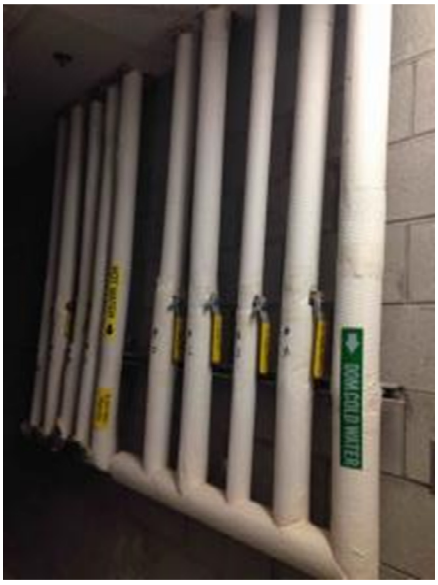


The exterior wall is hot and the interior wall is cold.

The ductwork chase accessed through Electrical Room 252 is in overall good condition. The ductwork and piping insulation is not showing signs of moisture in the space. Piping should be labeled.

This is inside the ductwork/plumbing chase next to Electrical Room 252.

The sprinkler room accessed by Corridor 250 is in overall good condition. The ductwork and piping insulation is not showing signs of moisture in the space.



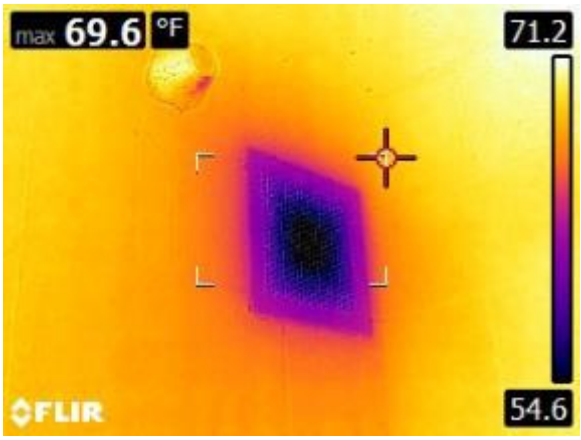
This is the piping and ductwork inside the sprinkler room accessed by Corridor 250.

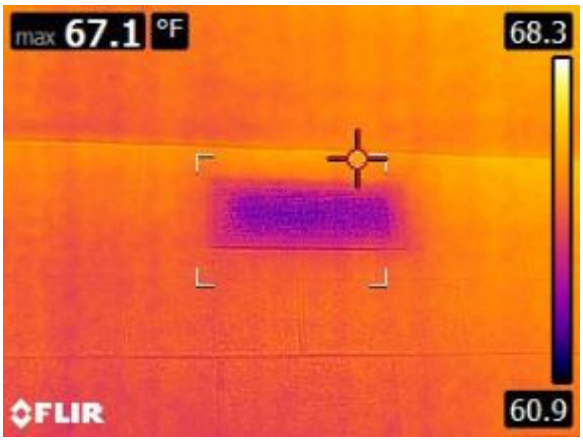
The ductwork chase accessed through Mechanical Room 255 is in overall good condition. The ductwork and piping are not showing signs of moisture in the space. Piping should be labeled. The ductwork insulation needs repair.


This is the piping and ductwork inside the sprinkler room accessed by Mechanical Room 255.

In general, air devices need to be cleaned. Grilles have been painted over and therefore are likely not functioning as designed.


Above are typical examples of grilles that have been painted over which impedes the airflow.





The supply grilles above have been painted over.

There are many instances of dirty air devices throughout the building.

Security bars have been provided in transfer openings. The design called for security bars to be installed in any roof or wall penetration exceeding 8 inches in either direction.

Security bars have been provided in the transfer opening in Equip 122.

Security bars have been provided in the transfer opening in Electrical Room 252.

DOMESTIC WATER SERVICE

There is a 4”ø domestic water service to the building. Existing civil drawings show a 4” double check valve after the water meter. The domestic water service enters the building in Mechanical Room 153.

There are two gas fired water heaters located in Mechanical Room 153 that are in good condition and generate 140°F hot water. Each water heater has a 200 gallon tank and a recovery rate of 1,212 gallons per hour. Their 12” diameter flues are vented through the roof.

WH-1

Model: BTP200-1250

ASME Number: Y-150036

Manufacturer: A.O. Smith Water Products Co.

Capacity: 200 gallons

BTU/Hour Input: 1,250,000

Recovery Capacity: 1,212 gallons/hour

WH-2

Model: BTP200-1250

ASME Number: Y-150059

Manufacturer: A.O. Smith Water Products Co.

Capacity: 200 gallons

BTU/Hour Input: 1,250,000

Recovery Capacity: 1,212 gallons/hour

There are two gas fired water heaters located in Mechanical Room 153.

The flue is vented through the roof above the water heaters.

EXPANSION TANK

The expansion tank, used for providing pressure relief for the water heaters, is suspended from the ceiling in Mechanical Room 153.

Manufacturer: Bell & Gossett

The expansion tank is suspended from the ceiling in Mechanical Room 153.

THERMOSTATIC MIXING VALVE

The thermostatic mixing valve is operating correctly as shown in the FLIR pictures. The hot water from the water heaters mixes with cold water to provide 115°F hot water for distribution throughout the building. The laundry room and kitchen are provided with 140°F hot water.

This is the thermostatic mixing valve for the domestic water system.

SANITARY AND VENT SERVICE

The sanitary sewer line serving the building collects below the first floor slab and exits the southeast side of the building by D105. The sanitary sewer main is 6”ø and the invert elevation is 94’-2 ¾” where the line exits the building. The existing drawings show floor and ground cleanouts throughout the system.

A 4,000 gallon grease interceptor is installed on the southwest side of the building for grease waste from the food service area. Floor drains, troughs, and kitchen sinks are piped to the grease interceptor.

The existing drawings indicate a vent through roof is provided for the vent piping in each group restroom and group shower. Vent through roof pipe sizes are either 3”ø or 4”ø.

Roof drains and overflow drains have been provided for storm water. They collect below the first floor slab and exit the building in 4 locations on the southwest side of the building.

PLUMBING FIXTURES

Throughout the building there is a variety of different types of plumbing fixtures – floor mounted water closets, wall mounted water closets, urinals, wall mounted lavatories, mop sinks, kitchen sinks, water coolers, sinks, and showers. There are penal-type, vitreous china, and stainless steel fixtures. Vitreous china fixtures have been provided in multiple areas accessible by inmates. Vitreous china fixtures have been provided in housing cells in block A, B, E, F, G, and I. The urinal has been removed from the men’s restroom in Room 202.

Penal fixtures have been provided within cells in booking, C-block, and H-block. Existing drawings were referenced for identifying fixture type in some housing cells that were occupied during field investigation.

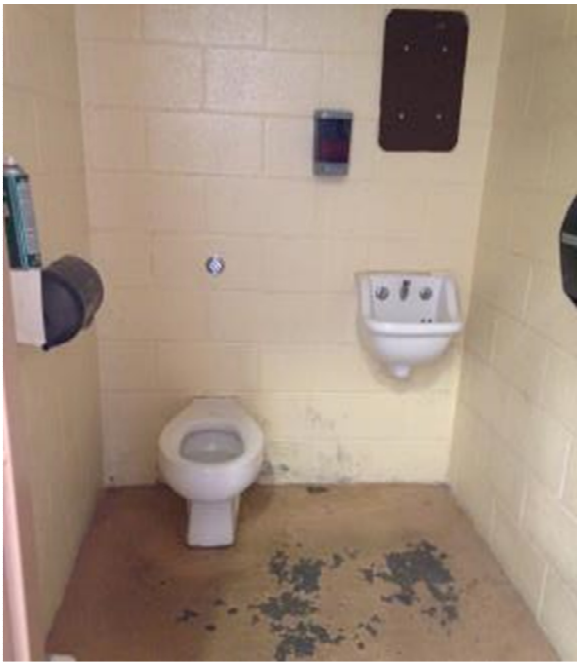
A penal fixture has been provided in Juvenile Holding 112.

Stainless steel, ADA accessible water coolers have been provided in Visitor Waiting 201.

The urinal has been removed in Men's 202.

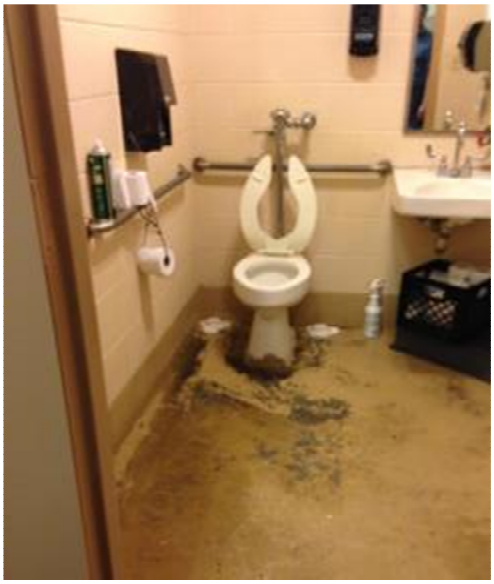
ADA accessible grab bars, controls, and faucets have been provided in Shower 235/Women's 237.

ADA accessible grab bars and controls have been provided in Shower 234.



The vitreous china fixtures installed are used by inmates in the visitor area. This allows inmates to purposely flood the toilet.

The vitreous china fixtures installed are used by inmates working in the kitchen. Additionally, a glass mirror is installed that is subject to breakage and theft.



The vitreous china fixtures installed are used by inmates in the medical area. Additionally, a glass mirror is installed that is subject to breakage and theft.

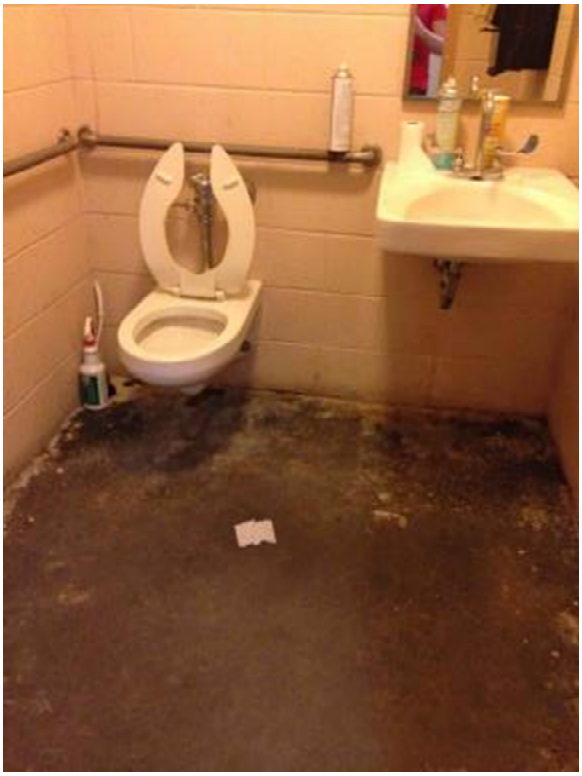
Mop hangers and wall guards have been provided for the mop sink in U.C. 178.

The mop sink in Janitor 233 is rusting and poor condition.

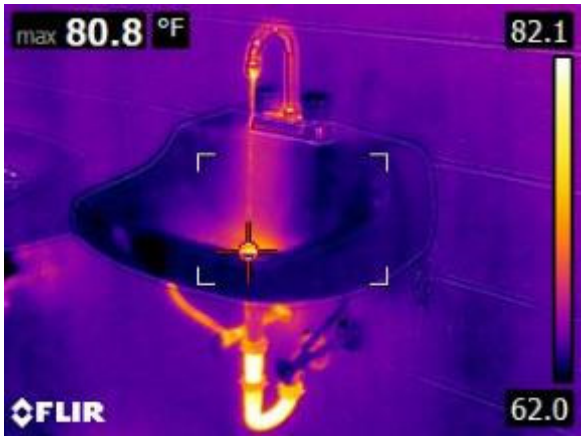
Several of the current restrooms do not meet ADA requirements – Rooms 106, 113, 172, and J101. ADA compliant grab bars, fixtures, fixture heights, pipe insulation, clearances, and faucets are required.

The staff toilet next to the juvenile holding room does not have ADA compliant fixtures or ADA compliant insulation on the piping below the lavatory.

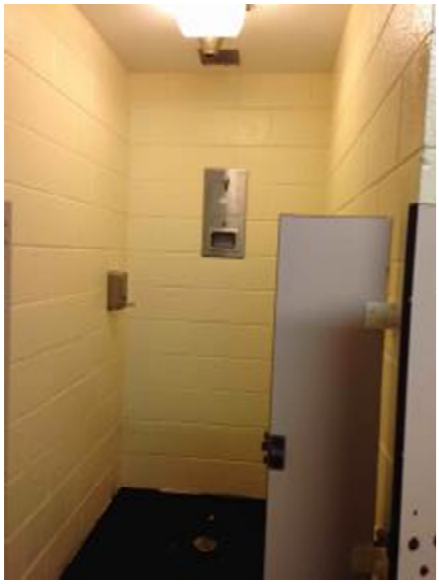
The lavatory does not have ADA compliant insulation on the piping below the lavatory in Room 113.



The lavatory does not have ADA compliant insulation on the piping below the lavatory in Room 106.



The lavatory intended for wheelchair users does not have an ADA compliant faucet or ADA compliant insulation.



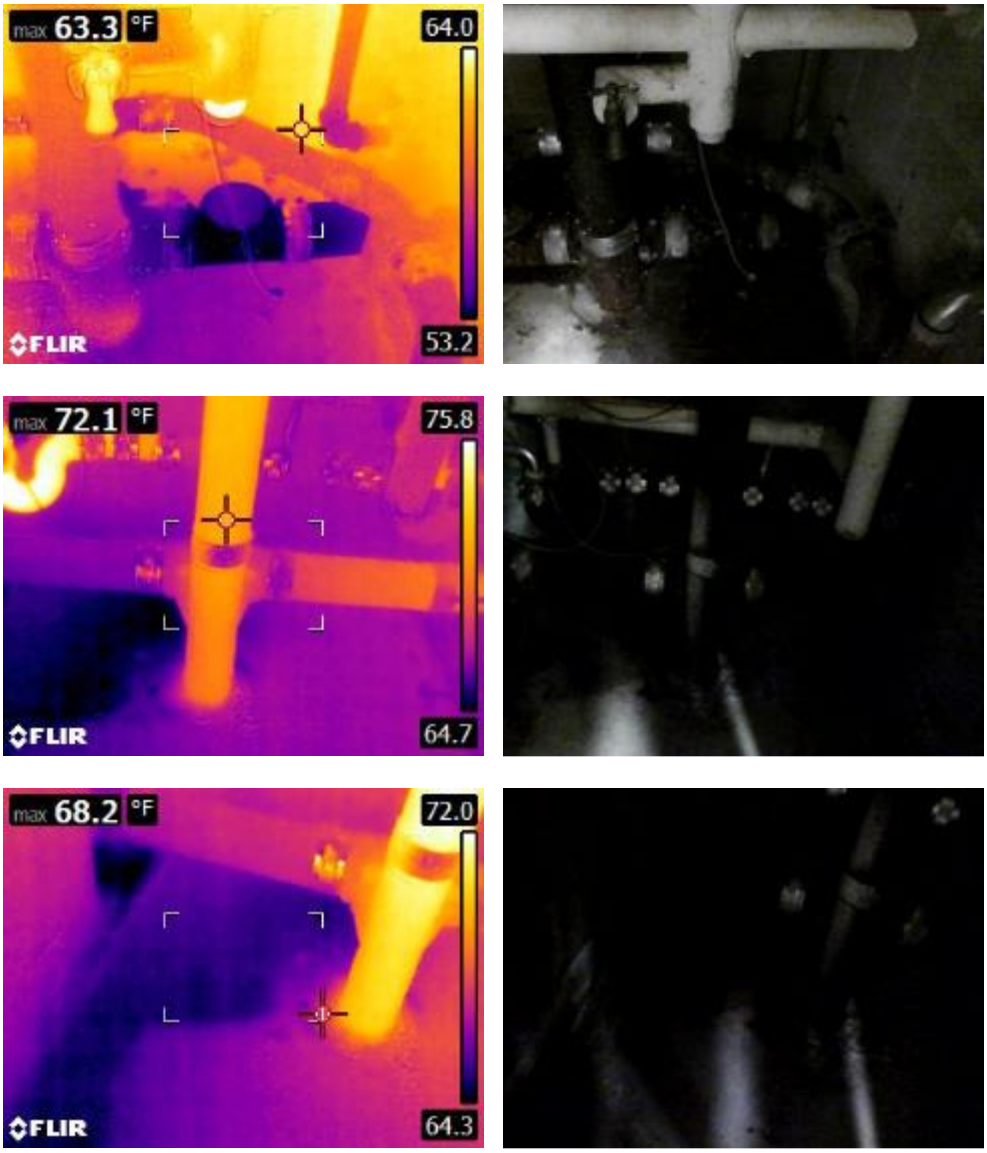
Penal fixtures have been provided in Shower 118 and 119 in the booking area. These showers do not meet ADA requirements.

A penal fixture has been provided in Shower 123 in the booking area. This shower does not meet ADA requirements.

Piping insulation is in poor condition in plumbing chases. The existing insulation is torn and/or missing on piping. Additionally, there is a leak and a bucket has been placed below it as a temporary provision.

This is torn and damaged insulation on the piping serving the group restroom lavatories with a bucket placed below a leak.

There is torn and damaged insulation on the piping serving the housing cells.



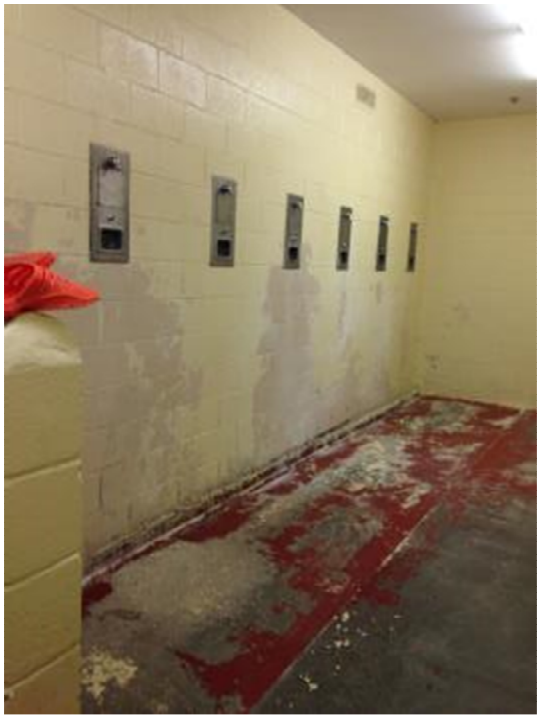
Temperatures within the plumbing chases to the housing units are as low as 53°F.

There are currently 2 sets of washers and dryers installed. Utilities are available for 2 additional sets of washers and dryers.



There are currently 2 sets of washers and dryers installed. Utilities are available for 2 additional sets of washers and dryers.

The current group restroom shower is not in accordance with PREA because there are no shower partitions installed.



The group shower does not have privacy partitions installed.

KITCHEN FIXTURES

Stainless steel fixtures have been provided in the kitchen. Kitchen sinks have been piped to floor sinks which distribute to the grease interceptor.

Above are some of the fixtures and equipment located in the kitchen.

GAS DISTRIBUTION

The gas pressure regulator is located outside of the main mechanical room. The current installation of the gas main does not have a shutoff valve. A 2”ø gas supply line enters into Mechanical Room 153. Gas is distributed to food service, water heaters, rooftop units, makeup air units, unit heaters, and dryers.

Type: S202G

Date: March 2002

Spring Range: 8.5”-18” WC

Maximum Inlet Pressure: 25 PSIG

Maximum Operating Outlet Pressure: 30” WC

Outlet Pressure: 2 PSIG

Design Gas Load: 8895 CFH

The gas pressure regulator is located outside of the main mechanical room.

FIRE SPRINKLER SYSTEM

There is a 6”ø fire water service to the building. Existing civil drawings show a double check valve and vault assembly. The fire water service enters the building in Mechanical Room 153.

The entire building (excluding mechanical rooms and laundry) contains an automatic wet pipe, light hazard, sprinkler system. The mechanical and laundry rooms contain an automatic wet pipe, ordinary hazard, sprinkler system.

Security sidewall sprinkler heads are located in cells, showers, below walkways, and inmate secure areas without ceilings. Security pendant sprinkler heads are located in secure areas with ceilings, including the inmate access corridor. Recessed sprinkler heads are in non-secure areas with ceilings occupied by staff and administration. Chrome pendant sprinkler heads are located in the kitchen, booking area, control rooms, and public corridors. Upright brass sprinkler heads are located in non-secure areas without ceilings. Dry type chrome pendent heads are located in the coolers and freezers.

All sprinkler heads should be exposed to function as intended.

The sprinkler head in the shower stall above is currently covered with a cup.

ELECTRICAL

Rooftop equipment local safety switches have excessive rust damage and are mounted on wood stands. The support structures are not seismically anchored as a permanent structure to the building.

This rooftop unit has a rusted safety switch that is mounted on wood.

The original design provided for the supply fan for RTUs 1, 2 & 4 to be connected to the emergency generator which would supply heat to the inmate sleeping units. The supply fan local safety switch for each of the three large roof top units is no longer connected to the emergency generator. The safety switches are currently in the OFF position.

This rooftop unit supply fan safety switch is in the OFF position.

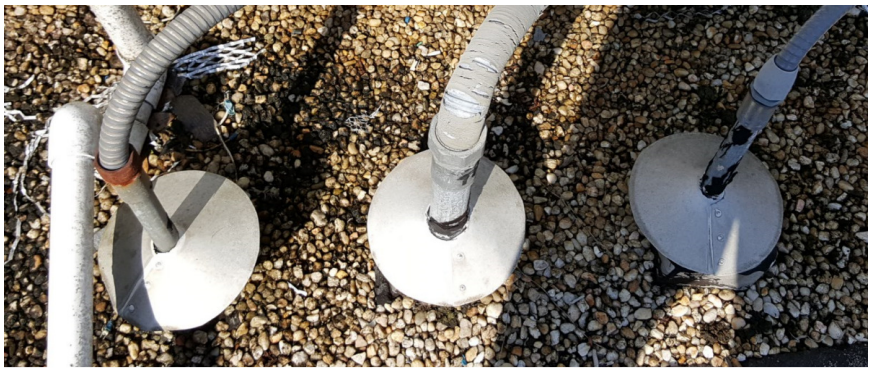
There is a significant amount of electrical conduit laying directly on the roof surface and is not properly supported.

This flexible non-metallic conduit is connected to a security camera that is mounted below on the building wall.

This rigid non-metallic conduit has disconnected from the receptacle box and wires are exposed.

This flexible conduit is not supported from the rooftop unit to the safety switch. Condition is typical for all of the rooftop units.

Conduit penetrations should include connectors, be properly sealed and provided with pitch pockets.



This left most flexible non-metallic conduit connection does not have a proper connection where it is connected to the rigid conduit. The PVC coated flexible metal conduit (center) is showing signs of extensive deterioration to the outside coated.

In several locations the electrical conduit is cracked and damaged and has separated from its connectors.

This electrical conduit has broken or has disconnected from termination point.

Rooftop unit safety switch does not comply with the “readily accessible” NEC requirement. Acceptable mounting height is 6’-7” to the top of the operating handle.

This safety switch handle is mounted at 84” above finished roof.

Code required mechanical equipment receptacles are in poor condition.

This receptacle is not properly supported, latch on weatherproof cover appears broken and electrical conduit is crushed.

Wiring device knockouts are exposed allowing for water to enter the box and raceway.

This receptacle does not have a cover on the knock-out opening.

The lightning protection system does not appear to be in proper working order.

Lightning protection cable attachment has become dislodged from the parapet wall.

Lightning protection cable is laying on the roof surface and not permanently attached.

This is an improper connection to the lightning protection system or it is being used for support.

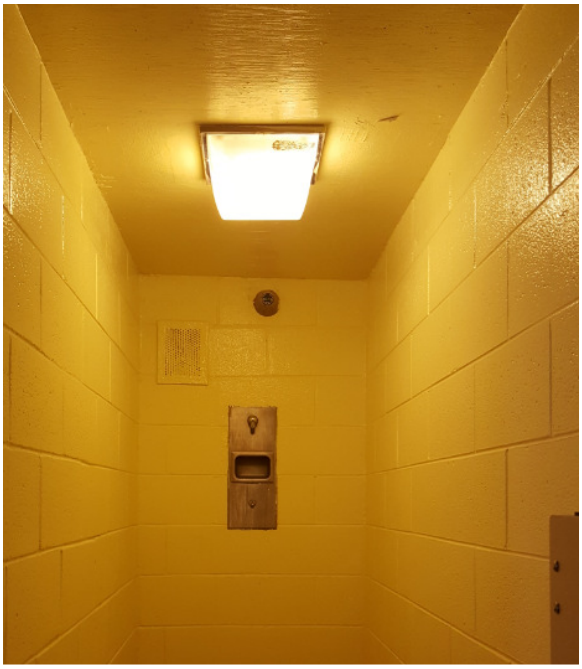
The exterior emergency generator is nearing 5,000 hours of runtime.

This is the 350kW / 438kVA emergency generator.

National Electrical Code (NEC), Article 110 required clearance in front of electrical distribution equipment is not being maintained.

Main Electrical Room. Condition occurs in several of the other electrical rooms.

Light fixtures located within shower facilities show a significant amount of moisture damage.

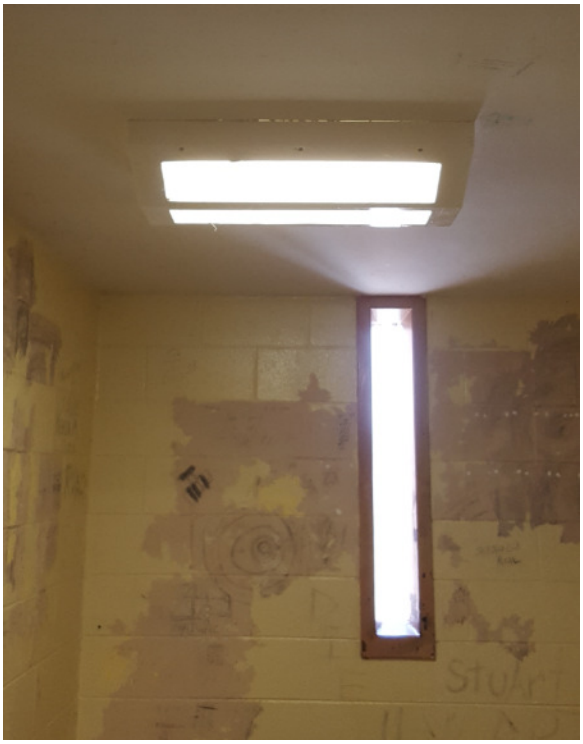


This is in A Block.

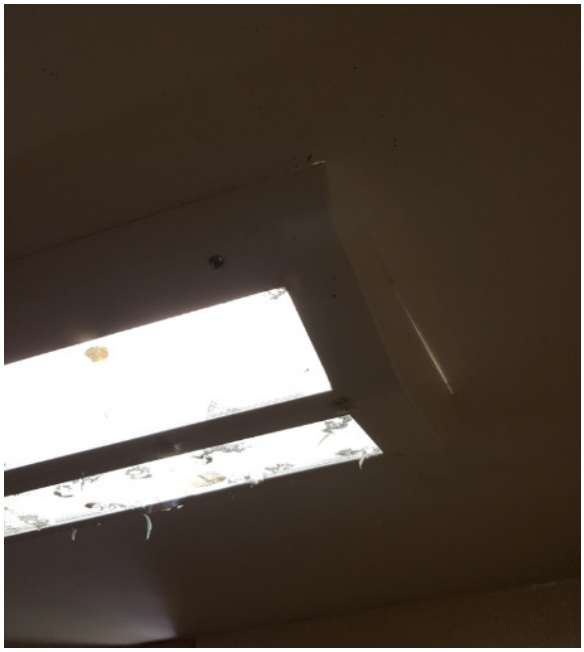
At several wall mounted television locations, cables are hanging to within reach of inmates.

This is in A Block.

Ceiling mounted surface light fixtures are not tight to the ceiling.



This is in D Block.



This is in H Block

Light fixture is not penal type in Juvenile Holding 112.

Light fixture is not properly installed in Janitor 233

Multi-outlet plugstrips are being used in administration areas. Extension cords are not a means of permanent wiring per NEC 240.5.

This is under the center desk in the Booking area.

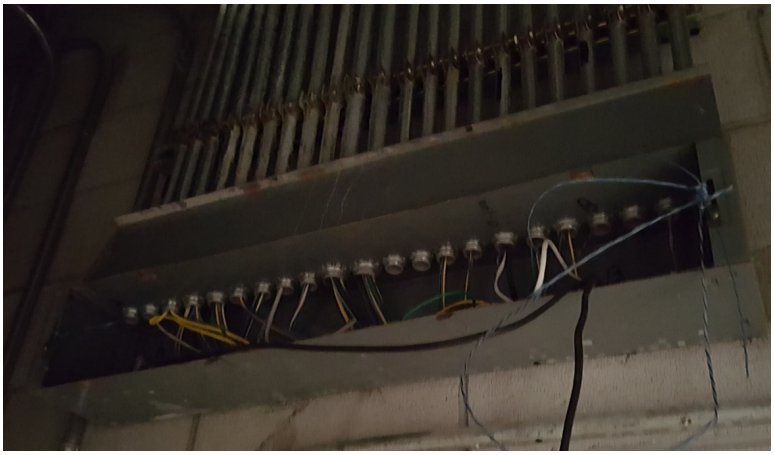
Plastic guards have been installed on ceiling air devices that are located near fire alarm smoke detectors.

This is in the Booking area.

There are several locations where junction box and wiring device coverplates have been removed.

Coverplate needed on junction box in mechanical chase.

Wiring device coverplate needed on light switch in plumbing chase.



Mechanical space near Central Control.

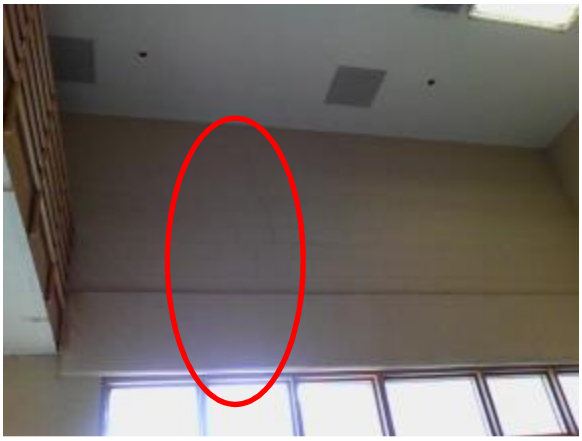
STRUCTURAL FRAME AND BUILDING ENVELOPE

While not part of the scope of the project, RMF noted many instances of visible cracks throughout the building. RMF recommends further investigation of these visible issues by a qualified structural engineer.

This is a representative crack located in the building.

There is a crack in Janitor Room 233 in the administrative area.

There is a crack in Multipurpose Room A100.

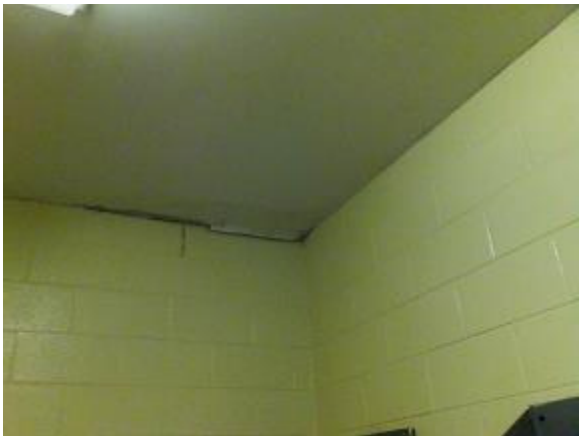


There is a crack in Multipurpose Room A100.

There is a crack in A-Block Female Presentenced Dayroom B100.

There is a crack in C-block Initial Housing Dayroom D100.

There is a crack in D-Block in the Special Management Dayroom E100.



There is a gap between the wall and ceiling in Shower F103.

Walls have been partially repaired behind plumbing fixtures.

The wall behind the urinal in Men's Toilet 231 needs repair.

Concrete appears to be shifting away from the building.

There is a gap forming between the concrete slab and wall.

SECTION 2 – CALCULATIONS AND STANDARDS

ROOFTOP UNIT LOAD CALCULATION

In order to determine the HVAC load for the facility, RMF performed load calculations using the Carrier Hourly Analysis Program version 4.9. The following data summarizes the information used in the preparation of the heating and cooling load.

CODES AND STANDARDS

The following sections detail the design criteria used to calculate the system requirements to meet code. The basis for this this study is that all mechanical, plumbing, fire protection, and electrical systems will be designed to comply with the following adopted codes and standards (in place at the time of the study):

2015 International Building Code (IBC) with SC modifications

2015 International Fire Code (IFC) with SC modifications

2015 International Plumbing Code (IPC) with SC modifications

2015 International Mechanical Code (IMC) with SC modifications;

2009 International Energy Conservation Code (IECC)

2015 International Fuel Gas Code (IFGC) with SC modifications

2014 National Electrical Code (NEC)

National Fire Protection Agency (NFPA) Standards (latest editions)

2013 Minimum Standards for Local Detention Facilities in South Carolina

2012 Prison Rape Elimination Act (PREA) Prisons and Jail Standards

2011 National Institute of Corrections Jail Design Guide

2003 American Society of Plumbing Engineers (ASPE) Domestic Water Heating Design Guide

ASHRAE Standards and Handbooks

DESIGN CRITERIA

Outdoor Ambient Conditions

The cooling and dehumidification design values are based on 1% annual cumulative frequency of occurrence and the heating design values are based on 99.6% annual cumulative frequency of

occurrence. The following climatic design information shall be used for the design of all HVAC systems. Climate data is for Myrtle Beach, SC as indicated in the 2013 ASHRAE Handbook – Fundamentals.

	Cooling	Dehumidification	Heating
Design Temperature, Dry Bulb	90.3°F	85.5°F	25.5°F
Design Temperature, Wet Bulb	78.5°F	79.6°F	--
Mean Wind Speed	8.1 MPH	8.1 MPH	4.9 MPH
Prevailing Wind Direction	180°True	180°True	0°True

Indoor Design Conditions

The following design temperature and humidity conditions are required for all interior program spaces. Temperature will be generally controlled to plus/minus 2°F and humidity to plus/minus 10% RH from the stated values. When a max or min value is noted, that implies the limit of system operability.

	Summer	Winter
Cells	75°F DB/50% RH	70°F DB
Administrative	75°F DB/50% RH	70°F DB
Meeting	75°F DB/50% RH	70°F DB
Lobby	75°F DB/50% RH	70°F DB
Kitchen	75°F DB/50% RH	70°F DB
Electrical and Mechanical Rooms	85°F DB (Note 1)	60°F DB (Note 1)
Elevator Machine Rooms	Note 2	Note 2

Note 1: Rooms less than 60-sf with no heat producing equipment, such as transformers and electronic panels with data processing boards, will be conditioned with transfer air.

Note 2: Rooms will be provided with an independent direct expansion (dx) fan coil unit to protect against the overheating of electrical equipment. Indoor design condition shall be as required by the equipment manufacturer's recommendations.

Building Operation Schedule

All areas are expected to operate 24 hours per day, 7 days per week.

Internal Heat Gains

Equipment load factors were utilized for each space type from Chapter 18 in the 2013 ASHRAE Handbook – Fundamentals as follows:

- Housing Units: 0.25 watts/square foot
- Laundry Room: 1 watt/square foot
- Administrative/Control Rooms: 1.5 watts/square foot

- Kitchen: 5 watts/square foot

Lighting loads were based on the minimum design requirements of ASHRAE 90.1 (2007) Table 9.6.1 as follows:

- Housing Units: 0.9 watts/square foot
- Laundry Room: 0.6 watts/square foot
- Administrative/Control Rooms : 1.1 watts/square foot
- Kitchen: 1.2 watts/square foot

Occupant Loads

Both the design and maximum capacity that the detention center will house was provided by the Georgetown County Detention Center. The design capacity is the following:

A-Block: 8 rooms, 16 beds, 16 people

B-Block: 4 rooms, 8 beds, 8 people

C-Block: 10 rooms, 20 beds, 20 people

D-Block: 6 rooms, 6 beds, 6 people

E-Block: 1 room, 50 beds, 50 people

F-Block: 16 rooms, 32 beds, 32 people

G-Block: 16 rooms, 32 beds, 32 people

H-Block: 16 rooms, 32 beds, 32 people

I-Block: 1 room, 16 beds, 16 people

Total Design Capacity: 212 people

The maximum capacity the detention center will house is 1 additional inmate in each room in block A, B, C, F, and G which is the following.

A-Block: 8 rooms, 16 beds, 24 people

B-Block: 4 rooms, 8 beds, 12 people

C-Block: 10 rooms, 20 beds, 30 people

D-Block: 6 rooms, 6 beds, 6 people

E-Block: 1 room, 50 beds, 50 people

F-Block: 16 rooms, 32 beds, 48 people

G-Block: 16 rooms, 32 beds, 48 people

H-Block: 16 rooms, 32 beds, 32 people

I-Block: 1 room, 16 beds, 16 people

Total Maximum Capacity: 266 people

Staff supervises the blocks from the towers. The staffing is as follows:

Tower 1 (supervises blocks A, B, C, D): 2 people

Tower 2 (supervises blocks E, F, G, H, I): 2 people

Booking: 2 people

Main Control: 1 person

Medical: 2 people

Administration: 7 people

Additional Staff: 3 people

Total Staff: 19 people

There are two visiting rooms and the lobby serves as a visitor waiting area. The number of visitors is as follows:

Visiting A205: 14 people

Visiting K205: 14 people

Visitor Waiting Area: 21 people

Total Visitors: 49 people

Activity level was chosen using Chapter 18, Table 1 in the 2013 ASHRAE Handbook – Fundamentals for reference. The activity level of the occupants was chosen to be at “medium work” which corresponds to 295 BTU/hour/person of sensible heat and 455 BTU/hour/person of latent heat.

Envelope Load Criteria

Building skin/conduction loads were based on the architectural wall, roof, and window constructions available in the existing drawings.

VENTILATION REQUIREMENTS

The Minimum Standards for Local Detention Facilities in South Carolina (2013) has indoor air quality requirements listed in section 2014-23,

> "Ventilation system(s) is/are in compliance with the applicable Standard Mechanical Code and Standard Building Codes or portions thereof adopted by the State of South Carolina. Forced air circulation of at least 10 cubic feet per minute of fresh or purified air per inmate."

MAKEUP AIR UNITS

In accordance with the International Mechanical Code (2015) section 501.4, makeup air must be provided if more air is exhausted than supplied by a mechanical ventilating system.

WATER SERVICE MAIN

The domestic water main is 4" in diameter. The size of the main was evaluated by calculating the number of fixture units based on the number of fixtures in the building per the International Plumbing Code (2015) and the existing drawings. The total fixture units were then converted to gallons per minute. The total gallons per minute were found to be 210 gpm.

WATER HEATER LOAD CALCULATION

According to the American Society of Plumbing Engineers (ASPE) Domestic Water Heating Design Manual, for jail and prison housing units, "the shower operation is the factor that determines the required sizes of the water heater and storage tank". The current recommendation in the ASPE manual is to have 1 shower per 8 cells so that all showers can be completed within 1 hour. The standard shower temperature for jails and prisons is 105°F. This results in 84.6% hot water as calculated below.

P=% hot water

Tm= Mixed Water Temperature (105°F)

Th= Hot Water Temperature (115°F)

Tc=Cold Water Temperature (50°F)

$$P = \frac{Tm - Tc}{Th - Tc} = \frac{105 - 50}{115 - 50} = 0.846$$

At design capacity, 212 inmates, the water heater peak demand for showers is 1,185 gallons/hour. At the maximum capacity, 266 inmates, the water heater peak demand for showers is 1,303 gallons/hour. This is assuming that 8 inmates shower each hour per shower, with about 3.5 minutes of water usage per person (per ASPE Domestic Water Heating Design Manual). The rest of the shower time is for changing clothes and drying off.

Without taking any diversity, the shower demand at maximum capacity is 21.7 gallons/minute. The rest of the building hot water demand (kitchen sinks, lavatories, etc.) is 23.2 gallons/minute. If all hot water fixtures were in use at the same time, 44.9 gallons/minute would be required.

The current water heaters each have a recovery rate of 1,212 gallons/hour at a 100°F rise. This results in 40.4 gallons/minute of hot water production. Additionally, each of the water heaters store 200 gallons of hot water. This totals in 400 gallons of hot water storage. Therefore, the current water heaters are capable of meeting the hot water demand with 90% diversity.

ELECTRICAL CALCULATIONS

POWER DISTRIBUTION SYSTEM

Switchboard SB1
1600 Amp, 480Y/277 Volt, 3 Phase, 65,000 A.I.C.

Load	Circuit Breaker (Amps)	Load from As-Built Dwgs (kVA)	* Load Modifications (kVA)	Estimated Calculated Load (kVA)	Estimated Calculated Load (Amps)
Panel HA & HC	200	41.30	-11.00	30.30	36.5
Panel HE & E	300	190.79	-10.00	180.79	217.6
SPARE	400				
Panel HDEA	600	428.09	-12.06	415.49	500.0
Panel HB, B & C	350	163.52	-42.60	120.92	145.5
Panel A	225	96.39		96.39	116.0
Main w/GFP (total)	1520	920.09	-75.66	844.43	1015.6

* Load modifications include mechanical equipment changes.

EMERGENCY SYSTEM

Distribution Board HDEA
600 Amp, 480Y/277 Volt, 3 Phase, 25,000 A.I.C.

Load	Circuit Breaker (Amps)	Load from As-Built Dwgs (kVA)	* Load Modifications (kVA)	Estimated Calculated Load (kVA)	Estimated Calculated Load (Amps)
Panel HEA & EA	225	134.11	+11.00	145.11	174.6
Panel HEE & EE	225	92.10	-33.46	58.64	70.6
Panel HEC & EC	70	35.30		35.30	42.5
SPARE	200				
Panel HEB, EB & ED	225	166.58	+9.86	176.44	212.3
Main (total)	600	428.09	-12.60	415.49	500.0

* Load modifications include mechanical equipment changes.

SECTION 3 – SYSTEM ANALYSIS

AIR HANDLING SYSTEMS (RTU'S) ANALYSIS/DEFICIENCIES

There are 9 air handlers with gas fired heaters operating without a connection for code required outside air and at a depressed leaving air temperature. The average supply air temperature into the spaces is 55°F, which results in abnormally cold space conditions and requires a greater energy usage compared to a space temperature with more appropriate indoor space conditions.

RTU-1 (UNIT 4)

- Exhibits signs of excessive internal and external corrosion
- 9 years old, approaching end of anticipated service life
- Does not have code required outside air
- Uses R22 refrigerant which has been phased out
- Air handling unit casing is not well insulated/delaminating insulation
- Difficult to properly maintain due to roof access constraints
- Roof curb adapter is corroded and flashing is in poor condition, refer to the roofing report for leak concerns
- Broken condensate piping needs to be replaced and properly sloped to a roof drain
- Existing electrical disconnects are in poor condition
- Electrical conduit is not properly supported
- Bird screen is torn

RTU-2 (UNIT 5)

- Exhibits signs of excessive internal and external corrosion
- 10 years old, approaching end of anticipated service life
- Does not have code required outside air
- Air handling unit casing is not well insulated
- Difficult to properly maintain due to roof access constraints
- Roof curb adapter is corroded and flashing is in poor condition, refer to the roofing report for leak concerns
- Existing electrical disconnects are in poor condition
- Electrical conduit is not properly supported

RTU-3 (UNIT 6)

- Does not have code required outside air
- Difficult to properly maintain due to roof access constraints
- Roof curb flashing is in poor condition, refer to the roofing report for leak concerns
- Condensate piping is not piped to a roof drain
- Existing electrical disconnects are in poor condition
- Electrical conduit is not properly supported

RTU-4 (UNIT 3)

- Exhibits signs of excessive internal and external corrosion
- Does not have code required outside air
- Air handling unit casing is not well insulated
- Difficult to properly maintain due to roof access constraints
- Roof curb adapter does not have proper modifications, is corroded, and flashing is in poor condition. Refer to the roofing report for leak concerns.
- Existing electrical disconnects are in poor condition
- Electrical conduit is not properly supported
- Gas piping is not properly secured
- The fins are torn and delaminating

RTU-5 (UNIT 2)

- Exhibits signs of excessive internal and external corrosion
- Does not have code required outside air
- Air handling unit casing is not well insulated
- Difficult to properly maintain due to roof access constraints
- Roof curb adapter flashing is in poor condition, refer to the roofing report for leak concerns
- Existing electrical disconnects are in poor condition
- Electrical conduit is not properly supported
- Gas piping pitch pocket is damaged
- The fins are torn and delaminating

RTU-6 (UNIT 1)

- Exhibits signs of excessive internal and external corrosion
- 10 years old, approaching end of anticipated service life
- Does not have code required outside air
- Use R22 refrigerant which has been phased out
- Air handling unit casing is not well insulated
- Difficult to properly maintain due to roof access constraints
- Roof curb is corroded and flashing is in poor condition, refer to the roofing report for leak concerns
- Condensate piping is not piped to a roof drain
- Existing electrical disconnects are in poor condition
- Electrical conduit is not properly supported

RTU-7 (UNIT 7)

- Exhibits signs of excessive internal and external corrosion
- 8 years old, approaching end of anticipated service life
- Does not have code required outside air
- Air handling unit casing is not well insulated
- Difficult to properly maintain due to roof access constraints

- Roof curb does not have proper modifications, is corroded, and flashing is in poor condition. Refer to the roofing report for leak concerns.
- Condensate piping needs to be piped to a roof drain
- Existing electrical disconnects are in poor condition
- Electrical conduit is not properly supported

RTU-8 (UNIT 9)

- Exhibits signs of excessive internal and external corrosion
- 8 years old, approaching end of anticipated service life
- Does not have code required outside air
- Air handling unit casing is not well insulated
- Difficult to properly maintain due to roof access constraints
- Roof curb adapter does not have proper modifications, is corroded, and flashing is in poor condition. Refer to the roofing report for leak concerns.
- Condensate piping is not properly sloped to a roof drain
- Existing electrical disconnects are in poor condition
- Electrical conduit is not properly supported

RTU-9 (UNIT 8)

- Exhibits signs of excessive internal and external corrosion
- 8 years old, approaching end of anticipated service life
- Does not have code required outside air
- Air handling unit casing is not well insulated
- Difficult to properly maintain due to roof access constraints
- Roof curb adapter does not have proper modifications, is corroded, and flashing is in poor condition. Refer to the roofing report for leak concerns.
- Condensate piping is not piped to a roof drain
- Existing electrical disconnects are in poor condition
- Electrical conduit is not properly supported

MAKEUP AIR UNITS (MAU) ANALYSIS/DEFICIENCIES

In accordance with the International Mechanical Code (2015) section 501.4, makeup air must be provided if more air is exhausted than supplied by a mechanical ventilating system. Section 504.6 of the International Mechanical Code states makeup air must be provided if a clothes dryer exhausts more than 200 CFM. The minimum exhaust rate, as defined by ASHRAE Standard 62.1 (2007), is 1.0 CFM/SF for soiled laundry storage rooms.

Space temperature readings were recorded as high as 92°F within the kitchen during the field investigation. As requested as a preference by the owner, the kitchen should be cooled for occupant comfort.

MAU-1

- Exhibits signs of excessive corrosion
- Beyond ASHRAE service life
- Difficult to properly maintain due to roof access constraints
- Roof curb adapter is corroded and flashing is in poor condition, refer to the roofing report for leak concerns
- Existing electrical disconnect is in poor condition
- Electrical conduit is not properly supported
- No cooling

MAU-2

- Difficult to properly maintain due to roof access constraints
- Roof curb adapter is corroded and flashing is in poor condition, refer to the roofing report for leak concerns
- Electrical conduit is not properly supported
- Gas piping penetration is not protected by a pitch pocket
- Gas vent soot indicates potential combustion issues
- No cooling

MAU-3

- Exhibits signs of excessive corrosion
- Beyond ASHRAE service life
- Difficult to properly maintain due to roof access constraints
- Roof curb adapter is corroded and flashing is in poor condition, refer to the roofing report for leak concerns
- Existing electrical disconnect is in poor condition
- Electrical conduit is not properly supported
- Gas is turned off to the unit
- No cooling

SPLIT SYSTEMS (CU) ANALYSIS/DEFICIENCIES

There are 2 split direct expansion systems that serve the elevator machine room and the telecomm room. The manufacturing date could not be obtained from the nameplate, but it is clear that the units are aged and corroded. The condensing unit serving the elevator machine room (CU-2) is completely inoperable and parts have been taken from it to be used in the repair of CU-1.

CU-1

- Exhibits signs of excessive corrosion
- Beyond ASHRAE service life
- Difficult to properly maintain due to roof access constraints

- Roof curb adapter is corroded and flashing is in poor condition, refer to the roofing report for leak concerns
- No wind restraints
- Existing electrical disconnect is in poor condition
- Electrical conduit is not properly supported

CU-2

- Unit is not functioning
- Exhibits signs of excessive corrosion
- Beyond ASHRAE service life
- Difficult to properly maintain due to roof access constraints
- Roof curb adapter is corroded and flashing is in poor condition, refer to the roofing report for leak concerns
- No wind restraints
- Existing electrical disconnect is in poor condition
- Electrical conduit is not properly supported

EXHAUST SYSTEM ANALYSIS/DEFICIENCIES

There are 27 exhaust fans located on the roof and 5 roof hoods. There is an apparent building pressurization issue with the air pressure because the roof hoods are relieving air instead of acting as an intake for the exhaust system.

EXHAUST SYSTEM

- Equipment exhibits signs of excessive corrosion
- Beyond ASHRAE service life
- Difficult to properly maintain due to roof access constraints
- Roof curb adapter is corroded and flashing is in poor condition, refer to the roofing report for leak concerns
- Roof hoods are relieving air instead of acting as intakes
- Exhaust fans labeled “SEF-X” are running continuously

CODE REQUIRED VENTILATION SYSTEM DEFICIENCIES

The code required outdoor ventilation air, shown in column 5 of Table 1, varies based on space usage are established in ASHRAE Standard 62.1 (2007). This air quality standard was used to calculate the minimum outdoor air required at the Georgetown County Detention Center. Currently no fresh or purified ventilation air is entering the building through the air handling units, which is a violation of the code. The calculated values in Table 1 are the outside air requirements for each rooftop unit. The outdoor air was calculated at maximum occupancy.

Outdoor Air Required					
Designation	Maximum Occupants	Existing Outside Air (CFM)	Required Outdoor Air (CFM/person)	Required Outdoor Air (CFM/SF)	Total Required Outdoor Air (CFM)
RTU-1	112	0	10	0.12	2,640
RTU-2	96	0	10	0.12	2,000
RTU-3	4	0	10	0.18	650
RTU-4	86	0	10	0.12	1,640
RTU-5	15	0	10	0.06	460
RTU-6	31	0	10	0.06	640
RTU-7	2	0	10	0.06	40
RTU-8	2	0	10	0.06	40
RTU-9	2	0	10	0.06	45

Table 1: Outdoor Air Requirements

COOLING/HEATING CAPACITY ANALYSIS/DEFICIENCIES

The cooling sensible and total capacities for the air handling equipment are listed in Table 2. The first column identifies the rooftop unit designation. The second column shows the capacity of each existing rooftop unit. Column 3 shows the loads that are required to meet code and properly condition the facility. The fourth column shows the deficiency between the existing equipment capacity and the required capacity. The values were calculated using design criteria from the existing drawings and field investigation.

Without the load imposed by bringing in code required ventilation air, the existing equipment has excess cooling capacity that allows for overcooling the building.

Additionally, we have calculated the cooling/heating load for the kitchen which is currently not provided with space conditioning. RTU-K is the calculated capacity if cooling is added to the kitchen.

Cooling Capacity			
Designation	Installed Equipment Capacity (Tons)	Calculated at Required Capacity (Tons)	Existing Equipment Deficiency (Tons)
RTU-1	30	36	6
RTU-2	30	37	7
RTU-3	10	9	-
RTU-4	30	32	2
RTU-5	12.5	12.5	-
RTU-6	20	18	-
RTU-7	1.5	1	-
RTU-8	1.5	1	-
RTU-9	1.5	1	-
RTU-K	-	20	20

Table 2: Cooling Capacity.

The maximum heating loads are listed in Table 3. The second column shows the capacity of each existing rooftop unit. The values in the third column of Table 3 were calculated using design criteria from the existing drawings and field investigation. RTU-K is the calculated capacity if a new unit is added to the kitchen, which reduces the heating capacity required of MAU-2 and MAU-3.

Heating Capacity			
Designation	Installed Equipment Capacity (MBH)	Calculated at Required Capacity (MBH)	Existing Equipment Deficiency (MBH)
RTU-1	283	193	-
RTU-2	283	238	-
RTU-3	140	59	-
RTU-4	283	200	-
RTU-5	142	60	-
RTU-6	203	107	-
RTU-7	32	2.5	-
RTU-8	32	2.5	-
RTU-9	32	3.0	-
MAU-1	175	178	3
MAU-2	unknown	254	unknown
MAU-3	475	273	-
RTU-K	-	128	128

Table 3: Heating Capacity.

In general, the air handling systems are appropriately sized.

AIR HANDLING EQUIPMENT SERVICE LIFE ANALYSIS

The existing air handling equipment was manufactured between 1995 and 2015. ASHRAE recommends that an anticipated maximum service life for this type of equipment as follows (ASHRAE 2015 Handbook-HVAC Applications, Table 37.4). At the end of the anticipated maximum service life, the equipment is likely at the point where replacement is required.

Designation	Age (years)	ASHRAE Service Life (years)	Replace (yes/no)
RTU-1	9	15	No
RTU-2	10	15	No
RTU-3	1	15	No
RTU-4	7	15	No
RTU-5	6	15	No
RTU-6	10	15	No
RTU-7	8	15	No
RTU-8	8	15	No
RTU-9	8	15	No
MAU-1	21	15	Yes
MAU-2	unknown	15	-
MAU-3	21	15	Yes
EF-X	21	20	Yes
SEF-X	21	20	Yes

Table 4: Age of Equipment and ASHRAE Service Life

The anticipated service life noted above is for equipment that can be routinely maintained to manufacturers recommended levels. However, the units at the detention center are difficult to maintain due to the access to the roof. All maintenance activities on the rooftop equipment must be accessed through an internal roof ladder from the second floor of the administration areas, or via a ladder in the secure side of the detention center. This difficult access likely leads to reduced preventative maintenance which lowers the anticipated service lifespan. There is visible wear to all the units. As a result of the poor condition of the rooftop units, it is recommended that they be scheduled for replacement.

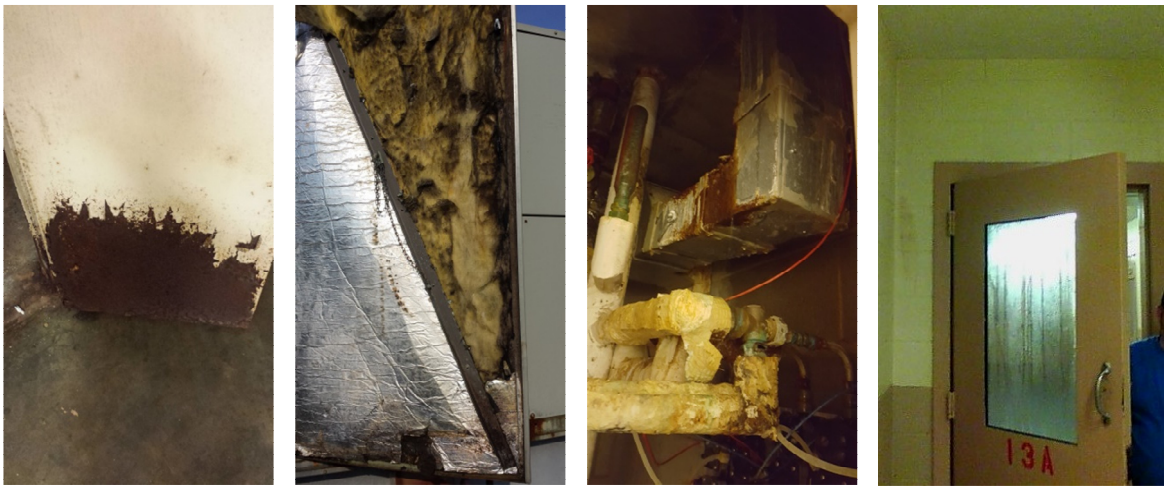
AIR DISTRIBUTION/ MOISTURE ANALYSIS/DISCUSSION

The building suffers from uncontrolled infiltration which has led to high indoor moisture levels. The uncontrolled infiltration is a result of the building exhaust system pulling in unconditioned air through large louvers throughout the building as the building operates at a negative pressure. The outdoor air being pulled in through the louvers is unfiltered and is not conditioned. The exhaust fans are used to remove odors from within the building and are required. As can be seen from the photo below, the louver, which should seal tightly to prevent infiltration, has a large amount of opening that lets in outdoor air without control. This louver should be sealed tightly with no visible light, or air, able to pass.

Typical louver allowing outside air to be pulled directly into the building when the exhaust system is running.

Additionally, it is important for air filters at the air handlers to be cleaned or replaced when dirty. When the filters are clogged, air is restricted from passing through and the return side of the air handling unit will pull additional unfiltered air in through building cracks and joints at the exterior of the building.

The indoor air quality is an overall building concern because the combination of high dew point temperatures and moisture laden air has resulted in condensation that has led to microbial growth. The microbial growth results in discoloration, odor issues, and deteriorating building materials. There is evidence throughout the building of pervasive moisture and condensation on doors, ductwork, air devices, piping, drywall, painted CMU walls, flooring, sprinkler heads, and within the mechanical equipment. This has led to corrosion on many surfaces indicating the uncontrolled moisture infiltration has been an issue for a long time. In a properly performing air handling system, the introduction of code required ventilation air through the air handling system where it is properly dehumidified is required to eliminate the moisture inside the building.



Above are primary examples of moisture concerns throughout the building.

The examples above are of piping insulation in bad condition within chases of C block and E block.

Space temperatures around 60°F were recorded within the housing units during field investigation. The housing units were designed to be cooled to a space temperature of 78°F in the summer. The overcooling of the spaces is resulting in increased potential for the spaces to reach the dew point. When the surface reaches the dew point, condensation will occur.

Temperatures within the housing unit above are extremely low.

The load calculations in section 2 of this narrative help to illustrate how the existing equipment has the capacity to cool the building to such low temperatures, which are well below the original design intent. The existing design included an outdoor air intake at each air handler which would provide the code required ventilation air to the spaces. Conditioning the hot and humid air at the air handler, and removing the unwanted humidity, requires a certain capacity to remove the moisture from the air

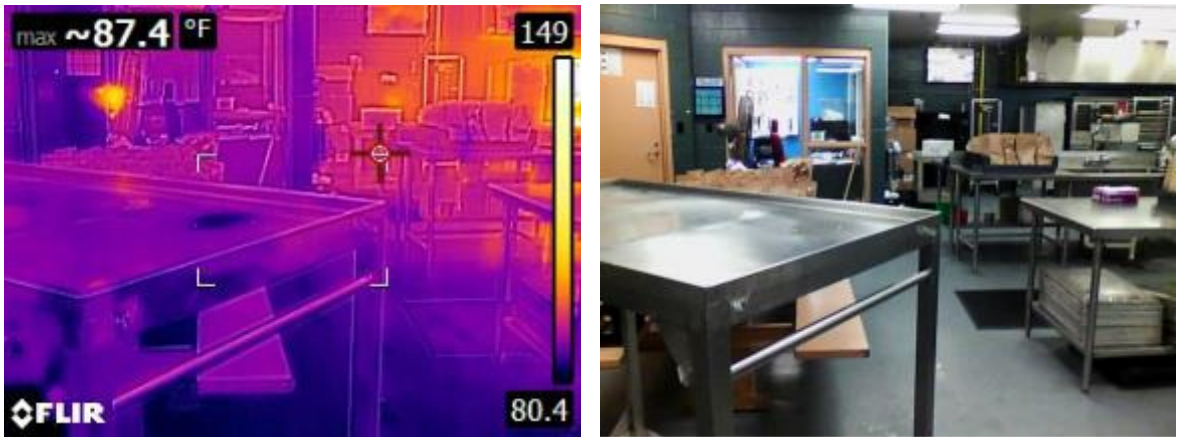
before delivering it to the space in a cool and dry manner. Since the existing AHU outdoor air louvers on the equipment are closed, blanked off, or nonexistent, no fresh outside ventilation air is entering any of the units, and resulting in excess capacity at every air handler. This excess capacity is allowing the AHU's to overcool the spaces.

The result of the uncontrolled infiltration through the louvers, lack of ventilation air being introduced by the AHU's, and the overcooling, is the moisture problem that the building is experiencing.

In an attempt to control this recurring condensation issue with the current AHU system, the building has been overcooled by decreasing the supply air temperature to attempt to remove moisture from the unconditioned air brought in via the louvers while the exhaust system is running. However, unless the uncontrolled infiltration is eliminated, the overcooling of the space simply serves to lower the temperature closer to the dew point, resulting in more condensation. The solution to the issue is to eliminate the infiltration, allow the AHU's to introduce the code required ventilation air and operate the space under a slightly positive pressure.

KITCHEN ANALYSIS/DEFICIENCIES

The Georgetown Detention Center has expressed a desire to add cooling to the currently uncooled kitchen. Per the facility staff, the condition of the space where the kitchen workers work is a concern due to the excessive heat that occurs in the space during work hours. Currently, the kitchen space temperatures are tempered via outdoor air and the kitchen is not cooled. Other than kitchen exhaust, the latent heat and moisture are not being mechanically controlled in the kitchen.



High temperatures exist in the uncooled kitchen.

In addition to the space temperature concerns for workers in the kitchen, the walk-in cooler, freezer, and ice machine are less efficient when ambient conditions increase excessively.

There is a drastic difference in temperature by the ice machine.

Since the kitchen is not conditioned, the interior rooms adjacent to the kitchen have an increased heating load through the partition walls. It is also important to note that there should not be conditioned spaces connected to unconditioned spaces without a vapor barrier. The walls surrounding the unconditioned space should be built like an exterior wall with proper insulation and a vapor barrier. At this time, the lack of an appropriate partition construction is leading to condensation on interior walls that separate the kitchen from the rest of the conditioned spaces in the building.

RMF has calculated that the cooling and heating requirement for the kitchen and the cooling load is 20 tons for cooling and 128 MBH for heating. Adding cooling to the kitchen would decrease the temperature difference between the spaces and reduce moisture and condensation concerns where the kitchen abuts the conditioned spaces.

Moisture visible on the door separating the kitchen from the conditioned areas suggests there may be moisture above the ceiling as well.

AIR DEVICE DEFICIENCIES

Many air devices throughout the building are excessively dirty and in some cases have been painted over restricting air distribution. The air path is impeded and air devices are no longer functioning as designed. This restriction increases the static pressure that the AHU supply fan needs to overcome on the supply side that the exhaust fans need to overcome on the return/exhaust side, and decreases total airflows within the building. All damaged, restricted, or painted air devices should be replaced.

There are many instances of dirty and damaged air devices throughout the building.

Security bars have been provided in transfer openings within the building. However, security bars have not been installed on the outside of large louvers. This is a security concern for possible inmate escape.

Security bars have not been provided in the louvers.

GENERAL DEFICIENCIES

Two of the units use R-22 as a working refrigerant (RTU-1 and RTU-6). There is a current phase-out plan for R-22 that commences in 2020 and bans the import or production of new refrigerant. After this time, only stockpiled R-22 can be used. In the future, R-22 will not be used, and in the near term, the cost for refrigerant will increase. Any new equipment provided at this time should not use R-22 as the working refrigerant.

There is no central building automation control system (BAS) installed at the Georgetown Detention Center. A central BAS control system would allow the facilities staff to monitor the air handlers, fans, MUA's, etc. and be notified of any issues within the system. A BAS system also allows for maintenance tracking to ensure that the AHU systems are being maintained in a preventative manner.

AIR HANDLING SYSTEM CONCLUSIONS

The air handling units are operating without code required outside ventilation air. Currently 4 of the 9 units have the capability of bringing in outside air, however, the outside air intake louvers on those rooftop units have been blanked-off and closed therefore they do not bring in any outside air. The other 5 units do not contain proper outside air intake louvers. The result is that the building is deficient approximately 10,000 CFM of outside air from the original design. Because of this, the building operates at highly negative building pressure resulting in uncontrolled infiltration.

Outside air is infiltrating into the building through louvers because the building exhaust system is constantly removing air which needs to be made up. In a properly operating building, the air handling system provides this makeup air through the AHU's where it is properly dehumidified prior to introduction into the spaces. In this facility, the combination of a cold discharge temperature and unconditioned outside air is allowing condensation to occur on the surfaces inside the building. Many surfaces are being affected by this moisture from the paint peeling, cell doors rusting, and the insulation on the ductwork delaminating because it is wet. This inappropriate operation of the mechanical system has led to moisture issues throughout the building and occupants are uncomfortable at these low temperatures.

NEW EQUIPMENT RECOMMENDATIONS

With the assumption that equipment replacements will be required in the near future, new air handlers with proper outside air introduction are recommended. All code required outside ventilation air must be delivered through the air handling equipment to allow for proper humidity control and space pressurization. All new equipment needs to be properly insulated and accessible for maintenance. We would suggest that when the equipment is replaced that consideration be given to providing an easier roof access pathway for both personnel access, but also access for maintenance parts. All new equipment must be seismically restrained on new roof curbs when replaced. Tie-downs for wind restraints should be installed as required. RMF suggests that air handlers should be sized based on load calculations for the proposed future occupancy, as calculated in this study. When the new equipment is installed, proper installation procedures should be followed such as: gas piping penetrations should be protected by pitch pockets and the gas lines should be sealed securely to the unit. New electrical disconnect switches shall be provided and shall be installed per code requirements. Conduit shall be properly supported and sealed liquid tight with a connector.

As part of any AHU replacement, the louvers located in the exterior walls of the building need to be replaced to allow for a tight seal. The new louvers should have an insulated plenum and be sealed vapor tight to avoid infiltration.

All new equipment and louvers should be controlled by a new building automatic control system (BAS). This system will allow the facilities staff to efficiently control and maintain the building systems.

DOMESTIC WATER SERVICE

The domestic water service was evaluated to confirm the existing incoming service main is sized correctly. One complaint by the Georgetown County Detention Center was low water pressure. The domestic water main is sized appropriately for the number of fixtures and demand in the building. It is unlikely that a larger pipe is necessary for the facility; however the existing domestic water line should be scoped to find any debris impairing the flow of water.

The 2 existing water heaters are sized appropriately for the existing plumbing system. Since the existing water heaters are in good condition, it is recommended they remain if there are no changes to the existing plumbing system or building additions. The existing expansion tank and thermostatic mixing valve are in good condition for continued use as well.

Future additions to the building will require additional plumbing equipment, fixtures, and piping because the existing plumbing system cannot support additions to the building.

SANITARY AND VENT SERVICE

Surface rust on cast iron piping in the housing unit chase implies there is moisture in the space. This does not necessarily indicate excessive corrosion on the interior of the cast iron piping. There are no known chemicals added to the sanitary system that would cause damage to the interior of the piping. The stoppages that the building experiences are more likely a result of debris in the mains opposed to breaks from internal corrosion. To further evaluate the condition of the sanitary system, we recommend a video-scoping with a video provided to the owner.

PLUMBING FIXTURES

There are vitreous china fixtures that need to be replaced with penal fixtures in housing units, day rooms, and the kitchen. Penal fixtures are required to avoid breakage, vandalism, and flooding of plumbing fixtures. Additionally, mirrors in inmate accessible areas should also be penal type. Americans with Disabilities Act (ADA)- compliant showers, toilets, and sink fixtures should be provided.

The Prisons and Jail Standards 2012, national standards to prevent, detect, and respond to prison rape under the Prison Rape Elimination Act (PREA) sets limits to cross-gender viewing and searches in section 115.15.d,

> “The facility shall implement policies and procedures that enable inmates to shower, perform bodily functions, and change clothing without nonmedical staff of the opposite gender viewing their breasts, buttocks, or genitalia, except in exigent circumstances or when such viewing is incidental to routine cell checks. Such policies and procedures shall require staff of the opposite gender to announce their presence when entering an inmate housing unit.”

The group showers do not have partitions.

The National Institute of Corrections (2011 Jail Design Guide, Third Edition) recommends modesty and security to be considered in the shower area. It would be best to use shower curtains or a door so that inmates' head/shoulder and foot/ankle areas are visible from the security area. It is important to avoid blind spots as much as possible.

The privacy of a partial height wall (approximately 44 inches tall) and the water closet placed toward the back of the cell is recommended. The design provides privacy while also allowing the cell to be more visible to security personnel. Further, a stainless steel combination fixture with a sink and toilet is preferred.

Another suggestion from the National Institute of Corrections is to have a separate laundry area for work release inmates to prevent contraband passage. Currently there is only one laundry room serving the entire detention center.

A PREA requirement is to provide a youth shower for inmates under the age of 18 to be able to shower separately than adults. Currently there is not a shower in the juvenile portion of the detention center.

The plumbing chase behind the men's group restroom in E block is in poor condition. A bucket has been placed under the piping due to a leak. In general, the domestic water piping insulation is damaged and not completely covering piping.

GAS DISTRIBUTION DEFICIENCIES

The existing gas piping does not have a shutoff valve at the gas main entering the building. A shutoff valve needs to be provided for maintenance and safety purposes to allow facilities to turn the gas to the building off if needed. The pressure regulator is aged and needs to be replaced.

FIRE SPRINKLER SYSTEM

The main deficiency with the fire sprinkler system is rusted/corroded sprinkler heads. Any damaged or nonfunctional heads need to be replaced. The fire water main is sized appropriately for the building and proper backflow protection has been provided.

ELECTRICAL SYSTEM AND EQUIPMENT OVERVIEW

POWER DISTRIBUTION SYSTEM

A Santee Electric Cooperative pad mounted transformer provides the electric service to the building. The utility company meter is installed on the side of the transformer. From the transformer to the main service entrance distribution equipment (Switchboard SB1) there are (4) sets of 500kcmil conductors.

Pad mounted utility transformer

Switchboard SB1

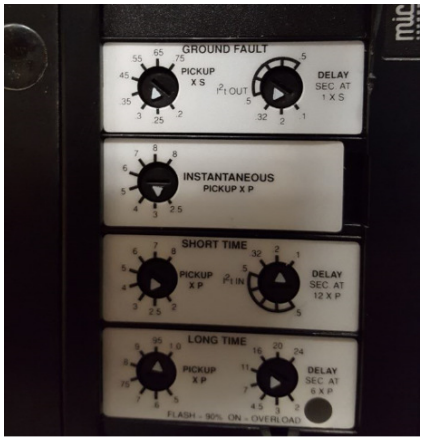
Switchboard SB1 is a Square D 1600 amp, 480Y/277 volt, 3 phase distribution deadfront switchboard with an integral digital meter and adjustable 1600 amp, 3 pole, main switch (set at 1520 amps) with ground fault protection. There are six 3 pole circuit breakers installed, three are adjustable, that distribute power throughout the building. The switchboard is installed in the Main Electrical Room 154, which is located on the first floor. It is of original construction and is 21 years old. The typical life expectancy for electrical distribution equipment is 30 years. The installation complies with the National Electrical Code clearance requirements.

Switchboard SB1 distributes normal power to the building via six 3 pole circuit breakers as follows:

Circuit Breaker		Location	Load Types
200 amp	Panel HA	Elec. 154	Kitchen & Booking Lighting, MAUs 1 & 2 & ACU/CU-2
300 amp, adjustable trip	Panel HE	Elec. 254	Cell & Dorm Lighting & RTUs 1 & 2
400 amp, adjustable trip	SPARE		
600 amp, adjustable trip	Panel HDEA	Elec. 155	Emergency Distribution
350 amp	Panel HB	Elec. 252	Cell & Admin. Lighting & RTUs 3, 4 & 5
225 amp	Panel A via 150kVA transformer	Elec. 154	Kitchen Equipment, EFs 14, 17 & 18 & SF-1

DEFICIENCIES & RECOMMENDATIONS

Per Georgetown County the 1600 amp, 3 pole, main circuit breaker has experienced some unexplained nuisance tripping. Without knowing any of the other circumstances during or prior to the breaker tripping, it is not possible to definitively say what corrective action could be recommended without completing a more comprehensive study of the distribution system.



A Circuit Breaker Coordination Study is recommended, since the main circuit breaker and several downstream breakers include an adjustable trip unit. The coordination study maximizes power system selectivity by isolating faults to the nearest protective device, as well as helping to avoid nuisance operations that are due to transformer inrush or motor starting operations. The study will result in updated values for the electronic trip units for the four adjustable circuit breakers based on the current loads.

The estimated cost for the circuit breaker coordination study recommendation is $5,000.

An Arc Flash Study is also recommended. It will help to ensure that personnel and equipment are protected by establishing proper interrupting ratings. When an electrical fault exceeds the interrupting rating of the protective device, the consequences can be devastating, including injury, damaged electrical equipment, and costly downtime. An Arc Flash Study would include all the distribution equipment and panelboards throughout the building.

The estimated cost for the arc flash study and equipment labeling recommendation is $20,000.

It is recommended to add a Transient Voltage Surge Suppressor (TVSS) at the electrical service entrance. It is required to be installed such that the connecting conductors are no longer than 18”. The TVSS will help to protect the electrical distribution equipment from damage caused by a lightning strike. This is a good engineering practice for the coastal South Carolina area, but not a code requirement.

The estimated cost for the TVSS recommendation is $5,000.

The digital meter installed integral to Switchboard does not appear to be operational. Although, a functioning meter is not required by code, it is a valuable tool in self-monitoring power consumption.

EMERGENCY SYSTEM

The emergency standby generator that provides backup power to the building is a Detroit Diesel Spectrum 350, 350 kW/438 kVA, 480Y/277 volt, 3 phase generator with a 600 amp, 3 pole generator-mounted, enclosed circuit breaker. It is connected to the building via a 600 amp, 480Y/277 volt, 3 pole Spectrum Detroit Diesel automatic transfer switch. The generator is installed exterior to the building on a concrete pad in a weatherproof enclosure with a sub-base diesel fuel tank. It is of original construction and is 21 years old. There are currently 4,895 hours of logged run time. With proper maintenance, the typical life expectancy for a standby generator can be in excess of 30 years. The installation complies with the National Electrical Code clearance requirements.

The Emergency Distribution Panel HDEA is a Square D I-Line 600 amp, 480Y/277 volt, 3 phase distribution panel. Panel HDEA is connected to both normal and emergency power via the automatic transfer switch. There are five 3 pole circuit breakers installed that distribute emergency power throughout the building. The distribution panel is installed in the Emergency Electrical Room 155, which is adjacent to the Main Electrical Room, and has a door to the outside of the building. It is of original construction and is 21 years old. The typical life expectancy for electrical distribution equipment is 30 years. The installation complies with the National Electrical Code clearance requirements.

Distribution Panel HDEA distributes emergency power to the building via five 3 pole circuit breakers as follows:

Circuit Breaker		Location	Load Types
225 amp	Panel HEA	Elec. 155	Egress Lighting, Laundry Equipment, Elevator, MAU-3, EFs 15 & 16
225 amp	Panel HEE	Elec. 254	Egress Lighting, RTU-8, SEFs 1, 2, 3, 4, 5, 6 & 7 & EFs 1, 2, 3, 4 & 5
70 amp	Panel HEC	Equip. 122	Egress Lighting
200 amp	SPARE		
225 amp	Panel HEB	Elec. 252	Egress Lighting, RTUs 6, 7 & 9, SEFs 8, 9, 10, 12 & 13

DEFICIENCIES & RECOMMENDATIONS

The 600 amp, 3 pole circuit breakers mounted on the generator, installed in Switchboard SB1 and Distribution Panel HDEA are 80% rated. The maximum continuous load permitted to be connected to an 80% rated 600-amp circuit breaker is 480 amps. The current calculated load on the circuit breakers is

500 amps. The 350 kW/438 kVA generator is rated to produce 527 amps of power. In order to capture the full power potential of the generator, all three circuit breakers would need to be replaced with 100% rated circuit breakers. Based on there not being any documented problems related to this deficiency, it is not recommended to make this change. If there existed an actual overload, the circuit breakers would trip in order to prevent any equipment damage.

The 225 amp, 3 pole circuit breaker installed in Panel HDEA is 80% rated. The maximum continuous load permitted to be connected to an 80% rated 225-amp circuit breaker is 180 amps. The current calculated load on the circuit breaker is 212.3 amps. Based on there not being any problems related to this deficiency, it is not recommended to make this change. If there existed an actual overload, the circuit breaker would trip in order to prevent any equipment damage.

It is uncertain the reason that the Supply Exhaust Fans (SEFs) and Exhaust Fans (EFs) are connected to the emergency generator. Unless these fans are for a Life Safety purpose, such as a smoke evacuation system, they are not permitted to be on the same generator transfer switch as the life safety loads. Further investigation is necessary before a recommendation can be made.

RTU-6 is the HVAC rooftop unit that serves the second floor clerical, offices, and visitor waiting and is not considered an 'Emergency' load. Per Article 700 of the National Electrical Code (NEC), emergency systems consist of illumination and / or power for systems essential for safety to human life. In order to correct this code deficiency, there are two options recommended for RTU-6. The first is to remove the rooftop unit from Panel HEB and the automatic transfer switch. The other is to provide a generator mounted enclosed circuit breaker, a circuit breaker in the normal distribution equipment and an automatic transfer switch to feed the rooftop unit. Based on the installed RTU-6 nameplate data the equipment load is 40 kVA. The circuit breaker and transfer switch shall be rated at 60 amps at 480 volts.

The estimated cost for the refeed of RTU-6 recommendation is $11,000.

It is the County's desire to add the rest of the rooftop air handling equipment to the generator. The added load is not considered an NEC 700 'Emergency' load and must be on a separate automatic transfer switch. These units could be connected in the same way as discussed in the previous paragraph with the addition of a distribution panelboard. The equipment included is RTUs 1, 2, 3, 4 & 5. Based on the installed equipment nameplate data, the total load is 221 kVA or 266 amps at 480 volts. The circuit breakers and automatic transfer switch shall be 100% rated at 400 amps at 480 volts.

The estimated 'calculated' connected load on the generator is 430 kVA, which is almost to the 438 kVA capacity. Although, per the generator load test performed on May 12, 2016 from 11am to 1:05pm, the connected load recorded is 53 kVA. It is typically expected that the 'actual' load is less than the 'calculated' load. This is due to all the loads that are connected, do not typically operate all at the same time. The difference is usually about half of the calculated load.

It is recommended to perform a 30-day metering on the feeder to Distribution Panel HDEA. This is to get a more accurate picture of the generator actual loading. Once the metering confirms the load is 140 kVA or less, the six rooftop units could be added to the generator via the separate 400 amp automatic transfer switch. A connection between the two transfer switches shall be provided, in order to shed the non-emergency transfer switch, if required.

The estimated cost for the 30-day metering recommendation is $3,000.

The estimated cost for the six rooftop units connection to the generator recommendation is $45,000.

EQUIPMENT CONNECTIONS

The electrical safety switches for the roof top mechanical equipment are installed local to the equipment with the exception of the exhaust fans, these are installed inside the building. The switches are Square D heavy duty, NEMA 3R switches for all the air handling equipment, except RTU-4. RTU-4 safety switch is manufactured by Eaton. There are five switches (RTU-1, RTU-2, RTU-4, RTU-5) that were connected to the emergency system that have been abandoned. The Square D switches are of original construction and are 21 years old.

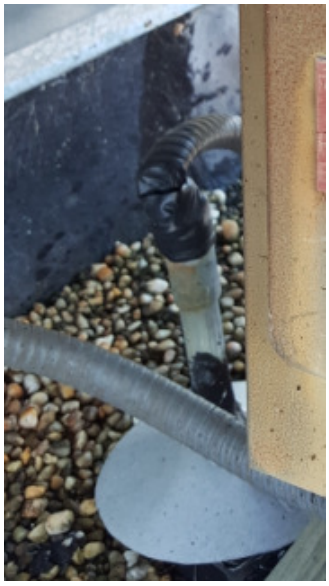
Square D Safety Switches (RTU-2) – Poor Condition

Eaton Safety Switch (RTU-4) – Good Condition

The electrical conduit installed on the roof is a mixture of Liquidtight Flexible Nonmetal Conduit (LFNC) and Liquidtight Flexible Metal Conduit (LFMC), which is typical for this environment. The connectors installed at box, enclosure and equipment connections are appropriate for the raceway installed. The conduit and connectors are of original construction and are 21 years old.

Split conduit (RTU-7)

Exposed conductors (RTU-4)



Deteriorated sunlight-resistant jacket (RTU-1)

Electrical tape in lieu of connector (RTU-5)

Electrical conduit not supported (RTU-5)

DEFICIENCIES & RECOMMENDATIONS

Safety Switches: An equipment enclosure with a rating of NEMA 3R, has a rust resistant finish. Over time the finish can begin to fail and allow rust corrosion to start. Eventually water can enter the enclosure exposing the energized parts to moisture and corrosion. The result of this unsafe condition could lead to HVAC equipment failure, possible arcing, nuisance tripping, or switch failure. The intended purpose of the local safety switch is to de-energize the HVAC equipment so that it can be safely maintenance. Due to the advanced nature of the corrosion, it is recommended the Square D safety switches be replaced.

In several locations, the electrical conduit and connections to boxes, enclosures or equipment have failed. The outer sunlight-resistant jacket of the conduit has deteriorated and exposed the inner flexible metal core or the conduit has completely broken open exposing the energized conductors. The resulting unsafe condition could lead to equipment failure or even electrocution of maintenance personnel. It is recommended that any conduit that has failed be replaced.

There are also locations where the conduit connectors have failed and the conduit has become detached from the junction box or enclosure exposing energized conductors. There is at least one location where electrical tape has been used in lieu of a code required connector. It is recommended that each connector that has failed be replaced.

Besides the exposure from the sunlight and weather over time, another factor that has contributed to the conduit and connections failing is there not being any code required fasteners or supports on the conduit.

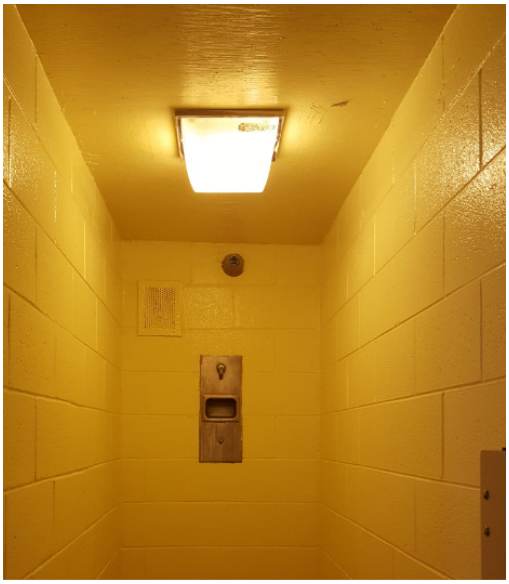
The National Electrical Code requirement for Liquidtight Flexible Nonmetal Conduit (LFNC) is where installed in lengths exceeding 6 ft., the conduit shall be securely fastened at intervals not exceeding 3 ft. and within 12 in. on each side of every outlet box, junction box, cabinet, or fitting. Liquidtight Flexible Metal Conduit (LFMC) shall be securely fastened at intervals not exceeding 4.5 ft. and within 12 in. on each side of every outlet box, junction box, cabinet, conduit body, or other conduit termination.

The estimated cost for each rooftop unit recommendation is per the table below:

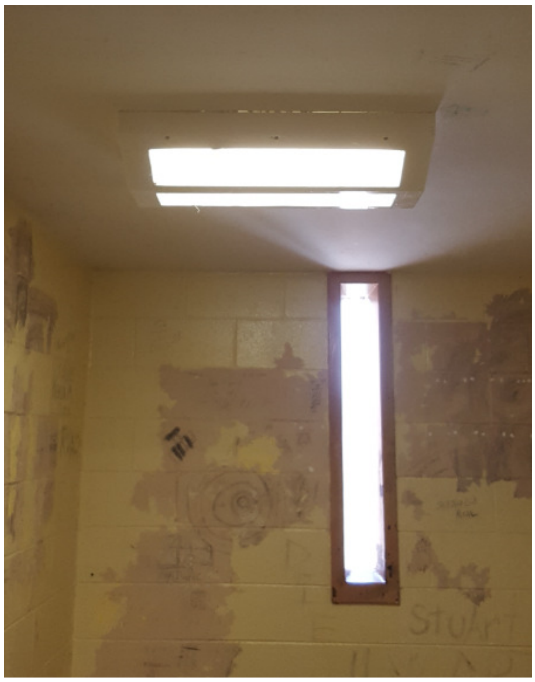
HVAC Unit	Size & Voltage	Estimated Cost
RTU-1, RTU-2, RTU-4	90A-480V-3P	$1,600 per unit
RTU-3	30A-480V-3P	$1,300
RTU-5	40A-480V-3P	$1,450
RTU-6	60A-480V-3P	$1,450
RTU-7, RTU-8, RTU-9	20A-208V-2P	$1,100 per unit
SEF-1 thru 13, EF-15 & EF-16	15A-480V-3P	$900 per unit
MAU-1 thru 3	15A-480V-3P	$1,300 per unit
EF-1 thru 10, 14, 17, 18, SF-1	20A-120V-1P	$750 per unit
ACU/CU-1 & ACU-CU-2	15A-208V-2P	$1,100 per unit

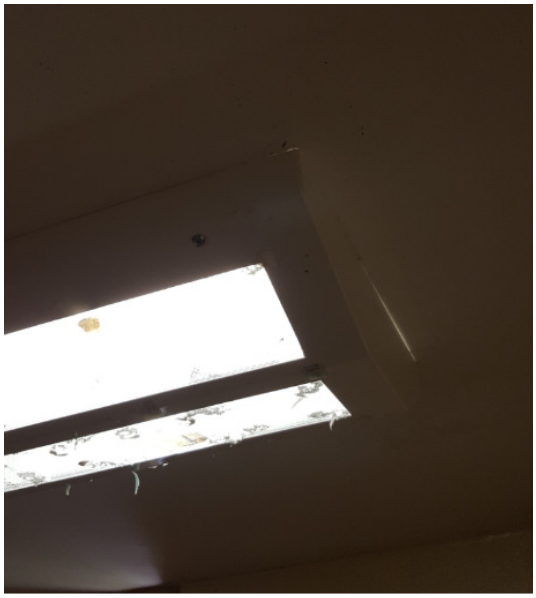
LIGHTING SYSTEM

The light fixtures installed in all of the inmate showers have a significant amount of moisture damage.



Throughout inmate cell and holding spaces the installed surface mounted light fixtures are not sealed tight to ceiling and are a potential ligature point.





Light Fixtures in Cell Block D & H not flush with ceiling. Note gap where light is leaking out from behind the fixture.

DEFICIENCIES & RECOMMENDATIONS

Replace the light fixtures that are installed in the inmate shower stalls. Recommended light fixtures are included in the following table:

Cooper Industries	Fail-Safe FUSL
Kenall Manufacturing	Mighty Mac SSQA
Luminaire Lighting	Vision 4 VPF41

There are total of 16 light fixtures included. The estimated cost for this recommendation is $9,500.

Replace Inmate cell and holding area light fixtures with a light fixture that is 'anti-ligature' compliant. AT this time, there are no manufacturers in the United States that make a light fixture that is listed as 'anti-ligature'. The Office of Mental Health in New York has published a document, Patient Safety Standards, Materials and System Guidelines (for Mental Health facilities) that was used as a basis for this recommendation. This document includes guidelines on the type of light fixtures that are accepted for installation in high risk patient areas. Those guidelines are as follows:

> Light fixtures must be installed flush with ceiling. It is critical to ensure there are no gaps for graspability or ligature tie-off. Any remaining gaps shall be filled with tamper resistant (pick proof) sealant.
>
> Lens: 1/8-inch thick minimum polycarbonate. Lens frame requires enough edge bite in order to retain the lens during maximum deflection. Lens frame shall be fastened with a minimum of two tamper resistant fasteners minimum. Fasteners shall not pass through polycarbonate material.
>
> Housing: To be unbreakable.
>
> Exposed Fasteners: To be tamper resistant.

The document included recessed, surface mounted, task, and general light fixtures that were acceptable for installation. The following table is a list of the surface mounted fixtures that are recommended for this installation:

Cooper Industries	Fail-Safe FUSL
Kenall Manufacturing	Mighty Mac SSA, SSB, SSC, SSD Series
Kenall Manufacturing	Millenium Stretch MLHA8, MLHA12
Luminaire Lighting	VPF4 Series, VPF41 – VPF44

There are total of 76 (w/night lights) and 6 (w/o night lights) light fixtures included. The estimated cost for this recommendation is $71,000.

FIRE ALARM SYSTEM

There are a several locations where a fire alarm smoke detector has been installed adjacent to the mechanical air supply device. Air deflectors are installed to direct the air away from the smoke detector. The air deflector is not intended for this application and is obstructing the proper air flow from the device to the space.

Booking Area

DEFICIENCIES & RECOMMENDATIONS

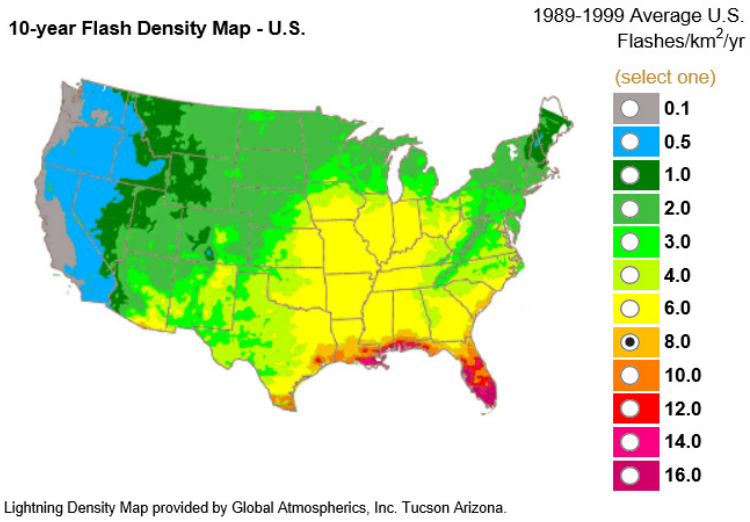
Per NFPA 72, National Fire Alarm Code and Signaling Code, fire alarm smoke detectors should not be placed in the path of the air flow supply or return. Placement of detectors near supply or return air vents can cause excessive accumulation of dust and dirt on the detectors. This dirt can cause detectors to malfunction and cause unwanted alarms. Detectors should not be located closer than 3 feet from an air supply diffuser or an air return vent. It is recommended to relocate all smoke detectors that are located closer than 3 feet from an air diffuser.

The estimated cost for this recommendation is $500 per instance.

LIGHTNING PROTECTION SYSTEM

The installed 'franklin type' lightning protection system does not appear to be in working order. There are several loose connection points, cable is not adhered to the building, or any protection at all. System continuity and effectiveness has been compromised during the HVAC alterations and antennae additions. The typical life expectancy of a lightning protection system is dependent on periodic inspections being done when modifications occur to the roof or any roof mounted equipment.

DEFICIENCIES & RECOMMENDATIONS



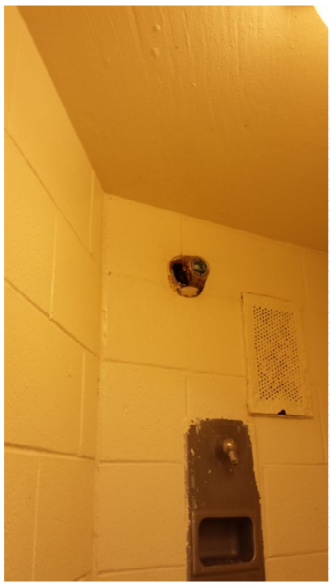
Per the 10-year Flash Density Map, coastal South Carolina receives 21 lightning strikes per square mile per year. As shown in the map, this is higher than 95% of the United States. Based on flash density, the isolated proximity and building use, the building is a High Risk for a lightning strike. In its current state, the existing lightning protection is past the point of making repairs and recertifying. It is recommended to replace the existing lightning protection system with a new NFPA 780 compliant one.

The estimated cost for this recommendation is $25,000.

STRUCTURAL FRAME AND BUILDING ENVELOPE

Cracks, moisture, and water damage are prevalent throughout the building. When the exhaust system is used, large louvers open to allow unfiltered, raw, moist air to enter the building. In some areas microbial growth is already occurring due to moisture in the space. In other areas with visible water damage, microbial growth is likely to occur.

The excessive corrosion and rust in housing unit chases that implies there is moisture in the chase. There is even evidence of corrosion occurring on the exterior gates that lead to the booking area as well as rust on the exterior of the building in the recreation yards. There are rusted sprinkler heads within the building. All rusted sprinkler heads should be replaced not only for functionality, but also so contraband cannot be hidden behind the sprinkler heads.



Corroded sprinkler heads need to be replaced.

There are several locations where the paint is reacting to moisture issues. The paint on CMU block walls is delaminating due to apparent migration moisture. The paint is flaking off the drywall at the boiler room entrance. The group restrooms are frequently repainted due to paint chipping off.

Paint is delaminating.

There is a massive thermal difference at the door in the corridor connecting the non-cooled kitchen area to the rest of the building. The window on the door is sweating which means moisture must also be occurring above the ceiling. Above the ceiling the moisture does not have the opportunity to dry out so it is probable that microbial growth is occurring.

Moisture visible on the door suggests there may be moisture above the ceiling as well.

Further investigation may be required for structural cracks throughout the building. There is evidence of the building shifting in the recreation yards where there is a gap forming between the concrete slab and exterior wall.

APPENDIX 1

Problem Areas with Detention Center

Received 6/27/2016

Outside

1. Needs Painting
2. Refinish ceiling by electrical room
3. Replace sally port beams
4. Put razor wire on fence

Roof

1. Tie all AC units into generator power
2. Replace rusted metal under small AC units
3. Fix all roof drain covers
4. Replace older AC units
5. Add AC to kitchen
6. Replace roofing

Main Hallways

1. Replace all hinges on doors and rework locks

Kitchen

1. Repair and refinish entire kitchen floor
2. Replace metal on walk in cooler and freezer
3. Replace doors on coolers
4. Put in new cut off valves
5. Put more stainless steel behind stoves
6. Replace tile in kitchen hallway
7. Redo staff dining room- hopefully enlarge it

Booking

1. Replace ceiling in front of counter
2. Replace ceiling in holding cells
3. Refurbish rubber room
4. Update all moving parts and switches in sliding door
5. Sandblast showers and redo them
6. Add another rubber room
7. More holding cells needed in booking
8. New air chute
9. Floors sweating at 70 degrees and above

E Gang

1. Refurbish and update shower area
2. New lockers
3. Replace closet door
4. Repaint all stairs
5. Replace ceiling registers

I Gang

1. Replace all ceiling registers
2. Refurbish and update shower area
3. Paint all stalls
4. New lockers
5. Replace closet door

A-B-C-F-G-H Blocks

1. Refurbish and update all showers
2. Replace all manways inside showers
3. Replace all sprinklers and thimbles
4. Replace all cast iron plumbing in closets and behind showers with PVC piping
5. Take all commodes and sinks loose and replace all wax donuts and rusted piping with PVC
6. Replace a lot of the air control valves for sinks
7. A lot of doors and frames need to be replaced
8. Replace ceiling registers
9. All tables need to be sandblasted and repainted – several may need replacing
10. Need a lot of tables and stools in the cells
11. Need to replace some ductwork inside closets
12. Replace some of the fire sprinkler pipes and check the rest out thoroughly
13. Install intercoms in all cells
14. Replace bad intercoms in block areas
15. Replace most of the ES 400 21 volt locks

D Block

1. Replace all cast iron plumbing in closets with PVC
2. Take all fixtures loose and replace rings and piping
3. Replace all doors in D block
4. Refurbish and update showers
5. Repaint entire cell area
6. Install a fire evacuation door

Security System

1. Need to replace battery backups for all 3 security rooms
2. Get all paging and intercoms to work with computers
3. Add more cameras

Offices

1. Change out all carpet

All around DC

1. Change out all water closet doors and some locks

Yards

1. All slabs need to be cemented to walls

Detention Center under cement slab

1. All cast iron plumbing needs to be relined

APPENDIX 2

Summary List of Possible Detention Center Deficiencies

Received 6/27/2016

1. Kitchen exhaust fans are not connected to the emergency generator, as a result the grill and fryer (though LP gas fired) cannot be used during power out conditions. (During Hurricane Floyd the generator ran for 20-hours.)
2. Low water pressure due to inadequate main size and poor plumbing infrastructure.
3. There are no restricted flush valves on inmate toilets, which allow repeated flushing with the toilet blocked to purposefully cause flooding.
4. There is insufficient holding capacity to segregate juveniles, particularly separating those charged from those merely booked, and those with suspected illness.
5. Locks: the 400 series locks in A, B, F, and G Housing Units should have had stronger 120 series locks and heavy duty frames and doors. Solution would be to retrofit with Air Tech lock on outside of current door frame.
6. Rekey corridor doors to single key for emergencies.
7. Replace front door locks.
8. CTV switching controls need to be replaced.
9. Floor in kitchen should have been Quarry Tile. Floor was originally painted, the paint wore off and DHEC cited the detention center to fix the problem because it could not be cleaned properly. It was sanded and refinished with epoxy sealer.
10. Exterior of building was to be originally done with split faced brick. Because of the cost, the county decided to paint the building. Continuous repainting will be every 5 to 7 years.
11. Roof AC units should have permanent filters. A water faucet needs to be on roof so the coils and filters can be cleaned.
12. Wiring had to be replaced to one AC unit because it was not heavy enough gauge to handle the load.
13. Certain cell furniture is coming loose from the walls due to anchoring hollow walls. Imbeds should be installed and furniture could be welded to imbeds.
14. Shower stalls are not tiled therefore constantly painting with epoxy paint.
15. No voice communication between control rooms and cells. Every time the state inspects the facility, that question comes up.
16. Escape: No security grills were place on the outside of exhaust vents in housing units.
17. Exit door in kitchen and laundry area is not a security door or lock.
18. Court room is not large enough and in a bad location.
19. Video surveillance system is repaired as cameras fail. No proactive system upgrade.
20. Battery backup/UPS for Control 2.
21. New locks on kitchen doors.

Division 2 – Roofing

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02/14/2017

GEORGETOWN CO. DENTITION CENTER. – GEORGETOWN, SC

RMF PO. 31613.A0-002

ADC PROJECT NO. 15391

PM: RICK COOK, RICKC@ADCENGINEERING.COM

Roof Condition Assessment and Written Report

February 14, 2017

Dave Crutchfield
RMF Engineering
194 Seven Farms Drive
Suite G
Charleston, SC 29492

subject: Roofing Condition Assessment and Written Report
Georgetown County Detention Center
2394 Browns Ferry Rd. - Georgetown, SC 29440
ADC Project No.: 15391

Enclosures:

1. Roof Plans
   a) Overall Existing Roof Plan, Sheet R1
   b) Roof Core Sample Info Plan, Sheet R2
   c) Existing Roof Plans, Sheets R3-R4
2. Roof Photograph Summary
   a) Roof Area A Deficiency Photographs 1-19
   b) Roof Area B Deficiency Photographs 1-12
   c) Roof Area C Deficiency Photographs 1-15
   d) Roof Area D Deficiency Photographs 1-19
   e) Roof Area D1 Deficiency Photographs 1-6
   f) Roof Area E Deficiency Photographs 1-23
   g) Roof Area F Deficiency Photographs 1-27
   h) Roof Area G Deficiency Photographs 1-17
3. Asbestos Inspection of Roof Systems
4. References

INTRODUCTION

At the request of Mr. Dave Crutchfield, of RFM Engineering, Mr. Rick Cook, Mr. Daniel Atwell, and Mr. Charlton Ingram of ADC Engineering, Inc., conducted a roof investigation of approximately 41,450 SF of roofing at the subject facility. The scope of work included a visual inspection of the roof areas to determine overall roof condition, identify the existing roof membrane composition, and written documentation of our findings, specific repair/replacement recommendations and conclusions.

This report provides the scope of the investigation and the findings of our survey.

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INVESTIGATIVE PROCEDURE

The investigation of the roof was conducted to include a detailed visual inspection. The visual inspection included observation of the applicable roof areas, general roof appearance and surface conditions, flashing conditions and details, perimeter conditions, roof penetrations and terminations, and roof drainage mechanisms. Core samples were taken to determine the roof system composition and provide additional information on the roof membrane condition. Specific core samples were also taken and forwarded to S&ME Laboratories to be tested for asbestos containing roofing materials. Testing of the "miscellaneous" materials included three samples for each suspect homogenous material that were tested per PLM and TEM per SCDHEC requirements. The summary results are provided.

A series of roof plans were generated from the field survey measurements and are provided herein to document findings. A photograph summary is also provided for documentation and clarification of items discussed. All photograph locations are shown on the attached drawings.

FINDINGS

I. BUILDING INFORMATION:

A. General:

1. The subject facility was built in approximately 1992 -1994 and is located at 2394 Browns Ferry Rd, Georgetown, SC 29400.

2. The roof systems at the subject facility consist of low sloped aggregate (gravel) surfaced built up roof membrane and is approximately 24 years old.

3. The facility has eight (8) roof areas (approximately 41,450 SF total), which are labeled Roof Areas A – G for clarity of items discussed. The aggregate (gravel) surfaced built up low sloped roof membrane systems exist on all roof areas and appear to be the building's original roof systems.

4. Asbestos core samples of roofing and flashings indicate no asbestos containing roofing materials are present.

II. ROOF INFORMATION:

A. Roof System Description:

1. Roof Areas A, B, C, D, D1, E, F, and G are of similar roof assembly construction. The roof assembly construction is composed of an

aggregate (gravel) surfaced 4 ply asphalt built up roof membrane, installed over rigid board roof insulation on a metal deck. The base flashings are composed of a fully adhered multiply, bitumen based base flashing.

2. The primary Roof Areas A - G as designated on the attached drawings are of homogenous/similar/uniform roof assembly construction. Where core samples were taken and locations where the deck was visible from the underside, it was noted that the roof deck consists of a metal deck.

3. The base flashings are composed of a fully adhered multiply bitumen based base flashing, which are in very poor condition.

4. Random areas are evident where repairs have been made to the roofs.

5. The Roof Areas A, B, C, D, E, F, G drains to roof drains. Overflow drains are installed adjacent to roof drains and serve as emergency overflow or secondary drainage for these roof areas.

6. Roof Area D1 drains to a single roof drain. No overflow drains are installed within this roof area to serve as emergency overflow or secondary drainage.

7. The perimeter surrounding Roof Areas A - G include a parapet wall assembly that is capped with a metal coping system around the outside building wall.

8. A lighting protection system with lighting arrestor rods is installed around the perimeter and throughout the roof system / mechanical units on Roof Areas A – G.

9. Penetrations include roof drains, overflow drains, curb mounted mechanical equipment, stacks, pitch pans, electrical conduit/pipe penetrations through pitch pans, and VTR / pipe penetrations.

III. ROOF OBSERVATIONS:

A. Roof Area A: (See Sheet R2-R3, and Photographs 1- 19)

1. Roof Area:

   a. Approximately 9,728 square feet. (97 SQS)

2. Core Sample Data:

   a. Roof core samples were taken to identify the roof system components, evaluate the general condition of the components, and determine the roof deck type.

   b. Roof Area core data is noted on Sheet R2 (core sample information plan).

3. Summary Findings:

   a. The roof membrane on Roof Area A is approximately 24 years old and consists of an aggregate surfaced built up roof membrane installed over a rigid board roof insulation over a metal roof deck.

   b. The roof membrane is expected to be in overall fair condition with deficiencies evident primarily at roof system terminations/penetrations.

   c. In selective locations ponding water is occurring. Proper drainage needs to be provided where ponding water is occurring.

   d. The base flashings are in poor condition and have evident signs of deficiencies such as, open base flashing laps, cracking / splitting of the base flashing, loose / un-adhered base flashing. The base flashing system is also lower than the required 8 inch minimum in some locations. Proper repairs are needed.

   e. The sheet metal coping system is installed along the parapet wall. Standing seams existing at the joints of the sheet metal coping system. The color/paint that exists on the sheet metal coping is severely faded allowing for the metal to be exposed.

4. Recommendations:

   a. Due to the age of the roof membrane this area should be replaced when replacement of the other roof areas occurs.

   b. Repairs can be made to the roof system to extend the service life (but should focus on leaks); however, due to the

age of the roof system, even after repairs are made, future problems should be expected. Repairs should be minimized to extent needed to address leaks only, until roof replacement can be completed.

c. If the repair option is selected in the interim, deficiencies noted within this report should be repaired using recognized industry practices as outlined in the NRCA Repair Manual for Low Slope Membrane Roof Systems is recommended.

d. Also, installation of proper flashings at all penetrations and terminations in accordance with the Architectural Sheet Metal Manual, 7th Edition, Sheet Metal & Air Conditioning National Association (SMACNA) and the NRCA Roofing and Waterproofing Manual, Latest Edition is needed.

e. When funds become available for replacement, the new roof system should be designed in accordance with the latest adopted International Building Code (IBC/IEBC 2015), NRCA Roofing and Waterproofing Manual, Latest Edition, and Architectural Sheet Metal Manual, 7th Edition as a minimum.

5. Preliminary Cost Summary:

a. Immediate repairs of $10,000 - $12,000. Please understand that this dollar amount assumes that all repair work is to be performed at the same time as repairs to the surrounding areas. Smaller scopes of work will likely increase costs.

b. Replacement costs should be anticipated to be approximately $198,675 - $225,555. Please understand that this dollar amount is based on a current, competitively bid environment and designed in accordance with the above criteria. It also assumes that this roof area will be replaced with the other surrounding roof areas.

B. Roof Area B: (See Sheets R2-R3, and Photographs 1- 12)

1. Roof Area:

a. Approximately 1,715 square feet. (17 SQS)

2. Core Sample Data:

   a. Roof core samples were taken to identify the roof system components, evaluate the general condition of the components, and determine the roof deck type.

   b. Roof Area core data is noted on Sheet R2 (core sample information plan).

3. Summary Findings:

   a. The roof membrane on Roof Area B is approximately 24 years old and consists of an aggregate surfaced built up roof membrane installed over a rigid board roof insulation over a metal roof deck.

   b. The roof membrane is expected to be in overall fair condition with localized membrane deficiencies in the field and also at roof system terminations/penetrations.

   c. The base flashings are in poor condition and have evident signs of deficiencies such as, open base flashing laps, cracking / splitting of the base flashing, loose / un-adhered base flashing. Proper repairs are needed.

   d. The sheet metal coping system is installed along the parapet wall. Standing seams existing at the joints of the sheet metal coping system. The color / paint that exists on the sheet metal coping is severely faded allowing for the metal to be exposed.

   e. The exterior insulating finish system (EIFS) wall system, also known as synthetic stucco, that surrounds some of the sides of the lower roof system, appears to be in overall fair condition. The exterior sealants within the joints of the wall system are exhibiting signs deterioration. Adhesive and cohesive failure exists.

4. Recommendations:

   a. Due to the age of the roof membrane this area should be replaced when replacement of the other roof areas occurs.

b. Repairs can be made to the roof system to extend the service life (but should focus on leaks); however, due to the age of the roof system, even after repairs are made, future problems should be expected. Repairs should be minimized to extent needed to address leaks only, until roof replacement can be completed.

c. If the repair option is selected in the interim, deficiencies noted within this report should be repaired using recognized industry practices as outlined in the NRCA Repair Manual for Low Slope Membrane Roof Systems is recommended.

d. Also, installation of proper flashings at all penetrations and terminations in accordance with the Architectural Sheet Metal Manual, 7th Edition, Sheet Metal & Air Conditioning National Association (SMACNA) and the NRCA Roofing and Waterproofing Manual, Latest Edition is needed.

e. When funds become available for replacement, the new roof system should be designed in accordance with the latest adopted International Building Code (IBC/IEBC 2015), NRCA Roofing and Waterproofing Manual, Latest Edition, and Architectural Sheet Metal Manual, 7th Edition as a minimum.

f. Replacement of the exterior wall sealants should be in accordance with the Sealant, Waterproofing and Restoration Institute, Sealants: The Professionals Guide.

5. Preliminary Cost Summary:

a. Immediate repairs of $1,500 - $2,500. Please understand that this dollar amount assumes that all repair work is to be performed at the same time as repairs to the surrounding areas. Smaller scopes of work will likely increase costs.

b. Replacement costs should be anticipated to be approximately $34,820 - $39,530. Please understand that this dollar amount is based on a current, competitively bid environment and designed in accordance with the above criteria. It also assumes that this roof area will be replaced with the other surrounding roof areas.

C. Roof Area C: (See Sheet R2-R3, and Photographs 1- 15)

1. Roof Area:

   a. Approximately 1,860 square feet. (19 SQS)

2. Core Sample Data:

   a. Roof core samples were taken to identify the roof system components, evaluate the general condition of the components, and determine the roof deck type.

   b. Roof Area core data is noted on Sheet R2 (core sample information plan).

3. Summary Findings:

   a. The roof membrane on Roof Area C is approximately 24 years old and consists of an aggregate surfaced built up roof membrane installed over a rigid board roof insulation over a metal roof deck.

   b. The roof membrane is expected to be in overall fair condition with deficiencies evident primarily at roof system terminations/penetrations.

   c. The base flashings are in poor condition and have evident signs of deficiencies such as, open base flashing laps, cracking / splitting of the base flashing, loose / un-adhered base flashing.

   d. The sheet metal coping system is installed along the parapet wall. Standing seams existing at the joints of the sheet metal coping system. The color / paint that exists on the sheet metal coping is severely faded allowing for the metal to be exposed.

4. Recommendations:

   a. Due to the age of the roof membrane this area should be replaced when replacement of the other roof areas occurs.

   b. Repairs can be made to the roof system to extend the service life (but should focus on leaks); however, due to the

age of the roof system, even after repairs are made, future problems should be expected. Repairs should be minimized to extent needed to address leaks only, until roof replacement can be completed.

c. If the repair option is selected in the interim, deficiencies noted within this report should be repaired using recognized industry practices as outlined in the NRCA Repair Manual for Low Slope Membrane Roof Systems is recommended.

d. Also, installation of proper flashings at all penetrations and terminations in accordance with the Architectural Sheet Metal Manual, 7th Edition, Sheet Metal & Air Conditioning National Association (SMACNA) and the NRCA Roofing and Waterproofing Manual, Latest Edition is needed.

e. When funds become available for replacement, the new roof system should be designed in accordance with the latest adopted International Building Code (IBC/IEBC 2015), NRCA Roofing and Waterproofing Manual, Latest Edition, and Architectural Sheet Metal Manual, 7th Edition as a minimum.

f. Replacement of the exterior wall sealants should be in accordance with the Sealant, Waterproofing and Restoration Institute, Sealants: The Professionals Guide.

5. Preliminary Cost Summary:

a. Immediate repairs of $2,000 - $3,000. Please understand that this dollar amount assumes that all repair work is to be performed at the same time as repairs to the surrounding areas. Smaller scopes of work will likely increase costs.

b. Replacement costs should be anticipated to be approximately $38,915 - $44,180. Please understand that this dollar amount is based on a current, competitively bid environment and designed in accordance with the above criteria. It also assumes that this roof area will be replaced with the other surrounding roof areas.

D. Roof Area D: (See Sheets R2-R3, and Photographs 1- 19)

1. Roof Area:

    a. Approximately 5,900 square feet. (59 SQS)

2. Core Sample Data:

    a. Roof core samples were taken to identify the roof system components, evaluate the general condition of the components, and determine the roof deck type.

    b. Roof Area core data is noted on Sheet R2 (core sample information plan).

3. Summary Findings:

    a. The roof membrane on Roof Area D is approximately 24 years old and consists of an aggregate surfaced built up roof membrane installed over a rigid board roof insulation over a metal roof deck.

    b. The roof membrane is expected to be in overall fair condition with deficiencies evident primarily at roof system terminations/penetrations.

    c. The base flashings are in poor condition and have evident signs of deficiencies such as, open base flashing laps, cracking / splitting of the base flashing, loose / un-adhered base flashing.

    d. The sheet metal coping system is installed along the parapet wall. Standing seams existing at the joints of the sheet metal coping system. The color / paint that exists on the sheet metal coping is severely faded allowing for the metal to be exposed.

    e. The exterior insulating finish system (EIFS) wall system, also known as synthetic stucco, that surrounds some of the sides of the lower roof system, appears to be in overall fair condition. The exterior sealants within the joints of the wall system have been replaced in some locations.

4. Recommendations:

a. Due to the age of the roof membrane this area should be replaced when replacement of the other roof areas occurs.

b. Repairs can be made to the roof system to extend the service life (but should focus on leaks); however, due to the age of the roof system, even after repairs are made, future problems should be expected. Repairs should be minimized to extent needed to address leaks only, until roof replacement can be completed.

c. If the repair option is selected in the interim, deficiencies noted within this report should be repaired using recognized industry practices as outlined in the NRCA Repair Manual for Low Slope Membrane Roof Systems is recommended.

d. Also, installation of proper flashings at all penetrations and terminations in accordance with the Architectural Sheet Metal Manual, 7th Edition, Sheet Metal & Air Conditioning National Association (SMACNA) and the NRCA Roofing and Waterproofing Manual, Latest Edition is needed.

e. When funds become available for replacement, the new roof system should be designed in accordance with the latest adopted International Building Code (IBC/IEBC 2015), NRCA Roofing and Waterproofing Manual, Latest Edition, and Architectural Sheet Metal Manual, 7th Edition as a minimum.

5. Preliminary Cost Summary:

a. Immediate repairs of $6,500 - $7,500. Please understand that this dollar amount assumes that all repair work is to be performed at the same time as repairs to the surrounding areas. Smaller scopes of work will likely increase costs.

b. Replacement costs should be anticipated to be approximately $120,845 - $137,195. Please understand that this dollar amount is based on a current, competitively bid environment and designed in accordance with the above criteria. It also assumes that this roof area will be replaced with the other surrounding roof areas.

E. Roof Area D1: (See Sheets R2- R3, and Photographs 1- 16)

1. Roof Area:

    a. Approximately 578 square feet. (6 SQS)

2. Core Sample Data:

    a. Roof core samples were taken to identify the roof system components, evaluate the general condition of the components, and determine the roof deck type.

    b. Roof Area core data is noted on Sheet R2 (core sample information plan).

3. Summary Findings:

    a. The roof membrane on Roof Area D1 is approximately 24 years old and consists of an aggregate surfaced built up roof membrane installed over a rigid board roof insulation over a metal roof deck.

    b. The roof membrane is expected to be in overall fair condition with deficiencies evident primarily at roof system terminations/penetrations.

    c. The base flashings are in poor condition and have evident signs of deficiencies such as, open base flashing laps, cracking / splitting of the base flashing, loose / un-adhered base flashing.

    d. The flexible bellow expansion joint is showing signs of deterioration. Open laps exist within the flexible bellow expansion joint. Proper repairs are needed and a sheet metal expansion joint provided when the roof is replaced.

    e. The sheet metal coping system is installed along the parapet wall. Standing seams existing at the joints of the sheet metal coping system. The color / paint that exists on the sheet metal coping is severely faded allowing for the metal to be exposed.

4. Recommendations:

    a. Due to the age of the roof membrane this area should be replaced when replacement of the other roof areas occurs.

b. Repairs can be made to the roof system to extend the service life (but should focus on leaks); however, due to the age of the roof system, even after repairs are made, future problems should be expected. Repairs should be minimized to extent needed to address leaks only, until roof replacement can be completed.

c. If the repair option is selected in the interim, deficiencies noted within this report should be repaired using recognized industry practices as outlined in the NRCA Repair Manual for Low Slope Membrane Roof Systems is recommended.

d. Also, installation of proper flashings at all penetrations and terminations in accordance with the Architectural Sheet Metal Manual, 7th Edition, Sheet Metal & Air Conditioning National Association (SMACNA) and the NRCA Roofing and Waterproofing Manual, Latest Edition is needed.

e. When funds become available for replacement, the new roof system should be designed in accordance with the latest adopted International Building Code (IBC/IEBC 2015), NRCA Roofing and Waterproofing Manual, Latest Edition, and Architectural Sheet Metal Manual, 7th Edition as a minimum.

5. Preliminary Cost Summary:

a. Immediate repairs of $500 - $1,000. Please understand that this dollar amount assumes that all repair work is to be performed at the same time as repairs to the surrounding areas. Smaller scopes of work will likely increase costs.

b. Replacement costs should be anticipated to be approximately $12,290 - $13,955. Please understand that this dollar amount is based on a current, competitively bid environment and designed in accordance with the above criteria. It also assumes that this roof area will be replaced with the other surrounding roof areas.

F. Roof Area E: (See Sheets R2 & R4 and Photographs 1- 23)

1. Roof Area:

a. Approximately 7,435 square feet. (75 SQS)

2. Core Sample Data:

   a. Roof core samples were taken to identify the roof system components, evaluate the general condition of the components, and determine the roof deck type.

   b. Roof Area core data is noted on Sheet R2 (core sample information plan)

3. Summary Findings:

   a. The roof membrane on Roof Area E is approximately 24 years old and consists of an aggregate surfaced built up roof membrane installed over a rigid board roof insulation over a metal roof deck.

   b. There are multiple areas throughout the roof membrane where evident repairs have been made. The roof membrane is expected to have moisture intrusion occurring due to deficiencies within the roof membrane and deficiencies at roof system terminations / penetrations.

   c. The base flashings are in poor condition and have evident signs of deficiencies such as, open base flashing laps, cracking / splitting of the base flashing, loose / un-adhered base flashing.

   d. The flexible below expansion joint is showing signs of deterioration. Open laps exist within the flexible bellow expansion joint. Proper repairs are needed and a sheet metal expansion joint provided when the roof is replaced.

   e. In selective locations ponding water is occurring. Proper drainage needs to be provided where ponding water is occurring.

   f. The sheet metal coping system is installed along the parapet wall. Standing seams existing at the joints of the sheet metal coping system. The color / paint that exists on the sheet metal coping is severely faded allowing for the metal to be exposed.

g. The exterior insulating finish system (EIFS) wall system, also known as synthetic stucco, that surrounds some of the sides of the lower roof system, appears to be in overall fair condition. The exterior sealants within the joints of the wall system have been repaired in some locations. Deterioration of the exterior sealants is evident.

4. Recommendations:

a. Due to the age of the roof membrane this area should be replaced when replacement of the other roof areas occurs.

b. Repairs can be made to the roof system to extend the service life (but should focus on leaks); however, due to the age of the roof system, even after repairs are made, future problems should be expected. Repairs should be minimized to extent needed to address leaks only, until roof replacement can be completed.

c. If the repair option is selected in the interim, deficiencies noted within this report should be repaired using recognized industry practices as outlined in the NRCA Repair Manual for Low Slope Membrane Roof Systems is recommended.

d. Also, installation of proper flashings at all penetrations and terminations in accordance with the Architectural Sheet Metal Manual, 7th Edition, Sheet Metal & Air Conditioning National Association (SMACNA) and the NRCA Roofing and Waterproofing Manual, Latest Edition is needed.

e. When funds become available for replacement, the new roof system should be designed in accordance with the latest adopted International Building Code (IBC/IEBC 2015), NRCA Roofing and Waterproofing Manual, Latest Edition, and Architectural Sheet Metal Manual, 7th Edition as a minimum.

f. Replacement of the exterior wall sealants should be in accordance with the Sealant, Waterproofing and Restoration Institute, Sealants: The Professionals Guide.

5. Preliminary Cost Summary:

a. Immediate repairs of $8,500 - $9,500. Please understand that this dollar amount assumes that all repair work is to be performed at the same time as repairs to the surrounding areas. Smaller scopes of work will likely increase costs.

b. Replacement costs should be anticipated to be approximately $153,615 - $174,400. Please understand that this dollar amount is based on a current, competitively bid environment and designed in accordance with the above criteria. It also assumes that this roof area will be replaced with the other surrounding roof areas.

G. Roof Area F: (See Sheets R2 & R4, and Photographs 1- 27)

1. Roof Area:

a. Approximately 9,160 square feet (92 SQS)

2. Core Sample Data:

a. Roof core samples were taken to identify the roof system components, evaluate the general condition of the components, and determine the roof deck type.

b. Roof Area core data is noted on Sheet R2 (core sample information plan).

3. Summary Findings:

a. The roof membrane on Roof Area F is approximately 24 years old and consists of an aggregate surfaced built up roof membrane installed over a rigid board roof insulation over a metal roof deck.

b. There are multiple areas throughout the roof membrane where evident repairs have been made. The roof membrane is expected to have moisture intrusion occurring due to deficiencies within the roof membrane and deficiencies at roof system terminations / penetrations.

c. The base flashings are in poor condition and have evident signs of deficiencies such as, open base flashing laps, cracking / splitting of the base flashing, loose / un-adhered base flashing.

d. In selective locations ponding water is occurring. Proper drainage needs to be provided where ponding water is occurring.

e. The sheet metal coping system is installed along the parapet wall. Standing seams existing at the joints of the sheet metal coping system. The color / paint that exist on the sheet metal coping is severely faded allowing for the metal to be exposed.

4. Recommendations:

a. Due to the age of the roof membrane this area should be replaced when replacement of the other roof areas occurs.

b. Repairs can be made to the roof system to extend the service life (but should focus on leaks); however, due to the age of the roof system, even after repairs are made, future problems should be expected. Repairs should be minimized to extent needed to address leaks only, until roof replacement can be completed.

c. If the repair option is selected in the interim, deficiencies noted within this report should be repaired using recognized industry practices as outlined in the NRCA Repair Manual for Low Slope Membrane Roof Systems is recommended.

d. Also, installation of proper flashings at all penetrations and terminations in accordance with the Architectural Sheet Metal Manual, 7th Edition, Sheet Metal & Air Conditioning National Association (SMACNA) and the NRCA Roofing and Waterproofing Manual, Latest Edition is needed.

e. When funds become available for replacement, the new roof system should be designed in accordance with the latest adopted International Building Code (IBC/IEBC 2015), NRCA Roofing and Waterproofing Manual, Latest Edition, and Architectural Sheet Metal Manual, 7th Edition as a minimum.

5. Preliminary Cost Summary:

a. Immediate repairs of $10,000 - $12,000. Please understand that this dollar amount assumes that all repair work is to be performed at the same time as repairs to the surrounding areas. Smaller scopes of work will likely increase costs.

b. Replacement costs should be anticipated to be approximately $188,435 - $213,930. Please understand that this dollar amount is based on a current, competitively bid environment and designed in accordance with the above criteria. It also assumes that this roof area will be replaced with the other surrounding roof areas.

H. Roof Area G: (See Sheets R2 & R4, and Photographs 1- 17)

1. Roof Area:

a. Approximately 5,037 square feet. (51 SQS)

2. Core Sample Data:

a. Roof core samples were taken to identify the roof system components, evaluate the general condition of the components, and determine the roof deck type.

b. Roof Area core data is noted on Sheet R2 (core sample information plan).

3. Summary Findings:

a. The roof membrane on Roof Area G is approximately 24 years old and consists of an aggregate surfaced built up roof membrane installed over a rigid board roof insulation over a metal roof deck.

b. The roof membrane is expected to be in overall fair condition with deficiencies evident primarily at roof system terminations/penetrations.

c. The base flashings are in poor condition and have evident signs of deficiencies such as, open base flashing laps, cracking / splitting of the base flashing, loose / un-adhered base flashing.

d. The sheet metal coping system is installed along the parapet wall. Standing seams existing at the joints of the sheet metal coping system. The color / paint that exists on the sheet metal coping is severely faded allowing for the metal to be exposed.

e. The exterior insulating finish system (EIFS) wall system, also known as synthetic stucco, that surrounds some of the sides of the lower roof system, appears to be in overall fair condition. The exterior sealants within the joints of the wall system have been repaired in some locations. Deterioration of the exterior sealants is evident.

4. Recommendations:

a. Due to the age of the roof membrane this area should be replaced when replacement of the other roof areas occurs.

b. Repairs can be made to the roof system to extend the service life (but should focus on leaks); however, due to the age of the roof system, even after repairs are made, future problems should be expected. Repairs should be minimized to extent needed to address leaks only, until roof replacement can be completed.

c. If the repair option is selected in the interim, deficiencies noted within this report should be repaired using recognized industry practices as outlined in the NRCA Repair Manual for Low Slope Membrane Roof Systems is recommended.

d. Also, installation of proper flashings at all penetrations and terminations in accordance with the Architectural Sheet Metal Manual, 7th Edition, Sheet Metal & Air Conditioning National Association (SMACNA) and the NRCA Roofing and Waterproofing Manual, Latest Edition is needed.

e. When funds become available for replacement, the new roof system should be designed in accordance with the latest adopted International Building Code (IBC/IEBC 2015), NRCA Roofing and Waterproofing Manual, Latest Edition, and Architectural Sheet Metal Manual, 7th Edition as a minimum.

f. Replacement of the exterior wall sealants should be in accordance with the Sealant, Waterproofing and Restoration Institute, Sealants: The Professionals Guide.

5. Preliminary Cost Summary:

a. Immediate repairs of $5,500 - $6,500. Please understand that this dollar amount assumes that all repair work is to be performed at the same time as repairs to the surrounding areas. Smaller scopes of work will likely increase costs.

b. Replacement costs should be anticipated to be approximately $104,460 - $118,590. Please understand that this dollar amount is based on a current, competitively bid environment and designed in accordance with the above criteria. It also assumes that this roof area will be replaced with the other surrounding roof areas.

GENERAL DISCUSSION

When a roof system begins to show signs of deterioration or problems, such as leaks, or the building is damaged by some event, the building Owner has basically three possible solutions; repair, re-cover, or replace. A basic summary of these options is as follows:

Repair - Cut out/removal of deteriorated materials and replacement with new. Repairs can be defined as emergency, temporary, and permanent. This work is typically oriented toward flashings (penetrations and terminations). This should be minimized to extent needed to address leaks only, until roof replacement can be completed.

Re-cover - Minor preparation of existing roof, and installation of a new roofing system such as a single-ply system, elastomeric coating system, sprayed polyurethane foam, or other similar application over the existing roofing system. Based on roof assembly configuration and condition this is not a recommended option.

Replace – The complete demolition/removal of the existing roof system and installation of a totally new roof system. As soon as the project can be funded, complete roof replacement is recommended.

Typically, significant moisture and damage can occur to the system before interior leaks become evident. Once the leaks begin to cause an inconvenience to the Owner, repairs are attempted. All too often, these repairs are too late, improperly applied or bypassed altogether. Either the Owner ignores the roof until severe damage to the system has occurred, and/or the method of repairs attempted provides only a temporary solution (addressing the symptom versus the real problems), giving the Owner a false sense of security. After a few improper

repair attempts, the Owner is led to believe that the only remaining options are to recover or replace the roof (proper repairs is most often the right solution to the Owner, but the most difficult to obtain).

At this point the Owner looks to a Designer, Manufacturer or Contractor to provide guidance and/or direction as to the proper solution. Re-covering is seldom a good choice for the Owner pursuing a long-term fix. Re-cover will typically only fix the symptoms of the problem roof, while often covering up the unknown underlying problems. Re-cover options generally are recommended to the building Owner because the "up-front" costs are about 60% of that for a new roof, but the life expectancy and success rate is low. Thus making the re-cover option a gamble, and normally not cost effective when considering the total life cycle, energy, Code requirements, and maintenance costs. Due to the numerous potential problems all industry guides and Manufacturers require specific restrictions and precautions to be taken before a re-cover option is permitted, and many systems cannot be recovered. Based on roof assembly configuration and condition this is not a recommended option.

Roof replacement is the easiest option of the decision making process, carrying the least liability for the involved parties and the highest profits. The Owner needs to carefully review the justifications for this option, and should consider obtaining a second opinion if the justifications are not totally clear. Once the replacement option is pursued, careful attention to this type of work is also critical. A design that is restricted by existing conditions, but required to be brought up to code is not always an easy task.

In summary, we have considered our field investigations, available means through construction contracts and the three options available for the facility. Our recommendations for minimal repairs (focusing on leaks) and total roof replacement were made based on the above criteria.

CONCLUSIONS

Our conclusions reflect our experience with the visual examination of each roof area. A summary of our conclusions include the following:

A. Roof Areas A, B, C, D, D1, E, F, and G have exceeded their life expectancy and should be replaced when funding becomes available. Repairs can be made to the roof system in an effort to address specific leaks, when they occur in the roof system; however, due to the age of the roof membrane/flashings, even after repairs are made, future problems should be expected. A significant weather event such as high winds or a "cold snap" will likely cause various new leaks due to the conditions/age of the roofs.

B. If the repair option is selected in the interim, deficiencies noted within this report should be repaired using recognized industry practices as outlined in

the NRCA Repair Manual for Low Slope Membrane Roof Systems is recommended.

C. Also, installation of proper flashings at all penetrations and terminations in accordance with the Architectural Sheet Metal Manual, 7th Edition, Sheet Metal & Air Conditioning National Association (SMACNA) and the NRCA Roofing and Waterproofing Manual, Latest Edition is needed.

D. When funds become available for replacement, the new roof system should be designed in accordance with the latest adopted International Building Code (IBC/IEBC 2015), NRCA Roofing and Waterproofing Manual, Latest Edition, and Architectural Sheet Metal Manual, 7th Edition as a minimum.

1. Include tapered insulation, increased R-value, and tapered sumps at drains.

2. Provide new support and condensate lines for mechanical/electrical equipment on roof.

3. Provide new metal copings, edge metals that adhered to IBC required ES-1.

4. Provide two piece counterflashings and replace sealants at terminations and penetrations.

5. Require three (3) year Contractor Warranty and 20 year Manufacturer's NDL Warranty,

E. Whatever degree of repair or replacement you choose to proceed with, we will be more than willing to provide any technical support you need.

SUMMARY COSTS

The total roof repairs (focusing on leaks and minimizing leaks) of Roof Areas A, B, C, D, D1, E, F, and G would cost approximately $44,500 – $54,000. We recommend only these funds as needed, until roof replacement can be completed.

The estimates for total roof replacement of Roof Areas A, B, C, D, D1, E, F, and G (approximately 415 SQS) are based on using an asphalt based, multi ply roof membrane with a modified bitumen cap sheet and should be anticipated to cost approximately $850,000 – $965,000. This cost also includes all new sheet metal work (counterflashings, copings, edge metals, etc.), approximately 2% of deck repair/replacement, replacement of deteriorated wood products, a new tapered insulation system with an R-Value of 20 as required by Code, etc.

All of the estimated roof repair and roof replacement costs are based on the assumption that all areas will be completed at the same time. Higher costs should be anticipated if smaller scopes of work are pursued.

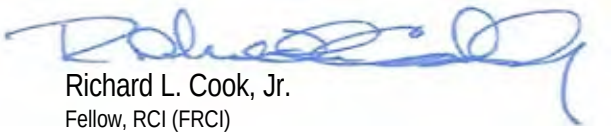
QUALIFICATIONS

This report summarizes our assessment of the roof system conditions at the subject facility at the time of our inspection. Statements herein are based on the information provided to us, our observations at the time of inspection, and our experience with similar conditions. The discovery of any changed conditions which deviate from the information contained in this report should be brought to our attention for further evaluation.

CLOSING

ADC Engineering, Inc. appreciates this opportunity to be of service. Please contact us if we can be of further assistance or if you have any questions or comments regarding this report.

Sincerely,
ADC Engineering, Inc.



Richard L. Cook, Jr.
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Registered Waterproofing Consultant (RWC)
Registered Exterior Wall Consultant (REWC)
Registered Building Envelope Consultant (RBEC)
CCS, CCCA, CDT; The Construction Specifications Institute
LEED® Accredited Professional, US Green Building Council
SC ACEM SC Accredited Commercial Energy Manager
Certified Solar Roofing Professional™ (CSRPs™), RISE™

Daniel Atwell, CDT, RRO
Project Manager / Building Envelope Designer
Registered Roof Observer (RRO), RCI, Inc.
CDT, The Construction Specifications Institute

Enclosures:

rlc

roof plans

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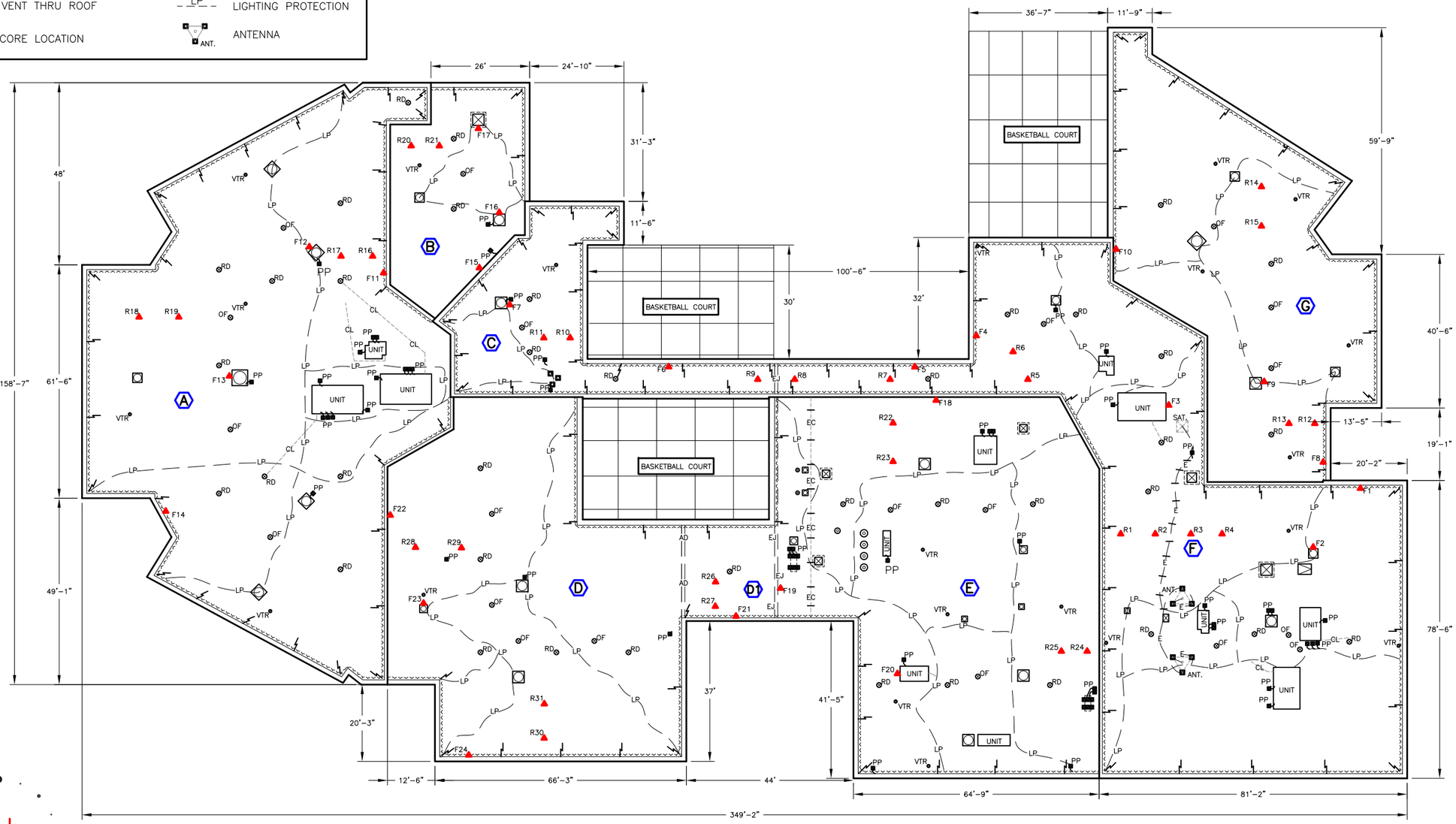
LEGEND

- XX — ROOF AREA SYMBOL
- RD — ROOF DRAIN
- OF — OVERFLOW ROOF DRAIN
- PARAPET WALL
- LIGHTNING ARRESTOR
- ROOF SCUTTLE
- PP — PITCH PAN
- VTR — VENT THRU ROOF
- R — CORE LOCATION
- EJ — EXPANSION JOINT
- ROOF PENETRATION
- UNIT — MECHANICAL UNIT
- ROOF PENETRATION
- STACK
- EC — ELECTRICAL CONDUIT
- CL — CONDENSATION LINE
- LP — LIGHTING PROTECTION
- ANT. — ANTENNA



PLAN NORTH

OVERALL EXISTING ROOF PLAN (GEORGETOWN DETENTION CENTER)

NOT TO SCALE

GEORGETOWN DETENTION CENTER

ADC PROJECT NUMBER: 15391

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OVERALL EXISTING ROOF PLAN

R1

CORE SAMPLE SUMMARY

A. CORE SAMPLE SUMMARIES ARE PROVIDED AS GENERAL INFORMATION ONLY. IT IS THE CONTRACTORS' SOLE RESPONSIBILITY TO COLLECT THE NECESSARY FIELD DATA TO PREPARE THEIR BID.

B. LOCATIONS OF THESE CORES ARE SHOWN ON THE EXISTING ROOF PLAN.

ITEM	DESCRIPTION
R9–	GBUR 1" PERLITE 5" POLYISOCYANATE METAL DECK 6" TOTAL THICKNESS
R10–	GBUR .75" PERLITE (2 LAYERS) .75" POLYISOCYANATE METAL DECK 2.25" TOTAL THICKNESS
R11–	GBUR .75" PERLITE (2 LAYERS) METAL DECK 1.5" TOTAL THICKNESS
R16–	GBUR .75" PERLITE 1⅜" POLYISOCYANATE METAL DECK 2⅛" TOTAL THICKNESS
R17–	GBUR .75" PERLITE .25" POLYISOCYANATE METAL DECK 1" TOTAL THICKNESS
R18–	GBUR .75" PERLITE 2.75" POLYISOCYANATE METAL DECK 3.5" TOTAL THICKNESS
R19–	GBUR .75" PERLITE 1⅛" POLYISOCYANATE METAL DECK 1⅞" TOTAL THICKNESS

ITEM	DESCRIPTION
R20–	GBUR .75" PERLITE 1.75" POLYISOCYANATE METAL DECK 2.5" TOTAL THICKNESS
R21–	GBUR .75" PERLITE .75" POLYISOCYANATE METAL DECK 1.5" TOTAL THICKNESS
R26–	GBUR .75" PERLITE 1.5" POLYISOCYANATE METAL DECK 2.25" TOTAL THICKNESS
R27–	GBUR .75" PERLITE .25" POLYISOCYANATE METAL DECK 1" TOTAL THICKNESS
R28–	GBUR .75" PERLITE 2.75" POLYISOCYANATE METAL DECK 3.5" TOTAL THICKNESS
R29–	GBUR .5" PERLITE 1" POLYISOCYANATE METAL DECK 1.5" TOTAL THICKNESS
R30–	GBUR .5" PERLITE 3" POLYISOCYANATE METAL DECK 3.5" TOTAL THICKNESS
R31–	GBUR .75" PERLITE 1.5" POLYISOCYANATE METAL DECK 2.25" TOTAL THICKNESS

CORE SAMPLE INFORMATION
AREAS A, B, C, D, & D1

CORE SAMPLE SUMMARY

A. CORE SAMPLE SUMMARIES ARE PROVIDED AS GENERAL INFORMATION ONLY. IT IS THE CONTRACTORS' SOLE RESPONSIBILITY TO COLLECT THE NECESSARY FIELD DATA TO PREPARE THEIR BID.

B. LOCATIONS OF THESE CORES ARE SHOWN ON THE EXISTING ROOF PLAN.

ITEM	DESCRIPTION
R1–	GBUR .75" PERLITE 1.75" POLYISOCYANATE METAL DECK 2.5" TOTAL THICKNESS
R2–	GBUR .75" PERLITE 1.25" POLYISOCYANATE METAL DECK 2" TOTAL THICKNESS
R3–	GBUR .75" PERLITE 1.25" POLYISOCYANATE METAL DECK 2" TOTAL THICKNESS
R4–	GBUR .75" PERLITE 1.25" POLYISOCYANATE METAL DECK 2" TOTAL THICKNESS
R5–	GBUR .75" PERLITE (2 LAYERS) .75" POLYISOCYANATE METAL DECK 2" TOTAL THICKNESS
R6–	GBUR .75" PERLITE .5" POLYISOCYANATE METAL DECK 1.25" TOTAL THICKNESS
R7–	GBUR .75" PERLITE 2.5" POLYISOCYANATE METAL DECK 3.25" TOTAL THICKNESS
R8–	GBUR 1" PERLITE 5" POLYISOCYANATE METAL DECK 6" TOTAL THICKNESS

ITEM	DESCRIPTION
R12–	GBUR .75" PERLITE 1.75" POLYISOCYANATE METAL DECK 2.5" TOTAL THICKNESS
R13–	GBUR .75" PERLITE 1" POLYISOCYANATE METAL DECK 1.75" TOTAL THICKNESS
R14–	GBUR 1" PERLITE 2.75" POLYISOCYANATE METAL DECK 3.75" TOTAL THICKNESS
R15–	GBUR .75" PERLITE 1⅜" POLYISOCYANATE METAL DECK 2⅛" TOTAL THICKNESS
R22–	GBUR 1" PERLITE 3.5" POLYISOCYANATE METAL DECK 4.5" TOTAL THICKNESS
R23–	GBUR .75" PERLITE 1.25" POLYISOCYANATE METAL DECK 2" TOTAL THICKNESS
R24–	GBUR .75" PERLITE 1.25" POLYISOCYANATE METAL DECK 2" TOTAL THICKNESS
R25–	GBUR .75" PERLITE 1.25" POLYISOCYANATE METAL DECK 2" TOTAL THICKNESS

CORE SAMPLE INFORMATION
AREAS E, F, & G

CORE SAMPLE INFORMATION PLAN

GEORGETOWN DETENTION CENTER

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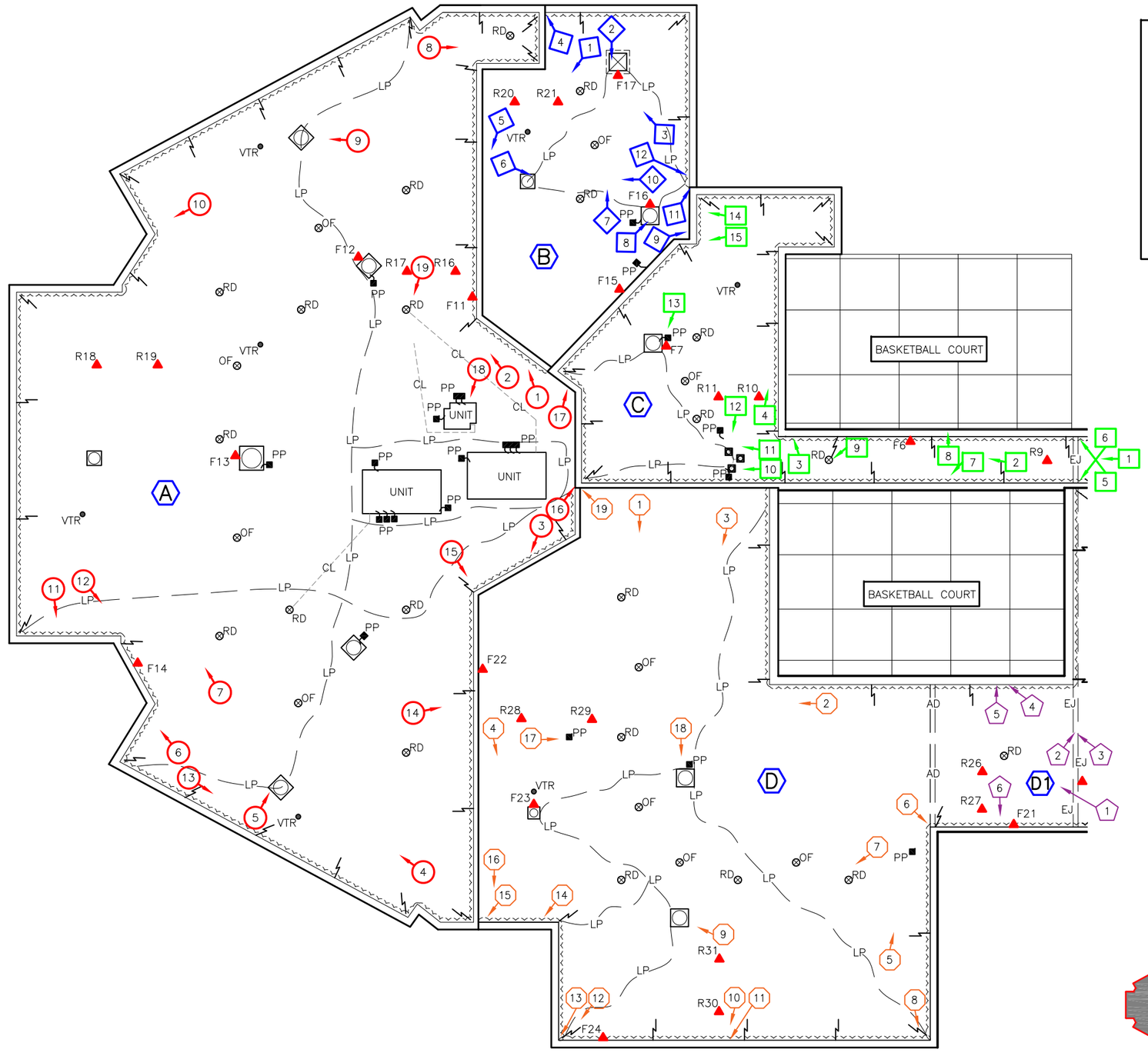
CORE SAMPLE INFORMATION PLAN

R2



LEGEND

- XXX — PHOTOGRAPH LOCATIONS AREA A
- XX — PHOTOGRAPH LOCATIONS AREA B
- XX — PHOTOGRAPH LOCATIONS AREA C
- XX — PHOTOGRAPH LOCATIONS AREA D
- XX — PHOTOGRAPH LOCATIONS AREA D1
- R — CORE LOCATION

PLAN NORTH

EXISTING ROOF PLAN
AREAS A, B, C, D, & D1

KEY PLAN

20' 10' 5' 0 10' 20' 40'
GRAPHIC SCALE

GEORGETOWN DETENTION CENTER

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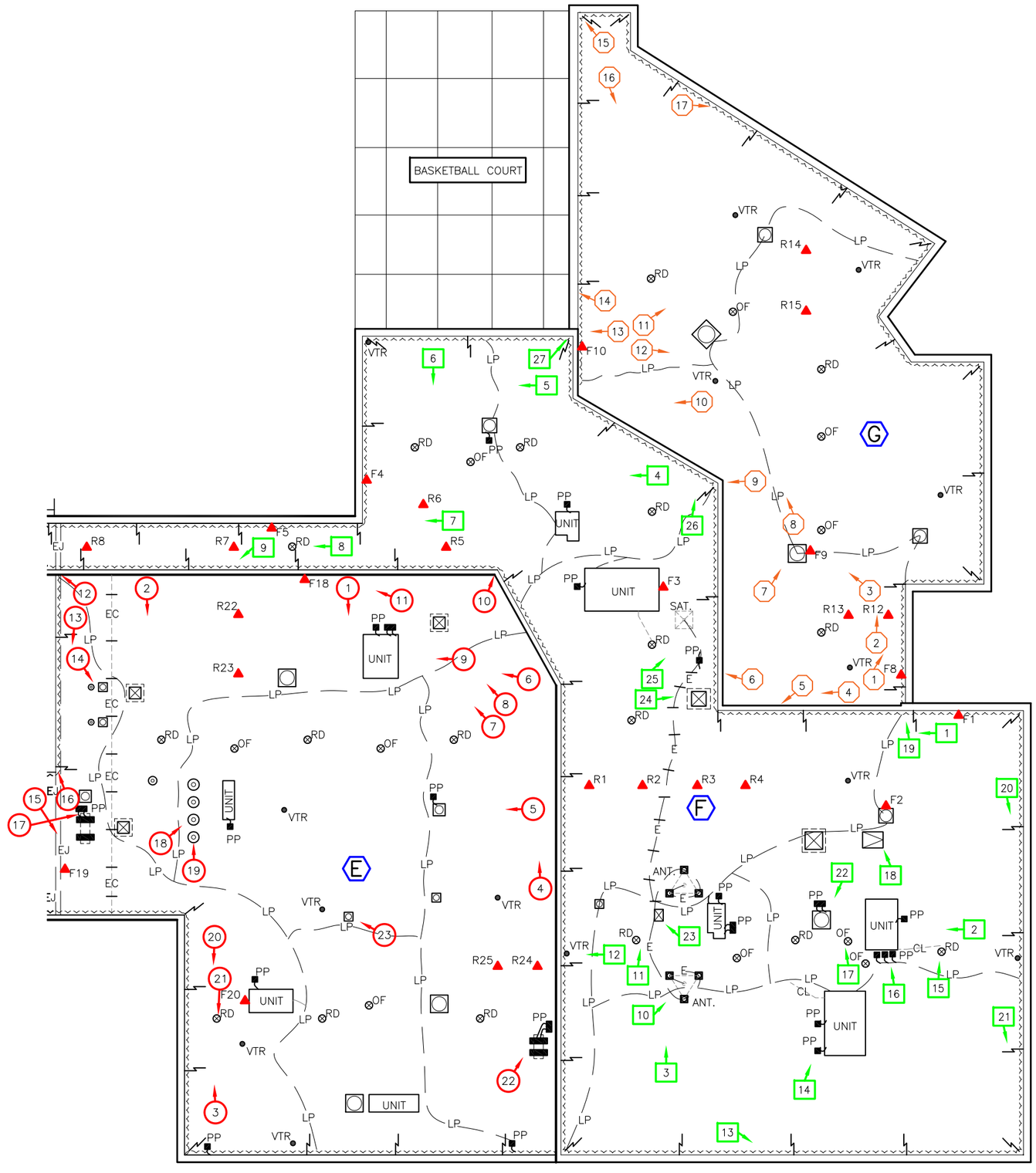
EXISTING
ROOF PLAN
AREAS A,B,C,D & D1

R3



PLAN NORTH

EXISTING ROOF PLAN AREAS E, F, & G

KEY PLAN

GRAPHIC SCALE 20' 10' 5' 0 10' 20' 40'

GEORGETOWN DETENTION CENTER

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EXISTING ROOF PLAN AREAS E, F, & G

R4

roof photographs

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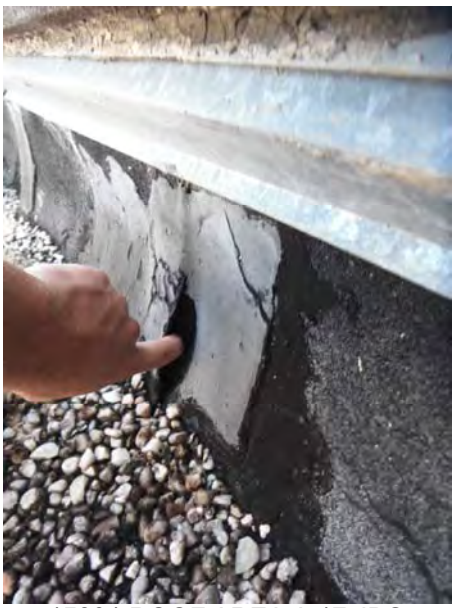
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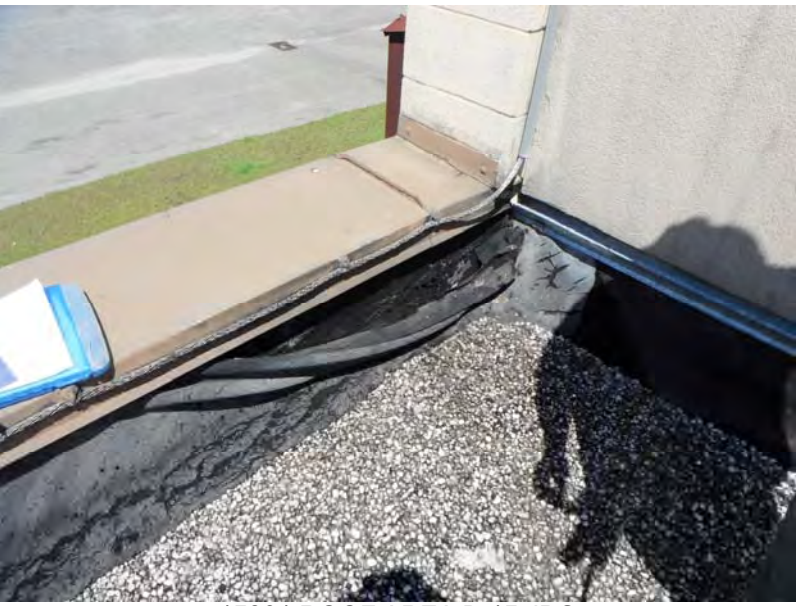
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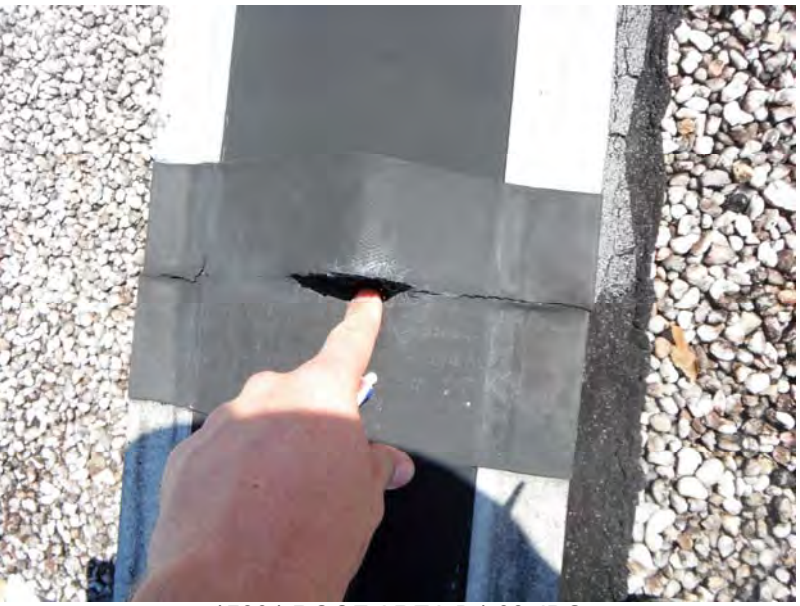
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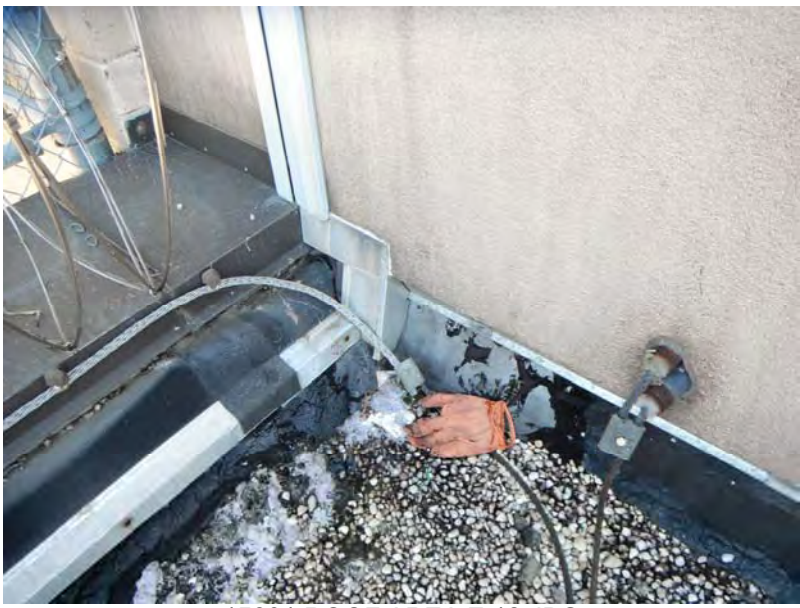
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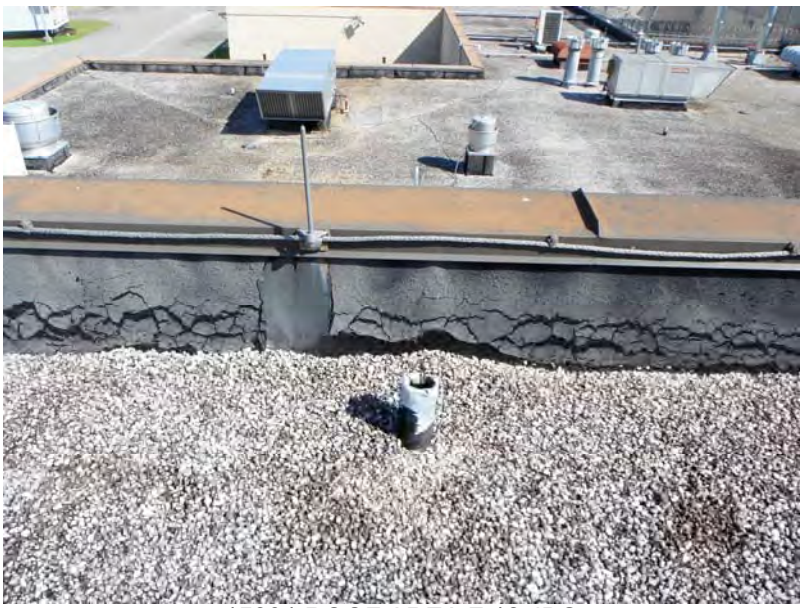
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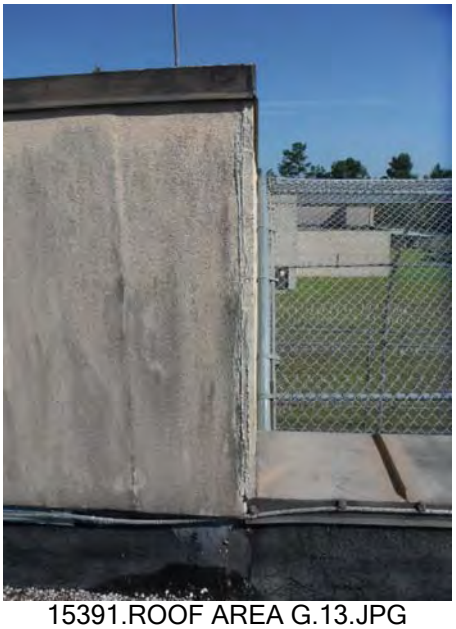
15391.ROOF AREA G.12.JPG


15391.ROOF AREA G.13.JPG


15391.ROOF AREA G.14.JPG


15391.ROOF AREA G.15.JPG


15391.ROOF AREA G.16.JPG


15391.ROOF AREA G.17.JPG

asbestos inspection of roof system

1226 YEAMANS HALL ROAD
HANAHAN, SC 29410
843-566-0161
fax 843-566-0162

ADCENGINEERING.COM

ADC
engineering specialists
BUILDING ENVELOPE

S&ME
9771D Southern Pine Boulevard
Charlotte, NC 28273
704-940-1830 Fax 704-565-4929
NVLAP Lab Code 102075-0

POLARIZED LIGHT MICROSCOPY
Performed by EPA 600/R-93/116 Method

Asbestos Analysis Summary

Client Name ADC Engineering Inc
Client Job Georgetown Co Detention Roof 15391

1226 Yeamans Hall Rd.
Hanahan SC 29410

Date Received 8/25/2016
Date Analyzed 8/26/2016

Job Number 1355-01-689

Lab ID:	*Sample #:*	*Appearance*	*Comments*	*Asbestos %/Type*	*Non-Asbestos Fibrous %/Type*	*Non-Fibrous %/Type*
16-7770	R2	BLACK FIBROUS		ND	10 GLASS 1 CELLULOSE	89 OTHER
16-7771	R11	BLACK FIBROUS		ND	10 GLASS 2 CELLULOSE	88 OTHER
16-7772	R14	BLACK FIBROUS		ND	10 GLASS 2 CELLULOSE	88 OTHER
16-7773	R18	BLACK FIBROUS		ND	10 GLASS 2 CELLULOSE	88 OTHER

Analyzed by: Jane Wasilewski
Additional Comments:

Jane Wasilewski
Laboratory Manager

For heterogeneous samples easily separated into subsamples, and for layered samples, each component is analyzed separately. ND = None Detected (Asbestos Not Present In Representative Sample). RCF= (Refractory Ceramic Fiber) The results relate only to the items tested.
The sample may not be fully representative of the larger material in question. This sheet may not be reproduced except with permission from SME, Inc. This report may not be used to claim product endorsement by NVLAP or any agency of the U.S. Government. Although Polarized Light Microscopy (PLM/Dispersion Staining) (Method EPA 600/R-93/116) is the specified method for analysis of bulk material samples for asbestos under the EPA Asbestos Hazard Emergency Response Act, there have been reports that this method may not identify asbestos when fiber sizes are extremely small or if they are bound in a resinous material. Such materials include floor tile, mastic and asphaltic roofing. Currently, reanalysis by Transmission Electron Microscopy (TEM) to verify results of <1% or "None Detected" for these materials is recommended.

Job Number 1355-01-689

Lab ID:	*Sample #:*	*Appearance*	*Comments*	*Asbestos %/Type*	*Non-Asbestos Fibrous %/Type*	*Non-Fibrous %/Type*
16-7774	R20	BLACK FIBROUS		ND	10 GLASS 2 CELLULOSE	88 OTHER
16-7776	F2	BLACK FIBROUS		ND	3 CELLULOSE 2 GLASS	95 OTHER
16-7777	F11	BLACK FIBROUS		ND	5 GLASS 2 CELLULOSE	93 OTHER
16-7778	F14	BLACK FIBROUS		ND	5 GLASS <1 CELLULOSE	95 OTHER
16-7779	F18	BLACK FIBROUS		ND	15 GLASS 2 SYNTHETIC	83 OTHER
16-7780	F20	BLACK FIBROUS		ND	10 GLASS	90 OTHER

Analyzed by: Jane Wasilewski

Additional Comments:

Jane Wasilewski
Laboratory Manager

For heterogeneous samples easily separated into subsamples, and for layered samples, each component is analyzed separately. ND = None Detected (Asbestos Not Present In Representative Sample). RCF= (Refractory Ceramic Fiber) The results relate only to the items tested.
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S&ME
ENVIRONMENTAL SERVICES
ENGINEERING • TESTING

BULK SAMPLE
CHAIN OF CUSTODY RECORD

1355-01-689

POLARIZED LIGHT MICROSCOPY
PERFORMED BY EPA 600/R-93/116 METHOD

PROJECT NO.	PROJECT NAME	RELINQUISHED BY	DATE	TIME	RECEIVED BY
15391	Georgetown Co. Detention Ctr Roof	Richard L. Cook, Jr.	8/24/2016	9:30 AM	8/25/16
FACILITY Georgetown Co. Detention Ctr Roof		RELINQUISHED BY:	DATE	TIME	RECEIVED BY:
SAMPLER(S) Richard L Cook, Jr.	**DATE TAKEN** August 2, 2016	RELINQUISHED BY:	DATE	TIME	RECEIVED BY:

SAMPLE #	LAB NUMBER	DATE ANALYZED	ANALYSTS INITIALS	ASBESTOS +	ASBESTOS N/D	ARCHIVE NUMBER	DATE ARCH	ARCHIVER INITIALS	SPECIAL INSTRUCTIONS
R2	16-7770								
R11	71								
R14	72								
R18	73								
R20	74								
R23	75								
F2	76								
F11	77								
F14	78								
F18	79								
F20	7780								

☐ Same Day ☐ 24 Hour ☒ 48 Hour ☐ 3 – 5 Day ☐ 6 – 10 Day

ALL SAMPLES WILL BE DISPOSED OF AFTER ANALYSIS UNLESS OTHERWISE REQUESTED

By signing below, I warrant that I am authorized to enter into this agreement for the client named below, and that I authorize the above analysis subject to the terms and conditions on the reverse hereof.

AUTHORIZED BY _____ August 24, 2016 VP (DATE & TITLE)

PRINT NAME Richard L. Cook, Jr.

This agreement is governed by the terms and conditions on the reverse side hereof.

Analysis charges shall be as included in S&ME, Inc.'s fee schedule in effect at the time of the analysis.

CLIENT INVOICE INFORMATION

Client Name: ADC Engineering, Inc. ATTN: Donna Yaw

Client PO#: 15391

Address: 1226 Yeamans Hall Road

City, State, Zip: Hanahan, SC 29410

Phone: (843) 566-0161 FAX: (843) 566-0162

SEND COPIES OF RESULTS TO

Name, Dept.: Nancy Stracener
nancys@adcengineering.com

Co.: ADC Engineering, Inc.

Address: 1226 Yeamans Hall Road

City, State, Zip: Hanahan, SC 29410

Phone: (843) 566-0161 FAX: (843) 566-0162

S&ME
ENVIRONMENTAL SERVICES
ENGINEERING • TESTING

BULK SAMPLE
CHAIN OF CUSTODY RECORD

POLARIZED LIGHT MICROSCOPY
PERFORMED BY EPA 600/R-93/116 METHOD

PROJECT NO.	PROJECT NAME	RELINQUISHED BY	DATE	TIME	RECEIVED BY
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FACILITY Georgetown Co. Detention Ctr Roof		RELINQUISHED BY:	DATE	TIME	RECEIVED BY:
SAMPLER(S) Richard L Cook, Jr.	**DATE TAKEN** August 2, 2016	RELINQUISHED BY:	DATE	TIME	RECEIVED BY:

SAMPLE #	LAB NUMBER	DATE ANALYZED	ANALYSTS INITIALS	ASBESTOS +	ASBESTOS N/D	ARCHIVE NUMBER	DATE ARCH	ARCHIVER INITIALS	SPECIAL INSTRUCTIONS
F R23	16-7781								

☐ Same Day ☐ 24 Hour ☒ 48 Hour ☐ 3 – 5 Day ☐ 6 – 10 Day

ALL SAMPLES WILL BE DISPOSED OF AFTER ANALYSIS UNLESS OTHERWISE REQUESTED

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Phone: (843) 566-0161 FAX: (843) 566-0162

SEND COPIES OF RESULTS TO

Name, Dept.: Nancy Stracener
nancys@adcengineering.com

Co.: ADC Engineering, Inc.

Address: 1226 Yeamans Hall Road

City, State, Zip: Hanahan, SC 29410

Phone: (843) 566-0161 FAX: (843) 566-0162

OrderID: 411606723

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Asbestos Chain of Custody

EMSL Order Number (*Lab Use Only*): 411606723

EMSL ANALYTICAL, INC.
376 CROMPTON ST
CHARLOTTE, NC 28273
PHONE: 704-525-2205
FAX: 704-525-2382

Company : S&ME Inc.		**EMSL-Bill to:** ☐ Same ☒ Different If Bill to is Different note instructions in Comments** *Third Party Billing requires written authorization from third party*	
Street: 9771D Southern Pine Blvd.			
City: Charlotte	**State/Province: NC**	**Zip/Postal Code: 28273**	**Country:**
Report To (Name): Jane Wasilewski		**Telephone #: 704-940-1830**	
Email Address: jwasilewski@smeinc.com		**Fax #:**	**Purchase Order:**
Project Name/Number:		**Please Provide Results:** ☐ Fax ☒ Email	
U.S. State Samples Taken:		**CT Samples:** ☐ Commercial/Taxable ☐ Residential/Tax Exempt	

Turnaround Time (TAT) Options* – Please Check

☐ 3 Hour ☐ 6 Hour ☐ 24 Hour ☑ 48 Hour ☐ 72 Hour ☐ 96 Hour ☐ 1 Week ☐ 2 Week

**For TEM Air 3 hr through 6 hr, please call ahead to schedule.*There is a premium charge for 3 Hour TEM AHERA or EPA Level II TAT. You will be asked to sign an authorization form for this service. Analysis completed in accordance with EMSL's Terms and Conditions located in the Analytical Price Guide.*

PCM - Air ☐ Check if samples are from NY
- ☐ NIOSH 7400
- ☐ w/ OSHA 8hr. TWA

PLM - Bulk (reporting limit)
- ☐ PLM EPA 600/R-93/116 (<1%)
- ☐ PLM EPA NOB (<1%)

Point Count
- ☐ 400 (<0.25%) ☐ 1000 (<0.1%)

Point Count w/Gravimetric
- ☐ 400 (<0.25%) ☐ 1000 (<0.1%)
- ☐ NYS 198.1 (friable in NY)
- ☐ NYS 198.6 NOB (non-friable-NY)
- ☐ NIOSH 9002 (<1%)

TEM – Air ☐ **4-4.5hr TAT (AHERA only)**
- ☐ AHERA 40 CFR, Part 763
- ☐ NIOSH 7402
- ☐ EPA Level II
- ☐ ISO 10312

TEM - Bulk
- ☒ TEM EPA NOB
- ☐ NYS NOB 198.4 (non-friable-NY)
- ☐ Chatfield SOP
- ☐ TEM Mass Analysis-EPA 600 sec. 2.5

TEM – Water: EPA 100.2
- Fibers >10µm ☐ Waste ☐ Drinking
- All Fiber Sizes ☐ Waste ☐ Drinking

TEM- Dust
- ☐ Microvac - ASTM D 5755
- ☐ Wipe - ASTM D6480
- ☐ Carpet Sonication (EPA 600/J-93/167)

Soil/Rock/Vermiculite
- ☐ PLM CARB 435 - A (0.25% sensitivity)
- ☐ PLM CARB 435 - B (0.1% sensitivity)
- ☐ TEM CARB 435 - B (0.1% sensitivity)
- ☐ TEM CARB 435 - C (0.01% sensitivity)
- ☐ TEM Qual. via Filtration Technique
- ☐ TEM Qual. via Drop-Mount Technique

Other:
- ☐

☐ **Check For Positive Stop – Clearly Identify Homogenous Group** | **Filter Pore Size (Air Samples):** ☐ 0.8µm ☐ 0.45µm

Samplers Name: | **Samplers Signature:**

Sample #	Sample Description	Volume/Area (Air) HA # (Bulk)	Date/Time Sampled
R23	Roof		
F23	Flashing		

Client Sample # (s): - **Total # of Samples:** 2

Relinquished (Client): Kyle Nelson **Date:** 8/26/16 **Time:**

Received (Lab): **Date:** 8/26/16 **Time:** 11:45AM D/N

Comments/Special Instructions: Bill to S&ME, Inc., 9751 Southern Pine Blvd., Charlotte NC 28273
****EMAIL INVOICE TO JANE WASILEWSKI****

1355-01-689 (15391)

EMSL Analytical, Inc.
376 Crompton Street, Charlotte, NC 28273
Phone/Fax: (704) 525-2205 / (704) 525-2382
http://www.EMSL.com charlottelab@emsl.com

EMSL Order:	411606723
CustomerID:	SMEI54
CustomerPO:	
ProjectID:	

Attn: **Jane Wasilewski**
S&ME, Inc.
9771D Southern Pine Blvd.
Charlotte, NC 28273

Phone:	
Fax:	(704) 565-4929
Received:	08/26/16 11:45 AM
Analysis Date:	8/29/2016
Collected:	

Project: **1355-01-689 (15391)**

Test Report: Asbestos Analysis of Non-Friable Organically Bound Materials by TEM via EPA/600/R-93/116 Section 2.5.5.1

SAMPLE ID	DESCRIPTION	APPEARANCE	% MATRIX MATERIAL	% NON-ASBESTOS FIBERS	ASBESTOS TYPES
R23 *411606723-0001*	Roof	Black Fibrous Heterogeneous	100	None	No Asbestos Detected
F23 *411606723-0002*	Flashing	Black Fibrous Heterogeneous	100	None	No Asbestos Detected

Analyst(s)

Derrick Young (2)

Lee Plumley, Laboratory Manager
or other approved signatory

Initial report from 08/30/2016 07:59:14

references

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fax 843-566-0162

ADCENGINEERING.COM

engineering specialists
BUILDING ENVELOPE

references

The references below are provided for clarification and to provide additional information for your benefit.

DECKS

1. *Deck Damages and Penetrations,* Heagler, Richard B, Steel Deck Institute, 1987 (Rev. 2000).
2. *Design Manual For Composite Decks, Form Decks And Roof Decks,* Number 31, Steel Deck Institute, 2007
3. *Manual for Construction with Steel Deck,* Steel Deck Institute, Second Edition, 2006.

EIFS

1. *Guide to Exterior Insulation and Finish System Construction*, EIMA (EIFS Industry Members Association).
2. *Exterior Insulation And Finish Systems Current Practices And Future Considerations*, Williams, Mark F. And Williams, Barbara Lamp, November 1994.
3. *Exterior Insulation and Finish System Design Handbook,* Thomas, Robert G., Jr., 1992.

ROOFING SYSTEM

1. *Manual of Low-Slope Roof Systems Fourth Edition*, Griffin, C. W. and Fricklas, Richard, McGraw Hill Companies, Inc , 2006.
2. *Repair Manual for Low-Slope Membrane Roof Systems*, published by the Asphalt Roofing Manufacturers Association, National Roofing Contractors Association (NRCA) and Single Ply Roofing Industry (SPRI), 2014.
3. *Roofing: Design Criteria, Options & Selections; Roof Design Application and Maintenance*, Herbert, R. D., III., 1989.
4. *Roofs - Design, Application and Maintenance*, Baker, Maxwell C., 1980.
5. *The NRCA Architectural Sheet Metal and Metal Roofing Manual*, 2006 Edition, published by the National Roofing Contractors Association.
6. *The NRCA Roofing and Waterproofing Manual*, Fifth Edition, published by the National Roofing Contractors Association, 2006.
7. *The NRCA Roofing Manual 2016 Boxed Set,* published by the National Roofing Contractors Association.

SEALANTS

1. *Sealants: The Professional's Guide*, Sealant, Waterproofing & Restoration Institute, 2013.

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SHEET METAL

1. *Architectural Sheet Metal Manual 7th Edition*, Sheet Metal and Air Conditioning Contractors' National Association, Inc. (SMACNA), 2012.

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Asbestos Inspection of Roof Systems

Mr. Dave Crutchfield
RMF Engineering
194 Seven Farms Drive
Suite G
Charleston, SC 29492
Phone: (843) 971-9639
Georgetown County Detention Center
2394 Browns Ferry Road – Georgetown, SC 29440

Date of Inspection: 08/02/2016
Date of Report: 08/30/2016

1226 YEAMANS HALL ROAD
HANAHAN, SC 29410
843-566-0161
fax 843-566-0162
ADCENGINEERING.COM

Inspector: Richard L. Cook, Jr.
rickc@adcengineering.com
Phone: (843) 566-0161
ADC Project No: 151391

engineering specialists
BUILDING ENVELOPE

August 30, 2016

Mr. Dave Crutchfield
RMF Engineering
194 Seven Farms Drive
Suite G
Charleston, SC 29492

subject: Cover Letter: Asbestos Inspection of Roof Systems
Georgetown County Detention Center
2394 Browns Ferry Road – Georgetown, SC 29440
ADC Project No. 15391

PURPOSE

This report is provided specific to the potential renovation project (roof replacement) for the subject facility as required by the National Emission Standard for Hazardous Air Pollutants (NESHAP) and Regulation 61.88.1, an owner/operator shall ensure that a building inspection, to detect the presence of asbestos-containing material (ACM), has been performed prior to any renovation or demolition activity at a regulated facility.

The scope of the construction project is for potential roof replacement down to the deck for Roof Areas A thru G and the asbestos inspection is limited to this scope.

GENERAL SYNOPSIS

Three (3) samples of each suspect homogenous material were collected for a total of twelve (12) bulk samples that were submitted for analysis and tested per PLM and TEM methods and all of these samples were negative.

All roof samples taken on Roof Area A thru G on August 2, 2016 and were tested in accordance with SCDHEC requirements and the results are attached.

All samples (roofing membrane and flashings) were negative.

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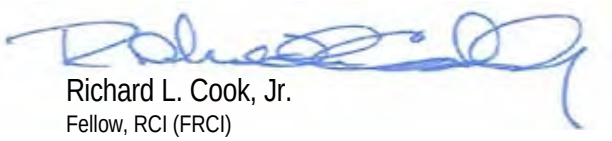
BUILDING ENVELOPE

CLOSING

ADC Engineering, Inc. appreciates this opportunity to be of service to RMF Engineering and Georgetown County Detention Center. Please contact us if we can be of further assistance or if you have any questions or comments regarding this report.

Sincerely,
ADC Engineering, Inc.



Richard L. Cook, Jr.
Fellow, RCI (FRCI)
Registered and Certified Roof Consultant (RRC), Registered Roof Observer (RRO)
Registered Waterproofing Consultant (RWC)
Registered Exterior Wall Consultant (REWC)
Registered Building Envelope Consultant (RBEC)
CCS, CCCA, CDT; The Construction Specifications Institute
LEED® Accredited Professional, US Green Building Council
SC ACEM SC Accredited Commercial Energy Manager
Certified Solar Roofing Professional™ (CSRPs™), RISE™
SCDHEC CONSULTPD ASB-22916
SCDHEC CONSULTBI ASB-22915

Enclosures: Asbestos Inspection of Roof Systems Report

rlc

August 30, 2016

Mr. Dave Crutchfield
RMF Engineering
194 Seven Farms Drive
Suite G
Charleston, SC 29492

subject: Asbestos Inspection of Roof Systems
Georgetown County Detention Center
2394 Browns Ferry Road – Georgetown, SC 29440
ADC Project No. 15391

Enclosures: PLM/TEM with Chain of Custody for Roof Cores taken on 08/02/2016 (with roof plan)

INTRODUCTION

To support the potential roof replacement project for the subject building, Richard L. Cook, Jr. of ADC Engineering, Inc. completed an inspection of the roof systems for the subject facility (Roof Areas A thru G).

NARRATIVE

The age of the original building is unknown, but is approximately twenty four (24) years old. The exterior walls are composed of exterior insulation and finish system (EIFS), also known as synthetic stucco. The roof is a low sloped gravel surfaced built up roof system with tapered polyisocyanurate insulation and a ½" perlite cover board. Various roof penetrations exist on the roof.

1. The square footage of the Roof Areas A thru G is approximately 41,450 SF (or 415 squares [SQS]).

2. The building materials that compose the roof assemblies are metal deck and rigid board insulation types (perlite and polyisocyanurate).

3. The suspect materials were the roof system (41,450 SF) and the flashings (1,920 LF).

4. The non-suspect materials of the roof system were the metal deck, asphalt, metal flashings, wood nailers, and insulations listed above. The roof insulations were included in the roof core samples as requested.

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BUILDING ENVELOPE

INVESTIGATIVE PROCEDURE

The investigation was completed in a systematic approach using both PLM and TEM methods as required by SCDHEC. A visual exterior review was completed of the building perimeter. The emphasis during this phase of the investigation was to review the roof systems, including their terminations, penetrations, and adjacent surfaces. The basic building footprint and any adjoining structures or additions were also noted. The investigation of the roof was then conducted to include a detailed visual inspection. The visual inspection included observation of the applicable roof areas, general roof appearance and surface conditions, flashing conditions and details, perimeter conditions, roof penetrations and terminations. Roof core samples were taken to determine the roof system composition and provide additional information on the roof membrane condition. The core samples were forwarded to S&ME Laboratories to be tested for asbestos containing roofing materials. The summary results are provided in cover letter and the actual reports are within the Enclosures.

A roof plan was generated from the field survey measurements and is provided herein to document the location of the roof, flashing, and other cores.

EXECUTIVE SUMMARY

Specific to the roof system, the roof system appears to be a homogenous assembly, as did the perimeter base flashing. The penetration flashings were also included.

1. Three samples for each of the above miscellaneous materials were collected for testing. The roof samples and base flashing samples were cored to the substrate.

2. The miscellaneous, bitumen based samples were taken on August 2, 2016 and were all in good condition and considered non-friable. Roof plans and lab results are provided within the Enclosures.

3. The homogenous materials identified were the roof and the base flashings.

4. The samples were tested in accordance with SCDHEC requirements for PLM and TEM.

5. All samples were negative, and no abatement of asbestos containing roofing materials is required for the roof replacement project.

QUALIFICATIONS

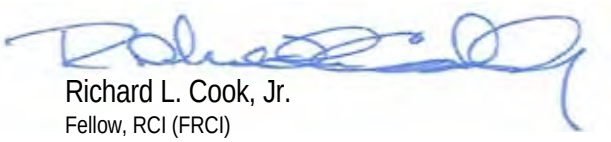
This report summarizes our assessment of the select roof system conditions (Areas A thru G) at the subject facility at the time of our inspection. Statements herein are based on the information provided to us, our observations at the time of inspection, and our experience with

similar conditions. The discovery of any changed conditions which deviate from the information contained in this report should be brought to our attention for further evaluation.

CLOSING

ADC Engineering, Inc. appreciates this opportunity to be of service to RMF Engineering and Georgetown County Detention Center. Please contact us if we can be of further assistance or if you have any questions or comments regarding this report.

Sincerely,
ADC Engineering, Inc.



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SC ACEM SC Accredited Commercial Energy Manager
Certified Solar Roofing Professional™ (CSRPs™), RISE™
SCDHEC CONSULTPD ASB-22916
SCDHEC CONSULTBI ASB-22915

Enclosures: PLM/TEM with Chain of Custody for Roof Cores taken on 08/02/2016 (with roof plan)

rlc

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POLARIZED LIGHT MICROSCOPY
Performed by EPA 600/R-93/116 Method

Asbestos Analysis Summary

Client Name ADC Engineering Inc
Client Job Georgetown Co Detention Roof 15391

1226 Yeamans Hall Rd.
Hanahan SC 29410

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Date Analyzed 8/26/2016

Job Number 1355-01-689

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Analyzed by: Jane Wasilewski
Additional Comments:

Jane Wasilewski
Laboratory Manager

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Job Number 1355-01-689

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16-7776	F2	BLACK FIBROUS		ND	3 CELLULOSE 2 GLASS	95 OTHER
16-7777	F11	BLACK FIBROUS		ND	5 GLASS 2 CELLULOSE	93 OTHER
16-7778	F14	BLACK FIBROUS		ND	5 GLASS <1 CELLULOSE	95 OTHER
16-7779	F18	BLACK FIBROUS		ND	15 GLASS 2 SYNTHETIC	83 OTHER
16-7780	F20	BLACK FIBROUS		ND	10 GLASS	90 OTHER

Analyzed by: Jane Wasilewski

Additional Comments:

Jane Wasilewski
Laboratory Manager

For heterogeneous samples easily separated into subsamples, and for layered samples, each component is analyzed separately. ND = None Detected (Asbestos Not Present In Representative Sample). RCF= (Refractory Ceramic Fiber) The results relate only to the items tested.
The sample may not be fully representative of the larger material in question. This sheet may not be reproduced except with permission from SME, Inc. This report may not be used to claim product endorsement by NVLAP or any agency of the U.S. Government. Although Polarized Light Microscopy (PLM/Dispersion Staining) (Method EPA 600/R-93/116) is the specified method for analysis of bulk material samples for asbestos under the EPA Asbestos Hazard Emergency Response Act, there have been reports that this method may not identify asbestos when fiber sizes are extremely small or if they are bound in a resinous material. Such materials include floor tile, mastic and asphaltic roofing. Currently, reanalysis by Transmission Electron Microscopy (TEM) to verify results of <1% or "None Detected" for these materials is recommended.

S&ME
ENVIRONMENTAL SERVICES
ENGINEERING • TESTING

BULK SAMPLE
CHAIN OF CUSTODY RECORD

1355-01-689

POLARIZED LIGHT MICROSCOPY
PERFORMED BY EPA 600/R-93/116 METHOD

PROJECT NO.	PROJECT NAME	RELINQUISHED BY	DATE	TIME	RECEIVED BY
15391	Georgetown Co. Detention Ctr Roof	Richard L. Cook, Jr.	8/24/2016	9:30 AM	8/25/16
FACILITY Georgetown Co. Detention Ctr Roof		RELINQUISHED BY:	DATE	TIME	RECEIVED BY:
SAMPLER(S) Richard L Cook, Jr.	**DATE TAKEN** August 2, 2016	RELINQUISHED BY:	DATE	TIME	RECEIVED BY:

SAMPLE #	LAB NUMBER	DATE ANALYZED	ANALYSTS INITIALS	ASBESTOS +	ASBESTOS N/D	ARCHIVE NUMBER	DATE ARCH	ARCHIVER INITIALS	SPECIAL INSTRUCTIONS
R2	16-7770								
R11	71								
R14	72								
R18	73								
R20	74								
R23	75								
F2	76								
F11	77								
F14	78								
F18	79								
F20	7780								

☐ Same Day ☐ 24 Hour ☒ 48 Hour ☐ 3 – 5 Day ☐ 6 – 10 Day

ALL SAMPLES WILL BE DISPOSED OF AFTER ANALYSIS UNLESS OTHERWISE REQUESTED

By signing below, I warrant that I am authorized to enter into this agreement for the client named below, and that I authorize the above analysis subject to the terms and conditions on the reverse hereof.

AUTHORIZED BY _____ August 24, 2016 VP (DATE & TITLE)

PRINT NAME Richard L. Cook, Jr.

This agreement is governed by the terms and conditions on the reverse side hereof.

Analysis charges shall be as included in S&ME, Inc.'s fee schedule in effect at the time of the analysis.

CLIENT INVOICE INFORMATION

Client Name: ADC Engineering, Inc. ATTN: Donna Yaw

Client PO#: 15391

Address: 1226 Yeamans Hall Road

City, State, Zip: Hanahan, SC 29410

Phone: (843) 566-0161 FAX: (843) 566-0162

SEND COPIES OF RESULTS TO

Name, Dept.: Nancy Stracener
nancys@adcengineering.com

Co.: ADC Engineering, Inc.

Address: 1226 Yeamans Hall Road

City, State, Zip: Hanahan, SC 29410

Phone: (843) 566-0161 FAX: (843) 566-0162

S&ME
ENVIRONMENTAL SERVICES
ENGINEERING • TESTING

BULK SAMPLE
CHAIN OF CUSTODY RECORD

POLARIZED LIGHT MICROSCOPY
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SAMPLER(S) Richard L Cook, Jr.	**DATE TAKEN** August 2, 2016	RELINQUISHED BY:	DATE	TIME	RECEIVED BY:

SAMPLE #	LAB NUMBER	DATE ANALYZED	ANALYSTS INITIALS	ASBESTOS +	ASBESTOS N/D	ARCHIVE NUMBER	DATE ARCH	ARCHIVER INITIALS	SPECIAL INSTRUCTIONS
F R23	16-7781								

☐ Same Day ☐ 24 Hour ☒ 48 Hour ☐ 3 – 5 Day ☐ 6 – 10 Day

ALL SAMPLES WILL BE DISPOSED OF AFTER ANALYSIS UNLESS OTHERWISE REQUESTED

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Name, Dept.: Nancy Stracener
nancys@adcengineering.com

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OrderID: 411606723

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Asbestos Chain of Custody

EMSL Order Number (*Lab Use Only*): 411606723

EMSL ANALYTICAL, INC.
376 CROMPTON ST
CHARLOTTE, NC 28273
PHONE: 704-525-2205
FAX: 704-525-2382

Company : S&ME Inc.		**EMSL-Bill to:** ☐ Same ☒ Different If Bill to is Different note instructions in Comments** *Third Party Billing requires written authorization from third party*	
Street: 9771D Southern Pine Blvd.			
City: Charlotte	**State/Province: NC**	**Zip/Postal Code: 28273**	**Country:**
Report To (Name): Jane Wasilewski		**Telephone #: 704-940-1830**	
Email Address: jwasilewski@smeinc.com		**Fax #:**	**Purchase Order:**
Project Name/Number:		**Please Provide Results:** ☐ Fax ☒ Email	
U.S. State Samples Taken:		**CT Samples:** ☐ Commercial/Taxable ☐ Residential/Tax Exempt	

Turnaround Time (TAT) Options* – Please Check

☐ 3 Hour ☐ 6 Hour ☐ 24 Hour ☑ 48 Hour ☐ 72 Hour ☐ 96 Hour ☐ 1 Week ☐ 2 Week

**For TEM Air 3 hr through 6 hr, please call ahead to schedule.*There is a premium charge for 3 Hour TEM AHERA or EPA Level II TAT. You will be asked to sign an authorization form for this service. Analysis completed in accordance with EMSL's Terms and Conditions located in the Analytical Price Guide.*

PCM - Air ☐ Check if samples are from NY
- ☐ NIOSH 7400
- ☐ w/ OSHA 8hr. TWA

PLM - Bulk (reporting limit)
- ☐ PLM EPA 600/R-93/116 (<1%)
- ☐ PLM EPA NOB (<1%)

Point Count
- ☐ 400 (<0.25%) ☐ 1000 (<0.1%)

Point Count w/Gravimetric
- ☐ 400 (<0.25%) ☐ 1000 (<0.1%)
- ☐ NYS 198.1 (friable in NY)
- ☐ NYS 198.6 NOB (non-friable-NY)
- ☐ NIOSH 9002 (<1%)

TEM – Air ☐ **4-4.5hr TAT (AHERA only)**
- ☐ AHERA 40 CFR, Part 763
- ☐ NIOSH 7402
- ☐ EPA Level II
- ☐ ISO 10312

TEM - Bulk
- ☒ TEM EPA NOB
- ☐ NYS NOB 198.4 (non-friable-NY)
- ☐ Chatfield SOP
- ☐ TEM Mass Analysis-EPA 600 sec. 2.5

TEM – Water: EPA 100.2
- Fibers >10µm ☐ Waste ☐ Drinking
- All Fiber Sizes ☐ Waste ☐ Drinking

TEM- Dust
- ☐ Microvac - ASTM D 5755
- ☐ Wipe - ASTM D6480
- ☐ Carpet Sonication (EPA 600/J-93/167)

Soil/Rock/Vermiculite
- ☐ PLM CARB 435 - A (0.25% sensitivity)
- ☐ PLM CARB 435 - B (0.1% sensitivity)
- ☐ TEM CARB 435 - B (0.1% sensitivity)
- ☐ TEM CARB 435 - C (0.01% sensitivity)
- ☐ TEM Qual. via Filtration Technique
- ☐ TEM Qual. via Drop-Mount Technique

Other:
- ☐

☐ **Check For Positive Stop – Clearly Identify Homogenous Group** | **Filter Pore Size (Air Samples):** ☐ 0.8µm ☐ 0.45µm

Samplers Name: | **Samplers Signature:**

Sample #	Sample Description	Volume/Area (Air) HA # (Bulk)	Date/Time Sampled
R23	Roof		
F23	Flashing		

Client Sample # (s): - **Total # of Samples:** 2

Relinquished (Client): Kyle Nelson **Date:** 8/26/16 **Time:**

Received (Lab): **Date:** 8/26/16 **Time:** 11:45AM D/N

Comments/Special Instructions: Bill to S&ME, Inc., 9751 Southern Pine Blvd., Charlotte NC 28273
****EMAIL INVOICE TO JANE WASILEWSKI****

1355-01-689 (15391)

EMSL Analytical, Inc.
376 Crompton Street, Charlotte, NC 28273
Phone/Fax: (704) 525-2205 / (704) 525-2382
http://www.EMSL.com charlottelab@emsl.com

EMSL Order:	411606723
CustomerID:	SMEI54
CustomerPO:	
ProjectID:	

Attn: **Jane Wasilewski**
S&ME, Inc.
9771D Southern Pine Blvd.
Charlotte, NC 28273

Phone:	
Fax:	(704) 565-4929
Received:	08/26/16 11:45 AM
Analysis Date:	8/29/2016
Collected:	

Project: **1355-01-689 (15391)**

Test Report: Asbestos Analysis of Non-Friable Organically Bound Materials by TEM via EPA/600/R-93/116 Section 2.5.5.1

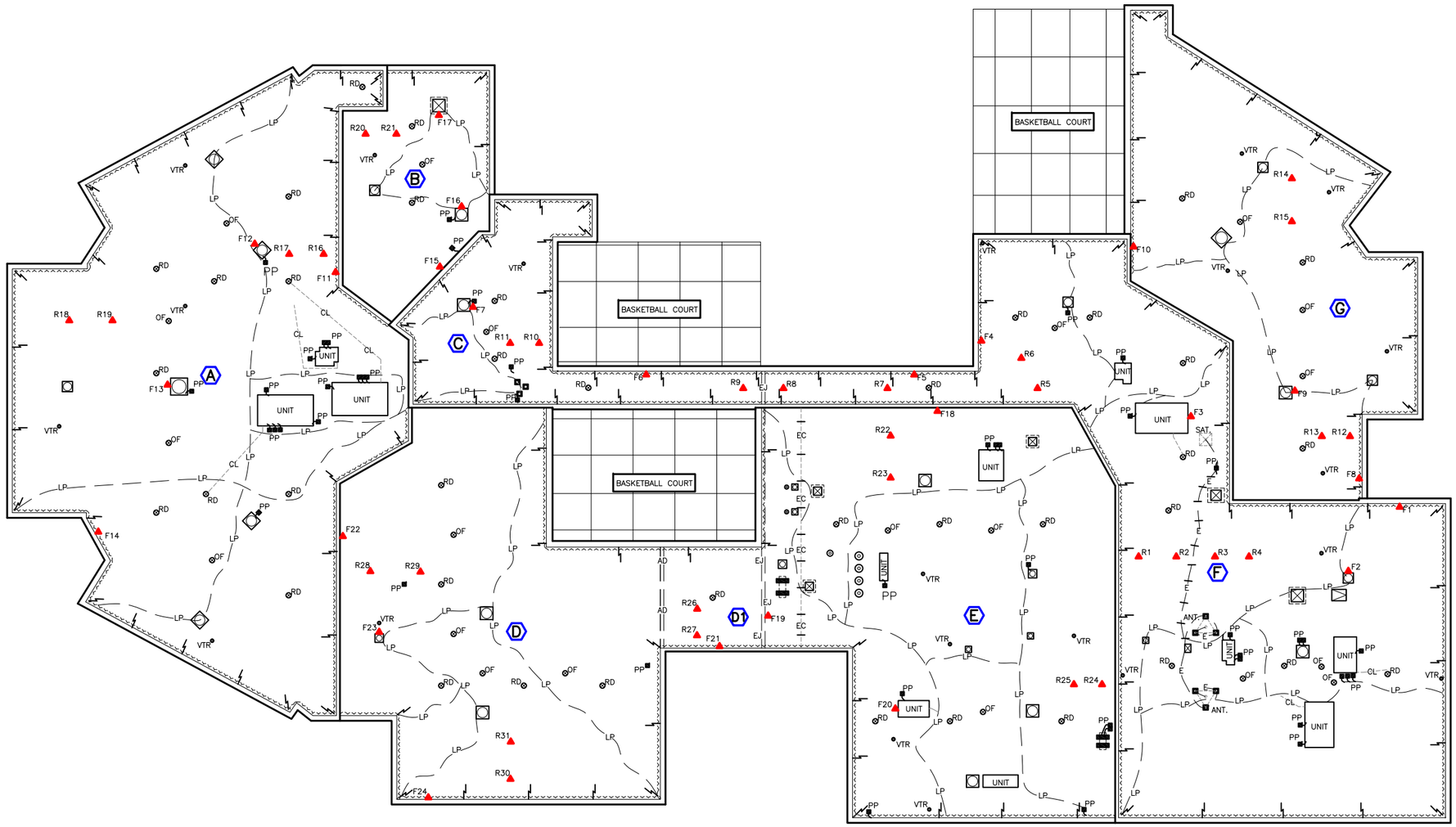
SAMPLE ID	DESCRIPTION	APPEARANCE	% MATRIX MATERIAL	% NON-ASBESTOS FIBERS	ASBESTOS TYPES
R23 *411606723-0001*	Roof	Black Fibrous Heterogeneous	100	None	No Asbestos Detected
F23 *411606723-0002*	Flashing	Black Fibrous Heterogeneous	100	None	No Asbestos Detected

Analyst(s)

Derrick Young (2)

Lee Plumley, Laboratory Manager
or other approved signatory

Initial report from 08/30/2016 07:59:14



PLAN NORTH

OVERALL EXISTING ROOF PLAN
(GEORGETOWN DETENTION CENTER)

NOT TO SCALE

GEORGETOWN DETENTION CENTER

2394 BROWN FERRY RD
GEORGETOWN, SOUTH CAROLINA

ENGINEERING SPECIALISTS
SITE SERVICES \ BUILDING ENVELOPE \ STRUCTURAL
1226 YEAMANS HALL ROAD
HANAHAN, SC 29410
843-566-0161
fax 843-566-0162
ADCENGINEERING.COM

OVERALL EXISTING ROOF PLAN

R1