

April 25, 2025

Mr. Matt Frank, CHC
Project Director
S.M. Wilson & CO
2185 Hampton Ave
St. Louis, MO 63139

**Subject: Sewer Odor Issues at Francis Howell North High School
2549 Hackmann Rd, St Charles, MO 63303**

To whom it may concern:

Case Engineering (CASE) visited the site on April 18th at 7:00am to evaluate the existing conditions related to sewer odor infiltration and to observe a smoke test.

CASE observed the following issues:

Underground sanitary waste piping:

1. Sag/Belly in sanitary waste piping was observed via sewer scoping video 2025-03-24_Video #2_Storage Room 1307 received from S.M. Wilson, in sanitary waste piping near column grid 24. Starting 93' away from floor cleanout in room 1307 to 111' prior to the exterior grade cleanout. Confirmation of exact belly location should be verified with additional scoping and utility locates prior to any work.
 - i. Bellies in piping, especially those serving restrooms, disrupts the normal flow within the system. This allows waste to sit and decompose till the next rush of water comes along to push it down stream. Bellies in the piping network can generate harsher odors as the waste continues to decompose. During periods of low use (weekends) the odors within the system can become more noticeable when frequency of use increases. Bellies also create partial blockages which can allow for the atmospheric pressure within the system to build up and exceed standard operating levels. Sanitary waste and venting systems should be of equal pressure. Clogged piping can create a positive pressure within the system, which pushes more sewer odors out of the building.
 - a. **Recommendation:** Sags/Bellies in piping sections should be removed, existing trench backfill and pipe bedding to be fixed to piping manufacturers specifications, pipe shall then be replaced with new segment (free from any defects) and connected into existing piping network. More frequent flushing of empty fixtures or running clearwater down this branch will assist in moving any caught wastes out of the belly.

2. Sanitary waste calculations were not included in the construction documents Case received to review nor were drainage fixture unit loading labeled on the drawings to confirm sizing. Case recommends that the engineer of record confirm all sizes of all sanitary waste piping for code compliance. Sanitary waste piping leaving the building at column grid 24 appears to be undersized per 2021 ST. Charles Plumbing Code between the exterior grade cleanout and the branch fitting serving the inflow from restrooms, 1602, 1611&1613. The plumbing drawings show this 4" segment of sanitary waste line receiving flows from small and large restroom groups, sanitary fixtures from culinary arts and accepts the discharge from the acid neutralizer which services close to 40 lab sinks. This branch appears to have 242 DFU (Drainage Fixture Units) worth of fixtures connected based on Case's interpretation of the code. Per 2021 ST. Charles Plumbing Code a 4" sanitary branch can support up to 180 DFUs at 1/8" (1%) slope and 216 DFU at 1/4" (2%) slope. The sewer videos we received show staining towards the top of piping which indicates the code recommendation of 50% full flow is being exceeded. However aside from the previously mentioned sag/belly, there was no signs of clogs and the piping was clear of waste. Sanitary waste piping systems flowing above 50% full can increase the atmospheric pressure on the venting system. This would push more odors out of the sanitary vent through the roof then what would normally escape during ideal operating flow conditions.
 - a. **Recommendation:** This piping section currently is carrying the waste out of the building and we have not been informed that clogging is an issue with this branch. It is recommended that regular flushing of clear water into this branch to ensure proper clearing of wastes so to not restrict the flow of air in the piping as much as possible. If clogging becomes an issue within this section of piping, upsizing this segment of piping to a 6" may be required.
3. It was observed watching sewer scoping video 2025-03-25_Video #8_Mens RR T105 received from S.M. Wilson starting in men's restroom T105. There was a bag of chips and another blockage getting hung up on a small segment of cast iron piping. This segment of piping is approximately 9 feet away from the cleanout and appears to be holding water at the connection to the PVC system. This sanitary line is serving water closets and lavatories. Any standing water in piping provides an opportunity for waste to get stuck and decompose which increases the sewer odor.
 - a. **Recommendation:** further investigate this segment with a sewer scoping team to confirm standing water is still in this segment of piping and if any waste is caught. More frequent flushing of empty water closets would assist in clearing this segment of piping to prevent any collection of waste. If problem persists repair of piping segment may be required to ensure proper slope and connection to PVC piping.
4. Sanitary waste calculations were not included in the construction documents Case received to review nor were drainage fixture unit loading labeled on the drawings to confirm sizing. Case recommends that the engineer of record confirm all sizes of all sanitary waste piping for code compliance. Sanitary waste piping leaving the building at column grid A,55 appears undersized per 2021 ST. Charles Plumbing Code between the exterior grade cleanout and the branch fitting serving the inflow from restrooms 1016,1020 and pump rooms. The plumbing drawings show this 4" segment of sanitary waste line receiving flows from small and large restroom groups, sanitary fixtures from kitchen/cafeteria and accepts the

discharge from the pump rooms. This branch appears to have 212 DFU (Drainage Fixture Units) worth of fixtures connected based on Case's interpretation of the code. Per 2021 ST. Charles Plumbing Code a 4" sanitary branch can support up to 180 DFUs at 1/8" (1%) slope and 216 DFU at 1/4" (2%) slope. The sewer videos we received show minor staining above the middle of the piping but no evidence of clogging in this segment was observed. Sanitary waste piping systems flowing above 50% full can increase the atmospheric pressure on the venting system. This would push more odors out of the sanitary vent through the roof than what would normally escape during ideal operating flow conditions.

- a. **Recommendation:** This piping section currently is carrying the waste out of the building and we have not been informed that clogging is an issue with this branch. It is recommended that regular flushing of clear water into this branch to ensure proper clearing of wastes so to not restrict the flow of air in the piping as much as possible. If clogging becomes an issue within this section of piping, upsizing this segment of piping to a 6" may be required.

Sanitary vent piping above roof:

1. It was generally observed that all sanitary VTRs (vent through roof) were located at code minimum distances away from mechanical air intakes or further. However, the surrounding building conditions at some of the VTR locations were not conducive to adequate dissipation of the odors before getting drawn into the mechanical unit's air intake. A few VTRs were especially foul which requires more clear space to dissipate.
 - a. **Recommendation:** Elevate all the sanitary vent through roofs to a minimum of 3'-0" above the mechanical equipment air intakes at problematic areas.
 - b. **Recommendation:** Provide air admittance valves (if allowed by local AHJ) at all vent through roofs. These devices would allow air to enter the pipe network but not allow odors to escape the system.
2. The VTR near RTU 16 had a very strong sewer odor emitting from the pipe. This odor carried 25' away and could be detected at the air intake of RTU 16.
 - a. **Recommendation:** Route sanitary vent piping to a minimum of 3' above the mechanical air intake. This will allow wind to carry the odors higher and away from the air intakes.
3. Sanitary VTR at column grid line N,39 had insulation debris stuck in the pipe. This was restricting the air flow into the system.
 - a. **Recommendation:** Contractors removed debris while on site. Confirm all sanitary vent through roofs are free of any debris and piping is open.
4. Sanitary VTR at H,41 serving kitchen fixtures has high walls on two sides of the vent and mechanical equipment on the other side. This is preventing the sewer odors from being carried away by the wind and allowing the sewer odors to get pulled into the mechanical air intake.
 - a. **Recommendation:** Route sanitary vent piping to a minimum of 3' above the adjacent walls. That way the wind can carry the odors higher and away from the mechanical air intake.

5. It was described to Case that during days that have southern wind gust, the sewer odors emitting from the VTRs over the auditorium (serving the restrooms) can get pulled down over the parapet and trapped on the low roof. These odors then have been noticed to travel over to and get pulled into the air intake of roof top unit #9.
 - a. **Recommendation:** Extend the sanitary vent piping further above the parapet by a minimum of 3' to allow for the sewer odors to not get caught in the recirculation flow areas when wind flows over walls and structures.

Conclusion:

Case Engineering observed a majority of the sewer odor issues are due to the odors getting pulled into the mechanical equipment air intakes and dispersed throughout the building via supply ductwork. Relocating the sanitary vent through roof outlets to a minimum of 3' above the surrounding mechanical air intakes should allow the wind to carry the odors higher and away from these intakes. An alternate solution would be air admittance valves at each sanitary vent through roof opening. This mechanical device would eliminate sewer odors from escaping while allowing air into the sanitary system.

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