

BATH COUNTY SCHOOL BOARD

AGENDA ITEM: INFORMATION { X } ACTION { } CLOSED MEETING { }

SUBJECT: ITEMS FOR BOARD MEMBERS

March 13, 2015

Mark Cook
Director Of Maintenance
Bath County Public Schools
464 Charger Lane
Hot Springs, VA 24445

Re: Bath County High School
Masonry Cracking

Dear Mr. Cook:

Per your request, I conducted an inspection of the Bath County High School to review numerous cracking in the masonry on January 30, 2015. I took photographs of each of these locations and my report will refer to each photo and will describe what it shows and the likely cause.

Photo 1

This is the front of the school. There is a beam that supports the second floor masonry just below the windows along the entire front of the structure. This beam is supported by columns located within the brick columns shown. Reviewing the design drawings, I noted that the beam is considered continuous from one end of the structure to the opposite end without any allowance for expansion and contraction. During warm weather the beam expands and in cold it contracts. This lateral movement due to this thermal expansion and contraction has created numerous cracks in the masonry as shown in the following photos.

Photo 2- This is the far right had end of the front of the structure and one can see that the masonry is pushed outward. Photo 3 shows a close up of the top of the crack. Photo 4 shows a column at about mid span and the cracks at the corners indicate movement in each direction that snapped the corners off of the brick.

This is not a structural issue except for the damage to the masonry. Simply repairing the masonry will be ineffective unless some modification is made to allow the steel to expand and contract at its own pace. Water within the cavity will freeze and cause further damage and to keep the cracking from worsening. The cracks should be sealed to keep out rain. Effectively sealing these cracks without drawing attention to them is difficult. A clear silicone works well if it is placed about 1/2" below the brick surface. This will go unseen, but the cracks will still be obvious.

Photo 5

This is the rear entrance into the facility and the columns on both sides of the steps have masonry cracks that extend up from the pavement. See Photos 6 & 7. We discussed this condition and I was told that the roof above these columns had problems in the past with overflowing. It is my opinion that the moisture from this overflow soaked the lower section of the brick columns and freezing temperatures caused the water to expand within the brick cavity. The brick here could be repaired if matching brick can be found. You would need to do one side of the column at a time, and as long as the roof problem does not occur again, there should be no problem in the future.



Consultants To The Construction Industry

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Roanoke, VA 24015
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Photo 8

This photo shows the exterior wall opposite where the stairs that lead to the stage area in the auditorium. There were numerous cracks on the inside of the stairwell, but they did not reflect on the exterior of the structure. Photos 9 through 12 show various cracks within the stairwell. They appear to have been caused by settlement of the foundation at the corner. There are two contraction joints along the exterior of the wall and I believe these have accommodated the movement on the exterior without cracking. However, there are no expansion joints within the interior wall and any movement would show up as cracking on the interior.

The repair here is fairly simple except along the sidewalk side of the structure. Should the settlement continue, I would recommend the installation of helical piers to provide additional support to the foundation. I have attached a sketch of one type of helical pier that is used for this purpose. I suggest installing crack monitors within the stairwell and recording the measurements and wait about 6 months to a year and measure them again. If the cracks have widened, I would go ahead and install the helical piers. If no movement is detected, I would recommend simply repairing the cracks on the inside and repainting the walls.

Photo 13

The center column at this area has a vertical crack down the middle on both sides. See photos 15 & 16. Again, there were roof problems at this area in the past and it is believed that the masonry has an old drain within its interior which is no longer used. The problem here is caused by moisture within the cavity freezing and the subsequent swelling broke the masonry as you can see. I looked at this column about a year ago and it doesn't appear that the cracking has gotten any worse. I could not ascertain if there was a structural column within the masonry. If there is one, the brick can likely be removed and replaced as long as the lintel above it bears on the column and not the masonry. If there is no column, the roof and adjacent masonry can be shored up and the brick removed and replaced.

Photo 17

I looked at this corner about a year ago and the downspout was draining directly on the ground and I instructed you to have the drain repaired. See Photo 18. This was done and it appears the problem has fixed itself since I could not see any movement by a simple visual assessment. It appears the corner is stable, but the section of wall over the entrance appears to have settled more than the corner. You indicated that some work was done on the corner in the past to address this condition, but none on the adjacent area on each side of the entrance. The entrance distributes the load from the wall to each side, therefore loading the foundation on both sides of the entrance more than between. This differential movement shown in Photo 20 is the cause of the cracking shown in Photos 19, 21, & 22.

I recommend installing crack monitors on the cracks within the gymnasium as well as on the exterior of the wall shown in Photo 20. We will measure these after installation and again in 6 months to a year to see if any additional movement is occurring. If movement is still occurring, I would recommend reinforcing the foundations there with the helical piers mentioned earlier in this report. The crack monitors in the gym now show movement and are quite deteriorated. Their original readings are not known so their readings are of no value for evaluating the settlement.



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Mark Cook
Director Of Maintenance

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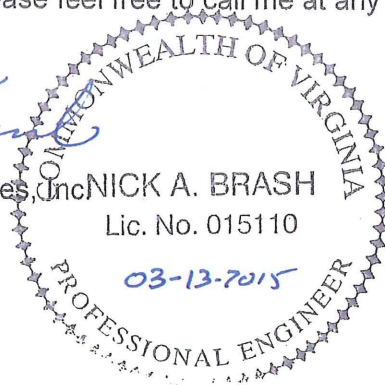
The crack monitors I use are quite different from the plastic ones previously used in the gymnasium. These are small stainless steel disks that are glued to the surface on each side of the crack in various patterns. They have a small dimple in the middle where you measure the distance between them with a micrometer. They are not very noticeable and therefore, not subject to damage by vandalism or from UV deterioration. They can be left in place indefinitely in case movement reoccurs in the future or they can be removed with a swift hit from a small chisel. I have attached a sample crack pin used to monitor the cracks.

I hope this report clarifies the reasons some of these things have occurred. We should probably at least monitor the area in the corner of the gymnasium where it has settled to see if it is still moving. You could simply repair the cracks in the hall near the stage and wait and see if the repair cracks. Let me know if you decide to install the monitors. I'll make myself available and come install them at your direction.

I apologize for the delay in getting this report back to you. With the severe winter, little emergencies kept cropping up all over and I just kept procrastinating. Should you have questions or require additional information, please feel free to call me at any time.

Sincerely,

Nick A. Brash, P.E., President
Comprehensive Construction Services, Inc.



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Sample Helical Pier

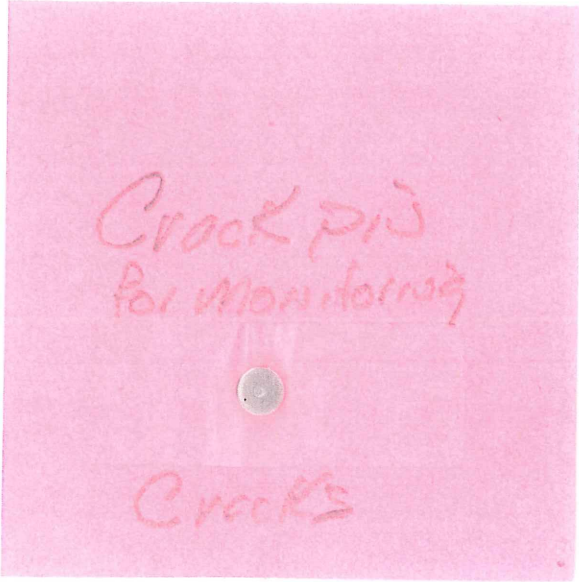
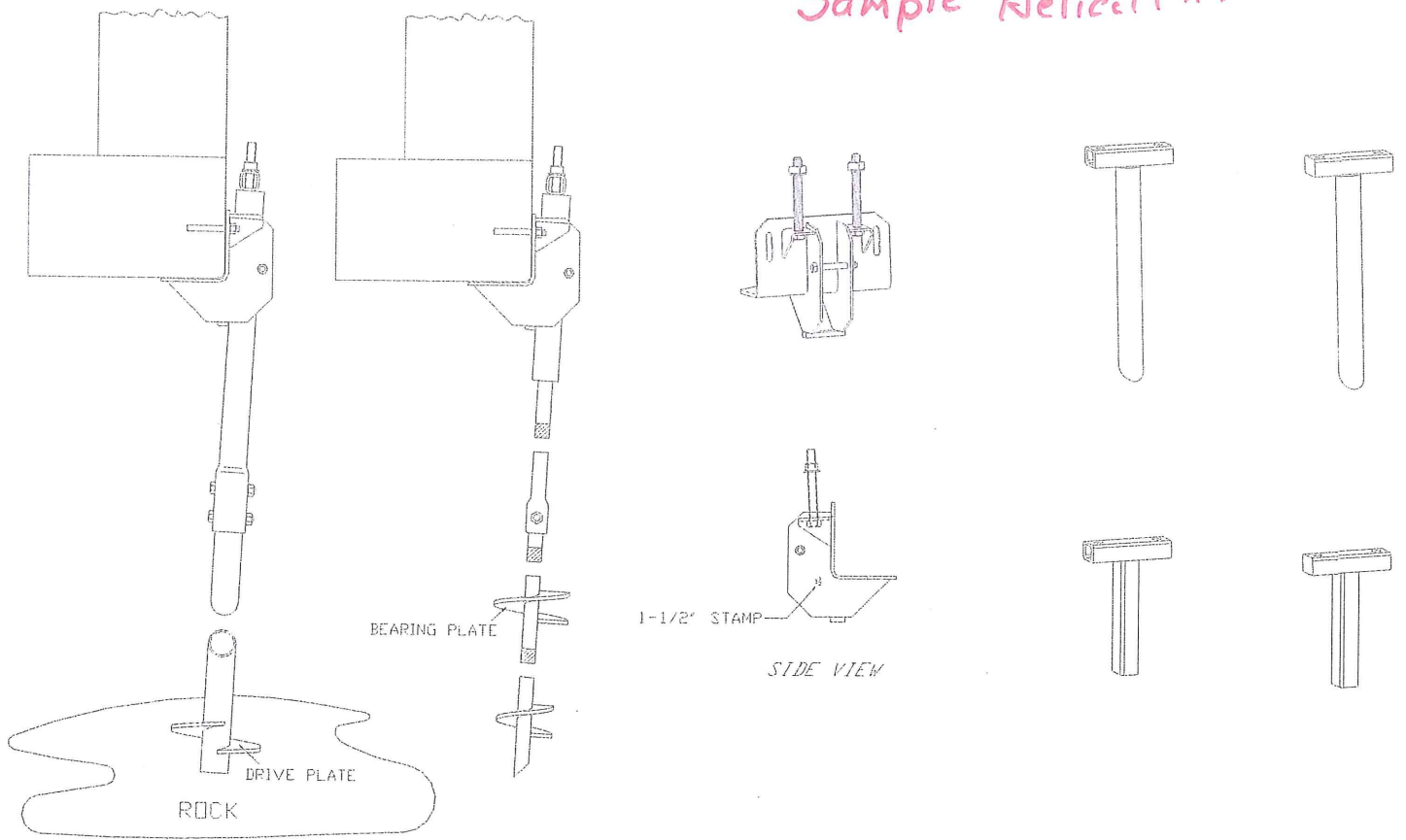


PHOTO SHEET

Structural Inspection
Bath County High School
Bath County Public Schools

Date of Inspection: January 30, 2015



PHOTO 1 - Front of Structure (Beam Supports Brick Just Below Windows)



PHOTO 2 - Far Right Brick Column At Front Of Structure Showing Movement Due to Expansion

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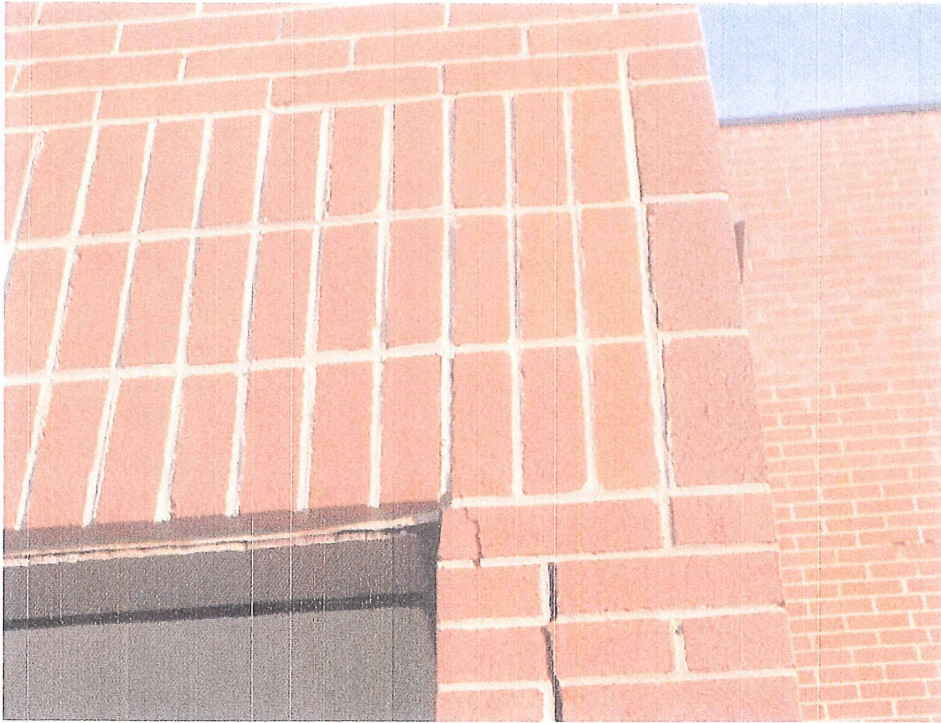


PHOTO 3 -Close Up of Crack Shown in Photo 2



PHOTO 4 - Typical Damage Due to Thermal Expansion / Contraction of Beam

PHOTO SHEET

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PHOTO 5 - Brick Columns at Rear Entrance



PHOTO 6 - Crack In The Left Brick Column at Stairs Shown In Photo 5

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PHOTO 7 - Crack In Right Brick Column at Stairs Shown In Photo 5



PHOTO 8 - Exterior Wall At Stairs to Auditorium Stage

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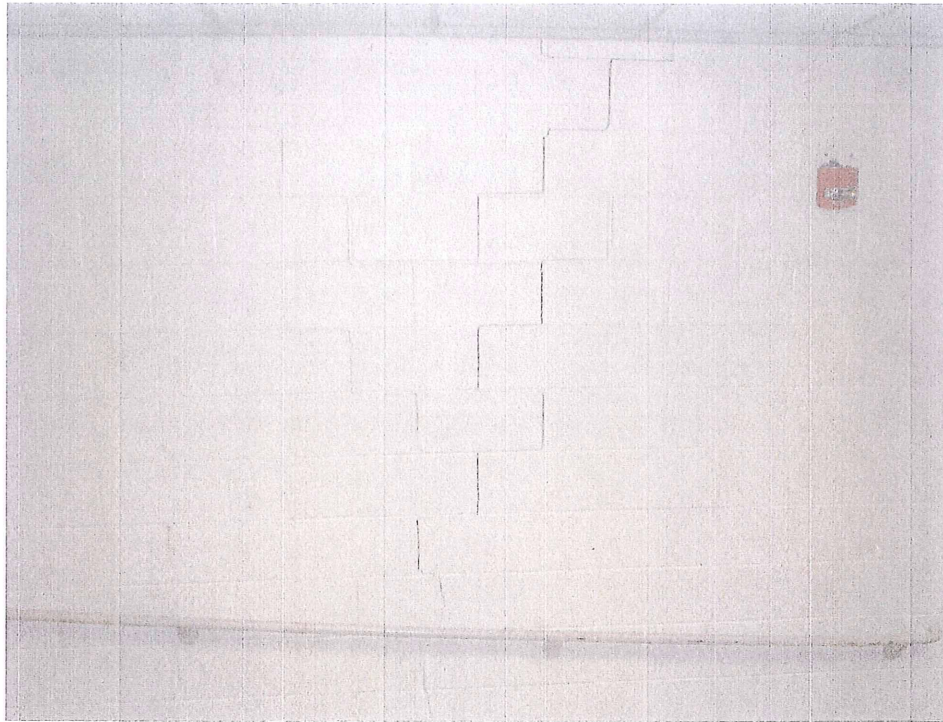


PHOTO 9 - Interior Crack At Stairs To Auditorium Stage(At Side Wall)

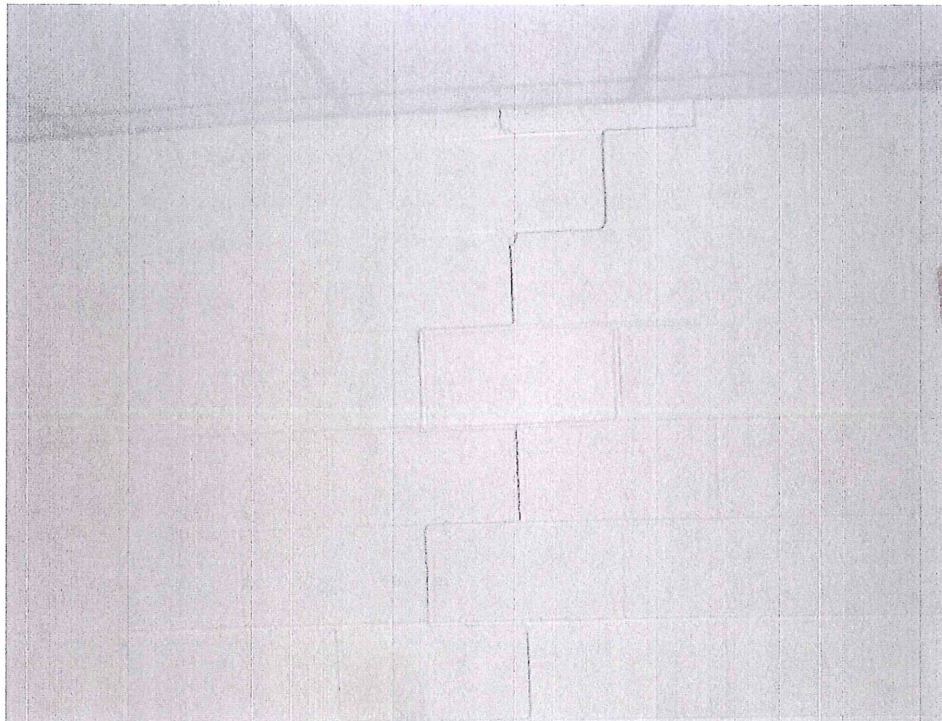


PHOTO 10 - Close Up of Interior Crack At Stairs To Auditorium Stage(At Side Wall)

PHOTO SHEET

Structural Inspection
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Bath County Public Schools

Date of Inspection: January 30, 2015



PHOTO 11 - Interior Crack At Stairs To Auditorium Stage (Near Rear Wall)

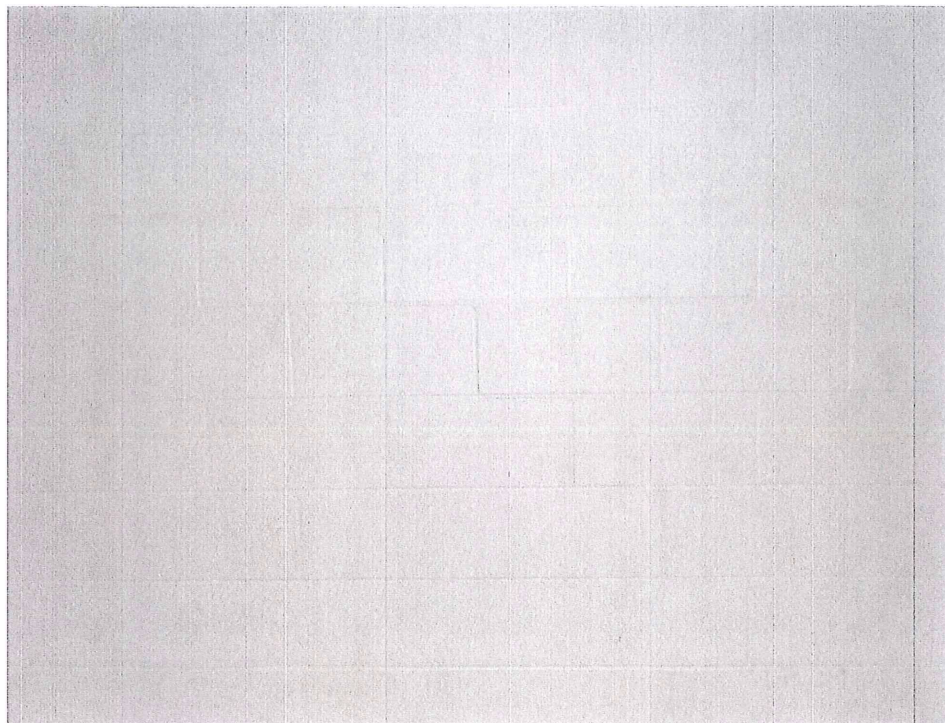


PHOTO 12 - Interior Crack At Stairs To Auditorium Stage(At Side Wall)

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PHOTO 13 - Location of Column Shown in Photos 14m, 15 & 16



PHOTO 14 - Brick Column Shown in Photos 15 & 16

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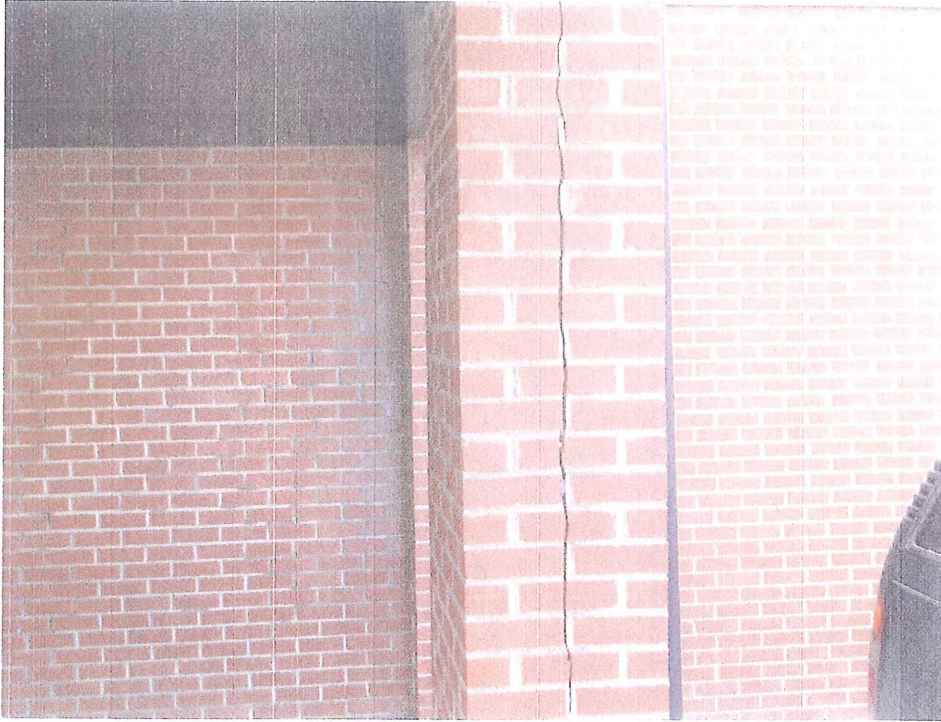


PHOTO 15 - Vertical Crack In Brick Column



PHOTO 16 - Vertical Crack In Brick Column

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PHOTO 17 - Gymnasium Corner Showing Differential Settlement



PHOTO 18 - Downspout is Likely Cause of Settlement At Corner

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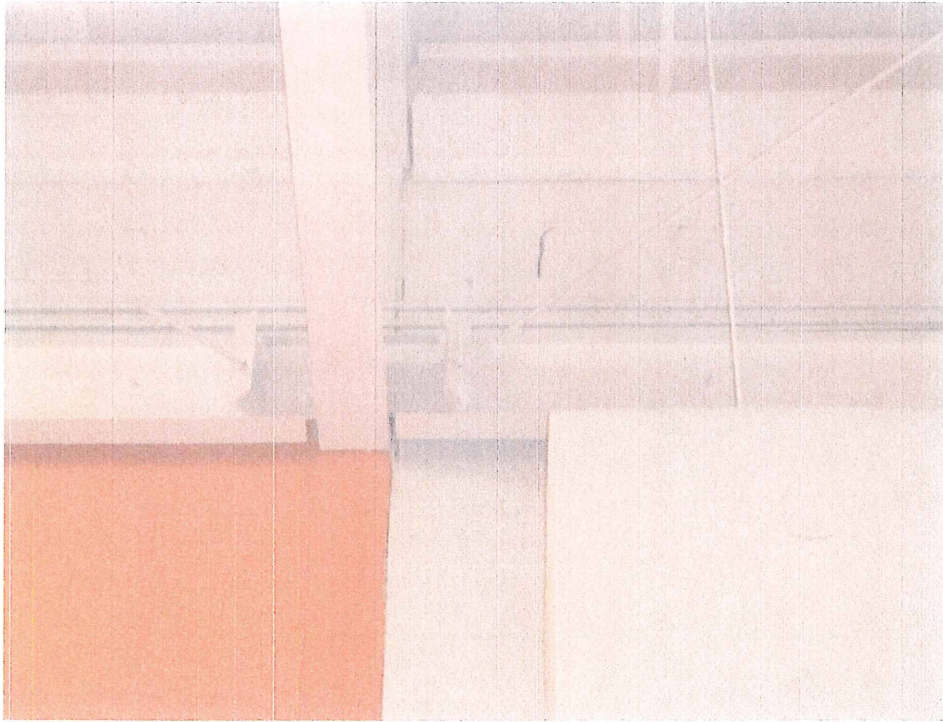


PHOTO 19 - Step Crack In Sidewall Of Gym Resulting From Corner Settlement



PHOTO 20 - Settlement of Wall Left of Corner

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PHOTO 21 - Horizontal and Diagonal Cracking Above Bleachers



PHOTO 22 - Horizontal Crack Above Bleachers (Close Up of Photo 21)

Bath County Public Schools K – 12 Projected Enrollment 2015-2016

(as of 3/30/15)

	Millboro	Valley	TOTAL ELEMENTARY	BCHS	Non-Resident		
	(Count includes non-Resident students)				MES	VES	TOTAL
Kindergarten	23	13	36		2	1	3
Grade 1	17	20	37		3	1	4
Grade 2	15	25	40		1	2	3
Grade 3	14	33	47		1	3	4
Grade 4	17	19	36		3	0	3
Grade 5	10	28	38		2	4	6
Grade 6	15	28	43		3	2	5
Grade 7	8	31	39		0	2	2
MES/VES TOTALS	119	197	316		15	15	30
Grade 8				38			0
Grade 9				50			6
Grade 10				54			3
Grade 11				60			4
Grade 12				46			2
BCHS TOTALS				248			15
TOTALS	119	197		248			
DIVISION TOTALS (includes non-resident students)							564
Subtract Non-Resident Students							-45
2015-2016 Bath County Students							519