On February 18 an 19 of 2019 Silver/Petrucelli and Associates visited Newfield Elementary School, Julia Stark Elementary School, Hart Elementary School, Toquam Magnet School and KT Murphy Elementary School. We conducted an assessment of the existing conditions related to the mechanical equipment in order to find deficits which may contribute to the current mold situation. Additionally, we made observations of the general installation of the systems in each school. The following report lists our observations along with supporting photographs. We will issue an additional report with further recommendations on how to improve or fix the current situation.

KT Murphy

General Mechanical Issues

During the site visit we spot checked several mechanical systems for general installation conditions.

Room 31

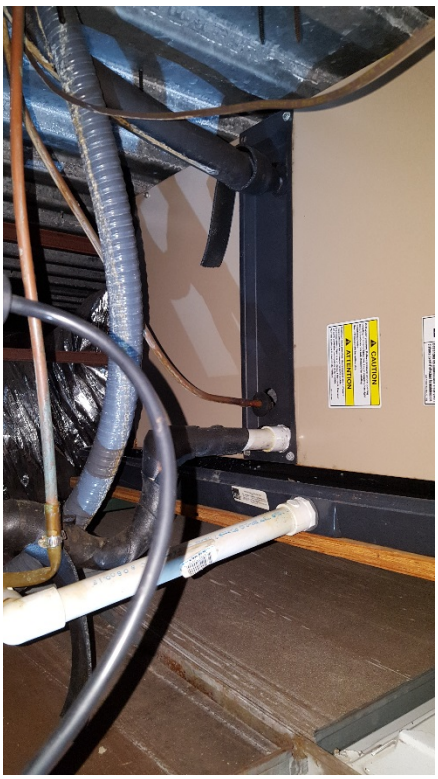
- No return grille serving the system.
- There is a return duct, or possibly an outside air duct, however it does not appear to be connected to anything.
- The unit has no return duct connected to a return grille. It effectively draws air from the plenum.

Air Handling Unit with No Ducted Return:

Rm 1 – Air Handling Unit

- Appears there was a leak where the refrigerant piping goes through the roof.
- Unit does not appear to be installed level which will make condensate draining potentially difficult depending on the configuration of the unit.
- The drain pan was pitched too far forward and the drain was in the center of the pan. The pan would have to fill up about half way before the condensate could be drained.

RM 1 AHU condensate drain pan:



Rm 32

- What appears to be an outside air duct just connects at the back of the intake of the air handling unit.
- The return operates as a plenum but the return grille is not near the intake of the unit. Most of the air being drawn to the unit is drawn from the ceiling.

Auditorium

- Appears that separate exhaust fans are used for pressure relief. These need to be tied into the outside air intake damper. If they were running but the outside air was not open they system would be drawing air in from other spaces.
- The ductwork above the stage was not insulated.

Uninsulated auditorium ductwork:

Media Center

- Ducts were connected such that sharp elbows had to occur in order to tap off the branches. This will restrict airflow.
- Ductwork did not appear to be sealed. Air movement was observed above the ceiling.

Restricted Media Center ductwork:

Ventilation

There is a noticeable lack of ventilation throughout the building. The original building appears to rely on only operable windows as a source of ventilation. There is no ventilation in any of the Janitor's Closets or Bathrooms.

Piping Insulation

We observed several gaps in the piping insulation on heating piping. It is possible that leaks were repaired, and the piping was never reinsulated. Gaps in heating piping insulation should not cause any potential mold issues however if there were piping leaks water could accumulate at these gaps on the ceiling.

Uninsulated section of piping:

Julia Stark

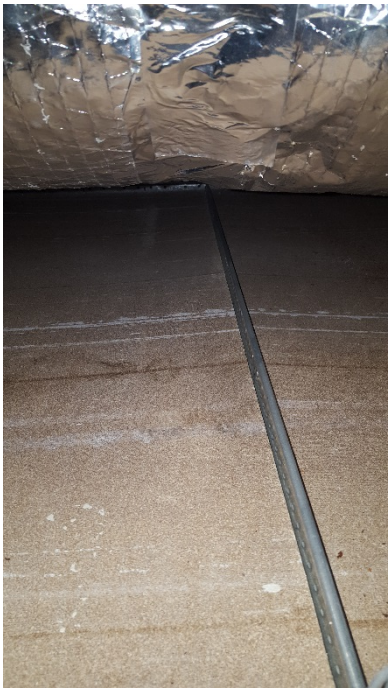
Rm101

There appear to be stains from condensation below the supply ductwork serving the classroom. We verified the size of the ductwork as well as the supply and return grilles. The system, which uses zone dampers as opposed to conventional VAV boxes, appears to be sized for approximately 4 tons of cooling load. Due to the condensation stains it is likely that the ductwork insulation is not completely sealed in a vapor tight manner. There is a heavy concentration of condensation below an access panel in the ductwork. The insulation does not appear to be sealed around it. Cool air leaks out and condenses in the warm, humid air above the ceiling. Further evaluation will have to determine if this condition is being repeated in other classrooms.

Water stain below access hatch in ductwork:

Underside of access hatch. Note the rusting on the handle:

Insulation with tear in it, leading to water staining below:



Branch ductwork connection not sealed:

Main Office

Branches of supply ducts off of the mains were uninsulated. During the cooling season moisture will likely condense on the surface of the ductwork.

Corridors

It was noted that in the corridors outside of Room 101 there was no mechanical cooling or ventilation. We have seen, in other schools, similar configurations and the result has been condensation on the walls of the unconditioned space.

Toquam

Classroom Cooling Systems

The air handling units serving the classrooms have a capacity of 5 tons and use chilled water as the cooling source. There is significant rusting on the supply grilles and the maintenance staff states that condensation occurs on the outside of the ducts during the cooling months. The supply ducts are not insulated. The mechanical code at the time stated that if the duct serving the space was located within the space, insulation is not required. Issues may occur on startup when the system has been off during the unoccupied mode and the space becomes warm and humid. During startup moisture may condense on uninsulated surfaces. Additionally, the unit is provided fresh air by a roof mounted ventilator. It was unclear during the initial inspection how the outside air is balanced.

Rusted supply grille:

Outside Air Connection:

Uninsulated Piping:

Piping Leaks

On the upper level of the building there were several ceiling tiles showing indications of water leaks. Upon examination of approximately a half dozen tiles it appears that the leaks come from multiple sources. Leaks were found under chilled water piping, condensate drain piping, fire protection piping and what appeared to be domestic cold water piping.

Piping Insulation

Without removing portions of insulation it was difficult to determine the thickness of the installed insulation. It was noted however that in many cases insulation has been damaged or removed in portions altogether. Due to the low ceiling height of the building it also appears that portions of insulation have been compressed in order to make the ceiling clearances. Besides reducing the insulation value it also likely compromises the integrity of the vapor barrier.

Compromised insulation:

Chilled water insulation with rusted staples indicating a compromised vapor barrier:

Compromised insulation. Insulation has been compressed around the hanger. The upper pipe has had the insulation wrapped around the hanger. Also note that the chilled water piping hanger is rusting and the other hanger is not:

Compromised insulation:

Media Center

The drain pan under one of the air handling units serving a portion of the Media Center appeared to be overpitched. As can be observed in the picture below severe rusting has occurred within the pan indicating where the water resides. It appears that about half the pan fills up prior to the condensate pump activating.

Media Center AHU drain pan:

Hart Elementary School

General Mechanical Issues

Classrooms

- Unit ventilators with 2-pipe coil (heating and cooling) serve the classroom spaces. Each unit ventilator has wall louver with motorized damper to provide ventilation air. Multiple roof mounted exhaust fans draw the air from the classrooms. The amount of air introduced to the spaces and the amount of air being exhausted need to be evaluated to make sure positive pressure is maintained in the building.

Media Center

- Series fan powered VAV boxes with hot water reheat coils serve the media center. Series fan powered VAV boxes mix primary air with induced air to deliver constant volume air to the space. Primary air is from the rooftop unit and induced air is from plenum above ceiling. Where VAVs are located, staining of ceiling is present.

- The VAV reheat coil is fed from the main 2-pipe water distribution system. Signs of water staining at the reheat coil cabinet is present (photo above). While the control valve on the supply side is closed during summer operation, water temperature inside the reheat coil is likely to approach the chilled water return temperature, where condensation at the surface of the pipes/coils can occur.
- Valves and specialties are not insulated. (photo below)

- Ductwork did not appear to be sealed. Air movement was observed above the ceiling.
- Ductwork insulation is not taped/stapled properly and no insulation at diffuser backpan. (middle and right photo above)

Classroom Corridor

- Series fan powered VAV boxes with hot water reheat coils serve the corridor. Series fan powered VAV box mixes primary air with induced air to deliver constant volume air to the space. primary air is from the rooftop unit and induced air is from ceiling mounted return grille in corridor. Where VAVs are located, staining of ceiling is present.

- Valves and specialties are not insulated. Copper oxidation (patina) in pipe fittings from leak drips/condensation overtime. (photo above)
- Duct insulation not sealed/taped.

Chilled Water Piping Insulation

- Mold spotted at chilled water piping insulation and bottom of elbow insulation jacket from chiller on roof. Portions of insulation need to be removed to verify integrity of vapor barrier and if vapor seals are installed at butt joints.

Newfield Elementary School

Boiler Room

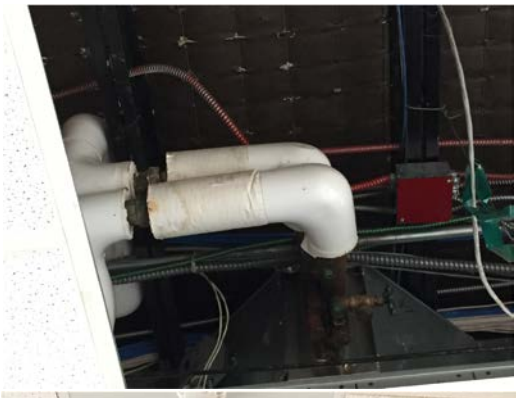
- Ventilation air to the boiler room is wide open all year round.
- Water at corner of the boiler room near domestic water heater is observed.

- Several gaps in the piping insulation on steam piping in the tunnel were observed. It is possible that leaks were repaired, and the piping was never reinsulated. (right photo above)

Classrooms

- Roof mounted supply air fans provide ventilation air to the classrooms and corridor. Duct mounted hot water coils are provided to temper air.

- Piping connections to the hot water coils have visible copper oxidation (patina) in pipe fittings from leak drips/condensation overtime. (photo below)



- Outside air ductwork serving the classrooms is not insulated. (photo above)
- Ductwork has no mastic sealer at joint.

Media Center

- Water on top of insulated exterior ductwork.

- Insulation falling off exposed ductwork on roof.