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THE STATE OF NEW HAMPSHIRE

DEPARTMENT OF TRANSPORTATION

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William Cass, P.E.  
Commissioner

DEC 17 2025

David Rodrigue, P.E.  
Assistant Commissioner

Michelle L. Winters  
Deputy Commissioner

Her Excellency, Governor Kelly A. Ayotte  
and the Honorable Council  
State House  
Concord, New Hampshire 03301

Bureau of Materials & Research  
October 15, 2025

**REQUESTED ACTION**

Authorize the Department of Transportation to amend a **SOLE SOURCE** Cooperative Project Agreement (CPA) with the University of New Hampshire Sponsored Programs Administration (Vendor #315187), Durham, New Hampshire, by extending the completion date from December 31, 2025, to June 30, 2027, to allow additional time to collect samples from delayed maintenance and construction projects as well as incorporate outcomes from recently awarded associated research. This is a time extension request, only. No new funding is being requested.

**EXPLANATION**

The Department is collaborating with UNH to conduct a cooperative research study, "Reducing Concrete Cracking through Mix Design". The original contract provides for a systematic investigation of concrete mix proportioning, specifically cementitious amount usage as well as use of supplementary materials, to determine the lowering of the early age cracking potentials of bridge curbs at several New Hampshire bridge sites. The original contract was effective upon Governor and Council approval through December 31, 2025, with approval granted on April 12, 2023, Item #40.

NHDOT is collaborating with UNH to address an immediate need by conducting a cooperative research study, "Reducing Concrete Cracking through Mix Design". In a previous project (SPR Project #26962P), researchers surveyed and analyzed data collected at several bridges to determine the factors driving early-age cracking in bridge curbs, and to develop cost-effective and easy-to-implement solutions. Improvements to wet-cure durations and changes to concrete mix designs were identified. While extended wet-cure practices have been implemented by NHDOT, complexities around optimizing concrete mix proportioning required this separate follow up project.

Better performing mixes have been identified, however, the research project has experienced delays due to reduced construction and maintenance by NHDOT that intended to deploy the range of mixes under consideration. An extension will allow researchers to capture planned samples when the delayed projects occur. Furthermore, the researchers were recently awarded a State Transportation Innovation Council award by Federal Highways to construct full scale curbs that leverage the best mixes identified to date and the extension will benefit NHDOT by allowing researchers to incorporate findings from those demonstrations into the products of this research at no additional cost.

Funding is 80% Federal Funds with 20% state match. Turnpike toll credits will be used for the match requirement, effectively using 100% Federal Funds. The Capital Budget Overview Committee approved the use of Turnpike Toll Credits to meet funding match requirements for the Department's State Planning and Research Part II (SPR2) Work Program on September 13, 2021, Item CAP 21-013.

This amended Agreement has been approved by the Attorney General as to form and execution. A copy of the fully executed amendment is on file at the Secretary of State's Office and the Department of Administrative Services, and subsequent to the Governor and Council approval, will be on file at the Department of Transportation.

It is respectfully requested that authority be given to amend this Agreement.

Sincerely,

A handwritten signature in black ink that reads "William Cass". The signature is written in a cursive style with a large, prominent "W" and "C".

William Cass, PE  
Commissioner

Attachments

**AMENDMENT #1 to**  
**COOPERATIVE PROJECT AGREEMENT**  
between the  
**STATE OF NEW HAMPSHIRE, Department of Transportation**  
and the  
**University of New Hampshire** of the UNIVERSITY SYSTEM OF NEW HAMPSHIRE

The Cooperative Project Agreement, approved by the State of New Hampshire Governor and Executive Council on 4/12/23, item # 40, for the Project titled “**Reduce Concrete Cracking through Mix Design (SPR2 42372M)**,” Campus Project Director, **Dr. Eshan Dave**, is and all subsequent properly approved amendments are hereby modified by mutual consent of both parties for the reason(s) described below:

**Purpose of Amendment (Choose all applicable items):**

- Extend the Project Agreement and Project Period end date, at no additional cost to the State.
- Provide additional funding from the State for expansion of the Scope of Work under the Cooperative Project Agreement.
- Other:

**Therefore, the Cooperative Project Agreement is and/or its subsequent properly approved amendments are amended as follows (Complete only the applicable items):**

- Article A. is revised to replace the State Department name of \_\_\_\_\_ with \_\_\_\_\_ and/or USNH campus from \_\_\_\_\_ to \_\_\_\_\_.
- Article B. is revised to replace the Project End Date of **12/31/25** with the revised Project End Date of **06/30/27**, and Exhibit A, article B is revised to replace the Project Period of **G&C approval – December 31, 2025** with **G&C approval – June 30, 2027**.
- Article C. is amended to add Exhibit A by including the proposal titled, “ \_\_\_\_\_ ,” dated \_\_\_\_\_.
- Article D. is amended to change the State Project Administrator to \_\_\_\_\_ and/or the Campus Project Administrator to \_\_\_\_\_.
- Article E. is amended to change the State Project Director to \_\_\_\_\_ and/or the Campus Project Director to \_\_\_\_\_.
- Article F. is amended to reduce funds in the amount of \$ \_\_\_\_\_ and will read:  

Total State funds in the amount of \$ \_\_\_\_\_ have been allotted and are available for payment of allowable costs incurred under this Project Agreement. State will not reimburse Campus for costs exceeding the amount specified in this paragraph.
- Article F. is amended to change the cost share requirement and will read:  

Campus will cost-share \_\_\_\_\_ % of total costs during the amended term of this Project Agreement.
- Article F. is amended to change the source of Federal funds paid to Campus and will read:  

Federal funds paid to Campus under this Project Agreement as amended are from Grant/Contract/Cooperative Agreement No. \_\_\_\_\_ from \_\_\_\_\_ under CFDA# \_\_\_\_\_. Federal regulations required to be passed through to Campus as part of this Project Agreement, and in accordance with the Master Agreement for Cooperative Projects between the State of New Hampshire and the University System of New Hampshire dated November 13, 2002, are attached

to this document as **revised** Exhibit B, the content of which is incorporated herein as a part of this Project Agreement.

- Article G. is exercised to amend Article(s) \_\_\_\_\_ of the Master Agreement for Cooperative Projects between the State of New Hampshire and the University System of New Hampshire dated November 13, 2002, as follows:

**Article** \_\_\_\_\_ is amended in its entirety to read as follows:

**Article** \_\_\_\_\_ is amended in its entirety to read as follows:

- Article H. is amended such that:

- State has chosen **not to take** possession of equipment purchased under this Project Agreement.
- State has chosen **to take** possession of equipment purchased under this Project Agreement and will issue instructions for the disposition of such equipment within 90 days of the Project Agreement's end-date. Any expenses incurred by Campus in carrying out State's requested disposition will be fully reimbursed by State.

- Exhibit A is amended as attached.

- Exhibit B is amended as attached.

All other terms and conditions of the Cooperative Project Agreement remain unchanged.

This Amendment, all previous Amendments, the Cooperative Project Agreement, and the Master Agreement constitute the entire agreement between State and Campus regarding the Cooperative Project Agreement, and supersede and replace any previously existing arrangements, oral and written; further changes herein must be made by written amendment and executed for the parties by their authorized officials.

This Amendment and all obligations of the parties hereunder shall become effective on the date the Governor and Executive Council of the State of New Hampshire or other authorized officials approve this Amendment to the Cooperative Project Agreement.

IN WITNESS WHEREOF, the following parties agree to this **Amendment #1** to the Cooperative Project Agreement.

**By An Authorized Official of:  
University of New Hampshire**

Name: Karen M. Jensen

Title: Manager, Sponsored Programs Administration

Signature and Date: Karen Jensen

Digitally signed by Karen Jensen  
Date: 2025.10.16 13:26:52 -0400

**By An Authorized Official of:  
Department of Transportation**

Name: Tobey Reynolds

Title: Asst. Director of Project Development

Signature and Date: *Tobey Reynolds* 10/27/25

**By An Authorized Official of: the New  
Hampshire Office of the Attorney General**

Name: *Meaghan Jensen*

Title: *Attorney*

Signature and Date: *Meaghan Jensen* 11/14/25

**By An Authorized Official of: the New  
Hampshire Governor & Executive Council**

Name: \_\_\_\_\_

Title: \_\_\_\_\_

Signature and Date: \_\_\_\_\_

## EXHIBIT A

- A. **Project Title:** Reduce Concrete Cracking through Mix Design (SPR Project # 42372M)
- B. **Project Period:** Upon G&C approval - June 30, 2027
- C. **Objectives:** Early age cracking severely reduces service life of bridge curbs and decks and increased cost-burden for maintenance of bridges. Premature failure leads to substantial costs associated with curb and deck replacement as well as closure of bridges that lead to traffic related challenges. Cracks allow the intrusion of water, chlorides, and other debris into the concrete, all of which contribute to further damage through the actions of freeze-thaw cycles and rebar corrosion. In a previous project (SPR Project #26962P), researchers surveyed and analyzed data collected at several bridges to determine the factors driving early-age cracking in bridge curbs, and to develop cost-effective and easy-to-implement solutions to mitigate this issue. Through a systematic approach, the study found that longer span bridges (> 40 ft) tended to have more cracking than shorter bridges. Moreover, it was found that a relationship exists between the level of cracking and the location on the curb with respect to the curb ends. Comparative analysis of curb performance also indicated that curbs constructed with concrete mixes containing a lower amount of cementitious materials and wet cured for a duration longer than the typical 7 days exhibited less cracks. The extended wet-cure practices have been implemented by NHDOT Bureau of Bridge Maintenance. There is need to systematically investigate the concrete mix proportioning, specifically, cementitious amount usage as well as use of supplementary materials in lowering the early age cracking potentials. Considering these outcomes, the primary objective of this study is to develop and experimentally validate concrete mix designs to mitigate cracking in bridge curbs and decks.

This study is designed with following objectives:

- Laboratory evaluation of current NHDOT structural concrete classes to benchmark their durability and mechanical performance and to design a lab and field experiment to investigate and validate mix designs for bridge curbs and decks;
- Construction and observation of bridge curbs and decks with trial of different concrete; and,
- Development of practice change recommendations to alleviate early age cracking problem.

- D. **Scope of Work:** In order to address early age cracking in concrete curbs and decks of New Hampshire bridges, this study will undertake four major research tasks.

### Task-1 Review of Literature and Current Practices

A review of the published literature pertinent to cracking in bridge curbs and decks will be conducted to determine existing methods and concrete mixes various state agencies have developed and implemented in their design and construction practices to minimize cracking. The review will also consider published numerical and experimental studies that have been conducted to understand the factors contributing to cracking and to quantify tensile stress demand in bridge curbs and decks. Additionally, site visits will be conducted at the bridges where curbs were constructed with low cementitious materials concrete mixes during the SPR Project #26962P. The purpose of the visits will be to document the performance of the bridge curbs since the completion of that project. The synthesized data will enable the researchers to identify gaps in the current body of knowledge and develop mix designs, which will be evaluated experimentally in the laboratory and refined as necessary before field application and monitoring. The review is expected to be completed within the first 4 months from the anticipated start date.

Task Deliverables: Memo on review of literature and current practices for lowering cracking potential of bridge curbs and decks through mix design revisions.; recommendations for PCC mix trials to be undertaken in task 2.

#### Task-2: Mix Design and Laboratory Evaluation

Trials of mix designs will be developed based on the information gathered in Task 1 using a factorial experimental design approach. Laboratory batching of the mixes will be conducted, and samples will be prepared to conduct compression, indirect tension, and flexural strength tests to determine the mechanical properties of the mixes. Simultaneously, durability testing will evaluate the freeze-thaw resistance and permeability (surface resistivity) of the trial mixes. Finally, shrinkage behavior of the mixes (autogenous and drying) will also be evaluated. All testing will be performed in accordance with the applicable AASHTO/ASTM standards or their variations with approval of project TAG. The effect of curing method and duration will also be studied. Statistical analysis will be performed on the experimental data to assess variability and determine any correlation between the various mix constituents and measured performance metrics. The analyses will provide an insight on the behavior of the mixes as their constituents change and enable the researchers to optimize the mix designs for peak performance.

Task Deliverable: Memo summarizing mix designs and laboratory measured properties as well as recommendations for the field trials.

#### Task-3: Survey of Study Sites for Cracking Performance

Based on the outcome of Task 2, a set of mix designs will be selected to be deployed in the field. The project team will work with the NHDOT Bureau of Bridge Maintenance to select various bridge sites to construct curbs and monitor their short- and long-term performance. Bridges will be selected based on criteria including bridge length and number of spans. Up to 7 bridges will be included in the study. At each site, when possible, side by side curbs will be constructed using the mix designs currently used by NHDOT and the new mix designs proposed by the researchers. This approach will enable a direct comparison of the performance of the proposed mixes relative to that of NHDOT current mixes and to quantitatively evaluate the improvement achieved by the new mixes. The research team will conduct periodic site visits after construction inspect and document the condition of the curbs through the measurement of cracks and photos using inspection protocols developed in the previous study (SPR Project #26962P). It is anticipated that the visits will initially be conducted at 3, 7, 14, 21, 28 days after construction of the curbs. After this initial period, the site visits will be conducted on a monthly basis. The gathered data will be analyzed to develop metrics, which will facilitate assessment of the performance of the curbs including, crack severity, and crack spacing.

Task Deliverable: Memo with analyzed cracking data results in terms of amount, severity and spacing of cracking for each of the study locations. Memo will also document other information collected during site visits.

#### Task-4: Analysis of Results and Recommendation Development

This final task of the project will utilize data and analysis results from all previous tasks to propose change of practice to lower the propensity of early age cracking in bridge curbs. A comprehensive final report will be prepared at the end of the study and delivered to NHDOT with the recommendations for specification and practice changes. The report will be fully edited for grammar and format prior to submittal and should not be a thesis. A poster (30"x40") will also be prepared for the project, poster will meet guidelines of NHDOT.

Task Deliverable: Final report and a poster for the project to be submitted and accepted by NHDOT by June 30, 2027.

Since this project involves substantial coordination between researchers from University of New Hampshire (UNH) and NHDOT staff, key activities of the research project where research team will need assistance from the NHDOT staff is shown below.

Task 1 and 3: Traffic control for site visits to bridge sites from previous research study

Task 2: Assistance in facilitating sampling of materials for laboratory testing

Task 3: Construction of bridge curbs and decks with various mix recommendations provided by the research team

Task 3: Gathering of mix designs, QC and acceptance test results for concrete from study site locations

**E. Deliverables Schedule:** The project schedule is shown is below. Please note that quarterly summary reports will be submitted at the end of each calendar quarter. Researchers will meet with project technical advisory group (TAG) at beginning of the project, end of Task-1, mid-way through Task-2, end of Task-2, mid-way through Task-3 and at the end of the project. At these meeting, researchers will make presentations to TAG summarizing progress on research to date and to present next steps.

Task 1: September 2023 - May 2024

Task-2: June 2024 - August 2025

Task 3: September 2025 - December 2026

Task 4: January 2027 - June 2027

**F. Budget and Invoicing Instructions:**

The total estimated budget for this project is \$190,235.

Budget Items

1. Salaries & Wages	\$90,318
2. Employee Fringe Benefits	\$3,432
3. Tuition	\$37,280
4. Travel	\$3,050
4. Supplies and Services	\$16,500
5. Equipment	0
Total Direct Costs	\$150,580
UNH Facilities & Admin Costs	\$39,655
Total Costs	\$190,235