

SOLUTIONS



RESEARCH PROGRAMS Spring 2018

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PROJECT HIGHLIGHTS

Advanced Methodology to Determine Highway Construction Cost Index

http://www.mdt.mt.gov/research/projects/const/const_cost_index.shtml

Highway Construction Cost Index (HCCI) is an indicator of cost fluctuation in current market condition and hence the purchasing power of a highway agency. It allows agencies to make early financial decisions based on the changing amount of financial resources and changing market conditions. It also helps determine the return on investment value of a new project. Higher budget and lower spending results in waste of remaining budget while lower budget and higher spending results in the cancellation or delay of projects. In addition, there is an inconsistency in the amount of federal funding available over years. Thus, quick and reliable conceptual cost estimation is very important for maximum utilization of available budget.



Prior to this research, the Montana Department of Transportation (MDT) used eight groups of bid items – earthwork, aggregate, plant mix, asphalt, reinforcing steel, structural steel, concrete, and structural concrete – to calculate the Highway Construction Cost Index (HCCI). The items were selected based on the availability of unit prices for a predetermined number of time periods. Items with same units within each group were then used to calculate the weighted average unit prices and were combined to generate HCCI. However, a single composite HCCI such as this has serious limitations.

Specifically, the effects of item quantities, project size, project type, and spatial distribution of the project are neglected, and



it is in many cases difficult to estimate cost changes and differences for a wide range of construction projects. This can be specifically problematic when state Departments of Transportation (DOTs) shift their strategic focus from letting fewer larger projects to many smaller maintenance and rehabilitation projects.

This project included an evaluation of current practice in Montana and elsewhere and resulted in the development of a Montana specific Multi-Dimensional Highway Construction Cost Index (HCCI) system using a newly developed concept of dynamic item basket. In addition, this project resulted in the development of a GIS visualization tool with a direct connection to MDT's Oracle database that automatically mines construction cost data and can display colorful heat maps indicating varying costs across the state. This GIS tool can be used to analyze the effect of location on the cost of a particular bid item and to visually communicate item specific market fluctuation over location. Options include the following

- Selecting data from projects statewide or by district, and by specific project types
- Selecting categories of materials or specific materials
- Limiting the range of data to specific time periods

- Viewing contract and project statics in addition to construction cost index
- Viewing results on a colored heat map with interactive features to see the specific information behind each data point
- Exporting results to a spreadsheet for further analysis

The new methodology and GIS tool developed in this research resulted in a number of benefits, including:

- Dynamic statistical analysis vs. static, one value result
- Staff time savings, with the new automated system
- Tool can be used by any MDT staff with customized results specific to each need
- Cost trends can be observed in real time
- Potential to improve Engineer's estimate
- Can be used as additional data for developing inflation rates
- Results are comparable to national index and other states' data
- Significant improvement to the accuracy and reliability of HCCI for planning and budgeting for future fiscal years
- Maximizes the use of available budget

For more information, please contact Sue Sillick (ssillick@mt.gov or 406.444.7693).

Sprayroq-SprayWall Polyurethane Applied Lining for Culvert Rehabilitation

<http://www.mdt.mt.gov/research/projects/spraywall.shtml>

The project is located at the crossing of Nemote Creek on Interstate 90 (I-90) in Mineral County, approximately two miles west of the Tarkio Loop Road interchange and 1.3 miles east of the Quartz Flats westbound rest area near milepost 59. The eight (8) gauge steel plate pipe culvert (SPPC) is 242 linear feet, with an interior radius of 12 ft. Bulging and sagging of the steel plated panels located near the east end of the culvert were noted in 2006, and recommended for remedial action in May 2013. Maximum deflection within areas of deformation was roughly estimated to be six inches located in the upper plates of the pipe. The purpose of the rehabilitation effort is to improve the structural capacity of the pipe to reduce the chance of a culvert failure that would impact the I-90 roadway.



Representative image of the observed sagging in the top panels of the steel plate arch culvert. Deflection estimated at six (6) inches as inspected in 2014 (red arrow).



Due to site constraints and apparent minimal change in the areas of deformation over the past seven years, the Department applied the SprayWall cure-in-place-pipe (CIPP). The selected product is Sprayroq’s SprayWall which is a procedure using self-priming, spray-applied structural polyurethane coating as the lining medium. The manufacturer states the lining allows return to active service within an hour of application and added structural integrity of the culvert lining.

The 360 ° SprayWall application treated the culvert inlet and 30 ft. into the culvert, with deformed areas receiving a thicker treatment.

This project was constructed in January of 2017 and will be evaluated for the next five years.



Once the culvert walls are properly prepared, workers wearing protective clothing apply the SprayWall to the culvert eventually insuring a complete coverage. The lining was allowed to come to a full cure in several hours.



Surface prep is the key to any successful polymer application. For maximum adhesion of the SprayWall liner, the interior surface of the culvert need to be (as possible,) free of debris, rust, scale, moisture, etc.



Completed SprayWall application. Average epoxy thickness is 1.25 inches

For more information, please contact Craig Abernathy (cabernathy@mt.gov or 406.444.6269).



LIBRARY CORNER

Have Resources, Will Travel

<http://www.mdt.mt.gov/research/unique/services.shtml>

In February, the Montana Department of Transportation held the Pre-Construction Conference in Helena, MT and subsequently held a Construction Conference in Billings, MT. The research office held a prominent place at these conferences filling three sessions.

These presentations focused on experimental projects and a tour of library resources. Attendees learned where to find safety information, transportation journals, winter highway maintenance resources, and how to access library databases. They also learned how to put in a request for a literature search to receive targeted information when researching subjects.

The major impetus of these sessions was to educate MDT staff on the use of the library catalog to find resources. The Montana Department of Transportation library is a member of the Montana Shared Catalog (MSC), a consortium serving many libraries throughout the state. The MSC uses the Sirsi Dynix platform for cataloging, circulation and the OPAC (online public access catalog). The OPAC is the primary access point to library materials for Montana Department of Transportation staff.

Upon opening the catalog, the first thing most users notice is the “book river” it displays the newest additions to the library. If something in the book river looks like it might be useful, simply click “find in my library” to learn more or place a hold.

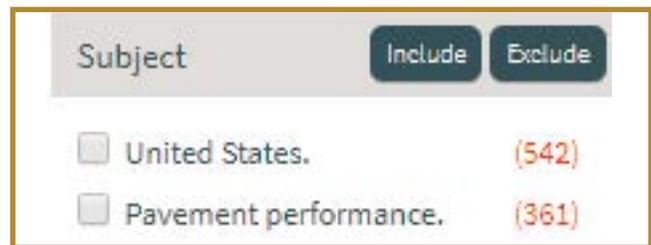


Clicking into the item record results in even more great information. Where did the material come from? Who wrote it? Is it a physical copy or an e-Resource? What other searchable related subjects might be worth consideration?



In our OPAC searching can occur in more than one way. Our catalog uses something called “Fuzzy Searching”. This helps with misspellings or uncertainties about the author or titles. Another option is to select facets.

A blank search brings up everything in the catalog. There are over 20,500 entries and the facets, located on the left side of the screen can be used as limiters to select content that best meets criteria.



This is useful when the searcher knows generally what they want but would still like to browse. This also allows searching to occur without typing into the search box. Most often our users rely on both options, typing search terms into the box and further limiting and browsing with the facets. Those who came to the sessions learned how to sort research results, place them on hold, and create lists when logged into the catalog with their card number.

Finally, we discussed the types of materials available from the library. We have standards, research papers, TRB materials, AASHTO materials, a section for professional development, study materials for FE and PE exams and much more.

For more information, please contact Bobbi deMontigny (bodemontigny@mt.gov or 406.444.0871).



DID YOU KNOW?

Unmanned Aerial Vehicle Forum

<http://www.mdt.mt.gov/mdt/uav-forum.shtml>

The use of drones, unmanned aerial systems (UAS), and unmanned aerial vehicles (UAV), used synonymously in this article is growing by leaps and bounds. In an effort to learn from others and to prevent a reinvention of the wheel, MDT initiated a UAV Forum, which includes a listserv and resources website for sharing information.



Anyone can sign up to join the listserv. To do so, just complete the form found [here](#). However, we ask that information be shared and no solicitations be posted to the listserv. There are over 90 individuals/groups from government, universities, non-profits, and the private sector currently subscribed to this listserv.

Resources shared include such information as research projects and results, equipment and software in practice, use cases, webinar recordings, regulations, flight planning, data processing, and policy and safety information. To view these resources, click on the above link and then click on UAV Resources.

For more information or to share resources, please contact Bobbi deMontigny (bodemontigny@mt.gov or 406.444.0871).

CALENDAR OF EVENTS

May

TCRP IDEA Proposals Due 5/1
AASHTO Spring Meeting - 5/21-5/24
MDT RRC Meeting - 5/30

June

MDT RRC Meeting - 6/27
TCRP Problem Statements Due - 6/15

July

MDT RRC Meeting - 7/19
AASHTO RAC Meeting - 7/23-7/26

August

MDT RRC Meeting - 8/30

September

NCHRP IDEA Proposals Due - 9/1
Rail-Safety IDEA Proposals Due - 9/15
MDT RRC Meeting - 9/27

October

AASHTO Special Committee on Research
and Innovation - 10/19 - 10/30
MDT RRC Meeting - 10/31



For additional information, please see: <http://rppm.transportation.org/Lists/Calendar/>



NEW RESEARCH REPORTS

[Advanced Methodology to Determine Highway Construction Cost Index](#)

A listing of all past and current research projects can be found at

http://www.mdt.mt.gov/research/projects/sub_listing.shtml.

NEW EXPERIMENTAL REPORTS

[A2000 Polyvinyl Chloride \(PVC\) Irrigation Line](#)

[Centerline Rumble Strip \(CLRS\)](#)

NEW EXPERIMENTAL PROJECTS

[Tencate-Mirifi MPV400 Polypropylene Nonwoven Geotextile](#)

[Fog Seal over Chip Seal \(FSCS\) Applications](#)

A listing of all past and current experimental projects can be found at

http://www.mdt.mt.gov/research/projects/exp_sub_listing.shtml



REMINDER

Information on research services and products, such as research and experimental project processes and reports and technology transfer services, can be found on the Research web site at www.mdt.mt.gov/research.

MDT's library collection can be searched through the [library catalog](#). The catalog and other information resources are available through the [MDT Library web site](#).

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