

**Structure Needs  
Memorandum**

I-90 Exit 32-40: Corridor Study  
and Design Project



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SDDOT

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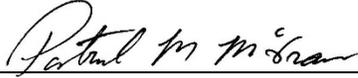
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## **Executive Summary**

For this analysis of bridge conditions, available sources of data include the Structural Inventory and Appraisal (SIA) Reports with National Bridge Inventory (NBI) Ratings and Maintenance History, and the current Element-Level Inspection Reports. The SIA Reports give data on location, geometrics, traffic, load capacity, and structural condition. NBI Ratings provide a picture of the in-place bridge as compared to the as-built condition. The Element-Level Inspection Reports give data on the type of elements, material makeup, and the severity and quantity of deterioration. Structural plans for the original construction and rehabilitations also reviewed where available.

This document uses the Good-Fair-Poor bridge condition measures outlined in outlined in 23 CFR Part 490 FHWA final rule RIN 2125-AF53 Pavement and Bridge Condition Performance Measures, published in January of 2017. NBI ratings  $\geq 7$  are Good, 5-6 are Fair, and  $\leq 4$  is Poor.

In this study of I-90 from Exit 32 to 40, there are two mainline bridges, two local overpass bridges, four culverts, and one railroad multi-plate. The structures are in fair to good condition, with adequate geometrics, and load carrying capacity. Deterioration is generally common in nature for structures of these types that were built in the Interstate Expansion Era from 1956 to 1966 and can be addressed with miscellaneous repair projects—concrete surface repair, painting—and routine preventative maintenance such as chip sealing and cleaning joints. The deck on the Pleasant Valley Road bridge has a considerable amount of delamination, which is a condition that impacts the performance of the structure and maintenance costs. On the two mainline bridges over the National Cemetery Road, thought should be given to shielding the piers with plate beam guard or a cable system. Considering the recent flooding and closure of I-90 in 2015 it would be good to review the hydraulics at all the box culverts for changed conditions.

## Abbreviations

AASHTO	American Association of State Highway Transportation Officials
ADT	Average Daily Traffic count
AREMA	American Railway Engineering and Maintenance-of-Way Association
FHWA	Federal Highway Administration
NBI	National Bridge Inventory
RC/P&E RR	Rapid City, Pierre & Eastern Railroad
SDDOT	South Dakota Department of Transportation
SIA	Structural Inventory and Appraisal

## Glossary

Inventory Rating	The Inventory Rating represents the normal live load capacity of a bridge using the current load distribution factors, calculated with the Load Factor Methods, but reflects the existing member and material deterioration. The AASHTO HS loading configuration, which has a 36 ton three-axle design vehicle, is the applied live load. The load rating is expressed in terms of HS-type loadings. This load rating is intended to represent the load that can be safely carried by the bridge on a frequently repeated and continuing basis.
Operating Rating	The Operating Rating represents the maximum live load capacity of a bridge calculated as noted above for the Inventory Rating, but with a reduced load factor for Live Load. The AASHTO HS loading configuration is used as the applied load. This load rating is intended to represent loads that can be safely carried by the bridge on an infrequent basis. Allowing unlimited numbers of vehicles to use a bridge at the Operating Level may shorten the life of the bridge.
Sufficiency Rating	The bridge sufficiency is a method of evaluating highway bridge data by calculating four separate factors to obtain a numeric value which is indicative of bridge sufficiency to remain in service. The result of this method is a percentage in which 100 percent would represent an entirely sufficient bridge and zero percent would represent an entirely insufficient or deficient bridge. Historically, the sufficiency rating was used as a guide for federal participation which had been required to be less than 50 for replacement. Today, the sufficiency rating is a significant consideration in prioritizing project requests.

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For this analysis of bridge conditions, available sources of data include the Structural Inventory and Appraisal (SIA) Reports with National Bridge Inventory (NBI) Ratings and Maintenance History, and the current Element-Level Inspection Reports. The SIA Reports give data on location, geometrics, traffic, load capacity, and structural condition. NBI Ratings provide a picture of the in-place bridge as compared to the as-built condition. The Element-Level Inspection Reports give data on the type of elements, material makeup, and the severity and quantity of deterioration. Structural plans for the original construction and rehabilitations were reviewed where available.

This document uses the Good-Fair-Poor bridge condition measures outlined in 23 CFR Part 490 FHWA RIN 2125-AF53 Pavement and Bridge Condition Performance Measures final rule, published in January of 2017. NBI ratings  $\geq 7$  are Good, 5-6 are Fair, and  $\leq 4$  is Poor.

As shown in the following table, the study area includes two structures carrying the Mainline Interstate over Local Roads, two carrying Local Roads over the Mainline, four Culverts Conveying Creeks, and one Railroad Multi-plate.

**Table 1 Structures**

Structure No.	Mile Marker	Feature Crossed	Type	Age	Sufficiency Rating	Inventory Rating
<b>Mainline Bridges Over Local Roads</b>						
47-048-461	34.81	I-90 WB over Natl Cemetery Rd	Concrete Slab	54	82.0	HS 22.2 (39.9 tons)
47-048-462	34.81	I-90 EB over Natl Cemetery Rd	Concrete Slab	54	82.0	HS 21.3 (38.4 tons)
<b>Local Road Bridges Over Mainline</b>						
47-061-480	37.01	Pleasant Valley Rd over I-90	Steel Beam	54	96.7	HS 18.3 (33.0 tons)
47-069-510	40.20	Tilford Road over I-90	Steel Beam	53	86.0	HS 21.7 (39.0 tons)
<b>Culverts</b>						
47-045-458	34.32	I-90 over Alkali Creek	Concrete	70	81.9	HS 61.2 (110.1 tons)
47-064-484	37.40	I-90 over Pleasant Valley Creek	Concrete	61	82.0	HS 23.2 (41.8 tons)
47-068-501	39.32	I-90 over Creek	Concrete	61	82.0	HS 32.0 (57.6 tons)
47-068-503	39.45	I-90 over North Br Morris Creek	Concrete	61	82.0	HS 20.6 (37.1 tons)
<b>Railroad Culvert/Multi-Plate</b>						
47-068-495	38.67	I-90 over RC/P&E RR	Steel	36	82.0	HS 25.6 (46.1 tons)

For ease of reading, the age, sufficiency rating, and inventory rating data are shown on a color scale based on their values with red indicating the worst value, yellow the midpoint, and green indicating the best value.

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The average age these structures is 56 years, which is just over the 50-year theoretical service life anticipated for bridges constructed during the Interstate Building Era. Structure 47-045-458, the concrete culvert carrying the Interstate over Alkali Creek, is the oldest at 70 years and structure 47-068-495, the steel culvert/multi-plate carrying I-90 over the Rapid City, Pierre & Eastern Railroad, is the newest at 36 years.

On a scale in which 100 percent would represent an entirely sufficient bridge and zero percent for an entirely insufficient or deficient bridge, the Sufficiency Ratings for these structures are all above the 81.9 percent. However, as a single number the Sufficiency Rating is not accurate for determining actual bridge condition. The geometry of a structure, condition of primary components, and load carrying capacity are better measures of bridge performance.

### 1.1 MAINLINE STRUCTURES OVER LOCAL ROADS

The two bridges, which carry Interstate I-90 over the local roads, were constructed in 1963 as 3-span concrete slab span bridges. The bridges have approach guard railings with all features reported as meeting currently acceptable standards. The abutments consist of concrete sills supported on timber piles, and the piers consist of three columns on individual spread footings.



Photo No. 1 Bridge 47-048-461 WB



Photo No. 2 Bridge 47-048-462 EB

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### 1.1.1 Geometrics

The table below compares the existing physical data—clear width, vertical and lateral clearances, surface protection, roadway alignment, railings—to desired geometrics and specifications.

**Table 2 Physical Data Mainline Bridges**

Structure No./Item	47-048-461 WB	47-048-462 EB	Desired
Curb-to-Curb Width	40.0-ft	40.0-ft	40.0-ft <sup>1</sup>
Vertical Clearance	17.24-ft ▲	16.25-ft ▼	17.0-ft <sup>2,3</sup>
Lateral Underclearance*	9.8-ft ▼	9.4-ft ▼	12.0-ft <sup>4</sup>
Wearing Surface/ Protective System	Epoxy chip seal ▲ Latex modified epoxy overlay ▲ Plain black rebar ◀	Epoxy chip seal ▲ Low slump dense concrete overlay ▲ Plain black rebar ◀	Corrosion resistant rebar Concrete cover High-performance concrete Overlay/Sealer
Roadway Alignment	Tangent, 0.255% longitudinal grade ▼	Tangent, 0.255% longitudinal grade ▼	0.5% customary
Bridge Railings	1'-11" concrete wall on original 1'-0" curb with 5 ½" ledge ▼ (verify strength)	1'-11" concrete wall on original 1'-0" curb with 5 ½" ledge ▼ (verify strength)	Test Level TL-4 <sup>5</sup>
Approach Guardrails	W beam with flared ends and transitioned to a cable guardrail extension and attached Thrie beam ▲	W beam with flared ends and transitioned to a cable guardrail extension and attached Thrie beam ▲	630 Series <sup>6</sup>

\* Lateral Underclearance is the distance from the edge of the through roadway (excluding shoulders) to the nearest substructure unit (pier, abutment, etc.)

KEY ▲ = meets desired criteria, ◀ = tolerable, ▼ = less than desirable

<sup>1</sup> SDDOT Design Standards Table 7-1. Lane / Shoulder Width and Surfacing Standards for Construction, Reconstruction, and Shoulder Widening Projects

<sup>2</sup> SDDOT Design Standards Chapter 6, Vertical Clearances

<sup>3</sup> AASHTO GDHS-4, A Policy on Geometric Design of Highways and Streets

<sup>4</sup> SDDOT Design Standards Table 7-1. Lane / Shoulder Width and Surfacing Standards for Construction, Reconstruction, and Shoulder Widening Projects

<sup>5</sup> AASHTO Guide Specification for Bridge Railings

<sup>6</sup> SDDOT - Design Guidance for 630 Series of Standard Plates 4/28/2017

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### Meets Desirable Bridge Width

The bridges and approach roadways are equal to the desired width of 40'-0" presented in the SDDOT Design Standards for bridges with ADT less than 30,000. In 2016, the ADT for these bridges was 9,420.

### Less Than Desirable Clearance Over Local Road

These underpasses meet the minimum vertical clearance as allowed by AASHTO of 14'-0" for bridge structures over collector roads and streets. However, SDDOT applies a stricter standard. Bridge 47-048-462, which has a clearance of 16'-3", does not meet the desired clearance of 17'-0" in the current SDDOT Design Standards. However, SDDOT Standards do allow a minimum clearance of 16'-4" if costs or geometrics become unreasonable, and as low as 14'-4" for existing structures on low volume roads. No evidence of damage from tall vehicles was noted in the inspection reports. The ADT for National Cemetery Road was 1,084 in 2015.

### Substandard Lateral Underclearance

The lateral clearances from the right edge of the travel lane of the road below to the face of the columns is less than the desired clear zone distance of 12'-0" and are substandard. These bridges are carrying mainline Interstate and therefore are considered critical bridges. Vehicle barriers are required to shield the columns—no barriers are in place today. Collision damage to columns was repaired in 1984.

### Protective System in Place

The wearing surface on the bridges is an epoxy chip seal on overlays—latex modified epoxy on structure 47-068-461 and low slump dense concrete on 47-068-462. Reinforcing steel in the slabs is plain black bars. If the superstructure or entire bridge is to be replaced current practice is to use epoxy coated reinforcing steel in the superstructure.

### Grade Less Than Desired

Longitudinal grades on these structures is less than the minimum desirable longitudinal vertical gradient of 0.5 percent for highway structures. There have been ponding problems on bridges with smaller gradients. Water may be trapped at the parapet due to the longitudinal grade and crown slope.

### Traffic Safety Features, Nonstandard parapets

The railings on the bridges were removed and 12" wide concrete walls were added as parapets. These altered walls likely do not meet current AASHTO standards for parapets crash tested to Test Level 4. The approach guardrails consist of a steel W beam and cable guardrail system. The system is gradually stiffened as it comes closer to the bridge railing transitioning to Thrie beam that is firmly attached to the bridge railing.

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### 1.1.2 Structural Condition

Although the bridges are structurally sufficient, they have undergone improvements and repairs as chronicled in the table below.

**Table 3 Construction/Reconstruction/Repair History Mainline Bridges**

Structure/ Year	47-048-461 WB	47-048-462 EB
Built	1963	1963
1984	Overlay-Bridge rail	Overlay-Bridge rail
1993	Approach Slab-Barrier modification	Approach slab-Barrier modification
2008	Extensions chip seal patch	Extensions chip seal patch
2009	Column repair	-

The following are the Condition Ratings from the recent safety inspection.

**Table 4 NBI Condition Ratings Mainline Bridges**

Structure No.	47-048-461 WB			47-048-462 EB		
	Deck	Superstructure	Substructure	Deck	Superstructure	Substructure
12/19/2016	5	5	6	5	5	6

NBI ratings  $\geq 7$  are Good(green), 5-6 are Fair(yellow), and  $\leq 4$  is Poor(red)

#### Fair Condition Ratings

Overall the structures are in fair condition. The superstructures have National Bridge Inventory (NBI) assessment Ratings of 5, which is considered fair condition. Here are a few issues with the condition that are noted in the element-level inspection data:

- Railings have random vertical hairline to wider cracks with staining
- Chip seal wearing surfaces are thinning
- Concrete slabs have areas with exposed rebar
- All spans have hairline map cracking with leakage and efflorescence

### 1.1.3 Load Capacity

With Inventory Ratings of HS 22.2 and HS 21.3 or 39.9 and 38.4 tons as shown in Table 1 Structures, these bridges have sufficient capacity to safely carry traffic. A structure can remain in place if the operating rating capacity can safely service the system for an additional 20 years<sup>7</sup>.

<sup>7</sup> A Policy on Design Standards--Interstate System, 5th Edition

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## 1.2 LOCAL ROAD STRUCTURES OVER THE MAINLINE

Bridges 47-061-480 and 47-069-510—Pleasant Valley Road and Tilford Road—were constructed in 1963 and 1964 as 4-span haunched steel plate girder bridges. The bridges have approach guard railings with all features reported as meeting currently acceptable standards. Both bridges are supported on concrete sill abutments on timber piles and piers consisting of a concrete cap beam on two columns on individual spread footings.



**Photo No. 3**  
**Bridge 47-061-480 Pleasant Valley Road**



**Photo No. 4**  
**Bridge 47-069-510 Tilford Road**

### 1.2.1 Geometrics

The table below compares the existing physical data—clear width, vertical and lateral clearances, surface protection, roadway alignment, traffic safety features—to desired geometrics and specifications.

**Table 5 Physical Data Overpasses**

Structure No./Item	47-061-480 Pleasant Valley	47-069-510 Tilford	Desired
Curb-to-Curb Width	30.0-ft ◀	30.0-ft ◀	32.0-ft <sup>8</sup> /28.0-ft <sup>9</sup>
Vertical Clearance	16.75-ft ◀	17.00-ft ▲	17.0-ft <sup>10</sup>
Lateral Underclearance	11.9-ft ▼	10.7-ft ▼	40.0-ft <sup>11</sup>

<sup>8</sup> SDDOT Design Standards Table 7-1. Lane / Shoulder Width and Surfacing Standards for Construction, Reconstruction, and Shoulder Widening Projects

<sup>9</sup> AASHTO GDHS-6, A Policy on Geometric Design of Highways and Streets, Tables 5-6 and 6-6

<sup>10</sup> SDDOT Design Standards Chapter 6, Vertical Clearances

<sup>11</sup> AASHTO DS-5, A Policy on Design Standards Interstate System

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Structure No./Item	47-061-480 Pleasant Valley	47-069-510 Tilford	Desired
Wearing Surface/ Deck Protective System	Low slump dense concrete overlay ▲ Plain black rebar ◀	Epoxy chip seal ▲ Plain black rebar ◀	Corrosion resistant rebar Concrete cover High-performance concrete Overlay/Sealer
Roadway Alignment	0.76% +/- longitudinal grade ▲	Top of a crest vertical curve with zero point on the bridge ▼	0.5% customary
Railings	1'-9" concrete wall on original 1'-0" curb ▼ (verify strength)	1'-9" concrete wall on original 1'-0" curb ▼ (verify strength)	Test Level TL-4 <sup>12</sup>
Approach Guardrails	W beam with energy absorbing ends and Thrie beam attached to bridge ▲	W beam with energy absorbing ends and Thrie beam attached to bridge ▲	630 Series <sup>13</sup>

KEY ▲ = meets desired criteria, ◀ = tolerable, ▼ = less than desirable

### Desirable Bridge Width

The width of the bridges matches the approach roadway of 30 ft. Both bridges and approach roadways are less than the desired width of 32'-0" presented in the SDDOT Design Standards for bridges on rural highways with an ADT 251 to 550. However, with Pleasant Valley Road functionally classified as a rural local route and Tilford Road as a rural minor collector the minimum clear roadway width on bridges specified in AASHTO for the current ADTs of 433(2015) and 392(2015) is a 22-ft traveled way plus 3-ft each side. In the footnotes, AASHTO further specifies that the actual surfaced approach roadway width (traveled way plus shoulders) should be carried across the structure, which is the case for these two structures.

### Substandard Clearance Over Interstate

These overpasses meet the minimum vertical clearance as allowed by AASHTO of 16'-0"<sup>14</sup> for bridge structures over interstates. Bridge 47-061-480 does not meet the desired clearance of 17'-0" in the current SDDOT Design Standards. The inspection report notes that "it has had collision damage numerous times in the past". In 1978, a damaged portion of the exterior girder was removed and replaced after a vehicle strike. SDDOT Standards do allow a minimum clearance of 16'-4" if costs or geometrics become unreasonable. The ADT for I-90 below was 18,520 in 2015.

<sup>12</sup> AASHTO Guide Specification for Bridge Railings

<sup>13</sup> SDDOT - Design Guidance for 630 Series of Standard Plates 4/28/2017

<sup>14</sup> AASHTO DS-5, A Policy on Design Standards Interstate System



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### Lateral Underclearance, Columns Shielded

Spanning over mainline interstate, these are considered critical bridges. At both bridges the outside columns are shielded by steel Thrie beam guardrail and the median columns are shielded by 4-cable guardrails.

### Grade, Adequate

The grade on these structures is adequate. For highway structures, the minimum desirable longitudinal vertical gradient is 0.5 percent.

### Traffic Safety Features, Nonstandard parapets

The railings on the bridges were removed and 12" wide concrete walls were added as parapets. These altered walls likely do not meet current AASHTO standards for parapets crash tested to Test Level 4. The approach guardrails consist of a steel W beam system. The system is gradually stiffened as it comes closer to the bridge railing transitioning to Thrie beam that is firmly attached to the bridge railing.

## 1.2.2 Structural Condition

Although the bridges are structurally sufficient, they have undergone improvements and repairs as chronicled in the table below.

**Table 6 Construction/Reconstruction/Repair History Overpasses**

Structure/Year	47-061-480 Pleasant Valley	47-069-510 Tilford
Built	1963	1964
1978	-	Partial removal and replacement of exterior girder Crack repair
1984	Guard rail upgrade	Guard rail upgrade
1987	Approach rail	Approach rail
2000	Overlay, bridge joint	Overlay bridge joint
2009	-	Column repair
2014/2016	LSOC overlay, joint modification	Two coat epoxy chip seal, Overlay joint modification

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**Table 7 NBI Condition Ratings Overpasses**

Structure No.	47-061-480 Pleasant Valley			47-069-510 Tilford		
	Deck	Superstructure	Substructure	Deck	Superstructure	Substructure
12/20/2016	5	6	6	5	5	5

NBI ratings  $\geq 7$  are Good(green), 5-6 are Fair(yellow), and  $\leq 4$  is Poor(red)

### Fair Condition Ratings

Overall the structures are in fair condition. The superstructures have National Bridge Inventory (NBI) assessment Ratings of 6 and 5, which is considered fair condition. Here are a few issues with the condition that are noted in the element-level inspection data:

- Steel girders and bearings have lead based paint throughout, paint is deteriorating
- Steel girders have been repaired for collision damage and cracks
- Decks have transverse and longitudinal cracks with efflorescence
- Delamination of the deck—Bridge 47-061-480 18.4% in 2013, Bridge 47-069-510 2.4% in 2012
- Railings have vertical and map cracking with staining

Delamination of the decks is expected to progress. Assuming a reasonable rate of 0.625%<sup>15</sup> each year, the quantities for 47-061-480 and 47-069-510 respectively are projected to be 22% and 6% in 2018 and 32% and 16% in 2034. Bridge preservation activities such as maintaining the epoxy surface can slow down the deterioration.

### 1.2.3 Load Capacity

The minimum structural capacity per AASHTO<sup>16</sup> Tables 5-7 and 6-7 for bridges carrying rural local and collector roads to remain in place is HS 15. With Inventory Ratings of HS 18.3 and HS 21.7 or 33.0 and 39.0 tons as shown in Table 1 Structures, these bridges have sufficient capacity to safely carry traffic.

<sup>15</sup> VTRC 08-CR4 Bridge Deck Service Life Prediction and Cost

<sup>16</sup> AASHTO GDHS-6, A Policy on Geometric Design of Highways and Streets

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### 1.3 CULVERTS CONVEYING CREEKS

The four culverts conveying creeks beneath the Interstate were constructed between 1947 and 1956 as cast-in-place concrete box culverts with concrete end walls and aprons.

#### 1.3.1 Geometrics

The table below presents the culvert size and compares the existing physical data—freeboard, clear zone—to desired geometrics and specifications.

**Table 8 Physical Data Culverts**

Structure No./Item	47-045-458 Alkali	47-064-484 Pleasant Valley	47-068-501 "Forbes Gulch"	47-068-503 N. Br. Morris	Desired
Culvert Size,	2-12'Wx10'H cells	3-10'Wx10'H cells	3-8'Wx4'H cells	2-10'Wx7'H cells	
Freeboard	unknown	6.16-ft. ▲	4.18-ft. ▲	2.5-ft. ▲	2-ft. <sup>17</sup>
Clear Zone(L/R)	35.6-ft/24.5-ft ◀	33.2-ft/31.2-ft ▲	35-ft/36.6-ft ▲	31.5-ft/30.5-ft ▲	30 ft.

KEY ▲ = meets desired criteria, ◀ = tolerable, ▼ = less than desirable

#### Freeboard

Using the FHWA standard practice of providing 2-ft of freeboard below the subgrade shoulder, the culverts carrying Pleasant Valley Creek (Beaver Creek), Forbes Creek, and the North Branch of Morris Creek (Breakneck Gulch) seem to be adequate. This is comparing the 25-year Design High Water elevation to the roadway subgrade at the inlet ends. The Design High Water elevation for Alkali Creek was not shown in the design plans.

While freeboard at these structures seems to be adequate, there have been flooding issues in this area in the past. In 2015, it was reported that: "A heavyweight storm, which seemed to stand still Monday night as it hammered Piedmont, shut down a 20-mile stretch of Interstate 90 north of Rapid City, stranding dozens of motorists. Up to a foot of water covered the Interstate in some areas, and I-90 was closed for a time between mile markers 32 and 55, according to the South Dakota Highway Patrol." If these structures were involved in the flooding, a complete review of the culvert hydraulics should be completed.

#### Clear Zone Acceptable

Review of the clear distance from the edge of pavement to the headwalls showed that distances or shielding is adequate. The side slopes along the interstate are carried across the culverts. Using 12-ft wide outer lanes, the clearances are greater than 30-ft except for culvert 47-045-458 which is only 24.5-ft but is shielded with 4-cable guardrail.

<sup>17</sup> FHWA-HIF-12-026 Hydraulic Design of Highway Culverts

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### 1.3.2 Structural Condition

Although the culverts are structurally sufficient, they have undergone improvements and repairs as chronicled in the table below.

**Table 9 Construction/Reconstruction/Repair History Culverts**

Structure/ Year	47-045-458 Alkali	47-064-484 Pleasant Valley	47-068-501 "Forbes Gulch"	47-068-503 N. Br. Morris
Built	1947	1956	1956	1956
1980	-	Extension		
1994	-	Extension rail	-	Extension rail
2008	Extension	Extension	Extension	Extension

**Table 10 NBI Condition Ratings Culverts**

Structure No.	47-045-458 Alkali	47-064-484 Pleasant Valley	47-068-501 "Forbes Gulch"	47-068-503 N. Br. Morris
Culvert Rating	6	6	7	6

NBI ratings  $\geq 7$  are Good (green), 5-6 are Fair (yellow), and  $\leq 4$  is Poor (red)

#### Fair to Good Condition Ratings

Culverts 47-045-458, 47-64-484 and 47-068-503 are in fair condition with NBI ratings of 6. Culvert 47-068-501 is in good condition with an NBI of 7. Issues with the condition noted in the element-level inspection data include exposed reinforcing, cracks in the wingwalls and headwalls, cracks and spalls on the aprons and delamination at floor joints, and cracking with leakage and efflorescent through the top slabs.

### 1.3.3 Load Capacity

With Inventory Ratings of HS 61.2, HS 23.2, HS 32.0, and HS 20.6, or 110.1, 41.8, 57.6, and 37.1 tons these culverts have sufficient capacity to safely carry traffic.

# STRUCTURE NEEDS MEMORANDUM I-90 EXIT 32-40: CORRIDOR STUDY AND DESIGN PROJECT

STRUCTURES I-90 IN MEADE COUNTY FROM EXIT 32 TO EXIT 40  
January 22, 2018

## 1.4 RAILROAD MULTI-PLATE

Multi-plate 47-068-495 is a 38-ft wide galvanized steel culvert that carries the RC/P&E RR line under I-90.



**Photo No. 5**  
**Multi-plate 47-068-495 RC/P&E RR**

### 1.4.1 Geometrics

The table below presents the culvert size and compares the existing physical data—vertical and lateral clearances—to desired geometrics and specifications.

**Table 11 Physical Data RR Multi-Plate**

Structure No./Item	47-068-495	Required	Desired
Vertical Clearance Above Top of Rail	22.582-ft ▲	22.5-ft <sup>18</sup>	23.0-ft <sup>19</sup>
Lateral Clearance from C/L Track	16.708-ft ▲	9.0-ft <sup>20</sup>	

KEY ▲ = meets desired criteria, ◀ = tolerable, ▼ = less than desirable

<sup>18</sup> SDDOT Design Standards Chapter 6, Vertical Clearances

<sup>19</sup> AREMA Chapter 28 Clearance, Figure 28-1-3

<sup>20</sup> AREMA Chapter 28 Clearance, Figure 28-1-3

# STRUCTURE NEEDS MEMORANDUM I-90 EXIT 32-40: CORRIDOR STUDY AND DESIGN PROJECT

STRUCTURES I-90 IN MEADE COUNTY FROM EXIT 32 TO EXIT 40  
 January 22, 2018

## Sufficient Vertical Clearance, Check Field Measurement

For bridges, SDDOT Design Standards require a minimum clearance of 22'-6" above the top of the track, which is nearly equal to the field measurement. For bridges AREMA Chapter 28 requires a clearance of 23'-0" at 6-ft from the centerline of the track (see Figure 1). According to the design drawings, the multi-plate has sufficient vertical clearance of 23'-0" above top of rails to meet that requirement. The field measurement however, is less than 23'-0" and should be checked. The multi-plate does meet the requirements of 20'-3" for a double stack train as on AREMA Plate H (see Figure 2).

## Sufficient Lateral Clearance

With 16.7-ft of lateral clearance the multi-plate meets the AREMA Bridge Clearance requirement of 9-ft for a tangent track (see Figure 1). It was noted in the SAI Report that the lateral clearance is substandard but that does not seem to agree with AREMA diagrams. When using the NBI Appraisal rating for minimum lateral underclearance for railroads, this structure is downgraded since the value for railroads in FHWA's Recording and Coding Guide for the Structure and Appraisal of the Nation's Bridges is for bridge substructures rather than thru bridges.

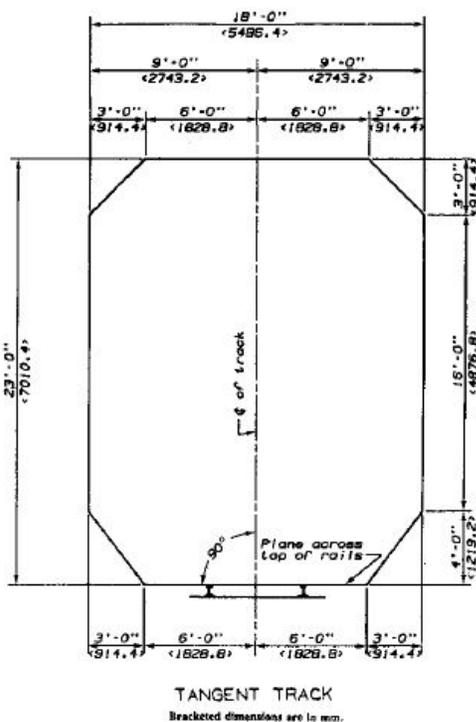


Figure 1 - AREMA Bridge Clearances

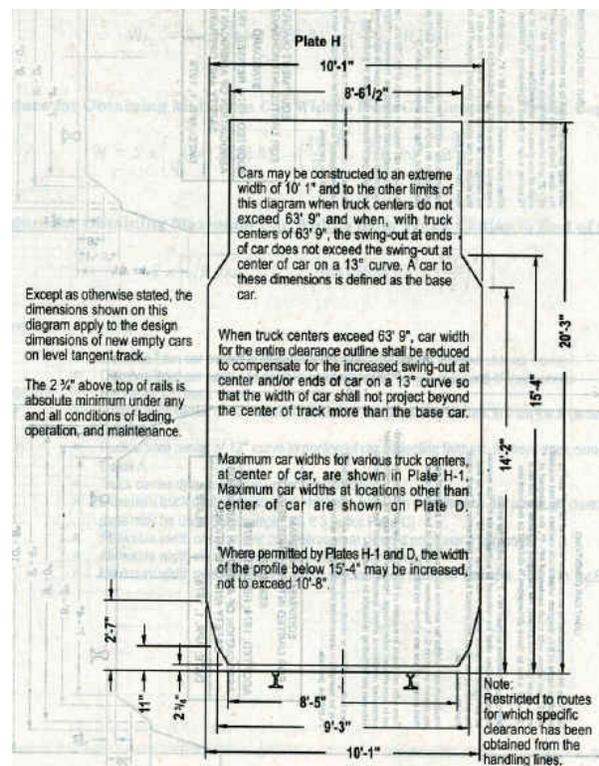


Figure 2 - Plate H Double Stack Railcar

## STRUCTURE NEEDS MEMORANDUM I-90 EXIT 32-40: CORRIDOR STUDY AND DESIGN PROJECT

STRUCTURES I-90 IN MEADE COUNTY FROM EXIT 32 TO EXIT 40

January 22, 2018

### 1.4.2 Structural Condition

The steel multi-plate was built in 1981 and was extended in a 2008 improvement project. In 2014, the southwest bin/wingwall was struck by a trailer house that blew off a westbound transport. It was recorded in the inspection report but there was no defect to the structure.

#### Good Condition Rating

Multi-plate 47-068-495 is in good condition with an NBI rating of 7. In the element-level inspection it is noted that there is water leakage with corrosion at the joint between the 4<sup>th</sup> and 5<sup>th</sup> plates.

### 1.4.3 Load Capacity

With an Inventory Rating of HS 25.6, or 46.1 tons, the multi-plate has sufficient capacity to safely carry traffic.

# **APPENDIX**

# STRUCTURE NEEDS MEMORANDUM I-90 EXIT 32-40: CORRIDOR STUDY AND DESIGN PROJECT

Appendix A Inspection Reports  
January 22, 2018

## Appendix A INSPECTION REPORTS

GENERAL BRIDGE DATA :

(8) STR NO : 47-048-461  
 (7) FACILITY : I090 W  
 (6) FEAT INTER : I090 WF & BH NATL CEM RD  
 (9) LOCATION : BH NATL CEM INTERCHANGE  
 INTERCHANGE :   
 SECTION(S) : 26  
 TOWNSHIP(S) : 005N  
 RANGE(S) : 05E  
 (2) REGION : Rapid City  
 (3) COUNTY : 47 MEADE  
 (21) CUSTODIAN : 1 State Highway Agency  
 (22) OWNER :  
 MAINT PROJ : 090 W 451  
 (42A) SERV TYPE ON : 1 Highway  
 (42b) SERV TYPE UND : 1 Highway  
 (103) TEMP STRUCTURE : Unknown (NBI)  
 (99) BORDER BRIDGE STR NO : -1  
 (98A) NEIGHBOR STATE : Not Applicable (P)  
 (98B) PERCENT SHARE :

HIGHWAY CARRIED (NBI 5)

(5B) ROUTE PREFIX : 1 Interstate Hwy  
 (5C) LEVEL OF SERVICE : 1 Mainline  
 (5D) ROUTE NUMBER : 00090  
 (5E) DIRECT SUFFIX : 4 West  
 MRM ENGLISH : 34.81  
 POSTED SPEED : 75 MPH  
 SCHOOL BUS RT :  MAIL RT :   
 (104) NHS SYSTEM : 1 On the NHS  
 FA ROUTE : 0090  
 (26) FUNC CLASS : 01 Rural Interstate  
 (28A) LANES : 2  
 (102) DIRECTION TRAFFIC : 1 1-way traffic  
 (105) FED LANDS HWY : 0 N/A (NBI)  
 (19) DETOUR : 0 mi  
 (29) ADT TOTAL : 9,420  
 (30) YEAR OF ADT : 2016  
 (109) % TRUCK : 9 %  
 (53) MIN V CLR RT : 328.1 ft  
 (53) MIN V CLR LT : 0.0 ft  
 (10) MAX V CLR RT : 328.1 ft  
 (10) MAX V CLR LT : 0.0 ft  
 (47) HORIZ V CLR RT : 40.0 ft  
 (47) HORIZ V CLR LT : 0.0 ft

GIS DATA

LATITUDE : 44.37114 LONGITUDE : -103.47273  
 DATE : 3/28/16  
 COMMENT : Calculated GIS INFO

HIGHWAY CARRIED (UNDER RECORD)

(5A) RECORD TYPE :  
 (5B) ROUTE PREFIX :  
 (5C) LEVEL OF SERVICE :  
 (5D) ROUTE NUMBER : 00090  
 (5E) DIRECT SUFFIX :  
 MRM (ENGLISH) : 34.81  
 ADM JUR : 01 State Highway Agency  
 (104) NHS SYSTEM :  
 FA ROUTE : 0090  
 (26) FUNC CLASS :  
 (28B) LANES : 2  
 (101) DIRECTION OF TRAFFIC :  
 (19) DETOUR LENGTH : 4 mi  
 (29) ADT : 1,084 (30) ADT Year : 2015

GENERAL COMMENT: PARABOLIC

REGION COMMENT:

FREE COMMENT: 2008-EPOXY SEAL COAT, 1984-LSDC, REVQVED 06/90-RACS

INSPECTION TYPE	LAST INSPECTION DATE	REQUIRED	INSPECTION FREQUENCY	NEXT INSP DATE
NBI	12/19/2016		24 months	12/19/2018
FRACTURE CRITICAL	NA	N	NA	NA
UNDERWATER	NA	N	NA	NA
SPECIAL	NA	N	NA	NA
ELEMENT INSPECTION	12/11/2014		24 months	12/19/2018

GENERAL BRIDGE DATA

(27) YEAR BUILT : 1963 (106) RECONSTR : 0  
 (49) STR LENGTH : 119.0 ft  
 NB'S BRIDGE LENGTH : 115.0 ft  
 (48) MAX SPAN LENGTH : 43.0 ft  
 Main (43A) MATERIAL : 2 Concrete-Continuous  
 Span (43B) DESIGN : 01 Slab  
 SD STR TYPE : X220  
 (107) DECK STR TYPE : 1 Concrete-Cast-in-Place  
 (52) DECK WIDTH : 44.3 ft  
 (51) BRIDGE ROWY WIDTH : 40.0 ft  
 (32) APPR ROWY WIDTH : 38.0 ft  
 (50A) LT SIDEWALK WIDTH : 0.0 ft  
 (50B) RT SIDEWALK WIDTH : 0.0 ft  
 (34) SKEW : 0° SKEW DIR :  
 (45) NO MAIN SPANS : 3  
 (46) NO APPR SPANS : 0  
 (31) DESIGN LOAD : 6 MS18(HS20)+mod  
 (33) BRIDGE MEDIAN : 0 No median  
 (35) STR FLARED : 0 No flare

BOX CULVERT DATA :

BOX CULVERT SIZE : 0 X 0 X 0  
 FILL HT OVER BOX : 0.0 ft  
 LENGTH OF LONGEST CELL : 0.0 ft

RAIL DATA :

(36) SAFETY FEAT : 1111  
 BRIDGE RAIL 1 : 13  
 RAIL TRANS 1 : 51  
 APPR RAIL 1 : 61  
 APPR RAIL TERM 1 : 40

NBI PROP WORK

(75A) WORK TYPE : Unknown (P)  
 (75B) WORK BY : Unknown (NBI)  
 (76) IMPROV LENGTH : 0.0 ft  
 (94) BRIDGE IMPROV COST : \$(1)  
 (95) RDWAY IMPROV COST : \$(1)  
 (96) TOTAL PROJECT COST : \$(1)  
 (97) YEAR OF IMPROV COST : -1.00  
 (114) ADT FUTURE : 13,254  
 (115) YEAR OF ADT FUTURE : 2036

STEEL PAINT

UNDERCOAT :  
 TOPCOAT :  
 YEAR : COLOR :

STATUS

SUFF RATE : 82.0  
 FED SUFF RATE : 82.0  
 FED SR DATE : Mar 2017  
 DEFICIENCY : F  
 CANDIDATE :

DECK DATA

(108A) WEARING SURFACE : 5 Epoxy Overlay  
 DECK PROTECTION : None  
 OVERLAY THICKNESS : 2.70 in  
 DECK DELAM AREA : 2.0 sq ft  
 DECK DELAM DATE : 10/2016  
 DECK SURVEY : 09/2006

CHLORIDE :   
 RESTEEL DEPTH :   
 ELECTRO POTENT :

LOAD RATING DATA :

(41) OPER STATUS : A Open, no restriction  
 (66) INV HS20 : 39.9 tons HS 22.2  
 (65) METHOD : 1 LF Load Factor (tons)  
 (64) OP HS20 : 66.6 tons HS 37.0  
 (63) METHOD : 1 LF Load Factor (Tons)  
 TRUCK TYPE 3 : 53.1 tons  
 TRUCK TYPE 3S2 : 88.9 tons  
 TRUCK TYPE 3-2 : 102.3 tons  
 BARS NO : 090245

HYDRAULICS :

DRAINAGE AREA : 0.00 sq mi  
 OBSERV HW ELEV : 0.0 ft  
 YEAR :  
 DESIGN FREQ : 0  
 DESIGN FLOW : 0.0 cfs  
 DESIGN VELOCITY : 0.00 fps  
 DESIGN AREA : 0.0 sq ft  
 DESIGN YEAR :  
 DESIGN HW ELEV : ft  
 100 YEAR FLOW : 0.0 cfs  
 100 YR HW ELEV : ft  
 V MAX : fps  
 SCOUR SCREENING : N SCOUR RATING : N  
 TOPEKA SHINER :

RAIL PAINT:

UNDERCOAT :  
 TOP COAT :  
 YEAR : COLOR :

PROJECT NUMBER :

PCN :

DATE DONE :

PROJECT NUMBER	PCN	DATE DONE
IM 0901(120)33	6180	01/01/2008
JR-090-1(64)31	4751	01/01/1984
IM-090-1(116)31	3934	01/01/1984
I-090-1( )28	none	01/01/1963

GENERAL COMMENT: PARABOLIC

REGION COMMENT:

FREE COMMENT: 2008-EPOXY SEAL COAT, 1984-LSDC, REVQVED 06/90-RACS

INSPECTION TYPE	LAST INSPECTION DATE	REQUIRED	INSPECTION FREQUENCY	NEXT INSP DATE
NBI	12/19/2016		24 months	12/19/2018
FRACTURE CRITICAL	NA	N	NA	NA
UNDERWATER	NA	N	NA	NA
SPECIAL	NA	N	NA	NA
ELEMENT INSPECTION	12/11/2014		24 months	12/19/2018

INSPKEY : WGQA  
 APPRAIS BY : SS  
 APPRAIS DATE : 06/28/2017  
 QA INSPECTOR :  
 QA INSP DATE :  
 LAST INSPECTION BY : Kamarainen, Steve  
 CONSULTANT CODE : STATE HWY FORCES

CONDITION RATINGS:

(58) DECK : 5                    (59) SUPER : 5                    (60) SUB : 6                    (62) CULVERT : N  
(61) CHANNEL : N  
APPROACH : 7      New 1995. Some settlement observed.

APPRAISAL RATINGS

(67) STR APPR : 5      Minor cracks & deck delam.  
(68) DECK GEOM : 7      Substd width  
(69) UNDERCLR : 3      Lateral CL edge of driving lane to Bent Columns  
(71) WATERWAY : N  
(72) APPR ALIN : 8  
(70) BR POST : 5      LFA

Elements	Unit	ID	Env	Tot. Qty (English)	Units	Q 1	Q 2	Q 3	Q 4	Notes
Re Concrete Slab	MAIN	38	3	5,276	sq.ft	5,228.00	48.00	0.00	0.00	<p>12-19-1608/15/2008 - RACS removed, deck ground and an epoxy chip seal applied. New condition on ECS. No delam.</p> <p>12-18-08 No change.</p> <p>12/07/2010 Deck not visible with Epoxy Chip Seal with no worn / bare spots. Delamination checked October 2009 with none detected.</p> <p>12-17-2012 A few thin spots in ECS. No other visible defects. No new delam check.</p> <p>12-11-2014 No new delam check. Thin spots in the ECS.</p> <p>Soffit Smart Flag notes from before: 1-16-2007 HL map cracking present in all spans. Longitudinal cracks also exist in all spans predominantly near center line. These cracks are HL up to .20" in size. One longit continues through thickened slab over bent 3. Most cracks stop as they go into thicker concrete. Eff prominently at BAW deck joint, but their Eff is light traces on underside.</p> <p>12-18-08 No change.</p> <p>12/07/2010 No Change</p> <p>12-17-2012 Random HL cracks. No eff.</p> <p>12-11-2014 Abut 1 has light scaling with light eff extending out up to 1' from the backwall. No additional cracks.</p> <p>12-19-16 &amp; 3-2-17 See defects.</p>
Low Slump Dense Concrete Overlay	MAIN	810	3	4,760	sq.ft	4,758.00	2.00	0.00	0.00	1984 LSDC.
Del/Spall/Patch/Pot(Wear Surf)	MAIN	3210	3	2	sq.ft	0.00	2.00	0.00	0.00	12-19-16 & 3-2-17 Deck delam check 10-16 = 2 sf, 0.04%.
Epoxy/Polymer Chip Seal	MAIN	812	3	4,760	sq.ft	2,856.00	0.00	952.00	952.00	2008 ECS.
Effectiveness (Wearing Surface)	MAIN	3230	3	1,904	sq.ft	0.00	0.00	952.00	952.00	12-19-16 & 3-2-17 40% of the epoxy chip seal is thin.
Delamination/Spall/Patched Area	MAIN	1080	3	4	sq.ft	0.00	4.00	0.00	0.00	12-19-16 & 3-2-17 Right edge of slab has 1 delamination in Span 2. Left edge of slab has 1 delamination in each span.
Exposed Rebar	MAIN	1090	3	1	sq.ft	0.00	1.00	0.00	0.00	12-19-16 & 3-2-17 Right edge of slab has 1 spall with exposed resteel over Bent 2.
Efflorescence/Rust Staining	MAIN	1120	3	35	sq.ft	0.00	35.00	0.00	0.00	12-19-16 & 3-2-17 Vertical cracks on edges of slab that project to the underside of slab with 6" to 12" of efflorescence: Span 1 it = 1, Span 2 it = 2, Span 2 rt = 5, Span 3 it = 1, Span 3 rt = 4.
Cracking (RC and Other)	MAIN	1130	3	8	sq.ft	0.00	8.00	0.00	0.00	12-19-16 & 3-2-17 Typically, there are approx 6 HL longitudinal cracks, mainly near centerline, in all spans. Typically, there are transverse HL cracks at the interface between the parabolic slab and constant depth slab sections. Vertical HL cracks on the edges of the slab. Edge of slab at Abut 4 left has shear cracks, to 0.04", with efflorescence. Edges of slab at Abut 1 left & right and Abut 4 right have HL cracks with efflorescence/discoloration.
Re Conc. Column	MAIN	205	2	6	each	5.00	1.00	0.00	0.00	<p>1-16-2007 All 6 columns on bents have no visible signs of cracking and are all near vertical in position.</p> <p>12-8-08 No change.</p> <p>12/07/2010 All columns good. West column @ bent 3 was smoked stained from an accident, but has been painted. (Additional notes by RS) The Bent 3 west column was damaged by collision and resulting fire in May 2009. A contract project in 2009 repaired the column by removing delaminated concrete, placing concrete in the removal areas and then placing a column fiber wrap around the column. The fiber wrapped area was painted. The rest of the column and the bottom of the deck was cleaned to remove soot from the fire.</p> <p>12-17-2012 No defects noted. Repaired column looks good.</p> <p>12-11-2014 No defects noted.</p> <p>12-19-16 &amp; 3-2-17 No change.</p>
Delamination/Spall/Patched Area	MAIN	1080	2	1	each	0.00	1.00	0.00	0.00	12-19-16 & 3-2-17 Collision damaged column repaired in 2009.
Damage	MAIN	7000	2	1	each	0.00	1.00	0.00	0.00	12-19-16 & 3-2-17 Collision damaged column repaired in 2009.

Re Conc Abutment	MAIN	215	2	124	ft	116.00	8.00	0.00	0.00	1-16-2007 Abut 1 & 4 have random HL to slightly larger cracks. Some areas of map cracking exist. Both abuts have .02 ft. ft. cracks at center line through date running vertical. This crack has light EFF. Abut 4 B/W has transv crack that is HL to slightly larger approx right in center of B/W. This crack also has light EFF prominently around deck B/W connection. Backwall sides also have diagonal cracks running into deck sides. 12-18-08 Horizontal crack right of center on abutment 1 backwall. 12/07/2010 No additional crks 12-17-2012 Wingwalls all have random HL cracks. Both backwalls have a vertical HL crack Lt of centerline with light eff. 12-11-2014 No additional cracks in wingwalls, some stains. Backwalls-in addition to previous Abut 4 now has some map cracking in the Lt half. 12-19-16 & 3-2-17 See defects.
Efflorescence/Rust Staining	MAIN	1120	2	8	ft	0.00	8.00	0.00	0.00	12-19-16 & 3-2-17 Abut 4 bw- 1 vertical crack with light efflorescence and area 6' long with light scale/efflorescence.
Strip Seal Exp Joint	MAIN	300	3	84	ft	82.00	2.00	0.00	0.00	1-16-2007 Both strip seals have glands intact and appear functioning well. 12-18-08 Abut 4 strip seal is bent in the driving lane with concrete spall at approximately 3 ft. from centerline. Gouges in asphalt growth joints at both ends. 12/07/2010 Strip Seal armored sections mostly good with minor bent area on Abut 4 section. Glands are intact. 12-17-2012 Minor spalling along extrusion at Abut 4 on sleeper slab side. Extrusions are all secure. Glands appear intact. 12-11-2014 Extrusions are secure. No additional spalling on the sleeper slab side of Abut 4. Glands appear intact. 12-19-16 & 3-2-17 See defects.
Metal Deterioration or Damage	MAIN	2370	3	2	ft	0.00	2.00	0.00	0.00	12-19-16 & 3-2-17 Abut 4 jt has 2' of loose extrusion.
Re Conc Approach Slab	MAIN	321	3	1,884	sq.ft	1,490.00	394.00	0.00	0.00	1-16-2007 Approach on abut 1 end has very few cracks that are HL in size. Wheel paths tinning worn off with pass lane having light scaling. Abut 4 approach has routed unsealed cracks in drive lane having light scaling. Wheel path tinning worn off and light scaling in pass lane. Both approaches have fair rides with some settlement . Abut 1 off end appears to have settled aprox 1 1/2 ft. ft.. 12-18-08 No change. 12/07/2010 There are none to very few crks on Appr Slabs, but both slabs have numerous scaling or small popoff spots <<See attached photo ft.s. Smooth ride. 12-17-2012 Pop off spots remain near the same as previous. Abut 4 DL has 1 longitudinal crack that has been routed but not filled. 12-11-2014 Condition of both remains very near the same as previous. 12-19-16 & 3-2-17 See defects.
Epoxy Resteeel	MAIN	820	3	1,884	sq.ft	1,884.00	0.00	0.00	0.00	Top mat only.
Delamination/Spall/Patched Area	MAIN	1080	3	19	sq.ft	0.00	19.00	0.00	0.00	12-19-16 & 3-2-17 Numerous pop offs.
Cracking (RC and Other)	MAIN	1130	3	15	sq.ft	0.00	15.00	0.00	0.00	12-19-16 & 3-2-17 Abut 1 has longitudinal HL cracks. Abut 4 DL has 15' of .030" to .050" cracking that has been routed, but not sealed.
Abrasion(PSC/RC)	MAIN	1190	3	360	sq.ft	0.00	360.00	0.00	0.00	12-19-16 & 3-2-17 Abut 1 & Abut 4 have abrasion with exposed aggregate in the wheel tracks.
Re Conc Bridge Railing	MAIN	331	3	238	ft	94.00	89.00	55.00	0.00	1-16-2007 Rectangular blocks on top of curb are in good condition with random vertical HL. to larger cracks with discoloration. 12-18-08 No change. 12/07/2010 No additional crks. 12-17-2012 No additional cracks, some rust stains. 12-11-2014 Vertical cracks front and back of both, most with stains. 12-19-16 & 3-2-17 See defects.
Efflorescence/Rust Staining	MAIN	1120	3	55	ft	0.00	0.00	55.00	0.00	12-19-16 & 3-2-17 Left barrier has 30 vertical cracks with discoloration. Right barrier has 25 vertical cracks with discoloration.
Cracking (RC and Other)	MAIN	1130	3	89	ft	0.00	89.00	0.00	0.00	12-19-16 & 3-2-17 Right curb under snow. Left curb has horizontal cracking for nearly the full length

# Elements								
Action	Agency Status	Agency Priority	Assigned to a Project	Rec. Date	Str No	Assigned To	Notes	Target Year

**GENERAL BRIDGE DATA :**

(8) STR NO : 47-048-462  
(7) FACILITY : I090 E  
(6) FEAT INTER : 090 EF & BH NAT CEM RD  
(9) LOCATION : BH NATL CEM INTERCHANGE  
INTERCHANGE   
SECTION(S) : 26  
TOWNSHIP(S) : 005N  
RANGE(S) : 05E  
(2) REGION : Rapd City  
(3) COUNTY : 47 MEADE  
(21) CUSTODIAN : 1 State Highway Agency  
(22) OWNER :  
MAINT PROJ : 090 E 451  
(42A) SERV TYPE ON : 1 Highway  
(42b) SERV TYPE UND : 1 Highway  
(103) TEMP STRUCTURE : Unknown (NBI)  
(99) BORDER BRIDGE STR NO : -1  
(98A) NEIGHBOR STATE : Not Applicable (P)  
(98B) PERCENT SHARE :

**HIGHWAY CARRIED (NBI 5)**

(5B) ROUTE PREFIX : 1 Interstate Hwy  
(5C) LEVEL OF SERVICE : 1 Mainline  
(5D) ROUTE NUMBER : 00090  
(5E) DIRECT SUFFIX : 2 East  
MRV ENGLISH : 34.8  
POSTED SPEED : 75 MPH  
SCHOOL BUS RT :  MAIL RT :   
(104) NHS SYSTEM : 1 On the NHS  
FA ROUTE : 0090  
(26) FUNC CLASS : 01 Rural Interstate  
(28A) LANES : 2  
(102) DIRECTION TRAFFIC : 1 1-way traffic  
(105) FED LANDS HWY : 0 N/A (NBI)  
(19) DETOUR : 0 mi  
(29) ADT TOTAL : 9,420  
(30) YEAR OF ADT : 2016  
(109) % TRUCK : 9%  
(53) MIN V CLR RT : 328.1 ft  
(53) MIN V CLR LT : 0.0 ft  
(10) MAX V CLR RT : 328.1 ft  
(10) MAX V CLR LT : 0.0 ft  
(47) HORIZ V CLR RT : 40.0 ft  
(47) HORIZ V CLR LT : 0.0 ft

**GIS DATA**

LATITUDE : 44.37099 LONGITUDE : -103.47297  
DATE : 3/28/16  
COMMENT : Calculated GIS INFO

**HIGHWAY CARRIED (UNDER RECORD)**

(5A) RECORD TYPE :  
(5B) ROUTE PREFIX :  
(5C) LEVEL OF SERVICE :  
(5D) ROUTE NUMBER : 00090  
(5E) DIRECT SUFFIX :  
MRV (ENGLISH) : 34.81  
ADM JUR : 01 State Highway Agency  
(104) NHS SYSTEM :  
FA ROUTE : 0090  
(26) FUNC CLASS :  
(28B) LANES : 2  
(101) DIRECTION OF TRAFFIC :  
(19) DETOUR LENGTH : 4 mi  
(29) ADT : 1084 (30) ADT Year : 2015

GENERAL COMMENT : PARABOLIC

REGION COMMENT :

FREE COMMENT : 2008-EPOXY SEAL COAT. 1983-LMC. REMOVED 07/86-RACS

INSPECTION TYPE	LAST INSPECTION DATE	REQUIRED	INSPECTION FREQUENCY	NEXT INSP DATE
NBI	12/19/2016		24 months	12/19/2018
FRACTURE CRITICAL	NA	N	NA	NA
UNDERWATER	NA	N	NA	NA
SPECIAL	NA	N	NA	NA
ELEMENT INSPECTION	12/11/2014		24 months	12/19/2018

**GENERAL BRIDGE DATA :**

(27) YEAR BUILT : 1963 (106) RECONSTR : 0  
(49) STR LENGTH : 119.0 ft  
NBIS BRIDGE LENGTH : 115.0 ft  
(48) MAX SPAN LENGTH : 43.0 ft  
Main (43A) MATERIAL : 2 Concrete Continuous  
Span (43B) DES GN : 01 Slab  
SD STR TYPE : X220  
(107) DECK STR TYPE : 1 Concrete-Cast-in-Place  
(52) DECK WIDTH : 44.3 ft  
(51) BRIDGE RDWY WIDTH : 40.0 ft  
(32) APPR RDWY WIDTH : 38.0 ft  
(50A) LT SIDEWALK WIDTH : 0.0 ft  
(50B) RT SIDEWALK WIDTH : 0.0 ft  
(34) SKEW : 0' SKEW DIR :  
(45) NO MAIN SPANS : 3  
(46) NO APPR SPANS : 0  
(31) DESIGN LOAD : 6 MS18(HS20)+mod  
(33) BRIDGE MEDIAN : 0 No median  
(35) STR FLARED : 0 No flare

**BOX CULVERT DATA :**

BOX CULVERT SIZE : 0 X 0 X 0  
FILL HT OVER BOX : 0.0 ft  
LENGTH OF LONGEST CELL : 0.0 ft

**RAIL DATA :**

(36) SAFETY FEAT : 1111  
BRIDGE RAIL 1 : 13  
RAIL TRANS 1 : 51  
APPR RAIL 1 : 61  
APPR RAIL TERM 1 : 40

**NBI PROP WORK**

(75A) WORK TYPE : Unknown (P)  
(75B) WORK BY : Unknown (NBI)  
(76) IMPROV LENGTH : 0.0 ft  
(94) BRIDGE IMPROV COST : \$(1)  
(95) RDWY IMPROV COST : \$(1)  
(96) TOTAL PROJECT COST : \$(1)  
(97) YEAR OF IMPROV COST : -1.00  
(114) ADT FUTURE : 13,254  
(115) YEAR OF ADT FUTURE : 2036

**STEEL PAINT**

UNDERCOAT :  
TOPCOAT :  
YEAR : COLOR :

**STATUS**

SUFF RATE : 82.0  
FED SUFF RATE : 82.0  
FED SR DATE : Mar 2017  
DEFICIENCY : F  
CANDIDATE :

**DECK DATA**

(108A) WEARING SURFACE : 5 Epoxy Overlay  
DECK PROTECTION : None  
OVERLAY THICKNESS : 1.50 in  
DECK DELAM AREA : 134.0 sq ft  
DECK DELAM DATE : 10/2016  
DECK SURVEY : 09/2006

CHLORIDE :   
RESTEEL DEPTH :   
ELECTRO POTENTIAL :

**LOAD RATING DATA :**

(41) OPER STATUS : A Open, no restriction  
(66) INV HS20 : 38.4 tons HS 21.4  
(65) METHOD : 1 LF Load Factor (tons)  
(64) OP HS20 : 64.2 tons HS 35.6  
(63) METHOD : 1 LF Load Factor (Tons)  
TRUCK TYPE 3 : 51.1 tons  
TRUCK TYPE 3S2 : 85.6 tons  
TRUCK TYPE 3-2 : 98.5 tons  
BARS NO : 090243

**HYDRAULICS :**

DRAINAGE AREA : 0.00 sq mi  
OBSERV HW ELEV : 0.0 ft  
YEAR :  
DESIGN FREQ : 0  
DESIGN FLOW : 0.0 cfs  
DESIGN VELOCITY : 0.00 fps  
DESIGN AREA : 0.0 sq ft  
DESIGN YEAR :  
DESIGN HW ELEV : ft  
100 YEAR FLOW : 0.0 cfs  
100 YR HW ELEV : ft  
V MAX : fms  
SCOUR SCREENING : N SCOUR RATING : N  
TOPEKA SHNER :

**RAIL PAINT :**

UNDERCOAT :  
TOP COAT :  
YEAR : COLOR :

PROJECT NUMBER :	PCN :	DATE DONE :
IM 0901(120)33	6180	01/01/2008
IR-090-1(67)32	4747	01/01/1983
IM-090-1(116)31	3934	01/01/1994
I-090-1( )28	none	01/01/1963

CONDITION RATINGS:

(58) DECK : 5                    (59) SUPER : 5                    (60) SUB : 6                    (62) CULVERT : N  
(61) CHANNEL : N  
APPROACH : 8

APPRAISAL RATINGS

(67) STR APPR : 5   Minor cracks & delam.  
(68) DECK GEOM : 7   Substd width  
(69) UNDERCLR : 3   Lateral CL edge of driving lane to Bent Columns  
(71) WATERWAY : N  
(72) APPR ALIN : 8  
(70) BR POST : 5   LFA

Elements	Unit	ID	Env	Tot. Qty (English)	Units	Q 1	Q 2	Q 3	Q 4	Notes
Re Concrete Slab	MAIN	38	3	5,276	sq.ft	5,151.00	125.00	0.00	0.00	<p>10-2008, Deck ground and ECS placed over existing LSDCOL. New condition. No delam.</p> <p>12-18-2008 No visible defects. ECS is good. Delam checked 10-08, none found.</p> <p>12/07/2010 Deck not visible with Epoxy Chip Seal with no worn / bare spots. Delamination checked October 2009 with none detected.</p> <p>12-17-2012 ECS has a few thin spots. No new delam check.</p> <p>12-11-2014 No new delam check. Cracked/delam areas: Abut 1 DL 1 ft.x9 ft. Abut 4 DL 1 ft.x4 ft. . A few transverse cracks showing through ECS. Thin spots in ECS.</p> <p>Soffit Smart Flag notes from before: HL superficial crks throughout underside and 1-approx 2'x2' minor scaled spot</p> <p>12-18-2008 No additional cracks. Previous mentioned scaling spot at Abut 1 ft is now 3'x5' with light scaling and light eff.</p> <p>12/07/2010 Scaled spot remains the same. No additional crks.</p> <p>12-17-2012 Cracking and scaling area remain very near the same.</p> <p>12-11-2014 There is now light scaling and light eff all along Abut 1 and extending out up to 1'. No additional cracking.</p> <p>12-19-16 &amp; 3-2-17 See defects for additional comments.</p>
Latex Modified Concrete Overlay	MAIN	811	3	4,760	sq.ft	4,534.00	226.00	0.00	0.00	1983 LMC.
Del/Spall/Patch/Pol(Wear Surf)	MAIN	3210	3	186	sq.ft	0.00	185.00	0.00	0.00	12-19-16 & 3-2-17 Deck delam check 10-16 = 134 sf. 2.54%. Patched areas = 52 sf.
Crack (Wearing Surface)	MAIN	3220	3	40	sq.ft	0.00	40.00	0.00	0.00	12-19-16 & 3-2-17 40' of .020" to .040" transverse cracks visible.
Epoxy/Polymer Chip Seal	MAIN	812	3	4,760	sq.ft	2,328.00	0.00	1,190.00	1,242.00	ECS 2008.
Effectiveness (Wearing Surface)	MAIN	3230	3	2,432	sq.ft	0.00	0.00	1,190.00	1,242.00	12-19-16 & 3-2-17 50% of epoxy chip seal is thin. Some longitudinal cracking in ecs, mainly in the thin areas. Patched areas of LCM without ecs = 52 sf.
Exposed Rebar	MAIN	1090	3	38	sq.ft	0.00	38.00	0.00	0.00	12-19-16 & 3-2-17 Underside: In the 3' x 5' area of light efflorescence & light scaling at Abut 1 left is 1 sf of spalling with exposed rebar. Left edge of slab has 30 spalls with exposed resteel and right edge has 7.
Efflorescence/Rust Staining	MAIN	1120	3	79	sq.ft	0.00	79.00	0.00	0.00	12-19-16 & 3-2-17 Underside: 40 sf of light scale and efflorescence along Abut 4 backwall. 3' x 5' area of light eff/scaling at Abut 1 left noted before. The light scaling/eff at Abut 1 (noted 12-11-14) is discoloration. Vertical cracks on edges of slab that project to the underside of slab with 6" to 12" of eff. Span 1 ft = 3, Span 2 ft = 6, Span 2 ft = 8, Span 3 ft = 4
Cracking (RC and Other)	MAIN	1130	3	8	sq.ft	0.00	8.00	0.00	0.00	12-19-16 & 3-2-17 Underside: Edges of slab at Abut 1 left and right right have shear cracks, to 0.04", with eff. Edges of slab at Abut 4 left and right have HL cracks with eff/dyscoloration. Typically there are approx 6 HL longitudinal cracks, mainly near centerline, in all spans. Typically there are transverse HL cracks at the interface between the parabolic slab and constant depth slab sections. Numerous vertical HL cracks on the edges of slab.
Re Conc Column	MAIN	205	2	6	each	6.00	0.00	0.00	0.00	<p>Good - No crks</p> <p>12-18-2008 No defects found.</p> <p>12/07/2010 No crks or other defects.</p> <p>12-17-2012 No defects found.</p> <p>12-11-2014 No defects found.</p> <p>12-19-16 &amp; 3-2-17 No change.</p>

Re Conc Abutment	MAIN	215	2	124	ft	74.00	50.00	0.00	0.00	HL vertical superficial crks on wingwalls and backwalls 12-18-2008 No additional cracks. 12/07/2010 No additional crks 12-17-2012 Wingwalls all have random HL cracks. Abut 1 backwall-random HL cracks at centerline. 1 vertical HL crack Rt of centerline with light eff. Abut 4-vertical HL cracks Lt and Rt of centerline. 12-11-2014 No additional cracks in wingwalls, some have stains. Backwalls have no additional cracks. Abut 4 has light scaling and light eff along the top. 12-19-16 & 3-2-17 All wingwalls have HL map cracking and discoloration. See defect notes for additional comments.
Efflorescence/Rust Staining	MAIN	1120	2	49	ft	0.00	49.00	0.00	0.00	12-19-16 & 3-2-17 Abut 1 has 1 vertical crack with light efflorescence and a 4' long area of light scale/efflorescence. Abut 4 has light efflorescence along the top full width.
Cracking (RC and Other)	MAIN	1130	2	1	ft	0.00	1.00	0.00	0.00	12-19-16 & 3-2-17 Abut 4 has 1 vertical 2HL crack near centerline.
Re Conc Approach Slab	MAIN	321	3	1,717	sq.ft	1,365.00	352.00	0.00	0.00	A few HL to slightly larger superficial transverse crks. 12-18-2008 Abut 1 end has 1 transverse HL to 1/32 in. crack across both lanes. Abut 4 good. Good ride. 12/07/2010 No additional crks. 12-17-2012 No additional cracks. 12-11-2014 No additional cracks. 12-19-16 & 3-2-17 See defect notes.
Cracking (RC and Other)	MAIN	1130	3	24	sq.ft	0.00	24.00	0.00	0.00	12-19-16 & 3-2-17 Abut 1 approach slab has 24' of .020" to .040" transverse cracks.
Abrasion(PSC/RC)	MAIN	1190	3	328	sq.ft	0.00	328.00	0.00	0.00	12-19-16 & 3-2-17 Abut 1 and Abut 4 approach slabs have thin tining and the tining is worn off and aggregate exposed in the wheel lines.
Re Conc Bridge Railing	MAIN	331	3	238	ft	69.00	79.00	90.00	0.00	Numerous HL and few slightly larger vertical crks on top and both sides 12-18-2008 No additional cracks. 12/07/2010 No additional crks 12-17-2012 No additional cracks, some rust stains. 12-11-2014 Vertical cracks front and back of both, most with stains. 12-19-16 & 3-2-17 See defect notes.
Efflorescence/Rust Staining	MAIN	1120	3	90	ft	0.00	0.00	90.00	0.00	12-19-16 & 3-2-17 Left barrier has 40 vertical cracks with discoloration. Right barrier has 50 vertical cracks with discoloration.
Cracking (RC and Other)	MAIN	1130	3	79	ft	0.00	79.00	0.00	0.00	12-19-16 & 3-2-17 Right curb under snow. Left curb has horizontal cracking for nearly the full length.
# Elements										

Action	Agency Status	Agency Priority	Assigned to a Project	Rec. Date	Str No	Assigned To	Notes	Target Year

**GENERAL BRIDGE DATA :**

(8) STR NO : 47-061-480  
 (7) FACILITY : PLEASANT VALLEY RD  
 (6) FEAT INTER : 1090  
 (9) LOCATION : 3.2NW TILFORD INTERCHANGE  
 INTERCHANGE :   
 SECTION(S) : 31 06  
 TOWNSHIP(S) : 005N 004N  
 RANGE(S) : 06E  
 (2) REGION : Rapid City  
 (3) COUNTY : 47 MEADE  
 (21) CUSTODIAN : 1 State Highway Agency  
 (22) OWNER :  
 MAINT PROJ : 090 451  
 (42A) SERV TYPE ON : 1 Highway  
 (42b) SERV TYPE UND : 1 Highway  
 (103) TEMP STRUCTURE : Unknown (NB)  
 (99) BORDER BRIDGE STR NO : -1  
 (98A) NEIGHBOR STATE : Unknown (P)  
 (98B) PERCENT SHARE : -2

**HIGHWAY CARRIED (NB1 5)**

(5B) ROUTE PREFIX : 4 County Hwy  
 (5C) LEVEL OF SERVICE : 1 Mainline  
 (5D) ROUTE NUMBER : 00000  
 (5E) DIRECT SUFFIX : 0 N/A (NB1)  
 MRM ENGLISH : 0.00  
 POSTED SPEED : 55 MPH  
 SCHOOL BUS RT :  MAIL RT :   
 (104) NHS SYSTEM : 0 Not on NHS  
 FA ROUTE : 0000  
 (26) FUNC CLASS : 08 Rural min Collector  
 (28A) LANES : 2  
 (102) DIRECTION TRAFFIC : 2 2-way traffic  
 (105) FED LANDS HWY : 0 N/A (NB1)  
 (19) DETOUR : 0 mi  
 (29) ADT TOTAL : 433  
 (30) YEAR OF ADT : 2015  
 (109) % TRUCK : 2 %  
 (53) MIN V CLR RT : 328.1 ft  
 (53) MIN V CLR LT : 0.0 ft  
 (10) MAX V CLR RT : 328.1 ft  
 (10) MAX V CLR LT : 0.0 ft  
 (47) HORIZ V CLR RT : 30.0 ft  
 (47) HORIZ V CLR LT : 0.0 ft

**GIS DATA**

LATITUDE : 44.34420 LONGITUDE : -103.44721  
 DATE : 3/28/16  
 COMMENT : Calculated GIS INFO

**HIGHWAY CARRIED (UNDER RECORD)**

(5A) RECORD TYPE :  
 (5B) ROUTE PREFIX :  
 (5C) LEVEL OF SERVICE :  
 (5D) ROUTE NUMBER : 00090  
 (5E) DIRECT SUFFIX :  
 MRM (ENGLISH) : 37.01  
 ADM JUR : 01 State Highway Agency  
 (104) NHS SYSTEM :  
 FA ROUTE : 0090  
 (26) FUNC CLASS :  
 (28B) LANES : 4  
 (101) DIRECTION OF TRAFFIC :  
 (19) DETOUR LENGTH : 0 mi  
 (29) ADT : 18,520 (30) ADT Year : 2016

GENERAL COMMENT: PLATE GIRDER 253.6' PARABOLIC  
 REGION COMMENT: JT MOD & DECK OVLY 2000-PCEMS 4253, 2016 LSDC Overlay  
 FREE COMMENT: 2000-EPOXY SEAL COAT, 08/84-RACS

**GENERAL BRIDGE DATA**

(27) YEAR BUILT : 1963 (106) RECONSTR : -1  
 (49) STR LENGTH : 258.4 ft  
 NBIS BRIDGE LENGTH : 247.7 ft  
 (48) MAX SPAN LENGTH : 74.0 ft  
 Main (43A) MATERIAL : 4 Steel Continuous  
 Span (43B) DESIGN : 02 Stringer/Girder  
 SD STR TYPE : X271  
 (107) DECK STR TYPE : 1 Concrete-Cast-in-Place  
 (52) DECK WIDTH : 32.3 ft  
 (51) BRIDGE RDWY WIDTH : 30.0 ft  
 (32) APPR RDWY WIDTH : 30.0 ft  
 (50A) LT SIDEWALK WIDTH : 0.0 ft  
 (50B) RT SIDEWALK WIDTH : 0.0 ft  
 (34) SKEW : 32\* SKEW DIR : R  
 (45) NO MAIN SPANS : 4  
 (46) NO APPR SPANS : 0  
 (31) DESIGN LOAD : 5 MS 18 (HS 20)  
 (33) BRIDGE MEDIAN : 0 No median  
 (35) STR FLARED : 0 No flare

**BOX CULVERT DATA :**

BOX CULVERT SIZE : 0 X 0 X 0  
 FILL HT OVER BOX : 0.0 ft  
 LENGTH OF LONGEST CELL : 0.0 ft

**RAIL DATA :**

(38) SAFETY FEAT : 1111  
 BRIDGE RAIL 1 : 13  
 RAIL TRANS 1 : 51  
 APPR RAIL 1 : 20  
 APPR RAIL TERM 1 : 90

**NBI PROP WORK**

(75A) WORK TYPE : Unknown (P)  
 (75B) WORK BY : Not Applicable (P)  
 (76) IMPROV LENGTH : 0.0 ft  
 (94) BRIDGE IMPROV COST : \$(1)  
 (95) RDWY IMPROV COST : \$(1)  
 (96) TOTAL PROJECT COST : \$(1)  
 (97) YEAR OF IMPROV COST : -1.00  
 (114) ADT FUTURE : 433  
 (115) YEAR OF ADT FUTURE : 2035

**STEEL PAINT**

UNDERCOAT : LEAD-BASED PAINT  
 TOPCOAT : LEAD-BASED PAINT  
 YEAR : 1985 COLOR : GREEN

**STATUS**

SUFF RATE : 96.7  
 FED SUFF RATE : 96.7  
 FED SR DATE : Mar 2017  
 DEFICIENCY :  
 CANDIDATE :

**DECK DATA**

(108A) WEARING SURFACE : 4 Low Slump Concrete  
 DECK PROTECTION : None  
 OVERLAY THICKNESS : 2.00 in  
 DECK DELAM AREA : 0.0 sq ft  
 DECK DELAM DATE : 09/2016  
 DECK SURVEY : 05/1984

CHLORIDE :   
 RESTEEL DEPTH :   
 ELECTRO POTENT :

**LOAD RATING DATA :**

(41) OPER STATUS : A Open, no restriction  
 (66) INV HS20 : 33.0 tons HS 18.3  
 (65) METHOD : 1 LF Load Factor (tons)  
 (64) OP HS20 : 56.0 tons HS 31.1  
 (63) METHOD : 1 LF Load Factor (Tons)  
 TRUCK TYPE 3 : 50.0 tons  
 TRUCK TYPE 3S2 : 72.5 tons  
 TRUCK TYPE 3-2 : 79.6 tons  
 BARS NO : 090247

**HYDRAULICS :**

DRAINAGE AREA : 0.00 sq mi  
 OBSERV HW ELEV : 0.0 ft  
 YEAR :  
 DESIGN FREQ : 0  
 DESIGN FLOW : 0.0 cfs  
 DESIGN VELOCITY : 0.00 fps  
 DESIGN AREA : 0.0 sq ft  
 DESIGN YEAR :  
 DESIGN HW ELEV : ft  
 100 YEAR FLOW : 0.0 cfs  
 100 YR HW ELEV : ft  
 V MAX : fps  
 SCOUR SCREENING : N SCOUR RATING : N  
 TOPEKA SHINER :

**RAIL PAINT :**

UNDERCOAT :  
 TOP COAT :  
 YEAR : COLOR :

**PROJECT NUMBER :**

PROJECT NUMBER :	PCN :	DATE DONE :
IR-090-1(74)0	0497	01/01/1985
IM 90-1(00)37	4253	01/01/2000
IR-090-1(84)30	1195	01/01/1988
I-090-1(08)28	none	01/01/1963

(5A) RECORD TYPE :  
 (5B) ROUTE PREFIX :  
 (5C) LEVEL OF SERVICE :  
 (5D) ROUTE NUMBER : 00090  
 (5E) DIRECT SUFFIX :  
 MRM (ENGLISH) : 37.01  
 ADM JUR : 01 State Highway Agency  
 (104) NHS SYSTEM :  
 FA ROUTE : 0090  
 (26) FUNC CLASS :  
 (28B) LANES : 4  
 (101) DIRECTION OF TRAFFIC :  
 (19) DETOUR LENGTH : 0 mi  
 (29) ADT : 18,520 (30) ADT Year : 2016

INSPECTION TYPE	LAST INSPECTION DATE	REQUIRED	INSPECTION FREQUENCY	NEXT INSP DATE
NBI	12/20/2016		24 months	12/20/2018
FRACTURE CRITICAL	NA	N	NA	NA
UNDERWATER	NA	N	NA	NA
SPECIAL	NA	N	NA	NA
ELEMENT INSPECTION	12/09/2014		24 months	12/20/2018

INSPKEY : KDCL  
 APPRAIS BY : SS  
 APPRAIS DATE : 07/18/2017  
 QA INSPECTOR :  
 QA INSP DATE :  
 LAST INSPECTION BY : Kamarainen, Steve  
 CONSULTANT CODE : STATE HWY FORCES

CONDITION RATINGS:

(58) DECK : 5                    (59) SUPER : 6                    (60) SUB : 6                    (62) CULVERT : N  
(61) CHANNEL : N  
APPROACH : 7                    A few small cracks.

APPRAISAL RATINGS

(67) STR APPR : 6    Deck cracks, Minor rust, minor traffic collision damage, photos linked.  
(68) DECK GEOM : 6    Substd width  
(59) UNDERCLR : 5    Substd CL  
(71) WATERWAY : N  
(72) APPR ALIN : 8    Top of vert curve  
(70) BR POST : 5    LFA

Elements	Unit	ID	Env	Tot. Qty (English)	Units	Q 1	Q 2	Q 3	Q 4	Notes
Re Concrete Deck	MAIN	12	3	8,353	sq.ft	5,305.00	3,048.00	0.00	0.00	<p>Deck Cracking Smart Flag #358</p> <p>12/28/2010 Transverse crack at same location as 6"x6" spall in EBL left wheel line. Longitudinal cracks, some with efflorescence, in WBL shoulder. Transverse cracks in EBL, including over Bent 3. Edge of deck has cracking with discoloration.</p> <p>12/10/2012: Transverse crack over Bent 2.</p> <p>12/9/2014: Significant transverse cracks throughout especially over bents. A number of delams have spalled along existing transverse cracks.</p> <p>1-17-2007 Overlay in 2000 is still in new condition and has 100% coverage. Deck shows minimal wear. Delams checked in 2005 and 745 sqft was found and 9.6% total area.</p> <p>12-29-2008 No defects visible. A few small bare spots in the ECS. Delam checked 7-07, 619 sf detected, 8%.</p> <p>12/28/2010 6 in. x6 in. spall in EBL left wheel line approx 35 ft. from Abut 3. Aug 2009 delam: 721 sf (9.3%). Several areas 6 in. or less where ECS has worn off and to other areas where ECS is scraped thin.</p> <p>12/10/2012: Transverse crack over Bent 2. Several small pop-outs throughout deck, a few of which are beginning to spall. June 2011 delam check: 734 sf (9.5%)</p> <p>12/9/2014: Significant transverse cracks throughout especially over bents. A number of delams have spalled along existing transverse cracks. A significant amount of delamination throughout including approx. 25sf over Bent 4 in the EB lane.</p> <p>August 2013 delam check: 1,426 sf (18.4%)</p> <p>12/20/2016: Epoxy Chip Seal was removed &amp; replaced w/ LSDC Overlay in 2015 contract PCN 04VW.</p>
Low Slump Dense Concrete Overlay	MAIN	810	3	7,751	sq.ft	7,751.00	0.00	0.00	0.00	<p>12/20/2016: Low Slump Dense Concrete Overlay added in 2015 by contract PCN 04VW. Timing is rough in the EBL near Abutment 5. November 2015 delam check = 1013 sf, 12.14% September 2016 delam check = 0 sf.</p>
Crack (Wearing Surface)	MAIN	3220	3	282	sq.ft	282.00	0.00	0.00	0.00	<p>12/20/2016: There are a few HL longitudinal &amp; diagonal cracks in both lanes of travel over Bents 2 &amp; 4</p>
Delamination/Spall/Patched Area	MAIN	1080	3	2,285	sq.ft	0.00	2,285.00	0.00	0.00	<p>1-17-2007 Overlay in 2000 is still in new condition and has 100% coverage. Deck shows minimal wear. Delams checked in 2005 and 745 sqft was found and 9.6% total area.</p> <p>12-29-2008 No defects visible. A few small bare spots in the ECS. Delam checked 7-07, 619 sf detected, 8%.</p> <p>12/28/2010 6 in. x6 in. spall in EBL left wheel line approx 35 ft. from Abut 5. Aug 2009 delam: 721 sf (9.3%). Several areas 6 in. or less where ECS has worn off and to other areas where ECS is scraped thin.</p> <p>12/10/2012: Transverse crack over Bent 2 Several small pop-outs throughout deck, a few of which are beginning to spall. June 2011 delam check: 734 sf (9.5%)</p> <p>12/9/2014: Significant transverse cracks throughout especially over bents. A number of delams have spalled along existing transverse cracks. A significant amount of delamination throughout including approx. 25sf over Bent 4 in the EB lane.</p> <p>August 2013 delam check: 1,426 sf (18.4%)</p> <p>12/20/2016: November 2015 delam check = 1,013 SF, 12.14% September 2016 delam check = 0 SF PCN 04VW repaired approximately 2285 SF of delaminations prior to installing LSDC Overlay.</p>

<p>Efflorescence/Rust Staining</p>	<p>MAIN</p>	<p>1120</p>	<p>3</p>	<p>84</p>	<p>sq.ft</p>	<p>0.00</p>	<p>84.00</p>	<p>0.00</p>	<p>0.00</p>	<p>Soffit Smart Flag #359 1-17-2007 underside has no visible large cracks. Small area of light JEFF on LTV side of G-3 in span 3. Offsite has HL to slightly larger cracks with JEFF. Most of which are under joints in barriers. 12-29-2008 No additional cracks or eff. 12/28/2010 No change. From previous inspections: small area (approx 1'x2') map cracking and light efflorescence in Span4 Bay 1. Random HL cracks in all spans. HL transverse cracks with effl. Small area of light effl on left side of G3 Span 3 soffit crack with effl. 12/10/2012: No change. 12/9/2014: Span 3 LT cantilever has scaling over DL at G1. Bay 1 has scaling w/ eff 10' from Bent 4. 12/20/2016: No change.</p>
<p>Cracking (RC and Other)</p>	<p>MAIN</p>	<p>1130</p>	<p>3</p>	<p>1,480</p>	<p>sq.ft</p>	<p>835.00</p>	<p>645.00</p>	<p>0.00</p>	<p>0.00</p>	<p>Deck Cracking Smart Flag #358 12/28/2010 Transverse crack at same location as 6"x6" spall in EBL left wheel line. Longitudinal cracks, some with efflorescence, in WBL shoulder. Transverse cracks in EBL, including over Bent 3. Edge of deck has cracking with discoloration. 12/10/2012: Transverse crack over Bent 2. 12/9/2014: Significant transverse cracks throughout especially over bents. A number of delams have spalled along existing transverse cracks.  Soffit Smart Flag #359 1-17-2007 underside has no visible large cracks. Small area of light JEFF on LTV side of G-3 in span 3. Offsite has HL to slightly larger cracks with JEFF. Most of which are under joints in barriers. 12-29-2008 No additional cracks or eff. 12/28/2010 No change. From previous inspections: small area (approx 1'x2') map cracking and light efflorescence in Span4 Bay 1. Random HL cracks in all spans. HL transverse cracks with effl. Small area of light effl on left side of G3 Span 3 soffit crack with effl. 12/10/2012: No change. 12/9/2014: Span 3 LT cantilever has scaling over DL at G1. Bay 1 has scaling w/ eff 10' from Bent 4. 12/20/2016: No change.</p>
<p>Abrasion(PSC/RC)</p>	<p>MAIN</p>	<p>1190</p>	<p>3</p>	<p>34</p>	<p>sq.ft</p>	<p>0.00</p>	<p>34.00</p>	<p>0.00</p>	<p>0.00</p>	<p>Soffit Smart Flag #359 1-17-2007 underside has no visible large cracks. Small area of light JEFF on LTV side of G-3 in span 3. Offsite has HL to slightly larger cracks with JEFF. Most of which are under joints in barriers. 12-29-2008 No additional cracks or eff. 12/28/2010 No change. From previous inspections: small area (approx 1'x2') map cracking and light efflorescence in Span4 Bay 1. Random HL cracks in all spans. HL transverse cracks with effl. Small area of light effl on left side of G3 Span 3 soffit crack with effl. 12/10/2012: No change. 12/9/2014: Span 3 LT cantilever has scaling over DL at G1. Bay 1 has scaling w/ eff 10' from Bent 4. 12/20/2016: There is an 8 SF area of scaling in Span 2 over G2.</p>

Steel Opn Girder/Beam	MAIN	107	2	1,024	ft	889.00	119.00	16.00	0.00	<p>1-17-2007 Snooper inspected Tom Russell and found to have no major distortion of girders. Paint peeled with light rust areas over traffic. Ends of girders on both N &amp; S ends have freckling and moderate rust spots. Paint system 95% good condition. Collision damage over WBL on G-1 and G-2 is near center line of DL bottom flange. Area has small bent up spot and G-3 has scrapes and G-4 has small flattened spot on bottom flange, exterior corner. Over EBL G-1 thru G-4 over DL have minor scrapes. ( SEE PHOTOS )</p> <p>12-29-2008 No additional damage to girders. A few small peeling spots in the paint. No additional rust.</p> <p>1-21-09 Cherry picker inspection. No additional information. Note: girders have had collision damage due to overheight hits numerous times in the past, some of the collision damage in the past has been repaired with heat straightening, the diaphragm stiffeners were welded to the top and bottom flanges in 1985.</p> <p>12/28/2010 G2 &amp; G3 web and bottom flanges have moderate rusting at diaphragm at Abut 5 bearings. G4 has a questionable crack on interior side of girder over center of EB driving lane. Paint has light rusting and peeling throughout.</p> <p>12/10/2012: Previously noted questionable crack on interior side of G4 over EB driving lane has been mag particle tested and no crack was found.</p> <p>G2 at Abut 1 has beginning of pack rust between the bottom flange and sole plate.</p> <p>Previously noted probable weld cracks were mag particle tested and no cracks were found.</p> <p>12/9/2014: - Girders on either side of Bay 3 in Span 2 have significant areas of peeling paint. - G1 over the EB driving lane, bottom flange is warped from impact damage on 10/27/2014. Detailed measurements can be found in the bridge file. A project will be let to heat straighten the girder flange. There is no apparent sweep in girder 1. - Bottom flange gouge on G1 LT at approx. 7 ft. from diaphragm to west.</p> <p>Continued in (2) Notes...</p>
Lead Based Paint	MAIN	816	2	10,738	sq.ft	10,631.00	0.00	0.00	107.00	<p>12/20/2016: Lead based paint throughout girders. Repair areas included Class 1 repainting after completion of work but did not require complete removal of lead based paint.</p>
Peel/Bub/Crack(Stl Protect Coat)	MAIN	3420	2	33	ft	0.00	0.00	0.00	32.61	<p>12/20/2016: Paint has failed where corrosion is present.</p>
Corrosion	MAIN	1000	2	102	ft	0.00	102.00	0.00	0.00	<p>1-17-2007 Snooper inspected Tom Russell and found to have no major distortion of girders. Paint peeled with light rust areas over traffic. Ends of girders on both N &amp; S ends have freckling and moderate rust spots. Paint system 95% good condition. 12-29-2008 No additional damage to girders. A few small peeling spots in the paint. No additional rust.</p> <p>1-21-09 Cherry picker inspection. No additional information.</p> <p>12/28/2010 G2 &amp; G3 web and bottom flanges have moderate rusting at diaphragm at Abut 5 bearings. Paint has light rusting and peeling throughout.</p> <p>12/10/2012: G2 at Abut 1 has beginning of pack rust between the bottom flange and sole plate.</p> <p>12/9/2014: - Girders on either side of Bay 3 in Span 2 have significant areas of peeling paint. - Girders have light pack rust between bottom flanges and sole plates at Abut 1 bearings. - Paint is cracked at web to bottom flange weld on exterior face of G1 at approx. 9' from diaphragm to west.</p> <p>12/20/2016: No change.</p>

Distortion	MAIN	1900	2	17	ft	0.00	17.00	0.00	0.00	<p>1-17-2007 Snooper inspected Tom Russell and found to have no major distortion of girders. Collision damage over WBL on G-1 and G-2 is near center line of DL bottom flange. Area has small bent up spot and G-3 has scrapes and G-4 has small flattened spot on bottom flange, exterior corner. Over EBL G-1 thru G-4 over DL have minor scrapes. ( SEE PHOTOS )</p> <p>12-29-2008 No additional damage to girders.</p> <p>1-21-09 Cherry picker inspection. No additional information. Note: girders have had collision damage due to overheight hits numerous times in the past, some of the collision damage in the past has been repaired with heat straightening, the diaphragm stiffeners were welded to the top and bottom flanges in 1985.</p> <p>12/28/2010 G4 has a questionable crack on interior side of girder over center of EB driving lane.</p> <p>12/10/2012: Previously noted questionable crack on interior side of G4 over EB driving lane has been mag particle tested and no crack was found. Previously noted probable weld cracks were mag particle tested and no cracks were found.</p> <p>12/9/2014: - G1 over the EB driving lane, bottom flange is warped from impact damage on 10/27/2014. Detailed measurements can be found in the bridge file. A project will be let to heat straighten the girder flange. There is no apparent sweep in girder 1. - Bottom flange gouge on G1 LT at approx. 7 ft. from diaphragm to west. - Crack in weld at G1 field splice in Span 2 adjacent to Bent 2 - crack at intersecting welds at bottom flange splice weld and bottom flange to web weld.</p> <p>12/20/2016: Girder repairs took place in 2014 by contract PCN 13MF. Repairs included heat straightening G1 in Span 2, removing/replacing cracked welds, &amp; grinding of nicks and gouges. The heat straightened area looks good &amp; paint is holding up well.</p>
Damage	MAIN	7000	2	17	ft	0.00	17.00	0.00	0.00	<p>12-28-10 From previous inspection: over WBL G1 &amp; G2 have minor damage near centerline of driving lane. Bottom flange is slightly distorted upward. G3 has scrapes. G4 has small flattened spot of bottom flange exterior corner. Over EBL G1 thru G4 over driving lane have minor scrapes.</p> <p>12/10/2012: No change.</p> <p>12/9/2014: On 10/27/2014 a tractor trailer hauling 2 large tanks was returning to True North in Rapid City. The driver entered I90 EB at Whitewood &amp; without proper permits, hit G1 in the EB driving lane.</p> <p>12/20/2016: Girder repairs took place in 2014 by contract PCN 13MF. Repairs included heat straightening G1 in Span 2, removing/replacing cracked welds, &amp; grinding of nicks and gouges. The heat straightened area looks good &amp; paint is holding up well.</p>
Re Conc Column	MAIN	205	2	6	each	4.00	2.00	0.00	0.00	<p>1-17-2007 Columns on all 3 bents have no visible cracks anywhere. Bent 4 Lt column 2/3 rds way up column has small defect when constructed.</p> <p>12-29-2008 No defects found.</p> <p>12/28/2010 No change.</p> <p>12/10/2012: Bent 2, Column 1 has a small spall on north side, approximately 1' above ground line.</p> <p>12/9/2014: No change.</p> <p>12/20/2016: No change except as detailed in defect notes.</p>
Delamination/Spall/Patched Area	MAIN	1060	2	1	each	0.00	1.00	0.00	0.00	<p>12/10/2012: Bent 2, Column 1 has a small spall on north side, approximately 1' above ground line.</p> <p>12/9/2014: No change.</p> <p>12/20/2016: No change.</p>
Cracking (RC and Other)	MAIN	1130	2	1	each	1.00	0.00	0.00	0.00	<p>1-17-2007 Columns on all 3 bents have no visible cracks anywhere.</p> <p>12-29-2008 No defects found.</p> <p>12/28/2010 No change.</p> <p>12/10/2012: No change.</p> <p>12/9/2014 No change.</p> <p>12/20/2016 Bent 4. C1 has minor crack 6'-7" high on southwest side.</p>
Abrasion(PSC/RC)	MAIN	1190	2	1	each	0.00	1.00	0.00	0.00	<p>12/20/2016: Bent 4. C1 has minor crack 6'-7" high on southwest side. Bent 4. C2 has a 2"x2" scrape near bottom.</p>

Re Conc Abutment	MAIN	215	2	104	ft	71.00	33.00	0.00	0.00	1-17-2007 Backwalls on abut 1& 5 have no visible cracks. Abut 5 has small spots of discoloration due to steel next to surface. Also very minor scale in spots. 12-29-2008 No additional deterioration. 12/28/2010 Wingwalls have minor HL random cracks. Abut 5 RT has vertical crack with efflorescence. 12/10/2012: No change. 12/9/2014: Abut 5 RT WW has a slight spall on outer corner from vehicle impact on 11/17/2014. 12/20/2016: No change except as detailed in defect notes.
Delamination/Spall/Patched Area	MAIN	1080	2	1	ft	0.00	1.00	0.00	0.00	12/9/2014: Abut 5 RT WW has a slight spall on outer corner from vehicle impact on 11/17/2014. 12/20/2016: No change.
Efflorescence/Rust Staining	MAIN	1120	2	6	ft	0.00	6.00	0.00	0.00	1-17-2007 Abut 5 has small spots of discoloration due to steel next to surface. 12-29-2008 No additional deterioration. 12/28/2010 Abut 5 RT has vertical crack with efflorescence. 12/10/2012: No change. 12/9/2014: No change. 12/20/2016: No change.
Cracking (RC and Other)	MAIN	1130	2	3	ft	3.00	0.00	0.00	0.00	1-17-2007 Backwalls on abut 1& 5 have no visible cracks. 12-29-2008 No additional deterioration. 12/28/2010 Wingwalls have minor HL random cracks. Abut 5 RT has vertical crack with efflorescence. 12/10/2012: No change. 12/9/2014: No change. 12/20/2016: No change.
Abrasion(PSC/RC)	MAIN	1190	2	26	ft	0.00	26.00	0.00	0.00	1-17-2007 Abut 5 has very minor scale in spots. 12-29-2008 No additional deterioration. 12/28/2010 No comment 12/10/2012: No change. 12/9/2014: No change. 12/20/2016: Approx 50% of Abut 5 BW width has scaling along the top.
Damage	MAIN	7000	2	1	ft	0.00	1.00	0.00	0.00	12/9/2014: Abut 5 RT WW has a slight spall on outer corner from vehicle impact on 11/17/2014. 12/20/2016: No change.
Re Conc Pier Cap	MAIN	234	2	108	ft	84.00	24.00	0.00	0.00	1-17-2007 Caps on all 3 bents have HL to .020 ft. wide cracks above all columns. These cracks run vertical to slightly diagonal from top of cap towards bottom of cap. All 3 caps on outside radius edges have HL map cracking. Most on West sides. 12-29-2008 No additional cracks. 12/28/2010 Bent 2 cap top has numerous vertical cracks, diagonal cracks on face, and horizontal cracks on south end. Bent 3 cap has vertical cracks at top of face, full height vertical cracks between columns and horizontal cracking on south end. Bent 4 cap has vertical cracking throughout top of face and over both columns, horizontal cracking above columns, and random cracking on west edge. 12/10/2012: No change. 12/9/2014: Bent 3: Minor map cracking on east face under G4. Bent 4: LT end has multiple horizontal cracks & minor map cracking. 12/20/2016: No change.

<input type="checkbox"/> Cracking (RC and Other)	MAIN	1130	2	36	ft	12.00	24.00	0.00	0.00	<p>1-17-2007 Caps on all 3 bents have HL to .020 ft. ft. wide cracks above all columns. These cracks run vertical to slightly diagonal from top of cap towards bottom of cap. All 3 caps on outside radius edges have HL map cracking. Most on West sides.</p> <p>12-29-2008 No additional cracks.</p> <p>12/28/2010 Bent 2 cap top has numerous vertical cracks, diagonal cracks on face, and horizontal cracks on south end. Bent 3 cap has vertical cracks at top of face, full height vertical cracks between columns and horizontal cracking on south end. Bent 4 cap has vertical cracking throughout top of face and over both columns, horizontal cracking above columns, and random cracking on west edge.</p> <p>12/10/2012: No change.</p> <p>12/9/2014: Bent 3: Minor map cracking on east face under G4. Bent 4: LT end has multiple horizontal cracks &amp; minor map cracking.</p> <p>12/20/2016: No change.</p>
<input type="checkbox"/> Strip Seal Exp Joint	MAIN	300	3	76	ft	56.00	20.00	0.00	0.00	<p>1-17-2007 Strip seals was new in 2000 and is still in new condition with no signs of failure. Glands still intact.</p> <p>12-29-2008 Glands appear to be intact.</p> <p>12/28/2010 Glands appear intact.</p> <p>12/10/2012: No change.</p> <p>12/9/2014: Strip seals filled with dirt. (Tops of abutment backwalls adjacent to the strip seals are delaminated or spalled for much of the length. RS)</p> <p>12/20/2016: Concrete adjacent to strip seals was replaced in 2015, securing strip seal extrusions &amp; is in good condition.</p>
<input type="checkbox"/> Debris Impaction	MAIN	2350	3	76	ft	56.00	20.00	0.00	0.00	<p>1-17-2007 Strip seals was new in 2000 and is still in new condition with no signs of failure. Glands still intact.</p> <p>12-29-2008 Glands appear to be intact.</p> <p>12/28/2010 Glands appear intact.</p> <p>12/10/2012: No change.</p> <p>12/9/2014: Strip seals filled with dirt. (Tops of abutment backwalls adjacent to the strip seals are delaminated or spalled for much of the length. RS)</p> <p>12/20/2016: No change.</p>
<input type="checkbox"/> Moveable Bearing	MAIN	311	2	16	each	0.00	16.00	0.00	0.00	<p>1-17-2007 All bearing devices good with light rust remaining on devices.</p> <p>12-29-2008 Generally good. No additional rust.</p> <p>12/28/2010 Abut 5 bearings have moderate rust, all other bearings have light rust. At Abut 5, G3 LT top of bolt is broke off and G4 RT bolt is broken off.</p> <p>12/10/2012: No change.</p> <p>12/9/2014: Bolts adjacent to Abut 5 appear as though they never were installed. Pins in bearings at bent 2 have peeling paint.</p> <p>12/20/2016: No change.</p>
<input type="checkbox"/> Lead Based Paint	MAIN	816	2	128	sq ft	92.00	0.00	0.00	36.00	<p>12/20/2016: Lead based paint throughout bearings.</p>
<input type="checkbox"/> Eff (Stl Protect Coat)	MAIN	3440	2	3	each	0.00	0.00	0.00	3.34	<p>12/20/2016: Paint has failed where corrosion is present.</p>
<input type="checkbox"/> Corrosion	MAIN	1000	2	16	each	0.00	16.00	0.00	0.00	<p>1-17-2007 All bearing devices good with light rust remaining on devices.</p> <p>12-29-2008 Generally good. No additional rust.</p> <p>12/28/2010 Abut 5 bearings have moderate rust, all other bearings have light rust. At Abut 5, G3 LT top of bolt is broke off and G4 RT bolt is broken off.</p> <p>12/10/2012: No change.</p> <p>12/9/2014: Pins in bearings at bent 2 have peeling paint.</p> <p>12/20/2016: No change.</p>

Fixed Bearing	MAIN	313	2	4	each	0.00	4.00	0.00	0.00	1-17-2007 Bearing devices have light rust with possible heavy rust in anchor bolts that cant be seen. Bolts all intact at this time. 12-29-2008 Generally good. No additional rust. 12/28/2010 Abut 1 bearings have moderate rust. 12/10/2012: No change. 12/9/2014: No change. 12/20/2016: No change.
Lead Based Paint	MAIN	816	2	22	sq ft	10.00	0.00	0.00	12.00	12/20/2016: Lead based paint throughout bearings.
Ef (Sl Protect Coat)	MAIN	3440	2	1	each	0.00	0.00	0.00	1.11	12/20/2016: Paint has failed where corrosion is present.
Corrosion	MAIN	1000	2	2	each	0.00	2.00	0.00	0.00	1-17-2007 Bearing devices have light rust with possible heavy rust in anchor bolts that cant be seen. Bolts all intact at this time. 12-29-2008 Generally good. No additional rust. 12/28/2010 Abut 1 bearings have moderate rust. 12/10/2012: No change. 12/9/2014: No change. 12/20/2016: No change.
Connection	MAIN	1020	2	2	each	0.00	2.00	0.00	0.00	1-17-2007 Bearing devices have light rust with possible heavy rust in anchor bolts that cant be seen. Bolts all intact at this time. 12-29-2008 Generally good. No additional rust. 12/28/2010 Abut 1 bearings have moderate rust. 12/10/2012: G2 at Abut 1 has beginning of pack rust between the bottom flange and sole plate. 12/9/2014: Girders have light pack rust between bottom flanges and sole plates at Abut 1 bearings. 12/20/2016: No change.
Re Conc Bridge Railing	MAIN	331	3	516	ft	311.00	205.00	0.00	0.00	1-17-2007 Rectangular block railing on both LT and RT sides of bridge have random HL to .016 ft. wide cracks with discoloration. Cracks predominantly vertical. End blocks were new in 2000 and are still in new condition. 12-29-2008 No additional cracks or discoloration. 12/28/2010 Numerous vertical cracks throughout, many with discoloration. 12/10/2012: No change. 12/9/2014: Abut 5 RT end block has map cracking at the bottom. HL vertical crcks in the LT & RT barrier are spaced at 2 ft +/-. Abut 5 RT back of barrier has superficial scrapes from vehicle impact. 12/20/2016: Contractor applied special surface finish to cover graffiti on back side of LT barrier in Span 2. The region bridge crew also painted over new graffiti in 2016 in the same area.
Epoxy Resteel	MAIN	820	3	2,322	sq ft	2,322.00	0.00	0.00	0.00	12/20/2016: Not visible.
Efflorescence/Rust Staining	MAIN	1120	3	74	ft	0.00	74.00	0.00	0.00	1-17-2007 Rectangular block railing on both LT and RT sides of bridge have random HL to .016 ft. wide cracks with discoloration. Cracks predominantly vertical. End blocks were new in 2000 and are still in new condition. 12-29-2008 No additional cracks or discoloration. 12/28/2010 Numerous vertical cracks throughout, many with discoloration. 12/10/2012: No change. 12/9/2014: Abut 5 RT end block has map cracking at the bottom. HL vertical crcks in the LT & RT barrier are spaced at 2 ft +/-. 12/20/2016: No change.

<input type="checkbox"/> Cracking (RC and Other)	MAIN	1130	3	129	ft	0.00	129.00	0.00	0.00	<p>1-17-2007 Rectangular block railing on both LT and RT sides of bridge have random HL to .016 ft. wide cracks with discoloration. Cracks predominantly vertical. End blocks were new in 2000 and are still in new condition.</p> <p>12-29-2008 No additional cracks or discoloration.</p> <p>12/28/2010 Numerous vertical cracks throughout, many with discoloration.</p> <p>12/10/2012: No change.</p> <p>12/9/2014: Abut 5 RT end block has map cracking at the bottom. HL vertical cracks in the LT &amp; RT barrier are spaced at 2 ft +/-.</p> <p>12/20/2016: No change.</p>
<input type="checkbox"/> Abrasion(PSC/RC)	MAIN	1190	3	2	ft	0.00	2.00	0.00	0.00	<p>12/9/2014: Abut 5 RT back of barrier has superficial scrapes from vehicle impact.</p> <p>12/20/2016: No change.</p>
<input type="checkbox"/> Damage	MAIN	7000	3	2	ft	0.00	2.00	0.00	0.00	<p>12/9/2014: Abut 5 RT back of barrier has superficial scrapes from vehicle impact.</p> <p>12/20/2016: No change.</p>
# Elements										

Action	Agency Status	Agency Priority	Assigned to a Project	Rec. Date	Str No	Assigned To	Notes	Target Year

GENERAL BRIDGE DATA :

(8) STR NO : 47-069-510  
 (7) FACILITY : TILFORD RD  
 (6) FEAT INTER : I090  
 (9) LOCATION : TILFORD INTERCHANGE  
 INTERCHANGE :   
 SECTION(S) : 18 19  
 TOWNSHIP(S) : 004N  
 RANGE(S) : 06E  
 (2) REGION : Rapid City  
 (3) COUNTY : 47 MEADE  
 (21) CUSTODIAN : 1 State Highway Agency  
 (22) OWNER :  
 MAINT PROJ : 090 451  
 (42A) SERV TYPE ON : 1 Highway  
 (42b) SERV TYPE UND : 1 Highway  
 (103) TEMP STRUCTURE : Unknown (NB)  
 (99) BORDER BRIDGE STR NO : -1  
 (98A) NEIGHBOR STATE : Unknown (P)  
 (98B) PERCENT SHARE : -2

HIGHWAY CARRIED (NBI S)

(5B) ROUTE PREFIX : 4 County Hwy  
 (5C) LEVEL OF SERVICE : 1 Mainline  
 (5D) ROUTE NUMBER : 00000  
 (5E) DIRECT SUFFIX : 0 N/A (NB)  
 MRM ENGLISH : 0.00  
 POSTED SPEED : 0 MPH  
 SCHOOL BUS RT :  MAIL RT :   
 (104) NHS SYSTEM : 0 Not on NHS  
 FA ROUTE : 0000  
 (26) FUNC CLASS : 09 Rural Local  
 (28A) LANES : 2  
 (102) DIRECTION TRAFFIC : 2 2-way traffic  
 (105) FED LANDS HWY : 0 N/A (NB)  
 (19) DETOUR : 0 mi  
 (29) ADT TOTAL : 392  
 (30) YEAR OF ADT : 2015  
 (109) % TRUCK : 2 %  
 (53) MIN V CLR RT : 328.1 ft  
 (53) MIN V CLR LT : 0.0 ft  
 (10) MAX V CLR RT : 328.1 ft  
 (10) MAX V CLR LT : 0.0 ft  
 (47) HORIZ V CLR RT : 30.0 ft  
 (47) HORIZ V CLR LT : 0.0 ft

GIS DATA

LATITUDE : 44.30011 LONGITUDE : -103.43337  
 DATE : 3/28/16  
 COMMENT : Calculated GIS INFO

HIGHWAY CARRIED (UNDER RECORD)

(5A) RECORD TYPE :  
 (5B) ROUTE PREFIX :  
 (5C) LEVEL OF SERVICE :  
 (5D) ROUTE NUMBER : 00090  
 (5E) DIRECT SUFFIX :  
 MRM (ENGLISH) : 40.20  
 ADM JUR : 01 State Highway Agency  
 (104) NHS SYSTEM :  
 FA ROUTE : 0090  
 (26) FUNC CLASS :  
 (28B) LANES : 4  
 (101) DIRECTION OF TRAFFIC :  
 (19) DETOUR LENGTH : 0 mi  
 (29) ADT : 18,420 (30) ADT Year : 2016

GENERAL BRIDGE DATA

(27) YEAR BUILT : 1964 (106) RECONSTR : -1  
 (49) STR LENGTH : 227.0 ft  
 NBIS BRIDGE LENGTH : 218.0 ft  
 (48) MAX SPAN LENGTH : 62.5 ft  
 Main (43A) MATERIAL : 4 Steel Continuous  
 Span (43B) DESIGN : 02 Stringer/Girder  
 SD STR TYPE : X271  
 (107) DECK STR TYPE : 1 Concrete-Cast-in-Place  
 (52) DECK WIDTH : 32.4 ft  
 (51) BRIDGE RDWY WIDTH : 30.0 ft  
 (32) APPR RDWY WIDTH : 30.0 ft  
 (50A) LT SIDEWALK WIDTH : 0.0 ft  
 (50B) RT SIDEWALK WIDTH : 0.0 ft  
 (34) SKEW : 0° SKEW DIR :  
 (45) NO MAIN SPANS : 4  
 (46) NO APPR SPANS : 0  
 (31) DESIGN LOAD : 5 MS 18 (HS 20)  
 (33) BRIDGE MEDIAN : 0 No median  
 (35) STR FLARED : 0 No flare

BOX CULVERT DATA :

BOX CULVERT SIZE : 0 X 0 X 0  
 FILL HT OVER BOX : 0.0 ft  
 LENGTH OF LONGEST CELL : 0.0 ft

RAIL DATA :

(36) SAFETY FEAT : 1111  
 BRIDGE RAIL 1 : 13  
 RAIL TRANS 1 : 51  
 APPR RAIL 1 : 20  
 APPR RAIL TERM 1 : 90

NBI PROP WORK

(75A) WORK TYPE : Unknown (P)  
 (75B) WORK BY : Not Applicable (P)  
 (76) IMPROV LENGTH : 0.0 ft  
 (94) BRIDGE IMPROV COST : \$(1)  
 (95) RDWAY IMPROV COST : \$(1)  
 (96) TOTAL PROJECT COST : \$(1)  
 (97) YEAR OF IMPROV COST : -1.00  
 (114) ADT FUTURE : 392  
 (115) YEAR OF ADT FUTURE : 2035

STEEL PAINT

UNDERCOAT : LEAD-BASED PAINT  
 TOPCOAT : LEAD-BASED PAINT  
 YEAR : 1985 COLOR : GREEN

STATUS

SUFF RATE : 86.0  
 FED SUFF RATE : 86.0  
 FED SR DATE : Mar 2017  
 DEFICIENCY :  
 CANDIDATE :

DECK DATA

(108A) WEARING SURFACE : 5 Epoxy Overlay  
 DECK PROTECTION : None  
 OVERLAY THICKNESS : 0.20 in  
 DECK DELAM AREA : 0.0 sq ft  
 DECK DELAM DATE : 09/2012  
 DECK SURVEY : 05/1984  
 CHLORIDE :   
 RESTEEL DEPTH :   
 ELECTRO POTENT :

LOAD RATING DATA :

(41) OPER STATUS : A Open, no restriction  
 (66) INV HS20 : 39.0 tons HS 21.7  
 (65) METHOD : 1 LF Load Factor (tons)  
 (64) OP HS20 : 66.0 tons HS 36.7  
 (63) METHOD : 1 LF Load Factor (Tons)  
 TRUCK TYPE 3 : 55.9 tons  
 TRUCK TYPE 3S2 : 87.0 tons  
 TRUCK TYPE 3-2 : 96.4 tons  
 BARS NO : 090280

HYDRAULICS :

DRAINAGE AREA : 0.00 sq mi  
 OBSERV HW ELEV : 0.0 ft  
 YEAR :  
 DESIGN FREQ : 0  
 DESIGN FLOW : 0.0 cfs  
 DESIGN VELOCITY : 0.00 fps  
 DESIGN AREA : 0.0 sq ft  
 DESIGN YEAR :  
 DESIGN HW ELEV : ft  
 100 YEAR FLOW : 0.0 cfs  
 100 YR HW ELEV : ft  
 V MAX : fps  
 SCOUR SCREENING : N SCOUR RATING : N  
 TOPEKA SHINER :

RAIL PAINT :

UNDERCOAT :  
 TOP COAT :  
 YEAR : COLOR :

PROJECT NUMBER : PCN : DATE DONE :

(5A) RECORD TYPE :	(54) MIN V CLR RT : 17.500 ft	090 W-468		01/01/2009
(5B) ROUTE PREFIX :	(54) MIN V CLR LT : 17.000 ft	IR-090-1(84)30	1195	01/01/1988
(5C) LEVEL OF SERVICE :	(10) MAX V CLR RT : 17.920 ft	IM 90-1(00)37	4253	01/01/2000
(5D) ROUTE NUMBER : 00090	(10) MAX V CLR LT : 17.170 ft	0905-559	none	01/01/1979
(5E) DIRECT SUFFIX :	(47) HORIZ CLR RT : 38.200 ft	I-090-1(09)38	none	01/01/1964
MRM (ENGLISH) : 40.20	(47) HORIZ CLR LT : 38.100 ft	IR-090-1(74)0	0497	01/01/1985
ADM JUR : 01 State Highway Agency	(55) OUT UNDCLR RT : 18.600 ft			
(104) NHS SYSTEM :	(55) OUT UNDCLR LT : 10.700 ft			
FA ROUTE : 0090	(56) MED UNDCLR RT : 27.400 ft			
(26) FUNC CLASS :	(56) MED UNDCLR LT : 20.500 ft			
(28B) LANES : 4				
(101) DIRECTION OF TRAFFIC :				
(19) DETOUR LENGTH : 0 mi				
(29) ADT : 18,420 (30) ADT Year : 2016				

GENERAL COMMENT: PLATE GIRDER 223' PARABOLIC  
 REGION COMMENT: JT MOD & DECK OVLY 2000-PCEMS 4253  
 FREE COMMENT: 2000-EPOXY SEAL COAT, 07/84-RACS, 2015/2016 two coat epoxy chip seal

INSPECTION TYPE	LAST INSPECTION DATE	INSPECTION REQUIRED	INSPECTION FREQUENCY	NEXT INSP DATE	INSPKEY :	MGHQ
NBI	12/20/2016		24 months	12/20/2018	APPRAIS BY :	SS
FRACTURE CRITICAL	NA	N	NA	NA	APPRAIS DATE :	07/24/2017
UNDERWATER	NA	N	NA	NA	QA INSPECTOR :	
SPECIAL	NA	N	NA	NA	QA INSP DATE :	
ELEMENT INSPECTION	12/18/2014		24 months	12/20/2018	LAST INSPECTION BY :	Kamarainen, Steve
					CONSULTANT CODE :	STATE HWY FORCES

CONDITION RATINGS:

(58) DECK : 5                    (59) SUPER : 5                    (60) SUB : 5                    (62) CULVERT : N  
(61) CHANNEL : N  
APPROACH : 8

APPRAISAL RATINGS

(67) STR APPR : 5    Light gir rust  
(68) DECK GEOM : 6    Substd width  
(69) UNDERCLR : 4    Vert good, Substd Horiz CL.  
(71) WATERWAY :    N  
(72) APPR ALIN : 6    Top of vert curve  
(70) BR POST : 5    LFA

Elements	Unit	ID	Env	Tot. Qty (English)	Units	Q 1	Q 2	Q 3	Q 4	Notes
Re Concrete Deck	MAIN	12	3	7,339	sq.ft	3,669.00	3,670.00	0.00	0.00	<p>Deck Cracking Smart Flag # 358 12/28/2010 Numerous transverse cracks throughout, including over Bent 4 (spanning both lanes). Longitudinal cracks in EBL on Abut 1 end where joint has been replaced. 12/10/2012: No change. 12/18/2014: Cracking near Abut 1 includes 1.5' longitudinal crack in eastbound RT wheel path &amp; a 2' diagonal crack in eastbound LT wheel path. Transverse cracking appears worst in the EBL. Delams associated with a number of transverse cracks.</p> <p>Soffit Smart Flag # 359 12-05-2006 Random HL cracks in all spans. Light eff over bents and in spans 3 &amp; 4. 12-29-2008 Random HL cracks in all spans, a few with light eff. 12/28/2010 Transverse HL cracks, some with efflorescence, throughout deck and cantilevers. 12/10/2012: No change. 12/18/2014: HL transverse cracks throughout at 2' spacing or less. Span 1, Bay 3, near girder splice has a 2' long transverse crack with moisture present. Span 2, Bay 3, 10' from Bent 2 has a 4' transverse crack with moisture present.</p> <p>12/28/2010 Numerous transverse cracks throughout, including over Bent 4 (spanning both lanes). Longitudinal cracks in EBL on Abut 1 end where joint has been replaced. Deck delam check Aug 2009 = 26 sf, 0.4%. 12/10/2012: June 2011 delam check: 99 sf (1.5%) Sept 2012 delam check: 162 sf (2.4%) ECS is wearing thin in many spots. Curbs are snow covered. 12/18/2014: No new delam check. Cracking near Abut 1 includes 1.5 ft. longitudinal crack in eastbound RT wheel path &amp; a 2 ft. diagonal crack in eastbound LT wheel path. Transverse cracking appears worst in the EBL. Delams associated with a number of transverse cracks.</p> <p>12/20/2016: New Epoxy Chip Seal in 2015 by contract PCN 04VW. Approx. 2' of deck was replaced w/ joint replacement at both abutments in 2015.</p>
Epoxy/Polymer Chip Seal	MAIN	812	3	6,810	sq ft	6,810.00	0.00	0.00	0.00	<p>12/20/2016: New Epoxy Chip Seal in 2015 by contract PCN 04VW. 1/4" thick. Good condition.</p>
Efflorescence/Rust Staining	MAIN	1120	3	184	sq.ft	0.00	184.00	0.00	0.00	<p>Soffit Smart Flag # 359 12-05-2006 Random HL cracks in all spans. Light eff over bents and in spans 3 &amp; 4. 12-29-2008 Random HL cracks in all spans, a few with light eff. 12/28/2010 Transverse HL cracks, some with efflorescence, throughout deck and cantilevers. 12/10/2012: No change. 12/18/2014: HL transverse cracks throughout at 2' spacing or less. Span 1, Bay 3, near girder splice has a 2' long transverse crack with moisture present. Span 2, Bay 3, 10' from Bent 2 has a 4' transverse crack with moisture present.</p> <p>12/20/2016: No change.</p>

Cracking (RC and Other)	MAIN	1130	3	3,486	sq.ft	0.00	3,486.00	0.00	0.00	<p>Deck Cracking Smart Flag # 358 12/28/2010 Numerous transverse cracks throughout, including over Bent 4 (spanning both lanes). Longitudinal cracks in EBL on Abut 1 end where joint has been replaced. 12/10/2012: No change. 12/18/2014: Cracking near Abut 1 includes 1.5' longitudinal crack in eastbound RT wheel path &amp; a 2' diagonal crack in eastbound LT wheel path. Transverse cracking appears worst in the EBL. Delams associated with a number of transverse cracks.</p> <p>Soffit Smart Flag # 359 12-05-2006 Random HL cracks in all spans. Light eff over bents and in spans 3 &amp; 4. 12-29-2008 Random HL cracks in all spans, a few with light eff. 12/28/2010 Transverse HL cracks, some with efflorescence, throughout deck and cantilevers. 12/10/2012: No change. 12/18/2014: HL transverse cracks throughout at 2' spacing or less. Span 1, Bay 3, near girder splice has a 2' long transverse crack with moisture present. Span 2, Bay 3, 10' from Bent 2 has a 4' transverse crack with moisture present.</p> <p>12/28/2010 Numerous transverse cracks throughout, including over Bent 4 (spanning both lanes). Longitudinal cracks in EBL on Abut 1 end where joint has been replaced. 12/10/2012: No comment. 12/18/2014: Cracking near Abut 1 includes 1.5 ft. longitudinal crack in eastbound RT wheel path &amp; a 2 ft. diagonal crack in eastbound LT wheel path. Transverse cracking appears worst in the EBL. 12/20/2016: No change.</p>
Steel Opn Girder/Beam	MAIN	107	2	896	ft	324.00	557.00	15.00	0.00	<p>Steel Fatigue Smart Flag # 356 12-28-10 Crack in tack weld of interior web splice (east side of plate) on G1 splice on Span 3 side of Bent 3. Possible crack in web: G4, exterior side, approx 4 ft. west of bottom flange splice on Span 3 side of Bent 4. 12/10/2012: No change. 12/18/2014: No change.</p> <p>Previous comments &gt; GIRDER REPAIRED Numerous areas of peeling paint. Some of it is down to aluminum coating and some to bare steel. Areas of previous leakage such as Abut 1 have moderate rust areas. 12-29-2008 Peeling paint continues throughout with a minimal amount of additional. No distortion in girders. 1-21-2009 Cherry picker inspection. No additional information. Note: Girders have had collision damage numerous times in the past. Girders have been repaired several times in the past with heat straightening. Girder G4 in span 3 over the WBL had collision damage repaired by replacing portions of the bottom flange and web. The bottom flange bolted field splice was offset from the original bolted field splice location and a second bottom flange bolted field splice was added between the original bolted splice location and bent 4. The diaphragm stiffeners were welded to the girder flanges in 1985. 12/28/2010 Approx 7 ft. west of G1 splice on Span 2 side of Bent 3, bottom flange is deflected upward approx 5/16 in. over 3 ft. of girder. Approx 9 ft. west of mid-point stiffener between diaphragms over EB passing lane, exterior side of bottom flange is gouged approx 1 1/4 in. x 1/2 in., flange is distorted upward approx 1/8 in. over 2 ft. of girder. Peeling paint and freckle rust continues throughout. 12/10/2012: No change. 12/18/2014: Paint peeling but primer intact on webs at numerous diaphragm locations where stiffeners were welded to girder top flanges. 12/20/2016: No change.</p>
Lead Based Paint	MAIN	816	2	9,444	sq ft	8,689.00	94.00	0.00	661.00	<p>12/20/2016: Lead based paint throughout girders.</p>

<input type="checkbox"/>	Peel/Bub/Crack(SII Protect Coat)	MAIN	3420	2	230	ft	0.00	28.65	0.00	201.47	Numerous areas of peeling paint. Some of it is down to aluminum coating and some to bare steel. Areas of previous leakage such as Abut 1 have moderate rust areas. 12-29-2008 Peeling paint continues throughout with a minimal amount of additional. No distortion in girders. 1-21-2009 The diaphragm stiffeners were welded to the girder flanges in 1985. 12/28/2010 Peeling paint and freckle rust continues throughout. 12/10/2012: No change. 12/18/2014: Paint peeling but primer intact on webs at numerous diaphragm locations where stiffeners were welded to girder top flanges. 12/20/2016: No change.
<input type="checkbox"/>	Corrosion	MAIN	1000	2	548	ft	0.00	538.00	10.00	0.00	Previous comments > GIRDER REPAIRED Numerous areas of peeling paint. Some of it is down to aluminum coating and some to bare steel. Areas of previous leakage such as Abut 1 have moderate rust areas. 12-29-2008 Peeling paint continues throughout with a minimal amount of additional. No distortion in girders. 1-21-2009 Cherry picker inspection. No additional information. 12/28/2010 Peeling paint and freckle rust continues throughout. 12/10/2012: No change. 12/18/2014: Paint peeling but primer intact on webs at numerous diaphragm locations where stiffeners were welded to girder top flanges. 12/20/2016: No change.
<input type="checkbox"/>	Cracking	MAIN	1010	2	1	ft	0.00	1.00	0.00	0.00	1-21-2009 Cherry picker inspection. No additional information. Note: Girders have had collision damage numerous times in the past. Girder G4 in span 3 over the WBL had collision damage repaired by replacing portions of the bottom flange and web. The bottom flange bolted field splice was offset from the original bolted field splice location and a second bottom flange bolted field splice was added between the original bolted splice location and bent 4. 12/28/2010 No comment. 12/10/2012: No change. 12/18/2014: No change. 12/20/2016: No change.
<input type="checkbox"/>	Connection	MAIN	1020	2	2	ft	0.00	2.00	0.00	0.00	12/20/2016: Minor pack rust is developing at splice locations including G4, Span 3 & Span 2.
<input type="checkbox"/>	Distortion	MAIN	1900	2	21	ft	0.00	16.00	5.00	0.00	Previous comments > GIRDER REPAIRED 1-21-2009 Cherry picker inspection. No additional information. Note: Girders have had collision damage numerous times in the past. Girders have been repaired several times in the past with heat straightening. Girder G4 in span 3 over the WBL had collision damage repaired by replacing portions of the bottom flange and web. The bottom flange bolted field splice was offset from the original bolted field splice location and a second bottom flange bolted field splice was added between the original bolted splice location and bent 4. The diaphragm stiffeners were welded to the girder flanges in 1985. 12/28/2010 Approx 7 ft. west of G1 splice on Span 2 side of Bent 3, bottom flange is deflected upward approx 5/16 in. over 3 ft. of girder. Approx 9 ft. west of mid-point stiffener between diaphragms over EB passing lane, exterior side of bottom flange is gouged approx 1 1/4 in. x 1/2 in., flange is distorted upward approx 1/8 in. over 2 ft. of girder. Peeling paint and freckle rust continues throughout. 12/10/2012: No change. 12/18/2014: No change. 12/20/2016: No change.

<input type="checkbox"/> Damage	MAIN	7000	2	21	ft	0.00	16.00	5.00	0.00	<p>Note: Girders have had collision damage numerous times in the past. Girders have been repaired several times in the past with heat straightening. Girder G4 in span 3 over the WBL had collision damage repaired by replacing portions of the bottom flange and web. The bottom flange bolted field splice was offset from the original bolted field splice location and a second bottom flange bolted field splice was added between the original bolted splice location and bent 4.</p> <p>12/28/2010 current: Approx 7 ft. west of G1 splice on Span 2 side of Bent 3, bottom flange is deflected upward approx 5/16 in. over 3 ft. of girder. Approx 9 ft. west of mid-point stiffener between diaphragms over EB passing lane, exterior side of bottom flange is gouged approx 1 1/4 in. x 1/2 in., flange is distorted upward approx 1/8 in. over 2 ft. of girder.</p> <p>12/10/2012: No change. 12/18/2014: No change. 12/20/2016: No change.</p>
Re Conc Column	MAIN	205	2	6	each	3.00	3.00	0.00	0.00	<p>12-05-2006 No defects found.</p> <p>12-29-2008 Bent 2 Lt. has a vertical crack that starts just above the ground and extends up approx. 4 ft.. See photos.</p> <p>12/28/2010 The Bent 2 Column 1 noted above was repaired with column fiber wrap in 2009.</p> <p>12/10/2012: No change. 12/18/2014: No change. 12/20/2016: No change.</p>
<input type="checkbox"/> Cracking (RC and Other)	MAIN	1130	2	2	each	0.00	2.00	0.00	0.00	<p>12-05-2006 No defects found.</p> <p>12-29-2008 Bent 2 Lt. has a vertical crack that starts just above the ground and extends up approx. 4 ft.. See photos.</p> <p>12/28/2010 The Bent 2 Column 1 noted above was repaired with column fiber wrap in 2009.</p> <p>12/10/2012: No change. 12/18/2014: No change. 12/20/2016: C2 at Bent 2 has 2 HL cracks near its base.</p>
<input type="checkbox"/> Abrasion(PSC/RC)	MAIN	1190	2	1	each	0.00	1.00	0.00	0.00	<p>12/20/2016: C1 at Bent 4 has a scrape near the bottom on the south face.</p>
Re Conc Abutment	MAIN	215	2	94	ft	73.00	18.00	3.00	0.00	<p>12-05-2006 There is a spall approx. 32 in. x 12 in. near the top of the backwall on Abut 1 Bay 2. There are 2 pieces of rebar showing. Spall is 1 in. deep at the deepest point. Photo on U drive.</p> <p>12-29-2008 No additional spalling. A few random HL cracks on both backwalls.</p> <p>12/28/2010 Spalls on wingwalls previously repaired. Abut 1: minor map cracking on wingwall; back of backwall is spalling; RT backwall has vertical cracking with discoloration and efflorescence; large spall at top of backwall in Bay 2 with exposed rebar, located at centerline and approx 4 ft. wide; minor cracking of LT backwall. Abut 5 LT: diagonal cracking near top of wingwall.</p> <p>12/10/2012: Abut 1 LT WW has map cracking and discoloration at strip seal attachment at deck edge. Abut 5 BW has vertical and diagonal cracking under RT deck cantilever. Abut 1 sill top is cracked in Bay 1. Abut 5 sill: -Larger than HL horizontal crack on face of sill under G3. -Bottom of sill exposed in Bay 3. -RT edge of sill has a crack that extends down the face of the RT end of the sill.</p> <p>12/18/2014: Abut 1 RT WW has HL cracks perpendicular to the top, 12 in. -14 in. spacing, full width. Also has map cracking &amp; discoloration at strip seal attachment. Abut 1 BW: Large spall in top of BW in Bay 2 now has 3 rebar exposed. Abut 5 BW: Scaling &amp; eff at top of BW at G1 w/ rust staining from above. RT deck cantilever has noticeable moisture on BW.</p> <p>12/20/2016: Spall w/ exposed rebar in Bay 2 was repaired during joint replacement in 2015.</p>

Delamination/Spall/Patched Area	MAIN	1080	2	11	ft	0.00	11.00	0.00	0.00	<p>12-05-2006 There is a spall approx. 32 in. x 12 in. near the top of the backwall on Abut 1 Bay 2. There are 2 pieces of rebar showing. Spall is 1 in. deep at the deepest point. Photo on U drive.</p> <p>12-29-2008 No additional spalling.</p> <p>12/28/2010 Spalls on wingwalls previously repaired. Abut 1: back of backwall is spalling: large spall at top of backwall in Bay 2 with exposed rebar, located at centerline and approx 4 ft. wide.</p> <p>12/10/2012: No comment.</p> <p>12/18/2014: Abut 1 BW: Large spall in top of BW in Bay 2 now has 3 rebar exposed.</p> <p>12/20/2016: Spall w/ exposed rebar in Bay 2 was repaired during joint replacement in 2015.</p>
Efflorescence/Rust Staining	MAIN	1120	2	9	ft	0.00	7.00	2.00	0.00	<p>12/28/2010 Abut 1: RT backwall has vertical cracking with discoloration and efflorescence;</p> <p>12/10/2012: Abut 1 LT WW has map cracking and discoloration at strip seal attachment at deck edge.</p> <p>Abut 5 sill: 12/18/2014: Abut 1 RT WW has map cracking &amp; discoloration at strip seal attachment.</p> <p>Abut 5 BW: Scaling &amp; eff at top of BW at G1 w/ rust staining from above. RT deck cantilever has noticeable moisture on BW.</p> <p>12/20/2016: No change.</p>
Cracking (RC and Other)	MAIN	1130	2	18	ft	18.00	0.00	0.00	0.00	<p>12-29-2008 A few random HL cracks on both backwalls.</p> <p>12/28/2010 Abut 1: minor map cracking on wingwall; RT backwall has vertical cracking with discoloration and efflorescence; minor cracking of LT backwall. Abut 5 LT: diagonal cracking near top of wingwall.</p> <p>12/10/2012: Abut 1 LT WW has map cracking and discoloration at strip seal attachment at deck edge.</p> <p>Abut 5 BW has vertical and diagonal cracking under RT deck cantilever.</p> <p>Abut 1 sill top is cracked in Bay 1.</p> <p>Abut 5 sill: -Larger than HL horizontal crack on face of sill under G3. -RT edge of sill has a crack that extends down the face of the RT end of the sill.</p> <p>12/18/2014: Abut 1 RT WW has HL cracks perpendicular to the top, 12 in.- 14 in. spacing, full width. Also has map cracking &amp; discoloration at strip seal attachment.</p> <p>12/20/2016: No change.</p>
Abrasion(PSC/RC)	MAIN	1190	2	1	ft	0.00	0.00	1.00	0.00	<p>12/18/2014: Abut 5 BW: Scaling &amp; eff at top of BW at G1 w/ rust staining from above. RT deck cantilever has noticeable moisture on BW.</p> <p>12/20/2016: No change.</p>
Re Conc Pier Cap	MAIN	234	2	93	ft	73.00	18.00	2.00	0.00	<p>12-05-2006 HL random cracking on the ends of all caps.</p> <p>12-29-2008 No additional cracking.</p> <p>12/28/2010 Bent 2 has cracking on north and south ends of cap and vertical cracking of top and bottom of face (both sides of cap). Bent 3: vertical cracks at top of face; map cracking on north and south ends (worse on north); vertical/diagonal crack on top and bottom of face under G1, both sides of cap; vertical cracks with discoloration on bottom of cap face; vertical cracks on bottom of face at mid-span. Bent 4: vertical cracks at top of face; horizontal cracking on south end; map cracking on north and south ends.</p> <p>12/10/2012: No change.</p> <p>12/18/2014: Bent 3: Map cracking under G1, both sides. Bent 4: Vertical cracks on south end. Span 4 side on north end has vertical crack at location of curvature.</p> <p>12/20/2016: - HL vertical cracks in Bent 2 cap are 3 each over each column. - Bent 2 end of cap cracking LT &amp; RT is condition CS3.</p>
Efflorescence/Rust Staining	MAIN	1120	2	2	ft	0.00	2.00	0.00	0.00	<p>12/28/2010 Bent 3: vertical cracks with discoloration on bottom of cap face</p> <p>12/10/2012: No change.</p> <p>12/18/2014: No change.</p> <p>12/20/2016: No change.</p>

<input type="checkbox"/> Cracking (RC and Other)	MAIN	1130	2	21	ft	3.00	16.00	2.00	0.00	12-05-2006 HL random cracking on the ends of all caps. 12-29-2008 No additional cracking. 12/28/2010 Bent 2 has cracking on north and south ends of cap and vertical cracking of top and bottom of face (both sides of cap). Bent 3: vertical cracks at top of face; map cracking on north and south ends (worse on north); vertical/diagonal crack on top and bottom of face under G1, both sides of cap; vertical cracks with discoloration on bottom of cap face; vertical cracks on bottom of face at mid-span. Bent 4: vertical cracks at top of face; horizontal cracking on south end; map cracking on north and south ends. 12/10/2012: No change. 12/18/2014: Bent 3: Map cracking under G1, both sides. Bent 4: Vertical cracks on south end. Span 4 side on north end has vertical crack at location of curvature. 12/20/2016: - HL vertical cracks in Bent 2 cap are 3 each over each column. - Bent 2 end of cap cracking LT & RT is condition CS3.
Compressn Joint Seal	MAIN	302	2	64	ft	64.00	0.00	0.00	0.00	12/20/2016: Strip Seals were removed & replaced with new membrane sealant joint in 2015 by contract PCN 04VW. - Light dirt covering.
<input type="checkbox"/> Debris Impaction	MAIN	2350	2	64	ft	64.00	0.00	0.00	0.00	12/20/2016: Light dirt covering.
Moveable Bearing	MAIN	311	2	16	each	0.00	16.00	0.00	0.00	12-05-2006 Light rust on most devices. 12-29-2008 Generally good. No additional rust. 12/28/2010 No significant change. 12/10/2012: No change. 12/18/2014: Abut 1 bearings have minor pack rust between girder & sole plate. G3 at Bent 2 has daylight visible between bottom flange of girder and sole plate on the left half. 12/20/2016: No change.
<input type="checkbox"/> Lead Based Paint	MAIN	816	2	116	sq.ft	94.00	0.00	0.00	22.00	12/20/2016: Lead based paint throughout bearings.
<input type="checkbox"/> Peel/Bub/Crack(SII Protect Coat)	MAIN	3420	2	2	each	0.00	0.00	0.00	2.04	12/20/2016: Paint has failed where corrosion is present.
<input type="checkbox"/> Corrosion	MAIN	1000	2	12	each	0.00	12.00	0.00	0.00	12-05-2006 Light rust on most devices. 12-29-2008 Generally good. No additional rust. 12/28/2010 No significant change. 12/10/2012: No change. 12/18/2014: No change. 12/20/2016: No change.
<input type="checkbox"/> Connection	MAIN	1020	2	4	each	0.00	4.00	0.00	0.00	12/18/2014: Abut 1 bearings have minor pack rust between girder & sole plate. 12/20/2016: No change.
Fixed Bearing	MAIN	313	2	4	each	0.00	4.00	0.00	0.00	12-05-2006 Light rust on all devices. 12-29-2008 Generally good. No additional rust. 12/28/2010 No significant change. 12/10/2012: No change. 12/18/2014: Berings at Abut 5 have moderate rust. 12/20/2016: No change.
<input type="checkbox"/> Lead Based Paint	MAIN	816	2	22	sq.ft	14.00	0.00	0.00	8.00	12/20/2016: Lead based paint throughout bearings.
<input type="checkbox"/> Peel/Bub/Crack(SII Protect Coat)	MAIN	3420	2	1	each	0.00	0.00	0.00	0.74	12/20/2016: Paint has failed where corrosion is present.

<input type="checkbox"/> Corrosion	MAIN	1000	2	4	each	0.00	4.00	0.00	0.00	12-05-2006 Light rust on all devices. 12-29-2008 Generally good. No additional rust. 12/28/2010 No significant change. 12/10/2012: No change. 12/18/2014: Berings at Abut 5 have moderate rust. 12/20/2016: No change.
Re Conc Bridge Railing	MAIN	331	3	454	ft	191.00	263.00	0.00	0.00	12-05-2006 Rectangular block railing on top of curb with vertical HL cracks. 12-29-2008 No additional cracks. Some of the cracks have discoloration. 12/28/2010 Numerous vertical cracks of barrier, some with discoloration and efflorescence. The curbs which support the concrete rail have severe deterioration. The left curb has severe scaling and spalling throughout, with numerous exposed rebar, many of which have significant section loss. Right curb has minor HL cracks and minor scale. 12/10/2012: No change. 12/18/2014: Map cracking in locations throughout. 12/20/2016: Curb repair was performed on LT curb in spans 1 & 2 in 2015 contract. 1'6" of each end block was replaced during joint replacement in 2015.
<input type="checkbox"/> Epoxy Resteel	MAIN	820	3	2,043	sq.ft	2,043.00	0.00	0.00	0.00	12/20/2016: Not visible.
<input type="checkbox"/> Delamination/Spall/Patched Area	MAIN	1080	3	74	ft	0.00	74.00	0.00	0.00	12/28/2010 The curbs which support the concrete rail have severe deterioration. The left curb has severe scaling and spalling throughout, with numerous exposed rebar, many of which have significant section loss. 12/10/2012: No change. 12/18/2014: No change. 12/20/2016: Curb repair was performed on LT curb in spans 1 & 2 in 2015 contract. 1'6" of each end block was replaced during joint replacement in 2015.
<input type="checkbox"/> Efflorescence/Rust Staining	MAIN	1120	3	76	ft	0.00	76.00	0.00	0.00	12-29-2008 No additional cracks. Some of the cracks have discoloration. 12/28/2010 Numerous vertical cracks of barrier, some with discoloration and efflorescence. 12/10/2012: No change. 12/18/2014: No change. 12/20/2016: No change.
<input type="checkbox"/> Cracking (RC and Other)	MAIN	1130	3	113	ft	0.00	113.00	0.00	0.00	12-05-2006 Rectangular block railing on top of curb with vertical HL cracks. 12-29-2008 No additional cracks. Some of the cracks have discoloration. 12/28/2010 Numerous vertical cracks of barrier, some with discoloration and efflorescence. Right curb has minor HL cracks and minor scale. 12/10/2012: No change. 12/18/2014: Map cracking in locations throughout. 12/20/2016: No change.
# Elements										

Action	Agency Status	Agency Priority	Assigned to a Project	Rec. Date	Str No	Assigned To	Notes	Target Year

GENERAL BRIDGE DATA :

(8) STR NO : 47-045-458
(7) FACILITY : 090
(6) FEAT. NTER : ALKALIC K
(9) LOCATON : 0.5 N.W.B.H. NATL CEMETARY
INTERCHANGE :
SECTION(S) : 23
TOWNSHIP(S) : 005N
RANGE(S) : 05E
(2) REGION : Rapid City
(3) COUNTY : 47 MEADE
(2) CUSTODIAN : 1 State Highway Agency
(2) OWNER :
MAINT PROJ : 090 451
(42a) SERV TYPE ON : 1 Highway
(42b) SERV TYPE UND : 5 Waterway
(13) TEMP STRUCTURE : Unknown (NB)
(95) BORDER BRIDGE STR NO : -1
(94) NEIGHBOR STATE : Unknown (P)
(93) PERCENT SHARE : -2

HIGHWAY CARRIED (NBI 5)

(53) ROUTE PREFIX : 1 Interstate Hwy
(50) LEVEL OF SERVICE : 1 Mainline
(52) ROUTE NUMBER : 00090
(55) DIRECT SUFFIX : 0 N/A (NB)
MRV ENGLISH : 34.32
POSTED SPEED : 75 MPH
SCHOOL BUS RT : MAIL RT :
(14) NHS SYSTEM : 1 On the NHS
FA ROUTE : 0090
(26) FUNC CLASS : 01 Rural Interstate
(24) LANES : 4
(12) DIRECTION TRAFFIC : 2 2-way traffic
(10) FED LANDS HWY : 0 N/A (NBI)
(19) DETOUR : 1 mi
(25) ADT TOTAL : 18,840
(30) YEAR OF ADT : 2016
(10) % TRUCK : 9 %
(53) MIN V CLR RT : 328.1 ft
(53) MIN V CLR LT : 328.1 ft
(10) MAX V CLR RT : 328.1 ft
(10) MAX V CLR LT : 328.1 ft
(47) HORIZ V CLR RT : 38.0 ft
(47) HORIZ V CLR LT : 0.0 ft

GIS DATA

LATITUDE : 44.37638 LONGITUDE : -103.47940
DATE : 3/28/16
COMMENT : Calculated GIS INFO

HIGHWAY CARRIED (UNDER RECORD)

(5A) RECORD TYPE
(53) ROUTE PREFIX :
(50) LEVEL OF SERVICE :
(50) ROUTE NUMBER :
(55) DIRECT SUFFIX :
MRV (ENGLISH) :
ADM JUR :
(104) NHS SYSTEM :
FA ROUTE :
(26) FUNC CLASS :
(28) LANES :
(10) DIRECTION OF TRAFFIC :
(19) DETOUR LENGTH : mi
(29) ADT : (30) ADT Year :

GENERAL COMMENT: APRONS - INLET & OUTLET
REGION COMMENT: High tension cable guardrail on outside shoulder of east bound only.
FREE COMMENT:

Table with columns: INSPECTION TYPE, LAST INSPECTION DATE, REQUIRED, INSPECTION FREQUENCY, NEXT INSP DATE. Rows include NBI, FRACTURE CRITICAL, UNDERWATER, SPECIAL, ELEMENT INSPECTION.

GENERAL BRIDGE DATA

(27) YEAR BUILT : 1947 (106) RECONSTR : 1963
(49) STR LENGTH : 24.7 ft
NBS BRIDGE LENGTH : 24.7 ft
(48) MAX SPAN LENGTH : 12.0 ft
Main (43A) MATERIAL : 2 Concrete Continuous
Span (43B) DESIGN : 19 Culvert
SD STR TYPE : X028
(107) DECK STR TYPE : N N/A (NBI)
(52) DECK WIDTH : 0.0 ft
(51) BRIDGE RDWY WIDTH : 0.0 ft
(32) APPR RDWY WIDTH : 76.0 ft
(50A) LT SIDEWALK WIDTH : 0.0 ft
(50B) RT SIDEWALK WIDTH : 0.0 ft
(34) SKEW : 0 SKEW DIR :
(45) NO MAIN SPANS : 2
(46) NO APPR SPANS : 0
(31) DESIGN LOAD : 2 M 13.5 (H 15)
(33) BRIDGE MEDIAN : 2 Closed Med w/o Barrier
(35) STR FLARED : 0 No flare

BOX CULVERT DATA :

BOX CULVERT SIZE : 2 X 12 X 10
FILL HT OVER BOX : 7.5 ft
LENGTH OF LONGEST CELL : 180.2 ft

RAIL DATA :

(36) SAFETY FEAT : NN11
BRIDGE RAIL 1 : NN
RAIL TRANS 1 : NN
APPR RAIL 1 : 65
APPR RAIL TERV 1 : 60

NBI PROP WORK

(75A) WORK TYPE : Unknown (P)
(75B) WORK BY : Unknown (NB)
(76) IMPROV LENGTH : 0.0 ft
(94) BRIDGE IMPROV COST : \$(1)
(95) RDWY IMPROV COST : \$(1)
(96) TOTAL PROJECT COST : \$(1)
(97) YEAR OF IMPROV COST : -1.00
(114) ADT FUTURE : 26,508
(115) YEAR OF ADT FUTURE : 2036

STEEL PAINT

UNDERCOAT :
TOPCOAT :
YEAR : COLOR :

STATUS

SUFF RATE : 81.9
FED SUFF RATE : 81.9
FED SR DATE : Mar 2017
DEFICIENCY :
CANDIDATE :

DECK DATA

(108A) WEARING SURFACE : N N/A (no deck (NB))
DECK PROTECTION : N N/A (no deck (NB))
OVERLAY THICKNESS : 0.05 in
DECK DELAM AREA : 0.0 sq ft
DECK DELAM DATE :
DECK SURVEY :

CHLORIDE
RESTEEL DEPTH :
ELECTRO POTENT :

LOAD RATING DATA :

(41) OPER STATUS : A Open, no restriction
(66) INV HS20 : 110.1 tons HS 61.2
(65) METHOD : 1 LF Load Factor (tons)
(64) OP HS20 : 110.1 tons HS 61.2
(63) METHOD : 1 LF Load Factor (Tons)
TRUCK TYPE 3 : 207.4 tons
TRUCK TYPE 3S2 : 385.6 tons
TRUCK TYPE 3-2 : 492.2 tons
BARS NO :

HYDRAULICS :

DRAINAGE AREA : 0.00 sq mi
OBSERV HW ELEV : 0.0 ft
YEAR :
DESIGN FREQ : 0
DESIGN FLOW : 699.9 cfs
DESIGN VELOCITY : 4.99 fps
DESIGN AREA : 139.9 sq ft
DESIGN YEAR : 1/1/1961 12.00 CCAM
DESIGN HW ELEV : ft
100 YEAR FLOW : 0.0 cfs
100 YR HW ELEV : ft
V MAX : fps
SCOUR SCREENING : 9 SCOUR RATING : 8
TOPEKA SHINER :

RAIL PAINT :

UNDERCOAT :
TOP COAT :
YEAR : COLOR :

PROJECT NUMBER : PCN : DATE DONE :

Table with columns: PROJECT NUMBER, PCN, DATE DONE. Rows include M 0901(120)33, 090-1(08)28, SN-F-88(05).

**CONDITION RATINGS:**

(58) DECK : N (59) SUPER : N (60) SUB : N (62) CULVERT : 6  
(61) CHANNEL : 7  
APPROACH : 8 New concrete pavement E.B.L.

**APPRAISAL RATINGS**

(67) STR APPR : 6 Minor cracks, scaling & spalls  
(68) DECK GEOM : N  
(69) UNDERCLR : N  
(71) WATERWAY : 8  
(72) APPR ALIN : 8  
(70) BR POST : 5

Elements	Unit	ID	Env	Tot. Qty (English)	Units	Q 1	Q 2	Q 3	Q 4	Notes
Re Conc Culvert	MAIN	241	2	360	ft	224.00	136.00	0.00	0.00	Box culvert extended in 2008 - 5 ft of new barrel plus new wingwalls and aprons at each end in new condition. The older sections have minor spalls with slight leakage at the first two construction joints in from the outlet end. Large spall in middle wall at the inlet end was repaired by contractor. The floor in the old section of box at the inlet end has been overlaid with LMC. 12-5-2012 Both barrels have light to moderate eff in the roof at all joints and some minor spalling along joints. Parapets are both good. Floor is partially visible with no defects found. Outlet apron is clean and good. Inlet is partially visible with no defects noted. SW wingwall has 1 diagonal crack, balance are good. 12-15-16 Barrel #1 - 5 joints in the roof with light eff, 1 joint with edge spalling and exposed steel in the roof. Barrel #2 - 4 joints in the roof with light eff, 1 joint in the roof with moderate scaling along each side, 1 joint in the roof with spalling and exposed steel along the edge, 1 tranverse HL crack in the roof with light eff. Each parapet has 1 vertical crack with discoloration. The floor is 50% visible with no defects noted. Aprons are snow covered. Wingwalls: SW - 2 diagonal HL cracks, SE - 1 vertical HL crack, balance good.
Delamination/Spall/Patched Area	MAIN	1080	2	122	ft	0.00	122.00	0.00	0.00	Box culvert extended in 2008 - Large spall in middle wall at the inlet end was repaired by contractor. The floor in the old section of box at the inlet end has been overlaid with LMC.
Exposed Rebar	MAIN	1090	2	2	ft	0.00	2.00	0.00	0.00	12-15-16 Barrel #1 - 5 joints in the roof with light eff, 1 joint with edge spalling and exposed steel in the roof. Barrel #2 - 4 joints in the roof with light eff, 1 joint in the roof with moderate scaling along each side, 1 joint in the roof with spalling and exposed steel along the edge, 1 tranverse HL crack in the roof with light eff.
Efflorescence/Rust Staining	MAIN	1120	2	10	ft	0.00	10.00	0.00	0.00	12-15-16 Barrel #1 - 5 joints in the roof with light eff, 1 joint with edge spalling and exposed steel in the roof. Barrel #2 - 4 joints in the roof with light eff, 1 joint in the roof with moderate scaling along each side, 1 joint in the roof with spalling and exposed steel along the edge, 1 tranverse HL crack in the roof with light eff.
Abrasion(PSC/RC)	MAIN	1190	2	2	ft	0.00	2.00	0.00	0.00	12-15-16 Barrel #1 - 5 joints in the roof with light eff, 1 joint with edge spalling and exposed steel in the roof. Barrel #2 - 4 joints in the roof with light eff, 1 joint in the roof with moderate scaling along each side, 1 joint in the roof with spalling and exposed steel along the edge, 1 tranverse HL crack in the roof with light eff.
# Elements										
Action	Agency Status	Agency Priority	Assigned to a Project	Rec. Date	Str No	Assigned To	Notes			Target Year

GENERAL BRIDGE DATA :

(8) STR NO : 47-064-484  
 (7) FACILITY : 1090  
 (6) FEAT INTER : PLEASANT VALLEY CK  
 (9) LOCATION : 2.7 NW TILFORD INTERCH  
 INTERCHANGE :   
 SECTION(S) : 06  
 TOWNSHIP(S) : 004N  
 RANGE(S) : 06E  
 (2) REGION : Rapid City  
 (3) COUNTY : 47 MEADE  
 (21) CUSTODIAN : 1 State Highway Agency  
 (22) OWNER :  
 MAINT PROJ : 090 451  
 (42A) SERV TYPE ON : 1 Highway  
 (42b) SERV TYPE UND : 5 Waterway  
 (103) TEMP STRUCTURE : Unknown (NBI)  
 (99) BORDER BRIDGE STR NO : -1  
 (98A) NEIGHBOR STATE : Not Applicable (P)  
 (98B) PERCENT SHARE :

HIGHWAY CARRIED (NBI)

(5B) ROUTE PREFIX : 1 Interstate Hwy  
 (5C) LEVEL OF SERVICE : 1 Mainline  
 (5D) ROUTE NUMBER : 00090  
 (5E) DIRECT SUFFIX : 0 N/A (NBI)  
 MRM ENGLISH : 37.40  
 POSTED SPEED : 75 MPH  
 SCHOOL BUS RT :  MAIL RT :   
 (104) NHS SYSTEM : 1 On the NHS  
 FA ROUTE : 0090  
 (26) FUNC CLASS : 01 Rural Interstate  
 (28A) LANES : 4  
 (102) DIRECTION TRAFFIC : 2 2-way traffic  
 (105) FED LANDS HWY : 0 N/A (NBI)  
 (19) DETOUR : 1 mi  
 (29) ADT TOTAL : 18,420  
 (30) YEAR OF ADT : 2016  
 (109) % TRUCK : 12 %  
 (53) MIN V CLR RT : 328.1 ft  
 (53) MIN V CLR LT : 328.1 ft  
 (10) MAX V CLR RT : 328.1 ft  
 (10) MAX V CLR LT : 328.1 ft  
 (47) HORIZ V CLR RT : 38.0 ft  
 (47) HORIZ V CLR LT : 0.0 ft

GIS DATA

LATITUDE : 44.33927 LONGITUDE : -103.44380  
 DATE : 3/28/16  
 COMMENT : Calculated GIS INFO

HIGHWAY CARRIED (UNDER RECORD)

(5A) RECORD TYPE : (54) MIN V CLR RT : ft  
 (5B) ROUTE PREFIX : (54) MIN V CLR LT : ft  
 (5C) LEVEL OF SERVICE : (10) MAX V CLR RT : ft  
 (5D) ROUTE NUMBER : (10) MAX V CLR LT : ft  
 (5E) DIRECT SUFFIX : (47) HORIZ CLR RT : ft  
 MRM (ENGLISH) : (47) HORIZ CLR LT : ft  
 ADM JUR : (55) OUT UNDCLR RT : ft  
 (104) NHS SYSTEM : (55) OUT UNDCLR LT : ft  
 FA ROUTE : (56) MED UNDCLR RT : ft  
 (26) FUNC CLASS : (56) MED UNDCLR LT : ft  
 (28B) LANES :  
 (101) DIRECTION OF TRAFFIC :  
 (19) DETOUR LENGTH : mi  
 (29) ADT : (30) ADT Year :

GENERAL COMMENT : APRONS - INLET & OUTLET  
 REGION COMMENT : NONE  
 FREE COMMENT :

GENERAL BRIDGE DATA

(27) YEAR BUILT : 1956 (106) RECONSTR : 1981  
 (49) STR LENGTH : 31.3 ft  
 NBIS BRIDGE LENGTH : 31.3 ft  
 (48) MAX SPAN LENGTH : 10.0 ft  
 Main (43A) MATERIAL : 2 Concrete Continuous  
 Span (43B) DESIGN : 19 Culvert  
 SD STR TYPE : X028  
 (107) DECK STR TYPE : N N/A (NBI)  
 (52) DECK WIDTH : 0.0 ft  
 (51) BRIDGE RDWY WIDTH : 0.0 ft  
 (32) APPR RDWY WIDTH : 76.0 ft  
 (50A) LT SIDEWALK WIDTH : 0.0 ft  
 (50B) RT SIDEWALK WIDTH : 0.0 ft  
 (34) SKEW : 0° SKEW DIR :  
 (45) NO MAIN SPANS : 3  
 (46) NO APPR SPANS : 0  
 (31) DESIGN LOAD : 5 MS 18 (HS 20)  
 (33) BRIDGE MEDIAN : 2 Closed Med w/o Barrier  
 (35) STR FLARED : 0 No flare

BOX CULVERT DATA :

BOX CULVERT SIZE : 3 X 10 X 10  
 FILL HT OVER BOX : 3.0 ft  
 LENGTH OF LONGEST CELL : 194.0 ft  
RAIL DATA :  
 (36) SAFETY FEAT : NNNN  
 BRIDGE RAIL 1 : NN  
 RAIL TRANS 1 : NN  
 APPR RAIL 1 : NN  
 APPR RAIL TERM 1 : NN

NBI PROP WORK

(75A) WORK TYPE : Unknown (P)  
 (75B) WORK BY : Unknown (NBI)  
 (76) IMPROV LENGTH : 0.0 ft  
 (94) BRIDGE IMPROV COST : \$(1)  
 (95) RDWY IMPROV COST : \$(1)  
 (96) TOTAL PROJECT COST : \$(1)  
 (97) YEAR OF IMPROV COST : -1.00  
 (114) ADT FUTURE : 23,338  
 (115) YEAR OF ADT FUTURE : 2036

STEEL PAINT

UNDERCOAT :  
 TOPCOAT :  
 YEAR : COLOR :

STATUS

SUFF RATE : 82.0  
 FED SUFF RATE : 82.0  
 FED SR DATE : Mar 2017  
 DEFICIENCY :  
 CANDIDATE :

DECK DATA

(108A) WEARING SURFACE : N N/A (no deck (NBI))  
 DECK PROTECTION : N N/A (no deck (NBI))  
 OVERLAY THICKNESS : 0.00 in  
 DECK DELAM AREA : 0.0 sq ft  
 DECK DELAM DATE :  
 DECK SURVEY :

CHLORIDE :   
 RESTEEL DEPTH :   
 ELECTRO POTENT :

LOAD RATING DATA :

(41) OPER STATUS : A Open, no restriction  
 (66) INV HS20 : 41.8 tons HS 23.2  
 (65) METHOD : 1 LF Load Factor (tons)  
 (64) OP HS20 : 69.8 tons HS 38.8  
 (63) METHOD : 1 LF Load Factor (Tons)  
 TRUCK TYPE 3 : 85.2 tons  
 TRUCK TYPE 3S2 : 185.6 tons  
 TRUCK TYPE 3-2 : 246.1 tons  
 BARS NO :

HYDRAULICS :

DRAINAGE AREA : 0.00 sq mi  
 OBSERV HW ELEV : 0.0 ft  
 YEAR :  
 DESIGN FREQ : 50  
 DESIGN FLOW : 1099.7 cfs  
 DESIGN VELOCITY : 10.17 fps  
 DESIGN AREA : 108.0 sq ft  
 DESIGN YEAR : 1/1/1980 12:00:00AM  
 DESIGN HW ELEV : 3633.5 ft  
 100 YEAR FLOW : 1599.8 cfs  
 100 YR HW ELEV : ft  
 V MAX : fps  
 SCOUR SCREENING : 9 SCOUR RATING : 8  
 TOPEKA SHINER :   
RAIL PAINT :  
 UNDERCOAT :  
 TOP COAT :  
 YEAR : COLOR :

PROJECT NUMBER : PCN : DATE DONE :

PROJECT NUMBER	PCN	DATE DONE
IM 0901(120)33	6180	01/01/2008
I-090-1(49)37	4703	01/01/1981
IN-88(07)	none	01/01/1956
IM-090-1(114)0	3937	01/01/1994

INSPECTION TYPE	LAST INSPECTION DATE	REQUIRED	INSPECTION FREQUENCY	NEXT INSP DATE	INSPKY :	TGND
NBI	08/02/2016		48 months	8/2/2020 12	APPRAIS BY :	SS
FRACTURE CRITICAL	NA	N	NA	NA	APPRAIS DATE :	06/14/2017
UNDERWATER	NA	N	NA	NA	QA INSPECTOR :	
SPECIAL	NA	N	NA	NA	QA INSP DATE :	
ELEMENT INSPECTION	08/22/2012		48 months	8/2/2020 12	LAST INSPECTION BY :	Heinrich, Lyte
					CONSULTANT CODE	STATE HWY FORCES

CONDITION RATINGS:

(58) DECK : N      (59) SUPER : N      (60) SUB : N      (62) CULVERT : 6  
(61) CHANNEL : 7

APPROACH : 8      New PCC

APPRAISAL RATINGS

(67) STR APPR : 6      Parapet spalling, Jt leakage  
(68) DECK GEOM : N  
(69) UNDERCLR : N  
(71) WATERWAY : 8  
(72) APPR ALIN : 8  
(70) BR POST : 5

Elements	Unit	ID	Env	Tot. Qty (English)	Units	Q 1	Q 2	Q 3	Q 4	Notes
Re Conc Culvert	MAIN	241	2	582	ft	565.00	11.00	6.00	0.00	2008 - 10 ft. extension added at outlet end with new ww ft.s and apron. Spall in floor at inlet end S. barrel and at 1st joint in from inlet in N. barrel. Spall at base of S. ww at inlet apron. Leakage in lower portion of N. barrel in 1981 section. Leakage at const. joints. Overall generally good condition. 08/22/2012: South barrel south wall has exposed rebar due to lack of cover. North barrel south wall has spall at bottom fillet at 2nd construction joint from outlet. All barrels have: -Leakage through top slab. -Rusty ties on top slab. Outlet parapet has several vertical cracks. South barrel has a 3'x3' spall, with exposed rebar, at inlet. Center and north barrels have slight settlement of floor at 1st construction joint from inlet. North barrel has leakage through floor along north wall at 2nd construction joint from inlet. Inlet apron: -Several greater than HL diagonal cracks. -3 spalls along northwest WW. -3 spalls along southwest WW. Inlet WWs have diagonal cracks with discoloration. 8-2-16 Parapets each have 2 vertical HL cracks. Outlet wingwalls are good. Inlet wingwalls both have several HL cracks with discoloration. Aprons both have random HL cracks.
<input type="checkbox"/> Delamination/Spall/Patched Area	MAIN	1080	2	5	ft	0.00	2.00	3.00	0.00	8-2-16 Barrel 1-delam in floor at first joint from inlet 1'. #2-delam in floor at inlet 1'. #3-spall at inlet 42"x36"
<input type="checkbox"/> Exposed Rebar	MAIN	1090	2	1	ft	0.00	1.00	0.00	0.00	8-2-16 Centerwall near outlet has a shallow spall with exposed steel.
<input type="checkbox"/> Efflorescence/Rust Staining	MAIN	1120	2	11	ft	0.00	8.00	3.00	0.00	8-2-16 Barrel #1-Old/new tie in at outlet end has moderate scaling and light eff in the roof 2'. First joint from outlet has moderate eff for 3' in the roof. #2-first joint from outlet has heavy eff for 3' in the roof. #3-first joint from the outlet has moderate eff for 3' in the roof.
# Elements										

Action	Agency Status	Agency Priority	Assigned to a Project	Rec. Date	Str No	Assigned To	Notes	Target Year

GENERAL BRIDGE DATA :

(8) STR NO : 47-068-501  
(7) FACILITY : I090  
(6) FEAT INTER : CK  
(9) LOCATION : 0.9 NW TILFORD INTERCH  
INTERCHANGE :   
SECTION(S) : 18  
TOWNSHIP(S) : 004N  
RANGE(S) : 06E  
(2) REGION : Rapid City  
(3) COUNTY : 47 MEADE  
(21) CUSTODIAN : 1 State Highway Agency  
(22) OWNER :  
MAINT PROJ : 090 451  
(42A) SERV TYPE ON : 1 Highway  
(42b) SERV TYPE UND : 5 Waterway  
(103) TEMP STRUCTURE : Unknown (NBI)  
(99) BORDER BRIDGE STR NO : -1  
(98A) NEIGHBOR STATE : Not Applicable (P)  
(98B) PERCENT SHARE :

HIGHWAY CARRIED (NBI 5)

(5B) ROUTE PREFIX : 1 Interstate Hwy  
(5C) LEVEL OF SERVICE : 1 Mainline  
(5D) ROUTE NUMBER : 00090  
(5E) DIRECT SUFFIX : 0 N/A (NBI)  
MRM ENGLISH : 39 32  
POSTED SPEED : 75 MPH  
SCHOOL BUS RT :  MAIL RT :   
(104) NHS SYSTEM : 1 On the NHS  
FA ROUTE : 0090  
(26) FUNC CLASS : 01 Rural Interstate  
(28A) LANES : 4  
(102) DIRECTION TRAFFIC : 2 2-way traffic  
(105) FED LANDS HWY : 0 N/A (NBI)  
(19) DETOUR : 1 mi  
(29) ADT TOTAL : 18,420  
(30) YEAR OF ADT : 2016  
(109) % TRUCK : 12 %  
(53) MIN V CLR RT : 328.1 ft  
(53) MIN V CLR LT : 328.1 ft  
(10) MAX V CLR RT : 328.1 ft  
(10) MAX V CLR LT : 328.1 ft  
(47) HORIZ V CLR RT : 38.0 ft  
(47) HORIZ V CLR LT : 0.0 ft

GIS DATA

LATITUDE : 44.31305 LONGITUDE : -103.43606  
DATE : 3/28/16  
COMMENT : Calculated GIS INFO

HIGHWAY CARRIED (UNDER RECORD)

(5A) RECORD TYPE :  
(5B) ROUTE PREFIX :  
(5C) LEVEL OF SERVICE :  
(5D) ROUTE NUMBER :  
(5E) DIRECT SUFFIX :  
MRM (ENGLISH) :  
ADM JUR :  
(104) NHS SYSTEM :  
FA ROUTE :  
(26) FUNC CLASS :  
(28B) LANES :  
(101) DIRECTION OF TRAFFIC :  
(19) DETOUR LENGTH : mi  
(29) ADT : (30) ADT Year :

GENERAL COMMENT: APRON - OUTLET. MEDIAN DRAINS(3)  
REGION COMMENT:  
FREE COMMENT:

GENERAL BRIDGE DATA

(27) YEAR BUILT : 1956 (106) RECONSTR : 0  
(49) STR LENGTH : 28.9 ft  
NBIS BRIDGE LENGTH: 28.9 ft  
(48) MAX SPAN LENGTH: 9.2 ft  
Main (43A) MATERIAL : 2 Concrete Continuous  
Span (43B) DESIGN : 19 Culvert  
SD STR TYPE : X028  
(107) DECK STR TYPE : N N/A (NBI)  
(52) DECK WIDTH : 0.0 ft  
(51) BRIDGE RDWY WIDTH : 0.0 ft  
(32) APPR RDWY WIDTH : 76.0 ft  
(50A) LT SIDEWALK WIDTH : 0.0 ft  
(50B) RT SIDEWALK WIDTH : 0.0 ft  
(34) SKEW : 30° SKEW DIR : L  
(45) NO MAIN SPANS : 3  
(46) NO APPR SPANS : 0  
(31) DESIGN LOAD : 5 MS 18 (HS 20)  
(33) BRIDGE MEDIAN : 2 Closed Med w/o Barrier  
(35) STR FLARED : 0 No flare

BOX CULVERT DATA :

BOX CULVERT SIZE : 3 X 8 X 4  
FILL HT OVER BOX : 5.2 ft  
LENGTH OF LONGEST CELL : 226.4 ft

RAIL DATA :

(36) SAFETY FEAT : NN11  
BRIDGE RAIL 1 : NN  
RAIL TRANS 1 : NN  
APPR RAIL 1 : 65  
APPR RAIL TERM 1 : 60

NBI PROP WORK

(75A) WORK TYPE : Unknown (P)  
(75B) WORK BY : Unknown (NBI)  
(76) IMPROV LENGTH : 0.0 ft  
(94) BRIDGE IMPROV COST : \$(1)  
(95) RDWAY IMPROV COST : \$(1)  
(96) TOTAL PROJECT COST : \$(1)  
(97) YEAR OF IMPROV COST : -1.00  
(114) ADT FUTURE : 23,338  
(115) YEAR OF ADT FUTURE : 2036

STEEL PAINT

UNDERCOAT :  
TOPCOAT :  
YEAR : COLOR :

STATUS

SUFF RATE : 82.0  
FED SUFF RATE : 82.0  
FED SR DATE : Mar 2017  
DEFICIENCY :  
CANDIDATE :

DECK DATA

(108A) WEARING SURFACE : N N/A (no deck (NBI))  
DECK PROTECTION : N N/A (no deck (NBI))  
OVERLAY THICKNESS : 0.00 in  
DECK DELAM AREA : 0.0 sq ft  
DECK DELAM DATE :

DECK SURVEY :

CHLORIDE :   
RESTEEL DEPTH :   
ELECTRO POTENT :

LOAD RATING DATA :

(41) OPER STATUS : A Open, no restriction  
(66) INV HS20 : 57.6 tons HS 32.0  
(65) METHOD : 1 LF Load Factor (tons)  
(64) OP HS20 : 96.1 tons HS 53.4  
(63) METHOD : 1 LF Load Factor (Tons)  
TRUCK TYPE 3 : 90.7 tons  
TRUCK TYPE 3S2 : 179.2 tons  
TRUCK TYPE 3-2 : 232.8 tons  
BARS NO :

HYDRAULICS :

DRAINAGE AREA : 0.00 sq mi  
OBSERV HW ELEV : 0.0 ft  
YEAR :  
DESIGN FREQ : 0  
DESIGN FLOW : 899.8 cfs  
DESIGN VELOCITY : 18.80 fps  
DESIGN AREA : 47.9 sq ft  
DESIGN YEAR : 1/1/1955 12:00:00AM  
DESIGN HW ELEV : ft  
100 YEAR FLOW : 0.0 cfs  
100 YR HW ELEV : ft  
V MAX : fps  
SCOUR SCREENING : 9 SCOUR RATING : 8  
TOPEKA SHINER :

RAIL PAINT :

UNDERCOAT :  
TOP COAT :  
YEAR : COLOR :

PROJECT NUMBER :

PCN : DATE DONE :  
IM 0901(120)33 6180 01/01/2008  
IN-88(07) none 01/01/1956

INSPECTION TYPE	LAST INSPECTION DATE	REQUIRED	INSPECTION FREQUENCY	NEXT INSP DATE
NBI	10/13/2016		48 months	10/13/2020
FRACTURE CRITICAL	NA	N	NA	NA
UNDERWATER	NA	N	NA	NA
SPECIAL	NA	N	NA	NA
ELEMENT INSPECTION	10/25/2012		48 months	10/13/2020

INSPKEY : NUMD  
APPRAIS BY : SS  
APPRAIS DATE : 06/15/2017  
QA INSPECTOR : ER  
QA INSP DATE : 06/23/2009  
LAST INSPECTION BY : Heinrich, Lyle  
CONSULTANT CODE : STATE HWY FORCES

CONDITION RATINGS:

(58) DECK : N                      (59) SUPER : N                      (60) SUB : N                      (62) CULVERT : 7  
(61) CHANNEL : 8  
APPROACH : 8      3 Cable railing Rt. side EBL only

APPRAISAL RATINGS

(67) STR APPR : 7 Minor spalls  
(68) DECK GEOM : N  
(69) UNDERCLR : N  
(71) WATERWAY : 8  
(72) APPR ALIN : 8  
(70) BR POST : 5

Elements	Unit	ID	Env	Tot. Qty (English)	Units	Q 1	Q 2	Q 3	Q 4	Notes
Re Conc Culvert	MAIN	241	2	679	ft	661.00	18.00	0.00	0.00	2008 - The silt / rock has been cleaned from the barrels. Structure extended at inlet and outlet. New extensions in new condition. Joints in old sections show minor leaching with light water leakage at first joint in from the inlet end in the old section ( South barrel). Overall good condition throughout. Able to walk thru all barrels due to cleanout. 10-25-2012 Barrels have no additional deterioration in the old section and new sections are good. Parapets both have vertical HL cracks over interior walls. Floor is not visible due to a light silt cover. Inlet apron is mostly visible and is good. Outlet apron has a light silt cover. Wingwalls are all good. 10-25-2012 Outlet parapet has 2 vertical HL cracks. Inlet has 5 vertical HL cracks. Floor is not visible due to light silt cover. Outlet apron is silt and rock covered. Inlet is good. Wingwalls are good.
Efflorescence/Rust Staining	MAIN	1120	2	18	ft	0.00	18.00	0.00	0.00	10-13-16 All barrels have light to moderate eff in the roof at the joints.
# Elements										
Action	Agency Status	Agency Priority	Assigned to a Project	Rec. Date	Str No	Assigned To	Notes	Target Year		

GENERAL BRIDGE DATA:

(8) STR NO : 47-068-503  
(7) FACILITY : I090  
(6) FEAT INTER : NORTH BR MORRIS CK  
(9) LOCATION : 0.7 NW TILFORD INTERCH  
INTERCHANGE :   
SECTION(S) : 18  
TOWNSHIP(S) : 004N  
RANGE(S) : 06E  
(2) REGION : Rapid City  
(3) COUNTY : 47 MEADE  
(21) CUSTODIAN : 1 State Highway Agency  
(22) OWNER :  
MAINT PROJ : 090 451  
(42A) SERV TYPE ON : 1 Highway  
(42b) SERV TYPE UND : 5 Waterway  
(103) TEMP STRUCTURE : Unknown (NBI)  
(99) BORDER BRIDGE STR NO : -1  
(98A) NEIGHBOR STATE : Not Applicable (P)  
(98B) PERCENT SHARE :

GENERAL BRIDGE DATA

(27) YEAR BUILT : 1956 (106) RECONSTR : 2008  
(49) STR LENGTH : 20.5 ft  
NBIS BRIDGE LENGTH : 20.5 ft  
(48) MAX SPAN LENGTH : 10.0 ft  
Main (43A) MATERIAL : 2 Concrete Continuous  
Span (43B) DESIGN : 19 Culvert  
SD STR TYPE : X028  
(107) DECK STR TYPE : N N/A (NBI)  
(52) DECK WIDTH : 0.0 ft  
(51) BRIDGE RDWY WIDTH : 0.0 ft  
(32) APPR RDWY WIDTH : 76.0 ft  
(50A) LT SIDEWALK WIDTH : 0.0 ft  
(50B) RT SIDEWALK WIDTH : 0.0 ft  
(34) SKEW : 0° SKEW DIR :  
(45) NO MAIN SPANS : 2  
(46) NO APPR SPANS : 0  
(31) DESIGN LOAD : 5 MS 18 (HS 20)  
(33) BRIDGE MEDIAN : 2 Closed Med w/o Barrier  
(35) STR FLARED : 0 No flare

STATUS

SUFF RATE : 82.0  
FED SUFF RATE : 82.0  
FED SR DATE : Mar 2017  
DEFICIENCY :  
CANDIDATE :

DECK DATA

(108A) WEARING SURFACE : N N/A (no deck (NBI))  
DECK PROTECTION : N N/A (no deck (NBI))  
OVERLAY THICKNESS : 0.00 in  
DECK DELAM AREA : 0.0 sq ft  
DECK DELAM DATE :  
DECK SURVEY :

CHLORIDE :   
RESTEEL DEPTH :   
ELECTRO POTENT :

LOAD RATING DATA :

(41) OPER STATUS : A Open, no restriction  
(65) INV HS20 : 37.1 tons HS 20.6  
(65) METHOD : 1 LF Load Factor (tons)  
(64) OP HS20 : 61.9 tons HS 34.4  
(63) METHOD : 1 LF Load Factor (Tons)  
TRUCK TYPE 3 : 58.1 tons  
TRUCK TYPE 3S2 : 113.2 tons  
TRUCK TYPE 3-2 : 145.8 tons  
BARS NO :

HYDRAULICS :

DRAINAGE AREA : 0.00 sq mi  
OBSERV HW ELEV : 0.0 ft  
YEAR :  
DESIGN FREQ : 0  
DESIGN FLOW : 0.0 cfs  
DESIGN VELOCITY : 0.00 fps  
DESIGN AREA : 0.0 sq ft  
DESIGN YEAR :  
DESIGN HWELEV : ft  
100 YEAR FLOW : 0.0 cfs  
100 YR HWELEV : ft  
V MAX : fps  
SCOUR SCREENING : 9 SCOUR RATING : 8  
TOPEKA SHINER :

RAIL PAINT :

UNDERCOAT :  
TOP COAT :  
YEAR : COLOR :

HIGHWAY CARRIED (NBI 5)

(58) ROUTE PREFIX : 1 Interstate Hwy  
(5C) LEVEL OF SERVICE : 1 Mainline  
(5D) ROUTE NUMBER : 00090  
(5E) DIRECT SUFFIX : 0 N/A (NBI)  
MRM ENGLISH : 39.45  
POSTED SPEED : 75 MPH  
SCHOOL BUS RT :  MAIL RT :

BOX CULVERT DATA :

BOX CULVERT SIZE : 2 X 10 X 7  
FILL HT OVER BOX : 5.6 ft  
LENGTH OF LONGEST CELL : 189.0 ft

RAIL DATA :

(36) SAFETY FEAT : NNNN  
BRIDGE RAIL 1 : NN  
RAIL TRANS 1 : NN  
APPR RAIL 1 : NN  
APPR RAIL TERM 1 : NN

NBI PROP WORK

(75A) WORK TYPE : Unknown (P)  
(75B) WORK BY : Unknown (NBI)  
(76) IMPROV LENGTH : 0.0 ft  
(94) BRIDGE IMPROV COST : \$(1)  
(95) RDWAY IMPROV COST : \$(1)  
(96) TOTAL PROJECT COST : \$(1)  
(97) YEAR OF IMPROV COST : -1.00  
(114) ADT FUTURE : 23,338  
(115) YEAR OF ADT FUTURE : 2036

STEEL PAINT

UNDERCOAT :  
TOPCOAT :  
YEAR : COLOR :

GIS DATA

LATITUDE : 44.31113 LONGITUDE : -103.43574  
DATE : 3/28/16  
COMMENT : Calculated GIS INFO

HIGHWAY CARRIED (UNDER RECORD)

(5A) RECORD TYPE : (54) MIN V CLR RT : ft  
(5B) ROUTE PREFIX : (54) MIN V CLR LT : ft  
(5C) LEVEL OF SERVICE : (10) MAX V CLR RT : ft  
(5D) ROUTE NUMBER : (10) MAX V CLR LT : ft  
(5E) DIRECT SUFFIX : (47) HORIZ CLR RT : ft  
MRM (ENGLISH) : (47) HORIZ CLR LT : ft  
ADM JUR : (55) OUT UNDCLR RT : ft  
(104) NHS SYSTEM : (55) OUT UNDCLR LT : ft  
FA ROUTE : (56) MED UNDCLR RT : ft  
(26) FUNC CLASS : (56) MED UNDCLR LT : ft  
(28B) LANES :  
(101) DIRECTION OF TRAFFIC :  
(19) DETOUR LENGTH : mi  
(29) ADT : (30) ADT Year :

PROJECT NUMBER :	PGN :	DATE DONE :
IM 0901(120)33	6180	01/01/2008
IM-090-1(114)0	3937	01/01/1994
IN-88(07)	none	01/01/1956

GENERAL COMMENT: APRON - OUTLET. MEDIAN DRAINS(2)

REGION COMMENT:

FREE COMMENT:

INSPECTION TYPE	LAST INSPECTION DATE	INSPECTION REQUIRED	INSPECTION FREQUENCY	NEXT INSP DATE
NBI	10/13/2016		48 months	10/13/2020
FRACTURE CRITICAL	NA	N	NA	NA
UNDERWATER	NA	N	NA	NA
SPECIAL	NA	N	NA	NA
ELEMENT INSPECTION	10/03/2012		48 months	10/13/2020

INSPKEY : IQME  
APPRAIS BY : SS  
APPRAIS DATE : 06/15/2017  
QA INSPECTOR :  
QA INSP DATE :  
LAST INSPECTION BY : Heinrich, Lyle  
CONSULTANT CODE : STATE HWY FORCES

CONDITION RATINGS:

(58) DECK : N (59) SUPER : N (60) SUB : N (62) CULVERT : 6  
(61) CHANNEL : 8  
APPROACH : 8

APPRAISAL RATINGS

(67) STR APPR : 6 Hairline cracks, Jt leakage  
(68) DECK GEOM : N  
(69) UNDERCLR : N  
(71) WATERWAY : 8  
(72) APPR ALIN : 8  
(70) BR POST : 5

Elements	Unit	ID	Env	Tot. Qty (English)	Units	Q 1	Q 2	Q 3	Q 4	Notes
Re Conc Culvert	MAIN	241	2	378	ft	357.00	10.00	1.00	0.00	6 in. to 10 in. of silt on floor of North barrel from CL to the outlet and 1 in. to 8 in. of silt on floor of South barrel from CL to the outlet. Minor eff at const jts. Crack with eff in roof of new section, South barrel, in 20 ft. from the outlet end, in the new section. WW ft.s, aprons and barrel sections of new sections in new condition with exception of roof crack as mentioned. 10-03-2012 Light to moderate eff on roof at construction joints. No additional cracks. No defects on parapets. Approx 95% of the floor is visible with no defects. Apron is good at inlet and under 6-8 in. of silt at the outlet. Inlet wingwalls are good, outlet have equipment scrapes. 10-13-16 Each parapet has 1 vertical HL crack. Floor is about 90% visible with no defects noted. Inlet apron is good. Outlet apron is silt covered. No change in wingwalls.
Delamination/Spall/Patched Area	MAIN	1080	2	1	ft	0.00	0.00	1.00	0.00	10-13-16 Barrel #1 has a shallow spall, 6"x12", with exposed steel in the roof near the inlet.
Efflorescence/Rust Staining	MAIN	1120	2	10	ft	0.00	10.00	0.00	0.00	10-13-16 Both barrels have 1 transverse HL crack with light eff in the roof and light eff at 4 joints in the roof.
# Elements										

Action	Agency Status	Agency Priority	Assigned to a Project	Rec. Date	Str No	Assigned To	Notes	Target Year

**GENERAL BRIDGE DATA :**

(8) STR NO : 47-068-495  
 (7) FACILITY : I090  
 (6) FEAT INTER : CP/DM&E RR  
 (9) LOCATION : 1.6 NW TILFORD INTERCH  
 INTERCHANGE :   
 SECTION(S) : 07  
 TOWNSHIP(S) : 004N  
 RANGE(S) : 06E  
 (2) REGION : Rapid City  
 (3) COUNTY : 47 MEADE  
 (21) CUSTODIAN : 1 State Highway Agency  
 (22) OWNER :  
 MAINT PROJ : 090 451  
 (42A) SERV TYPE ON : 1 Highway  
 (42b) SERV TYPE UND : 2 Railroad  
 (103) TEMP STRUCTURE : Unknown (NBI)  
 (99) BORDER BRIDGE STR NO : -1  
 (98A) NEIGHBOR STATE : Not Applicable (P)  
 (98B) PERCENT SHARE :

**HIGHWAY CARRIED (NBI 5)**

(5B) ROUTE PREFIX : 1 Interstate Hwy  
 (5C) LEVEL OF SERVICE : 1 Mainline  
 (5D) ROUTE NUMBER : 00090  
 (5E) DIRECT SUFFIX : 0 N/A (NBI)  
 MRM ENGLISH : 39.67  
 POSTED SPEED : 75 MPH  
 SCHOOL BUS RT :  MAIL RT :   
 (104) NHS SYSTEM : 1 On the NHS  
 FA ROUTE : 0090  
 (26) FUNC CLASS : 01 Rural Interstate  
 (28A) LANES : 4  
 (102) DIRECTION TRAFFIC : 2 2-way traffic  
 (105) FED LANDS HWY : 0 N/A (NBI)  
 (19) DETOUR : 1 mi  
 (29) ADT TOTAL : 18,090  
 (30) YEAR OF ADT : 2015  
 (109) % TRUCK : 14 %  
 (53) MIN V CLR RT : 328.1 ft  
 (53) MIN V CLR LT : 328.1 ft  
 (10) MAX V CLR RT : 328.1 ft  
 (10) MAX V CLR LT : 328.1 ft  
 (47) HORIZ V CLR RT : 38.0 ft  
 (47) HORIZ V CLR LT : 0.0 ft

**GIS DATA**

LATITUDE : 44.32322 LONGITUDE : -103.43582  
 DATE : 3/28/16  
 COMMENT : Calculated GIS INFO

**HIGHWAY CARRIED (UNDER RECORD)**

(5A) RECORD TYPE :  
 (5B) ROUTE PREFIX :  
 (5C) LEVEL OF SERVICE :  
 (5D) ROUTE NUMBER : DM&ER  
 (5E) DIRECT SUFFIX :  
 MRM (ENGLISH) : 0.00  
 ADM JUR :  
 (104) NHS SYSTEM :  
 FA ROUTE :  
 (26) FUNC CLASS :  
 (28B) LANES : 0  
 (101) DIRECTION OF TRAFFIC :  
 (19) DETOUR LENGTH : 0 mi  
 (29) ADT : 0 (30) ADT Year : -4

**GENERAL BRIDGE DATA**

(27) YEAR BUILT : 1981 (106) RECONSTR : 0  
 (49) STR LENGTH : 64.6 ft  
 NBIS BRIDGE LENGTH : 56.9 ft  
 (48) MAX SPAN LENGTH : 56.9 ft  
 Main : (43A) MATERIAL : 3 Steel  
 Span : (43B) DESIGN : 19 Culvert  
 SD STR TYPE : X134  
 (107) DECK STR TYPE : N N/A (NBI)  
 (52) DECK WIDTH : 0.0 ft  
 (51) BRIDGE RDWY WIDTH : 0.0 ft  
 (32) APPR RDWY WIDTH : 76.0 ft  
 (50A) LT SIDEWALK WIDTH : 0.0 ft  
 (50B) RT SIDEWALK WIDTH : 0.0 ft  
 (34) SKEW : 54° SKEW DIR : L  
 (45) NO MAIN SPANS : 1  
 (46) NO APPR SPANS : 0  
 (31) DESIGN LOAD : 6 MS18(HS20)+mod  
 (33) BRIDGE MEDIAN : 2 Closed Med w/o Barrier  
 (35) STR FLARED : 0 No flare

**BOX CULVERT DATA :**

BOX CULVERT SIZE : 1 X 38 X 23  
 FILL HT OVER BOX : 9.1 ft  
 LENGTH OF LONGEST CELL : 397.0 ft

**RAIL DATA :**

(36) SAFETY FEAT : NN11  
 BRIDGE RAIL 1 : NN  
 RAIL TRANS 1 : NN  
 APPR RAIL 1 : 65  
 APPR RAIL TERM 1 : 60

**NBI PROP WORK**

(75A) WORK TYPE : Unknown (P)  
 (75B) WORK BY : Unknown (NBI)  
 (76) IMPROV LENGTH : 0.0 ft  
 (94) BRIDGE IMPROV COST : \$(1)  
 (95) RDWY IMPROV COST : \$(1)  
 (96) TOTAL PROJECT COST : \$(1)  
 (97) YEAR OF IMPROV COST : -1.00  
 (114) ADT FUTURE : 22,920  
 (115) YEAR OF ADT FUTURE : 2035

**STEEL PAINT**

UNDERCOAT :  
 TOPCOAT :  
 YEAR : COLOR :

**STATUS**

SUFF RATE : 82.0  
 FED SUFF RATE : 82.0  
 FED SR DATE : Mar 2016  
 DEFICIENCY :  
 CANDIDATE :

**DECK DATA**

(108A) WEARING SURFACE : N N/A (no deck (NBI))  
 DECK PROTECTION : N N/A (no deck (NBI))  
 OVERLAY THICKNESS : 0.00 in  
 DECK DELAM AREA : 0.0 sq ft  
 DECK DELAM DATE :  
 DECK SURVEY :

CHLORIDE :   
 RESTEEL DEPTH :   
 ELECTRO POTENT :

**LOAD RATING DATA :**

(41) OPER STATUS : A Open, no restriction  
 (65) INV HS20 : 46.1 tons HS 25.6  
 (65) METHOD : 3 LRFR (tons)  
 (64) OP HS20 : 59.8 tons HS 33.2  
 (63) METHOD : 3 LRFR (Tons)  
 TRUCK TYPE 3 : 35.5 tons  
 TRUCK TYPE 3S2 : 72.4 tons  
 TRUCK TYPE 3-2 : 80.5 tons  
 BARS NO :

**HYDRAULICS :**

DRAINAGE AREA : 0.00 sq mi  
 OBSERV HW ELEV : 0.0 ft  
 YEAR :  
 DESIGN FREQ : 0  
 DESIGN FLOW : 0.0 cfs  
 DESIGN VELOCITY : 0.00 fps  
 DESIGN AREA : 0.0 sq ft  
 DESIGN YEAR :  
 DESIGN HW ELEV : ft  
 100 YEAR FLOW : 0.0 cfs  
 100 YR HW ELEV : ft  
 V MAX : fps  
 SCOUR SCREENING : N SCOUR RATING : N  
 TOPEKA SHINER :

**RAIL PAINT :**

UNDERCOAT :  
 TOP COAT :  
 YEAR : COLOR :

**PROJECT NUMBER :**

PCN : DATE DONE :  
 IM 0901(120)33 6180 01/01/2008  
 I-90-1(49)37 4703 01/01/1981  
 (54) MIN V CLR RT : 22.582 ft  
 (54) MIN V CLR LT : 0.000 ft  
 (10) MAX V CLR RT : 0.000 ft  
 (10) MAX V CLR LT : 0.000 ft  
 (47) HORIZ CLR RT : 0.000 ft  
 (47) HORIZ CLR LT : 0.000 ft  
 (55) OUT UNDCLR RT : 16.798 ft  
 (55) OUT UNDCLR LT : 327.756 ft  
 (56) MED UNDCLR RT : 0.000 ft  
 (56) MED UNDCLR LT : 0.000 ft

GENERAL COMMENT: 345' LONG SPAN STRUCTURAL PLATE HIGH PROFILE ARCH. 2008 a 52 ft extension was added to make a new length of 397'

REGION COMMENT:

FREE COMMENT:

INSPECTION TYPE	LAST INSPECTION DATE	INSPECTION REQUIRED	INSPECTION FREQUENCY	NEXT INSP DATE	INSKEY :	PQLT
NBI	02/29/2016		24 months	2/28/2018 1	APPRAIS BY :	SS
FRACTURE CRITICAL	NA	N	NA	NA	APPRAIS DATE :	07/05/2016
UNDERWATER	NA	N	NA	NA	QA INSPECTOR :	
SPECIAL	NA	N	NA	NA	QA INSP DATE :	
ELEMENT INSPECTION	02/27/2014		24 months	2/28/2018 1	LAST INSPECTION BY :	Kamarainen, Steve
					CONSULTANT CODE :	STATE HWY FORCES

CONDITION RATINGS:

(58) DECK : N (59) SUPER : N (60) SUB : N (62) CULVERT : 7  
(61) CHANNEL : N  
APPROACH : 8 Conc/ Cracks sealed

APPRAISAL RATINGS

(67) STR APPR : 7  
(68) DECK GEOM : N  
(69) UNDERCLR : 6 Lateral CL Centerline RR to structure & footing connection  
(71) WATERWAY : N  
(72) APPR ALIN : 8  
(70) BR POST : 5 STEEL ARCH

Elements	Unit	ID	Env	Tot. Qty (English)	Units	Q 1	Q 2	Q 3	Q 4	Notes
Steel Culvert	MAIN	240	2	397	ft	351.00	40.00	6.00	0.00	smooth symmetrical curvature, minor superficial corrosion 2-14-2008 No obvious deformity. Areas of corrosion with the worst being at the joint between the 4th and 5th sections up from the footings. Corrosion ranges from light to moderate. 8-15-2008 A 52 ft. - 0 in. extension has been added to the South end of the arch. This is the end adjacent the WBL. The extension and new bin walls are in new condition. Additional reflectors were added to the new extension so this new section of the structure can be monitored for movement along with the existing structure. 2-10-10 Visual inspection did not detect any significant flattening, peaking or racking of the arch. In addition to visual monitoring, survey targets have been set on the interior of the arch to enable further monitoring of the shape. The targets in the original section of barrel are approximately 4 in. square, the targets at the interface of the old and new barrel sections are approximately 8 in. square and the targets in the rest of the new barrel section are approximately 5 in. square. It appears that the targets are not installed at the key points on the arch that are indicated on the drawings to control the arch shape-the targets at the apex appear to be offset to the side, the targets on each end of the top arc chord appear to be offset vertically and horizontally, the targets at each end of the springline may be in the correct position, no targets were set at the ends of the bottom base of the arch. New survey has been requested to tie the installed targets to horizontal and vertical control to enable monitoring the arch on a global as well as local basis. In addition to surveying the targets, survey of the bottom base of the arch at top of footing (truncated)
<input type="checkbox"/> Metalized/Galvanized	MAIN	818	2	57,168	sq.ft	57,076.00	0.00	0.00	92.00	2/29/2016: The structure is composed of 14 lapped galvanized corrugated plates that form the shape of the cross section.
<input type="checkbox"/> Eff (Stl Protect Coat)	MAIN	3440	2	28	ft	0.00	0.00	0.00	28.04	2/29/2016: Galvanizing has failed where corrosion is present.
<input type="checkbox"/> Corrosion	MAIN	1000	2	46	ft	0.00	40.00	6.00	0.00	2-10-10 As before, areas of corrosion exist with the worst being at the joint between the 4th and 5th plate sections above the base. In addition to the corrosion, there are also signs of efflorescence, including stalactites, at this joint. Some efflorescence also occurs on the arch above and below this joint. The arch sides at the base are also discolored for 1' to 2' up the sides. 2-16-12 The joints between the 4th & 5th plate sections above the base have efflorescence like deposits, including stalactites. Leakage is also evident with water dripping onto the footings below. Some efflorescence, corrosion and leakage is also evident on the joints above and below these locations. The arch sides at the base are also discolored and have some corrosion for 1' to 2' up the sides. 2-27-2014 No change. 2/29/2016 No change.
<input type="checkbox"/> Damage	MAIN	7000	2	4	ft	0.00	4.00	0.00	0.00	2-27-2014 The top stringer and stringer stiffener on the highest binwall of the southwest binwall/wingwall was damaged by a trailer house that blew off a west bound transport. A special inspection was performed on 1-29-2014 and found this issue. 2/29/2016 No change The damage defect is being included to record the event, but it does not correspond to a defect in the structure.
# Elements										

Action	Agency Status	Agency Priority	Assigned to a Project	Rec. Date	Str No	Assigned To	Notes	Target Year

# STRUCTURE NEEDS MEMORANDUM I-90 EXIT 32-40: CORRIDOR STUDY AND DESIGN PROJECT

Appendix B Structure Plans  
January 22, 2018

## Appendix B **STRUCTURE PLANS**

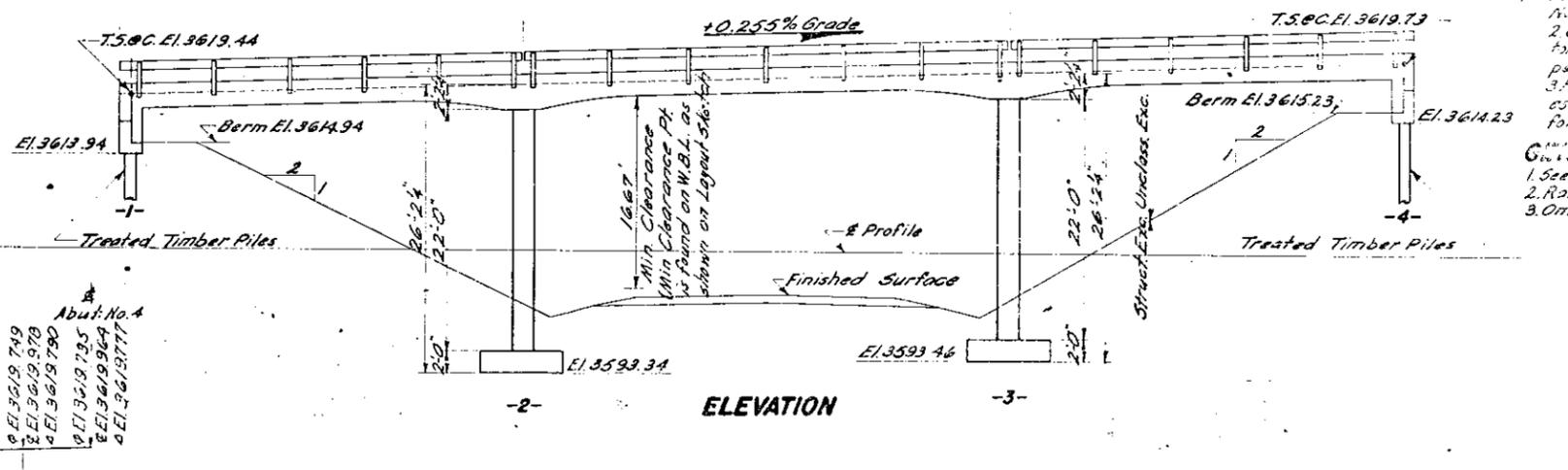
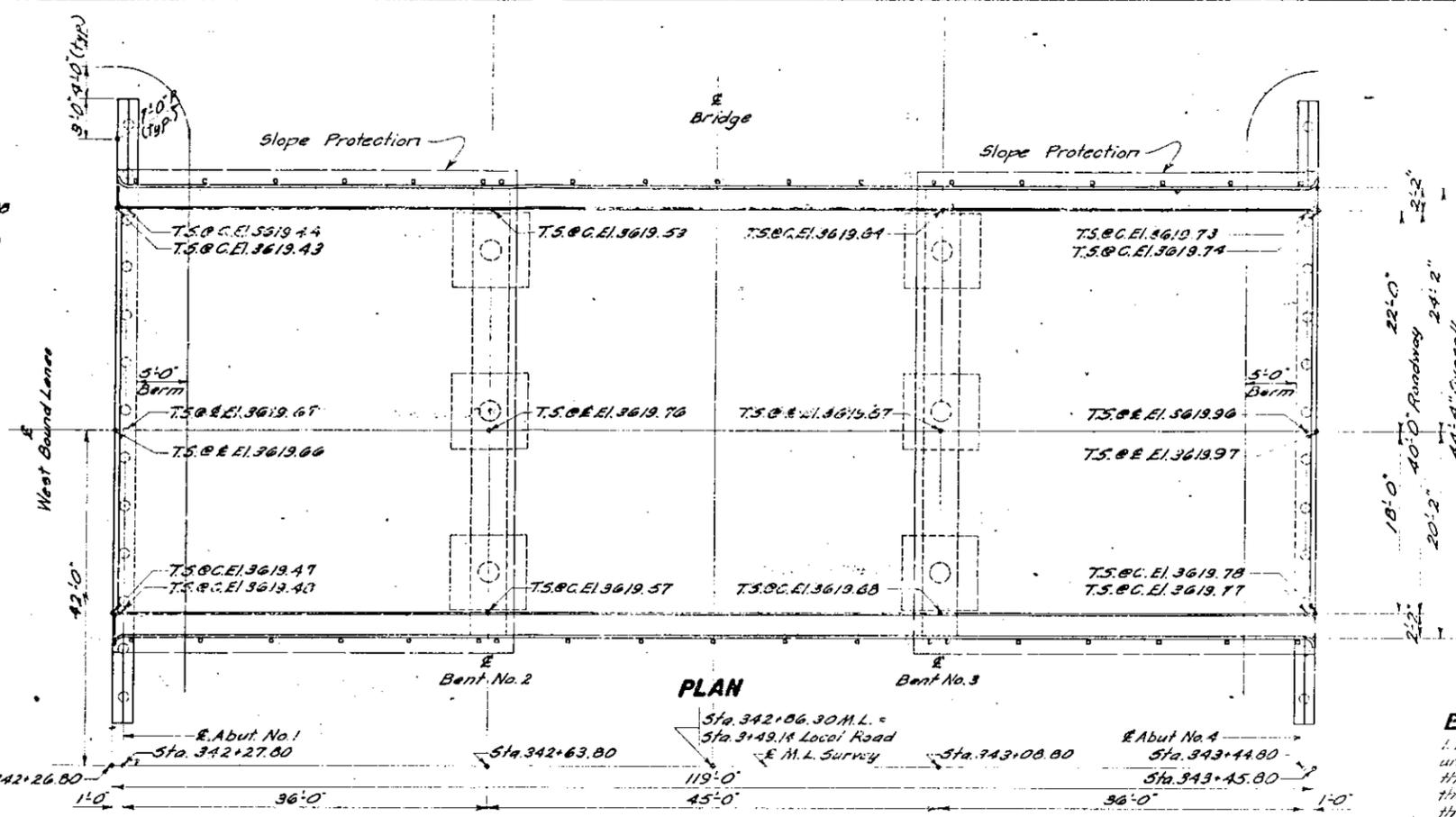
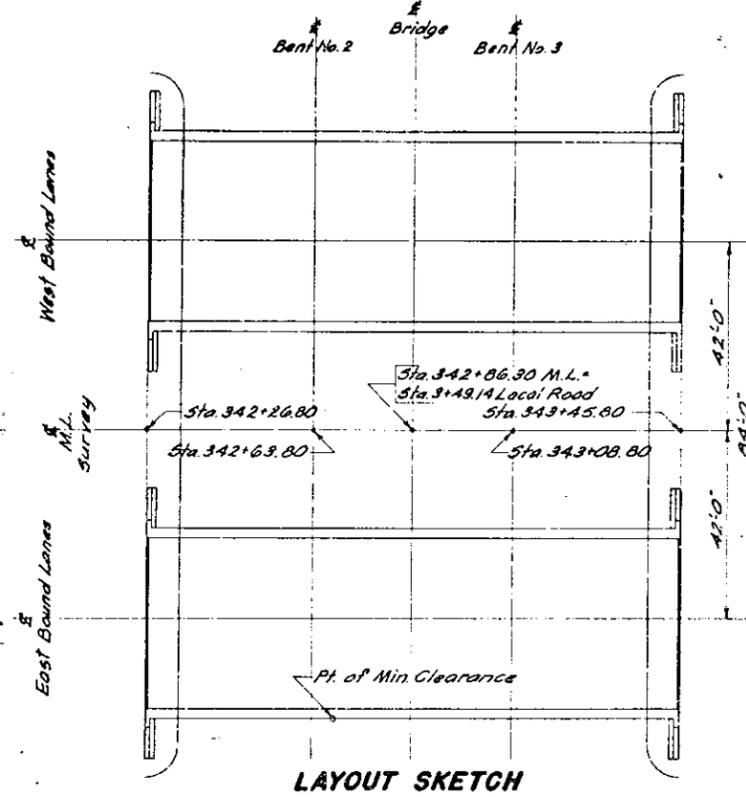
**INDEX OF BRIDGE SHEETS—**

- Sheet No. 1—General Drawing, Layout and Quantities.
- Sheet No. 2—Subsurface Investigations.
- Sheet No. 3—Details of Superstructure.
- Sheet No. 4—Details of Substructure.
- Sheet No. 5—Standard Type RA-1M Steel Railing CS-RA-1M (8-30-62)

B.M. #43—E. 3601.68  
Re-Bar # 35  
160 Rt. Sta. 339+00

B.M. #43—E. 3601.68 Lock—E. 3600.00  
Re-Bar # 35  
150 Rt. Sta. 346+00

NOTE: T.S.C. = Top of Slab at Curb  
T.S.C. = Top of Slab at Centerline



**EXCAVATION NOTES—**

- Footings for Bents No. 2 and 3 shall be cast against undisturbed gravel, and carried into some approximation the depth of footings. Limits of gravel excavation to these footings shall be bounded as nearly as practical the neat lines as shown in details of footings for Bent No. 2 and 3 on Sheet No. 3.
- Gravel shall develop a minimum bearing value of 2 tons per sq. ft. If the bearing value is less than 2 tons per sq. ft. communicate with the BRIDGE DIVISION.
- Final footing elevations for Bents No. 2 and 3 shall be established before ordering so much reinforcing steel for the respective Bents.

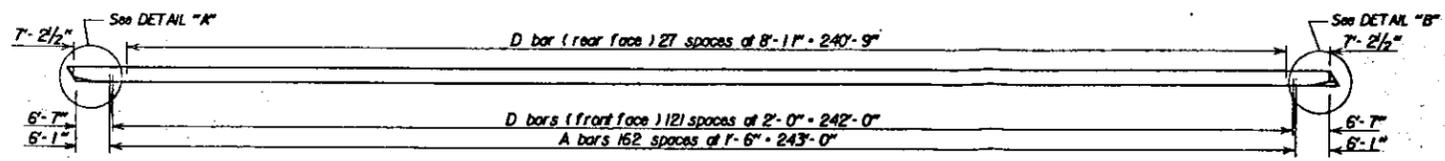
**GENERAL NOTES—**

- See Notes on Sheets No. 3 and 4.
- Rail Posts shall be built vertical.
- Omit Floor Drains.

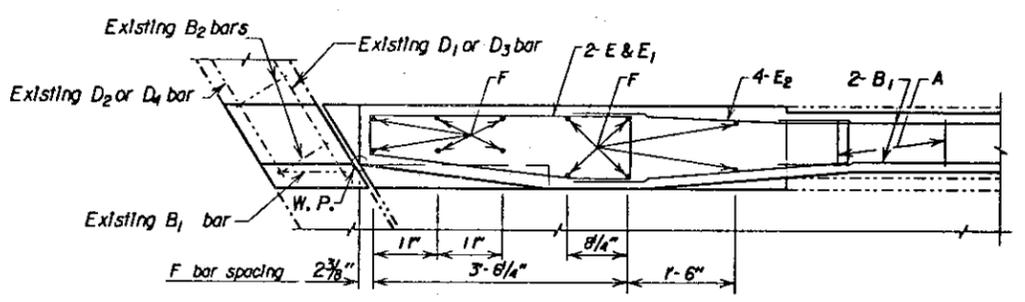
**CURB & ELEVATIONS**

Abut. No. 1	Bent No. 2	Bent No. 3	Abut. No. 4
• E. 3619.947	• E. 3619.521	• E. 3619.643	• E. 3619.735
• E. 3619.666	• E. 3619.760	• E. 3619.649	• E. 3619.964
• E. 3619.478	• E. 3619.563	• E. 3619.672	• E. 3619.964
• E. 3619.496	• E. 3619.529	• E. 3619.685	• E. 3619.977
• E. 3619.725	• E. 3619.754	• E. 3619.911	• E. 3619.977
• E. 3619.558	• E. 3619.566	• E. 3619.724	• E. 3619.977
• E. 3619.524	• E. 3619.521	• E. 3619.791	• E. 3619.977
• E. 3619.754	• E. 3619.754	• E. 3619.940	• E. 3619.977
• E. 3619.566	• E. 3619.566	• E. 3619.940	• E. 3619.977
• E. 3619.521	• E. 3619.521	• E. 3619.790	• E. 3619.977
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• E. 3619.563	• E. 3619.563	• E. 3619.979	• E. 3619.977
• E. 3619.529	• E. 3619.529	• E. 3619.790	• E. 3619.977
• E. 3619.754	• E. 3619.754	• E. 3619.964	• E. 3619.977
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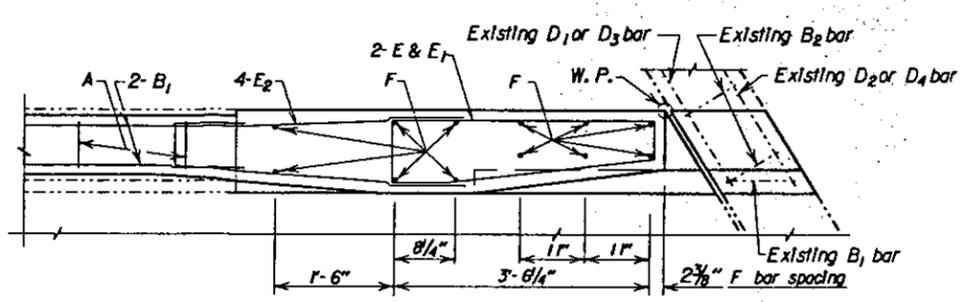




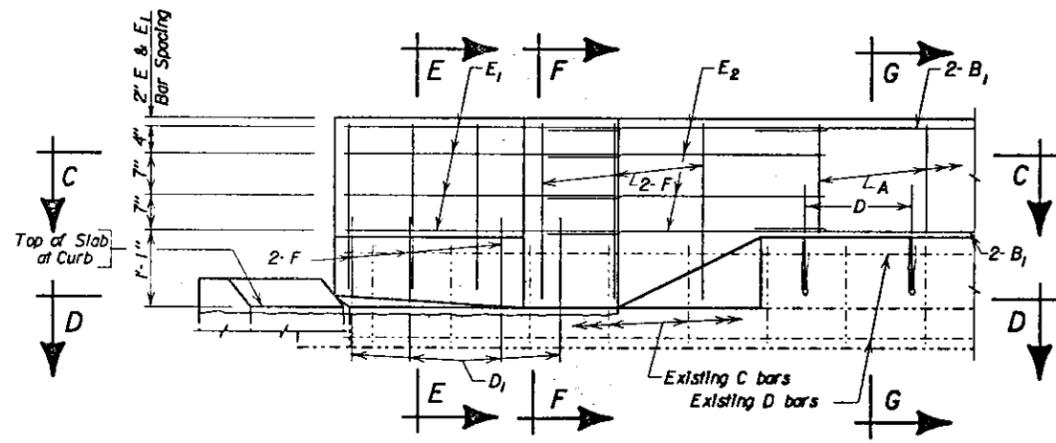
REINFORCING STEEL LAYOUT



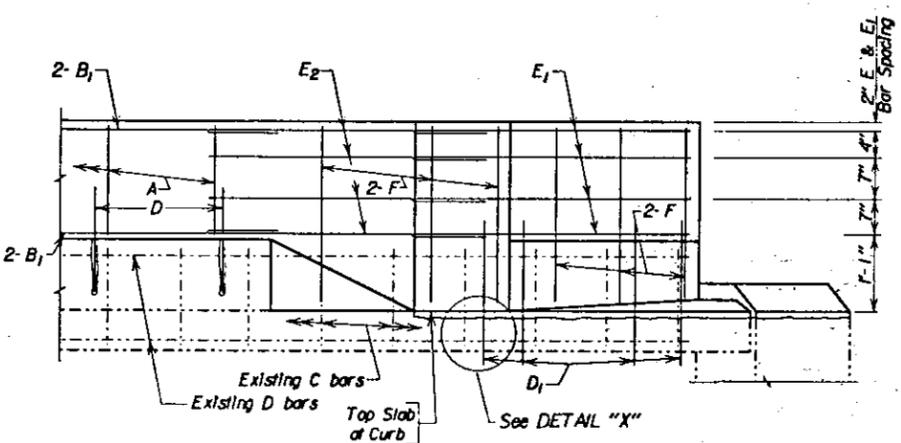
PLAN - DETAIL "A"



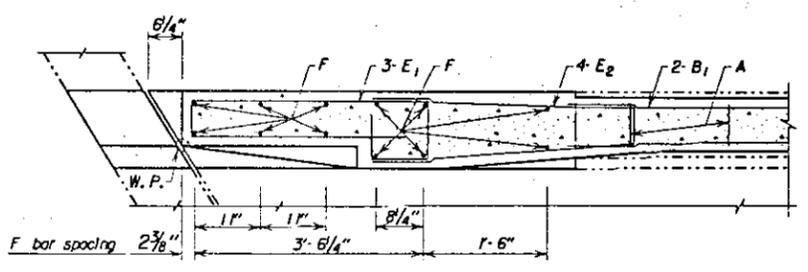
PLAN - DETAIL "B"



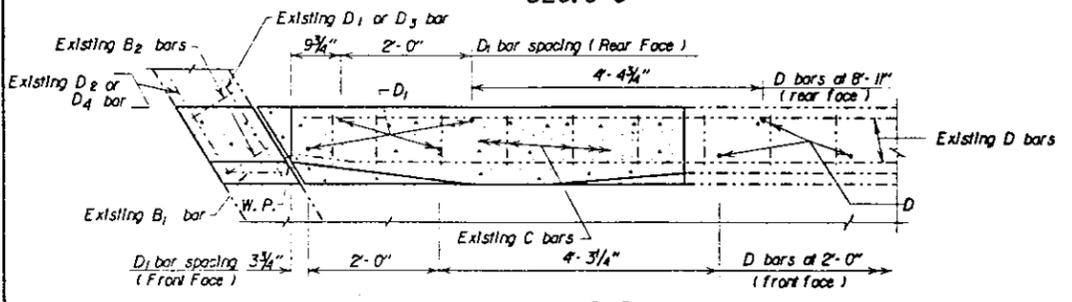
ELEVATION - DETAIL "A"



ELEVATION - DETAIL "B"

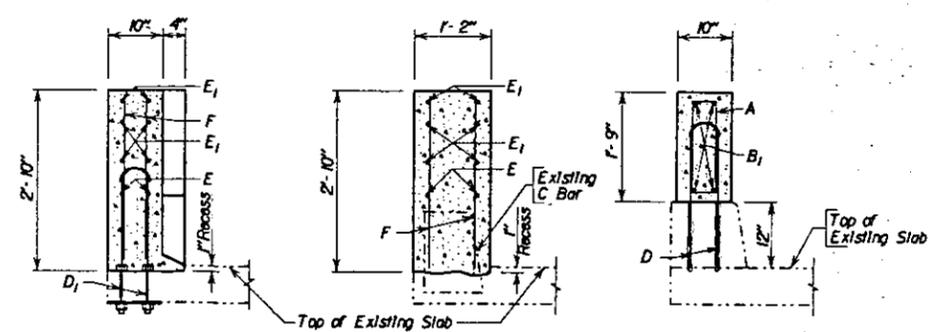


SEC. C-C



SEC. D-D

(F bars not shown for clarity of D bars.)



SEC. E-E

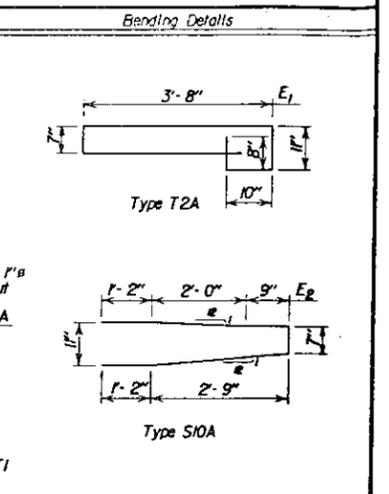
SEC. F-F

SEC. G-G

NOTE: If existing resteel is struck while drilling holes for Dowels, the spacing can be shifted 2" longitudinally, 1" transversely or as approved by the Engineer to miss the existing steel.

REINFORCING SCHEDULE (For One Bridge)

Mk.	No.	Size	Length	Type
A	326	4	4'-9"	T1
B1	48	4	4'-6"	Str.
*D	300	7	2'-11"	IA
*D1	16	8	2'-11"	IA
E1	16	4	10'-2"	T2A
E2	16	4	8'-5"	S10A
F	48	6	2'-5"	Str.

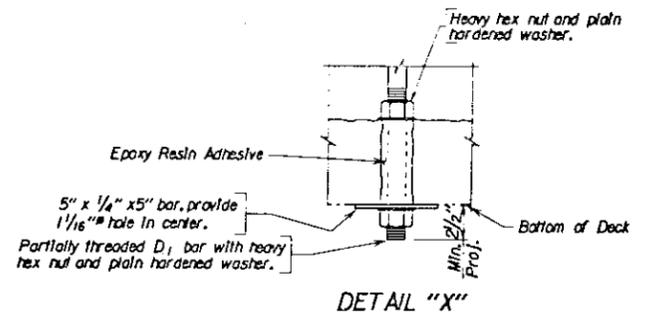


All dimensions are out to out of bars.

ESTIMATED QUANTITIES

ITEM	UNIT	QUANTITY
Class "A45" Concrete, Bridge Repair	Cu. Yds.	27.7
*Epoxy Coated Reinforcement for Concrete Masonry	Lbs.	2748
Install Dowels In Concrete	Each	316
Breakout Structural Concrete	Cu. Yds.	1.3
Remove Bridge Railing	Ln. Ft.	519.0

\* Does not include 1913 lbs. for dowels as these are included in the item "Install Dowels In Concrete."



BARRIER REINFORCEMENT DETAILS FOR 258'-4 1/4" CONT. COMP. GIRDER BRIDGE 30'-0" ROADWAY OVER I90 SEC. 31/6-T5/4N-R6E STA. 12+54.463 TO STA. 15+12.817 IR 90-11(84)30 STR. NO. 47-061-480 32° SKEW R.H.F. MEADE COUNTY S. D. DEPT. OF TRANSPORTATION

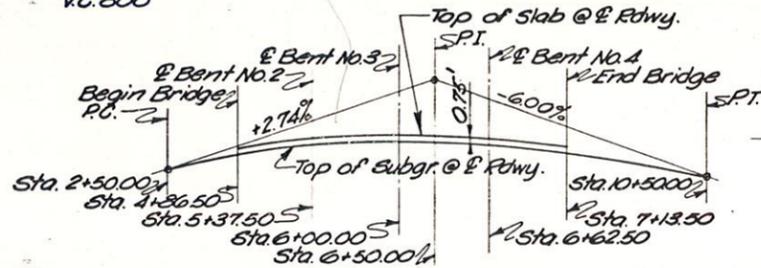
APRIL 1987 (3) OF (8)

DESIGNED BY T.S.	DRAWN BY D.A.H. & W.C.P.	CHECKED BY TDW	APPROVED BRIDGE ENGINEER
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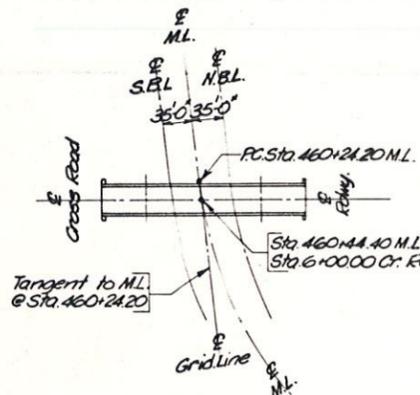
### INDEX OF BRIDGE SHEETS

- Sheet No. 1 - General Drawing and Quantities
- Sheet No. 2 - Subsurface Investigations
- Sheet No. 3 - Details of Sills No. 1 and No. 5
- Sheet No. 4 - Details of Bents 2, 3 and 4
- Sheet No. 5 - Superstructure Details
- Sheet No. 6 - Superstructure Details
- Sheet No. 7 - Details of Shoes, Expansion Device and Armored Joint
- Sheet No. 8 - Erection Data
- Sheet No. 9 - Std. Type Railing and Curb Details RRA-1(8-30-62)
- Sheet No. 10 - Details of Bolted Splices.

PI Sta. 6+50.00  
 El. 3648.57  
 V.C. 800



SUBGRADE CURVE DATA

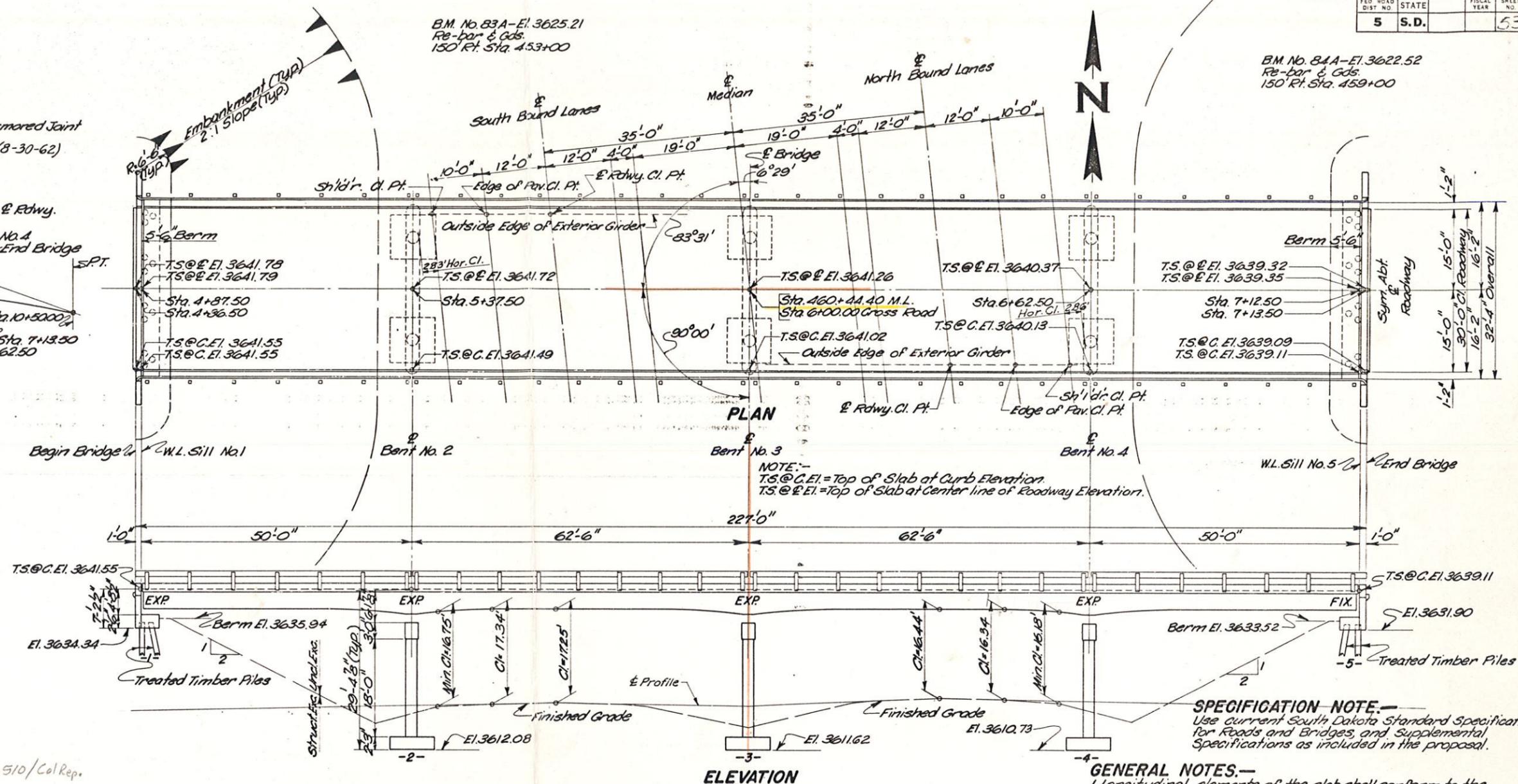


LAYOUT

U: / BR / Misc / EJA / 47-069-510 / Col Rep.

### EXCAVATION NOTES.

- Footings for Bents No. 2, 3 & 4 shall be cast against red sandy gravel on reddish gray to white gypsum and carried into same approximately depth of footing. Limits of excavation for these footings shall be bound as nearly as practicable by the neat lines as shown in details of footings for Bents No. 2, 3 & 4 on Sheet No. 4.
- Red sandy gravel or reddish gray to white gypsum shall develop a minimum bearing value of 3.75 tons per sq. ft. If the bearing value is less than 3.75 tons per sq. ft. communicate with the BRIDGE SECTION.
- Final footing elevations for Bents No. 2, 3, & 4 shall be established before ordering column reinforcing steel for the respective bents.



ELEVATION

### ESTIMATED QUANTITIES

ITEM	Ct. 2" Concrete Cu. Yds.	Steel-Lbs. Rein. Struct.	Type-A Steel Piling-Lin. Ft.	Timber Piling-Lin. Ft.		Steel Pile shoes No.	Excavation-Cu. Yds.		
				Treated Timber Piles	Test Pile		Struct.	Unclass.	
Superstructure	170.1	52,450	118,890	456.3					
Sill No. 1	23.2	2205			11 @ 25=275	1 @ 30=30	12	18	
Sill No. 5	23.2	2205			11 @ 25=275	1 @ 30=30	12	18	
Bent No. 2	25.2	6825						60	
Bent No. 3	25.2	6825						65	
Bent No. 4	25.2	6825						80	
<b>Totals</b>	<b>292.1</b>	<b>77335</b>	<b>118890</b>	<b>456.3</b>	<b>550</b>	<b>60</b>	<b>*24</b>	<b>241</b>	<b>15879</b>

One Treated Timber Test Pile shall be driven at Sills No. 1 and 5 before remaining piles are ordered.  
 See Grading Plans for Unclassified Excavation.  
 PILE NOTE: - Piles driven at Sills No. 1 and 5 including test piles, shall obtain their full bearing (24 tons) in the natural ground below the new embankments, elevations 3620.05 and 3617.81 respectively. Pre-bored holes thru the fill to natural ground are required, and shall have a minimum diameter 2" larger than the nominal diameter (3' from butt) of the pile.  
 \*All Steel Pile Shoes as approved by the ENGINEER shall be used.

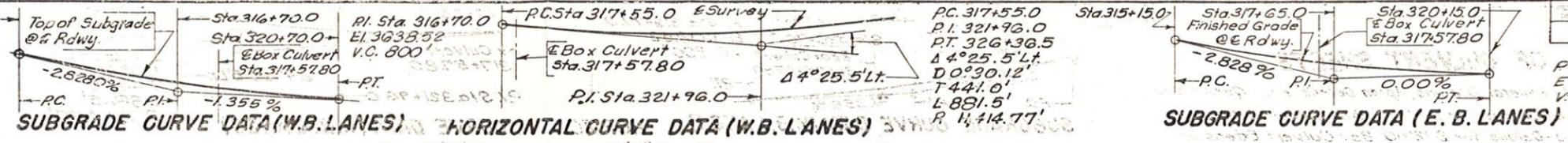
**SPECIFICATION NOTE.**  
 Use current South Dakota Standard Specification for Roads and Bridges, and Supplemental Specifications as included in the proposal.

- GENERAL NOTES.**
- Longitudinal elements of the slab shall conform to the vertical curve.
  - For elevations of Grout Pads G1, G2, G3, & G4, see table on Erection Data sheet.
  - Surface finish, Sec. 46.3 x (3) of the current South Dakota Standard Specifications, shall include such portions of the structure which are visible from any traveled lane.
  - Rail Posts shall be built vertical.
  - Omit Floor Drains.

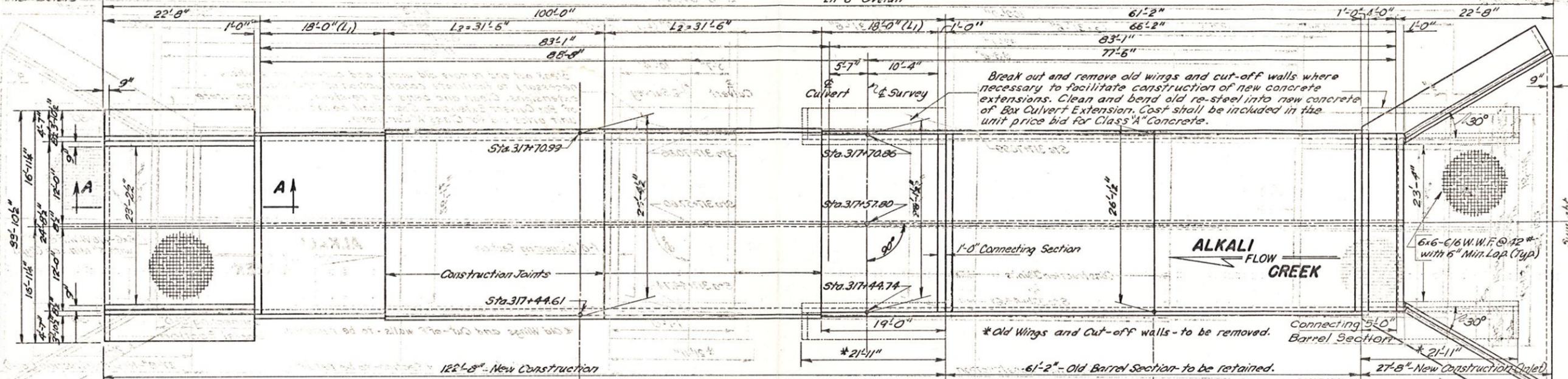
GENERAL DRAWING AND QUANTITIES  
 FOR  
**227'-0" CONT. COMP. GIRDER VIADUCT**  
 30'-0" ROADWAY  
 OVER I.S. NO. 90 STA. 460+44.4 SEC. 18/19-T4N-R6E  
 STA. 4+86.50 TO STA. 7+13.50 I 90-1(9)38  
 MEADE COUNTY  
 SOUTH DAKOTA H20-S16-44  
 DEPARTMENT OF HIGHWAYS

**-X028-  
INDEX OF CULVERT SHEETS**

Sheet No.1 - General Drawing, Apron Details and Quantities.  
 Sheet No.2 - Details for 2-12'x10' Box Culvert Extension.  
 Sheet No.3 - Details for 2-12'x10' Box Culvert Extension.  
 Sheet No.4 - Inlet Details



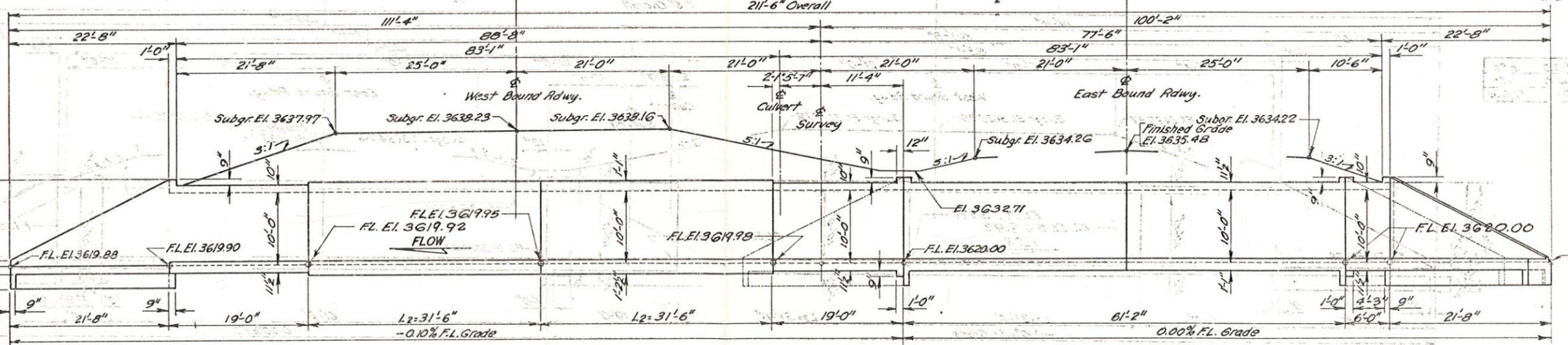
ROAD	STATE	FISCAL YEAR	SHEET NO.	TOTAL
4	57		257	



B.M. No. 40 - E.I. 3661.27  
 Rebar & Gds.  
 12.5' Ft. Sta. 304+00

B.M. No. 41 - E.I. 3631.84  
 Rebar & Gds.  
 12.5' Ft. Sta. 318+50

Q	700	cfs.
A	140	ft. <sup>2</sup>
V	5.0	ft./sec.



**GENERAL DRAWING, APRON DETAILS AND QUANTITIES  
 FOR  
 2-12'x10' BOX CULVERT EXTENSION**

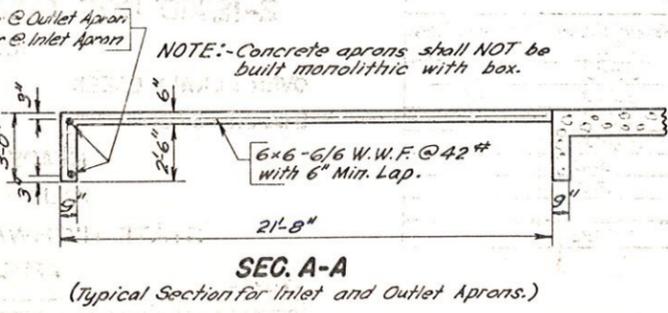
105'-0"  
 OVER ALKALI CREEK  
 STA. 317+57.80  
 MADE COUNTY  
 SOUTH DAKOTA  
 STATE HIGHWAY COMMISSION  
 SEC. 23-T5N-R5E  
 1 90-1(4) 28  
 H20-S16-44 & ALT.

- GENERAL NOTES-**
- Use current South Dakota Standard Specifications for Roads and Bridges and the Supplemental Specifications as included in the Proposal.
  - Design Loading - H20-S16-44 (T-Current) A.A.S.H.O. & Alt.
  - All Reinforcing Steel shall conform to A.S.T.M. Specifications - A 305 (T-Current) and A 15 (T-Current) Intermediate Grade.
  - Unit Stresses - Concrete  $f_c = 1,600$  p.s.i.  
 Reinf. Steel  $f_s = 20,000$  p.s.i. (Int. Grade)
  - All exposed edges shall be chamfered 1".
- (Alternate Loading as designated in P.P.M. 20-4, Section 4c.)

**ESTIMATED QUANTITIES**

ITEM	Cl. A Concrete Cu Yds.	Reinf. Steel Lbs.	Str. Exc. - Cu Yds. (Below F.L.)
1 - Inlet (Incl. 5'-0" Conn. Barrel Sect. - L1)	44.22	6058	21
1 - Outlet	22.80	3063	13
2 - Barrel Sections - L1	98.11	16,915	36
2 - Barrel Sections - L2	202.76	38,437	77
1 - Inlet Apron	17.71	548	18
1 - Outlet Apron	1092	317	11
<b>Totals</b>	<b>396.52</b>	<b>65,338</b>	<b>176</b>

\*Includes 1'-0" Connecting Section.



B.M. #1 Elev. 3619.19  
Top of 18" R.C. Pipe  
115' L. of Sta. 299+00

Break out and remove old wings and cut-off wall where necessary. Clean and bend 12" of old re-steel into new concrete of Box Culvert Extension. Cost shall be included in the unit price bid for Class "A" Concrete.

B.M. #2 Elev. 3623.66  
Iron Pin & Gds.  
217' L. of Sta. 317+82

FED. HWY. ADMIN. NO.	STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
8	S.D.	7-90-1 (49) 37	45	132

**INDEX OF CULVERT SHEETS**

Sheet No 1- General Drawing, Apron Details and Quantities.  
Sheet No 2- Inlet Details.  
Sheet No 3- S<sub>1</sub> Barrel Section Details at Inlet End  
Sheet No 4- S<sub>1</sub> Barrel Section Details.  
Sheet No 5- Details of Standard Plates No. 306 and 307.  
Sheet No 6- Details of Standard Plate No. 308.

**SPECIFICATION NOTE-**

Use South Dakota Standard Specifications for Roads and Bridges, 1977 Edition and Required Provisions Supplemental Specifications and/or Special Provisions as included in the proposal.

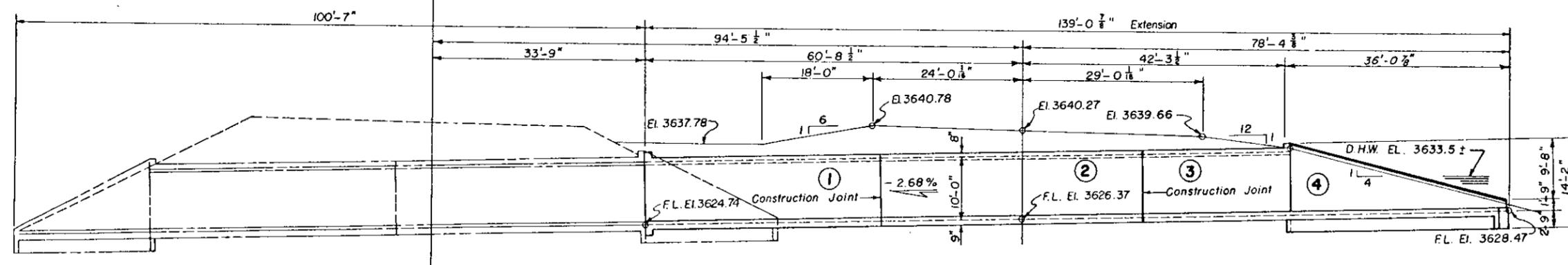
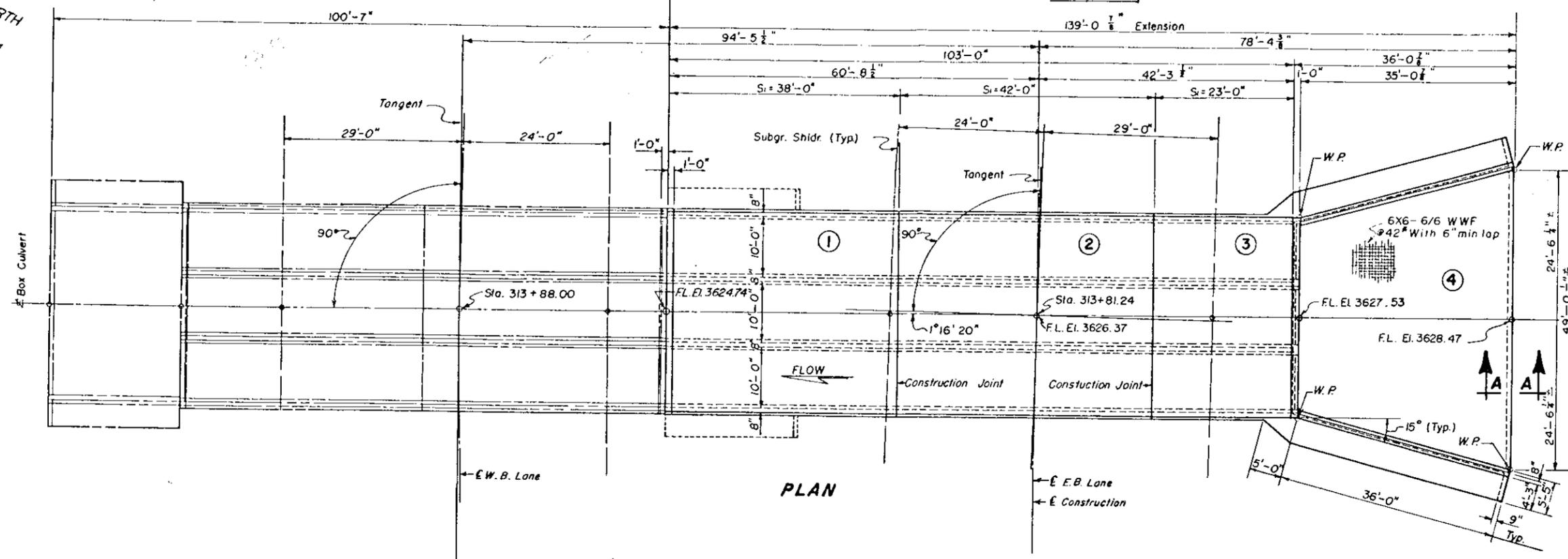
**DESIGN MIX OF CONCRETE-**

- Mix shall be designed to produce a concrete having a minimum compressive strength of 4,500 p.s.i. at 28 days.
- Type II Cement is required.

**GENERAL NOTES-**

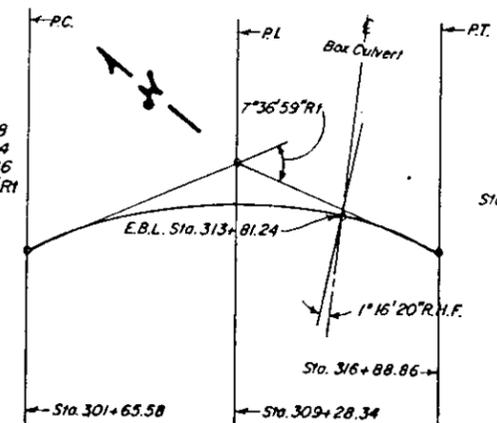
- All exposed edges shall be chamfered 3/4".
- Design Specification A.A.S.H.T.O. Specifications for Highway Bridges, 1977 Edition.
- Design Loading: HS 20-44 A.A.S.H.T.O. and Alternate Loading.
- All Reinforcing Steel shall conform to A.S.T.M. - A615 Grade 60.
- Unit Stresses Concrete  $f_c = 1,800$  p.s.i. Reinforcing Steel  $f_s = 24,000$  p.s.i.
- The design of the barrel sections is based on maximum fill over the box of 6 ft.
- The Contractor shall imprint on the structure the date of construction as specified and detailed on Standard Plate No. 308 which is on sheet No. 6 of 6.
- Core shall be taken to establish Working Points (W.P.) as shown on wings.

Q50	1100 c.f.s.
A	108 sq. ft.
V	102 f.p.s.
Q100	1600 c.f.s.
A	144 sq. ft.
V	111 f.p.s.



**H.C. DATA**

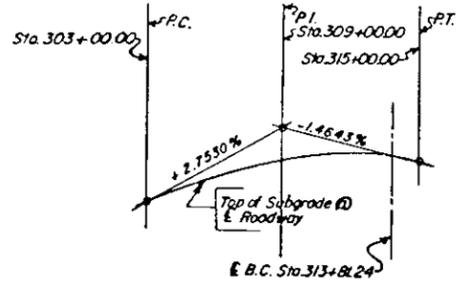
E. B. Lane  
PC = 301+65.58  
PI = 309+28.34  
PT = 316+88.86  
Δ = 7°36'59"Rt  
D = 0°30'  
T = 762.76'  
LC = 1523.28'  
R = 11459.16'



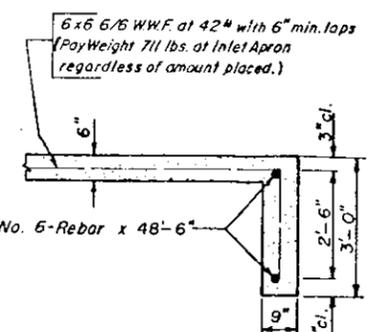
**HORIZONTAL CURVE DATA**

**V.C. DATA**

E. B. Lane  
P.I. Sta. 309+00.00  
El. 3648.00 (Subgr.)  
V.C. 1200'



**VERTICAL CURVE DATA**



**SEC. A-A**

NOTE -  
Inlet Apron shall NOT be built monolithic with Box Culvert

ESTIMATED QUANTITIES		
ITEM	UNIT	QUANTITY
Class "A" Concrete Box Culvert	Cu. Yds.	359.5
Reinforcement Concrete Masonry	Lbs.	57,045
Structure Excavation Box Culvert	Cu. Yds.	145.3

**GENERAL DRAWING, APRON DETAILS AND QUANTITIES FOR SPECIAL 3-10'x10' BOX CULVERT EXTENSION 0° SKEW**

OVER PLEASANT VALLEY CREEK SEC. 6-T 4N-R6E  
E.B. LANE STA. 313+81.24 I 90-1 (49) 37  
STR. NO. 47-064-484 HS 20-44 (8 ALT.)

MEADE COUNTY  
S.D. DEPT. OF TRANSPORTATION  
DIVISION OF HIGHWAYS

SEPT. 1980 1 OF 6

SHEET 45 OF 132 SHEETS

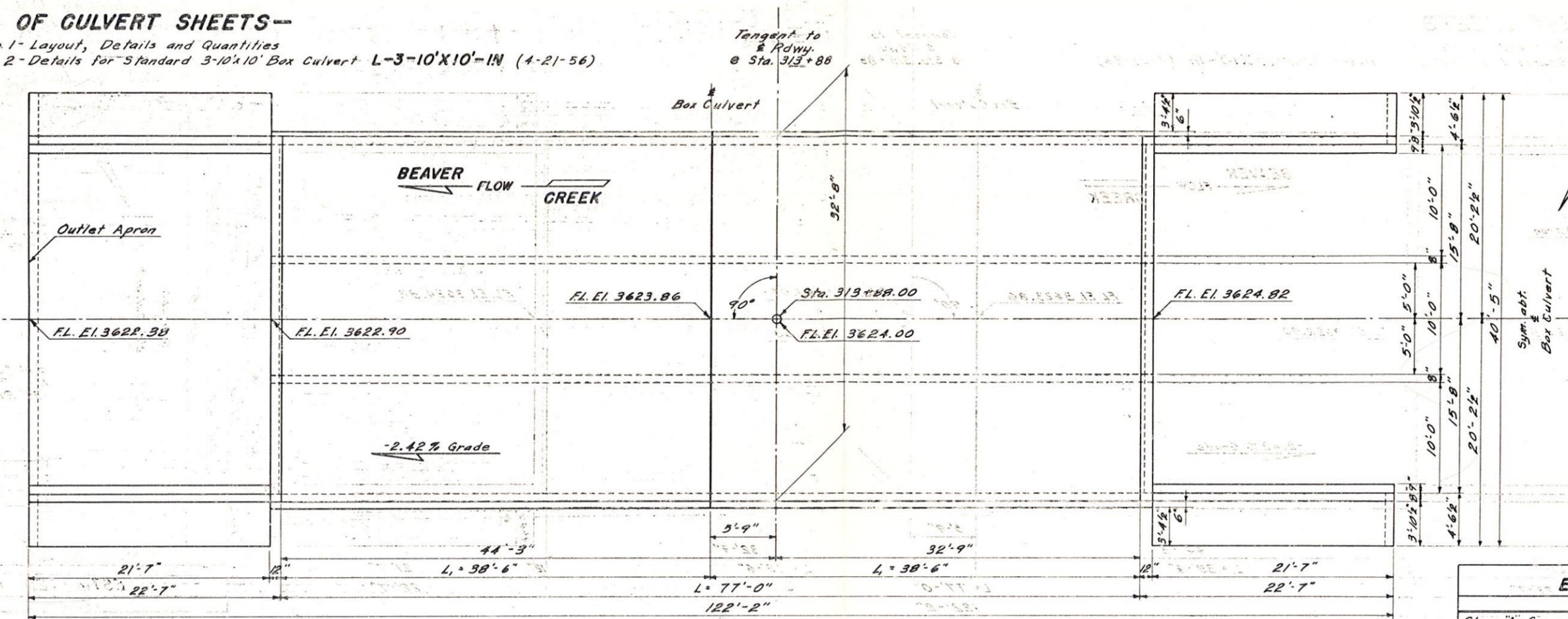
PLANS BY  
BRIDGE PROGRAM S. DAK. DIVISION OF HWYS.

DESIGNED BY	DRAWN BY	CHECKED BY	APPROVED
	K.M.	W.C.P.	H.C. Wilson BRIDGE ENGINEER

**INDEX OF GULVERT SHEETS-**

Sheet No. 1 - Layout, Details and Quantities  
 Sheet No. 2 - Details for Standard 3'-10" x 10' Box Culvert L-3-10' x 10' - IN (4-21-56)

FED. ROAD DIST. NO.	STATE	FISCAL YEAR	SHEET NO.	TOTAL
5	S.D.			



B.M. #56A - E.I. 3630.77  
 Iron Pin and Gd.  
 116' Rt. Sta. 322+76

B.M. #55A - E.I. 3635.23  
 Iron Pin and Gd.  
 155' Rt. Sta. 310+84

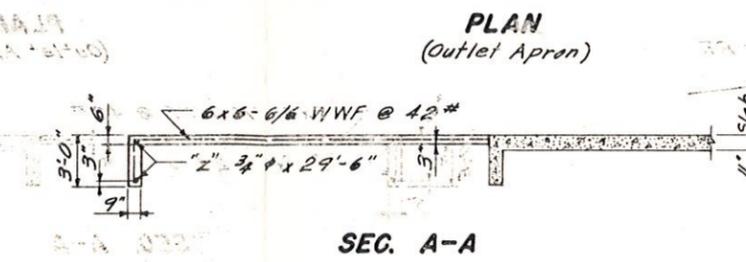
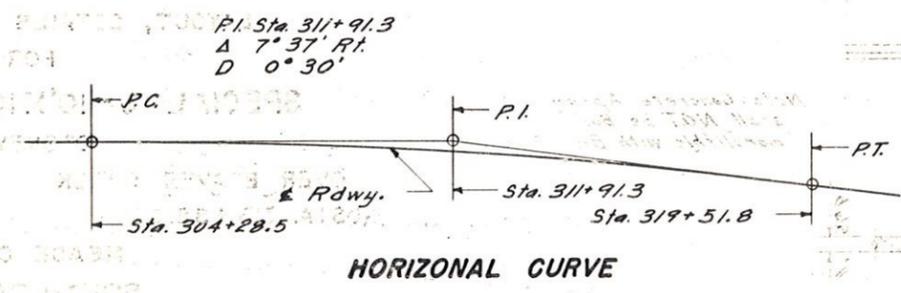
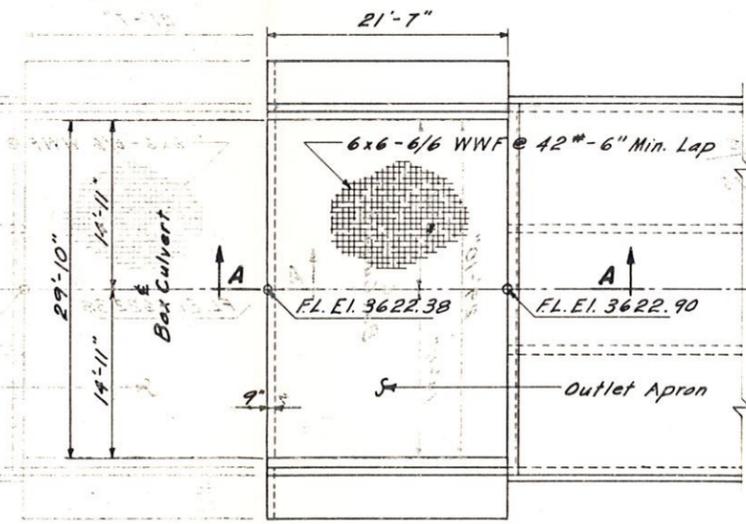
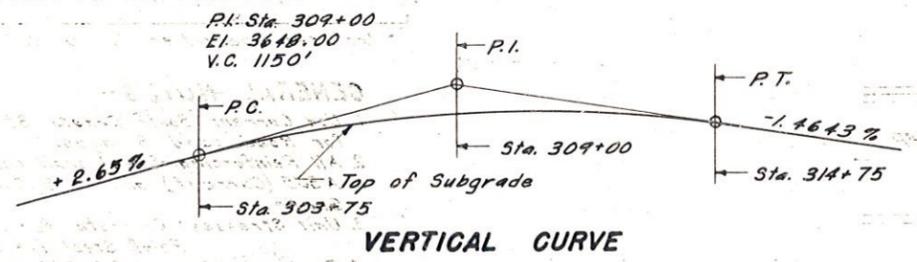
Q	1510	c.f.s.
A	100	sq. ft.
V	15.1*	Ft./sec.

ESTIMATED QUANTITIES		
ITEM		Quantity *
Class "A" Concrete	Cu. Yds.	303.7
Reinforcing Steel	Lbs.	48,365
Structure Excavation (Below F.L.)	Cu. Yds.	130

\* Includes Quantities for Outlet Apron.

**GENERAL NOTES-**

- Use Current South Dakota Standard Specifications for Roads and Bridges.
- All Reinforcing Steel shall conform to A.S.T.M. A 305 (Current) and A 15 (Current) Intermediate Grade.
- Unit Stresses: Concrete  $f_c = 1600$  p.s.i.  
Reinf. Steel  $f_s = 20,000$  p.s.i.
- Design Loading: H20-S16-44 A.A.S.H.O.



Note: Concrete Apron shall NOT be built monolithic with Box.

LAYOUT, DETAILS AND QUANTITIES FOR  
**SPECIAL 3'-10" X 10' BOX CULVERT**  
 0° SKEW

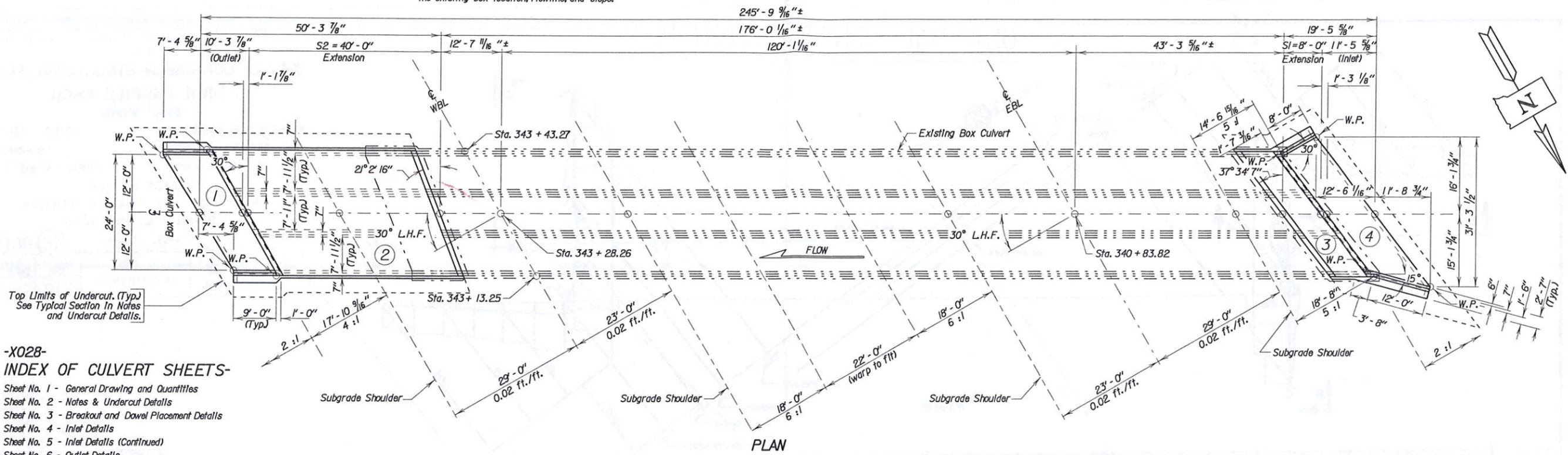
OVER BEAVER CREEK SEC. 6-T4N-R6E  
 STA. 313+88.00 IN 88 (7)

MEADE COUNTY  
 SOUTH DAKOTA H20-S16-44  
 STATE HIGHWAY COMMISSION

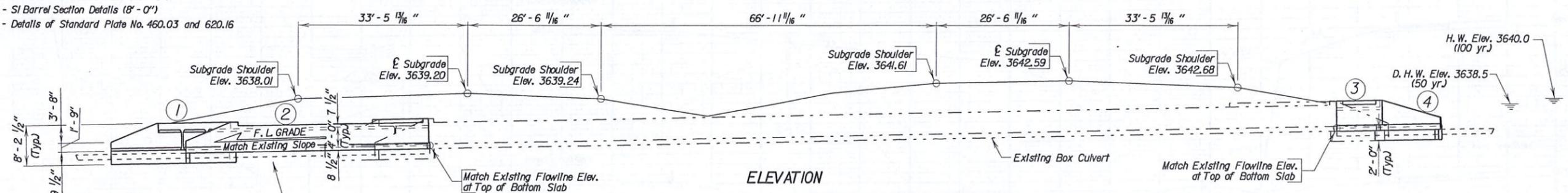
The elevations shown in these plans are based on the National Geodetic Survey (NGS) North American Vertical Datum of 1988 (NAVD88).

NOTE: All stations and elevations are based on the survey of the existing box culvert. The intent is to match the existing box location, flowline, and slope.

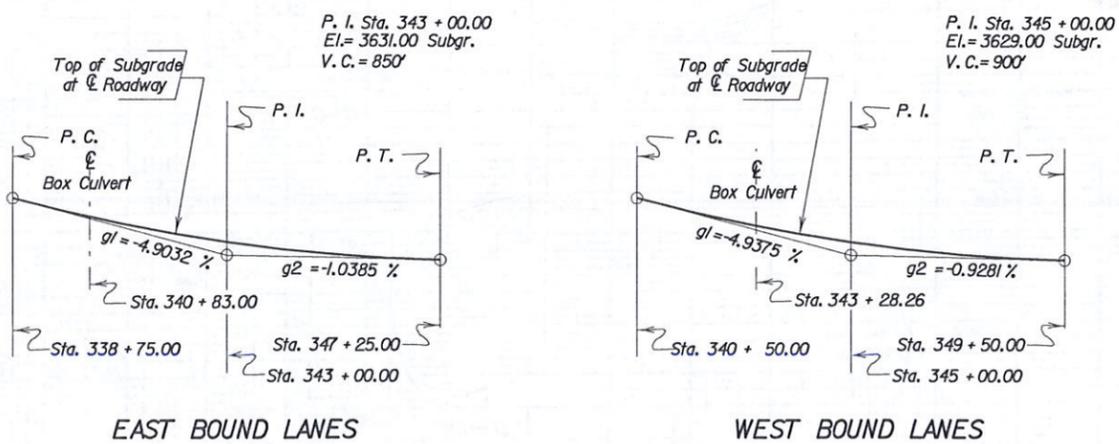
STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	IM 090(120)33	E43	E69



- X028-  
INDEX OF CULVERT SHEETS-**
- Sheet No. 1 - General Drawing and Quantities
  - Sheet No. 2 - Notes & Undercut Details
  - Sheet No. 3 - Breakout and Dowel Placement Details
  - Sheet No. 4 - Inlet Details
  - Sheet No. 5 - Inlet Details (Continued)
  - Sheet No. 6 - Outlet Details
  - Sheet No. 7 - S2 Barrel Section Details (40'-0")
  - Sheet No. 8 - S1 Barrel Section Details (8'-0")
  - Sheet No. 9 - Details of Standard Plate No. 460.03 and 620.16



ESTIMATED QUANTITIES		
ITEM	UNIT	QUANTITY
Class A45 Concrete, Box Culvert	Cu.Yd.	117.0
Breakout Structural Concrete	Cu.Yd.	20.9
Install Dowel In Concrete	Each	80
Reinforcing Steel	Lb.	25965
Structure Excavation, Box Culvert	Cu.Yd.	58.3
Box Culvert Undercut	Cu.Yd.	94



VERTICAL CURVE DATA

**HYDRAULIC DATA**

$Q_d$	640 cfs
$A_d$	35 sq.ft.
$V_d$	18.1 fps
$Q_F$	640 cfs
$Q_{100}$	1010 cfs
$Q_{OT}$	726 cfs
$V_{max}$	19.6 fps

$Q_d$  = Design discharge for the proposed culvert based on 50 year frequency, El. 3638.5.  
 $Q_{OT}$  = Overtopping discharge and frequency 62 yr. recurrence interval, El. 3639.0, Location Sta. 343 ± Rt. Ditch.  
 $Q_F$  = Designated peak discharge for the basin approaching proposed project based on 50 year frequency.  
 $Q_{100}$  = Computed discharge for the basin approaching proposed project based on 100 year frequency, El. 3640.0.  
 $V_{max}$  = Maximum computed outlet velocity for the proposed culvert based on a 100 year frequency.

GENERAL DRAWING AND QUANTITIES FOR

**3 - 8' X 4' BOX CULVERT EXTENSION**

STA. 343+28.26 (WBL) 30° L.H.F. SKEW  
 OVER FORBES GULCH SEC. 18-T4N-R6E  
 STR. NO. 47-068-501 IM 090(120)33  
 PCN 6180 HS 20-44 (& ALT.)

MEADE COUNTY  
 S. D. DEPT. OF TRANSPORTATION  
 NOVEMBER 2006

-X028-  
 DESIGNED BY PW/AV MEAD6180  
 DRAWN BY AV/JK 6180KGOI  
 CHECKED BY PW/TB  
 Kevin N. Goeden  
 BRIDGE ENGINEER

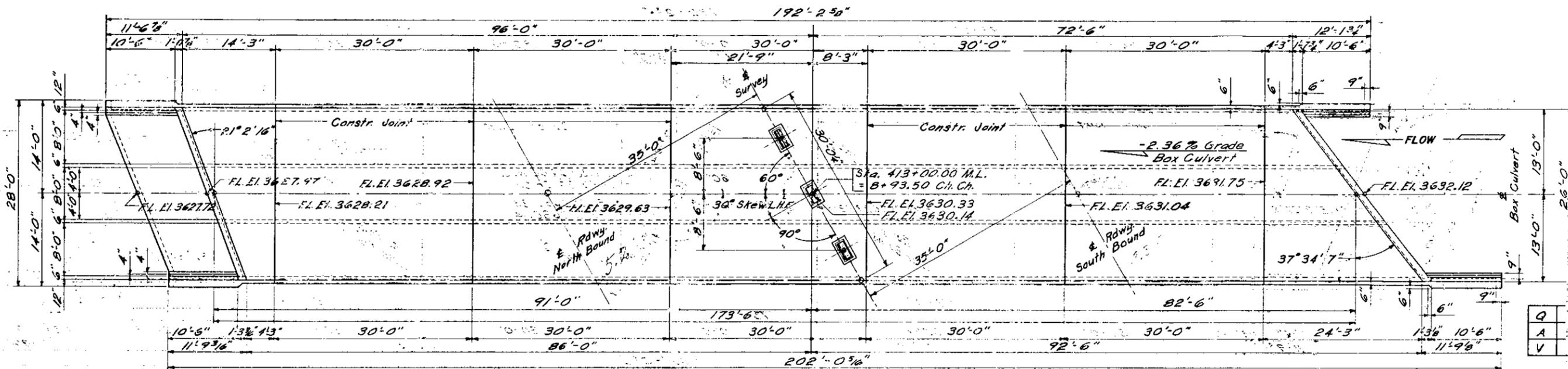
PLANS BY : OFFICE OF BRIDGE DESIGN, SOUTH DAKOTA DEPARTMENT OF TRANSPORTATION

**INDEX OF CULVERT SHEETS-**

Sheet No.1-Layout, Details and Quantities for Special 3-8'x4' Box Culvert.  
 Sheet No.2-Details for Special 3-8'x4' Box Culvert.  
 Sheet No.3-Details for Special 3-8'x4' Box Culvert.

B.M. #74 - El. 3658.47  
 Iron Pin & Gds.  
 66' Rt. Sta. 406+00

B.M. #76 - El. 3631.91  
 Iron Pin & Gds.  
 90' Lt. Sta. 414+00



Q	966 c.f.s.
A	42 sq.ft.
V	12.8 f.p.s.

LAYOUT

**ESTIMATED QUANTITIES**

ITEM	Quantity
Glass "A" Concrete	Cu.Yds. 287.0
Reinforcing Steel	Lbs. 58,420
Structure Excavation (Below FL.)	Cu.Yds. 125
Grate Assembly	No. 3

\* Includes Quantities for Outlet Apron and three Drop Inlets.

**GENERAL NOTES--**

- Use current South Dakota Standard Specifications for Roads and Bridges.
- Design Loading: H20S16-44
- All reinforcing steel shall conform to ASTM A305 50T and A15-50T (Intermediate Grade).
- All exposed edges shall be chamfered one inch.
- Grate Assembly shown is No. R-3393 Standard D-6, Neenah Foundry Co., Neenah Wisconsin. Equivalent Grate Assembly may be used, if acceptable to the Engineer.

LAYOUT, DETAILS AND QUANTITIES

FOR  
**SPECIAL 3-8'x4' BOX CULVERT**  
 30° SKEW L.H.F.

OVER DRAW SEC. 18-T4N-R6E  
 STA. 413+00.00 IN 88 (7)

MEADE COUNTY  
 SOUTH DAKOTA H20-S16-44

STATE HIGHWAY COMMISSION

JAN. 1956 ① OF ③

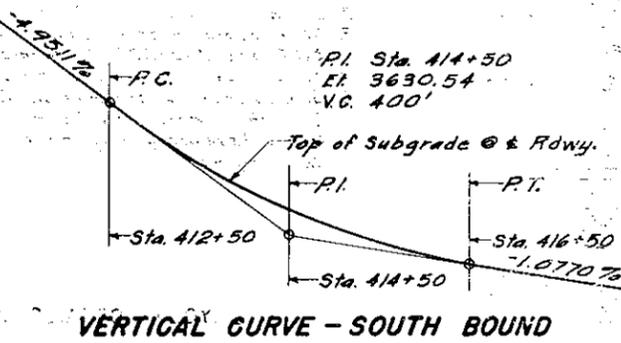
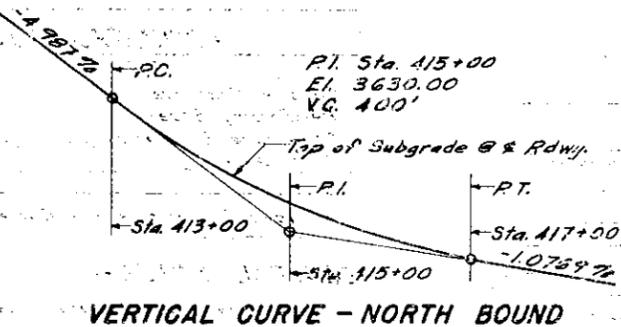
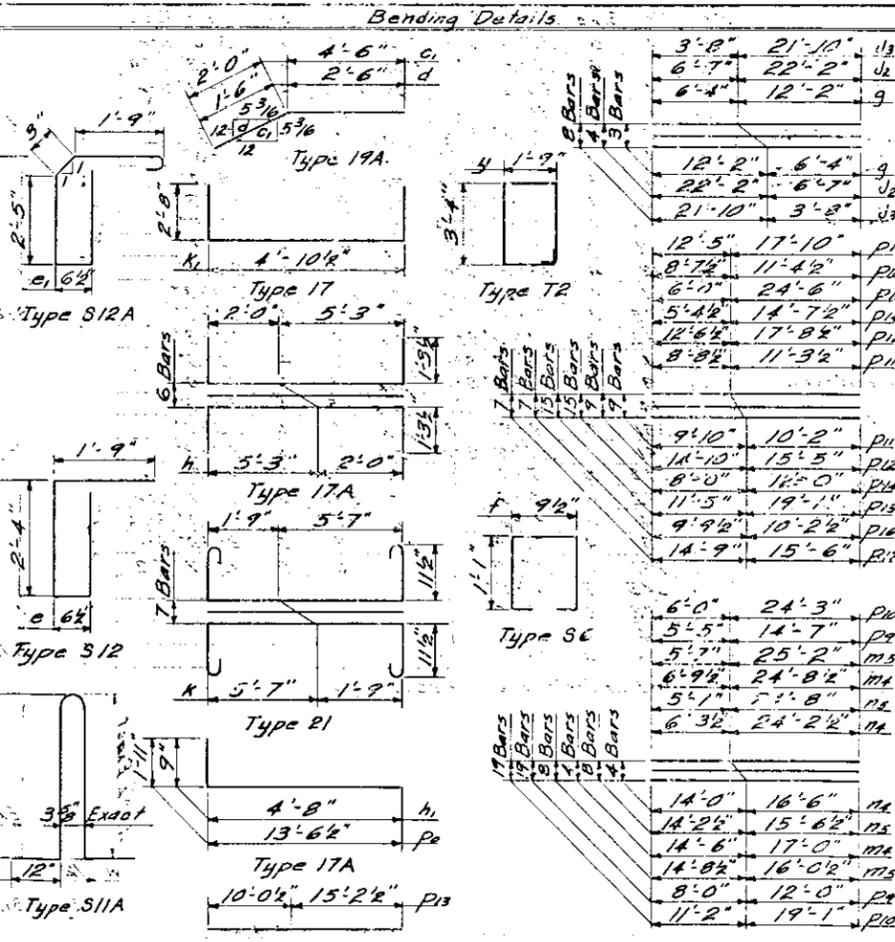
DESIGNED BY: [Signature]  
 DRAWN BY: [Signature]  
 CHECKED BY: R.K.  
 APPROVED: [Signature]  
 BRIDGE ENGINEER

**REINFORCING SCHEDULE**

MR	No	Size	Length	Type	MR	No	Size	Length	Type
a	4	6	27'-6"	Str.	*p	20	6	13'-6"	Str.
ai	4	6	32'-3"		*p	8	6	15'-3"	17A
b	4	6	26'-6"		p	690	4	27'-9"	Str.
bi	4	6	31'-3"		pe	18	4	5'-6"	
e	16	5	11'-6"	Str.	pe	9	4	8'-3"	
ci	4	11	6'-6"	19A	pe	9	4	11'-6"	
d	16	4	4'-0"	19A	pe	9	4	15'-0"	
e	58	4	6'-9"	S12	pe	9	4	25'-3"	
ei	36	4	7'-9"	S12	pe	9	4	18'-3"	
f	62	4	3'-6"	S6	pe	9	4	11'-9"	
g	12	4	18'-6"	Str.	pe	19	4	20'-0"	
h	12	4	7'-6"	17A	pe	19	4	30'-3"	
i	235	4	5'-3"	17A	pe	9	4	20'-0"	
ja	162	6	24'-0"	Str.	pe	9	4	30'-3"	
jb	4	6	28'-9"	Str.	pe	2	4	25'-3"	
jc	8	6	25'-8"	Str.	pe	15	4	20'-0"	
k	14	4	10'-0"	2L	pe	15	4	30'-6"	
ki	351	6	9'-9"	17	pe	7	4	20'-0"	
mi	161	4	26'-9"	Str.	pe	7	4	30'-3"	
ma	343	5	7'-3"		s	676	6	4'-0"	
ms	172	4	6'-0"		t	346	6	5'-0"	Str.
ma	4	4	31'-6"		w	352	5	11'-0"	S11A
mb	8	4	30'-9"		x	2	6	25'-3"	Str.
ni	161	4	25'-9"		y	6	5	10'-9"	T2
na	343	7	7'-9"						
ns	172	6	6'-0"						
na	4	4	30'-6"						
nb	8	4	29'-9"	Str.					

\* Bend in field where necessary.

Note: All dimensions are out to out of bars.



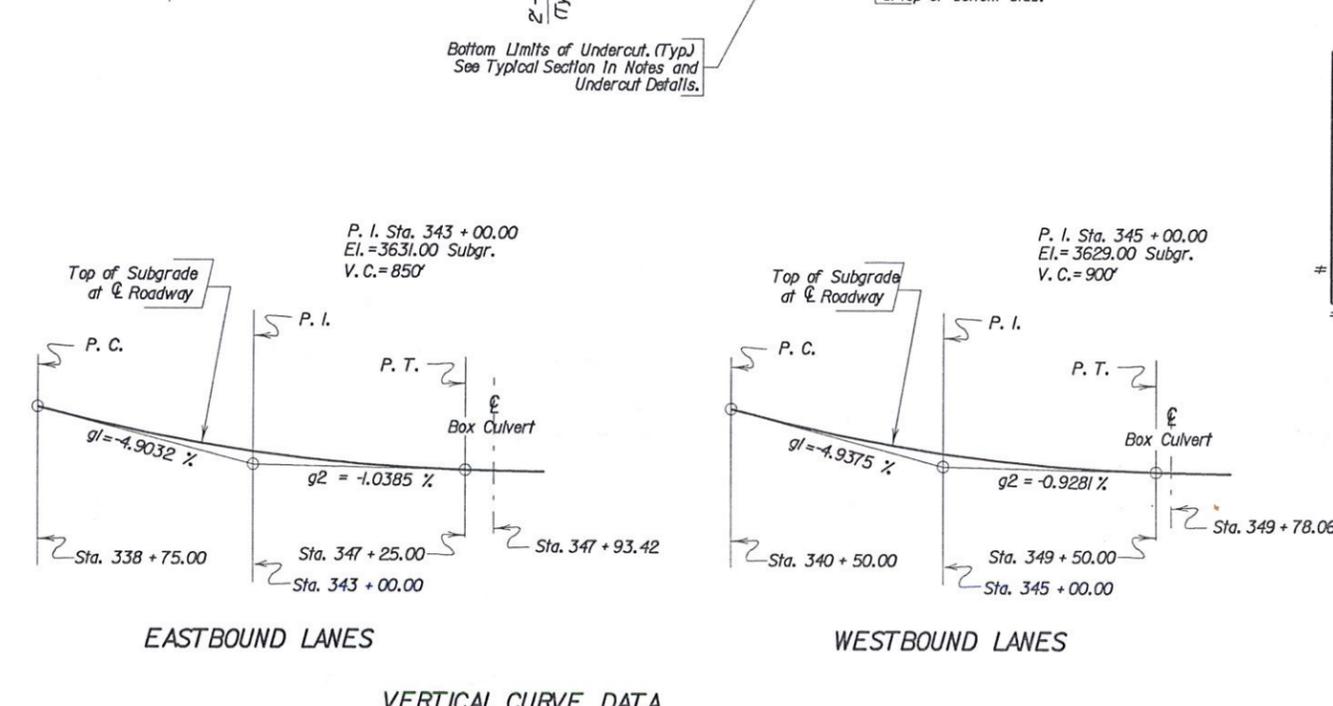
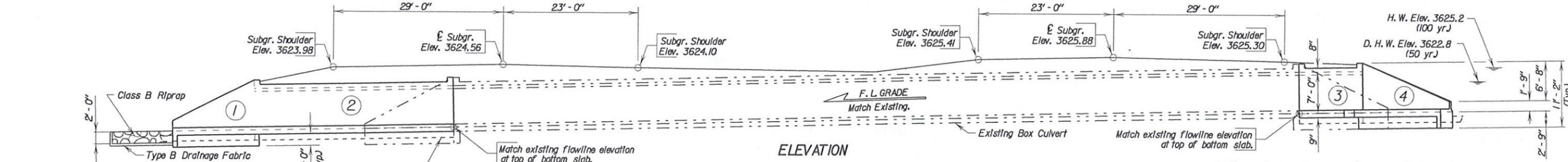
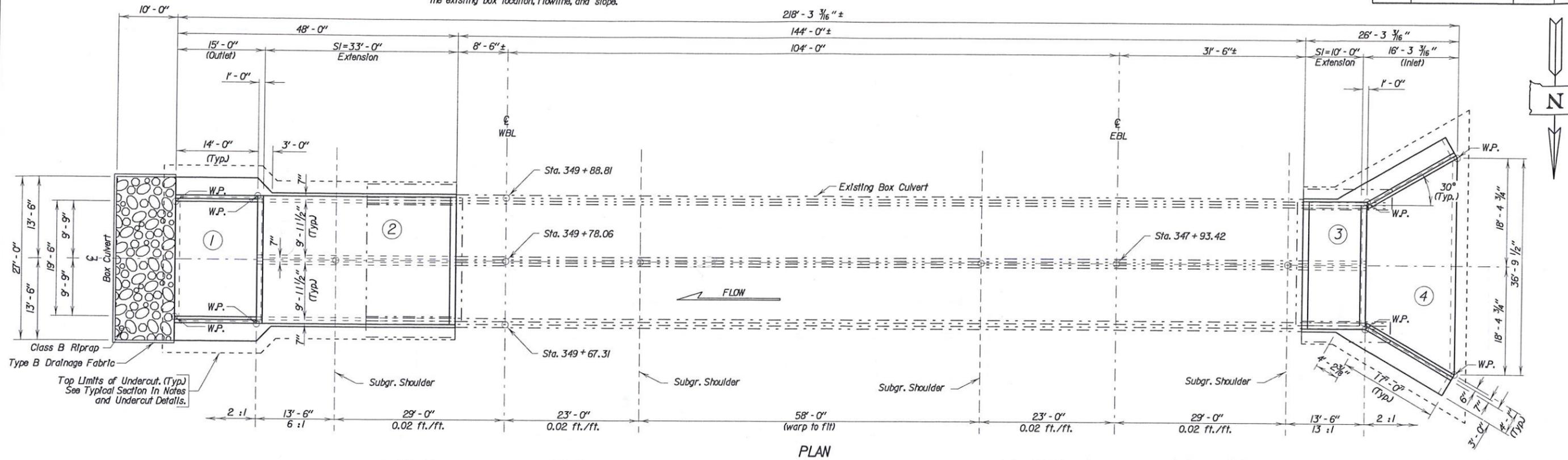
**LEGEND FOR PLACING RE-STEEL**

OFWW	- Outside Face of Wing Wall
IFWW	- Inside Face of Wing Wall
OFOW	- Outside Face of Outside Wall
IFOW	- Inside Face of Outside Wall
IW	- Inner Wall
TTS	- Top of Top Slab
BTS	- Bottom of Top Slab
TBS	- Top of Bottom Slab
BBS	- Bottom of Bottom Slab

The elevations shown in these plans are based on the National Geodetic Survey (NGS) North American Vertical Datum of 1988 (NAVD88).

NOTE: All stations and elevations are based on the survey of the existing box culvert. The intent is to match the existing box location, flowline, and slope.

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	IM 0901(20)33	E52	E69



ITEM	UNIT	QUANTITY
Class A45 Concrete, Box Culvert	Cu.Yd.	119.7
Breakout Structural Concrete	Cu.Yd.	36.3
Install Dowel In Concrete	Each	66
Reinforcing Steel	Lb.	20578
Structure Excavation, Box Culvert	Cu.Yd.	59.4
Box Culvert Undercut	Cu.Yd.	95
Class B Riprap	Ton	28.0
Type B Drainage Fabric	Sq.Yd.	46.4

\* For estimating purposes only, a factor of 1.4 tons/cu.yd. was used to convert Cu.Yds. to Tons.

HYDRAULIC DATA

$Q_d$	770 cfs
$A_d$	42 sq.ft.
$V_d$	18.5 fps
$Q_F$	770 cfs
$Q_{100}$	1244 cfs
$V_{max}$	20.5 fps

$Q_d$  = Design discharge for the proposed culvert based on 50 year frequency. El. 3622.8  
 $Q_F$  = Designated peak discharge for the basin approaching proposed project based on 50 year frequency.  
 $Q_{100}$  = Computed discharge for the basin approaching proposed project based on 100 year frequency. El. 3625.2  
 $V_{max}$  = Maximum computed outlet velocity for the proposed culvert based on a 100 year frequency.

GENERAL DRAWING AND QUANTITIES FOR 2 - 10' X 7' BOX CULVERT EXTENSION

STA. 349+78.06 (WBL) 0° SKEW  
 OVER BREAKNECK GULCH SEC. 18-T4N-R6E  
 STR. NO. 47-068-503 IM 0901(20)33  
 PCN 6180 HS 20-44 (& ALT.)

MEADE COUNTY S. D. DEPT. OF TRANSPORTATION NOVEMBER 2006 1 OF 8

-X028- INDEX OF CULVERT SHEETS-  
 Sheet No. 1 - General Drawing and Quantities  
 Sheet No. 2 - Notes & Undercut Details  
 Sheet No. 3 - Breakout and Dowel Placement Details  
 Sheet No. 4 - Inlet Details  
 Sheet No. 5 - Outlet Details  
 Sheet No. 6 - SI Barrel Section Details (33' - 0")  
 Sheet No. 7 - SI Barrel Section Details (10' - 0")  
 Sheet No. 8 - Details of Standard Plate No. 460.03 and 620.16

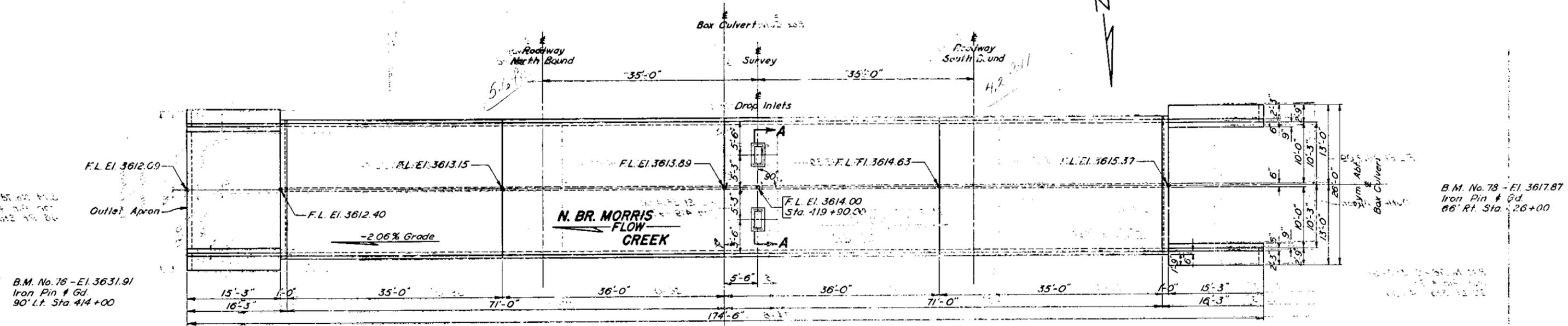
PLANS BY: OFFICE OF BRIDGE DESIGN, SOUTH DAKOTA DEPARTMENT OF TRANSPORTATION

DESIGNED BY PW/SJ MEAD6180  
 DRAWN BY AV/JK 6180KH01  
 CHECKED BY PW/TB  
 Kevin N. Coeden BRIDGE ENGINEER

**-X028-**  
**INDEX OF CULVERT SHEETS—**

Sheet No. 1—Layout, Details and Quantities.  
 Sheet No. 2—Details for 2-10'x7' Box Culvert

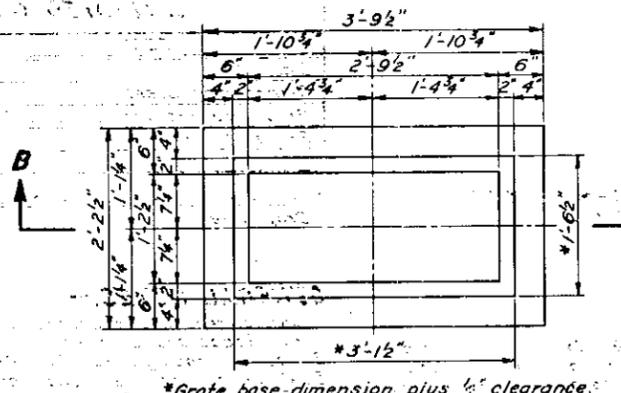
FED. ROAD DIST. NO.	STATE	FISCAL YEAR	SHEET NO.
5	S.D.		



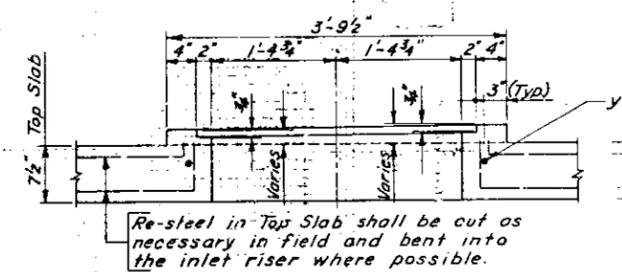
B.M. No. 76 - El. 3631.91  
 Iron Pin # 6d  
 90' Lt. Sta. 414+00

B.M. No. 78 - El. 3617.87  
 Iron Pin # 6d  
 66' Rt. Sta. 26+00

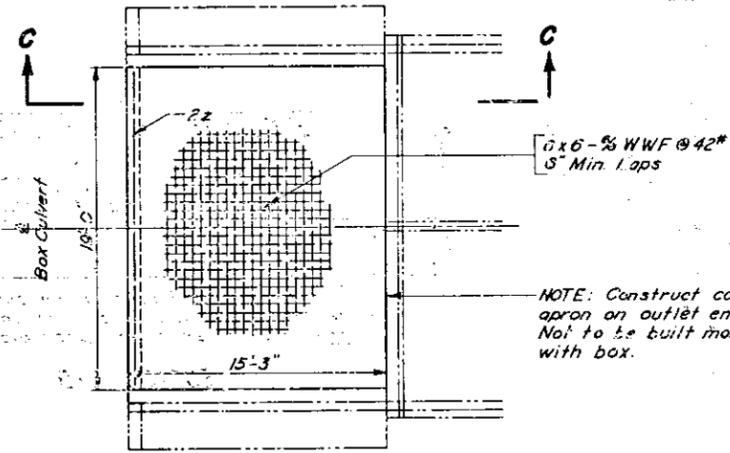
**LAYOUT JOINTS**



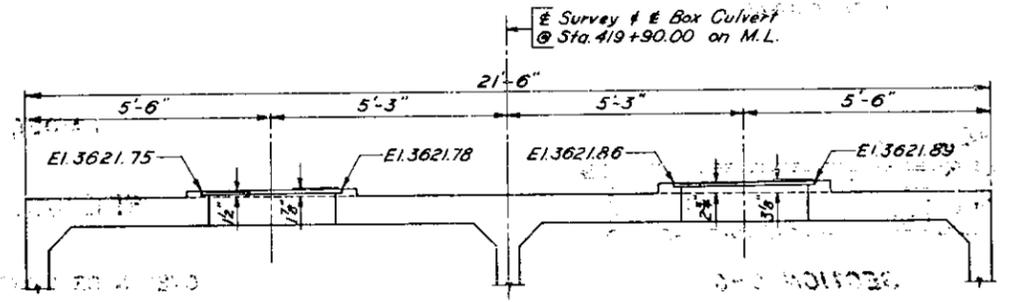
**TYPICAL DROP INLET PLAN**



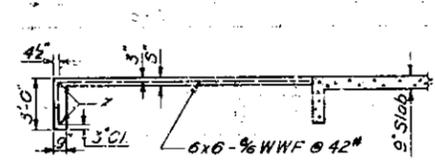
**SECTION B-B**



**PLAN OUTLET APRON**



**SECTION A-A**



**SECTION C-C**

ESTIMATED QUANTITIES		
ITEM		Quantity
Class A Concrete	Cu. Yds.	250.2
Reinforcing Steel	Lbs.	50,795
Structure Excavation (Below FL)	Cu. Yds.	108.9
Grate Assembly	No.	2

\* Includes Quantities for Outlet Apron and two Drop Inlets.

- GENERAL NOTES.—**
- Use current South Dakota Standard Specifications for Roads and Bridges.
  - Design Loading: H20 S16-44.
  - All reinforcing steel shall conform to A.S.T.M. A305 (Current) and A15 (Current). (Intermediate Grade)
  - All exposed edges shall be chamfered one inch.
  - Grate Assembly shown is No. R-339—Standard D-6, Neenah Foundry Co., Neenah, Wisconsin. Equivalent Grate Assembly may be used if acceptable to the Engineer.

**LAYOUT, DETAILS AND QUANTITIES FOR SPECIAL 2-10'x7' BOX CULVERT 0° SKEW**

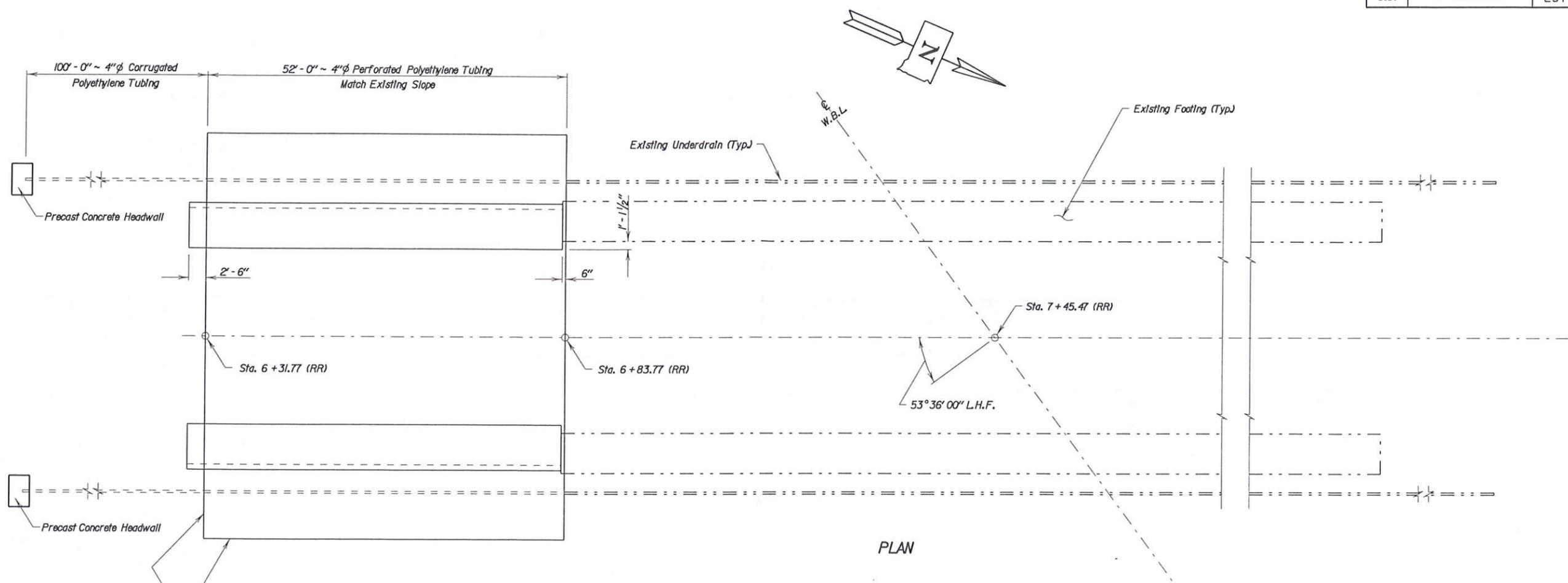
OVER N. BR. MORRIS CREEK  
 STA. 419 + 90.00

MEADE COUNTY  
 SOUTH DAKOTA H20-S16-44  
 STATE HIGHWAY COMMISSION

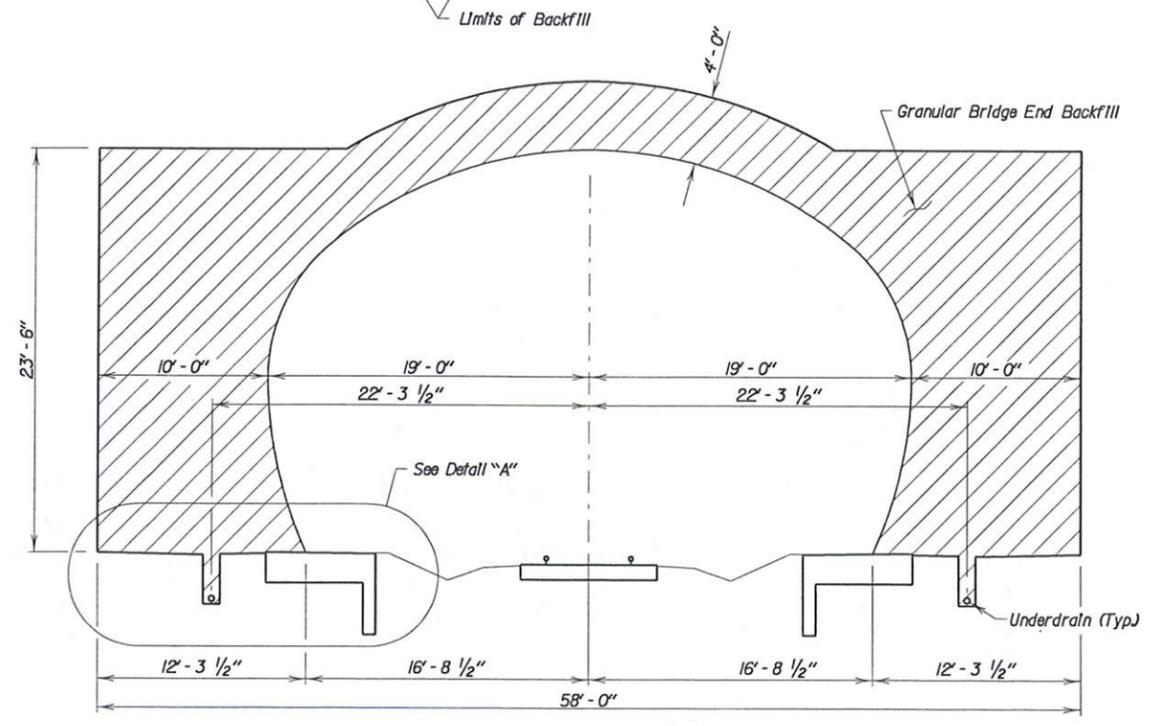
-X028- APRIL 1956 ① OF ②

DESIGNED BY	DRAWN BY	CHECKED BY	APPROVED
	R.C.M.		<i>[Signature]</i>

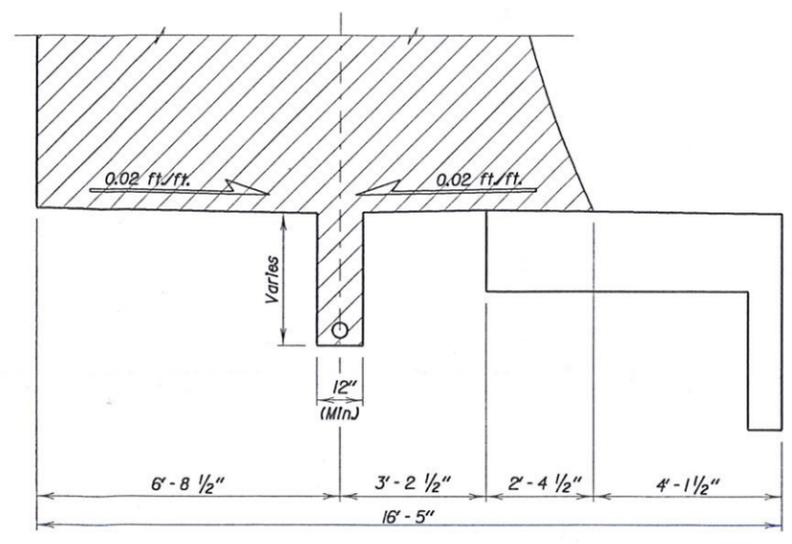
BRIDGE ENGINEER



PLAN



TYPICAL SECTION



DETAIL "A"

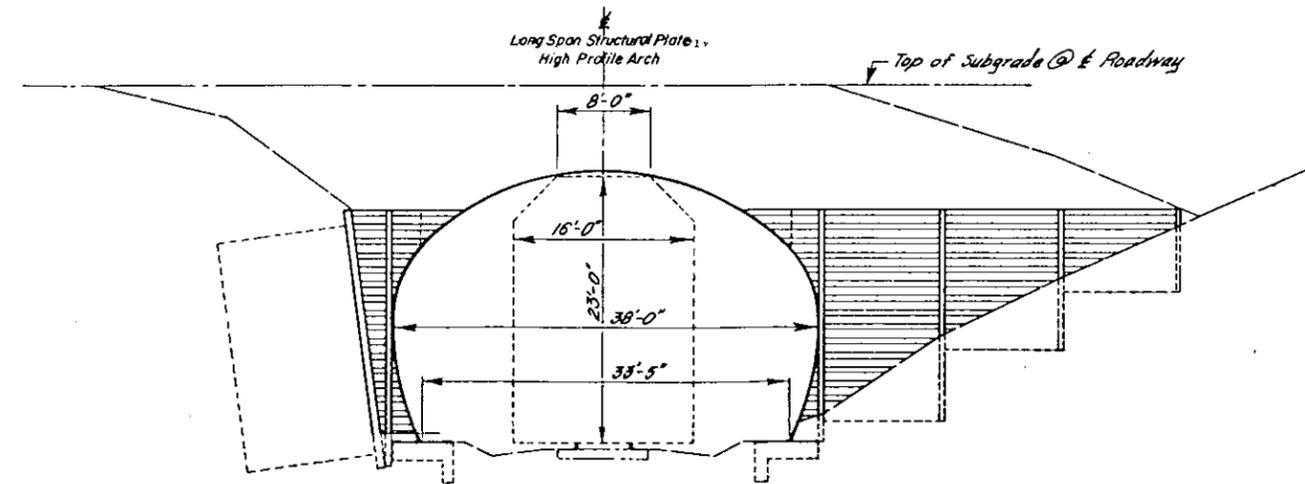
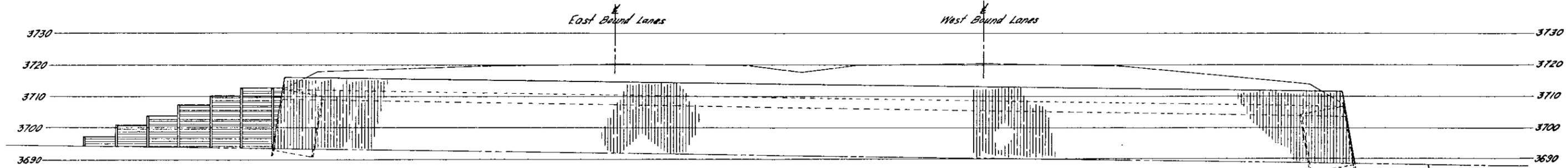
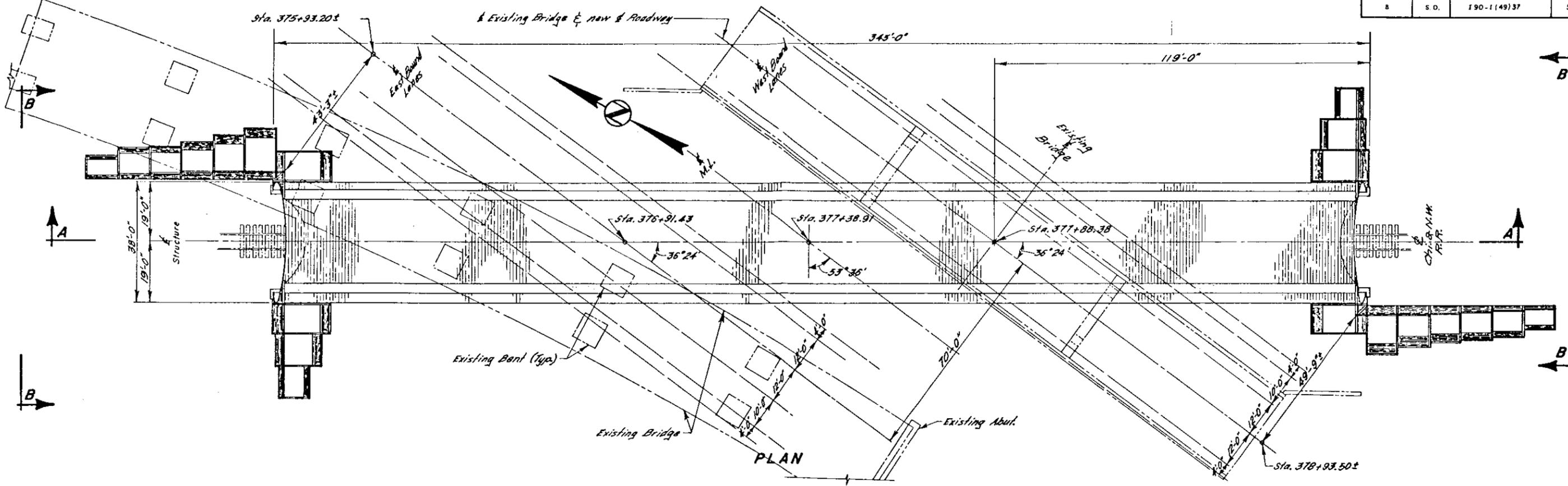
ESTIMATED QUANTITIES		
ITEM	UNIT	QUANTITY
Granular Bridge End Backfill	Cu. Yd.	1298.0
4" Underdrain Pipe	Ft.	304
Precast Concrete Headwall for Underdrain	Each	2

**LIMITS OF UNDERDRAIN & GRANULAR BACKFILL**  
 FOR  
**LONG SPAN STRUCTURAL PLATE**  
**HIGH PROFILE ARCH EXTENSION**  
 38' - 0" WIDTH  
 STA. 307+17.93 (WBL) 53° 36' 0" L.H.F. SKEW  
 OVER DM & E RAILROAD SEC. 7-T4N-R6E  
 STR. NO. 47-068-495 IM 090I(20)33  
 HS 20-44  
 (& ALT.)

MEADE COUNTY  
 S. D. DEPT. OF TRANSPORTATION  
 AUGUST 2007

DESIGNED BY DM/PW MEAD6180	DRAWN BY SG 6180GF05	CHECKED BY DM/PW	 BRIDGE ENGINEER
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FED. HWY. ADMIN. NO.	STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
8	S. D.	190-1(49)37	51	132



**INDEX OF STRUCTURE SHEETS-**

- 1 - General Drawing
- 2 - Estimate of Structure Quantities and Notes
- 3 - Limits of Select Granular Backfill & Unclassified Excavation
- 4 - Footing & Thrust Beam Details
- 5 - Binwall Details
- 6 - Notes for Underdrain System
- 7 - Underdrain System Details
- 8 - Special Cross Sections

**GENERAL DRAWING FOR 345'-0" LONG SPAN STRUCTURAL PLATE HIGH PROFILE ARCH**

38'-0" WIDTH

OVER CHI. & N.W. R.R. SEC. 7-T4N-R6E

STA. 376+91.43 CONST. 190-1(49)37

STR. NO. 47-068-495 SKEW 53° 36' L.H.F.

MEADE COUNTY

S. D. DEPT. OF TRANSPORTATION

DIVISION OF HIGHWAYS

OCT. 1980 (1) OF (8)

DESIGNED BY	DRAWN BY	CHECKED BY	APPROVED
	D. Behring		K.C. Wilson
			BRIDGE ENGINEER