December 10, 2020

Mr. David Wisnewski
MN Department of Corrections
Suite 200
1450 Energy Park Drive
St Paul, MN  55108-5219

Subject:  Air Quality Assessment
Minnesota Correctional Facility – St. Cloud
IHSC Project Number:  M20-551.4

Dear Mr. Wisnewski:

Industrial Hygiene Services Corporation (IHSC) has completed our assessment of air quality associated with the living units at the Minnesota Correctional Facility in St. Cloud, Minnesota. The air quality assessment was developed to describe indoor air quality (IAQ) metrics that were present within accessible living unit areas of the facility and to develop recommendations to improve observed conditions or the measured results that fall outside of industry or regulatory standards.

Assessment work was completed on December 3, 2020.

SCOPE OF WORK AND ASSESSMENT LOCATIONS

The following areas and spaces within the facility were part of the IAQ assessment.

Air Handling Units (AHUs) in Living Units A, B, C, D, E, R-Annex, Segregation, and the School House

Specific AHUs within the referenced living units where data was collected as part of the air quality assessment included:

- Living Unit A AHU
- Living Unit B AHU
- Living Unit C AHU (under construction and not operable)
- Living Unit D
- South AHU (attic, 2020 installation)
- North AHU (attic, 2020 installation)
  - Living Unit E
    - North AHU (basement)
    - South AHU (basement)
  - R-Annex AHU
  - Segregation AHU
  - School House AHU

Adenosine Triphosphate Sampling in Living Unit Spaces

Facility staff informed IHSC personnel that Living Unit B was the only unit where controlled cases of Covid-19 were present. The facility reported that there was a strong possibility of community spread, even with face covering, hand washing, and social distancing in the remaining living units. Based on this information, IHSC did not enter active living unit areas where uncontrolled Covid-19 was present to test surfaces for adenosine triphosphate (ATP). However, IHSC did sample surfaces in Living Unit B.

TEST PROCEDURES AND METHODS

To assess ambient IAQ conditions, IHSC used a variety of direct reading instruments to collect data that could be compared to relevant regulatory and industry standards for the purpose of describing overall indoor air quality.

Sampling and assessment focused on temperature, relative humidity (RH), carbon monoxide (CO), carbon dioxide (CO₂), air movement parameters including air velocity and air volume, and efficiency of filter capture through measurement of ultrafine particles (particles between 0.02 and 1 micron in diameter).

In addition, visual inspection and observations were recorded (Table 1) and digitally documented (Exhibit 1), where possible.

Evaluation Parameters

Air Flow and Air Volume

Air flow and volume measurements were made with a calibrated hot wire anemometer (TSI VelociCalc, Model 9535). Measurements were compared with building automation system controls, if available. Particular attention was given to air movement at room boundaries to determine pressurization features.
Common Indoor Air Quality Elements

Industrial Hygiene Services Corporation obtained measurements for temperature, RH, CO, and CO$_2$ using a calibrated IAQ Calc (TSI IAQ Calc, Model 7545). Spot measurements collected were evaluated against published American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE) and Occupational Safety and Health Administration (OSHA) guidance. This data can indicate areas of inadequate air movement or mixing and the presence of contaminants from outside the room boundaries.

Ultrafine Particle Concentration

Ultrafine particle concentrations were measured to obtain heating, ventilation, and air conditioning (HVAC) air filter performance. A calibrated ultrafine particle counter (TSI P-Trak, Model 8525) was used upstream and downstream of the supply air filter banks to perform this assessment. In addition, indoor air or make-up air was evaluated against outside air to determine the concentration of ultrafine particulate that was captured through the return air system. This device measures particles between 0.02 and 1 micron in diameter.

Measurements were obtained from the upstream and downstream side of the filter banks to determine capture efficiency and areas of by-pass that may be present in the filter bank.

Heating, Ventilation, and Air Conditioning System Inspection

Inspection of the evaluated HVAC systems occurred at specific locations where access was available or where critical components requiring maintenance were present. Qualitative visual inspection of the HVAC units was documented with digital images, where possible. Representative images of conditions observed are included with this report as Exhibit 1.

Adenosine Triphosphate Sampling

To evaluate the level of cleaning occurring at locations where staff and offenders have access to high touch surfaces and where routine cleaning of those surfaces should be occurring daily, IHSC used adenosine triphosphate (ATP) swabs to measure ATP concentrations. Surface contaminations were collected with Hygiena brand UltraSnap test swabs following the manufacturer’s instructions and analyzed in a Hygiena SystemSure Plus luminometer. Adenosine Triphosphate concentrations can be used to assess the level of cleanliness of the sampled surface.
Adenosine Triphosphate is the energy molecule that is present in all living cells. An ATP test will determine if a surface is contaminated with organic residue. An ATP test will not specify the type of organic residue present, but the results will indicate that a surface contains a bioburden. Used as a screening tool, it is effective in rapidly evaluating surface conditions in nearly any work environment.

Adenosine Triphosphate was measured as a Relative Light Unit (RLU) or unit of measure for bioluminescence. Measuring the amount of bioluminescence from an ATP reaction provides an excellent indication of surface cleanliness because the quantity of light generated by the reaction is directly proportional to the amount of ATP present in the sample. The bioluminescence reaction is immediate, and results are expressed numerically on the luminometer screen in RLUs.

For interpretation of ATP surface sampling results in RLUs, the following criteria have been used in this report: lower than 30 RLUs = Pass (acceptable condition), 30 to 100 RLUs = Caution, and greater than 100 RLUs = Fail (unacceptable condition). The acceptance criteria levels were based on information provided by Hygiena’s product information, “Establishing RLU Pass/Fail Limits”, retrieved from https://www.hygiena.com/rlulimits-hc.html.

Surfaces evaluated included surfaces that offenders or staff would likely come in contact. Variation in measured ATP concentrations of similar surfaces is likely attributed to the inconsistent cleaning techniques employed by personnel during the cleaning process. The sample results and sample locations for all buildings tested are summarized in the attached Table 2.

**Interviews and Maintenance Record Review**

Industrial Hygiene Services Corporation reviewed maintenance activities, procedures, and discussed maintenance schedules with physical plant staff. Observations and information obtained from facility personnel have been incorporated into the recommendations of this report.

**PROJECT OBSERVATIONS AND RESULTS**

**Air Handling Units (AHUs) in Living Units A, B, B-Annex, C, D, E, R-Annex, Segregation, and the School House**

Evaluation of the air handling units in the living units was limited by the quality of the seals at access doors on the upstream and downstream side of the filter bank.
Of the eight AHUs evaluated, six of the units in the facility could be completely sealed during the testing. The AHUs in Living Unit D and R-Annex required that a door or hatch remain cracked to allow for insertion of the sampling probe. Air Handling Units openings caused the measurements to reflect the actual conditions less accurately than the units that could be completely sealed during testing. In review of the data obtained from the other Minnesota Correctional Facilities assessed, IHSC has calculated that there was a 3.5 percent (%) decrease in measured ultrafine particle filter capture when the AHU was not fully sealed. This indicates that a slight, but mostly negligible, loss of accuracy when taking measurements in unsealed AHUs.

At every location except for the Segregation Living Unit AHU, each AHU contained at least one 2-inch-thick air filter with a Minimum Efficiency Reporting Value (MERV) of 8. The AHUs in Living Units A, B, and C were outfitted with a second 4-inch MERV 8 filter within the filter rack. Replacement filters were observed in each of the mechanical spaces.

In general, the HVAC filters were found to both reduce the air velocity and ultrafine particle (UFP) levels. The average UFP level from all tested interior locations was 1,933 particles per cubic centimeter (pt/cm³). The number of ultrafine particles on the exterior of the building on the day of sampling was relatively low at 2,730 pt/cm³. IHSC calculated that the air within the living units had been filtered with a 30 percent (%) efficiency, but likely the filters are capable of greater capture efficient when the exterior ultrafine particle counts increase. Typical capture efficiency for a filter with a MERV 8 rating is 10 to 20 percent.

Further, when measuring the circulated indoor air within the AHUs, it was found that there was an average of 13% UFP reduction in AHUs using only MERV rated 8 filters, and an average 20% UFP reduction in Living Unit A where two sets of MERV 8 filters had been installed. Filter reduction efficiency is affected by several factors including gaps in the filter bank, MERV rating of the air filters, proper filter installation, and data collection technique. The use of air filters with a 5-8 MERV rating within the living units is appropriate for the size and age of the air handling units.

When present, elevated levels of UFP measured on the downstream side of the supply filters would indicate that maintenance or repair is necessary.

The average recorded CO₂ level from in and adjacent to the AHUs was measured to be 665 parts per million (ppm). The exterior air on the day of sampling was measured at 365 ppm. This value falls below the 1,000-ppm threshold as set by OSHA as the upper indoor CO₂ limit. Except for the air handling unit in the School House, the air supplied to the living areas is a mixture of returned air from the interior and make-up air from the exterior.
The supply and return registers in the living units were not evaluated due to potential exposure to the coronavirus. Representative registers in common areas were observed.

**Living Unit A Observations**

The AHU for this living unit was located in an upper-level penthouse. This penthouse also houses the AHUs that supply Living Units B and C. A single AHU serves each living area in Living Units A, B, and C. Downstream measurements of the AHU were not possible due to exposed fan blades and belts making the units unsafe to test while in operation.

The AHU in Living Unit A was the only AHU observed to have two sets of MERV 8 filters within the filter rack. Facility personnel were not sure why the observed configuration was present at this location and not at the other living unit AHUs. A determination should be made to determine the correct number and layers of filters that meet the design criteria for each air handling unit. Dirt accumulation on the air filters was observed to be acceptable and maintenance records indicated that filters were changed on a quarterly basis, following manufacturer recommendations.

Living Unit A was not entered due to community transmission of Covid-19 and restrictions placed on IHSC by the facility. IHSC did observe precautionary signage in the living unit. IHSC observed wall postings and floor markings to remind staff and offenders of good masking, social distancing, and hand washing practices.

**Living Unit B and B-Annex Observations**

The AHU for this living unit was located in an upper-story penthouse. A single AHU serves Living Unit B. Measurements of the AHU performance was not possible due to a broken heating coil. Parts were expected within the next 4 to 6 weeks at which time the unit will be put back in service.

IHSC reviewed a smaller AHU that served the area labeled at B-Annex. This unit was decommissioned and not operational. Facility personnel indicated that this unit was scheduled to be replaced in the 2nd quarter 2021. No measurements or assessments were made of this unit.

IHSC reviewed the common pipe chase between the cell blocks. Exhaust air from the cells passes through a secure grate and into the chase to be exhausted through the attic space. Supply air ducts enter each cell block. Recent construction work was evident in this space as it was clean and devoid of exhaust air accumulation.
Dirt accumulation on the air filters was observed to be acceptable and maintenance records indicated that filters were changed on a quarterly basis, following manufacturer recommendations.

Precautionary signage was not evident in Living Unit B. IHSC did not observe wall postings or floor markings to remind staff and offenders of good masking, social distancing, and hand washing practices. Facility staff indicated that offenders are only expected to wear face coverings outside of their cells.

Living Unit C Observations

The AHU for Living Unit C was located in an upper story penthouse, along with the AHUs that serve Living Units A and B. Facility staff reported that the AHU serving Living Unit C was under construction and had not operated for two months. The facility reported that the air handling unit would be thoroughly inspected and maintained, with new filters installed, prior to returning it to service at the end of the construction event and before offenders were moved back into the space.

Precautionary signage and information in Living Unit C appeared to be the same as posted in Living Units A and B.

Living Unit D Observations

Air handling units for Living Unit D were located in the attic of the space. Two units are present, one serving the north side of the space and one serving the south side of the space. Recent construction in the space included the addition of attic insulation. Visible dust was generated by movement in the attic. Similarly, visible dust was generated when AHU doors were opened for testing.

The AHU serving the north side of the living unit was not operating on the day of the assessment. Facility staff were determining why the unit was not operating. For testing, facility personnel turned the unit on, testing was completed, and the unit was turned off again. A determination will be made as to the maintenance status of this unit.

IHSC reviewed the common pipe chase between the cell blocks. Exhaust air from the cells passes through a secure grate and into the chase to be exhausted through the attic space. Supply air ducts enter each cell block. Recent construction work was evident in this space as it was clean and devoid of exhaust air accumulation.
Dirt accumulation on the air filters was observed to be acceptable and maintenance records indicated that filters were changed on a quarterly basis, following manufacturer recommendations.

Precautionary signage was limited in Living Unit D. IHSC did not observe wall postings or floor markings to reminder staff and offenders of good masking, social distancing, and hand washing practices. Facility staff indicated that offenders are only expected to wear face coverings outside of their cells.

**Living Unit E Observations**

Two older air handling units serve Living Unit E and were located in the basement of the space. One unit serves the north side of the space and one unit serves the south side of the space. Air velocity on the downstream side of the filters was measured at the higher rate than upstream of the filters. This is likely due to leakage within the duct downstream of the filters and areas of filter by-pass that are enhanced by the greater vacuum created on the downstream side of the filters.

IHSC observed that the interior of the AHU and the filter faces contained observable dirt accumulation. It was not clear that adequate maintenance records existed for this living unit and filter change-out records indicated that filters were changed on a quarterly basis, following manufacturer recommendations.

Living Unit E was not entered due to community transmission of Covid-19 and restrictions placed on IHSC by the facility. To the extent it could be observed from outside the living unit, IHSC did observe precautionary signage in the living unit.

**R-Annex Observations**

The air handling unit for the R-Annex was located above the restroom ceiling in the space. Facility staff reported that access of this unit for maintenance is difficult. IHSC measured the highest CO₂ levels in this space which was likely the result of minimal fresh air entering the space, limited movement of air in the space, and many individuals occupying this space.

Measurements on each side of the filter bank was not possible without leaving an access door open. Recorded measurements of air velocity and ultrafine particles in the AHU as recorded are not precise. IHSC did observe that unit and visible interior duct on either side of the filter bank were dirty. Maintenance records for this AHU were not readily available for inspection. It was not clear when the filters were last changed in this unit.
Precautionary signage was evident in the R-Annex. IHSC did observe wall postings to remind staff and offenders of good masking, social distancing, and hand washing practices. Facility staff indicated that offenders are only expected to wear face coverings outside of their cells.

**Segregation Living Unit Observations**

The air handling unit for the Segregation living unit was located below the unit in the basement level of the building. The AHU sits on a dirt floor. When the unit was accessed for evaluation and testing, it was noted that the supply fan was not operating. Facility staff were not sure how long the fan had been in this condition. A repair order was issued, and attempts were made to repair the fan unsuccessfully. Parts will be ordered so the unit can be returned to an operational state. IHSC also observed that there were no filters in the upstream filter bank. Facility personnel were not sure if the filters were intentional left out of the AHU to aide in moving some air, or if the replacement of filters reached a certain point and was forgotten. Access of this unit for maintenance is difficult.

Measurements were obtained on the downstream side of the filter bank but are not particularly meaningful given the lack of filters within the unit. IHSC observed that unit and visible interior duct on either side of the filter bank were dirty. Maintenance records for this AHU were not readily available for inspection. It was not clear when the filters were last changed in this unit.

IHSC did not enter the living unit space due to Covid-19 infections; however, facility staff indicated that signage in this unit was similar to signage observed in other living units.

**School House Living Unit Observations**

A single unique air handling unit serves the School House Living Unit. In this space, supply air is drawn out of the basement of the building, passed through a bank of filters and heating coils through negative pressure created by a supply fan pushing air into the unit. The supply fan is located downstream of the filter bank. Air velocity on the downstream side of the filters was measured at the higher rate than upstream of the filters. This is likely due to leakage within the duct downstream of the filters and areas of filter by-pass that are enhanced by the greater vacuum created on the downstream side of the filters.

IHSC did not enter the living unit space due to Covid-19 infections; however, facility staff indicated that signage in this unit was similar to signage observed in other living units.
Indoor Air Quality Measurements

The American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) and OSHA recommends ambient room temperature between 68 degrees Fahrenheit (°F) to 76° F.

The American Society of Heating, Refrigeration and Air Conditioning Engineers recommends a relative humidity (RH) level between 30% and 70%. The Occupational Safety and Health Administration recommends a level between 20% and 60%. The average humidity level recorded in interior areas were at the low end of the OSHA and ASHRAE recommendations, which is not unusual in Minnesota at this time of year. Low humidity levels have been shown to dry the lining of nasal passages making occupants susceptible to rhinoviruses.

The American Society of Heating, Refrigeration and Air Conditioning Engineers recommends a CO₂ level below 1,000 (ppm). The Occupational Safety and Health Administration, based on the National Institute for Occupational Safety and Health recommendations, recommends 600 ppm for minimal air quality complaints and 1,000 ppm as an upper limit for indoor levels. The Occupational Safety and Health Administration also has a Permissible Exposure Limit (PEL) Time Weighted Average (TWA) of 5,000 ppm. The minimum, maximum, and average readings for all areas tested were all well below the maximum recommended CO₂ reading of 1,000 ppm.

The American Society of Heating, Refrigeration and Air Conditioning Engineers recommends a CO level below 9 ppm in an office setting, and Minnesota OSHA sets a PEL TWA over an eight-hour period of 35 ppm. All measurements for CO on December 3, 2020 were 0.0 ppm, except for Living Unit B. Other than Living Unit B, CO levels will not be addressed in the rest of the report.

Table 1 attached to this report presents data obtained at each air handling unit and living unit space that was functioning and accessible.

Living Unit A Measurements

At the downstream side of the supply fan, the temperature was measured at 71.6° F, the relative humidity was measured at 17.6%, and the CO₂ level measured at 483 ppm. With the exception of relative humidity, common IAQ parameters were within the OSHA and ASHRAE recommended ranges. The measured relative humidity value is acceptable given the time of year of the assessment was performed.
Note that low humidity levels have been shown to dry the lining of nasal passages making occupants susceptible to rhinoviruses.

No ATP sampling of living unit surfaces occurred.

**Living Unit B Measurements**

Within the living unit the temperature was measured at 63.8°F, slightly lower than the recommended range, but according to staff this was a welcome deviation from typical conditions that tend to run on the warm side. The cooler temperature measured is likely related to the broken heating coil referenced earlier. The relative humidity was measured at 29%, and the CO2 level measured at 636 ppm. Living Unit B was the one location at the facility where CO levels were detected at 3.6 ppm, significantly less than the Minnesota OSHA PEL, but may be an indication that uncombusted fuel is being introduced to the AHU from exterior areas of the building (parking lots, loading dock, truck gate, idling vehicles in front of the Administration Building). Other than the ambient temperature in the space, common IAQ parameters were within the OSHA and ASHRAE recommended ranges.

Living Unit B was the one unit that IHSC could access for sampling of commonly used or touched surfaces. Since the function of each living unit is essentially the same, data obtained in Living Unit B is likely the same or very similar to data that would have been obtained from the other Living Units.

Using 30 Relative Light Units (RLUs) as acceptable and greater than 100 RLUs as unacceptable, two areas were found to have acceptable levels of bioburden: the receiver of phone #2 and the ice machine dispenser button.

Four areas tested were in the caution range, including a staircase banister, a tabletop, a fan power cord switch, and a keypad on a vending machine.

Seven surfaces were measured to have bioburden present greater than 100 RLUs. Surfaces included a door handle, a tabletop, an armrest, a desktop, a handrail, and a floor area. These results indicate an unacceptable level of cleanliness and indicate greater effort is needed to frequently clean those surfaces with an approved sanitizer and disinfectant.

Table 2 summarizes the surfaces measured and ATP results obtained in Living Unit B.

The facility has developed a procedure for the use of hand-held sprayer and bottles and food service sanitizer and disinfectant to clean commonly touched surfaces within the living units. The food service sanitizer in use will effectively address viruses, bacteria, and fungi.
The period that the surface must remain damp to achieve the manufacturers efficacy performance is generally two minutes. Physically scrubbing a surface that has been sprayed will further enhance the effectiveness of the sanitizer and disinfectant.

A copy of the Department of Corrections Workplace Cleaning/Disinfecting Procedures is attached at Attachment 4, Exhibit 2. This is an very good outline of cleaning procedures and cleaning frequency to be followed within the living units.

**Living Unit C Measurements**

As indicated, Living Unit C was under construction at the time of the assessment. AHUs were not operating, exterior doors were opened and closed to allow for construction traffic and no offenders were in the space. No measurements were obtained from this space.

**Living Unit D Measurements**

Within the living unit the temperature was measured at 67.6°F, slightly lower than the recommended range, but according to staff this was a welcome deviation from typical conditions that tend to run on the warm side. The cooler temperature measured is likely related to the North AHU that was not operating when the attic was accessed for assessment. The relative humidity was measured at 23.2%, and the CO₂ level measured at 577 ppm. Other than the ambient temperature in the space, common IAQ parameters were within the OSHA and ASHRAE recommended ranges.

No ATP sampling of living unit surfaces occurred.

**Living Unit E Measurements**

Downstream of the North AHU, the temperature was measured at 75.6°F, although temperature measured varied from 66°F to 75.6°F. The relative humidity was measured at 24.8%, and the CO₂ level measured at 695 ppm. Other than the variation of temperature in the space, common IAQ parameters were within the OSHA and ASHRAE recommended ranges.

No ATP sampling of living unit surfaces occurred.

**R-Annex Living Unit Measurements**

Downstream of the North AHU, the temperature was measured at 74.8°F, the relative humidity was measured at 31.8%, and the CO₂ level measured at 1,425 ppm. As indicated
previously, the elevated CO₂ levels are likely the result of reduced air movement and large numbers of people in this space. The CO₂ level could be improved with better air circulation and reduced room population. Other than that measured CO₂ level, common IAQ parameters were within the OSHA and ASHRAE recommended ranges.

No ATP sampling of living unit surfaces occurred.

**Segregation Living Unit Measurements**

The temperature was measured at 77.7°F, the relative humidity was measured at 19.5%, and the CO₂ level measured at 563 ppm. While the relative humidity was measured at the low end of recommended indoor levels, it is not out of line with normal conditions this time of year in Minnesota. Remaining common IAQ parameters were within the OSHA and ASHRAE recommended ranges.

No ATP sampling of living unit surfaces occurred.

**School House Living Unit Measurements**

Downstream of the North AHU, the temperature was measured at 74.8°F, the relative humidity was measured at 19.4%, and the CO₂ level measured at 481 ppm. While the relative humidity was measured at the low end of recommended indoor levels, it is not out of line with normal conditions this time of year in Minnesota. Remaining common IAQ parameters were within the OSHA and ASHRAE recommended ranges.

No ATP sampling of living unit surfaces occurred.

**Building Exterior Measurements**

Exterior to the building, the temperature was measured at 44.3°F, the relative humidity was measured at 21.5%, and the CO₂ level measured at 365 ppm.

**COVID-19 Response Practices**

On the day of the assessment, most of the staff, contractors, and offenders were observed to be wearing face masks properly. The facility was under a mandatory N95 order. The use of N95 lessens the chance of spreading or being infected with an illness compared to the use of a cloth or surgical mask. Also, the facility required all personnel, except offenders and guards, to wear disposable surgical isolation gowns before entering living units.
Signs at the front entrance to the facility direct staff, visitors, and vendors not to enter if they are showing symptoms consistent with COVID-19. Further, signs said face coverings and social distancing were required. Entrants have their temperature taken to confirm it is below the current required Center for Disease Control level before they can enter the building.

Floor markings were found inside the secure perimeter where lines of staff would typically be formed. Signage directing offenders and staff to wear masks and remain socially distanced were observed in passageways and in living units as the assessors passed through them to go to the AHU Rooms or were visible in common areas.

RECOMMENDATIONS

Based on the observations and measurements made at the St. Cloud facility, IHSC has outlined the following recommendations for action or considerations to modify current practice:

1. Air handling equipment at the facility is aged. While maintenance occurs, records are sparse or non-existent. IHSC recommends that a thorough mechanical evaluation be conducted at the facility to determine if existing equipment can be repaired or if systematic replacement of existing equipment needs to be considered.

2. Building automation should be part of the overall mechanical upgrade for the facility. Having the ability to monitor system performance, units not operating, and the ability to balance ventilation needs in a living unit or across living unit boundaries would benefit overall indoor air quality conditions at the facility.

3. A mechanical evaluation needs to consider the current and future capacity plans for the facility. Spaces like the R-Annex are housing more people can the current air handling equipment is designed to support. Spaces like the R-Annex can be used for housing, but the ventilation capacity needs to be increased.

4. System maintenance is challenging due to limited access to the small AHUs, availability of parts keeping units inoperable for long periods, and no surplus ventilation capacity to balance air needs in the living units. Checklists and a detailed maintenance schedule need to be revised for each air handling unit so that routine maintenance can be performed, areas of repair can be identified in a timely fashion, and filter maintenance can occur with greater regularity.
5. Develop an annual cleaning schedule for AHUs and ducts in the living units. IHSC recommends that the units in Living Unit E, R-Annex, Segregation, and the School House be performed first. The AHUs in the larger living units have been reviewed and are being upgraded or replaced as part of current construction plans. These should be the last units scheduled for periodic cleaning. Full time occupancy of the building will create duct occlusion that will reduce air quality and air movement capacity over time. Duct cleaning in the future for the facility should be done on rotational basis so that at least two Living Units are inspected and cleaned (if necessary) on an annual basis.

6. When duct cleaning is performed, duct interiors should be treated with Oxine (or an approved equivalent) as a broad-spectrum sanitizer and disinfectant.

7. When installing air filters, ensure the filter is properly seated in the frame to create a seal. Inspect the filters to ensure that they are facing the correct way in the filter frame. Minimizing air by-pass in the filter racks will improve the capture efficiency of particulate material present in the HVAC system. Routine inspection of the air handling units will help ensure that missing filters are replaced as was observed in the Segregation Unit.

8. Filters replacement schedules need to be reviewed and then implemented. Filter change-out in the smaller living units may need to occur with greater frequency due to the capacity of the AHU and the population in those spaces. Recording the date that filters were changed on the side of the replacement filters will help with periodic inspection and in determining the correct frequency to change out heavily loaded filters.

9. Inspect each air handling unit to remove gaps, openings, and other areas of by-pass. Every AHU reviewed at the facility showed some degree of by-pass. While the capture efficiency of the existing filters is acceptable (30 percent), air quality can be improved by more efficient capture of particulate, especially the ultrafine particles, in the filter media.

10. Add CDC recommended precautionary signage to all buildings where staff and offenders reside. There is increasing evidence that individuals will follow recommended practice if they are provided guidance as frequently as feasible.

11. Consider routine and frequent electrostatic spraying of living units. Electrostatic spray surface cleaning is the process of spraying an electrostatically charged mist onto surfaces and objects. Electrostatic spray uses a specialized solution that is combined with air and atomized by an electrode inside the sprayer. Subsequently,
the spray contains positively charged particles that can aggressively adhere to surfaces and objects. Because the particles in the spray are positively charged, the droplets become attracted to all negative surfaces, covering the visible area, underside, and backside, with the sanitizing agent.

Surfaces that are already covered will repel the spray, making the method extremely efficient. This allows the appropriate sanitizers, mold preventatives and disinfectants to wrap around and evenly coat all types of surfaces for a more complete clean.

For awkwardly shaped objects or hard to reach places, cleaning staff can point and spray; the nature of the mist allows it to coat surfaces evenly, and envelope objects—even if the mist is only sprayed from one side. After the spray is applied, the sanitizing agent works to disinfect the covered surfaces. For this reason, electrostatic spray is an excellent solution for germ and contaminant ridden areas.

12. Routine cleaning of accessible surfaces within Living Unit B can be improved. ATP levels measured on commonly contacted surfaces should higher levels of bioburden than expected. Greater diligence to routine cleaning of commonly used or touched surfaces in each of the living units will reduce bioburden present on those surfaces and will aide in decreasing the risk of pathogen transmission. While Living Unit B was on the only living unit sampled due to the presence of active Covid-19 cases, we suspect that similar levels of bioburden could be found in similar areas of the other living unit spaces. Focus hand wiping on commonly used surfaces such as vending machine keypads, door handles, and phone receivers, or where effective coverage with the backpack sprayer is not possible. Rigorously implement the Department of Corrections Workplace Cleaning/Disinfecting Procedures.

13. Increase the frequency of cleaning surfaces within the living units and verify its efficacy by measuring the RLUs of ATP on those surfaces. Consider routine cleaning of surfaces at twice the frequency that currently employed. Cleaners used should be selected from the Environmental Protection Agency’s (EPA) N-listed cleaners: https://www.epa.gov/pesticide-registration/list-n-disinfectants-coronavirus-covid-19

14. To the extent possible, segregate of positive cases from negative cases so that community spread can be controlled at a higher level.
We appreciate the opportunity to assist your office. If you have any questions, please contact me at (651) 287-5375.

Sincerely,

INDUSTRIAL HYGIENE SERVICES CORPORATION

[Signature]

Timothy P. Huber, CHMM, PG
Senior Project Manager

cc: Mr. Glen Heino, RECS
    Mr. Jeremy Black, MCF-St. Cloud

Attachments (4):

Table 1 - Air Handling Units Air Velocity, IAQ, and Ultrafine Particulates Measurements
Table 2 - Living Unit B ATP Surface Sampling Results
Exhibit 1 – Representative Site Images
Exhibit 2 - Department of Corrections Workplace Cleaning/Disinfecting Procedures
ATTACHMENT 1

Air Handling Unit Air Velocity, Indoor Air Quality, and Ultrafine Particle Measurements
# AIR HANDLING UNIT VELOCITY, IAQ, AND ULTRAFINE PARTICULATES

## Project Name: MCF - St. Cloud
2305 Minnesota Blvd.
St. Cloud, MN

## IHSC Project No.: M20-551.4

## Date Sampled: December 3, 2020

## Inspector: Daniel Flynn

<table>
<thead>
<tr>
<th>Building</th>
<th>Unit or Location</th>
<th>Relative to Filter</th>
<th>Air Velocity ft/min</th>
<th>CFM</th>
<th>Temp (°F)</th>
<th>RH%</th>
<th>CO (ppm)</th>
<th>CO₂ (ppm)</th>
<th>UFP/cc</th>
<th>Comments</th>
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</thead>
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<td>B House Living Unit</td>
<td>Ambient</td>
<td>NA</td>
<td>NA</td>
<td>63.8</td>
<td>29.0</td>
<td>3.6</td>
<td>636</td>
<td>NA</td>
<td>3,310</td>
<td>Staff &amp; Offenders all Wearing Masks.</td>
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<tr>
<td></td>
<td>Door Cracked</td>
<td></td>
<td></td>
<td>552</td>
<td>922</td>
<td></td>
<td></td>
<td></td>
<td>NA</td>
<td>Air Flowing into Living Unit from Hall.</td>
</tr>
<tr>
<td>B House Chase</td>
<td>Ambient</td>
<td>NA</td>
<td>NA</td>
<td>70.6</td>
<td>19.6</td>
<td>0.0</td>
<td>575</td>
<td></td>
<td>3,970</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A House Living Unit</td>
<td>Ambient</td>
<td>NA</td>
<td>NA</td>
<td>64.2</td>
<td>21.2</td>
<td>0</td>
<td>453</td>
<td></td>
<td>4,930</td>
<td>Generally clean within AHU. Welding occuring in room may increase UFP. No seal downstream.</td>
</tr>
<tr>
<td></td>
<td>Upstream</td>
<td>2618</td>
<td>91630</td>
<td>48.8</td>
<td>33.6</td>
<td>0</td>
<td>425</td>
<td>4,940</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Downstream</td>
<td>2380</td>
<td>83300</td>
<td>71.6</td>
<td>17.6</td>
<td>0</td>
<td>483</td>
<td></td>
<td>3,970</td>
<td></td>
</tr>
<tr>
<td>E House Living Unit</td>
<td>Ambient</td>
<td>NA</td>
<td>NA</td>
<td>66</td>
<td>19.2</td>
<td>0</td>
<td>448</td>
<td></td>
<td>3,990</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Upstream</td>
<td>277</td>
<td>11634</td>
<td>67.4</td>
<td>30.4</td>
<td>0</td>
<td>685</td>
<td>1,870</td>
<td></td>
<td>Both AHUs older. Both had dirt build up downstream and on filter.</td>
</tr>
<tr>
<td></td>
<td>Downstream</td>
<td>624</td>
<td>26208</td>
<td>75.6</td>
<td>24.8</td>
<td>0</td>
<td>695</td>
<td>1,620</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Upstream</td>
<td>357</td>
<td>14994</td>
<td>66.4</td>
<td>30.4</td>
<td>0</td>
<td>675</td>
<td>1,770</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Downstream</td>
<td>453</td>
<td>19026</td>
<td>68</td>
<td>30.4</td>
<td>0</td>
<td>717</td>
<td>1,550</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Building</td>
<td>Unit or Location</td>
<td>Relative to Filter</td>
<td>Air Velocity</td>
<td>IAQ</td>
<td>P-Trak</td>
<td>Comments</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---------------</td>
<td>------------------</td>
<td>--------------------</td>
<td>--------------</td>
<td>-----</td>
<td>--------</td>
<td>---------------------------------------------------------------------------</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D House</td>
<td>AHU Room</td>
<td>Ambient</td>
<td>NA</td>
<td>NA</td>
<td>67.6</td>
<td>23.2</td>
<td>0</td>
<td>577</td>
<td>1,350</td>
<td>Large amounts of fiberglass insulation.</td>
</tr>
<tr>
<td>Living Unit</td>
<td>D House South</td>
<td>Upstream</td>
<td>613</td>
<td>11034</td>
<td>69.2</td>
<td>26.1</td>
<td>0</td>
<td>676</td>
<td>1,100</td>
<td>No seal obtainable. Dust build up in unit.</td>
</tr>
<tr>
<td></td>
<td>AHU</td>
<td>Downstream</td>
<td>351</td>
<td>6318</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>907</td>
<td>No seal obtainable. Dust build up in unit. Unit was not initially on.</td>
</tr>
<tr>
<td>D House North</td>
<td>Upstream</td>
<td>390</td>
<td>7020</td>
<td>59.3</td>
<td>31.2</td>
<td>0</td>
<td>618</td>
<td>946</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AHU</td>
<td>Downstream</td>
<td>265</td>
<td>4770</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>865</td>
<td></td>
</tr>
<tr>
<td>D House Chase</td>
<td>Ambient</td>
<td>259</td>
<td>97</td>
<td>66.4</td>
<td>33</td>
<td>0</td>
<td>846</td>
<td>834</td>
<td>Air movement into cell supply duct.</td>
<td></td>
</tr>
<tr>
<td>R-Annex</td>
<td>AHU Room</td>
<td>Ambient</td>
<td>NA</td>
<td>NA</td>
<td>74.8</td>
<td>31.8</td>
<td>0</td>
<td>1,425</td>
<td>833</td>
<td>AHU in ceiling above bathroom.</td>
</tr>
<tr>
<td>Living Unit</td>
<td>R-Annex AHU</td>
<td>Upstream</td>
<td>440</td>
<td>3520</td>
<td>74.1</td>
<td>31.8</td>
<td>0</td>
<td>1,428</td>
<td>789</td>
<td>No seal obtainable. Dirt build-up in unit. Large population in room.</td>
</tr>
<tr>
<td></td>
<td>Downstream</td>
<td>801</td>
<td>6408</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>819</td>
<td></td>
</tr>
<tr>
<td>Segregation</td>
<td>AHU Room</td>
<td>Ambient</td>
<td>NA</td>
<td>NA</td>
<td>77.7</td>
<td>19.5</td>
<td>0</td>
<td>563</td>
<td>1,480</td>
<td>AHU Supply fan not working.</td>
</tr>
<tr>
<td>Living Unit</td>
<td>Segregation AHU</td>
<td>Upstream</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>563</td>
<td>No filters found in filter bank. Measurements taken downstream of coil.</td>
</tr>
<tr>
<td></td>
<td>Downstream</td>
<td>31</td>
<td>930</td>
<td>88</td>
<td>14</td>
<td>0</td>
<td>582</td>
<td>1,670</td>
<td></td>
<td></td>
</tr>
<tr>
<td>School House</td>
<td>AHU Room</td>
<td>Ambient</td>
<td>NA</td>
<td>NA</td>
<td>74.8</td>
<td>19.4</td>
<td>0</td>
<td>481</td>
<td>1,470</td>
<td>This AHU does not supply living space. All air supplied from outside. Dust build-up on filters.</td>
</tr>
<tr>
<td>Unit</td>
<td>School House</td>
<td>Upstream</td>
<td>43</td>
<td>2580</td>
<td>69.5</td>
<td>20.2</td>
<td>0</td>
<td>505</td>
<td>1,860</td>
<td></td>
</tr>
<tr>
<td></td>
<td>AHU</td>
<td>Downstream</td>
<td>41</td>
<td>2460</td>
<td>73.1</td>
<td>18.2</td>
<td>0</td>
<td>476</td>
<td>1,470</td>
<td></td>
</tr>
<tr>
<td>Outside</td>
<td>Outside</td>
<td>NA</td>
<td>NA</td>
<td>44.3</td>
<td>21.5</td>
<td>0</td>
<td>365</td>
<td>2,730</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
ATTACHMENT 2

Living Unit B ATP Surface Sampling Results
<table>
<thead>
<tr>
<th>Sample #</th>
<th>Location</th>
<th>Item</th>
<th>Surface</th>
<th>RLU Results</th>
<th>RLU (RLU)</th>
<th>Surface Guidance Level</th>
<th>Pass/Caution/Fail</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>B House Main Entry Door</td>
<td>Door Handle</td>
<td>Metal</td>
<td>&lt;30</td>
<td>162</td>
<td>&lt;30</td>
<td>Fail</td>
</tr>
<tr>
<td>2</td>
<td>Left Staircase at Front of Unit</td>
<td>Handrail</td>
<td>Metal</td>
<td>&lt;30</td>
<td>86</td>
<td>&lt;30</td>
<td>Caution</td>
</tr>
<tr>
<td>3</td>
<td>First Table on Right Side of Unit</td>
<td>Tabletop</td>
<td>Metal</td>
<td>&lt;30</td>
<td>569</td>
<td>&lt;30</td>
<td>Caution</td>
</tr>
<tr>
<td>4</td>
<td>Chair on Right Side of Unit</td>
<td>Arm Rest</td>
<td>Plastic</td>
<td>&lt;30</td>
<td>192</td>
<td>&lt;30</td>
<td>Caution</td>
</tr>
<tr>
<td>5</td>
<td>Officer Desk/Control Desk</td>
<td>Desktop</td>
<td>Painted Wood</td>
<td>&lt;30</td>
<td>226</td>
<td>&lt;30</td>
<td>Caution</td>
</tr>
<tr>
<td>6</td>
<td>Table Across from Office Desk</td>
<td>Microwave Control Panel</td>
<td>Plastic</td>
<td>&lt;30</td>
<td>69</td>
<td>&lt;30</td>
<td>Caution</td>
</tr>
<tr>
<td>7</td>
<td>Fan on Right Side of Unit</td>
<td>Fan Power Cord</td>
<td>Metal</td>
<td>&lt;30</td>
<td>65</td>
<td>&lt;30</td>
<td>Caution</td>
</tr>
<tr>
<td>8</td>
<td>Right Staircase at Back of Unit</td>
<td>Handrail</td>
<td>Metal</td>
<td>&lt;30</td>
<td>101</td>
<td>&lt;30</td>
<td>Caution</td>
</tr>
<tr>
<td>9</td>
<td>Back of Unit Vending Machines</td>
<td>Keypad</td>
<td>Plastic</td>
<td>&lt;30</td>
<td>91</td>
<td>&lt;30</td>
<td>Caution</td>
</tr>
<tr>
<td>10</td>
<td>Phone #2 Right Side of Unit</td>
<td>Handle</td>
<td>Plastic</td>
<td>&lt;30</td>
<td>8</td>
<td>&lt;30</td>
<td>Pass</td>
</tr>
<tr>
<td>11</td>
<td>Ice Machine Right Side of Unit</td>
<td>Ice Tray Door</td>
<td>Plastic</td>
<td>&lt;30</td>
<td>9</td>
<td>&lt;30</td>
<td>Pass</td>
</tr>
</tbody>
</table>
# Adenosine Triphosphate Swab Sample Results

<table>
<thead>
<tr>
<th>Sample #</th>
<th>Location</th>
<th>Item</th>
<th>Surface</th>
<th>RLU Results</th>
<th>Surface Guidance Level(^1) (RLU)</th>
<th>Pass/Caution/Fail(^2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>Floor in Front of B House Entrance Door</td>
<td>Floor</td>
<td>Ceramic Tile</td>
<td>106</td>
<td>&lt;30</td>
<td>Fail</td>
</tr>
<tr>
<td>13</td>
<td>Table on Right Side of Unit</td>
<td>Tabletop</td>
<td>Metal</td>
<td>196</td>
<td>&lt;30</td>
<td>Fail</td>
</tr>
</tbody>
</table>

* RLU – Relative light unit or unit of measure for bioluminescent measurements. Measuring the amount of bioluminescence from an ATP reaction provides an excellent indication of surface cleanliness because the quantity of light generated by the reaction is directly proportional to the amount of ATP present in the sample. The bioluminescence reaction is immediate and results are expressed numerically on the luminometer screen in Relative Light Units (RLU).

Interpretation of ATP surface sampling results (RLUs): <30 = Pass, 30 to 100 = Caution, and >100 = Fail. Guideline for Surface Sampling of Indoor Environmental Surfaces, Includes Initial Assessments, Pre-Cleaning, and Post Cleaning Verification Testing of Indoor Environment.
ATTACHMENT 3

Representative Site Images
COVID-19 Awareness Signage Posted Throughout Facility

Floor of A House AHU Upstream

A House AHU Filter Bank Upstream

A House AHU Downstream Floor/Fan

E House AHU North Upstream Filter Bank

E House AHU North Dirt on Dampers
D House South AHU Filter Bank Upstream Dirt Build Up

Fiberglass Outside D House South AHU

D House North Unit Filter Bank

D House North Unit Upstream Dirt Build-Up

R-Annex AHU Filter Bank

Segregation AHU where Filters Should Be
Department of Corrections – MCF-St. Cloud
Air Quality Assessment
St. Cloud, Minnesota

Segregation AHU where Filters Should Be
ATTACHMENT 4

Department of Corrections Workplace Cleaning/Disinfecting Procedures
Department of Corrections
Workplace Cleaning/Disinfecting Procedures

**Workplace Disinfection Procedures**

- **Cleaning Chemical Recommendation** Minncor’s Neutral Germicidal is a disinfectant that cleans and deodorizes in one step and can be used in staff, offender and public areas. Read product label and follow directions for use.
- **Dilution Ratio** Add 1 ounce of concentrated Germicidal per gallon of water. Don gloves and eye protection when cleaning.
- **Application** Apply solution with a mop, cloth, sponge, or hand-pump trigger sprayer so as to wet all surfaces thoroughly.
- **Contact Time** Allow to remain wet and air dry, or wait for 10 minutes then remove excess liquid. For heavily soiled areas, a pre-cleaning step is required.
- **Maximum Effectiveness** In addition to standard housekeeping practices, it is recommended to disinfect frequently touched surfaces and shared equipment.
- **Prioritize** Follow recommended guidelines below to help prioritize cleaning.

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>After user change, shift change.</td>
<td>Frequently “hand-touched” surfaces: doorknobs, handrails, light switches, control panels, etc.</td>
</tr>
<tr>
<td>Once to twice daily</td>
<td>Shared workstation equipment: desks, counters, chairs, phones, keyboards/mouse, etc.</td>
</tr>
<tr>
<td>Once daily</td>
<td>Shared correctional equipment: keys, cuffs, irritants, etc.</td>
</tr>
<tr>
<td>As needed</td>
<td>Exercise and sports equipment: weights, benches, machine handles, etc.</td>
</tr>
<tr>
<td></td>
<td>Bathrooms surfaces: faucets, dispensers, etc.</td>
</tr>
<tr>
<td></td>
<td>Any other frequently touched surfaces and used equipment.</td>
</tr>
<tr>
<td></td>
<td>Public areas: conference rooms, visiting, classrooms, transportation and fleet vehicles (e.g., mules, gators, etc.).</td>
</tr>
<tr>
<td></td>
<td>Tools: hand and power tools, shakedown tools, etc.</td>
</tr>
<tr>
<td></td>
<td>Offices and individual workstations. A regular office/workstation cleaning schedule is recommended.</td>
</tr>
</tbody>
</table>