Mccolley, Patrick

From: Bill Vermes <bvermes@ymail.com>
Sent: Friday, April 24, 2026 1:27 AM
To: jpautz@gmail.com; rexchildersphd@gmail.com; Young, Kacey; Geckle, David; Cherry, Joanie; Doug Miller; Mccolley, Patrick; tim.g.pedro@gmail.com; jgoch@waterville.org
Subject: Roiache de Boeuf - Engineering Group Update April 24

Everyone,

Here is a summary of my inquiries this week.

Arch Condition (Cause and Effect of Visible Efflorescence)

I contacted Patrick Sparks (Sparks Engineering, San Antonio, Texas), and sent him representative photos of the efflorescence present on the arch intrados. Here is his reply.

Bill,

It looks like the efflorescence aligns more or less with the longitudinal bars (6" o.c.) suggesting corrosion initiation. The efflorescence may very well be calcium hydroxide from the fill. I would want to test it to see what it is, and what is the chloride and sulfate content. Also, it would be essential to test for depth of carbonation. With a bridge that old, the carbonation may be pretty deep, if not all the way through. Every bridge I've looked at that is in that age category has been deeply carbonated. Once they get past 80 years, it is hard to save them. At 120 almost, I think it is unlikely that rehab could stop the progress of decay.

So, I'd recommend those basic tests before deciding.

Give me a call any time. I'm semi-retired now.

Patrick Sparks, P.E.
Sparks Engineering, Inc.

Let me add the following. First, TTL's petrographic analysis of the two cores states all observed carbonation depths to be less than ¾ inches, which is not near the cover distance of the steel reinforcing. It is my understanding that carbonation penetration is linear over time, thus I do not think carbonation will be an issue for quite some time.

Regarding calcium hydroxide, the following is from Wikipedia:

> *Calcium hydroxide (traditionally called slaked lime) is an inorganic compound with the chemical formula Ca(OH)2. It is a colorless crystal or white powder and is produced when quicklime (calcium oxide) is mixed with water. Annually, approximately 125 million tons of calcium*

hydroxide are produced worldwide. Calcium hydroxide does not corrode iron and steel, owing to passivation of their surface.

Maintaining Historic Bridge Status

I contacted Mary Rody Ohio State Historic Preservation Office, inquiring if enough of the historic fabric would remain if all spandrel walls were removed from the bridge. Her reply is....

Hi Bill!

Thanks for making the inquiry. At first blush, I am skeptical that the bridge would retain sufficient integrity. Due to conflicting schedules, I am going to confer with staff early next week and will report back.

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While this reply appears disappointing, I think there is room for discussion and mitigation. There are numerous examples of significant percentage of concrete element replaced in-kind on historic concrete arch bridges without the historic status being lost. Let's see where this discussion leads.

Finite Element Model

I contacted a consultant that I know well and trust during my time in consulting and as the bridge engineer for Portage County if they could develop an FE model and analysis using Midas of the Roche de Boeuf. Considering the immediacy of the decision making, I asked for a cost estimate and list of deliverables by today with a delivery an FEA by Friday, May 8, and shared my AutoCAD file and technical information I have of the structure. Wednesday, I received a reply that they cannot meet this tight schedule due to their current workload and priorities.

When I return from Oklahoma, I will start hand calcs of the arch. It won't be as accurate as FEA, but I may be able to get it done.

Zimmerman Bridge: I read this short article twice, and it is clearly stated that no equipment was on the bridge when it failed. The article also conspicuously says little more than that. I wonder if an imbalance occurred with fill still present on the first arch standing from the removed arch. On Roche de Boeuf, there are clear unreinforced compression regions that should not be placed in reversal.

Survey & Inspection

As I work on my Oklahoma project, I have been making opportunities to meet bridge engineers and historic preservation officials. Some of these meetings have become annual endeavors. Most discussions are related to Oklahoma bridges but some is of bridge work in general. Yesterday, a bridge engineer mentioned to me a new technology of stitching video together to develop a 3-D model of bridge. The new technology uses AI to develop this model and it can show defects as small as cracks in concrete and chips in paint on bridge steel. It was suggested that the cost to make this model could be less than a LIDAR survey and quicker. I'm awaiting for more information.

I don't know if the above survey can be implemented in time, but I feel it's worth considering.

Thank you,
Bill Vermes