



Smithville High School Cooling System

E&C Engineers & Consultants was hired to investigate an air conditioning issue within several classrooms inside Smithville High School in Smithville, Texas. The issue is the visible growth of mold inside the classroom adjacent to the mechanical devices. This led the school district's representative to ask E&C to inspect the existing mechanical infrastructure and design to help resolve the issue.

The High School is presently air conditioned with multiple small split system direct expansion air handling units (AHU). Each individual AHU receives its outside air through an energy recovery unit (ERU). The ERU is using exhaust air from the classrooms to precool the outside air being delivered to the air handling units. Even with this design there is mold growth at some locations within the building. For this mold to grow, moisture, food and mold spores are required to be present. Since the mold spores and food source, dust, are always present, the third parameter, moisture can be controlled. When the moisture level, relative humidity, inside the classroom is high the mold spores have the ability to grow. This relative humidity level can be controlled with the mechanical equipment serving the spaces.

It appears from analyzing the mechanical schedules that the air handling units are sized to work properly with the precooled outside air or the discharge air from the ERU. If the ERU fails to cool the warm, moist outside air the air handling units are not sized with the capacity to cool and dry the combined outside air and return air to an acceptable temperature and relative humidity. When the air handling units are not cooling and drying the air to this acceptable level, the warm moist air in the classroom is a good environment for mold to grow inside the classrooms. When a room is maintained at 75 degrees, the leaving air temperature for the air handling unit should be 55 degrees, this supply air temperature will keep the relative humidity a lower level and discourage the mold from growing.

The air handling units and ERU's are original equipment to the school. The units are reaching the end of their life expectancy. They are just not functioning at the same level or capacity as when they were first installed. It also appears that the classroom wings of the building are receiving a lot of outside air infiltration. There are double glass doors that open to the outside at the end of each wing, each time these doors are opened unconditioned outside air enters the building. Sometimes these doors remain open for extended periods of time. The existing AHU's do not have the capacity to cool and dehumidify this larger amount of outside air.

The goal is to lower and better control the relative humidity inside each classroom. There are several methods to do this:

1. The existing ERU's, which are approaching twenty years old and no longer have the ability to remove as much moisture from the air as when they were first installed. These Energy Recovery Units can be replaced with new versions of the same piece of equipment which will have better ability to remove the moisture from the air with a new desiccant wheel.

2. A second method to control the relative humidity is to replace the ERU's with a dedicated outside air pretreating air handling unit. This unit will serve pretreated air directly into the intake plenum of the classroom air handling units. This dedicated outside air, pretreating AHU will supply the required amount of fresh air to the classroom AHU's at 55 degrees consistently.
3. A third method to control the relative humidity inside the school will be to replace each AHU serving the classroom or other area of the building with a new larger capacity split system direct expansion AHU. This new AHU will have the capacity to condition the entering air without pretreatment. With this option the existing ERU's can remain in service to utilize their remaining life span.

The classroom AHU's require this constant supply of cool dry air, during a recent site visit we turned off one of the ERU's to examine the inside. After the examination, we entered a classroom served by this ERU, with the ERU being off for only a few minutes the air in the classroom had become noticeably more humid and overall warmer than the other classrooms in that corridor.

E&C's recommendation is to replace the existing ERU's with new dedicated pretreating air handling units. Option 2, this option also requires minimum disruption to the spaces being served and it could possibly extend the life of the existing AHU's, plus on some days require the existing AHU's to run very little. When looking at the three options above, option 1 will be the least costly, option 2 next and then option 3 the most costly.

Thank you for the opportunity to help better the learning environment for the Smithville High School students.

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