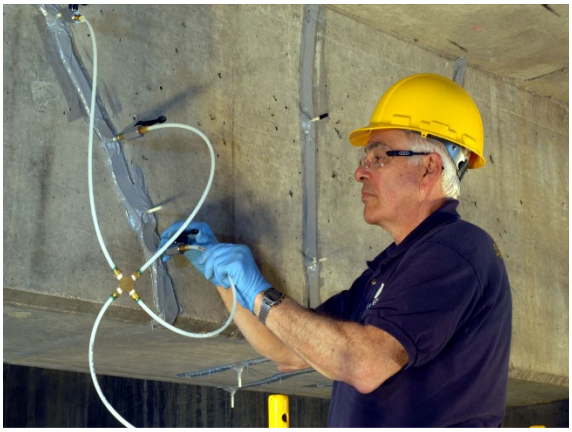
Volume 7, Issue 1 January 13, 2023

STRUCTURE BULLETIN

NCDOT Construction Unit

Website email

Current Issues: Epoxy Injection



As we all know, concrete cracks. There are many reasons why, and there are ways that cracking can be minimized or even eliminated. We'll save that topic for another bulletin. For now, we are going to focus on epoxy injection of cracks. This process uses an epoxy resin under pressure to fill the cracks and help restore the strength and integrity of the concrete member, thus increasing the service life. However, if done improperly, cracks will not be completely filled and will either re-crack, or the member will not be repaired as intended.

The special provisions should be reviewed thoroughly and followed, but ultimately it is the Contractor's responsibility to provide means and methods that will achieve **a completely filled** crack. For years, it was thought that as long as you start at the bottom of the crack, and you see epoxy coming out of the next port, it is ok to close the bottom port, and move to the next port, and so on. This misconception has led to a lot of cracks not being completely filled. Cracks are typically wider at the surface and narrower at the bottom. The epoxy will take the path of least resistance, which may be to the next port before it is forced into the bottom, narrower portion of the crack. The latest special provision requires the Contractor to pump to refusal. This means that even if they get port to port travel, they need to hold the pressure at certain points until the epoxy completely stops flowing.

So how do you know if the crack is completely filled? I'm glad you asked. See the next page for the answer!

Epoxy Injection Training Materials:

The Construction Unit has additional training materials available to assist inspectors and engineers. In 2018, NCDOT inspector training focused on bridge rehab. The Substructure Rehab Training presentation includes information on epoxy injection.

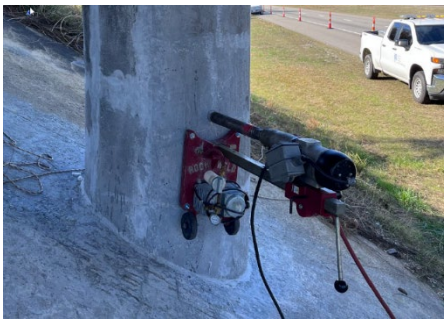
Although NCDOT does not endorse specific vendors, the following video by Lily Corp. is a great instructional video for epoxy injection:

Epoxy Injection Training Video

Additional resources and videos are available from the Construction Unit. Contact your Area Construction Engineer (ACE) for more content and videos to help you properly inspect epoxy injection operations.

Epoxy Injection Testing:

The only way to know that a crack has been completely filled is to cut cores. Until August of 2022, the special provisions stated that NCDOT would cut the cores. New contracts now require the Contractor to perform the coring. Regardless of who cuts the cores, it is very important that rebar is not cut while obtaining these cores. There are devices that can locate the reinforcing steel to ensure the steel is not cut. The old provision also required 4" cores, whereas the new provision requires 3" diameter by 6" deep cores. However, 2" diameter cores may be sufficient to help in missing reinforcement. The cores should be checked to ensure that epoxy has completely filled the crack or at least to the 6" depth of the core. Additionally, the cores will be tested for compressive strength. If the core breaks lower than 3000 psi, the failure plain is not allowed to be along the crack.



The other important thing to consider is when to cut the cores. If you wait until all the work is complete, you can't catch problems with the Contractor's means and methods until the end. Therefore, cores should be taken early in the process to verify complete filling of the cracks. As long as good results are obtained and the Contractor continues using the same procedures, testing frequency is reduced. (See below)

2019 Provision

- DOT cuts the cores
- 4" Diameter to full depth of crack
- 3 cores per 100'
- Compressive tests done on the cores. If fails along crack, must be 3000 psi minimum

2022 Provision

- Contractor cuts the cores
- 3" Diameter – 6" Deep
- 3 cores in first 50'
- 1 core per 100' if acceptable
- Compressive tests done on the cores. If fails along crack, must be 3000 psi minimum
- Avoid existing rebar!!!

Use the updated testing requirements, even if you have an old provision. It is also acceptable to cut smaller cores to avoid rebar

Videos:

Inspection training videos can be found on the Construction Unit YouTube playlist.

Structure Inspector Training:

A day and a half in depth structure inspector training has been scheduled for this winter. Check with your supervisor to confirm that they have you scheduled to attend:

Jan 24-26	Dublin
Feb 13-15	Waynesville
Feb 28-Mar 2	Winston Salem
Mar 6-8	Carthage
Mar 14-16	Raleigh
Mar 21-23	Williamston
Apr 18-20	Charlotte

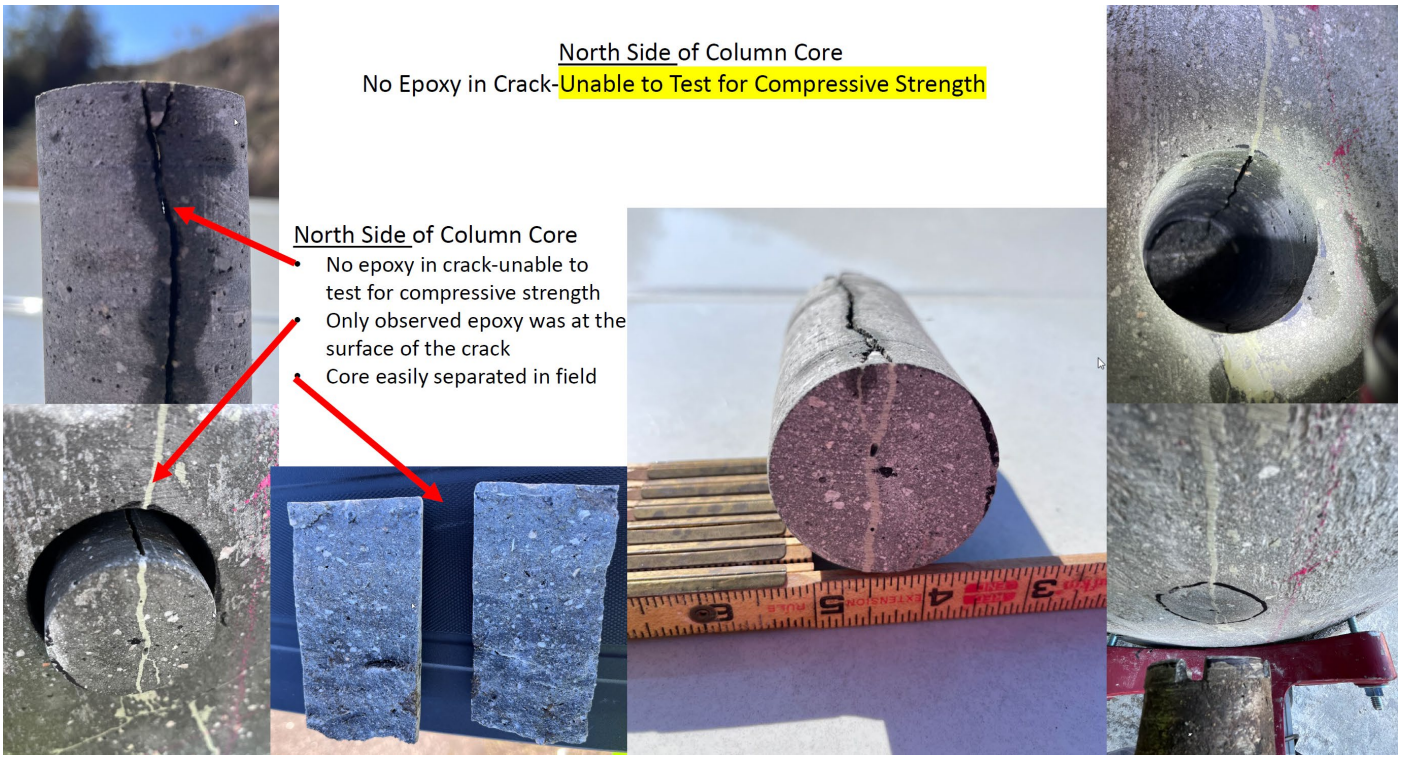
Structure Bulletins are archived on the Construction Unit website under Construction Resources.

Structure Bulletin Signup:

Scan the QR code below to sign up for the distribution lists to avoid missing any valuable information.

Epoxy Injection Case Study:

The pictures below are from cores taken by M&T on a bridge rehab project that was let under the 2019 special provision. A total of 12 bridges required epoxy injection. M&T was not contacted to cut the cores until all the epoxy injection had been completed. As can be seen in the photos below, many of the cracks did not have any epoxy deeper than the top quarter inch or so. Many of the cores just fell open on their own, and could not even be tested for compressive strength as required. If cores had not been taken, no one would have ever known that the cracks were not filled. However, if cores had been taken in the first 50' of production, the Contractor would not have been allowed to continue until they proved that their means and methods were working to fill the cracks.



Area Construction Engineers:

Div	Contact	Phone
1&2	Randy Hall	282-402-9957
3&4	David Candela	910-524-4931
5	Troy Brooks	336-972-4627
6&8	John Partin	336-847-1226
7	Marcus Kiser	336-972-3412
9	Vickie Davis	704-202-0945
10	Christopher Fine	336-225-4266
11&12	Mark Biggerstaff	828-803-9954
13&14	Aaron Powell	828-417-2629

For coring assistance, contact M&T:

Joseph Barbour
Data Collection and Investigations Engineer
919-329-4015
jdbarbour2@ncdot.gov

If you have a topic you would like to see in a future edition of the Structure Bulletin, please email us at aearwood@ncdot.gov or aegriffith@ncdot.gov