Forms

STRUCTURE BULLETIN

NCDOT Construction Unit

Website email

Current Issues: Shotcrete Surface Prep and Curing

Dry Mix Shotcrete is a common and effective method of repairing deteriorated bridges. Like all other repair methods, the repair is only as good as the surface preparation. A little upfront effort will result in longer life repairs and a better value for the Department. The special provisions require a shallow saw cut approximately 1/2" in depth around the repair area at right angles to the surface. This shallow saw cut eliminates feathered edges around the repair which are more susceptible to flaking off and provides a more well-defined repair area (see the two pictures above). After sandblasting and prior to shotcrete placement, the surface shall be saturated with clean water and brought to a saturated surface dry (SSD) condition prior to applying shotcrete. SSD is defined as the condition in which the surface of the concrete is "dry" (no excess surface water), but the inter-particle voids are saturated with water. Quickly spraying the surface with a pressure washer does not create SSD conditions. The concrete needs time to absorb the water. This can be difficult in dry, hot, and windy conditions and may require soaker hoses and covering with burlap or plastic or at least multiple applications of water. If SSD conditions are not met, the existing concrete can actually suck the moisture from the shotcrete and can be detrimental to the bond and cause cracking. Excessive surface water can also be detrimental. A final step in long lasting shotcrete is proper curing. Wet curing is the preferred method and should be the first option. However, if it is impractical to wet cure and curing compound is allowed by the Engineer, it should be placed at double the manufacturers recommended dosage rate.

Equipment on Bridges:

Section 420-20 of the Standard Specifications gives guidance on placing loads on structure members, and the Construction Manual gives further clarification on the matter. Additionally, a memo dated 2004 gave guidance on placing equipment on decks. In the wake of the I-35W bridge collapse in Minnesota a 2007 memo expanded the guidance to include construction loads, such as materials and debris. This memo has been revised to correct language since the departmental reorganization which combined Bridge Maintenance and Structure Design. A copy of the memo can be found at the Construction Resources page under Contract Administration Guidance, Contract Provisions & Letting and on the SMU website Here. A copy is also attached to this bulletin. Remember, storing materials and debris can be just as detrimental as using equipment on the deck. Contact your Area Construction Engineer if you have any questions.

DEAD LOAD DEFLECTION & CAMBER SCHEDULE - GIRDER 1

TWENTIETH POINTS	SPAN A																				
	1.00	1.05	1.10	1.15	1.20	1.25	1.30	1.35	1.40	1.45	1.50	1.55	1.60	1.65	1.70	1.75	F.S.	1.80	1.85	1.90	1.95	2.00
DEFLECTION DUE TO WEIGHT OF STEEL	0.000	0.008	0.016	0.024	0.030	0.036	0.040	0.042	0.044	0.044	0.042	0.040	0.036	0.032	0.027	0.021	0.019	0.016	0.011	0.006	0.003	0.000
DEFLECTION DUE TO WEIGHT OF SLAB	0.000	0.037	0.073	0.106	0.135	0.159	0.177	0.189	0.195	0.196	0.190	0.179	0.163	0.143	0.121	0.097	0.087	0.073	0.050	0.030	0.012	0.000
DEFLECTION DUE TO WEIGHT OF RAIL	0.000	0.005	0.010	0.015	0.019	0.022	0.024	0.026	0.027	0.027	0.026	0.025	0.023	0.020	0.017	0.013	0.012	0.010	0.006	0.003	0.001	0.000
TOTAL DEAD LOAD DEFLECTION	0.000	0.050	0.099	0.145	0.184	0.217	0.241	0.257	0.266	0.267	0.258	0.244	0.222	0.195	0.165	0.131	0.118	0.099	0.067	0.039	0.016	0.000
VERTICAL CURVE ORDINATE	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
REQUIRED CAMBER	0	5/16	1 3/16	1 7/8	2 5/16	2 7/8	2 7/8	3 5/16	3 7/16	3 7/16	3 5/16	2 15/16	2 11/16	2 5/16	2	1 5/8	1 1/2	1 5/16	1 1/16	7/16	3/16	0

Deflections VS. Buildups

The Engineering Control section of the Construction Manual contains **SUGGESTED PROCEDURE FOR GRADING BUILD-UPS ON CONTINUOUS OR SIMPLE SPAN BRIDGES**. This article directs inspectors and contractors to calculate and mark buildups at 20th, 40th, and 60th points along the tops of each girder, depending on the length of girder. This is to insure the distance between buildup points is not excessive, which can result in a poor ride.

The Structure Design Manual currently directs designers to supply deflection information at 10th, 20th, and 30th points. This language is being corrected to require the information to correspond to the Construction Manual language requiring the information at 20th, 40th, and 60th points. Until this change is reflected in the plans either the designers will need to supply the additional information needed or the inspector and contractor will need to interpolate between the supplied points to fill in the gaps.

Regardless of what information is shown in the plans, the bridge is still to be marked at 20th, 40th, or 60th points and the dry-run based on these numbers. Dry-run procedures can be found in the Construction manual at the following link: **SUGGESTED PROCEDURE FOR GRADING SCREEDS**, and are also covered in the video CIP Deck Class 2016, Dry Run.

Area Construction Engineers:

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1&2	Randy Hall	282-402-9957
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11&12	Doug Eller	336-877-7048
13&14	Aaron Powell	828-694-7971

Videos:

New video available: Cast In Place Bridge Decking has been uploaded to the NCDOT Communications YouTube site. The preceding video, Bridge Deck Buildups, is also available and discusses the buildup issues included in this bulletin.

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

Training:

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

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

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

ROY COOPER
GOVERNOR

J. ERIC BOYETTE
SECRETARY

DATE: May 18, 2020

MEMORANDUM TO: Division Engineers

FROM: T. M. Little, PE
Chief Engineer

SUBJECT: Operation of Construction Equipment on Bridges

Article 420-20 of the 2018 Standard Specifications requires that contractors submit, for review and approval, their plans to operate on or cross a bridge deck with heavy equipment that is not legally allowed on a roadway. Examples of equipment that fall under this requirement include, but are not limited to, crawler cranes, truck cranes and concrete pumping trucks operating with outriggers down, scrapers, off-road dump trucks, automatically controlled fine grading machines, and concrete paving machines.

In administering this requirement, the following review authority applies:

1. Structures Management Unit will review plans for all bridges that have been or are being constructed under the contract, or for existing bridges in or adjacent to the project that are open to public traffic. Related forms for submission to SMU can be found at https://connect.ncdot.gov/resources/Structures/Pages/Structure-Resources.aspx.
2. The Designer of Record will review and accept plans for Detour Bridges on the project that have been designed by the Contractor or consultant working for the Contractor. In this case, the Contractor must provide a letter, to the Resident Engineer from the Designer of Record, indicating that the proposed plan is acceptable. Details of the proposed operation must be submitted and sealed by the Design Engineer of Record.
3. The District/Resident Engineer will review all proposals to cross bridges with construction equipment that can legally cross a bridge but may cause damage to the bridge deck and joints. This includes, but is not limited to, asphalt paving machines and steel wheel rollers.

In order to expedite the review, the following information should be obtained and submitted with the request:

- Location, dimensions, and weight of stored materials or debris
- Make and model of the equipment including the manufacturer's catalog cuts
- General dimensions of the equipment, including width and length of tracks and spacing center to center of tracks or number and spacing of axles

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Website: ncdot.gov

- Weight of the equipment when traveling on the bridge including weight to be carried for individual axles
- Type of work being performed and weight of load to be lifted or carried by the equipment while on the bridge
- Size of construction mats to be used under the tracks or outriggers
- Spans that the equipment will be traveling on and exact locations on the spans
- Any other equipment, vehicles, or materials that will be on the span at the same time
- Proposed method for protecting joints or joint blockouts

Under no circumstances should heavy equipment be allowed on a bridge deck without prior approval. Upon completion of the work or crossing, both the contractor and the Department should inspect the deck and report any damage to the reviewing authority for further investigation.

Please direct any questions that you may have on this subject to the Area Construction Engineer or Regional Bridge Construction Engineer for your Division.

TML/acc

cc: Mr. C. A. Peoples, PE
Mr. M. L. Sylvester, PE
Mr. R. L. Keeter, PE
Mr. L. L. Mitchell, PE
Mr. P. A. Norman, PE
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Mr. E. B. Tharrington, PE
Mr. Brian Hanks, PE
Resident Engineers
District Engineers
Regional Bridge Construction Engineers
Area Construction Engineers