

To: Kasie Boaz
Eric Billmyer

From: Jim Golden, P.E.
WV P.E. License 15,477
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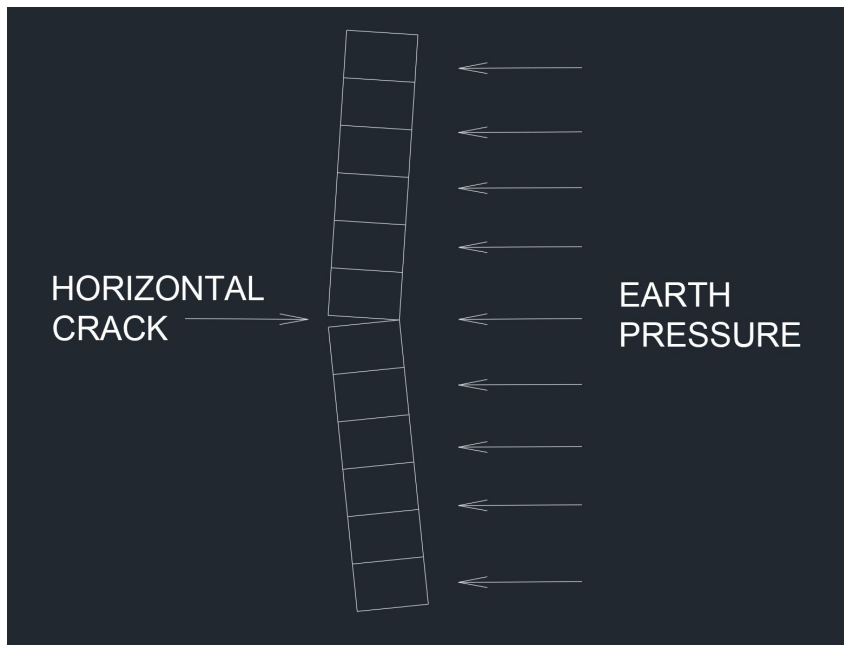
Date: January 12, 2024

Subject: Structural Status of Foundation of Property Located at
209 Orchard Road
Romney, WV 26757

Dear Kasie,

On January 10, 2024, I visited the above-mentioned property to inspect the foundation structure. There was concern about a horizontal crack. I met with owner, Eric Billmyer, and we examined the structure.

Horizontal cracks are typically indicative of hydraulic pressure outside the wall pushing the wall inward. They typically bow inward and the cracks tend to form in the center third of the wall. With a CMU block wall, it is usually the blocks rotating and the inside joint of the block pulling apart.



This diagram illustrates what is happening. The pressure outside pushes the wall inward, and as it bows, the CMU blocks pull apart like shown.

What is seen inside is the horizontal crack. That is what is happening here.

This is caused by improper surface drainage.

The following pictures were taken inside the basement and will show what is going on.



These two pictures show about half of the left side of the room and most of the right. You can see that the horizontal crack extends nearly across the entire wall. There is a stair step crack on the right side. That type of crack is indicative of differential settlement.

Differential Settlement is where one part of a wall settles more than another, and so something has to give. With a CMU block wall, it is typically the mortar joints that crack. However, they can also split the block.

In this case, it appears that the corner of the structure is laying wetter than the center, and so the corner has settled more than the center.



The left picture is a closeup of the stair step differential settlement crack. The right picture shows the horizontal crack extending clear over to the wall.



These two pictures show the extent of the horizontal bowing. It's about a half inch. While this is not optimum, I have seen much worse.

We walked outside to see if we could determine the cause of this cracking.



This is the back yard just above the section of wall in the photos above. The backfill has settled, and the whole yard is on a slope. Surface water has been running down hill against the house, saturating the ground by the wall, and causing it to swell and create hydraulic pressure. This is what is causing the large horizontal crack.

An extra amount runs down and around and lays against the corner, and that is what is causing the differential settlement cracking.



These two pictures are a zoom out showing the entire room (I couldn't get it all in one shot). But the cracking can be seen to line up with the outside pictures.

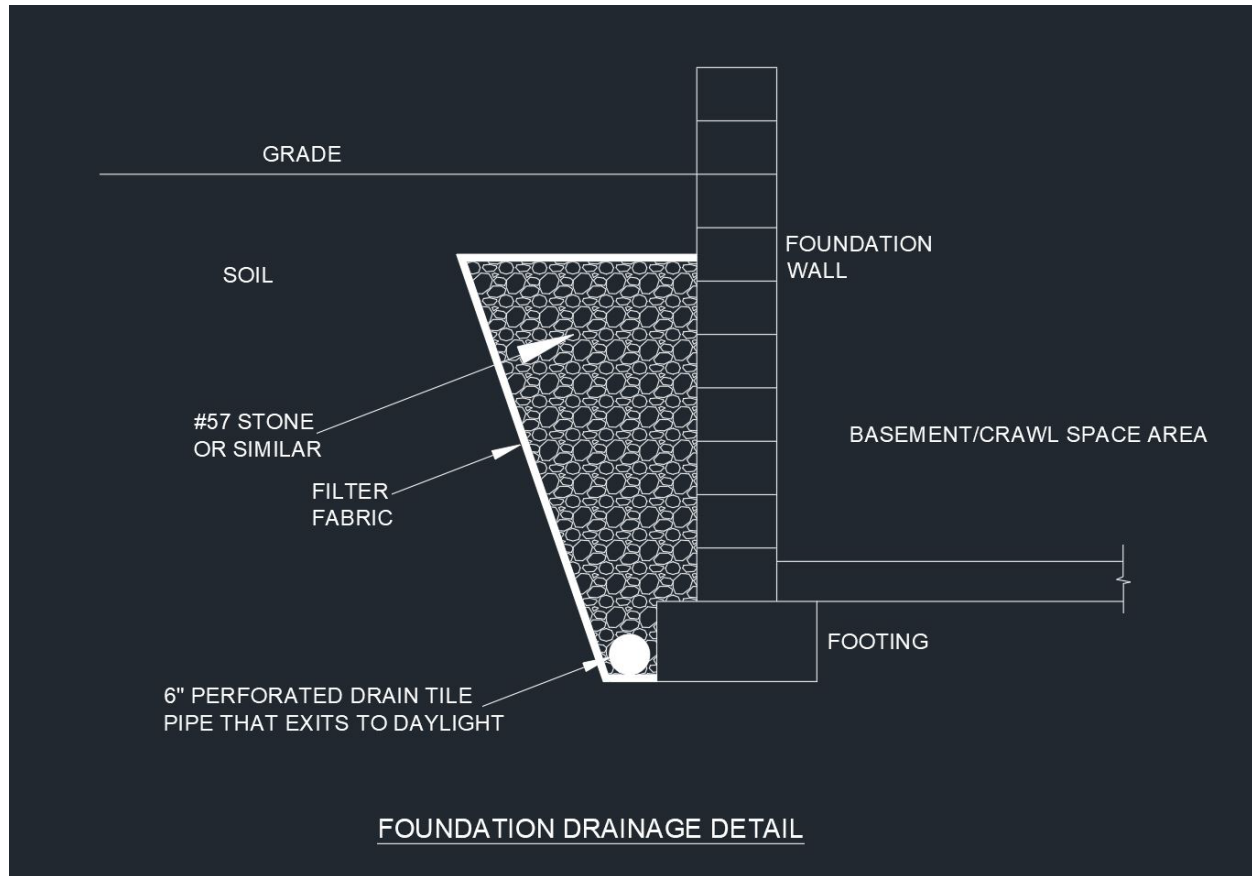
The other side of the basement is finished, and there was no way to observe for cracks without destroying the drywall. It probably has some cracking as well, but maybe not as severe since the concrete patio would block some of the water from saturating the ground. Although, over time, it will soak in from both sides.



These two pictures show the opposite end of the house, by the portion of the basement that is finished and the wall is not visible. It can be seen that the patio has settled and has pitched toward the house. And, the little dirt depression by the wagon is also allowing water to run toward the house.

So, the question becomes; how to fix this.

As I'd told Eric, the best way is to get a backhoe and dig up around the house along the entire wall down to the foundation to relieve the pressure. Then, from the inside, push the wall back out and into place. Get a mason to redo the joints. Then, on the outside, using filter fabric and #57 stone, put a French drain along the entire back of the house to get the water out.



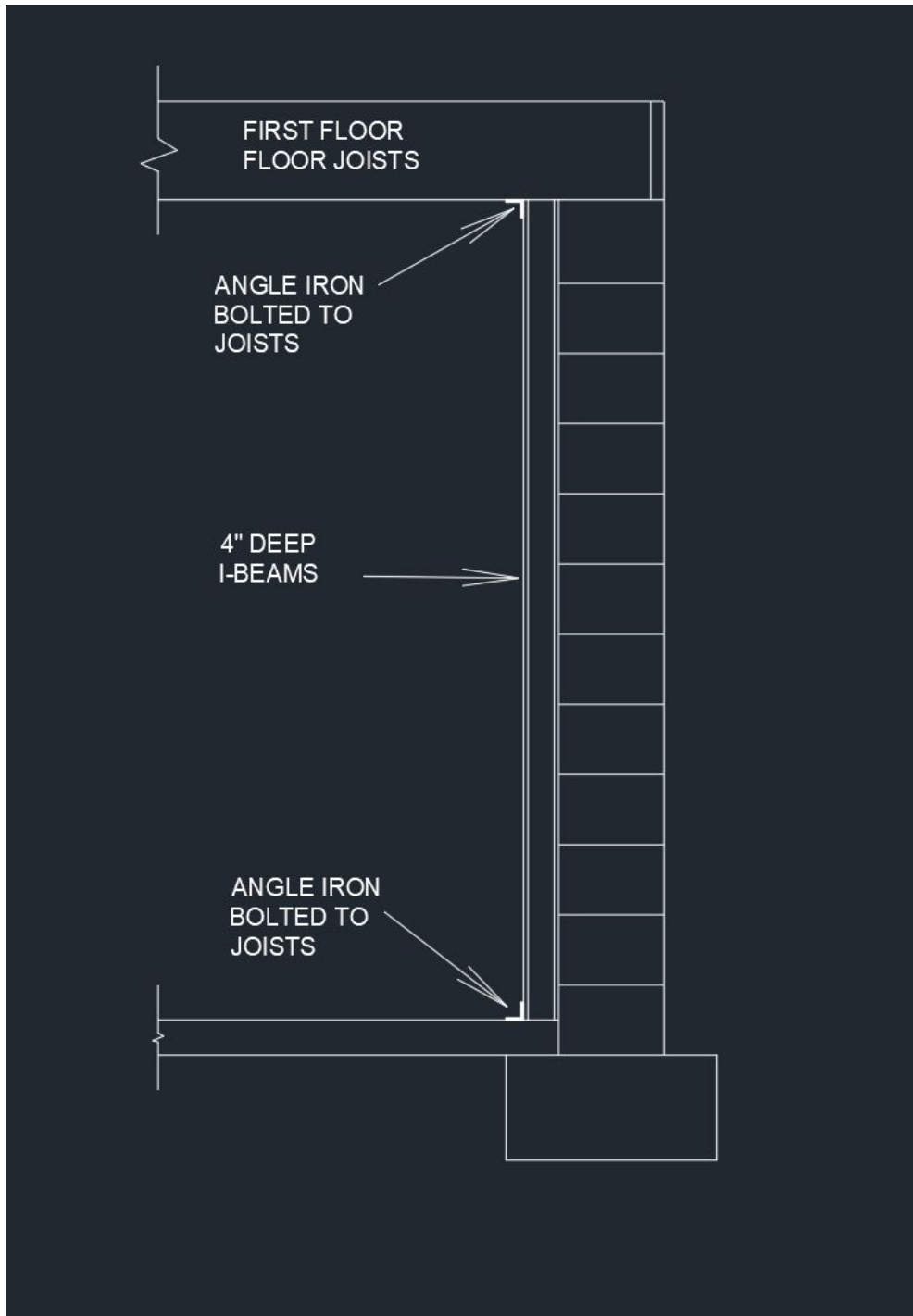
However, in this case, the bowing is not so severe as to require this, especially in light of how difficult it would be to do.

In this case, I recommend buttressing the wall inside. I would Kwik-Bolt a 2x2x1/4" steel angle to the floor, and lag bolt one to each floor joist above. These would hold 4" steel I-Beams vertically against the wall. Put a vertical I-Beam every 16" down the length of the wall. Bolt each I-Beam to both of the channels to stabilize them.

It would be best to pull out the shelving and washer and dryer, and do this down the entire length of the wall. The machines can then be put back.

Either before or after (probably better before, but do it right before...) is to get a mason in there and repoint all of the cracked joints.

Refer to the sketch below for how the buttressing steel would look. The steel should be primed (I recommend Rust-Oleum Rusty Metal Primer or similar) before installation so that it does not rust.



To prevent this from happening again or getting worse, the yard needs to be regraded and some drainage swales added. Using dirt fill, build up against the house so that the dirt is a good 6" or so higher against the house and the yard. Taper it down to yard level about 6-8' out from the house. Then, cut a swale from the edge of the patio arcing out toward the hill and down toward the driveway. Do the same thing on the other side of the patio, arcing out around that side of the house and down hill.

The patio itself might need a topper slab poured on top of it to get rain water to run away from the house. It has settled and is running water against the house. If this is not practical right now due to weather, then I'd recommend some type of industrial silicone caulk or something along the crack where the patio meets the foundation wall. This needs to be sealed up.

The best repairs would be to either hammer it out altogether and just build it up with soil and replant grass, hammer it out and pour a new slab that is pitched the correct way away from the house, or pour a new slab on top of the existing slab. If a new slab is poured, do not go thinner than 2.5" on the thin end and get it high enough on the house end to have a good positive drainage. Probably something like 6-8" thick against the house and 3" thick away from the house. Put welded wire fabric in it for crack control. It would be difficult, however, due to location, to get a concrete truck in there. But, something needs to be done to stop the water running across the patio and down the crack against the foundation.

A simpler repair that would help would be to pour a concrete "wedge" against the house on the patio. Something like a wedge that would come up about 6", to just under the siding, and then taper out to about 1.5" thick say a foot out from the house. That would be easy to do, inexpensive, and at least stop the water from going behind the slab.

The idea is to divert all the surface runoff away from the house. This will stop the ground from laying wet against the house and prevent it from getting worse.

In addition, make sure all gutters and downspouts are not leaking and have splash blocks and/or extensions at the bottom.

Summary:

This cracking does need to be fixed. Being not practical to dig out the entire back of the house I recommend the following:

1. Correct the surface drainage in the upper yard.
2. Make sure water is not pooling at the lower corner where the differential settlement cracking is occurring. Some minor grading may be required down there as well.
3. Have a mason repoint all of the cracks in the basement.
4. Buttress the wall with steel I-Beams and angles

Doing something along these lines will make a safe and adequate repair. The key, though, is to make sure the grading and drainage is correct so that it does not continue to move.

If you have any further questions or concerns, please feel free to contact me.

Sincerely,



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1/12/2024