City of Brookings | 2021 Bridge Inspections

November 23, 2021

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brookings SOUTH DAKOTA

BRING YOUR DREAMS.

Bridge Inspection Overview

- 4 NBIS Structures Owned & Maintained by the City of Brookings
- 1 Private Structure Owned & Maintained by the City of Brookings
  - Brookings Airport Bridge
- 5 Bridge Inspections Conducted in 2021
  - 4 - CDI Contract with SDDOT - $6,332.15 (20% County - $1,266.43)
- NBIS Structure constitutes any Bridge or Box Culvert > 20 ft in Length
- Bridges inspected generally every 24 Months
- Box Culverts inspected every 24 or 48 Months, depending on overburden & condition
- Field Work – Visual & Hands-On Inspections, Notes, Measurements, Photographs
- Office Work – Load Rating Analysis, Documentation, Report Generation
- Summary & Review Meeting with City of Brookings Engineering Department – 11/8/21
- Relates to structure condition & safety features only, no drainage analysis as part of this work

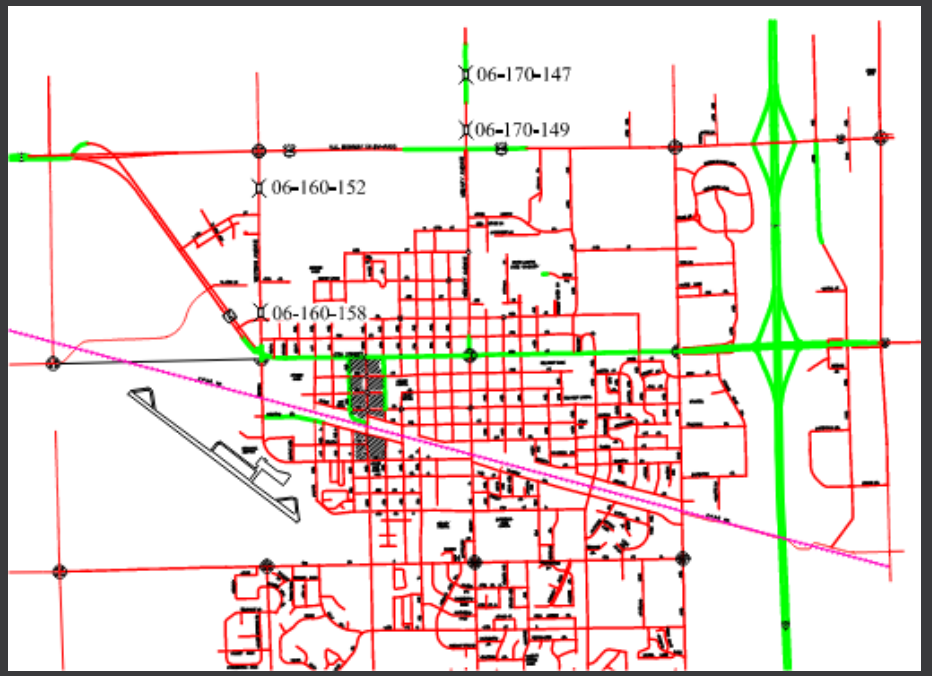
4 Existing Structures Inspected in 2021

Str. No. 06-160-152
Built in 1932

Str. No. 06-160-158
Built in 1988

Str. No. 06-170-147
Built in 1987

Str. No. 06-170-149
Built in 1968



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Field Work – Visual & Hands-On Inspections, Notes, Measurements, Photographs

Inspection Process

- Approaches, Signage
- Deck, Barrier Rail
  - Deck Delamination Survey
- Superstructure
- Substructure
- Channel & Channel Protection
  - Channel Profile – Scour Check
- Element Level Inspection

CHANNEL PROFILE
CITY OF BROOKINGS
STR. NO. 06-160-158

MEASUREMENTS TAKEN FROM THE TOP OF: **SIDEWALK**
MEASUREMENTS TAKEN ON THE INLET SIDE OF THE STRUCTURE: **EAST**

WATER ELEV: **N/A**

		8/7/2015	8/15/2017	8/29/2019	8/16/2021
South End	2	6.9	6.8	6.8	6.7
	15	7.5	7.6	7.5	7.5
	20	8.6	8.5	8.5	8.6
	25	8.3	8.2	8.3	8.2
	28	9.1	9.1	9.3	9.2
	33	9.6	9.6	9.6	9.4
	35.5	9.3	9.5	9.4	9.4
	39	9.1	8.4	9.0	9.4
	41	7.9	7.8	9.6	9.4
	44	9.1	9.8	9.2	9.6
	50	10.0	10.1	9.9	9.9
	60	9.8	9.8	10.2	10.3
	75	10.0	9.8	10.3	9.9
	85	9.1	9.0	9.0	8.9
	95	7.7	7.7	7.6	7.6
	105	6.9	7.4	7.3	7.0
North End	112	7.3	7.3	7.3	7.2

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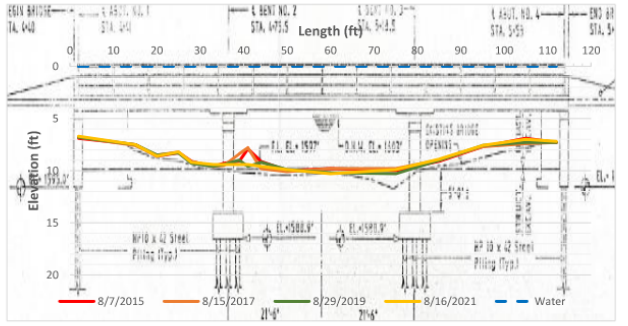

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Office Work – Analysis, Documentation, Report Generation

BRIDGE SAFETY INSPECTION REPORT

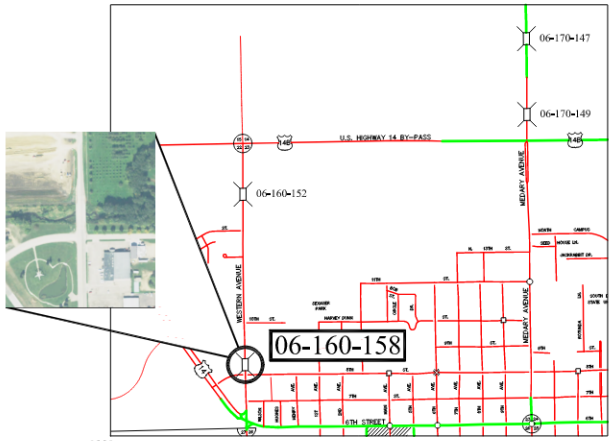
FOR

CITY OF BROOKINGS

SOUTH DAKOTA

2021

STRUCTURE NUMBER: **06-160-158**



REGISTERED PROFESSIONAL ENGINEER
REG. NO. 12059
CHRIS J. BROZIK
SOUTH DAKOTA
10/28/21

brookings SOUTH DAKOTA

CDI CIVIL DESIGN INC

INSPECTION BY:
CIVIL DESIGN INC., BROOKINGS, SD

Repair and Posting Recommendations
Bridges Maintained by Local Governments

Structure No.	06-160-158	**Hwy or Street**	Western Avenue
FA Route No.	3333	**Agency Responsible for Maintenance**	City of Brookings
Location	0.2 miles North of 6th Street/U.S. Hwy 14 on Western Avenue		
Bridge Desc.	114.0 ft Three Span Continuous Concrete Bridge with Concrete Abutments 58.3 ft Deck width (including sidewalks).		
Date Inspected	8/16/2021	**Year Built**	1988

Posting Recommendations

Single Unit - N.A. Tons — Current Posting – Not Posted
Combination - N.A. Tons — Legal Loads – No Load Posting Required

Legal Loads Based on Article 6.1.4 of AASHTO "The Manual for Bridge Evaluation", Second Edition

Repair, Rehabilitation, and/or Replacement Recommendations

1. Remove debris from under structure (bike, branches, concrete rubble, and old concrete structure).
2. Remove tree growth under all four (4) corners of the structure.
3. Clean & Repaint sidewalk steel tube railings.

The South Dakota Department of Transportation is required by Federal Statute to maintain an inventory of all bridges on all public traveled routes. Therefore it is important that County and City Officials report any changes on bridges on their system. Examples of changes which should be reported are: Replacement of an existing bridge with pipe or new bridge, safety updated, rehabilitation or repair of an existing bridge etc. Changes should be reported to: South Dakota Department of Transportation, Local Government Assistance, Pierre, South Dakota, 57501.

RECOMMENDATIONS MADE BY: _____ DATE: 8/16/2021
Chris Brozik, P.E.

Structure Number 06-160-158 Date 8/16/2021

Deck - Items 58.00 - 58.17

1. DECK CONDITION - CRACKING, SCALING, SPALLING, AND DELAMINATIONS –

   Cast-in-Place Reinforced Concrete – transverse and longitudinal hairline cracking is evident throughout. There are more evident longitudinal cracks evident at the backwalls and along the centerline of the deck. There is moderate transverse cracking occurring at the abutment and bent locations where large negative bending moments are occurring in the deck. At the North abutment, there is one (1) moderate transverse crack full width of the deck. At the North and South bent, there are multiple transverse cracks occurring, with minor to moderate crack openings. At the South abutment, there is one (1) moderate transverse crack full width of the deck with multiple hairline transverse and longitudinal cracks evident. There was minor map cracking in the SW corner of the bridge deck. Overall, the bridge deck appears to be in relatively good condition.

2. OVERLAY - TYPE, THICKNESS, AND CONDITION –

   None

3. JOINTS - OPENINGS – None

4. DRAINS – There are ten (10) 3" dia. PVC deck drains spaced @ 10 feet o.c. along the edge of the barrier curb on each side of the structure. All were open and functioning properly at the time of inspection.

5. CURBS & MEDIAN – None

6. SIDEWALKS – There are concrete sidewalks present along both sides of the structure cantilevered from the bridge barrier curb. There is minor hairline transverse cracking observed throughout the top surface of both sidewalks. Transverse cracking is more closely spaced over both bents, approximately 1-2 foot spacing. There is moderate transverse cracking with efflorescence staining on the underside of both sidewalks, with closer crack spacings at both bent locations. Overall, the sidewalks appear to be generally in good condition.

   There are bituminous approaches off each end of the concrete sidewalks. The bituminous approaches appear to be in good condition.

7. RAILING OR BARRIER – Cast-in-Place concrete barrier curb – there is vertical hairline cracking, scrapes and chips removed from barrier throughout. Scrapes and scaling are mostly observed along the curb line from snow removal equipment. There is isolated concrete spalling on the front face of barrier curbs. There are moderate vertical cracks evident over the bents on each barrier curb with crack spacing at approximately 6-10 inches o.c. and crack gaps of 0.02 inches on average. There is a moderate diagonal crack at the ends of the barrier curb at the NW, SW and SE ends.

   There is tapered barrier curb off the NE and SW corners of the structure. Scrapes and chips are evident at the ends and along the curb of both tapered barrier curbs. The preformed expansion joint filler located between the bridge barrier curb and the tapered barrier curb was loose at the time of inspection but still in place and functioning properly.

   There are pedestrian steel tube railings along the concrete sidewalk on both sides of the structure. The railing is secure and functioning as intended. The paint is showing signs of weathering with cracking and peeling and freckled rust throughout. Some areas are beginning to have moderate sections of paint loss with heavy rusting with no section loss. Paint loss is estimated at approximately 15%. East pedestrian rail post #4 is bulging at base.

8. LIGHTING – None on bridge. There is lighting south of structure on roadway (west side) and north of structure on overhead power poles (east side).

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Office Work – Analysis, Documentation, Report Generation (Cont.)

Structure Number 06-160-158 Date 8/16/2021

Substructure - Items 60.00 – 60.05

1. ABUTMENTS -
   - A. WINGWALLS – Cast-in-Place reinforced concrete – The wingwalls are straight extensions of the abutment backwalls and are 2 feet wide. The NW wingwall has some hairline map cracking along top and front face. The SW wingwall has spalling on the top and front face. There are fence anchors in each wingwall with no fence currently fastened to wings. Overall, the wingwalls appear to be in good condition.
   - B. BACKWALLS – Cast-in-Place reinforced concrete – The backwalls are moderately weathered throughout. There is vertical cracking with efflorescence staining in both the north and south backwalls. The north backwall has five (5) vertical cracks and the south backwall has five (5) vertical cracks. Overall, the backwalls appear to be in good condition.
   - C. FOOTINGS – None
   - D. PILE CAPS – None
2. PIERS OR BENTS –
   - A. CAPS – Cast-in-Place reinforced concrete – the thickened portions of the concrete slabs have transverse hairline cracking evident throughout. Both bent caps observed vertical hairline cracking over and near the center column. Overall, the concrete caps appear to be in good condition.
   - B. COLUMNS – Cast-in-Place reinforced concrete – there are three (3) concrete columns at each bent. The concrete columns are observing moderate weathering and radial hairline cracking along tops of columns but overall appear to be in good condition.
   - C. FOOTINGS – No footings (pile caps) were visible.
3. GROUT PADS – None
4. ANCHOR BOLTS – None
5. PILES – No piles were visible. Plans indicate HP 10x42 Steel Piling.
6. BRACING – None
7. PAINT – None
8. MOVEMENT –
   - A. PLUMBNESS – All substructure members appear plumb.
   - B. SETTLEMENT – None observed.
   - C. HORIZONTAL – None observed.

06-160-158_2021_13_CDI_East Bridge Barrier Rail

06-160-158_2021_14_CDI_West Pedestrian Steel Tube Rail

CHANNEL PROFILE

CITY OF BROOKINGS

STR. NO. 06-160-158

MEASUREMENTS TAKEN FROM THE TOP OF: **SIDEWALK**

MEASUREMENTS TAKEN ON THE INLET SIDE OF THE STRUCTURE: **EAST**

WATER ELEV: N/A

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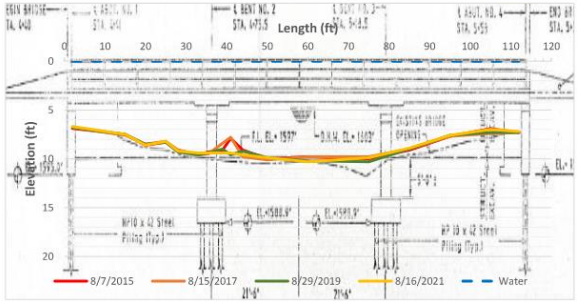

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Summary of Postings, Recommendations, Etc.

SUMMARY SHEETS INCLUDE THE FOLLOWING:

- Structure Number
- Feature Carried
- Feature Crossed
- Date Inspected
- Sufficiency Rating
- Current & Recommended Posting, if any
- Repair, Rehab, Replacement Recommendations

MEETING BETWEEN CDI & ENGINEERING DEPT.

- Date: Monday, November 8, 2021
- Review Bridge Inspection Reports in Detail
- Go over Repair Recommendations
- Discuss Miscellaneous Items

City of Brookings — **Re-inspections (4)** — Inspector of Record: Chris Brozik, PE

2021 Bridge Inspections Summary
P NBIS (40) PCN 04MD

Structure No.	Feature Carried	Feature Crossed	Inspection Date	Sufficiency Rating	Current Posting	Recommended Posting	Recommended Repairs
06-160-152	Western Avenue	Unnamed Tributary	8/16/2021	70.8	Not Posted	No Load Posting Required	1. Remove small tree growth from inlet and outlet ends of barrels. 2. Remove silt from east end of barrels to the top of the bottom slab and remove excess embankment around front face of wingwalls. 3. Clean and repair areas of spalled concrete along the top of the bottom slab and remove excess embankment around front face of wingwalls. 4. Install FHWA approved railing and approach guardrail.
06-160-158	Western Avenue	Sixmile Creek	8/16/2021	99.8	Not Posted	No Load Posting Required	1. Remove debris from under structure (bike, branches, concrete rubble, and old concrete structure). 2. Remove tree growth under all four (4) corners of the structure. 3. Clean and repaint sidewalk steel tube railings.
06-170-147	Medary Ave. (Co. Hwy. 77)	North Branch of Sixmile Creek	8/16/2021	99.0	Not Posted	No Load Posting Required	1. At 45° bend just upstream of structure where erosion has occurred in area of swirling channel, improve channel bank to 2:1 and install Type B drainage fabric and quartzite riprap to help mitigate channel bank erosion. 2. Remove tree growth in front of NE & SE wingwall and under the NW & SW corners of the structure. 3. Consider planning for future replacement (within the next 5 years) of approach guardrail off all four (4) corners of the structure due to collision damage and deterioration of timber posts and spacer blocks.
06-170-149	Medary Ave. (Co. Hwy. 77)	Sixmile Creek	8/16/2021	83.9	Not Posted	No Load Posting Required	1. Monitor bridge concrete overlay delaminations. Consider planning for future replacement of bridge deck concrete overlay (within next 5-10 years). 2. Repair and/or replace damaged guardrail sections, timber posts, and timber blocking. Consider full approach guardrail replacement with flared or tangent end terminals. 3. Repair broken welds on steel bridge railing post-to-rail connection. 4. Clean & repaint steel bridge railing. 5. Clean and repair spalling with exposed rebar at deck drain locations on underside of concrete slab. 6. Repair undermining at south abutment backwall and install Type B drainage fabric and quartzite riprap along north and south berms and backwalls. 7. Remove trees under and around north and south spans on east and west side of the structure

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THANK YOU

QUESTIONS?

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