Bridge Enterprise Board of Directors
Regular Meeting Agenda
Thursday, August 21, 2014
4201 East Arkansas Avenue
Denver, Colorado 80222

Ed Peterson, Chairman
Lakewood, District 2

Shannon Gifford
Denver, District 1
Gary M. Reiff
Englewood, District 3
Heather Barry
Westminster, District 4
Kathleen Gilliland
Livermore, District 5
Kathy Connell, Vice Chair
Steamboat Springs, District 6
Douglas E. Aden
Grand Junction, District 7
Sidny Zink
Durango, District 8
Les Gruen
Colorado Springs, District 9
William Thiebaut
Pueblo, District 10
Steven Hofmeister
Haxtun, District 11

THE CHAIRMAN MAY ALTER THE ITEM SEQUENCE OR TIMES

The times indicated for each topic on the Board agenda are an estimate and subject to change. Generally, upon the completion of each agenda item, the Board will immediately move to the next item. However, the order of agenda items is tentative and, when necessary to accommodate the public or the Board's schedules, the order of the agenda items is also subject to change.

Documents are posted at http://www.coloradodot.info/about/transportation-commission/meeting-agenda.html no less than 24 hours prior to the meeting. The documents are considered to be in draft form and for information only until final action is taken by the Board.

BRIDGE ENTERPRISE BOARD OF DIRECTORS .....Tab 15

11:35 a.m. Call to Order and Roll Call

11:35 a.m. Audience Participation
Subject Limit: 10 minutes; Time Limit: 3 minutes

11:40 a.m. Act on Consent Agenda .....Bridge Enterprise 03
a) Resolution to Approve Regular Minutes from July 17, 2014 (Herman Stockinger)

11:45 a.m. Discuss and Act on 2nd Budget Supplement for FY2015 (Scott Richrath) .....Bridge Enterprise 09

11:50 a.m. Monthly Progress Report
(Scott McDaniel) .....Bridge Enterprise 12

11:55 a.m. Region 1 SH 58 over Ford Innovative Stainless Steel Rebar Presentation (Steve Sherman) ..... Bridge Enterprise 17

12:00 p.m. Adjournment

Bridge Enterprise Board
Regular Meeting Minutes
Thursday, July 17, 2014

PRESENT WERE: Ed Peterson, Chairman, District 2
Kathy Connell, Vice Chairman, District 6
Shannon Gifford, District 1
Gary Reiff, District 3
Kathy Gilliland, District 5
Sidny Zink, District 8
Les Gruen, District 9
Steven Hofmeister, District 11

EXCUSED: Heather Barry, District 4
Doug Aden, Chairman, District 7
Bill Thiebaut, District 10

ALSO PRESENT: Scot Cuthbertson, Deputy Executive Director
Gary Vansuch, Director of Process Improvement
Debra Perkins-Smith, Director of Division of Transportation
Josh Laipply, Chief Engineer
Heidi Humphreys, Director of Admin & Human Resources
Barb Gold, Audit Director
Amy Ford, Public Relations Director
Scott Richrath, CFO
Herman Stockinger, Director of Policy and Government Relations
Mike Cheroutes, Director of HPTE
Mark Imhoff, Director of Division of Transit and Rail
Ryan Rice, Director of the Operations Division
Darrell Lingk, Director of the Office of Transportation Safety
Tony DeVito, Region 1 Transportation Director
Tom Wrona, Region 2 Transportation Director
Dave Eller, Region 3 Transportation Director
Kerrie Neet, Region 5 Transportation Director
Kathy Young, Chief Transportation Counsel
John Cater, FHWA
Vince Rogalski, Statewide Transportation Advisory Committee (STAC)

AND: Other staff members, organization representatives, the public and the news media

An electronic recording of the meeting was made and filed with supporting documents in the Transportation Commission office.

Chairman Peterson convened the meeting at 10:20am in the CDOT Headquarters building at 4201 E. Arkansas Avenue, Denver, CO.

Audience Participation

Chairman Peterson stated that no members of the audience wished to address the Board of Directors.

Act on Consent Agenda

Chairman Peterson entertained a motion to approve the Consent Agenda. Director Connell moved to approve the resolution, and Director Gilliland seconded the motion. Upon vote of the Commission the resolution passed unanimously.

Resolution #BE-162
Approval of Regular Meeting Minutes for June 19, 2014.

BE IT SO RESOLVED THAT, the Minutes for the June 2014, meeting of the Bridge Enterprise Board of Directors are hereby approved by the Bridge Enterprise Board as published in the Agenda for the July 16 & 17, 2014, meeting of the Bridge Enterprise Board of Directors.

Discuss and Act on the 1st Budget Supplement for FY'2015

Scott Richrath stated that there was one Design-Build project before the Board for the US 6 main line over Garrison in Jefferson County for $15.5 million.

Chairman Peterson entertained a motion to approve the Budget Supplement. Director Gilliland moved to approve the resolution, and Director Connell seconded the motion. Upon vote of the Board, the resolution passed unanimously.

Resolution #BE-163

BE IT SO RESOLVED THAT, the 1st Budget Supplement for FY'2015 is hereby approved by the Bridge Enterprise Board.

Discuss and Act on Resolution to Accept Asset Ownership of Bridges Previously Transferred from CDOT to Bridge Enterprise and Their New Assigned Bridge Numbers

Scott Richrath stated that the next two resolutions can be confusing, especially at first. Previously, an old bridge that became Bridge Enterprise eligible would be written down to 0 in the balance books. The bridge would be transferred, and the structure identity number would remain the same. About a year into that process, it became clear that if the books showed it was a valueless asset, there was no need to maintain the structure identity of that asset. The reconstruction was the reconstruction of a new asset. Under GASB 34, which drives much of CDOT's accounting work, it was necessary to recognize that a new asset was being created. The next two resolutions essentially divide the bridges that are transferring ownership to the Bridge Enterprise into those that

have already been resolved to move from old structures to new structures and those that came along after the new policy whereby the Bridge Enterprise is simply taking ownership of the new structure.

The first resolution is a list of bridge projects that would transfer under the old method to the Bridge Enterprise with the old identity even though they are new structures.

Chairman Peterson entertained a motion to approve the resolution to accept asset ownership of the list of bridges. Director Gruen moved to approve the resolution, and Director Connell seconded the motion. Upon vote of the Board, the resolution passed unanimously.

Resolution #BE-164

Resolution Number BE-164

Take-out-of-service and write-off previously Transferred "Poor" Bridge Asset and Acceptance of a New Bridge Asset

Approved by the Colorado Bridge Enterprise Board on July 17, 2014

WHEREAS, the General Assembly created the Bridge Enterprise as a government-owned business within CDOT, pursuant to 43-4-805 C.R.S.; and

WHEREAS, PURSUANT TO 43-4-805 C.R.S., the Bridge Enterprise is to operate as a government-owned business within the Department of Transportation and shall constitute an "enterprise" for the purposes of Section 20 of Article X of the Colorado Constitution so long as the Bridge Enterprise retains authority to issue revenue bonds and receives less than ten percent (10%) of its total annual revenue in grants, as defined in 24-77-102(7) C.R.S., from all State and local governments combined; and

WHEREAS, the business purpose of the Bridge Enterprise is to finance, repair, reconstruct, and replace designated bridges in the state; and

WHEREAS, Section 43-4-805(5)(f), C.R.S. authorizes the Bridge Enterprise Board to enter into agreements with the Transportation Commission, or the department to the extent authorized by the Transportation Commission, under which the bridge enterprise agrees to finance, repair, reconstruct, replace, and, if any given agreement so specifies, maintain designated bridges as specified in the agreements; and

WHEREAS, the Bridge Enterprise Board previously accepted ownership of previously existing structures (listed on Attachment A) transferred via Board approved resolution from CDOT to Colorado Bridge Enterprise, and the previously existing structures have been demolished and replaced with a new structure that was assigned its own unique Bridge ID.

NOW THEREFORE BE IT RESOLVED, the Bridge Enterprise Board hereby acknowledges that the previously transferred existing structures have been demolished and taken-out-of-service and any remaining book-value (if any) will be written-off CDOT accounting records, and Bridge Enterprise accepts asset ownership of the replacement structures with their new bridge identification numbers as itemized on Attachment A.

Herman Stockinger, Secretary
Colorado Bridge Enterprise Board

8-13-14
Date

Discuss and Act on Resolution to Accept Asset Ownership of Bridges Budgeted with FASTER Funding and Completed within FY2014

Scott Richrath stated that this resolution is under the new accounting procedures. The Board will be accepting ownership of brand new assets with new structure identifications. The Board will see more of these over time and fewer of the previously transferred assets. These two resolutions will come before the Board annually.

Chairman Peterson entertained a motion to approve the resolution to accept asset ownership of the list of bridges. Director Gruen moved to approve the motion, and Director Gilliland seconded the motion. Upon vote of the Board, the resolution passed unanimously.

Resolution #BE-165

Resolution Number BE-165

Acknowledge New Bridge Asset Funded by Bridge Enterprise

Approve by the Colorado Bridge Enterprise Board on July 17, 2014

WHEREAS, the General Assembly created the Bridge Enterprise as a government-owned business within CDOT, pursuant to 43-4-805 C.R.S.; and

WHEREAS, PURSUANT TO 43-4-805 C.R.S., the Bridge Enterprise is to operate as a government-owned business within the Department of Transportation and shall constitute an "enterprise" for the purposes of Section 20 of Article X of the Colorado Constitution so long as the Bridge Enterprise retains authority to issue revenue bonds and receives less than ten percent (10%) of its total annual revenue in grants, as defined in 24-77-102(7) C.R.S., from all State and local governments combined; and

WHEREAS, the business purpose of the Bridge Enterprise is to finance, repair, reconstruct, and replace designated bridges in the state; and WHEREAS, Section 43-4-805(5)(f), C.R.S. authorizes the Bridge Enterprise Board to enter into agreements with the Transportation Commission, or the department to the extent authorized by the Transportation Commission, under which the Bridge Enterprise agrees to finance, repair, reconstruct, replace, and, if any given agreement so specifies, maintain designated bridges as specified in the agreements; and

WHEREAS, Bridge Enterprise no longer transfers an existing Bridge ID that is programmed to be replaced; and currently utilizes an accounting policy that provides FASTER funding directly to the planned replacement structure and newly assigned Bridge ID; and

WHEREAS, the Bridge Enterprise Board previously approved the use of FASTER funding via the monthly budget supplement process to construct the below noted replacement structures which were completed and open to traffic in Fiscal Year 2014; and

New Bridge Enterprise Owned Bridge	**Facility Carried over Featured Intersection**
B-17-DF	US 85 ML(Nunn Bridge) over UP Railroad
E-16-HG	SH 58 ML over Ford Street, Wash
G-16-E	US 85 ML over Draw; Cook Ranch to Louviers
G-16-F	US 85 ML over Draw; Cook Ranch to Louviers

NOW THEREFORE BE IT RESOLVED, the Bridge Enterprise Board hereby accepts ownership of the new bridges.

Herman F. Stockinger III
Herman Stockinger, Secretary
Colorado Bridge Enterprise Board

8-13-14
Date

Acknowledgement of Board Elections and Appointment of CDOT Chief Engineer

Director Reiff stated that even though the next item is listed as an acknowledgement that a motion is in order. It is necessary to formally move to have new leadership so that there is not a blending of the two committees. Director Reiff moved that as of July 1

1. Ed Peterson be the Chair of the Bridge Enterprise Board of Directors.
2. Kathy Connell be the Vice Chair of the Bridge Enterprise Board of Directors.
3. Josh Laipply be the Chief Engineer of the Bridge Enterprise Board of Directors.
4. Herman Stockinger be the Secretary of the Bridge Enterprise Board of Directors.

Director Gruen seconded the motion. Upon vote of the Board, the motion passed unanimously. Chairman Peterson thanked the members of the Board for the confidence and stated that he would endeavor to live up to the expectations. He thanked Director Reiff for the procedural correction.

Monthly Progress Report

Scott McDaniel stated the Bridge Enterprise presentation is in the printed materials previously given to the Board. There were no significant changes from the previous month except the last two slides. Those slides provide information on the potential funding of the Bridge Enterprise toward the I-70 Viaduct project and the impacts that will have on the Bridge Enterprise program.

Adjournment

Chairman Peterson asked if there were any more matters to come before the Bridge Enterprise Board and hearing none, Chairman Peterson announced the adjournment of the meeting at 10:30am.

COLORADO
Department of Transportation
Statewide Bridge Enterprise

DATE: August 21, 2014

TO: Bridge Enterprise Board of Directors

FROM: Scott Richrath, CFO

SUBJECT: Second Supplement to the FY 2015 Bridge Enterprise Budget

Enclosed is the Second Supplement to the FY 2015 Bridge Enterprise Budget.

REGION 2

- $1,557,500 -US 50 GRANADA EAST AND WEST (old L-28-C & L-27-S) (new L-28-AS & L-27-V) This action requests additional construction funding for project award. The Bridge Enterprise portion of this combined CDOT/Bridge Enterprise project is 23% above the current approved budget. (18155/10001…)

US 50 – GRANADA EAST AND WEST
(Old L-28-C & L-27-S) (New L-28-AS & L-27-V)
Budget Components by Phase, Funding Program, Fiscal Year

Phase of Work	Funding Program	Current Budget	First Supplement Action Year of Budget FY 2015	FY 2016	FY 2017	Total Request	Revised Budget	Expended To-Date
ROW	*Bond Proceeds*	$79,387	$0	$0	$0	$0	$79,387	$46,794
	Total Design	**$79,387**	**$0**	**$0**	**$0**	$0	**$79,387**	**$46,794**
Utilities	*FASTER Funds*	$290,000	$0	$0	$0	$0	$290,000	$0
	Bond Proceeds	$100,000	$0	$0	$0	$0	$100,000	$36,745
	Total Design	**$390,000**	**$0**	**$0**	**$0**	**$0**	**$390,000**	**$36,745**
Design	*FASTER Funds*	$985,000	$0	$0	$0	$0	$985,000	$963,957
	Total Design	**$985,000**	**$0**	**$0**	**$0**	$0	**$985,000**	**$963,957**
Construction	*FASTER Funds*	$5,297,000	$1,557,500	$0	$0	$1,557,500	$6,854,500	$0
	Total Construction	**$5,297,000**	**$1,557,500**	**$0**	**$0**	$1,557,500	**$6,854,500**	**$0**
		$6,751,387	**$1,557,500**	**$0**	**$0**	**$1,557,500**	**$8,308,887**	**$1,047,496**

Total Project Budget	Year of Expenditure FY 2015	FY 2016	FY 2017	Total Request
		$1,557,500	$0	$1,557,500

Resolution No. BE-

"BE IT RESOLVED, That the Second Supplement to the Fiscal Year 2014-2015 Budget is approved by the Bridge Enterprise Board."

COLORADO
Department of Transportation
Statewide Bridge Enterprise

4201 E. Arkansas Ave., Room 124B
Denver, CO 80222

MEMORANDUM

TO: **Bridge Enterprise Board of Directors**

FROM: **Josh Laipply, Chief Engineer**

DATE: **August 21,2014**

SUBJECT: **August 2014 Bridge Enterprise Progress Report**

Purpose

The Bridge Enterprise (BE) team has prepared a progress report presentation to update the Board members of recent program initiatives, statistics and successes. No action from the Board is requested; for informational purposes only. Summarized below are the elements contained in the report:

Program Schedule and SPI:

The BE program schedule has been updated for work complete through July 2014. The July Schedule Performance Index (SPI) = 0.88, a 0.1 decrease from prior month (June SPI = 0.89). Note; Program Goal SPI ≥ 0.90. As noted in previous presentations, a flux in the index is expected as the remaining program projects are in varoius stages and/or face minor obstacles, e.g. railroad or utilities issues. Some factors affecting the current SPI both positively and negatively are:

- Over-performing projects: There are 2 projects with $4.2M in combined Earned Value (EV) greater than planned which increases the overall program SPI by 0.009; a 0.002 increase from prior month.
- Under-performing projects: There are 8 Railroad projects with $40.4M in combined lost EV which reduces overall program SPI calculation by 0.09; a 0.03 decrease from prior month. There is 1 non-Railroad project with lost EV of 0.010 or greater for this month; Region 4 SH14 over Cache La Poudre R. impacting program by 0.018, 0.002 increase from prior month.

Major Achievements:

The BE team continues to collaborate with CDOT in managing, monitoring and reporting on the progress and success of the program. Some recent program initiatives include annual data research for fiscal year performance reporting and FASTER Performance Audit (1410P) research and reporting. Recent BE project progress includes:

- The final RFP was released for the Region 1 F-16-ER, US 6 ML over Garrison Street, Lakewood project. This is an innovative bridge which will use a streamlined design-build delivery method.
- The design for G-17-A US 85 ML over Sand Creek in Douglas County was completed, design is to be shelved.
- The Region 2 K-14-B: US 50 ML over Oak Creek in Fremont County bridge went to AD.
- Region 2 bridges E-17-DC: I 76 ML Eastbound over UP Railroad and E-17-DU: I 76 ML Westbound over UP Railroad in Adams County began construction. (2 bridges, 1 project)

- Region 3 bridges F-11-AB: I 70 ML Westbound over US 6, Railroad, Eagle River and F-11-AC: I 70 ML Eastbound over US 6, Railroad, Eagle River in Eagle County began construction (2 bridges, 1 project).

Total Program Financial Performance

Expenditure and encumbrance data through June 30, 2014 summarized below:

- Projected Expenditures: Increased by $9.2M or 1.8%
- Actual Expenditures: Overall increased by $17.2M or 4.4% | Bond increased by $7.7M or 2.8%
- Encumbrance Balance: Overall increased by $8.3M or 5.1% | Bond decreased by -$7.9M or -22.5%

Status of FASTER Eligible Bridges

There are currently 180 bridges eligible for the BE program. Of those bridges 105 have been repaired or replaced, 15 are in various stages of construction, design has been completed for 8, 15 are in design, 21 have not been programmed, and no action is proposed for the remaining 16.

Status of $300M Bond Bridges

There are currently 93 structures in the BE bond program. Of those bridges 55 have been repaired or replaced, 15 are in various stages of construction, design has been completed for 7, 15 are in design, and no action is proposed for 1 that was deemed ineligible.

Status of 30 Most Deficient Bridges

The CBE has completed 28 of the 30 bridges originally identified as the most deficient and expects to complete the design and reconstruction of one of the remaining bridges by the end of calendar year 2015. The I-70 viaduct will be the final original '30 worst' bridge addressed. Below is the status of the 30 bridges originally identified as most deficient by the BE BOD and the status of the 30 currently rated worst in 2014:

Status	Original Worst 30	2014 Poor List Worst 30
Completed	28	6
In construction	0	5
Designed	0	2
In design	2	10
Remaining	0	7
Total	30	30

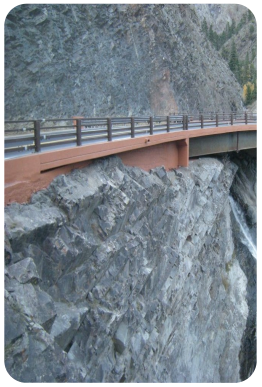
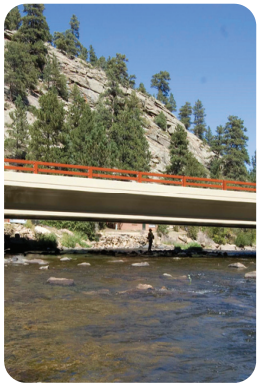
Unprogrammed Priority BE Bridges

BE has included a listing of 10 unprogrammed bridges with a Prioritization Plan score of 30 or above to present a brief snapshot of some of the program's most deserving structures. Scores range from 30 to 41.5 and were calculated using the objective Prioritization Plan scoring system where both quantitative and qualitative criteria are taken into consideration.

Attachment

August 2014 Monthly Progress Report

COLORADO
Department of Transportation

Colorado Bridge Enterprise

August 2014 Monthly Progress Report
Board of Directors Meeting

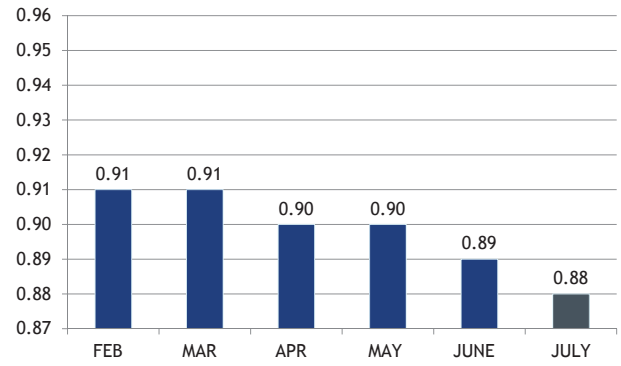
Program Schedule

- Program schedule updated for work complete through July 2014
- July Schedule Performance Index (SPI) = 0.88; 0.01 DECREASE from prior month (June SPI = 0.89)
- Over-performing projects
  - 2 projects with $4.2M in combined Earned Value (EV) greater than planned
  - INCREASES overall program SPI by 0.009; 0.002 INCREASE from prior month
- Under-performing projects
  - 8 Railroad projects with $40.4M in combined lost EV
    - Reduces overall program SPI calculation by 0.09; 0.03 DECREASE from prior month
  - 1 non-Railroad project with lost EV of 0.010 or greater for this month
    - Region 4 SH14 over Cache La Poudre R. impacting program by 0.018, 0.002 INCREASE from prior month

8/21/14

Program Schedule

Program SPI by Month



Program Goal SPI ≥ 0.90

Major Achievements

- CURRENT PROGRAM INITIATIVES
  - Annual Data Research for FY Performance Reporting
  - FASTER Performance Audit (1410P) Research and Reporting
- INNOVATIVE BRIDGES
  - Region 1
    - ➢ F-16-ER, US 6 ML over Garrison Street, Lakewood
      - Final RFP was released
- BRIDGES COMPLETED DESIGN
  - Region 1
    - ➢ G-17-A: US 85 ML over Sand Creek, Douglas County
      - This bridge design is to be shelved.

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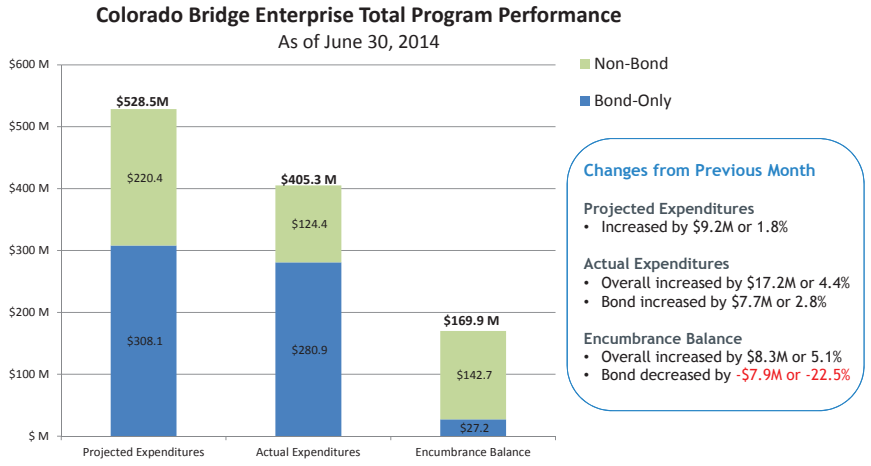
8/21/14

Major Achievements

- BRIDGES TO AD
  - Region 2
    - K-14-B: US 50 ML over Oak Creek, Fremont County
- BRIDGES TO CONSTRUCTION
  - Region 1
    - E-17-DC: I 76 ML Eastbound over UP Railroad, Adams County
    - E-17-DU: I 76 ML Westbound over UP Railroad, Adams County
  - Region 3
    - F-11-AB: I 70 ML Westbound over US 6, Railroad, Eagle River, Eagle County
    - F-11-AC: I 70 ML Eastbound over US 6, Railroad, Eagle River, Eagle County

8/21/14

Total Program Financial Performance



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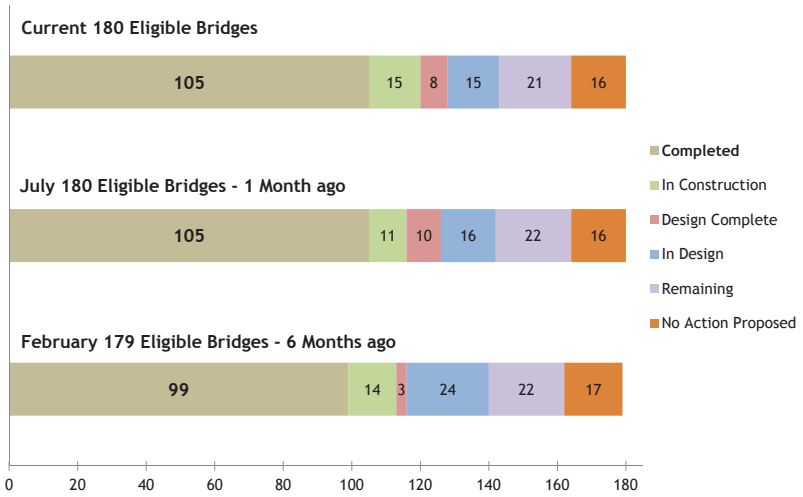
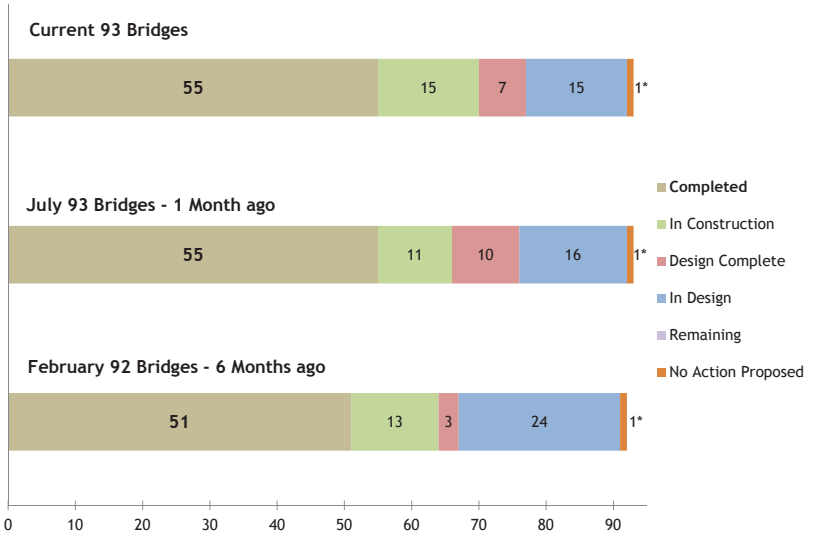
Status FASTER Eligible Bridges



8/21/14

Status $300M Bond Bridges



* One project was determined ineligible

8/21/14

Status of 30 Most Deficient Bridges

	2014 Poor List Bridges Worst 30 Status	Original 128 Bridges Worst 30 Status
Complete	6	28
In Construction	5	0
Design Complete	2*	0
In Design	10*	2
Remaining	7	0
Total Addressed	30	30

*Changes from last month:
2014 List:
G-17-A moved from In Design to Design Complete

Current Unprogrammed BE Projects

Highest Prioritization Score Rated 30 and Above

	Current Prioritization Plan Score	Original Bridge ID	Region	Facility Carried over Featured Intersection
East I-70 EIS	41.5 41.5	E-17-EW E-17-DF	1 1	I 70 ML EBND over UP RR I 70 ML WBND over UP RR
	38.5	N-17-BN	2	I25 ML SBND over CO RD 640, BUTTE CREEK
	34	N-17-S	2	I25 ML NBND over CO RD 103, BUTTE CREEK
E. I-70 EIS	36.5	E-17-KR	1	I 270 ML EBND over I 70 ML
	33.5	D-13-A	3	US 34 ML over N FK COLORADO RIVER
	33.5	G-03-Q	3	I 70 ML WBND over COLORADO RIVER OVERFLOW
Design Shelved	33	G-17-A	1	US 85 ML over SAND CREEK
	32	F-05-L	3	I 70 ML WBND over COLORADO RIVER
	31	C-17-B	4	SH 60 ML over SOUTH PLATTE RIVER
	30	F-10-L	3	I 70 ML EBND over US 6, RR, EAGLE RIVER

FASTER Q & A

Questions & Answers

COLORADO
Department of Transportation
Statewide Bridge Enterprise

4201 E. Arkansas Ave.
Denver, CO 80222

MEMORANDUM

TO: **Bridge Enterprise Board of Directors**

FROM: **Steve Sherman,PE - Region 1, West Program - Table Mountain Residency**

DATE: **August 21,2014**

SUBJECT: **SH58 over Ford Street in Golden, Stainless Steel Reinforced Bridge Deck**

Purpose

The August Bridge Enterprise (BE) agenda includes a presentation of SH58 over Ford Street in Golden, the first stainless steel reinforced bridge deck in Colorado. No action from the Board is requested; for informational purposes only. Summarized below are the elements contained in the presentation:

Details

Originally built in 1966,structural sufficiency in2011 degraded to 42.3 due to concrete spalling,reinforcing steel section loss, and broken reinforcing steel ties.

Design Phase-Oct 2011 to May 2013

- Started Oct, 2011
- CDOT "In-house"design
- Two-phase construction
- Staff Bridge (Mohamed Zaina and Andy Pott) used this bridge as an opportunity for a first CDOT trial of the AASHTO-LRFD (Load and Resistance Factor Design) Empirical Design Method for bridge decks.

Bridge Deck Empirical Design

- Detailed in the LRFD Manual for some time, Empirical Design Method was conditionally approved by the CDOT Bridge Engineer to be used in Colorado on a case-by-case basis.
- "The Empirical Design Method is based on laboratory testing of deck slabs. This testing indicates that the loads on the deck are transmitted to the supporting components mainly through arching action in the deck, not through shears and moments as assumed by traditional design; the Empirical Design Method requires less reinforcement in the interior portions of the deck than the (traditional) Approximate Method."-FHWA bridge design website.
- "Empirical Design employs the notion that the deck behaves more like a 'membrane' than a series of continuous beams." -Illinois DOT design guide.

What does this mean for the SH58 over Ford St. bridge deck?

- #3 and #6 bars were used instead of #5 and #9 bars as would typically be seen, reducing the total pounds of steel in the bridge deck by more than half.

• However, because the strength from the deck "arching" means cracking in the concrete deck is anticipated, there is concern that that traditional epoxy rebar would corrode and cause early concrete spalling in the bridge deck. To mitigate this concern, stainless steel rebar was used.

Project Stats
Notice To Proceed - May, 2013
Project Awarded to Hamilton Construction
Bid: 4.1M +$400K in Force Accounts
Project Complete – July 2014

Stainless Steel Conclusion
In theory, this deck design may be able to avoid a deck rehab halfway through the 75 year design life, saving approximately $300K.

Because there are no nearby suppliers (yet?), the stainless steel was manufactured in Cincinnati and cost approximately three times more than epoxy bar, per pound. While this higher cost offsets the savings from the reduction in the amount of steel on this project, the benefit of using less material overall is more sustainable, especially if the price per pound decreases due to a more local manufacturing alternative.

Project Conclusion
• The SH58 over Ford Bridge deck will remain open, without membrane or asphalt, for the first few years of life to observe the deck performance.
• Budget
– Design - $700K
– Construction: Under the $4.6M budget
– Construction Engineering: Approx $200K under the $843K budget

Attachment
SH58 over Ford Street in Golden presentation

COLORADO
Department of Transportation

SH58 over Ford Street in Golden

The first stainless steel reinforced bridge deck in Colorado

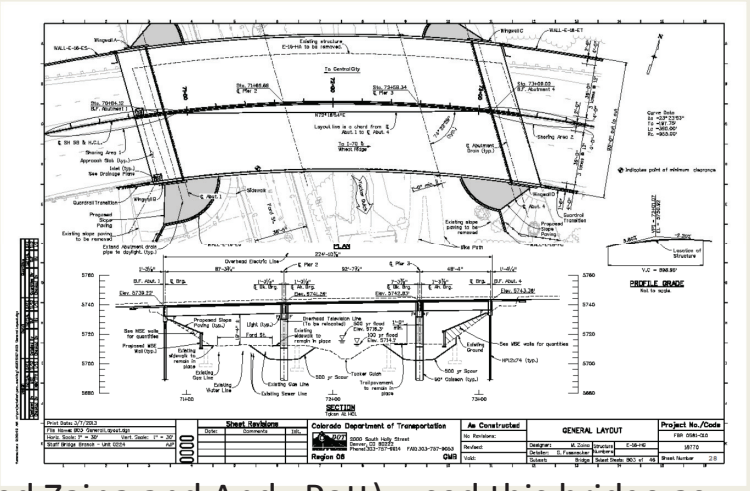
Steve Sherman, PE

Design Project Manager, Project Roadway Designer, and Project (Construction) Engineer

COLORADO
Department of Transportation

Originally built in 1966, structural sufficiency in 2011 degraded to 42.3 due to concrete spalling, reinforcing steel section loss, and broken reinforcing steel ties

Design Phase-Oct 2011 to May 2013



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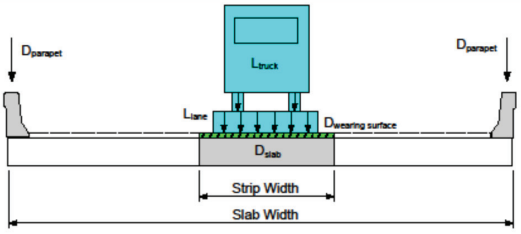
Bridge Deck Empirical Design

- Detailed in the LRFD Manual for some time, Empirical Design Method was conditionally approved by the CDOT Bridge Engineer to be used in Colorado on a case-by-case basis.
- "The Empirical Design Method is based on laboratory testing of deck slabs. This testing indicates that the loads on the deck are transmitted to the supporting components mainly through arching action in the deck, not through shears and moments as assumed by traditional design...the Empirical Design Method requires less reinforcement in the interior portions of the deck than the (traditional) Approximate Method."- FHWA bridge design website
- "Empirical Design employs the notion that the deck behaves more like a 'membrane' than a series of continuous beams." -Illinois DOT design guide



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What does this mean for the SH58 over Ford St. bridge deck?

- #3 and #6 bars were used instead of #5 and #9 bars as would typically be seen, reducing the total pounds of steel in the bridge deck by more than half.
- However, because the strength from the deck "arching" means cracking in the concrete deck is anticipated, there is concern that that traditional epoxy rebar would corrode and cause early concrete spalling in the bridge deck. To mitigate this concern, **stainless steel** rebar was used.

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Notice To Proceed - May, 2013

Project Awarded to Hamilton Construction

Bid: 4.1M +$400K in Force Accounts

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Phase 1 Foundations-Aug,2013

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Phase 1 pier caps and girders-Oct,2013

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Stainless steel deck prep – Oct,2013

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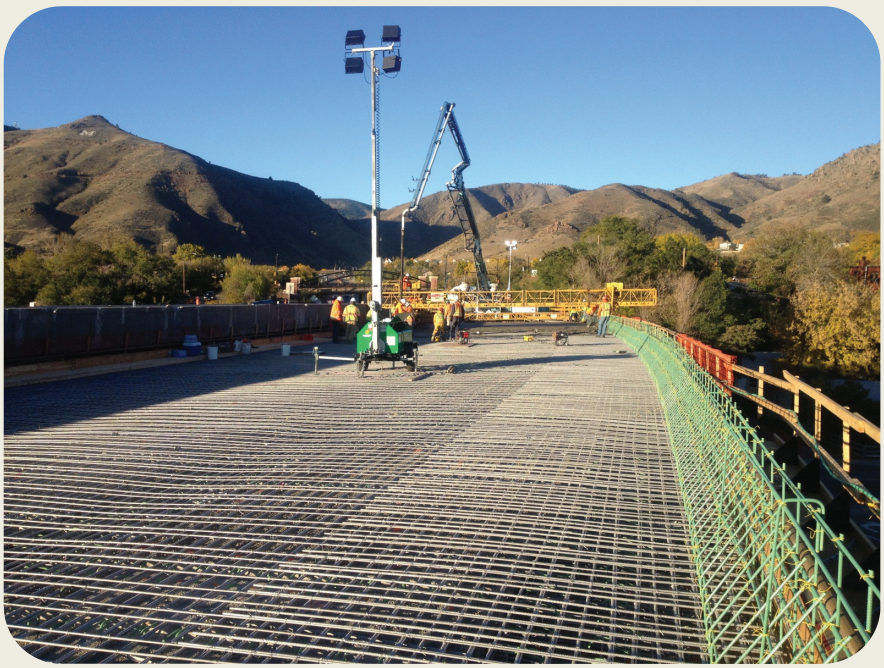
Phase 1 Deck Pour – Oct 25, 2013



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Phase 2, post deck pour – April, 2014

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Project complete – July 2014

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Stainless Steel Conclusion

- In theory, this deck design may be able to avoid a deck rehab halfway through the 75 year design life, saving approximately $300K.
- Because there are no nearby suppliers (yet?), the stainless steel was manufactured in Cincinnati and cost approximately three times more than epoxy bar, per pound. While this higher cost offsets the savings from the reduction in the amount of steel on this project, the benefit of using less material overall is more sustainable, especially if the price per pound decreases due to a more local manufacturing alternative.

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Project Conclusion

- The SH58 over Ford Bridge deck will remain open, without membrane or asphalt, for the first few years of life to observe the deck performance.
- Budget
  - Design - $700K
  - Construction
    - Under the awarded $4.5M budget
  - Construction Engineering
    - Approx $200K under the $843K budget