

August 25, 2023

TO: Mr. Charlie Brock, Superintendent
Estill County Schools

FROM: Randy Brookshire, AIA, LEED AP
Senior Principal, RossTarrant Architects, Inc.

RE: **Field Observations – Pyritic Shale Heaving Damage**
Estill County Middle School
Irvine, Kentucky

Introduction:

On this day, I met with Mr. Charlie Brock, Superintendent, and Mr. Stephen Willis, Director of School Safety, both of Estill County Schools, at the Estill County Middle School, located on Highway 89, to review ongoing issues and concerns associated with the building elements and systems due to moving walls and floor slabs caused by below grade pyritic shale expansion.

History

The Estill County Middle School, located on Highway 89 to the west of Irvine and on the same campus as the Estill County High School and Area Technology Center, was built in 1996 and 1997. It is this writer's understanding that the district has experienced issues associated with floor slab and interior wall movement since the building was completed and that a portion of the building was addressed soon after construction, that being the western portion, including the Gymnasium.

Existing Building

In review of the original construction documents dated April 1996, the building is a two-story structure with a mixture of spread footings, isolated column foundations and caissons. The primary floor elevation is 740'-0" while the second floor is at 752'-8", resulting in a floor-to-floor height of 12'-8". With the building pad being a combination of cut and fill (cut on the north side and fill on the south side), the majority of the structure is load bearing masonry (exterior and corridor walls) with the west most portion being a pre-engineered metal building structure with a partial below grade retaining wall. Interior non-load bearing walls are primarily masonry.

Pyritic Shale

Due to involvement in other projects, both on this campus and at other locations in Kentucky, it is known that soils in this area are very likely to contain pyritic shale, which when exposed to elements such as air and water, are expansive in nature. When not addressed during construction, these soils can cause significant upward pressures due to their expansive nature, resulting in the upheaval of building elements such as slabs and walls.

Observations:

Below find observations made during the walk-through of the building and through conversation with district personnel. This is not intended to be a comprehensive listing of items associated with this building and observations documented are based on visual observation and review of available drawings only:

1. Exterior sidewalks have heaved causing tripping hazards, impacting accessibility and causing doors to not operate properly. The inoperability of doors may cause an egress concern with occupants unable to exit

- the building as designed. The replacement of exterior walks that correct for heaving create positive slope toward the building, potentially causing water infiltration and icing.
2. Upon review of the building exterior, the load-bearing exterior walls do not have significant cracking, out of the ordinary. This is assumed due to the loading of these walls and bearing at a different elevation than that of other building elements.
 3. Frames and doors, both exterior and interior, have been 'racked' due to the ongoing wall and slab movement. While these doors have been modified to continue to function, this is an ongoing maintenance item that causes intermittent inoperability. This inoperability impacts the ability to open/close doors and appropriately secure teaching spaces in compliance with state law.
 4. Cracks at interior walls were noted in innumerable locations and typical throughout the building. Cracks were noted in both load bearing (typically corridor) and non-load-bearing walls.
 5. Separated walls were noted in multiple locations throughout the building, causing air gaps between spaces, some of which were significant.
 6. Vertical displacement of walls was noted in multiple locations, some measuring several inches, causing damage to interior finishes such as ceilings and flooring.
 7. Floors have heaved significantly, several inches in some locations, causing tripping hazards, unevenly sloped floors, and damage to interior floor finishes.
 8. District staff report that, due to the heaving floor slab and below slab fill, underslab utilities such as plumbing and electric have been damaged, to the point of having non-operable plumbing waste lines and broken electrical circuits.
 9. The CMU at the egress stairs and central stair that serve as the guardrail has broken away from adjacent supporting walls and is cracked in multiple locations. This potentially impacts code required egress from the second floor of the building.
 10. The district has reported organic growth on multiple items such as ceilings, walls, and stored items due to exterior air infiltration and damaged ductwork, some of which is attributable to heaving floors and walls.
 11. The cooler and freezer boxes in the kitchen are damaged due to heaving floors, causing damage to panels and misalignment of doors. This causes gaps, allowing air infiltration, excessive moisture, resulting in organic growth on cooler/freezer elements and stored materials.

Photos:



View of Estill County Middle School from the air, with High 89 behind and the baseball field in the background.



Main Entry facing East.



Floor Plan of the Primary Floor with north up the page.



Exterior Sidewalk has heaved creating a tripping hazard.



Exterior walk at egress door causing positive slope toward building and door.



Interior frame and door that has 'racked' causing intermittent inoperability and ongoing maintenance.



Displaced wall with significant cracking causing inoperability of door due to 'racked' frame.



Cracked interior load-bearing CMU wall at corridor, typical throughout building.



Separation of masonry walls and horizontal displacement of masonry walls, typical throughout building.



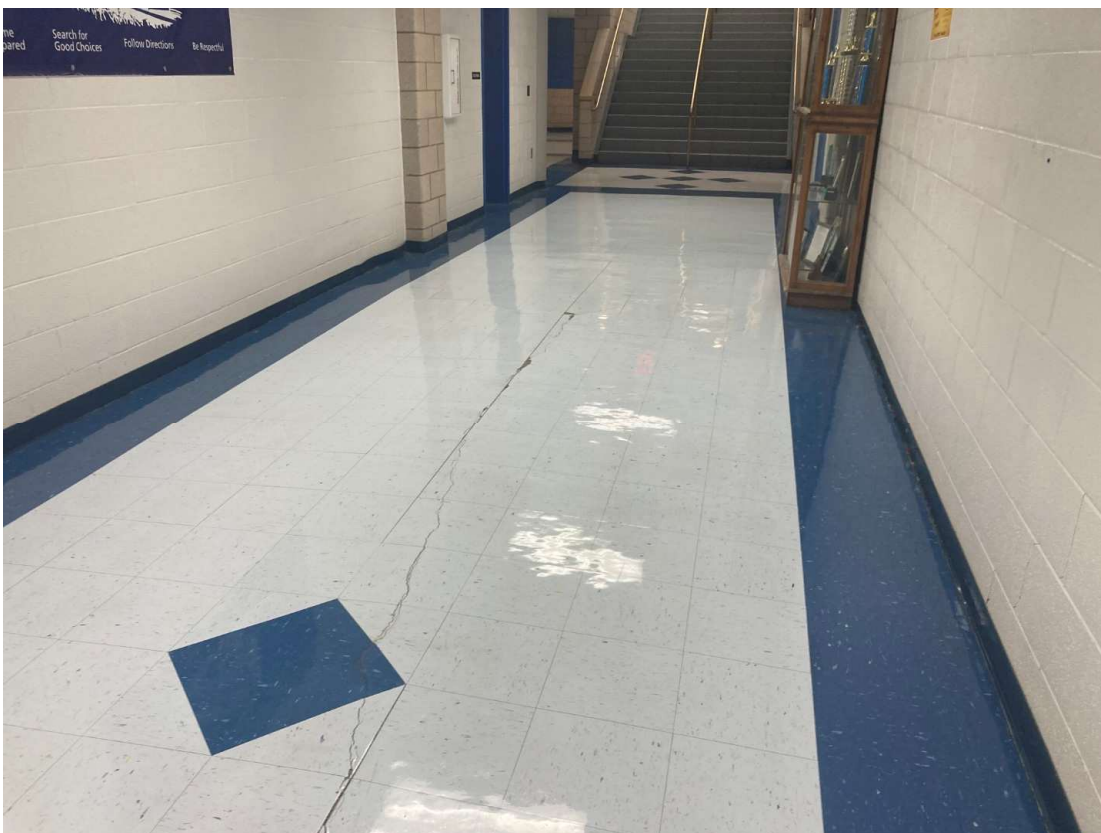
Vertical displacement of walls causing damage to interior finishes.



Vertical displacement of masonry walls as measured in inches. Note that the horizontal joints should align.



Vertical displacement of masonry walls causing a 'gap' at the floor and damage to interior finishes.



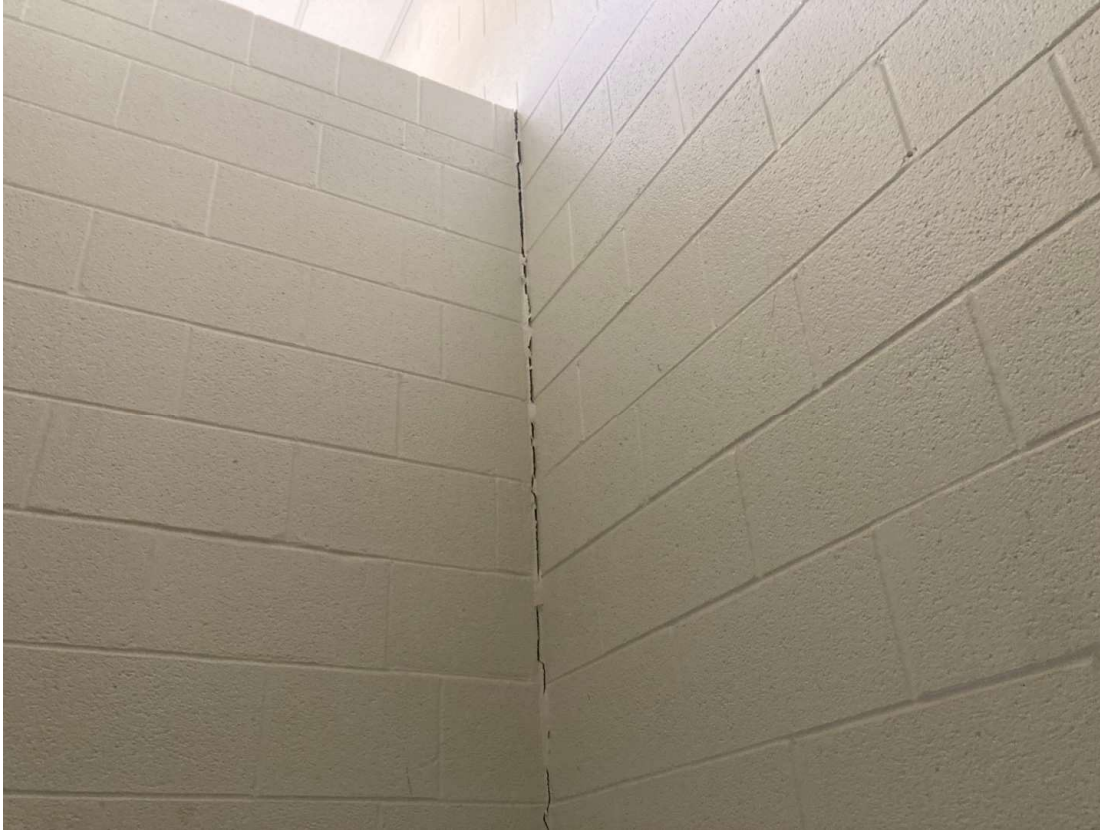
Interior 'heaved' slab at Main corridor causing uneven slope and damaged floor finishes.



Vertical displacement of floor slab causing tripping hazard and inoperable door.



Vertical displacement of slab at primary classroom wing corridor causing tripping hazard and damaged flooring.



CMU guardrail at Stair has broken away from adjacent wall and is cracked on the opposite side.



Abnormal organic growth on ceiling tile potentially due to air infiltration and damage to the duct.



Damaged cooler/freezer box with misaligned doors, due to heaving floors and walls.

END OF MEMORANDUM

/rb

Enclosures

c: Mr. Stephen Willis, Director of School Safety
Silke Becker, Jonathan Ruiz – RossTarrant Architects
File ME230825-Brock-Estill MS