MISSOULA BRIDGES
PLANNING STUDY

Appendix B

Existing and Projected Conditions Report

MISSOULA BRIDGES
PLANNING STUDY

EXISTING AND PROJECTED CONDITIONS REPORT

PREPARED FOR:

MONTANA MDT DEPARTMENT OF TRANSPORTATION

PREPARED BY:

DOWL HKM
104 East Broadway, Suite G-1
P.O. Box 1009
Helena, Montana 59624
(406) 442-0370

August 21, 2013

CONTENTS

1.0 INTRODUCTION 1

1.1 Study Area 1

2.0 TRANSPORTATION SYSTEM..... 2

2.1 Roadway System & Functional Classification 3
2.2 Bridge Design Standards 4
2.3 Higgins Avenue and Madison Street Bridges..... 4
2.3.1 Bridge Terminology..... 4
2.3.2 Bridge Type and Dimensions..... 6
2.3.3 Bridge Program Performance Measures 8
2.3.4 Structure Loading..... 11
2.3.5 Seismic Hazard..... 13
2.3.6 Channel Adequacy and Scour..... 14
2.3.7 Railings and Ramps..... 14
2.3.8 Right-of-Way and Jurisdiction..... 15
2.3.9 Bridge Projects 16
2.4 Bicycle and Pedestrian Elements 16
2.4.1 Non-Motorized Facilities and Usage..... 16
2.4.2 Bicycle Level of Service..... 17
2.5 Utilities 18
2.6 Transit..... 18
2.7 Crash Analysis 19
2.8 Traffic Volumes and Vehicular Operation 20
2.8.1 Higgins Avenue and Madison Street Bridge Segments..... 20
2.8.2 Study Intersections..... 22
2.9 Local Planning 26
2.9.1 Transportation Planning 26
2.9.2 Non-Motorized Transportation Planning..... 27
2.9.3 Land Use Planning..... 28

3.0 SOCIAL AND ENVIRONMENTAL CONDITIONS 29

3.1 Physical Environment..... 29
3.1.1 Soil Resources and Prime Farmland..... 29
3.1.2 Geologic Resources 29
3.1.3 Surface Waters..... 29
3.1.4 Wetlands..... 30
3.1.5 Floodplains..... 30

3.1.6 Groundwater Resources *30*
3.1.7 Hazardous Materials *31*
3.1.8 Air Quality *31*
3.2 Biological Resources 31
3.2.1 Biological Community *31*
3.2.2 Aquatic Resources *32*
3.2.3 Threatened and Endangered Species *32*
3.2.4 Species of Concern *32*
3.2.5 Noxious Weeds *32*
3.3 Social and Cultural Resources 32
3.3.1 Demographic and Economic Conditions *32*
3.3.2 Land Ownership and Land Use *33*
3.3.3 Recreational Resources *34*
3.3.4 Cultural Resources *34*
3.3.5 Noise *35*
3.3.6 Visual Resources *35*

4.0 CONCLUSION 35

5.0 REFERENCES 38

FIGURES

Figure 1-1 Study Area 2
Figure 2-1 Terminology for Bridge Elements 5
Figure 2-2 Higgins Avenue Bridge Lane Configuration 6
Figure 2-3 Madison Street Bridge Lane Configuration 7
Figure 2-4 Structure Condition Performance Measure 9
Figure 2-5 Deck Condition Performance Measure 10
Figure 2-6 Legal Loads for Load Rating Vehicles 12
Figure 2-7 Bridge Segment LOS (2010 – Existing) 21
Figure 2-8 Bridge Segment LOS (2040 – Existing, Committed, and Recommended) 21
Figure 2-9 Intersection Level of Service (2013) 25

TABLES

Table 2.1 Criteria for Structural Bridge Assessment 8
Table 2.2 Bridge Condition 10
Table 2.3 Bridge Load Ratings..... 13
Table 2.4 Bicycle LOS for Roadway Segments 17
Table 2.5 Existing Bicycle LOS (2013) 18
Table 2.6 AADT Volumes – Higgins Avenue and Madison Street Bridges (2010 and 2040) 20
Table 2.7 LOS Criteria for Signalized and Unsignalized Intersections 23
Table 2.8 Operational Analysis Results for Study Intersections (2013) 24
Table 4.1 Summary of Transportation System Issues 36
Table 4.2 Summary of Potential Environmental Issues and Constraints 37

APPENDICES

Appendix 1: Field Review Photo Log
Appendix 2: MDT Bridge Design Standards
Appendix 3: Bridge Inspection Reports
Appendix 4: Bridge Record Drawings
Appendix 5: Bridge Right-of-Way Drawings
Appendix 6: Operational Analysis Worksheets
Appendix 7: Mountain Line Routes

1.0 INTRODUCTION

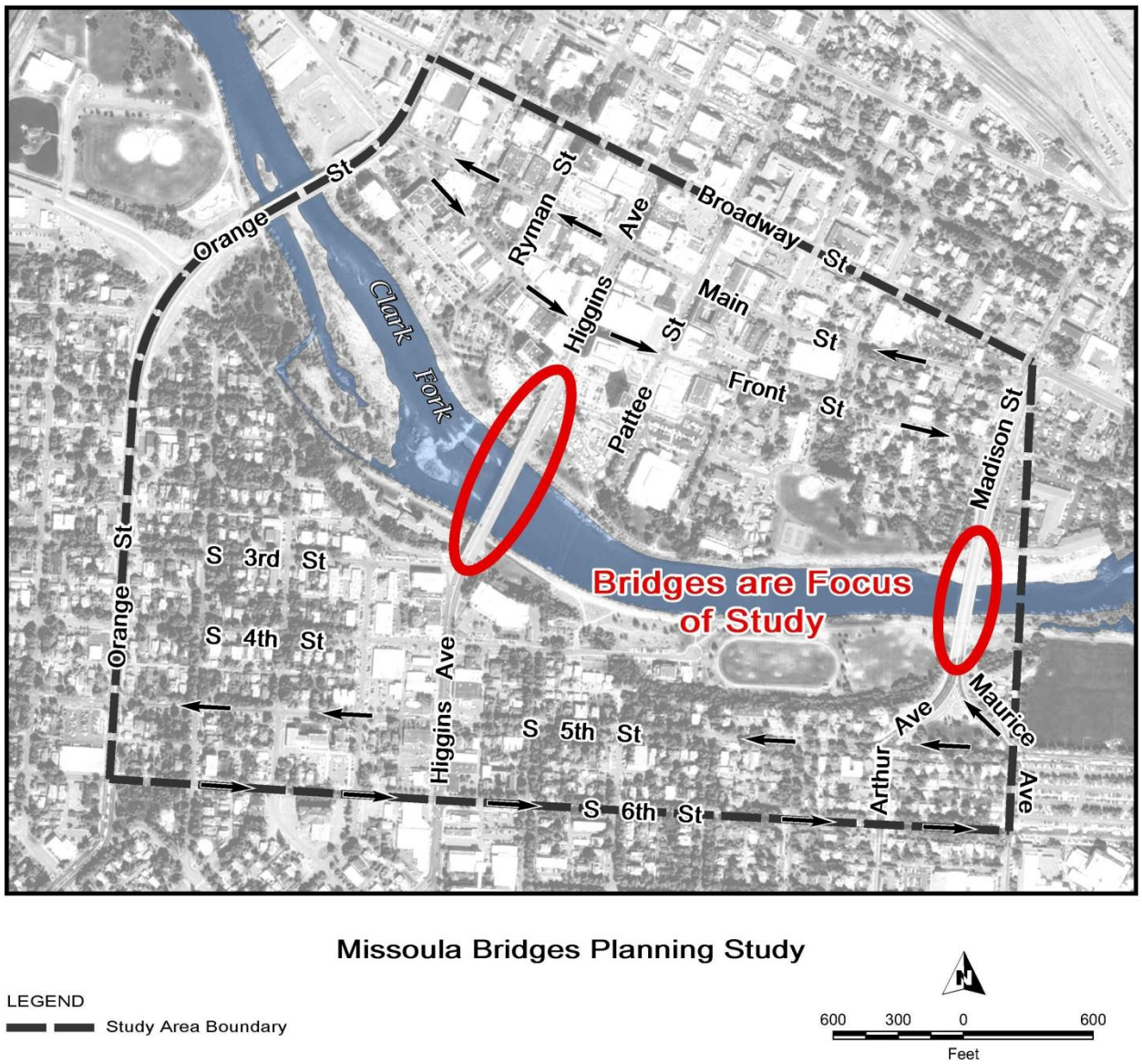
The Montana Department of Transportation (MDT) initiated the *Missoula Bridges Planning Study* to identify potential bridge improvement options for the Higgins Avenue and Madison Street Bridges. This study effort is a planning-level evaluation. It is not a design, maintenance, or construction project. Depending on needs and funding availability, an improvement option may be forwarded from this planning-level study and developed into a project at a later date.

The existing conditions report provides a planning-level summary of transportation system features and physical, biological, social, and cultural characteristics to help the study team identify issues, constraints, and opportunities within the study area.

1.1 Study Area

Figure 1-1 illustrates the study area. The study is focused on the Higgins Avenue and Madison Street Bridges. The existing conditions report primarily considers the bridges and immediately-adjacent areas. The transportation network within the broader study area is discussed only with respect to potential future impacts during construction of bridge improvement options, if forwarded. A detailed analysis of future traffic demand for the broader area has been evaluated and documented in the *2012 Missoula Long Range Transportation Plan Update*.

Figure 1-1 Study Area



2.0 TRANSPORTATION SYSTEM

Physical features and characteristics of the study area were identified through field observation and a review of published statistics, documentation, GIS data, and MDT record drawings (also referred to as "as-built" drawings). A field review was conducted in March 2013 to identify opportunities and constraints within the study area. Appendix 1 contains a photo log documenting conditions observed in the field.

2.1 Roadway System & Functional Classification

Functional classification is a system that organizes public roads and highways in accordance with Federal Highway Administration (FHWA) guidelines according to the type of service provided by the facility and the corresponding level of travel mobility and access to and from adjacent property. Urban roads are functionally classified into principal arterials, minor arterials, collectors, and local roads.

Urban principal arterials serve the major activity centers of an urban area and consist mainly of the highest-traffic-volume corridors. Urban principal arterials place an emphasis on mobility, and access to abutting land may be limited. Urban principal arterials carry a high proportion of the total vehicle miles traveled within the urban area; most of these trips have an origin or destination within the urban area. These roads also serve trips bypassing the central business districts (CBD) of urbanized areas. Urban principal arterials include interstate facilities with fully-controlled access and other principal arterials with partial or no controlled access.

Roadways that interconnect with and augment urban principal arterials are classified as urban minor arterials. These roadways serve trips of moderate length and place more emphasis on property access than mobility. Minor arterials provide intra-community connections and may serve local bus routes.

Urban collector streets collect traffic from local streets in residential areas or in CBDs and convey it to the arterial system. Collector streets provide an even balance between access and mobility functions. Collector streets usually traverse residential areas and facilitate traffic circulation within residential, commercial, and industrial areas. Urban local streets consist of all other roadways within the urban area. The primary purpose of these roadways is to provide access to abutting land and collector streets.

The study area is comprised of all four types of urban roadway classifications. Within the study area, Higgins Avenue has a posted speed limit of 25 miles per hour (mph) and is classified as an urban minor arterial on the urban system. Madison Street has a posted speed limit of 30 mph and is classified as an urban principal arterial on the primary system.

The Higgins Avenue Bridge connects the downtown Missoula CBD to commercial, recreational, and residential areas to the south, including the commercial development known as the “Hip Strip,” parks and trails along the Clark Fork River, and multiple residential neighborhoods.

The Madison Street Bridge connects the downtown CBD to the University of Montana (UM) campus and surrounding residential areas. The separate Madison Street pedestrian/bicycle bridge, located underneath the roadway bridge, connects riverfront trails on both sides of the Clark Fork River. The bridge provides convenient access to and from Interstate 90, and it is heavily used during special events hosted by the UM campus.

2.2 Bridge Design Standards

The American Association of State Highway and Transportation Officials (AASHTO) Load and Resistance Factor Design (LRFD) Bridge Design Specifications serve as a national guide for the development of a transportation agency's structural specifications and standards. MDT has adopted *AASHTO LRFD Bridge Design Specifications* as the preferred document for the structural design of highway bridges in Montana. Volume II of the *Montana Structures Manual* presents MDT's application of the LRFD specifications to structural design on Montana roadways.

MDT has also developed the *Montana Bridge Design Standards* (Appendix 2), which are approved MDT design requirements for loading, horizontal and vertical clearances, and bridge width. Formal design exception approval from the MDT Bridge Engineer must be secured when deviating from the *Montana Bridge Design Standards*.

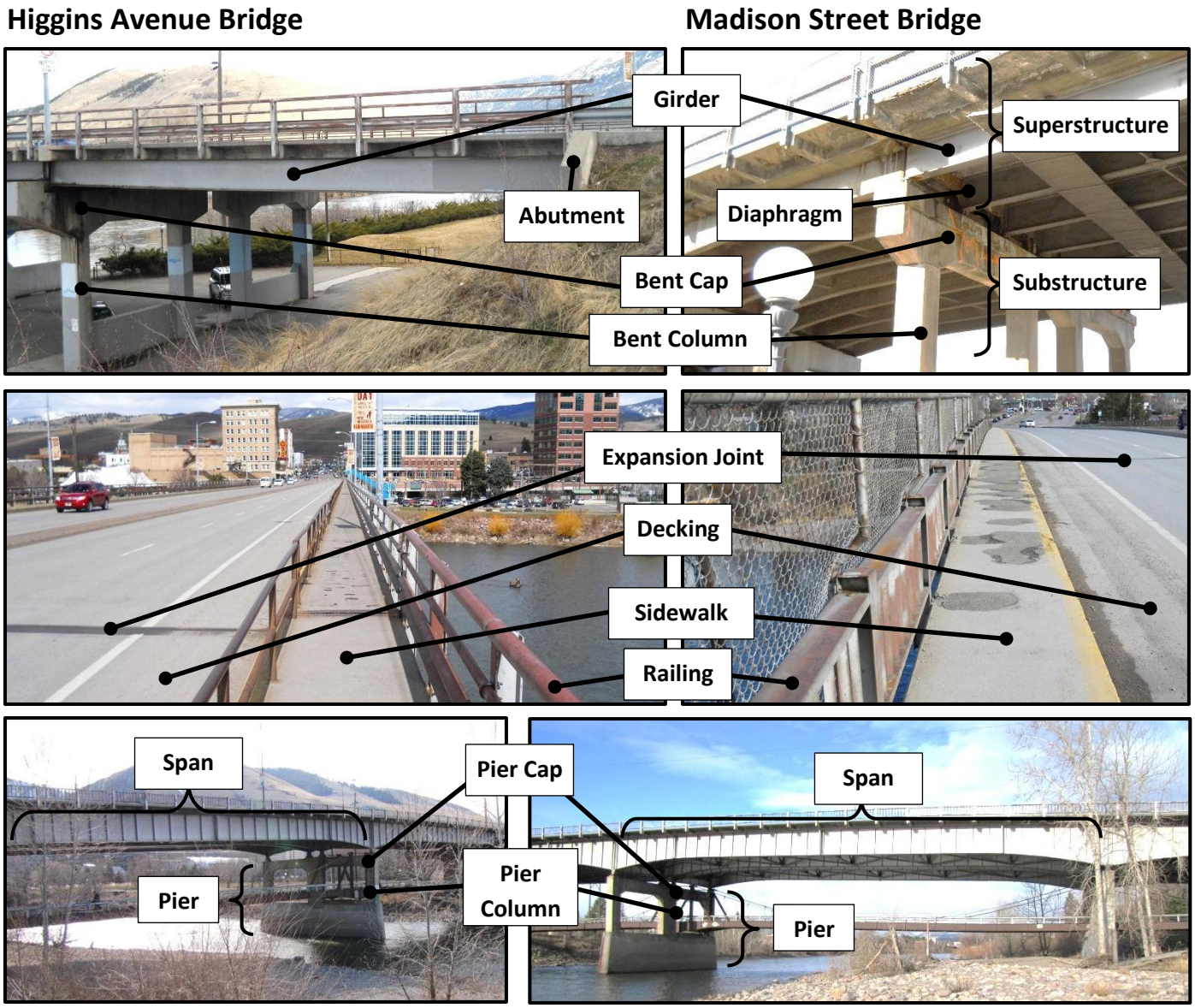
2.3 Higgins Avenue and Madison Street Bridges

Features and characteristics of the Higgins Avenue and Madison Street Bridges were identified through field observation and review of MDT inspection reports, MDT record drawings, and MDT right-of-way plans, which are contained in Appendices 3, 4, and 5. Appendix 1 contains a photo log documenting conditions observed during the field review conducted on March 21, 2013.

2.3.1 Bridge Terminology

Figure 2-1 illustrates terms used in this report to describe elements of the Higgins Avenue and Madison Street Bridges.

Figure 2-1 Terminology for Bridge Elements



Note: The term pier refers to substructure within the river. The term bent refers to substructure on dry land.

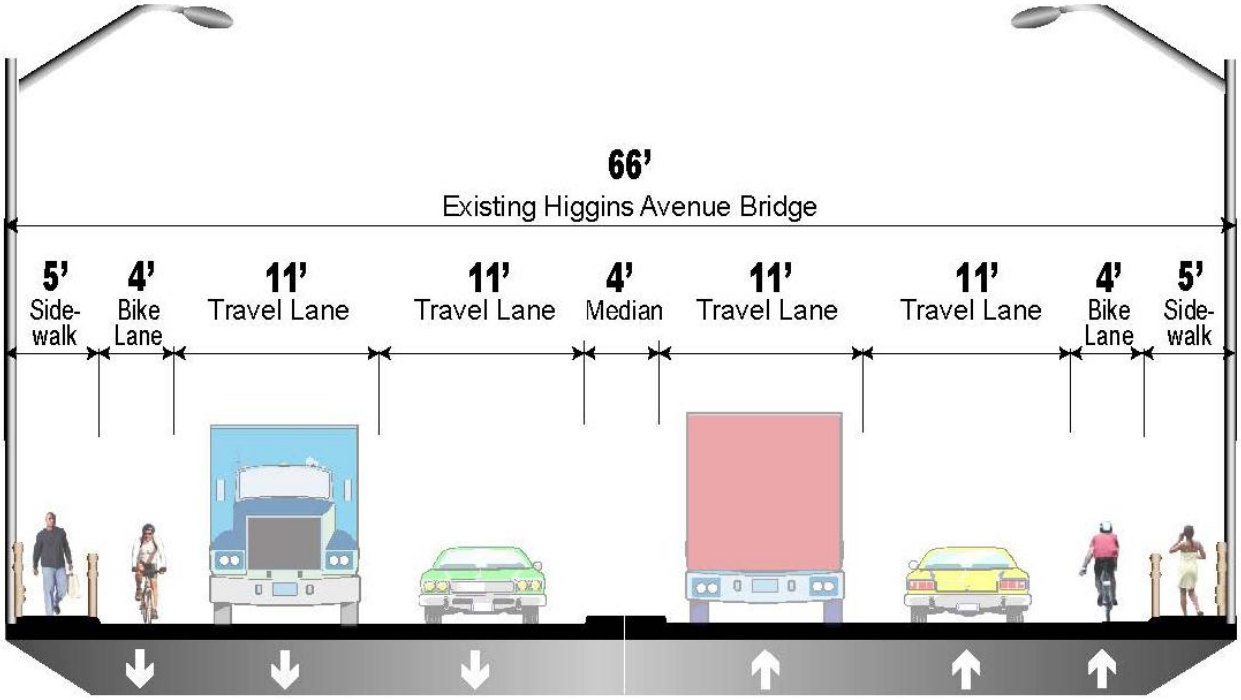
2.3.2 Bridge Type and Dimensions

Higgins Avenue Bridge

The Higgins Avenue Bridge (Bridge ID U08113000+02381) is a four-lane structure located within the City of Missoula on MDT Route U-8113 at Reference Post (RP) 0.23. Originally constructed in 1962, the bridge has a total of thirteen spans: including two approach spans at each end, three main girder spans over the Clark Fork River, and eight intermediate spans. The bridge is constructed with riveted plate girders, prestressed beams, and rolled steel beams. It is composed of two individual bridges separated by a one-inch expansion joint within the median.

Bridge plans indicate the total bridge width including the center gap is approximately 66 feet, which accommodates two five-foot sidewalks, two four-foot bicycle lanes, four 11-foot driving lanes, and a four-foot median. Pedestrian railings are provided on the inner edge (back of curb) and outer edge of the sidewalks, reducing usable width of the sidewalk. The total bridge length is approximately 972 feet. Figure 2-2 illustrates the Higgins Avenue Bridge lane configuration.

Figure 2-2 Higgins Avenue Bridge Lane Configuration



Note: Dimensions include striping and railing widths.

Madison Street Bridge

The Madison Street Bridge (Bridge ID P00007095+00581) is a four-lane structure located within the City of Missoula on MDT Route P-7 (US-12) at RP 95.05. Originally constructed in 1958, this bridge has a total of six spans: including an approach span on the south end of the bridge, two

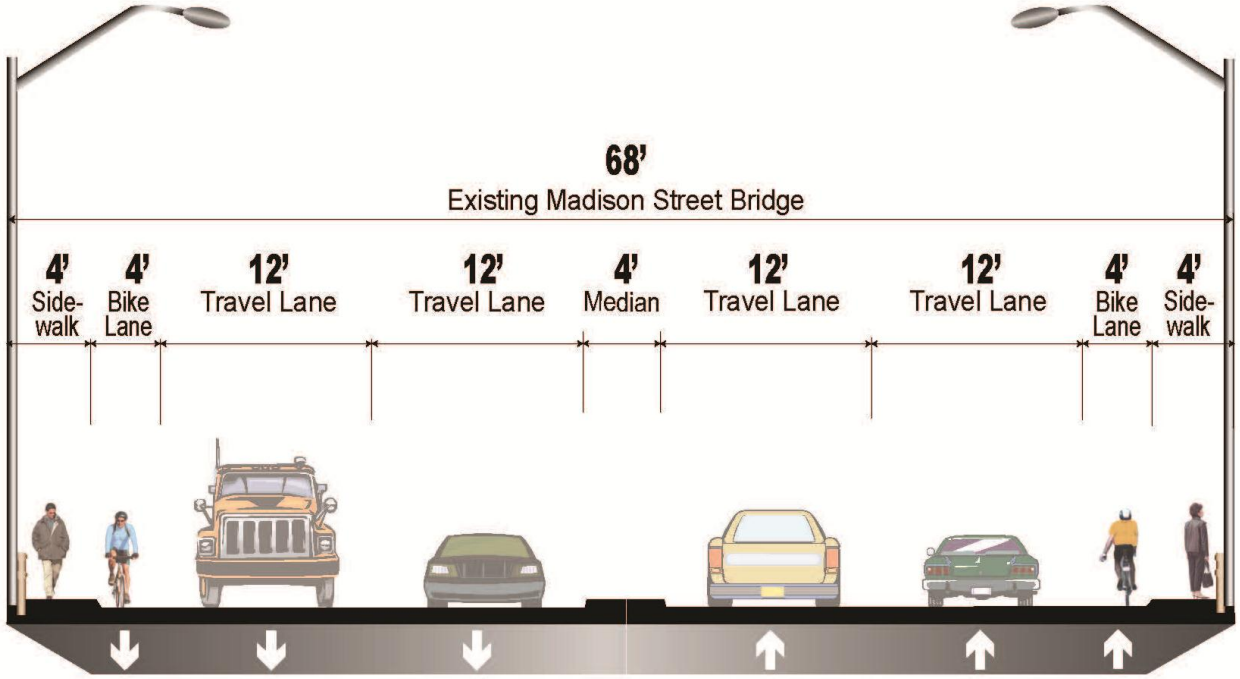
intermediate spans, and three main girder spans over the Clark Fork River. The bridge is constructed with riveted plate girders, prestressed beams, and rolled steel beams.

Similar to the Higgins Avenue Bridge, the bridge consists of two independent structures separated by a small expansion gap (approximately one inch), with the exception of piers 4, 5, and 6, which were constructed as single substructure elements.

Bridge plans indicate the total deck width is approximately 68 feet, including two four-foot sidewalks, two four-foot bicycle lanes, four 12-foot driving lanes, and a four-foot-wide median. A bridge railing is provided on the outer edge of the sidewalk. The northbound bridge is approximately 544 feet long, and the southbound bridge is approximately 559 feet long. A separate bridge (constructed in 2006) spanning from the north to the south bank of the Clark Fork River is supported on the walls of piers 4, 5, and 6 below the main bridge superstructure. This bridge provides a separated crossing facility for pedestrians and cyclists. Figure 2-3 illustrates the Madison Street Bridge lane configuration.

Madison Street Pedestrian/Bicycle Bridge

Figure 2-3 Madison Street Bridge Lane Configuration



Note: Dimensions include striping and railing widths.

2.3.3 Bridge Program Performance Measures

MDT has developed two bridge performance measures to assess bridge condition.

The performance measure for structure condition uses National Bridge Inventory (NBI) ratings, including the superstructure rating, substructure rating, and structurally deficient status, to assess bridge condition.

Bridges are considered structurally deficient if load carrying elements have deteriorated enough to be in poor condition or the adequacy of the waterway opening provided by the bridge is insufficient causing intolerable traffic interruptions. When a bridge is classified as structurally deficient, it does not mean that it is unsafe. A structurally deficient bridge typically requires increased maintenance and repair to remain in service and eventual rehabilitation or replacement to address deficiencies.

Table 2.1 outlines criteria used to determine the structural status of a bridge.

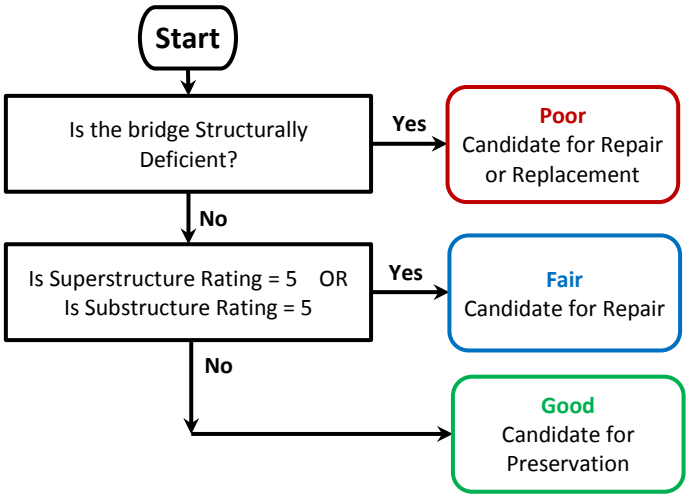
Table 2.1 Criteria for Structural Bridge Assessment

Structurally Deficient
A condition of **4 or less** for: Deck Rating, or Superstructure Rating, or Substructure Rating Or, an appraisal of **2 or less** for: Structure Rating, or Waterway Adequacy

Source: Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges, Report No. FHWA-PD-96-001, December 1995.

Structurally deficient bridges are ranked poor under the structure condition performance measure, indicating that they are a candidate for repair or replacement. Bridges with a superstructure or substructure rating of 5 are ranked fair, indicating that they are a candidate for repair. All other bridges are ranked good, indicating that they are a candidate for preservation and routine maintenance. Figure 2-4 illustrates the structure condition performance measure.

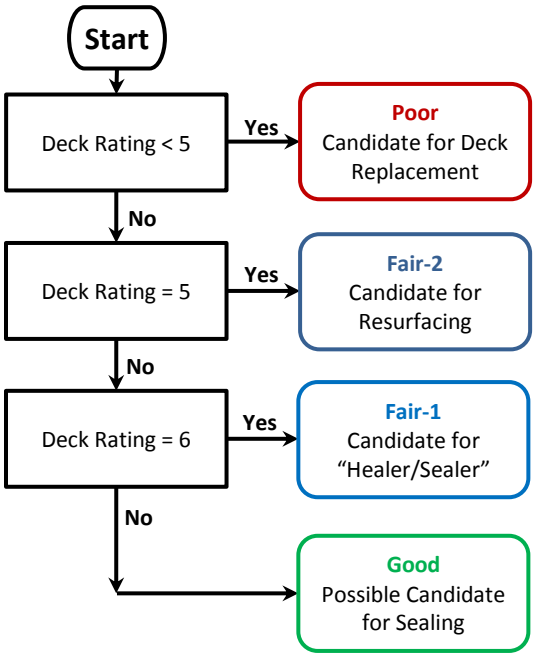
Figure 2-4 Structure Condition Performance Measure



Source: MDT Bridge Program under MAP-21, 2013.

The deck condition performance measure considers the NBI deck rating to provide an indication of deck condition and a planning-level indication of needed preservation treatment. Structurally deficient bridges (i.e., all bridges with a deck rating below 5) are ranked poor under the deck condition performance measure, indicating a candidate for deck replacement. Bridges with a deck rating equal to 5 are ranked fair-2, indicating a candidate for resurfacing. Bridges with a deck rating equal to 6 are ranked fair-1, indicating a candidate for sealant treatment. All other bridges are ranked good, indicating a possible candidate for sealing. Figure 2-5 illustrates the deck condition performance measure.

Figure 2-5 Deck Condition Performance Measure



Source: MDT Bridge Program under MAP-21, 2013.

Table 2.2 outlines the condition and performance measure rankings for the bridges. The Higgins Avenue and Madison Street Bridges are structurally deficient and ranked poor for structure condition and deck condition. Both bridges are eligible for repair or replacement.

Table 2.2 Bridge Condition

Structurally Deficient Criteria	Threshold Value	Higgins Avenue	Madison Street
Deck Rating	≤4	4	3
Superstructure Rating	≤4	4	3
Substructure Rating	≤4	6	5
Structure Rating	≤2	4	3
Waterway Adequacy	≤2	8	9
Structure Status		**Structurally Deficient**	**Structurally Deficient**
Structure Condition Performance Measure		**Poor**	**Poor**
Deck Condition Performance Measure		**Poor**	**Poor**

Source: MDT Inspection Report, June 2012; MDT Bridge Program under MAP-21, 2013. Shaded cells indicate elements qualifying the bridge as structurally deficient.

Higgins Avenue Bridge – Field Observations

The June 2012 MDT bridge inspection report noted several forms of deterioration, including concrete deck cracking and spalling, delamination of the riding surface and pedestrian sidewalks, exposed and corroded reinforcing bars, and corroded steel members (see photographs on pages 11 and 12). These conditions were confirmed during the March 2013 field review. Photos from the Higgins Avenue Bridge field review are provided in Appendix 1.

Concrete spalling is a form of surface failure resulting in splintered concrete chips and fragments.

Concrete diaphragms at bents 2 through 8 exhibit deterioration in the form of spalled concrete and corrosion of the reinforcing steel. This condition appears to be exacerbated by leaking joints in the bridge deck, which allow precipitation and de-icing chemicals to saturate the diaphragms and bents located below, furthering the deterioration process.

Madison Street Bridge – Field Observations

The June 2012 MDT bridge inspection report indicates the bridge exhibits deterioration including delaminated concrete decks and sidewalks, cracked and spalled concrete, corroded reinforcing steel, corroded structural steel, and pack rust at the steel girder bearings. These conditions were confirmed during the March 2013 field review. Photos from the Madison Street Bridge field review are provided in Appendix 1.

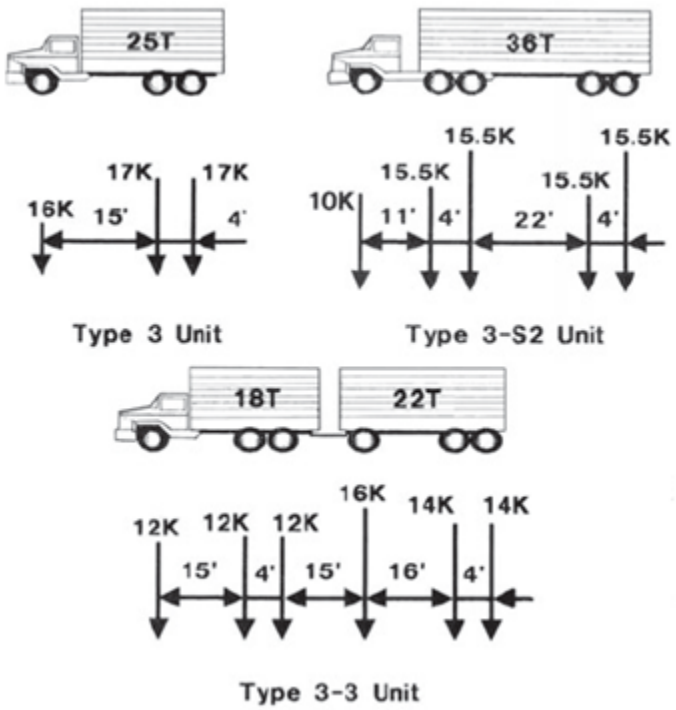
Concrete delamination is a form of surface failure resulting in separation of the surface layer.

2.3.4 Structure Loading

Bridges are rated according to the loads they may safely carry. MDT loading analyses include consideration of live loads such as moving vehicular traffic, bicycles, and pedestrians. The safe live load carrying capacity of a bridge is called its load rating.

MDT uses three AASHTO vehicle types to conduct a load rating analysis. Figure 2-6 illustrates AASHTO legal loads for short- (Type 3 Unit), medium- (Type 3-S2 Unit), and long- (Type 3-3 Unit) span bridges. The number in the center of the vehicle indicates the gross vehicle weight for legal loads in short tons (1 short ton = 2,000 pounds). The arrows below each vehicle indicate the weight distribution for each axle in kips (1 kip = 1,000 pounds). Legal loads are higher for longer trucks because the gross vehicle weight is distributed over more axles.

Figure 2-6 Legal Loads for Load Rating Vehicles



Source: FHWA, 2005.

MDT identifies bridge load rating values according to the following categories:

- The operating rating is the maximum permissible load that can be placed on the bridge. Allowing unlimited usage at the operating rating level will reduce the life of the bridge.
- The inventory rating is the load that can safely use the bridge for an indefinite period of time.

MDT compares legal loads for the three load rating vehicle types to the bridge's operating and inventory ratings. A bridge is posted for load restrictions when it is not able to safely carry legal loads.

Table 2.3 presents operating and inventory load ratings for the Higgins Avenue and Madison Street Bridges.

Table 2.3 Bridge Load Ratings

Load/Truck Type		Gross Vehicle Weight for Legal Loads	Load Rating Data	
			Higgins Avenue	Madison Street
Operating Load	Truck 1 Type 3	25 tons	39 tons	55 tons
	Truck 2 Type 3-S3	36 tons	61 tons	73 tons
	Truck 3 Type 3-3	40 tons	72 tons	80 tons
Inventory Load	Truck 1 Type 3	25 tons	Not Recorded	35 tons
	Truck 2 Type 3-S3	36 tons	Not Recorded	47 tons
	Truck 3 Type 3-3	40 tons	Not Recorded	51 tons

Source: MDT Inspection Report, June 2012. 1 ton (short) = 2,000 pounds.

Available documentation provided by MDT indicates the Higgins Avenue and Madison Street Bridges are currently able to safely carry AASHTO legal loads.

2.3.5 Seismic Hazard

MDT identifies seismic ratings for bridges in Montana according to criteria outlined in the *MDT Bridge Design Standards*. The seismic rating is based on three factors, including the bridge's structural vulnerability, the seismicity of the bridge site, and the bridge's importance as a vital transportation link. The structural vulnerability factor considers susceptible superstructure and substructure elements, vulnerability of the bridge abutments, and liquefaction vulnerability (or the tendency of soil to liquefy during an earthquake and the resulting bridge damage). The seismicity factor is based on soil properties and seismic hazard at the site. The importance factor considers the functional classification, daily traffic volumes, and detour length for the bridge route and the route crossed by the bridge (if applicable). Individual ratings for each factor are added to identify the total seismic rating for the bridge.

The seismic rating scale ranges from 7 to 100, with 7 indicating the least vulnerable bridge and 100 indicating the most vulnerable bridge. The average seismic rating of the 1,200 bridges rated in Montana is 24.4, with the most vulnerable bridge in Montana rated at 66.

The Higgins Avenue Bridge has a seismic rating of 45, and the Madison Street Bridge has a seismic rating of 46. While these ratings fall in the mid-range of the rating scale, they are more vulnerable than the statewide average rating.

MDT has identified multiple substructure and superstructure hazards that may affect the Higgins Avenue and Madison Street Bridges' ability to resist a seismic event. The existing bridges do not meet current MDT design requirements for seismicity.

2.3.6 Channel Adequacy and Scour

Assessment of channel adequacy considers the physical conditions associated with the flow of water through a bridge, such as stream stability and the condition of the channel, riprap, slope protection, or any stream control devices.

Scour is the erosion of streambed or bank material due to flowing water. This effect is often localized around bridge piers and abutments. A scour critical bridge has abutment or pier foundations rated as unstable due to observed scour at the bridge site or scour potential determined from a scour evaluation study. A greater scour depth indicates greater structural vulnerability.

Higgins Avenue Bridge

Channel adequacy and scour vulnerability data provided in the 2012 MDT inspection report indicate the bridge deck and approaches have a slight chance of being overtopped during a flood and the bridge foundations are stable for the calculated potential scour conditions. The calculated potential scour depth is above the top of the bridge footings, meaning the footings are not vulnerable due to scour. No evidence of scour or undermining of the bridge piers was observed during the March 2013 field review.

Madison Street Bridge

The 2012 MDT inspection report indicates the channel is adequate and banks are protected or well vegetated.

The rating for scour vulnerability indicates river bank protection is being eroded, river control devices and/or the embankment have been damaged, or trees and brush restrict the channel. An initial scour analysis performed in 1997 by the United States Geologic Service (USGS) calculated a potential total scour depth of 16.8 feet. A subsequent analysis completed by MDT estimated scour at 7.8 feet without debris and 9.4 feet with debris. A third analysis was completed by the WGM Group in 2004, with pier scour estimated at 6.1 feet. The 2004 analysis indicated estimated scour depths are within the footing elevation of pier 5 and above the footing elevation of pier 6. MDT considers the Madison Street Bridge to be a low risk for scour because of WGM Group's findings and because abutment scour is mitigated by riprap and natural stream armoring (boulders) along the riverbanks. MDT will continue to monitor scour on the current bridge inspection cycle based on this assessment.

2.3.7 Railings and Ramps

Current MDT design standards require a crashworthy bridge rail (such as a concrete barrier rail) topped by a pedestrian/bicycle rail at the outside edge of the bridge or where a barrier is used to separate pedestrians/bicyclists from vehicular traffic. The combined height of crashworthy bridge rail and pedestrian/bicycle rail must be a minimum of 43 inches above the walking surface. Pedestrian/bicycle rail used alone must also be a minimum of 43 inches in height.

Higgins Avenue Bridge

A steel handrail approximately 36 inches in height separates the inside edge of the pedestrian sidewalks from the main Higgins Avenue Bridge decking. The outer edge of each sidewalk is protected with bridge rail approximately 44 inches in height. The inner railing does not meet current MDT standards for crashworthy design or minimum height. The height of the outer railing complies with current MDT design standards for height, although the rails do not conform to the standard design for size and spacing.

Ramp transitions from the roadway sidewalks to the Higgins Avenue Bridge sidewalks are not compliant with the Americans with Disabilities Act (ADA) due to vertical surface discontinuities (i.e., trip hazards).

Madison Street Bridge

The bridge railing on the outer edge of each sidewalk is approximately 32 inches in height. Immediately above the abandoned railroad alignment, the bridge railing is augmented in height with chain link fencing for a total combined height of approximately six feet. There is no railing separating the inside edge of the pedestrian sidewalks from the adjacent roadway. The outer railing does not meet current MDT standards for crashworthy design. Portions of the railing do not meet current MDT design standards for minimum height for a combination rail.

Ramp transitions from the roadway sidewalks to the Madison Street Bridge sidewalks are not compliant with ADA requirements due to vertical surface discontinuities.

2.3.8 Right-of-Way and Jurisdiction

The State of Montana owns the Higgins Avenue and Madison Street Bridges and has contracted with the City of Missoula to maintain the existing right-of-way on each end of both bridges. Right-of-way limits for each bridge are described below.

Higgins Avenue Bridge

Right-of-way drawings for the Higgins Avenue Bridge indicate the right-of-way width along the full length of the bridge is 100 feet. The drawings indicate the bridge was intended to be centered within the proposed right-of-way.

Madison Street Bridge

Right-of-way drawings for the Madison Street Bridge illustrate variable right-of-way width along the length of the bridge. The minimum width is 100 feet in the vicinity of the abandoned Milwaukee Railroad main line. Right-of-way widths beyond the railroad corridor range from 160 feet to more than 200 feet. The drawings indicate the bridge was generally intended to be centered within the right-of-way.

2.3.9 Bridge Projects

Higgins Avenue Bridge

The Higgins Avenue Bridge received a high-density concrete overlay of the bridge deck in 1981. The project included removal and replacement of delaminated deck sections and repairs to the expansion joints and deck drains. A crack sealant treatment of the bridge deck was completed in the early 1990s.

Madison Street Bridge

The Madison Street Bridge received a high-density concrete overlay of the bridge deck in 1981. The project included removal and replacement of delaminated deck sections and repairs to the expansion joints and deck drains.

2.4 Bicycle and Pedestrian Elements

2.4.1 Non-Motorized Facilities and Usage

Within the study area, dedicated bicycle lanes extend along Orange Street, Higgins Avenue, Madison Street, Maurice Avenue, Arthur Avenue, and South 5th Street between Orange Street and Higgins Avenue. Dedicated four-foot bicycle lanes are located adjacent to the Higgins Avenue Bridge and Madison Street Bridge travel lanes within the street and are delineated by white lines and bicycle symbols. In some instances the painted white lines and bicycle symbols have become faded. Signing before the Higgins Avenue Bridge indicates bicycles are not allowed on the sidewalk.

AASHTO guidelines note bicycle lane widths should be determined by context, including the speed, volume, and type of vehicles in adjacent lanes. For roadways where bicycle lanes are immediately adjacent to a curb, guardrail, or other vertical surface, AASHTO recommends a minimum bicycle lane width of five feet.

Sidewalks are provided on both sides of all roadways within the study area. Sidewalks on the Higgins Avenue Bridge are approximately five feet wide and the Madison Street Bridge sidewalks are approximately four feet wide. Railings reduce usable sidewalk width.

Public rights-of-way accessibility guidelines (PROWAG) Section R301.3.1 recommends a minimum continuous, unobstructed clear width of four feet for a pedestrian access route, exclusive of the width of the curb. PROWAG Section R301.3.2 also recommends provision of passing spaces five feet in width by five feet in length at intervals of 200 feet. AASHTO guidelines recommend sidewalk widths ranging from four to eight feet in residential and commercial areas, including bridge applications.

The Higgins Avenue and Madison Street Bridges are high-use corridors for bicyclists and pedestrians, providing connections between residential and commercial developments on the north and south sides of the Clark Fork River. Bicycle/pedestrian trails and the separate

Madison Street bicycle/pedestrian bridge under the roadway bridge provide off-street bicycle/pedestrian access within the study area. The Ron MacDonald River Trail System parallels both banks of the Clark Fork River within the study area. The trail system is heavily used by joggers, pedestrians, bicyclists, and skateboarders. Outside the study area, the river trail system connects to the Kim Williams Trail (to the east) and the Milwaukee Trail and the Bitterroot Branch Trail (to the west) allowing users to move throughout the city with limited vehicular traffic contact.

2.4.2 Bicycle Level of Service

The Highway Capacity Manual (HCM) 2010 defines level of service (LOS) for bicycles along roadway segments based on a score relating to bicyclists' comfort and perceived exposure to vehicular traffic. This score considers the following five variables, listed in descending order of importance:

- average effective width of the outside through lane,
- motorized vehicle volumes,
- motorized vehicle speeds,
- heavy vehicle (truck) volumes, and
- pavement condition.

Closer proximity to motorized vehicles, higher vehicle volumes, a greater proportion of trucks and buses, higher vehicle speeds, and poorer pavement conditions decrease bicyclists' perceived comfort.

Table 2.4 presents LOS score criteria for bicycles along roadway segments based on these five criteria.

Table 2.4 Bicycle LOS for Roadway Segments

Level of Service	Bicycle Score
A	≤ 1.5
B	> 1.5 to 2.5
C	> 2.5 to 3.5
D	> 3.5 to 4.5
E	> 4.5 to 5.5
F	> 5.5

Source: HCM 2010, Exhibit 14-6 Bicycle LOS on Multilane Highways and HCM 2010, Exhibit 15-4 Bicycle LOS for Two-Lane Highways.

Highway Capacity Software (HCS) Version 2010 was used to analyze bicycle LOS along the Higgins Avenue and Madison Street Bridge roadway segments. Table 2.5 presents the results of

the bicycle LOS analysis for existing (2013) conditions for an average day (Monday – Sunday) along the roadway deck of the Higgins Avenue and Madison Street Bridges. Results for the morning and evening peak hours are based on current conditions and traffic volumes. HCS analysis worksheets are provided in Appendix 6.

Table 2.5 Existing Bicycle LOS (2013)

Segment	AM Peak Hour		PM Peak Hour	
	Bicycle LOS Score	LOS	Bicycle LOS Score	LOS
Higgins Avenue Bridge Northbound	2.21	**B**	2.24	**B**
Higgins Avenue Bridge Southbound	1.87	**B**	2.34	**B**
Madison Street Bridge Northbound	2.00	**B**	2.46	**B**
Madison Street Bridge Southbound	2.46	**B**	2.38	**B**

Source: DOWL HKM, 2013.

The Higgins Avenue and Madison Street Bridges are both rated LOS B for bicycle usage. LOS B corresponds to above-average bicyclist comfort.

2.5 Utilities

A communication line runs underneath the Higgins Avenue Bridge deck through a false ceiling. Security lights are attached beneath the Madison Street Bridge deck to illuminate the bicycle/pedestrian bridge. Both the Higgins Avenue and the Madison Street Bridges are lighted for vehicular traffic. No other utilities are contained within the bridge structures.

2.6 Transit

Mountain Line is a public transit agency serving the Missoula area. Mountain Line operates twelve fixed routes within the Missoula area. Mountain Line also operates para-transit service, a senior van, and provides transportation for special events. Route 6 runs along the Higgins Avenue Bridge. Route 12, Route 1, and the UM Park and Ride Shuttle runs along the Madison Street Bridge. Public transit service to and from downtown Missoula is generally available from 6:00 AM to 8:00 PM Monday through Friday and from 10:00 AM to 6:00 PM on Saturdays. No scheduled service is provided on Sundays. The Mountain Line transfer center is located adjacent to West Pine Street between Woody Street and Ryman Street. Appendix 7 presents Mountain Line's current route map.

2.7 Crash Analysis

MDT provided crash data for the Higgins Avenue and Madison Street Bridge segments for the five-year period from January 1, 2008 to December 31, 2012. Crash details are described below.

Higgins Avenue Bridge

A total of six crashes were reported on the Higgins Avenue Bridge during the five-year analysis period. One injury, no fatalities, and no vehicle crashes involving pedestrians/bicycles were reported. The single crash resulting in injury was identified as a collision with a bridge/pier/abutment, with alcohol and careless driving identified as contributing factors.

The majority of crashes on the Higgins Avenue Bridge (4 out of 6, or 66.7%) were classified as sideswipe collisions occurring between two vehicles. Contributing factors to sideswipe-type crashes included drugs, careless driving, and improper lane changing.

The majority of crashes, including the crash resulting in injury, occurred during clear, icy, and dark-lighted conditions.

Correctable crash trends were not identified based on the reported information.

Madison Street Bridge

A total of 12 crashes were reported on the Madison Street Bridge during the five-year analysis period. One injury, no fatalities, and no vehicle crashes involving pedestrians/bicycles were reported. The single crash resulting in injury was classified as a single vehicle crash, with failure to comply with a license restriction identified as a contributing factor.

The majority of crashes on the Madison Street Bridge (6 out of 12, or 50%) were classified as single vehicle collisions. Most of these crashes (5 out of 6, or 83.3%) involved collisions with roadside features including traffic signs, guardrail, and curbs. One crash was attributed to debris in the road.

The majority of crashes (6 out of 12, or 50%) occurred during clear and dry conditions. Crashes were evenly split between daylight and dark-lighted conditions. The single crash resulting in injury occurred during clear, dry, and daylight conditions. Contributing factors for the 12 total crashes included speed, alcohol, careless driving, following too closely, inattentive driving, and not complying with a license restriction.

Correctable crash trends were not identified based on the reported information.

2.8 Traffic Volumes and Vehicular Operation

2.8.1 Higgins Avenue and Madison Street Bridge Segments

Annual Average Daily Traffic Volumes

Annual Average Daily Traffic (AADT) is the total of all motorized vehicles traveling in both directions on a roadway on an average day throughout a given year.

Table 2.6 presents base-year (2010) and projected (2040) traffic volumes on the Higgins Avenue and Madison Street Bridges reported in the *2012 Missoula Long Range Transportation Plan* (LRTP). 2010 volumes reflect existing transportation infrastructure. 2040 volumes incorporate committed and recommended transportation projects identified in the LRTP. The term committed refers to transportation projects with dedicated funding. The term recommended refers to transportation projects that may require further analysis before being committed to implementation. Volumes listed in Table 2.6 were produced by the Missoula TransCAD model, a type of transportation planning and travel demand forecasting software. The volumes do not reflect actual count data.

Table 2.6 AADT Volumes – Higgins Avenue and Madison Street Bridges (2010 and 2040)

Year	Condition	Higgins Avenue Bridge AADT Volumes	Madison Street Bridge AADT Volumes
2010	**Existing**	18,148	12,665
2040	**Existing, Committed, and Recommended**	23,578	22,411

Source: Missoula LRTP Update, 2012.

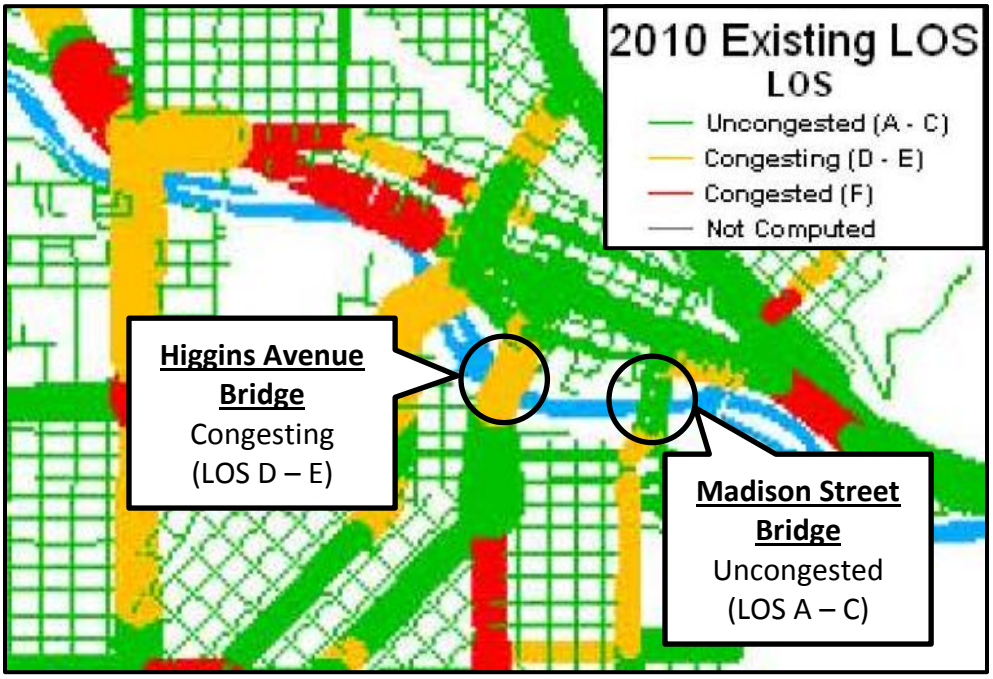
Bridge Segment Level of Service

Operational conditions on transportation facilities are commonly assessed using the Level of Service (LOS) concept. LOS is measured on an A to F scale, with LOS A representing the best operating conditions from the traveler's perspective and LOS F representing the worst.

The *2012 Missoula LRTP Update* identifies the Higgins Avenue Bridge segment as congesting (LOS D to E) in 2010 and congested (LOS F) in 2040. The LRTP identifies the Madison Street Bridge segment as uncongested (LOS A to C) in 2010 and congesting (LOS D to E) in 2040. Figures 2-7 and 2-8 illustrate bridge segment LOS in 2010 and 2040.

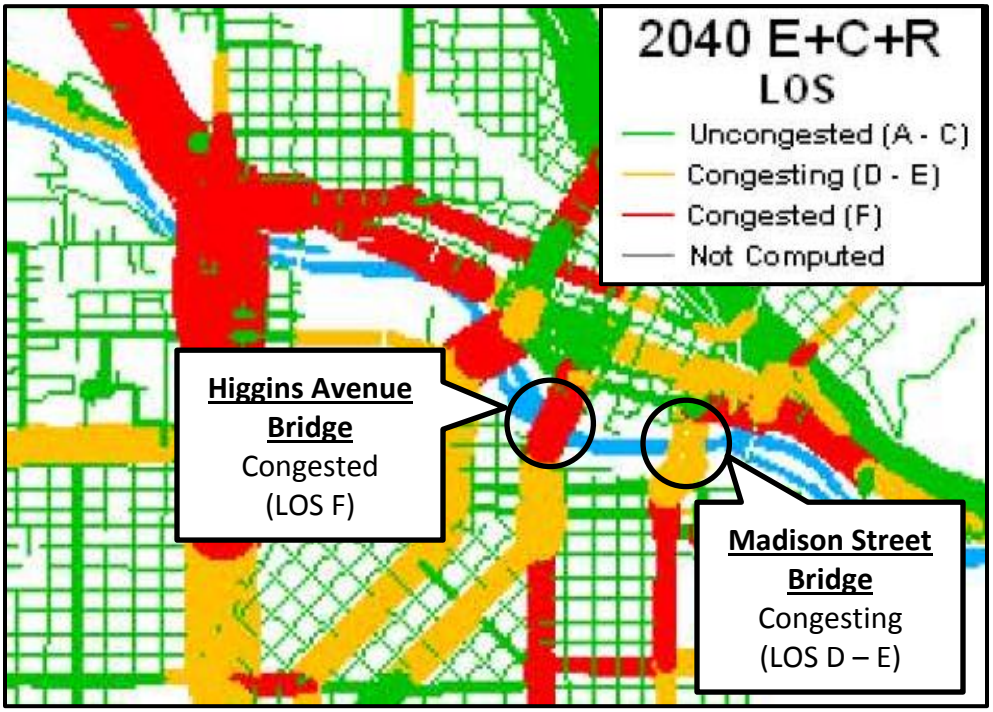
The MDT *Traffic Engineering Manual* defines the desirable target for design of urban principal and urban minor arterials as LOS B, and defines the minimum target for design as LOS C. The Higgins Avenue Bridge currently operates below LOS C, and vehicular operations on the bridge are forecasted to worsen by 2040. The Madison Street Bridge currently operates at LOS C or better, but is expected to fall below LOS C by 2040.

Figure 2-7 Bridge Segment LOS (2010 – Existing)



Source: Missoula LRTP, 2012.

Figure 2-8 Bridge Segment LOS (2040 – Existing, Committed, and Recommended)



Source: Missoula LRTP, 2012.

2.8.2 Study Intersections

Existing conditions at eighteen study intersections were analyzed only to identify potential future impacts that could occur during construction of bridge improvements forwarded from this study. Study intersections considered for this analysis are listed below.

1. Orange Street and Broadway Street
2. Orange Street and Front Street/Main Street
3. Orange Street and South 3rd Street
4. Orange Street and South 5th Street
5. Orange Street and South 6th Street
6. Ryman Street and Broadway Street
7. Higgins Avenue and Broadway Street
8. Higgins Avenue and Main Street
9. Higgins Avenue and Front Street
10. Higgins Avenue and South 4th Street
11. Higgins Avenue and South 5th Street
12. Higgins Avenue and South 6th Street
13. Pattee Street and Broadway Street
14. Madison Street and Broadway Street
15. Arthur Avenue and South 5th Street
16. Arthur Avenue and South 6th Street
17. Maurice Avenue and South 5th Street
18. Maurice Avenue and South 6th Street

Peak-Hour Traffic Volumes

The Missoula TransCAD model generated existing (2013) morning and evening peak-hour turning movement volumes for each study intersection in the study area. Missoula Office of Development Services staff conducted a validation process to confirm the morning and evening peak-hour turning movement volumes generated by the TransCAD model. Model volumes were compared to turning movement counts collected by MDT in September 2010. The model was calibrated for this study to more closely reflect MDT count data.

Intersection Level of Service

Traffic conditions on signalized and unsignalized intersections are commonly defined using the LOS concept. The *HCM 2010* defines LOS based on a variety of factors to provide a qualitative assessment of the driver's experience. Within the study area, sixteen study intersections are signalized and two study intersections (Maurice Avenue and 5th Street and Maurice Avenue and 6th Street) are unsignalized with stop control on the minor legs. The HCM defines LOS for signalized and unsignalized intersection on the basis of delay. Delay quantifies the increase in travel time due to a traffic signal or stop sign. It is also a surrogate measure of driver discomfort and fuel consumption.

For signalized and unsignalized intersections, six LOS categories ranging from A to F are used to describe traffic operations, with A representing the best conditions and F representing the worst. The LOS criteria for unsignalized intersections are different from the criteria used for signalized intersections, primarily because user perceptions differ between signalized and unsignalized intersection control. A signalized intersection is designed to carry higher traffic volumes and will experience longer delay than an unsignalized intersection. Unsignalized intersections are associated with more uncertainty for users, as delays are less predictable than at signals, which can reduce users' delay tolerance.

Table 2.7 presents LOS criteria for signalized and unsignalized intersections.

Table 2.7 LOS Criteria for Signalized and Unsignalized Intersections

Level of Service	Signalized Intersection Average Delay (sec/veh)	Unsignalized Intersection Average Delay (sec/veh)
A	≤ 10	≤ 10
B	> 10 to 20	> 10 to 15
C	> 20 to 35	> 15 to 25
D	> 35 to 55	> 25 to 35
E	> 55 to 80	> 35 to 50
F	> 80	> 50

Source: HCM 2010, Exhibit 18-4 LOS Criteria for Signalized Intersections and HCM 2010, Exhibit 19-1 LOS Criteria for Unsignalized Intersections.
sec/veh = seconds per vehicle

Intersection LOS analyses were conducted using the procedures outlined in the HCM, as appropriate, and through the use of Synchro 8 traffic signal timing and analysis software based on HCM delay, capacity, and level of service calculations. Appendix 6 contains Synchro operational analysis worksheets.

Table 2.8 and Figure 2-9 present the results of the signalized and unsignalized LOS analysis.

Table 2.8 Operational Analysis Results for Study Intersections (2013)

Intersection		AM Peak Hour			PM Peak Hour		
		Delay	V/C[3]	LOS	Delay	V/C[3]	LOS
1	Orange Street & Broadway Street[1]	31.0	0.89	C	53.8	1.00	D
2	Orange Street & Front Street/Main Street[1]	18.1	0.76	B	44.3	0.98	D
3	Orange Street & South 3rd Street[1]	20.8	0.82	C	24.5	0.98	C
4	Orange Street & South 5th Street[1]	7.9	0.68	A	12.7	0.81	B
5	Orange Street & South 6th Street[1]	17.3	0.80	B	9.4	0.55	A
6	Ryman Street & Broadway Street[1]	9.2	0.29	A	9.4	0.47	A
7	Higgins Avenue & Broadway Street[1]	10.6	0.60	B	21.8	1.00	C
8	Higgins Avenue & Main Street[1]	9.4	0.48	A	15.4	0.73	B
9	Higgins Avenue & Front Street[1]	13.3	0.61	B	20.3	0.81	C
10	Higgins Avenue & South 4th Street[1]	4.3	0.40	A	9.0	0.60	A
11	Higgins Avenue & South 5th Street[1]	14.1	0.77	B	18.3	0.85	B
12	Higgins Avenue & South 6th Street[1]	16.1	0.80	B	11.1	0.74	B
13	Pattee Street & Broadway Street[1]	9.6	0.32	A	12.0	0.47	B
14	Madison Street & Broadway Street[1]	30.3	0.76	C	38.6	0.85	D
15	Arthur Avenue & South 5th Street[1]	5.4	0.60	A	19.7	0.84	B
16	Arthur Avenue & South 6th Street[1]	25.3	0.81	C	32.1	0.88	C
17	Maurice Avenue & South 5th Street[2]	5.2	NA	A	7.1	NA	A
18	Maurice Avenue & South 6th Street[2]	13.9	NA	B	11.2	NA	B

Source: DOWL HKM, 2013.
[1] Reflects average signalized intersection delay.
[2] Reflects unsignalized approach with the longest delay.
[3] Maximum volume to capacity ratio.
NA: not applicable

Figure 2-9 Intersection Level of Service (2013)

Missoula Bridges – Operational Analysis Results for Study Intersections (2013)

Intersection Number	Intersection	Level of Service	
		AM Peak Hour	PM Peak Hour
1	Orange Street and Broadway Street	C	D
2	Orange Street and Front Street/Main Street	B	D
3	Orange Street and South 3rd Street	C	C
4	Orange Street and South 5th Street	A	B
5	Orange Street and South 6th Street	B	A
6	Ryman Street and Broadway Street	A	A
7	Higgins Avenue and Broadway Street	B	C
8	Higgins Avenue and Main Street	A	B
9	Higgins Avenue and Front Street	B	C
10	Higgins Avenue and South 4th Street	A	A
11	Higgins Avenue and South 5th Street	B	B
12	Higgins Avenue and South 6th Street	B	B
13	Pattee Street and Broadway Street	A	B
14	Madison Street and Broadway Street	C	D
15	Arthur Avenue and South 5th Street	A	B
16	Arthur Avenue and South 6th Street	C	C
17	Maurice Avenue and South 5th Street	A	A
18	Maurice Avenue and South 6th Street	B	B

LEGEND

1 — Level of Service - AM Peak Hour; Intersection Number; Level of Service - PM Peak Hour

Level of Service
- A
- B
- C
- D

Study Area Boundary

600 300 0 600
Feet

Path: H:\33\11156\ArcGIS\Exhibits2013\MissoulaIntersections_LOS_Orig.mxd
Date Saved: 5/24/2013 11:18:12 AM

2.9 Local Planning

The Missoula Office of Development Services is responsible for planning within the City of Missoula, including code compliance, development and building review, permits and inspections, zoning, non-motorized programming, and transportation planning.

2.9.1 Transportation Planning

A Metropolitan Planning Organization (MPO) is a regional planning organization responsible for transportation planning and allocation of federal transportation funding. Urban areas with a population exceeding 50,000 are required to have an MPO. The Missoula Transportation Policy Coordinating Committee (TPCC) serves as the policy-making body for the MPO, and the Transportation Division of the Missoula Office of Development Services performs transportation planning functions for the MPO.

The MPO prepares a *Unified Planning Work Program* (UPWP) annually that identifies projects and funding for the upcoming program year. The UPWP is augmented with a five-year Transportation Improvement Program (TIP) that identifies a priority list of projects and a financial plan demonstrating fiscal constraint. The TIP is the five-year incremental implementation of the Missoula LRTP, which establishes a long-term vision for transportation investments. Missoula updates its TIP annually. The draft 2013-2017 TIP does not include projects on or adjacent to the Higgins Avenue or Madison Street Bridges.

2012 Missoula Long Range Transportation Plan Update

The *2012 Missoula LRTP* Update is a revision of the 2008 LRTP. The 2012 plan analyzes existing and projected transportation conditions and identifies surface transportation projects and programs through 2040 for all modes to meet Missoula's transportation needs. The plan strives to link the city's vision for transportation, land use, and community development while remaining fiscally constrained by the amount of federal, state, and local funding anticipated to be available during the planning horizon.

The LRTP proposes studying the feasibility of different treatments on Higgins Avenue to improve access and safety for all modes, including converting the current four-lane roadway to a three-lane section with a single travel lane in each direction and a center turn lane.

Missoula Urban Transportation District Urban Streetcar Study

The *Missoula Urban Transportation District Urban Streetcar Study* evaluates operational factors and potential alignments for streetcar routes. The plan discusses potential funding options to build and maintain an initial streetcar line, required conditions to foster long-term support, and potential effects on property development. The plan proposes to construct a streetcar track along the Madison Street Bridge. Funding for implementation of a streetcar system has not been identified at this time.

Missoula Urban Transportation District Long Range Plan

The *Missoula Urban Transportation District Long Range Plan* is a 30-year plan designed to help meet Missoula's goals of providing safe and efficient transportation services. Specific goals identified in the plan include increasing the use of transit, improving transportation options, reducing single vehicle dependence, improving public health, creating incentives for reducing traffic congestion, and building partnership dedicated to reducing vehicle miles traveled (VMT). The plan does not identify any specific proposals for the Higgins Avenue or Madison Street Bridges.

2.9.2 Non-Motorized Transportation Planning

Missoula 2011 Active Transportation Plan

The *2011 Missoula Active Transportation Plan* (MATP) provides guidance for the development of active transportation facilities in Missoula. The *MATP* identifies policies, designs, and proposed projects based on the community's vision for bicycle and pedestrian components of the multi-modal transportation system, and presents recommendations for prioritizing federal aid transportation funding for bicycle and pedestrian infrastructure. The plan proposes protected bikeways, widened walkways, historic roadway lighting, and enhanced connections to Caras Park along the Higgins Avenue Bridge. The plan also proposes Riverfront Trail connections along the north side of the Clark Fork River at Madison Street, Higgins Avenue, and Orange Street.

Missoula Transit Development Plan

The *Missoula Transit Development Plan* (TDP) is prepared by the Missoula Urban Transportation District (MUTD), which operates the Mountain Line bus system. The TDP describes existing transit facilities and identifies future transit needs over a five-year planning horizon with the MUTD. These projects are incorporated into the Missoula TIP when funding allows. The TDP aims to contribute to a safe, convenient, and accessible transportation system for the MUTD, which reduces VMT, carbon emissions, air pollution, and traffic congestion. The Missoula TDP does not identify any specific proposals for the Higgins Avenue or Madison Street Bridges.

2012 Missoula County Parks and Trails Master Plan

The *Missoula County Parks and Trails Master Plan* is a land use plan that guides the administration and management of parks and recreational lands to improve recreational opportunities in Missoula County. The plan strives to promote personal health, social well-being, and economic benefits to improve the quality of life in Missoula County. The plan does not identify any specific proposals for the Higgins Avenue or Madison Street Bridges.

Missoula Urban Area Open Space Plan (2006 Update)

The *Missoula Urban Area Open Space Plan* is a land use plan aiming to conserve and expand existing open spaces for recreational and ecological purposes. The plan envisions a trail system "to provide recreational opportunities and help further facilitate non-motorized transportation

as a viable option for more people in and around the city." It prioritizes extension and connectivity of existing trails. The plan does not identify any specific proposals for the Higgins Avenue or Madison Street Bridges.

Master Parks and Recreation Plan for the Greater Missoula Area (2004)

The *Master Parks and Recreation Plan for the Greater Missoula Area* is a land use guide for parks, trails, open spaces, conservation lands, the urban forest, and recreational opportunities in the greater Missoula urban area. The plan establishes desired parkland acreage and standards for developed parks, and identifies goals, policies, and action items to increase the quantity and quality of parks. The plan does not identify any specific proposals for the Higgins Avenue or Madison Street Bridges.

2.9.3 Land Use Planning

Missoula County Growth Policy (2005 Update)

The *Missoula County Growth Policy* is an official public document that provides a framework for local government land use development decisions in Missoula and Missoula County. The growth policy combines more than 30 years of land use planning to provide a framework for existing goals and policies, and establishes the legal and philosophical foundation upon which future plans and regulations will be based. The growth policy notes "a primary objective of managing growth is to ensure the availability and affordability of infrastructure such as sewer, water, transportation, public safety, health and social services, public lands, parks, and other open spaces, cultural resources, and education. Adequate infrastructure is essential to a healthy, natural, economic, and social environment in Missoula County." The plan does not identify any specific proposals for the Higgins Avenue or Madison Street Bridges.

Missoula Urban Comprehensive Plan (1998 Update)

The *Missoula Urban Comprehensive Plan* is a policy document outlining Missoula's growth trends in population, residential development, commercial development, industrial development, and economic activity. It provides a coordinated guide for managing long-term growth and development. The plan does not identify any specific proposals for the Higgins Avenue or Madison Street Bridges.

Missoula Greater Downtown Master Plan

The *Missoula Greater Downtown Master Plan* guides the growth of Missoula's downtown with regard to land use and circulation for all modes of transportation. The plan notes "the *Missoula Greater Downtown Master Plan* is a comprehensive, balanced-center strategy for strengthening and expanding downtown Missoula's role as the economic and cultural heart of the community." The plan proposes to construct a streetcar track along the Madison Street Bridge. It also recommends consideration of three-lane and four-lane roadway configuration on Higgins Avenue, increased widths of sidewalks and dedicated bicycle lanes, and new bicycle/pedestrian connections to Caras Park.

The Missoula Urban Fringe Development Area Project

The *Missoula Urban Fringe Development Area Project* is a land use document providing regional context for residential growth on the edges of the City of Missoula. The goal of this project was to identify how an estimated 15,000 new residential units could be accommodated within the Missoula Urban Service Area (URSA), and develop implementation strategies for addressing growth in accordance with adopted policies. The plan does not identify any specific proposals for the Higgins Avenue or Madison Street Bridges.

3.0 SOCIAL AND ENVIRONMENTAL CONDITIONS

3.1 Physical Environment

3.1.1 Soil Resources and Prime Farmland

The study area is within the city limits of Missoula in a primarily urban area. NRCS soil mapping indicates there is no prime or unique farmland or farmland of statewide or local importance within the study area.

3.1.2 Geologic Resources

Montana Bureau of Mines and Geology maps indicate the study area is primarily composed of alluvium (gravel, sand, and silt) of older and active stream channels and floodplains.

3.1.3 Surface Waters

The Higgins Avenue and Madison Street Bridges cross the Clark Fork River, the major water body within the study area. The Missoula Irrigation Ditch parallels the Clark Fork River to the south before veering southwest.

The Clark Fork River is an impaired water body under Section 303(d) of the Clean Water Act. Causes of impairment include arsenic, cadmium, chlorophyll-a, copper, nitrogen, organic enrichment biological indicators (sewage), and phosphorus. Probable sources of these pollutants include mill tailings, industrial point source discharge, and municipal point source discharge. The Montana Department of Environmental Quality (DEQ) Total Daily Maximum Load (TMDL) standards for the Clark Fork River have been completed for chlorophyll-a, nitrogen, organic enrichment biological indicators, and phosphorous. DEQ TMDL standards and potential impacts to water quality would need to be considered if improvement options are forwarded from this study.

The Clark Fork River is a Water of the U.S. and falls within the jurisdiction of the U.S. Army Corps of Engineers (USACE) under Section 404 of the Clean Water Act. It is considered a navigable waterway by the State of Montana from Deer Lodge, Montana to the Idaho state line. Jurisdiction of the irrigation ditch has not been determined. The study area is also located within the Missoula Municipal Separate Storm Sewer System (MS4).

Coordination with federal, state, and local agencies would be necessary to determine appropriate permits if improvement options are forwarded from this study. Any work within Waters of the U.S. and navigable state surface waters would require a Clean Water Act Section 404 permit, water quality certification under Clean Water Act Section 401 (DEQ), a Montana Land Use Easement (Montana Department of Natural Resources and Conservation [DNRC]), a Montana Stream Protection Act permit (Montana Fish, Wildlife & Parks [FWP]), and a 318 temporary turbidity permit (DEQ). In addition, forwarded improvement options may trigger the need to obtain coverage under the Montana Pollutant Discharge Elimination System (MPDES) General Permit for Storm Water Discharges Associated with Construction Activity and comply with the requirements outlined in MDT's Storm Water Management Program (SWMP).

3.1.4 Wetlands

National Wetland Inventory (NWI) mapping for the study area indicates freshwater forested/shrub wetlands may be present just west of the Higgins Avenue Bridge. NWI maps are based on aerial and satellite imagery and have not been field verified. If improvement options are forwarded from this study, future wetland delineations would be required if bridge improvements include work within the Clark Fork River or other Waters of the U.S. Unavoidable impacts to wetlands must be compensated through mitigation in accordance with the USACE regulatory requirements. Work within Waters of the U.S., including jurisdictional wetlands, would require a Clean Water Act 404 permit (USACE).

3.1.5 Floodplains

Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps for Missoula (FEMA 2013) indicate a portion of the study area is within the 100-year floodplain of the Clark Fork River. The City of Missoula is currently in the process of adopting updated floodplain boundaries within the study area. The City of Missoula Floodplain Administrator is responsible for administering the floodplain management requirements in Missoula. If improvement options are forwarded from this study, impacts to floodplains would need to be identified and evaluated. Project development would require coordination with the City of Missoula to minimize floodplain impacts and obtain necessary floodplain permits.

3.1.6 Groundwater Resources

The Missoula Aquifer is a shallow, unconfined aquifer extending from the Clark Fork River at Hellgate Canyon to the Bitterroot River. The saturated portion of the aquifer averages eighty feet in thickness, and the depth below the surface to water (static water level) varies from ten to forty feet. According to the Groundwater Information Center at the Montana Bureau of Mines and Geology, public water supply well depths within the study area range from 130 to 200 feet, with static water levels between 30 and 55 feet. The Missoula Aquifer is the sole or principal source of drinking water in the Missoula area and was designated as a Sole Source Aquifer by the U.S. Environmental Protection Agency (EPA) in 1988. Any improvement options

forwarded from this study must meet the provisions found in the 1994 Missoula Aquifer Protection Ordinance, and would be subject to EPA review if federally funded.

3.1.7 Hazardous Materials

DEQ and Montana Natural Resources Information System (NRIS) records indicate ten underground storage tanks (UST) in the study area. Of these, three have been reported as leaking, with petroleum releases occurring at three of the sites. The study area is also located within the Petty Creek and Woodman Mining districts. If improvement options are forwarded from this study, further evaluation may be needed at specific sites to determine the potential for encountering contaminated soils or groundwater during construction. If contaminated soils or groundwater is encountered during construction, handling and disposing of the contaminated material would be conducted in accordance with applicable federal, state, and local laws and regulations.

3.1.8 Air Quality

The Missoula urban area was designated as non-attainment for particulate matter (PM_{10}) in 1991. The study area is located within the PM_{10} non-attainment area. Missoula was also designated as a non-attainment area for carbon monoxide (CO) in 1991. It was redesignated as a CO maintenance area in August 2007. Any improvement options forwarded from this study would need to demonstrate compliance with federal and state requirements.

3.2 Biological Resources

3.2.1 Biological Community

The study area is located within the intermountain grassland ecosystem at an elevation of 3,209 feet above mean sea level. The landscape within the study area has been largely altered, with the majority of native vegetation replaced with hard surfaces or urban landscaping. Native vegetation is primarily found along the Clark Fork River corridor.

The Montana Natural Heritage Program (MNHP) database indicates a number of mammals, birds, amphibians, and reptiles have been observed within the study area vicinity. Several bird species found in the area are protected under the Migratory Bird Treaty Act. Cliff swallow nests have been observed under the Madison Street Bridge. Cliff swallows may also nest under the Higgins Avenue Bridge. Osprey have been observed outside of the study area in the McCormick Park Ball Field just west of the Orange Street Bridge. Restrictions on construction activities potentially affecting occupied nests during the May 1st to August 15th breeding period would need to be considered if improvement options are forwarded from this study. This may include restrictions on vegetation removal and structure modification.

3.2.2 Aquatic Resources

Fifteen fish species are known to occur in the Clark Fork River within the study area. Occurrence of these species ranges from rare to abundant. Abundant and common species include largescale sucker, longnose sucker, longnose dace, mountain whitefish, and rainbow trout. Effects on aquatic resources would need to be considered if improvement options are forwarded from this study.

3.2.3 Threatened and Endangered Species

Seven threatened, proposed threatened, and candidate animal and plant species occur in Missoula County. Of these, bull trout is most likely to occur within the study area. The Clark Fork River is designated as critical habitat for bull trout. MNHP data shows recent observations of yellow-billed cuckoo outside of the study area on Beckwith Street, Myrtle Street, and Tower Street. The yellow-billed cuckoo may use cottonwood/willow habitat along the Clark Fork River within the study area as it migrates to more suitable breeding habitat; however, it is not likely to stay in the study area. Coordination with U.S. Fish and Wildlife Service (USFWS) and an evaluation of potential impacts to all endangered, threatened, proposed, or candidate species would need to be completed during the project development process for any improvement options forwarded from this study.

3.2.4 Species of Concern

Seventeen state species of concern have been documented by the MNHP within the study area vicinity as of March 26, 2013 (not counting federally listed species). An evaluation of potential impacts to all species of concern would need to be completed during the project development process if improvement options are forwarded from this study.

3.2.5 Noxious Weeds

Four noxious weeds are prevalent in the study area, including Dalmatian toadflax, leafy spurge, spotted knapweed, and sulfur cinquefoil. Any improvement options forwarded from this study would need to follow federal, state, and local noxious weed laws and regulations during construction. Coordination with the Missoula County Weed District would need to be conducted during project development to minimize noxious weed impacts.

3.3 Social and Cultural Resources

3.3.1 Demographic and Economic Conditions

Potential impacts related to Title VI of the Civil Rights Act of 1964 and Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, would need to be considered if improvements options are forwarded from this study.

Population and Growth

According to the 2010 Census, Missoula County was the second most populous county in Montana with 109,299 residents. For the last half century, population growth in the county has continued to outpace both the nation and the state. High population growth in Missoula County is expected to continue, with a projected population above 140,000 by 2030 (Montana Department of Commerce, 2012).

All Census tracts within Missoula County increased in population from 1990 to 2000, with the exception of the Missoula City Center which decreased by 155 people (6.9 percent). Urban and rural populations continued to grow in most Census tracts from 2000 to 2012, although the rate of growth slowed from 1990-2000 levels. The combined urban Census tract population in Missoula increased 17.7 percent from 1990-2000, and 14.4 percent from 2000-2010.

Population Demographics

As of the 2010 Census, 93 percent of Missoula County identified as White, with American Indian and Alaska Native individuals comprising 2.6 percent of the population. A number of other races make up the remainder of the population.

The population in Missoula County is aging, consistent with national trends. A 2035 MDT population model projects a substantial increase in the proportion of the population over age 65, as compared to the proportion of the 2035 population under the age of 18.

Employment and Income

The University of Montana dominates employment in the area. The public sector is a primary employer for the Missoula area, including a large number of jobs in the public school system, Missoula County, the U.S. Forest Service, and the City of Missoula. Large private employers include St. Patrick Hospital and Community Medical Center. In the coming decades, employment gains are projected in office and health service occupations. Production occupations and farm, fishing, and forestry occupations are anticipated to stagnate or decrease by 2030.

Unemployment in Missoula County has closely tracked statewide conditions for the last ten years, with unemployment numbers increasing from 2007 to 2010. Both Montana and Missoula County have fared relatively well in comparison to the nation as a whole, with current unemployment rates (at approximately 7.0 percent) below the national average (at approximately 9.0 percent).

3.3.2 Land Ownership and Land Use

Cadastral maps for Missoula show land within the study area as privately owned or owned by the City of Missoula or the University of Montana.

The study area is within the Missoula city limits. According to NRIS, the study area is predominately urban with low- and high-density residential and commercial areas. Public open space and parks within the study area are primarily found along the Clark Fork River corridor.

3.3.3 Recreational Resources

The Clark Fork River and adjacent lands provide a variety of recreational opportunities within the study area. Recreational opportunities on the Clark Fork River include fishing and boating. Brennan's Wave, a man-made river feature just west of the Higgins Avenue Bridge, is a play wave for kayakers. Multiple public open spaces and parks are located along the river corridor. The Ron MacDonald River Trail System parallels both banks of the Clark Fork River within the study area. Outside the study area, the river trail system connects to the Kim Williams Trail (to the east) and the Milwaukee Trail and the Bitterroot Branch Trail (to the west) allowing users to move throughout the city with limited contact with vehicular traffic.

Caras Park, the Clark Fork Natural Area, Bess Reed Park, Brennan's Wave, John Toole Park, Jeanette Rankin Park, Kiwanis Park, and the Ron MacDonald River Trail System (excluding portions funded with Community Transportation Enhancement Program [CTEP] funds), may be protected under Section 4(f) of the U.S. Department of Transportation Act of 1966. Caras Park and Kiwanis Park received funds from the National Land and Water Conservation Fund Act (LWCFA), known as Section 6(f). Potential effects on recreational use would need to be considered in accordance with Section 4(f) and Section 6(f) protections if improvement options are forwarded from this study.

3.3.4 Cultural Resources

The study area contains portions of three historic districts listed on the National Register of Historic Places (NRHP), including the Downtown Historic District, the Southside Historic District, and the University Area Historic District. Approximately 297 individual properties within the Downtown Historic District have been listed or are eligible for listing on the NRHP. A number of individual properties within and outside of the three districts have also been listed or are eligible for listing on the NRHP. Individually listed properties near the Higgins Avenue Bridge include the Wilma Building and the Milwaukee Depot. In addition to protections granted under the National Historic Preservation Act (NHPA), these districts and properties are also protected under Section 4(f) of the Transportation Act due to their historic significance.

No records of archaeological sites were identified within the study area.

According to the Montana State Historic Preservation Office and MDT, neither the Higgins Avenue Bridge nor the Madison Street Bridge have been surveyed or recorded as historic properties. Both bridges, along with other potential properties in the study area (including the Missoula Irrigation Ditch and the old Milwaukee Road that parallel the south side of the Clark Fork River), would need to be surveyed and assessed for eligibility in accordance with Section 106 of the NHPA if bridge improvement options are forwarded from this study. Concurrence

from the Montana State Historic Preservation Office on the eligibility determinations would need to be requested. Indirect impacts (such as visual, noise, and access impacts) to eligible or listed properties would also need to be considered.

3.3.5 Noise

The study area is located within an urban environment. Sensitive receptors, such as residences, are located within the study area and several are within 1,000 feet of the Higgins Avenue and Madison Street Bridges. Any proposed bridge improvements forwarded from this study that include substantial vertical or horizontal alignment alterations or the addition of through-traffic lanes would need to evaluate potential noise effects consistent with Federal Highway Administration requirements and MDT policy.

3.3.6 Visual Resources

The study area is characterized as urban, with low- and high-density residential areas, commercial areas, a transportation network of roadways and bridges, public open space, and parks. The Clark Fork River bisects the study area from east to west. A narrow riparian corridor of primarily cottonwood and willow extends on both sides of the Clark Fork River. Landscaped public city parks extend beyond the riparian corridor to the north and south, transitioning into the more developed historic downtown and south side commercial/residential districts. Mount Sentinel is visible to the southeast and Mount Jumbo visible to the northeast.

4.0 CONCLUSION

This existing and projected conditions report identifies transportation system elements and physical, biological, social, and cultural features within the study area. Table 4.1 presents a summary of potential transportation system issues.

Table 4.1 Summary of Transportation System Issues

Element	Issue
Bridge Condition	• The Higgins Avenue and Madison Street Bridges are structurally deficient and ranked poor for structure condition and deck condition.
Seismic Hazard	• The Higgins Avenue and Madison Street Bridges exhibit multiple seismic hazards.
Bicycle and Pedestrian Elements	• Higgins Avenue and Madison Street Bridge pedestrian/bridge railings do not meet current MDT design standards. • Sidewalks and ramp transitions from the roadway sidewalks to the Higgins Avenue and Madison Street Bridge sidewalks do not meet ADA requirements. • Bicycle lane widths do not meet AASHTO guidelines.
Operational Conditions	• The Higgins Avenue Bridge is identified as congesting (LOS D to E) in 2010 and congested (LOS F) in 2040. • The Madison Street Bridge is identified as congesting (LOS D to E) in 2040. • Three study intersections are identified as LOS D (congesting) in the PM peak hour.

Table 4.2 summarizes potential physical, biological, social, and cultural issues and constraints.

Table 4.2 Summary of Potential Environmental Issues and Constraints

Resource		Description
Physical Environment	**Surface Waters, Wetlands, and Floodplain**	• The Clark Fork River is an impaired water body under Section 303(d) of the Clean Water Act. • Wetland areas and the Missoula Irrigation Ditch are located within the study area. • The study area is within the 100-year floodplain for the Clark Fork River.
	Hazardous Materials	• Ten underground storage tanks, three of which are reported as leaking, and two mining districts are located within the study area.
	Air Quality	• The study area is located within a non-attainment area for PM_{10} and a maintenance area for CO.
Biological Resources	**Threatened and Endangered Species**	• Bull trout (a federally-listed threatened species) may occur in the study area. The Clark Fork River is designated as critical habitat for bull trout. • The yellow-billed cuckoo (a candidate species) may use cottonwood/willow habitat along the Clark Fork River within the study area.
	Species of Concern	• Seventeen animal and plant species of concern may occur in the study area vicinity.
Social and Cultural Resources	**Recreational Resources**	• John Toole Park, Clark Fork Natural Area, Caras Park, Bess Reed Park, Jeanette Rankin Park, and Kiwanis Park, and portions of the Ron MacDonald River Trail System are located within the study area and may be considered Section 4(f) resources. • Caras Park and Kiwanis Park are considered Section 6(f) resources.
	Cultural Resources	• Portions of the Downtown Historic District, the Southside Historic District, and the University Area Historic District are located within the study area. Individual properties within and outside these districts have been listed or are eligible for listing on the NRHP. These historic districts and properties are also protected under Section 4(f).
	Noise	• Sensitive noise receptors are located within 1,000 feet of the Higgins Avenue and Madison Street Bridges.

5.0 REFERENCES

American Association of State Highway and Transportation Officials (AASHTO). 2002. Standard Specifications for Highway Bridges, 17th Edition.

American Association of State Highway and Transportation Officials (AASHTO). 2008. The Manual for Bridge Evaluation, First Edition.

American Association of State Highway and Transportation Officials (AASHTO). 2012. Guide for the Development of Bicycle Facilities, Fourth Edition.

Federal Highway Administration (FHWA). 1995. Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges. Report No. FHWA-PD-96-001.

Federal Highway Administration (FHWA). 2005. Public Roads: Looking to Load and Resistance Factor Rating. Publication No. FHWA-HRT-05-006.

Federal Highway Administration (FHWA). 2006. Seismic Retrofitting Manual for Highway Structures. Publication No. FHWA-HRT-06-032.

Federal Register. 2004. National Bridge Inspection Standards Final Rule. 23 CFR Part 650 Subpart C.

Garber and Hoel. 2009. Traffic & Highway Engineering, Fourth Edition.

Montana Department of Transportation. Date Unknown. Bridge Design Standards.

Montana Department of Transportation. 2002. Montana Structures Manual. Volumes I and II.

Montana Department of Transportation. 2013. MDT Bridge Program under MAP-21.

Montana Department of Transportation. 2013. Missoula Bridges Environmental Scan.

Transportation Research Board of National Academies. 2010 and 2000. Highway Capacity Manual.

United States Access Board. 2005. Notice of Availability of Draft Public Rights-of-Way Accessibility Guidelines.

Appendix 1

Field Review Photo Log

MISSOULA BRIDGES
PLANNING STUDY

PHOTO LOG

PREPARED FOR:

MONTANA MDT DEPARTMENT OF TRANSPORTATION

PREPARED BY:

DOWL HKM

104 East Broadway, Suite G-1
P.O. Box 1009
Helena, Montana 59624
(406) 442-0370

March 2013

This photo log illustrates conditions observed during a field review conducted on March 21, 2013. Photo categories include bridge structures, bicycle/pedestrian facilities, and environmental conditions. This photo log does not provide a comprehensive account of all conditions within the study area. Conditions were visually inspected. No testing, delineations, or measurements were conducted.

Bridge Structures

Higgins Avenue Bridge

Photo 1. Cracking concrete with efflorescence and corroded rebar is visible on the Higgins Avenue Bridge diaphragms at the intermediate bents.

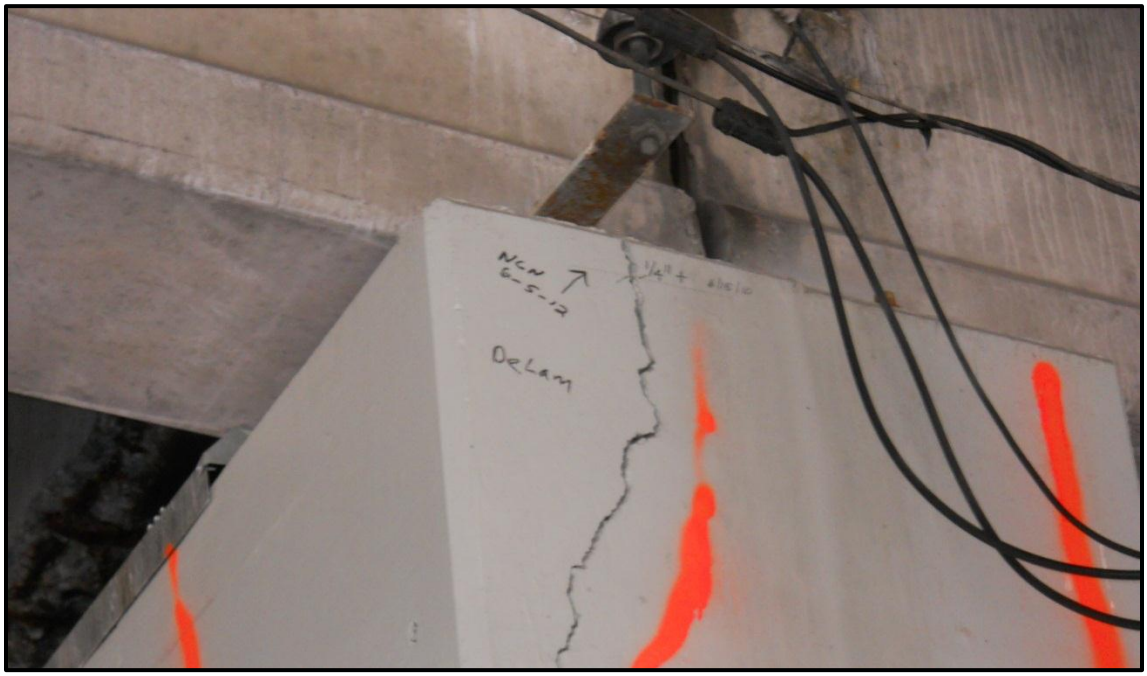


Photo 2. Cracking concrete delineated by orange paint on a Higgins Avenue Bridge pier.

Photo 3. Spalled concrete and corroded rebar in the soffit under the Higgins Avenue Bridge pedestrian sidewalk.

Photo 4. Cracking concrete with efflorescence and steel corrosion on the Higgins Avenue Bridge.

Photo 5. Cracking concrete with efflorescence on the Higgins Avenue Bridge. Photo 6 shows this area from the top side of the bridge.

Photo 6. Cracking concrete on the Higgins Avenue Bridge top decking. Photo 5 shows this area from underneath the bridge.

Photo 7. Concrete bent delamination delineated by orange paint and moderately corroded structural steel on the Higgins Avenue Bridge.

Photo 8. Corroded steel and dark staining of concrete on the Higgins Avenue Bridge.

Photo 9. Staining and cracking concrete with efflorescence on the Higgins Avenue Bridge. The white line on the left side of the photo is daylight filtering through the bridge median.

Photo 10. A modified ramp transition area from the roadway sidewalk to the Higgins Avenue Bridge sidewalk. This ramping would not be considered compliant with the Americans with Disabilities Act (ADA).

Photo 11. Delamination and spalling concrete along the Higgins Avenue Bridge sidewalk.

Photo 12. Cracking concrete along the Higgins Avenue Bridge sidewalk and collision damage to the bridge sidewalk railing.

Photo 13. Steel corrosion at a Higgins Avenue Bridge pier and bridge bearing connection.

Madison Street Bridge

Photo 14. Degradation on the north Madison Street Bridge abutment, including corroded steel, cracking concrete with efflorescence, and concrete staining indicating rebar corrosion.

Photo 15. View of girder bearing at the north abutment exhibiting debris/pack rust between the built-up rocker assembly and bearing plate, which may limit the movement of this joint on the Madison Street Bridge.

Photo 16. Concrete spalling and corroded rebar at the edge of the Madison Street Bridge. This condition was observed extending over the length of both sides of the bridge.

Photo 17. Cracking concrete with efflorescence and patches to concrete sections on the Madison Street Bridge.

Photo 18. Orange paint delineating steel corrosion and concrete delamination on the Madison Street Bridge.

Photo 19. Corroded steel on the Madison Street Bridge.

Photo 20. Spalled concrete beam at the north abutment of the Madison Street Bridge

Photo 21. Corroded steel and concrete delamination on a Madison Street Bridge bent.

Photo 22. Deterioration of the Madison Street Bridge bent near the ground, including concrete delamination and spalling.

Photo 23. Deterioration of the Madison Street Bridge bent, including corroded steel, cracking concrete with efflorescence, and stains from corroded rebar.

Photo 24. Cracking concrete with efflorescence and concrete deck patching with formwork left in place on the Madison Street Bridge.

Photo 25. Delaminated/spalled concrete and corroded rebar on the Madison Street Bridge.

Photo 26. Delaminated and patched sidewalk on the Madison Street Bridge.

Photo 27. Delaminated and patched sidewalk on the Madison Street Bridge. The railing measures 32 inches in height, which does not meet current standards.

Photo 28. A modified ramp transition area from the roadway sidewalk to the Madison Street Bridge sidewalk. This ramping would not be considered ADA compliant.

Photo 29. A modified ramp transition area from the roadway sidewalk to the Madison Street Bridge sidewalk. This ramping would not be considered ADA compliant.

Bicycle/Pedestrian Facilities

Photo 30. Looking north on the south side of the Madison Street Bridge bicycle/pedestrian underpass.

Photo 31. Looking south on the north side of the Madison Street Bridge bicycle/pedestrian underpass.

Photo 32. Looking north on the south leg of the Higgins Avenue and Broadway Street intersection. Dedicated bicycle lanes run north and south along Higgins Avenue. Bicycle racks can be seen in the photo along the east side of Higgins.

Photo 33. Looking south on the Higgins Avenue Bridge. Dedicated bicycle lanes run north and south along the bridge. A cyclist is using the southbound dedicated bicycle lane in the photo.

Photo 34. Looking south on the Higgins Avenue Bridge. A stairway is located on the west side of the Higgins Avenue Bridge with bicycle racks underneath.

Photo 35. Looking north on the south side of the Higgins Avenue Bridge. Bicycles are prohibited on the sidewalks as indicated by signs placed on either side of the bridge.

Photo 36. Looking north on the Higgins Avenue Bridge. A stairway is located on the east side of the bridge.

Photo 37. Looking north on the south leg of the Higgins Avenue and 4th Street intersection. A bicycle sharrow can be seen on the east side of Higgins Avenue.

Photo 38. Looking west on the east leg of the Higgins Avenue and 5th Street intersection. A dedicated bicycle lane is provided on the north side of 5th Street.

Photo 39. Looking south along the Riverfront Trail south of the Higgins Avenue Bridge.

Photo 40. Looking east on the west leg of Ryman Street and Main Street. Bicycle racks are provided in this location.

Photo 41. A member of the public loads her bicycle onto a bicycle rack attached to the front of a bus along Broadway Street.

Environmental Conditions

Photo 42. Looking upstream (east) at the Clark Fork River corridor from the Madison Street Bridge. A gravel bar is located on the northern side of the channel, while the south banks are steeply vegetated with cottonwood and willow.

Photo 43. Looking downstream (west) at the Clark Fork River corridor from the Madison Street Bridge. Both the north and south sides of the river have steeply vegetated banks.

Photo 44. Madison Park located just east of the Madison Street Bridge.

Photo 45. Looking west at the Madison Street Bridge and the Ron MacDonald Riverfront Trail, a public trail that parallels the south bank of the Clark Fork River.

Photo 46. Swallow nests on the east side of the Madison Street Bridge.

Photo 47. Looking east at a canal which crosses underneath the Madison Street Bridge south approach.

Photo 48. Looking west at canal culvert crossing underneath the Madison Street Bridge south approach.

Photo 49. View of John H. Toole Riverfront Park, a public park located west of the Madison Street Bridge on the south bank of the Clark Fork River.

Photo 50. Public track located within John H. Toole Park. The track is located west of the Madison Street Bridge.

Photo 51. Looking west at the Clark Fork River riparian corridor between the Madison Street Bridge and the Higgins Avenue Bridge. Cottonwood and willow are dominant riparian species along this corridor.

Photo 52. Looking west at the Higgins Avenue Bridge and the Ron MacDonald Riverfront Trail, a public trail that parallels the south bank of the Clark Fork River.

Photo 53. Milwaukee Depot, a historic building located on the south bank of the Clark Fork River and just west of the Higgins Avenue Bridge.

Photo 54. Looking west at palustrine freshwater forested/shrub wetland located downstream (west) of the Higgins Avenue Bridge.

Photo 55. Looking west at the canal which crosses underneath the Higgins Avenue Bridge south approach.

Photo 56. View facing the Missoula Southside Historic District, just south of the Higgins Avenue Bridge.

Photo 57. Caras Park, a public park located west of the Higgins Avenue Bridge on the north bank of the Clark Fork River.

Photo 58. View on the Higgins Avenue Bridge facing north toward the historic Wilma Building.

Photo 59. Looking east from the Higgins Avenue Bridge toward the Ron MacDonald Riverfront Trail. The trail is a public trail that parallels the north bank of the Clark Fork River.

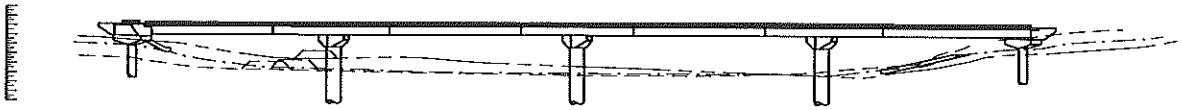
Photo 60. Mallard duck, a common waterfowl species on the Clark Fork River.

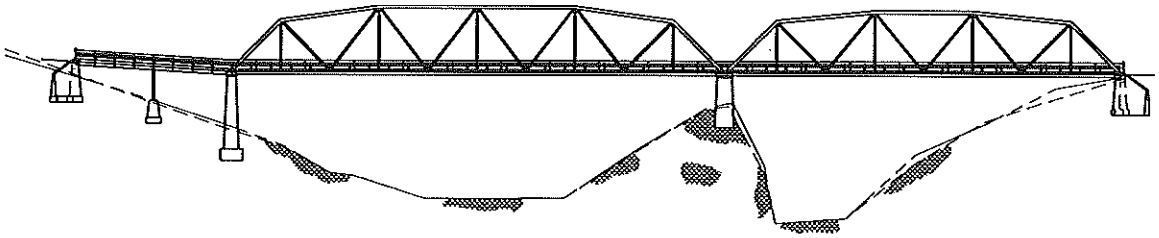
Photo 61. Bess Reed Park, a public park located east of the Higgins Avenue Bridge on the north bank of the Clark Fork River.

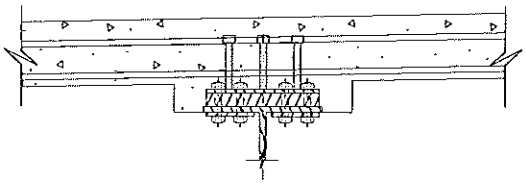
Photo 62. Kiwanis Park, a public park located west of the Madison Street Bridge on the north bank of the Clark Fork River.

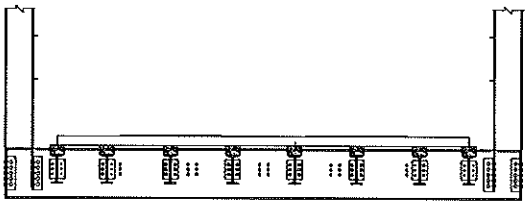
Appendix 2

MDT Bridge Design Standards









MONTANA DEPARTMENT OF TRANSPORTATION

Bridge Design Standards

(Metric and English Units)

Bridge Design Standards and Guidelines

The following text and figures provide a summary of geometric design guidelines to assist the designer in preparing bridge plans. Consider the material as Standards for those projects with full Federal Oversight (those on the Interstate and NHS Systems) and as design guidelines for projects without full federal oversight. (STP, Secondary and Off-system projects)

Standards: Strict design policies that the designer must either follow or obtain a formal Design Exception to modify. The appropriate authority, usually the Road or Bridge Engineer, must grant and approve the Design Exception. The Design Exception request must include thorough justification of the reasoning for not meeting a standard. Right of Way availability and cost saving may form part of the discussion addressing design standards, but only as secondary issues. The primary focus must always remain the safety of the traveling public.

Guidelines: General rules that assist the designer to develop a project and to maintain similarity among projects, systems, and design teams. Guidelines provide flexibility within each design to allow incorporation of context-sensitive elements in the design. Document unusual design elements, including non-standard roadway geometry, bridge load capacity, or widths, and obtain agreement to their implementation in the Scope of Work Report. These variations from standards typically do not require formal Design Exceptions. The safety of the traveling public must take highest priority when considering approval of unusual or unique design features.

BRIDGE DESIGN STANDARDS

NATIONAL HIGHWAY SYSTEM (NHS)
(INTERSTATE)

A) DESIGN STANDARDS

1) LIVE LOADING – HL 93 (LRFD Specifications)
HS 25 (MS 22.5) (AASHTO Standard Specifications)

2) DESIGN AND ANALYSIS PROCEDURES
Perform all structural designs with the current edition of the AASHTO LRFD Bridge Design Specifications or the AASHTO Standard Specifications for Highway Bridges and the Montana Department of Transportation Bridge Design Manual. If there is a difference between AASHTO and the Montana standards, the Montana standards control, because they tailor designs to local conditions.

B) HORIZONTAL AND VERTICAL CLEARANCES
See Attachment I-A

C) BRIDGE WIDTH

1) NEW BRIDGES
New bridges on the interstate system will have a roadway width of 38.0 ft (11.4 m). This width breaks down as follows:
   a) One 4.0 ft (1.2 m) inside shoulder
   b) Two 12.0 ft (3.6 m) lanes, and
   c) One 10.0 ft (3.0 m) outside shoulder.

See Attachment I-B for face to face of rail dimensions.

2) BRIDGES TO REMAIN IN PLACE
Consider bridges on the Interstate system with a roadway less than a 38.0 ft (11.4 m) for widening if they form part of a project already requiring major rehabilitation work to correct a deck problem or for a major seismic retrofit. Do not consider them for widening in projects consisting only of minor rehabilitation work.

Evaluate bridges requiring major rehabilitation work to determine if a cost/benefit analysis justifies widening them. Perform an engineering study for each bridge that considers sight distances, grades, roadway widths, bridge width, ADT, etc., prior to making the decision on whether to widen the bridge.

Where the project will not widen bridges, the Preconstruction Bureau will make recommendations about putting narrow bridge signs on bridges with a roadway width less than 38.0 ft (11.4 m).

D) SCOPE OF WORK (BRIDGES TO REMAIN IN PLACE)
Most of the work done on Interstate structures that remain in place will fall into one of three categories.

1) SAFETY WORK
Safety work will generally form part of a roadway resurfacing project, but can constitute a "stand alone" bridge project to correct a specific safety problem. Safety projects do not require widening bridges.

   a) Bridge Rail
   Modify bridge railing to comply with bridge rail policy (See Attachment I-G). Try to obtain a 31.0 ft (9.4 m) minimum roadway width for long bridges (over 200 ft (60 m)), if the cost/benefit analysis justifies doing so, when modifying rail to comply with policy.

b) Anti-skid treatment for decks.

2) MINOR REHABILITATION WORK
Minor rehabilitation work will generally consist of the items listed below and will usually form part of a roadway resurfacing project. It may include other items. Minor rehabilitation work does not require widening the bridge.

a) Guard Angles
b) Expansion joints
c) Deck Seal (silane, HMWM, etc.)
d) Spot painting of the structural steel
e) Drains and Drainage systems
f) Elevation adjustments
g) Lighting upgrades

3) MAJOR REHABILITATION WORK
Usually the work under this category requires more plan development time than the corresponding roadway plans for a roadway resurface or overlay project. This work often requires a "stand alone" bridge project.

a) Deck Rehabilitation

i) Replacements
If it becomes necessary to replace a deck, evaluate the cost effectiveness of widening the structure to a roadway width of 38.0 ft (11.4 m). Give higher priority to bridges less than 200 ft (60 m) in length, as our limited resources will widen more bridges that way.

ii) Deck overlays
When deck conditions warrant and sufficient lead time exists time to obtain the deck survey a deck overlay can form part of a roadway overlay or a widen and overlay project. If sufficient lead time does not exist to match the road project, pursue the deck overlay as a "stand alone" project. Placing a deck overlay does not require widening the bridge.

b) Repainting or overcoat painting

c) Scour countermeasures
Give no consideration to widening a bridge where the project includes only scour counter-measures.

d) Structure condition ratings
Bring all structural elements to a condition rating of at least (7) as defined in Attachment I-C.

e) Miscellaneous
Any safety or minor rehabilitation work listed in D)1) or D)2) above may also form part of a major rehabilitation project.

4) SEISMIC RETROFITTING
The Seismic Crew has screened all bridges for seismic requirements in accordance with the Bridge Bureau Seismic Screening procedure. (See Attachment 1-D). Base retrofit needs on their ratings.

NATIONAL HIGHWAY SYSTEM (NHS)
(NON - INTERSTATE)

A) DESIGN STANDARDS
1) LIVE LOADING – HL 93, HS 25 or MS 22.5 for new construction
HS 15 or MS 13.5 for bridges to remain in place
2) DESIGN AND ANALYSIS PROCEDURES
Perform all structural designs in accordance with the current edition of the AASHTO LRFD Bridge Design Specification or of the AASHTO Standard Specifications for Highway Bridges and the Montana Department of Transportation Bridge Design Manual. If there is a difference between AASHTO and the Montana standards, the Montana standards control, because they tailor designs to local conditions.

B) HORIZONTAL AND VERTICAL CLEARANCES
See Attachment I-A

C) BRIDGE WIDTH
1) NEW BRIDGES
New bridges on the NHS system (non-interstate) will have a roadway width in accordance with the table below, but the roadway width must also at least equal that shown on the NHS Route Segment Map. (See Attachment I-B for face-to-face of rail dimensions.)

FROM TABLE VII-2 P 499 1990 AASHTO GREEN BOOK FOR 50, 60 and 70 mph (80,100, and 110 kph) DESIGNS

Minimum Roadway Widths for New Bridges		
Projected Traffic	Bridge Roadway Width	
	English	Metric
ADT < 400	32.0 ft (60 & 70 mph)	9.6 m (100 & 110 kph)
ADT ≥ 400	36.0 ft	10.8 m
DHV* 100-200	36.0 ft	10.8 m
DHV > 200	40.0 ft	12.0 m

* Design Hourly Volume

FROM THE ROUTE SEGMENT MAP

Minimum Roadway Widths		
Road	English	Metric
Green Road	32.0 ft	9.6 m
Blue Road	36.0 ft	10.8 m
Red Road	40.0 ft	12.0 m

2) BRIDGES TO REMAIN IN PLACE
Bridges on the Non-Interstate NHS must have a roadway width of at least 28.0 ft (8.4 m) to qualify for consideration to remain in place. If a bridge within the limits of a project is functionally and structurally adequate and has a roadway width less than 28.0 ft (8.4 m) the project must widen it to meet the requirements of section C)1) above.

The Preconstruction Bureau will make recommendations about putting up narrow bridge signs when the bridge width is less than the roadway width.

D) SCOPE OF WORK (BRIDGES TO REMAIN IN PLACE)
Most of the work required on bridges that remain in place will fall into one of three categories.

1) SAFETY WORK
Safety work will generally form part of a roadway overlay or overlay and widen project, but can constitute a "stand alone" bridge project to correct a specific safety problem. If the bridge lies within the limits of a roadway overlay or overlay and widen project, the bridge's final roadway width must comply with Section C) 2) above.

a) Bridge Rail
Modify bridge railing to comply with bridge rail policy. (See Attachment I-G).
b) Anti-skid treatment for decks.

2) MINOR REHABILITATION WORK
Minor rehabilitation work will generally consist of the items listed below and will usually form part of a roadway overlay or overlay and widen project. It may include other items. Widen the bridge if its roadway width does not meet the requirements of section C) 2).

a) Guard Angles
b) Expansion joints
c) Deck seal (silane, HMWM, etc.)
d) Spot painting of structural steel
e) Drains and Drainage systems
f) Elevation adjustments
g) Lighting upgrades

3) MAJOR REHABILITATION WORK
Usually the work under this category requires more plan development time than the corresponding roadway plans for an overlay or overlay and widen project. This work often requires a "stand alone" bridge project.

a) Deck Rehabilitation

i) Replacements
If it becomes necessary to replace a deck, perform a cost benefit analysis to determine whether to widen the bridge to the width indicated in section C) 1).
ii) Deck overlays
When deck conditions warrant and sufficient lead time exists to obtain the deck survey and prepare plans, a deck overlay can form part of a roadway overlay or overlay and widen project. If the road project schedule does not allow time to perform deck testing, execute the deck overlay as a "stand alone" project. If the bridge meets the minimum roadway width requirement of 28.0 ft (8.4 m) widening the deck is not a required part of the overlay.

b) Repainting or overcoat painting

c) Scour counter-measures
Give no consideration to widening a bridge where the project includes only scour counter-measures.

d) Structure condition ratings
Bring all structural elements back to a condition rating of at least (7), as defined in Attachment I-C.

e) Miscellaneous

The project may include any safety or minor rehabilitation work listed in section D) 1) or D) 2).

4) SEISMIC RETROFITTING
The Seismic Crew has screened all bridges for seismic requirements in accordance with the Bridge Bureau Seismic Screening procedure. (See Attachment 1-D). Base retrofit needs on their ratings.

SURFACE TRANSPORTATION PROGRAM (STP)
(NON-NHS PRIMARY)

A) DESIGN STANDARDS

1) LIVE LOADING – HL 93, HS 25 or MS 22.5 for new construction
-- HS 15 or MS 13.5 for bridges to remain in place

2) DESIGN AND ANALYSIS PROCEDURES
All structural designs will be done in accordance with the current edition of the AASHTO LRFD Bridge Deign Specification or of the AASHTO Standard Specifications for Highway Bridges and the Montana Department of Transportation Bridge Design Manual. In the case of a difference between AASHTO and the Montana standards, the Montana standards control, because they tailor designs to local conditions.

B) HORIZONTAL AND VERTICAL CLEARANCES
See Attachment I-A

C) BRIDGE WIDTH

1) NEW BRIDGES
New bridges on the STP system (NON-NHS PRIMARY) will have a roadway width in accordance with the table below, but the roadway width must also at least equal that shown on the STP Route Segment Map. (See Attachment I-B for face-to-face of rail dimensions)

FROM TABLE VII-2 P 499 1990 AASHTO GREEN BOOK FOR 45, 55 and 60 mph (70, 90, AND 100 kph) DESIGNS

Minimum Roadway Widths for New Bridges		
Projected Traffic	Bridge Roadway Width	
	English	Metric
ADT < 400	30.0 ft (45 mph)	9.0 m (70 kph)
	32.0 ft (55 & 60 mph)	9.6 m (90 & 100 kph)
ADT ≥ 400	36.0 ft	10.8 m
DHV* 100-200	36.0 ft	10.8 m
DHV > 200	40.0 ft	12.0 m

* Design Hourly Volume

FROM THE ROUTE SEGMENT MAP

Minimum Roadway Widths		
Road	English	Metric
Black Road	Maintain Existing Level of Service	Maintain Existing Level of Service
Yellow Road	28.0 ft	8.4 m
Green Road	32.0 ft	9.6 m
Red Road	40.0 ft	12.0 m

2) BRIDGES TO REMAIN IN PLACE
The table below shows the minimum roadway width of bridge for consideration to remain in place at the present width on the STP (NON-NHS PRIMARY).

If a bridge within the limits of a project is functionally and structurally adequate to remain in place but has less roadway width than indicated in the table below widen it to the roadway width shown in C) 1).

The Preconstruction Bureau will make recommendations about putting narrow bridge signs up when the bridge width is less than the roadway width.

Minimum Bridge Roadway Width		
Route	English	Metric
Black Route	24.0 ft	7.2 m
Yellow Route	24.0 ft	7.2 m
Green Route	28.0 ft	8.4 m
Red Route	28.0 ft	8.4 m

D) SCOPE OF WORK (BRIDGES TO REMAIN IN PLACE)
Most of the work required on bridges that are to remain in place will fall into one of three categories shown below.

1) SAFETY WORK
Safety work will generally form part of a roadway overlay or overlay and widen project, but can constitute a "stand alone" bridge project to correct a specific safety problem. If the bridge lies within the limits of a roadway overlay or overlay and widen project the bridge's final roadway width must comply with the minimum roadway widths listed in paragraph C) 2) above.

a) Bridge Rail
Modify bridge railing to comply with the bridge rail policy. (See Attachment I-G).
b) Anti-skid treatment for decks

2) MINOR REHABILITATION WORK
Minor rehabilitation work will generally consist of the items listed below and will usually form part of an overlay or overlay and widen project. It may include other items. Widen the bridge if its roadway width does not meet the requirements in paragraph C) 2) above.

a) Guard Angles
b) Expansion joints
c) Deck seal (silane, HMWM, etc.)
d) Spot painting of structural steel
e) Drains and Drainage systems
f) Elevation adjustments
g) Lighting upgrades

3) MAJOR REHABILITATION WORK
Usually the work under this category requires more plan development time than the corresponding roadway plans for a roadway overlay or overlay and widen project. This work often requires a "stand alone" bridge project.

a) Deck Rehabilitation

i) Replacements
If it becomes necessary to replace a deck, perform a cost benefit analysis to determine whether to widen the bridge to the roadway width indicated in section C) 1).
ii) Deck overlays
When deck conditions warrant and if there is sufficient lead time to obtain the deck survey and prepare plans, a deck overlay can form part of a roadway overlay or overlay and widen project. If the road project schedule does not allow time to perform deck testing, execute the deck overlay as a "stand alone" project. As long as the bridge meets the minimum roadway width requirement shown in section C) 2) the overlay can proceed without widening the bridge.

b) Repainting of overcoat painting

c) Scour countermeasures
Give no consideration to widening a bridge when the project contains only scour counter-measures.

d) Structure condition ratings
Bring all structural elements back to a condition rating of at least (7), as defined in Attachment I-C.

e) Miscellaneous
The project may include any safety or minor rehabilitation work listed in sections D) 1) or D) 2) as part of a major rehabilitation project.

4) SEISMIC RETROFITTING
The Seismic Crew has screened all bridges for seismic requirements in accordance with the Bridge Bureau Seismic Screening procedure. (See Attachment 1-D). Base retrofit needs on their ratings.

SURFACE TRANSPORTATION PROGRAM (STP)
(SECONDARY & OFF SYSTEM)

A) DESIGN STANDARDS
1) LIVE LOADING – HL 93, HS 25 or MS 22.5 for new construction
– MS 13.5 for bridges to remain in place.
2) DESIGN AND ANALYSIS PROCEDURES
All structural designs will be done in accordance with the current edition of the AASHTO LRFD Bridge Design Specifications or of the AASHTO Standard Specifications for Highway Bridges and the Montana Department of Transportation Bridge Design Manual. In the case of a difference between AASHTO and the Montana standards, the Montana standards control, because they tailor designs to local conditions.

B) HORIZONTAL AND VERTICAL CLEARANCES
See Attachment I-A

C) BRIDGE WIDTH
1) NEW BRIDGES
a) Secondary System
New bridges on the STP system (SECONDARY) will have a roadway width in accordance with the table below, but not less than the MDT roadway standard for the Secondary System. (See Attachment I-B for face to face of rail dimensions).

FROM TABLE VI-5 P 475 1990 AASHTO GREEN BOOK FOR 45, 55 and 60 mph (70, 90, AND 100 kph) DESIGNS

Secondary and Local System Bridge Roadway Widths		
Current Traffic	Bridge Roadway Width	
	English	Metric
ADT < 400	28.0 ft	8.4 m
ADT ≥ 400	30.0 ft	9.0 m
DHV* 100-200	30.0 ft	9.0 m
DHV 200-400	32.0 ft	9.6 m
DHV > 400	40.0 ft	12.0 m

* Design Hourly Volume

b) Off-System
Use a minimum roadway width of 28.0 ft (8.4 m) for off-system bridges unless the county has a different standard or if the road has very low volume and a single lane bridge would be adequate. If the county does have a higher standard the bridge width, match the county standard.

Consider using single lane bridges for very low volume roads. The minimum roadway width of a single lane bridge is 16.0 ft (4.8 m). This width breaks down as follows:
a) One 2.0 ft (0.6 m) inside shoulder
b) One 12.0 ft (3.6 m) lane, and
c) One 2.0 ft (0.6 m) shoulder.

When considering bridge roadway widths less than 28.0 ft (8.4 m) or less than the county standard, obtain the District's and the county's concurrence.

2) BRIDGES TO REMAIN IN PLACE
For consideration to remain in place bridges must have a minimum roadway width of 24.0 ft (7.2 m).

If a bridge within the limits of a project is otherwise functionally and structurally adequate to remain, widen it to the width shown in section C) 1).

Truss bridges on off-system (county) routes that can be rehabilitated to the criteria of section D) 3) e) may for remain in place.

The Preconstruction Bureau will make recommendations about putting narrow bridge signs up whenever the bridge width is less than the roadway width.

D) SCOPE OF WORK (BRIDGES TO REMAIN IN PLACE)
Most of the work on bridges that remain in place will fall into one of three categories.

1) SAFETY WORK
Safety work will generally form part of a roadway overlay or overlay and widen project but can constitute a "stand alone" bridge project to correct a specific safety problem. If the bridge lies within the limits of a roadway overlay or overlay and widen project it must comply with the minimum roadway width of 24.0 ft (7.2 m) stated in C) 2) above.
a) Bridge Rail
Modify all bridge railing to comply with bridge rail policy. (See Attachment I-G).
b) Anti-skid treatment for decks

2) MINOR REHABILITATION WORK
Minor rehabilitation work will generally consist of the items listed below and will usually form part of a roadway overlay or overlay and widen project. Minor rehabilitation work may include other items. Widen the bridge if its roadway does not meet the minimum width of 24.0 ft (7.2 m) stated in C) 2) above.

a) Guard Angles
b) Expansion joints
c) Deck seal (silane, HMWM, etc.)
d) Spot painting of structural steel
e) Drains and Drainage systems
f) Elevation adjustments
g) Lighting upgrades

3) MAJOR REHABILITATION WORK
Usually the work under this category requires more plan development time than the corresponding roadway plans for a roadway overlay or overlay and widen project. This work often requires a "stand alone" bridge project.

a) Deck Rehabilitation

i) Replacements
If it becomes necessary to replace a deck, perform a cost benefit analysis to determine whether to widen the bridge to the roadway width indicated in C) 1) above.
ii) Deck overlays
If the road project allows sufficient time to obtain a deck survey and to prepare plans, a deck overlay can form part of a roadway overlay or overlay and widen project. As long as the bridge meets the minimum roadway width requirement of 28.0 ft (8.4 m) the project may overlay the bridge without widening it.

b) Repainting or overcoat painting

c) Scour counter-measures
Give no consideration to widening a bridge when the project consists only of scour counter-measures.

d) Structure condition ratings
Bring all structural elements back to a condition rating of at least (7), as defined in Attachment I-C.

e) Miscellaneous
The project may include safety or minor rehabilitation work listed in D) 1) or D) 2) above as a part of a major rehabilitation project.

f) Truss Rehabilitation

i) Width
Do not rehabilitate a truss that does not provide a roadway width of at least 16.0 ft (4.90 m).

ii) Widening a truss is seldom cost effective because it requires replacement of all floor beams and bracing. Do not consider widening a truss without specific approval from the Bridge Engineer.

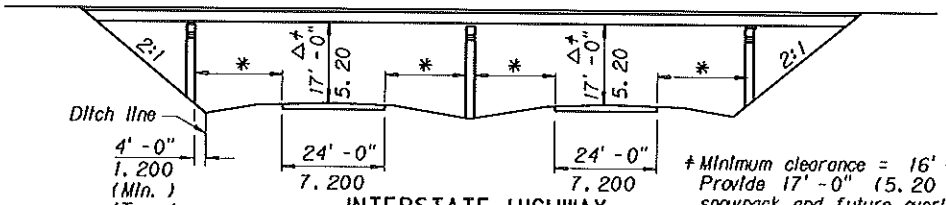
iii) Load Capacity
Do not rehabilitate a truss that cannot provide capacity for at least HS 15 or MS 13.5 loading when the work is complete. Perform a cost benefit analysis to determine whether to pursue MS 18 loading, MS 13.5, or whether to accept some intermediate value.

iv) Vertical Clearance
Do not rehabilitate a truss that cannot provide at least 14.0 ft (4.3 m) vertical clearance.

v) Historical Significance
Historically significant structures require special consideration when determining whether to rehabilitate them.

ATTACHMENT I-A

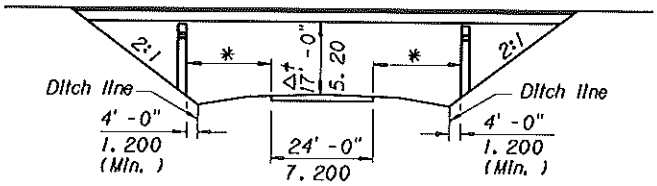
STANDARD HORIZONTAL AND VERTICAL CLEARANCES FOR SEPARATION STRUCTURES



† Minimum clearance = 16'-0" (4.90 m)
Provide 17'-0" (5.20 m) initially for snowpack and future overlay.

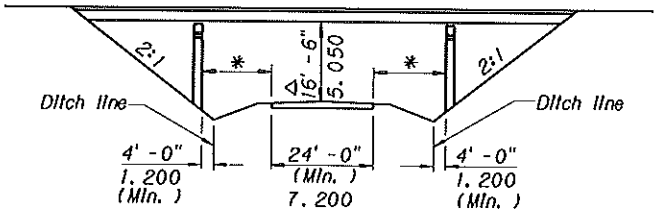
INTERSTATE HIGHWAY

(Freeway Under)



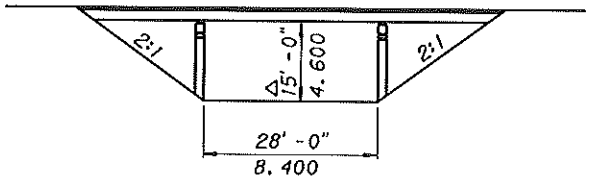
NON-INTERSTATE, NHS HIGHWAY

(Arterial Under)
(Design speed = 80 km/h or greater)
(ADT = 750 or more)



COUNTY ROADS AND NON-NHS INTERCHANGES

(Collector Road Under)
(Current ADT less than 750)



LOW VOLUME - LOW SPEED ROADS

(Local Road Under)
(Less than 50 ADT future traffic count)

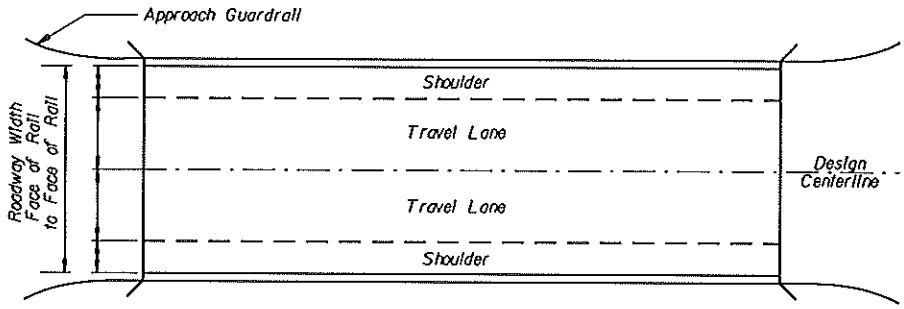
* Follow the standard drawings in placing guardrail where conditions do not allow providing the clear zone distances defined in the Montana Road Design Manual.

Δ These values provide room for up to 6 inches (150 mm) of additional surfacing without revising grades

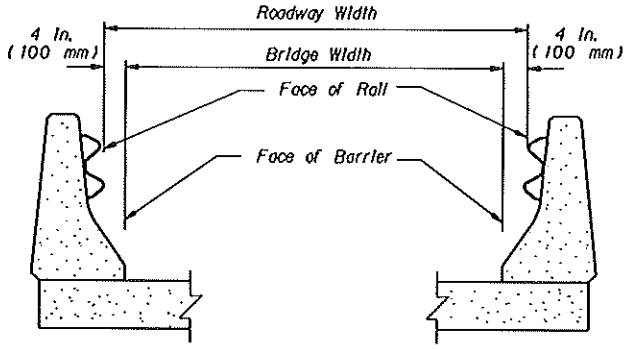
NOTE: See attachment I-F for railroad clearances.

NOTE: Measure vertical clearance to low point between roadway shoulders on exterior beams.

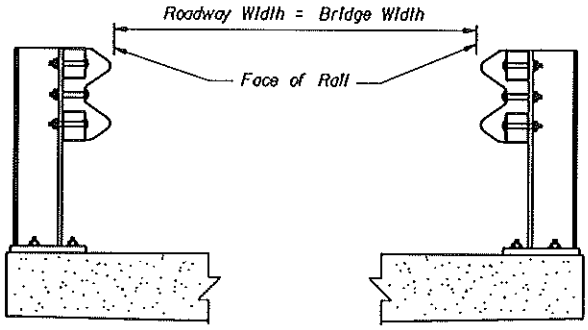
ATTACHMENT I-B



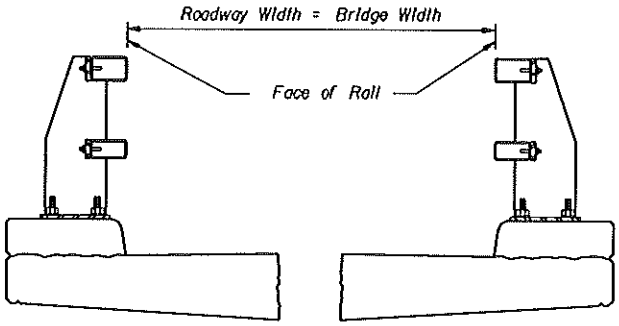
PLAN



CONCRETE BARRIER RAIL



T101 RAIL



WYOMING RAIL

ATTACHMENT I-C

STRUCTURE CONDITION RATINGS

The below structure condition rating descriptions are those used by our bridge inspectors. The ratings for the structural elements can be found in the inspection file for the structure in question.

(9) Excellent Condition

(8) Very Good Condition
No problems noted

(7) Good Condition
Some minor problems

(6) Satisfactory Condition
Structural elements show some minor deterioration.

(5) Fair Condition
All primary structural elements are sound but may have minor section loss, cracking, spalling or scour.

(4) Poor Condition
Advanced section loss, deterioration, spalling or scour

(3) Serious Condition
Loss of section, deterioration, spalling or scour have seriously affected primary structural components. Local failures are possible. Fatigue cracks in steel or shear cracks in concrete may be present.

(2) Critical Condition
Advanced deterioration of primary structural elements. Fatigue cracks in steel or shear cracks in concrete may be present or scour may have removed substructure support. Unless closely monitored it may be necessary to close the bridge until corrective action is taken.

(1) Imminent Failure Condition
Major deterioration or section loss is present in critical structural components or obvious vertical or horizontal movement affecting structural stability. Bridge is closed to traffic but corrective action may put it back in light service.

(0) Failed Condition
Out of service and beyond corrective action.

ATTACHMENT I-D

PRELIMINARY SCREENING OF BRIDGES FOR SEISMIC RETROFITTING

GENERAL:

An efficient and comprehensive retrofitting program requires that structures be rated according to their need for seismic retrofitting by a preliminary screening process.

The Seismic Rating System, described below, shall be used as a basis for selecting bridges for the more detailed quantitative evaluation.

SEISMIC RATING SYSTEM

Bridges in Seismic Performance Category – A (SPC-A) will be eliminated from review, because they generally do not require retrofitting.

To calculate the seismic rating of a bridge, consideration is given to structural vulnerability, seismicity of the bridge site, and the bridge's importance as a vital transportation link. This is accomplished by making independent ratings of the bridges in each of these three areas. The ratings are added to arrive at an overall seismic rating according to the following procedure:

Seismic Rating = 1.11 (superstructure + substructure + ½ liquefaction + ½ abutment) + 51.6 (seismicity) + 8.03 (importance)

The constants in this equation were derived to give equal weight to the three areas. The total Seismic Rating will typically have a value ranging from 7 to 100.

STRUCTURE VULNERABILITY RATING

The structure vulnerability rating is based on superstructure, substructure, liquefaction and abutment vulnerability ratings. Superstructure and substructure vulnerabilities are based on susceptible structural details. These can be evaluated more accurately than liquefaction and abutment vulnerabilities. The superstructure and substructure vulnerabilities will more likely cause catastrophic failures, whereas abutment vulnerabilities will cause serviceability failures. Therefore, superstructure and substructure vulnerability ratings have been weighted higher in the overall structure vulnerability rating.

Structure Vulnerability Rating = [Super + Sub + ½ (liquefaction) + ½ (abutment)]

Superstructure Vulnerability Rating

The superstructure vulnerability rating is based on the connections to the substructure which are mainly the bearing details. The Superstructure Vulnerability Rating is based on the "FHWA Seismic Retrofitting Guidelines for Highway Bridges".

The step-by-step method for determining the vulnerability rating of the superstructure follows:

Step 1: Determine if the bridge has non-vulnerable bearing details. These bridges would include:

a) Continuous structures with integral abutments.

b) Continuous structures with seat-type abutments where all of the following conditions are met:

i) The skew is less than 20°, or the skew is greater than 20° but less than 40°and the length-to-width ratio of the bridge deck is less than 1.5.

ii) Rocker bearings are not used.

iii) The bearing seat on the abutment end diaphragm is continuous in the transverse direction and the bridge has in excess of three girders.

iv) The support length is equal to or greater than one half the minimum required support length.

If the bearing details are non-vulnerable, a vulnerability rating of 0 may be assigned and the remaining steps for bearings omitted.

Step 2: Determine the vulnerability to structure collapse or loss of bridge access due to transverse movement.

Before significant transverse movement can occur, the transverse restraint must fail. Nominal bearing keeper bars or anchor bolts should be considered subject to failure for bridges in SPC-C and D. Nominally reinforced, non-ductile concrete shear keys should be considered subject to failure for bridges in SPC-D only.

When transverse restraint is subject to failure, girders are vulnerable to collapse if either of the following conditions exists:

a) Individual girders are supported on individual pedestals or columns.

b) The exterior girder in a 2- or 3- girder bridge is less than 18 inches from the edge of a continuous-bearing support.

In either of these cases, the vulnerability rating should be 10.

Step 3: Determine the vulnerability of the structure to collapse or loss of accessibility due to excessive longitudinal movement. Steel rocker bearings have been known to topple, resulting in a partial superstructure displacement. All bridges assigned to SPC-C or D are vulnerable to this type of failure.

If the longitudinal support length capacity/demand is greater than one, the vulnerability rating shall be assigned a value of 0 unless in addition rocker bearings are vulnerable to toppling, in which case a value of 5 should be assigned.

If the longitudinal support length capacity/demand is less than one, but greater than 0.5, the vulnerability rating shall be assigned a value of 5 unless in addition rocker bearings are vulnerable to toppling, in which case a value of 10 should be used. If the longitudinal support length capacity/demand is less than 0.5, then a vulnerability rating of 10 should be assigned.

The required longitudinal support length will be calculated using AASHTO 4.9.1 (Division I-A). The support length shall be measured normal to the face of an abutment or pier.

For SPC B

$$N = 8 + 0.02L + 0.08H \text{ (in.)}$$

For SPC C & D

$N = 12 + 0.03L + 0.12H$ (in.)

Where:

N = Required longitudinal support length in inches measured perpendicular to the face of the support.

L = length, in feet, of the bridge deck to the adjacent expansion joint, or to end of the bridge deck. For hinges within a span, L shall be the sum of L_1 and L_2 (the distances to either side of the hinge). For single span bridges L equals the length of the bridge deck.

For abutments

H = average height, in feet, of columns supporting the bridge deck to the next expansion joint. H = 0 for single span bridges.

For columns and/or piers

H = column or pier height in feet.

For hinges within a span

H = average height of the adjacent two columns or piers in feet.

Substructure Vulnerability Rating

The substructure vulnerability rating is based on a method used by WSDOT.

Where:

VRsub = (Vsplice + Vconf + Vanch) (Fr)

Vsplice = 3.5 or 0.0
Vconf = 3.5 or 0.0
Vanch = 3.0 or 0.0

Fr = 1.0 for single column
= 0.9 for double column
= 0.8 for all others including piers

For Seismic Performance Category B, C & D

If C/D > 1.0 then Vsplice, Vconf and Vanch = 0.0

Where:

C = Capacity of splice length, splice location, confinement provided by lateral reinforcement, and anchorage of longitudinal bars as determined from As-built plans.

D = Demand as required by AASHTO specifications for splice length, splice location, confinement, and anchorage.

Seismic Performance Category B

Vsplice: -Need to consider only the length of lap splice.
-No AASHTO Seismic Specification; need to satisfy AASHTO 8.32 (Division I)

Vconf: -Per AASHTO Seismic Specification 8.4.1(c, d, e) except maximum spacing is six inches.

Vanch: -No AASHTO Seismic Specification; need to satisfy AASHTO 8.25 through 8.30 (Division I)

Seismic Performance Categories C and D

Vsplice: -AASHTO sections 8.33 (Division I) and Seismic Specifications 8.41(f) (Division I-A).

Vconf: -AASHTO seismic specifications 8.4.1 (c, d, e)

Vanch -AASHTO Seismic Specifications 8.4.3.

ABUTMENT VULNERABILITY DETERMINATION

Abutment vulnerability is based on the FHWA "Seismic Retrofitting Guidelines for Highway Bridges". Abutment failures during earthquakes do not usually result in total collapse of the bridge. This is especially true for earthquakes of low-to-moderate intensity. Except in unusual cases, the maximum abutment vulnerability rating will be 5.

SCREENING

Step 1:

If bridge is in SPC-B, V_R=0

Step 2:

Determine the vulnerability of the structure due to abutment fill settlement in SPC-C and D. The fill settlement can be estimated as follows:

1% of the fill height when $0.19 < A \leq 0.29$
2% of the fill height when $0.29 < A \leq 0.39$
3% of the fill height when $A > 0.39$

The above settlements should be doubled if the bridge is a water crossing. When fill settlements are estimated to be greater than six inches, $V_R = 5$. If less than six inches, $V_R = 0$.

The above settlements should be increased additionally up to twice their new value (adjusted for water crossing) if the bridge inspection reports show problems with settlement or degradation of abutment foundation.

Step 3:

For bridges classified as SPC-D, free standing earth-retaining abutments, with skews greater than 40° and the distance between the seat and the bottom of the footing exceeds ten feet, a vulnerability rating of five should be assigned.

LIQUEFACTION VULNERABILITY DETERMINATION

Bridges with continuous superstructures and supports can withstand large translational deformations and usually remain serviceable. Bridges with discontinuous superstructures and/or brittle supporting members are usually severely damaged as a result of liquefaction. It must be kept in mind that the effect of liquefaction on spread footings is different than its effect on pile footings.

The depth of the water table may need to be assumed. This judgment should be based on bridge location, crossing, and general knowledge of the area.

SCREENING

Step 1:

Determine the susceptibility of foundation soils to liquefaction. Soils above the water table are not susceptible to liquefaction.

a) High susceptibility is associated with loose, fine, non-cohesive soils (sands, silty sands, and non-plastic silts).

b) Moderate susceptibility is associated with similar soils described as medium dense.

c) Low susceptibility is associated with dense soils. Clayey soils and gravels also fall into this category. Soils with large diameter particles (gravels) are unlikely to liquefy unless an overlying layer of low permeability soils inhibits drainage.

Step 2:

Determine the potential extent of liquefaction related damage where susceptible soil conditions exist:

a) Severe liquefaction related damage is likely to occur for conditions of high susceptibility when $A > 0.29$.

b) Major liquefaction related damage is likely to occur for conditions of high susceptibility when $0.19 < A \leq 0.29$, or for conditions of moderate susceptibility when $A > 0.29$.

c) Moderate liquefaction related damage is likely to occur for conditions of high susceptibility for $0.09 < A \leq 0.19$, and for conditions of moderate susceptibility where $0.19 < A \leq 0.29$.

d) Low liquefaction related damage is likely to occur for conditions of moderate susceptibility when $0.09 < A \leq 0.19$, and for all conditions of low susceptibility.

Step 3:

Bridges subjected to severe liquefaction related damage shall be assigned a $V_R = 10$. This rating may be reduced to 5 for single-span bridges with skews less than 20°.

Step 4:

Bridges subjected to major liquefaction related damage shall be assigned a $V_R = 10$. This may be reduced to 5 for single span bridges with skews less than 40°.

Step 5:

Bridges subjected to moderate liquefaction related damage should have a $V_R = 5$.

Step 6:

Bridges subjected to low liquefaction related damage should have a $V_R = 0$.

Seismicity Rating

Seismicity Rating = S*A

The site coefficient (S) approximates the effects of the site conditions on the elastic response coefficient or spectrum.

Site Coefficient (S)			
Soil Profile Type			
	I	II	III
S	1.0	1.2	1.5

SOIL PROFILE TYPE I is a profile with either:

1) Rock of any characteristic, either shale-like or crystalline in nature (such material may be characterized by a shear wave velocity greater than 2,500 ft/sec (762 m/sec), or by other appropriate means of classification); or

2) Stiff soil conditions where the soil depth is less than 200 ft (61 m) and the soil types overlying rock are stable deposits of sands, gravels, or stiff clays.

SOIL PROFILE TYPE II is a profile with stiff clay or deep cohesionless conditions where the soild depth exceeds 200 ft (61 m) and the soil types overlying rock are stable deposits of sands, gravels, or stiff clays.

SOIL PROFILE TYPE III is a profile with soft to medium-stiff clays and sands, characterized by 30 ft (9 m) or more of soft to medium-stiff clays with or without intervening layers of sand or other cohesionless soils.

In locations where the soil properties are not known in sufficient detail to determine the soil profile type or where the profile does not fit any of the three types, the site coefficient for Soil Profile Type II shall be used. The soil profile coefficients apply to all foundation types including pile supported and spread footings.

A = The seismic acceleration coefficient based on the Map of Horizontal Acceleration.

IMPORTANCE RATING

The mathematical model developed below is an index by which MDT will prioritize the importance of a bridge for seismic retrofitting. This model follows the basic criteria established by WSDOT, and uses information from the NBIS database.

The form of the model is:

$$I = [(RTcarry)\ (DLcarry)\ (Ncarry)] = \tfrac{2}{3}\ [(RTcross)\ (DLcross)\ (Ncross)] + \tfrac{1}{4}\ [(ADTcarry/6000)(L)]^{0.25} + RVcross$$

In which:

Rtcarry = Factor representing type of route carried by the bridge.

We will use the functional classification (item 26) from the NBIS database.

Codes of 01, 11, 12, & 14 will have a value = 1.0, all other codes will have a value = 0.8

DLcarry = Factor representing detour length of route carried by bridge

1.2 when detour is > 98 miles
1.0 when detour is ≥ 50 and ≤ 98 miles
0.9 when detour is ≥ 10 and < 50 miles or *Interstate 1 mile
0.8 when detour is ≥ 3 miles and < 10 miles
0.7 when detour is < 3 miles

*Note: Twin structures on the Interstate are coded with a one mile detour. This assumes that one structure will be the detour bridge. We will assume both structures are not useable and assign it a default value of 0.9 for preliminary screening.

Ncarry = Factor representing criticality of detour for the route carried due to traffic congestion.

$Ncarry = [ADTcarry/6000]^{0.25}$

ADTcarry = Average Daily Traffic of the route carried by the bridge.

RTcross = Factor representing type of route crossed by the bridge.

We will use the functional classification (item 26) and the type of service under (item 42) from the NBIS database.

If item 26 is coded a 01, 11, 12, or 14 then RTcross = 1.0, all other codes will yield a value = 0.8; if item 42 under is coded a 2, 4, 7, or 8 (railroad) the value will also be 1.0.

DLcross = Factor representing detour length of route crossed by bridge

1.2 when detour is > 98 miles
1.0 when detour is ≥ 50 and ≤ 98 miles
0.9 when detour is ≥ 10 and < 50 miles or *Interstate 1 mile
0.8 when detour is 3 miles to 10 miles
0.7 when detour is < 3 miles
0.9 when route crossed is a railroad

*Note: Twin structures on the Interstate are coded with a one mile detour. This assumes that one structure will be the detour bridge. We will assume both structures are not useable and assign it a default value of 0.9 for preliminary screening.

Ncross = Factor representing criticality of detour for the route carried due to traffic congestion.

$$Ncross = [ADTcross/6000]^{0.25}$$

ADTcross = Average Daily Traffic of route crossed by bridge, or
If RTcross is a railroad then ADTcross = 10,000
If ADT not available the ADTcross = 100

L = Length of bridge

RVcross = Factor representing a river crossing only. (NBI data item 42 = 5)

Rvcross = L/1000

Range of Importance Index "I"

Importance Index I can be as high as **4.15** when:

- Route carried by the bridge is Interstate, or a principle arterial in an urban setting (i.e. NBI item no. 26 = 1, 11, 12, or 14).
- Detour length for route carried is ten miles or more or a twin structure on the Interstate.
- ADT of the route carried is 20,000.
- Route crossed by the bridge is Interstate, or a principle arterial in an urban setting (i.e. NBI item no. 26 = 1, 11, 12, or 14).
- Detour length for route crossed is ten miles or more or a twin structure on the Interstate.
- ADT of the route crossed is 20,000.
- Bridge length is 1000 feet.

Importance Index I can be as low as **0.32** when:

- Route carried by the bridge is not a principle arterial
- Detour length for route carried is three miles or less.
- ADT of the route carried is 20.
- No route crossed.
- Bridge length is 50 feet.

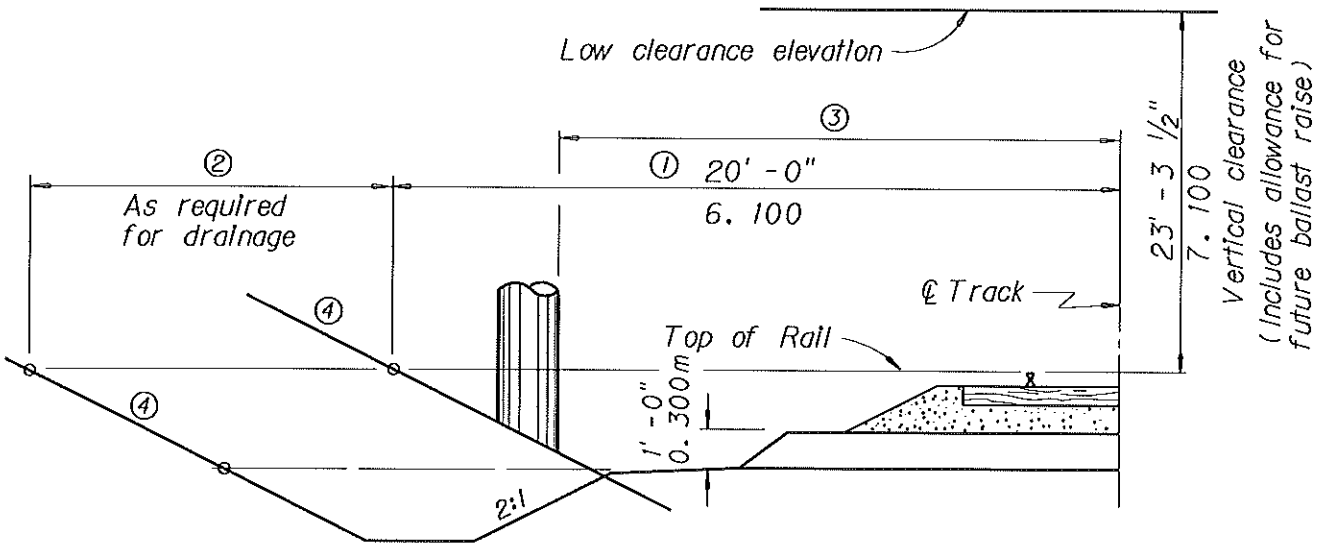
ATTACHMENT I-E

Define Seismic Retrofits

Minor seismic retrofit will usually be limited to seismic restrainers, dynamic isolation bearings, widening of beam seats and for the most part will be limited to work at or above the beam seats. The cost of minor retrofits will generally not exceed 25% of the cost of a new seismically designed structure.

Major seismic retrofits involves such items as strengthening columns, piers, bent caps, etc. It will generally include work below the level of the beam seats and may include work requiring cofferdams. The cost of major retrofits will generally not exceed 50% of the cost of a new structure seismically designed structure.

If the cost of a seismic retrofit approaches 50% of the cost of a new structure an in depth cost analysis must be completed. It will include life cycle cost analysis and alternative methods and levels of retrofitting.



RAILROAD CLEARANCES

① When providing more than 20 ft (6. 10m) justify the additional distance by documenting the need for off-track equipment roads, heavy snow accumulation or longitudinal drainage. In the case of an access road, provide at least 8ft (2. 50m) of additional clearance.

② Meet with Railroad staff soon after receiving the survey to discuss drainage requirements

③ Set the faces of bents a minimum of 18 ft (5. 500m) from the ℄ of an industrial or branch line and 25 ft (7. 700m) from the ℄ of a main line. Determine horizontal clearances at the initial meeting with railroad staff for multiple track installations, railroad yards and when rehabilitating or widening an overpass.

Bents less than 25 ft (7. 700m) from the centerline of a railroad track must incorporate heavy construction or include the protection of a reinforced concrete crash wall. Crash walls must have a minimum height of 6. 0 ft (1. 850m) above the top of rail. Design crash walls at least 2. 5 ft (0. 770m) thick and at least 12 ft (3. 700m) long.

④ Set the slope to fit the soil type. For the sake of stability, make the slope no steeper than 2: 1 unless paving the slope or designing a reinforced embankment.

ATTACHMENT I-G

MONTANA BRIDGE RAIL
POLICY AND PRACTICE
AUGUST 1988

This policy and practice statement will provide additional clarification regarding the Montana Department of Transportation's bridge rail policy which our FHWA Division office concurs in. Since our meeting of January 13, between MDT and the FHWA Division office, Mr. Morgan has concurred in Mr. Loveall's additional guidelines to AASHTO's proposed guide specifications for bridge railings. The additional guideline specifications state, in part, that railing designed and built subsequent to the institution of the 1964 Interim AASHTO Specifications railing provisions are not subject to replacement, provided its performance record is proven satisfactory. Existing Montana bridge rail that does not meet the 1964 specification will be required to be upgraded to a crashworthy design.

Since the preface of the guide specifications clarifies that the guide is for new bridges and for bridges being rehabilitated to the extent that railing replacement is obviously appropriate, therefore, on a case by case basis bridge rails designed and constructed subsequent to the 1964 AASHTO Specifications may be retained in service. Site specific data and railing performance data will need to be reviewed to determine whether to replace or retrofit the existing bridge rail to a crashworthy configuration or leave the existing bridge rail in place.

If the bridge rail has been previously blocked out and only requires repairs which are normally performed by MDT maintenance forces, then the rail can remain in place provided the rail will be repaired before the contract is let. The period between the field check stage and letting date should allow adequate time for the rail to be repaired.

Montana's Type No. 5 bridge rail with a 6 in. (150 mm) offset was designed prior to the 1964 Interim Specifications and therefore should be retrofitted. A blocked out thrie beam is currently being used. The Type No. 5 rail with a 3 in. (75 mm) offset to rail from curb was designed after the 1964 Interim Specifications. Therefore this rail, contingent on a review of each site and performance data, can remain in place.

Montana's Type No. 3, Type No. 4, and concrete post bridge rails were designed prior to 1964. If these rails have not been blocked out, they should be replaced or retrofitted. The Type No. 3 rail, when within a Federal-aid project, is being replaced with a cast-in-place, concrete barrier. The T4 and concrete post bridge rails are retrofitted, with Division office approval, by blocking out a thrie beam to the face of the curb.

An existing steel beam bridge rail, SBBR, that is blocked out to the curb can remain in place. Again, site specific data regarding railing performance and condition of existing rail components will need to be evaluated to determine if the blocked out SBBR can be left in place. If the existing SBBR is not blocked out then a cast-in-place Jersey barrier will be constructed. The blocked out SBBR's first steel post will be modified to accept Montana's crash worthy approach rail. The blocked out SBBR will still be treated as a bridge rail to remain in place since this modification to the first bridge rail post only is only for accepting a crashworthy approach rail.

An existing timber bridge rail that is blocked out to the curb does not satisfy the requirements of the 1964 provisions of AASHTO's Interim Bridge Railing Specifications. Also an existing timber bridge rail that is not blocked out to the curb does not satisfy these requirements. In accordance with previous correspondence from our Regional and Washington FHWA offices, the precast concrete barrier, originally proposed by the MDT, is not an acceptable retrofit. A continuous, cast-in-place concrete barrier rail secured to the deck, proposed by the MDT, is an acceptable solution but was found to cause excessive weight on the bridge reducing live load capacities. In 1989 Montana Department of Transportation submitted and received approval from FHWA for a modified Texas T101 attachment for timber bridges. The rail design has been used successfully on MDT's timber bridges since approval.

In accordance with the proposed policy, bridge rails for new bridge construction or bridge replacement are being constructed to a crashworthy design. Our Regional FHWA office concurs with holding off on Montana's crash testing of the T5 rail with a 3 in. (75 mm) offset and the SBBR until the proposed guide specifications are adopted. The adopted specifications may not require crash testing of rails designed after the 1964 Interim Bridge Specifications.

The 1988 bid estimates for retrofitting bridge rails with a blocked out thrie beam have averaged about $16.00/ft ($52.50 per linear meter). Assuming traffic control to be 20% results in a total unit cost of $20.00/ft ($65.50 per linear meter) for blocking out with a thrie beam.

The 1988 bid estimates for placing a cast-in-place concrete barrier have averaged $85/ft ($280 per linear meter). Assuming traffic control to be 20% results in a total unit cost of $102/ft ($335 per linear meter) for the concrete barrier.

For the remaining August through December 1988 lettings the cost to upgrade bridge rail to a crashworthy configuration within Federal Aid projects is estimated to be $150,000.

Attachment 1-G

Summary of Guardrail Retrofit Policy by FHWA

1) MONTANA SBR-T3	Retrofit with cast-in-place concrete barriers.
2) MONTANA SBR-T4	Thrie Beam retrofit upon FHWA Division office approval only. Dependent upon needed repairs, performance and other criteria.
3) MONTANA SBR-T5	Designed prior to the 1964 AASHTO Interims – (Curb to Rail Spacing of 6 in. (150 mm)) – Use blocked out thrie beam retrofit. Designed after the 1964 AASHTO Interims – (Curb to Rail Spacing of 3 in. (75 mm)) – No retrofit needed. This system can remain as is.
4) MONTANA SBBR	If this rail system is blocked out to the face of the rail, no retrofit is needed. This will also depend on the condition and the performance of the existing rail. If this rail system is not blocked out to the face of the curb, then a cast-in-place concrete barrier rail is required. New approach rail corresponding to a crashworthy bridge rail is also required.
5) TIMBER RAILS	Existing timber bridges with timber posts and rails or with timber posts and previously blocked out metal rails will be retrofit with a modified version of the Texas T101. This Rail system was adopted and approved by FHWA in 1989 for use in Montana on exiting timber structures for federal aid projects. Retrofit requires removal of the existing posts, curb, rail and plant mix surfacing (PMS) and then placement of the new rail and PMS. This retrofit can be adjusted to accommodate different scopes of roadwork from typical mill and fill, pavement preservation and seal and cover.

Appendix 3

Bridge Inspection Reports and
Scour Analysis Report

Montana Department of Transportation

INITIAL ASSESSMENT FORM FOR STRUCTURE :

U08113000+02381

Location : HIGGINS AVENUE, MISSOULA Structure Name: none

General Location Data

District Code, Number, Location : **01 Dist 1 MISSOULA**

Division Code, Location : **11 MISSOULA**

County Code, Location : **063 MISSOULA**

City Code, Location : **50200 MISSOULA**

Kind fo Hwy Code, Description : **5 5 City Street**

Signed Route Number : **08113**

Str Owner Code, Description : **1 State Highway Agency**

Maintained by Code, Description : **1 State Highway Agency**

Intersecting Feature : **CLARK FORK - CITY ST**

Kilometer Post, Mile Post : **0.37 km 0.23**

Structure on the State Highway System : [X]

Latitude : **46°52'06"**

Structure on the National Highway System : [ ]

Longitude : **113°59'47"**

Str Meet or Exceed NBIS Bridge Length : [X]

Construction Data

Construction Project Number : **F FG-215(7)**

Construction Station Number : **15+59.00**

Construction Drawing Number : **5236**

Construction Year : **1962**

Reconstruction Year : **1981**

Traffic Data

Current ADT : **15,940** ADT Count Year : **2009** Percent Trucks : **2 %**

Structure Loading, Rating and Posting Data

Loading Data :

Design Loading :		**5 MS 18 (HS 20)**
Inventory Load, Design :	**32.6 mton**	**B ASD Assigned**
Operating Load, Design :	**32.6 mton**	**B ASD Assigned**
Posting :		**5 At/Above Legal Loads**

Rating Data :

	Operating	Inventory	Posting
Truck 1 Type 3 :	**39**		
Truck 2 Type 3-S3 :	**61**		
Truck 3 Type 3-3 :	**72**		

Structure, Roadway and Clearance Data

Structure Deck, Roadway and Span Data :

Structure Length : **296.27 m**

Deck Area : **5,982.00 m sq**

Deck Roadway Width : **17.07 m**

Approach Roadway Width : **16.76 m**

Median Code, Description : **2 Closed median (no barrier)**

Structure Vertical and Horizontal Clearance Data :

Vertical Clearance Over the Structure : **99.99 m**

Reference Feature for Vertical Clearance : **H Hwy beneath struct**

Vertical Clearance Under the Structure : **4.36 m**

Reference Feature for Lateral Underclearance : **H Hwy beneath struct**

Minimum Lateral Under Clearance Right : **4.40 m**

Minimum Lateral Under Clearance Left : **0.00 m**

Span Data

Main Span

Number Spans : **3**

Material Type Code, Description : **4 Steel continuous**

Span Design Code, Description : **3 Girder and Floorbeam System**

Deck

Deck Structure Type : **1 Concrete Cast-in-Place**

Deck Surfacing Type : **3 Latex Concrete or similar additive**

Deck Protection Type : **0 None**

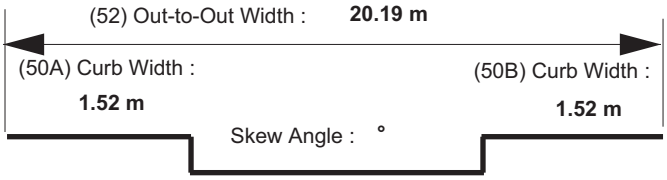
Deck Membrain Type : **0 None**

Approach Span

Number of Spans : **10**

Material Type Code, Description : **5 Prestressed concrete**

Span Design Code, Description : **2 Stringer/Multi-beam or Girder**



Structure Vertical and Horizontal Clearance Data Inventory Route :

Over / Under Direction Name	Inventory Route	South, West or Bi-directional Travel			North or East Travel		
		Direction	Vertical	Horizontal	Direction	Vertical	Horizontal
One Route Under	-1	N/A			N/A		
Route On Structure	U08113	Both	99.99 m	7.93 m	N/A		
HIGGINS AVENUE							

INITIAL ASSESSMENT FORM FOR STRUCTURE :

U08113000+02381

Continue

Inspection Data

Sufficiency Rating : **61.4**
Structure Status : **Struc Def - Elg Rehab**

Inspection Due Date : 14 June 2014
(91) Inspection Fequency (months) : **24**
Next Fracture Critical Due Date : **14 Jun 2014**
Fracture Critical Detail : **1 or 2 Stl-girder systms**

NBI Inspection Data

(90) Date of Last Inspection : 14 June 2012
Last Inspected By : Darrel Reich - 2051
(90) Inspection Date :
Inspected By :

(58) Deck Rating :	4	(68) Deck Geometry :	5	(36C) Approach Rail Rating :	0	(62) Culvert Rating :	N
(59) Superstructure Rating :	4	(67) Structure Rating :	4	(36A) Bridge Rail Rating :	0	(61) Channel Rating :	6
(60) Substructure Rating :	6	(69) Under Clearance :	5	(36B) Transition Rating :	0	(71) Waterway Adequacy :	8
(72) App Rdwy Align :	8	(41) Posting Status :	A	(36D) End Rail Rating :	0	(113) Scour Critical :	8

Unrepaired Spalls : 654 m sq
Deck Surfacing Depth : 1.70 in

Inspection Hours

Crew Hours for inspection :	35	Snooper Required :	Y
Helper Hours :	-1	Snooper Hours for inspection :	15
Special Crew Hours :	-1	Flagger Hours :	-1
Special Equipment Hours :	-1		

Inspection Work Candidates

Candidate ID	Date Requested	Status	Priority	Effected Structure Unit	Scope of Work	Action	Covered Condition States
D11-FY2010-000190	**23 June 2010**	**Approved**	**High**	All Spans	Bridge	Remove	

Remove the logs drifted against bent 11.

Approved. DRC

Same for 2012 inspection.

D11-FY2010-000192	**23 June 2010**	**Approved**	**Medium**	M Main	305 Assm Jt w/o Seal	Rehab Elem	

The steel cover on the left sidewalk has rusted through for the sliding plate joint at B12. Some of the same covers on the sidewalks at the other sliding plate joints have corrosion on the bottoms forcing the plates up and should be repaired.

Approved. DRC

Same for 2012 inspection.

D11-FY2010-000191	**23 June 2010**	**Approved**	**Medium**	A Approach	302 Compressn Joint Seal	Min Repair	

The right sidewalk is missing the seals at the joint and the soffit below typically has spalling with corroded rebar. There is a lot of moisture getting through. These open joints could be filled with a pourable seal. The left sidewalk has been sealed with a pourable material but they are failing and leaking and have the same problems in the soffit.

Approved. DRC

Same for 2012 inspection.

D11-FY2010-000193	**23 June 2010**	**Approved**	**Medium**	A Approach	311 Moveable Bearing	Rehab Elem	

The south bound left and median rocker bearing under the transverse girder at bent 12 has leaned enough to break both anchor bolts. No change since the last inspection.

Approved. DRC

Same for 2012 inspection.

INITIAL ASSESSMENT FORM FOR STRUCTURE :

U08113000+02381

Continue

Element Inspection Data

* * * * * * * * * * Span : **Main-0 - Riveted Pl. Girder Spans 9, 10 and 11** * * * * * * * * * *

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 12 - Bare Concrete Deck Sidewalks										
	1	4	415	sq.m.	X	0	0	0	100	0
						%	%	%	%	%

Previous Inspection Notes :

06/14/2012 - The sidewalk on the right and left have spalling and delaminations with exposed rebar. Did not chain the sidewalks. No changes noted from 2010 inspection. OZMY

06/18/2010 - Chained the sidewalk and found 13 percent shallow spalls, some with exposed rebar and delaminations for these spans. SFMZ

07/09/2008 - Quantity is 1.52mx273m = 415m2 Occasional spalling, usually shallow with exposed rebar in some. The concrete cover over the rebar appears to be shallow. KZHH

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 22 - P Conc Deck/Rigid Ov										
	1	4	2342	sq.m.	X	0	0	0	100	0
						%	%	%	%	%

Previous Inspection Notes :

06/14/2012 - Chained the main spans and found 425.9 M2 of delaminations in the overlay. 426/2342 = 18 percent. The soffit has transverse cracking with some patched areas. There is some delamination in the soffit along the center line median curb. OZMY

06/18/2010 - Chained the driving lanes and found 1.4 percent of the deck for these spans were delaminated with no spalls. Found some delaminations in the passing lanes but was not able to determine the extent. The soffit has mostly moderate transverse cracking with some patches mostly in the span 9 south bound lanes. There is a patch at the B12 joint in the median curb that is failing and a hole through the soffit at the edge of the patch. SFMZ

07/09/2008 - Reduced quantity for sidewalk area of deck by 415m2 (1.52mx273m). Sidewalk is not overlaid. Chained driving lane and found about 25 percent delams that indicate the overlay may be coming off. No spalls found in the main spans. Light cracking in the soffit. No changes in the cracking on the surface. KZHH

04/17/2006 - UNCHANGED. DECK DRAINS PLUGGED SOLID. SEVERAL SHALLOW SPALLS IN SIDEWALK. YSCZ

04/25/2005 - Deck shows numerous to frequent transverse cracking, some longitudinal and random cracking, some efflorescence. Some spalling and delaminations throughout. Some separation of approach asphalt from bridge ends. Drains mostly plugged. ZZEE

04/15/2003 - FREQUENT CRACKING AND SOME DELAMINATION IN HIGH DENSITY OVERLAY. EZHU

04/12/2001 - None IKHK

02/04/1999 - FREQUENT CRACKING IN OVERLAY. CCBL

09/30/1996 - None SITT

12/01/1993 - None REFI

Inspection Notes:

* * * * * * * * * * Span : **Main-0 - Riveted Pl. Girder Spans 9, 10 and 11 (cont.)** * * * * * * * * * *

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 107 - Paint Stl Opn Girder										
	1	2	546	m.		80	10	5	5	0
						%	%	%	%	%

Previous Inspection Notes :

06/14/2012 - Very little pack rust seen on the bottom flange in span 10. Pack rust is common between the vertical bearing stiffeners. The pack rust at bent 12 span 11 on the left side between the vertical bearing stiffener measures about 1 1/4" and bent 9 span 9 left is about the same. There is only minor pack rust between the rest of the vertical bearing stiffeners. No changes noted in the swelling between the bottom of the bottom flange of the girder and the top of the bearing at bent 9 left still only one bolt sheared off. Found 4 cracks in the tack welds in the south bound land and 4 cracks in tack welds on the north bound lane. The cracks are only in the tack welds. The girder have peeling paint, freckled rust some paint loss with primer showing and rusting with minor corrosion but no measurable section loss. No changes noted in the condition states from the last inspection. OZMY

06/18/2010 - The pack rust and swelling at the bottom flange in span 10 is very minor. Pack rust and swelling between the vertical bearing stiffeners is common. No change in the swelling between the bottom of the bottom flange and the top of the bearing at B9 left. No changes noted. SFMZ

07/09/2008 - Two girder system for northbound and two girder system for southbound from B9 to B12. Pack rust between the bearing stiffeners bowing the plates at B9 and B10. Pack rust between the bottom two plates below the bottom flange at both splice plates in the right SB girder in span 10. Plates are warping at the ends. Areas of topcoat fading, peeling or lost. Lots of paint chips showing rust. Some pack rust in the web at the floorbeam connection at B10. One missing bolt in the bottom flange splice plate. One missing in the gusset. One gusset with significant section loss from rust. Pack rust between the bottom flange and the bearing plate has bent the bottom flange and broken one bolt at B9. See photos KZHH

04/17/2006 - RUSTING ALONG EMBEDDED EDGE OF TOP FLANGE AT INTERSECTION WITH TRANSVERSE DECK CRACKS. AREAS OF PACK RUST AT VERTICAL STIFFENERS (PHOTOS). LIGHT FRECKLED RUST AT WEB/LOWER FLANGE CONNECTION ANGLE (PHOTO). YSCZ

04/25/2005 - None ZZEE

04/15/2003 - None EZHU

04/12/2001 - None IKHK

02/04/1999 - None CCBL

09/30/1996 - None SITT

12/01/1993 - None REFI

Inspection Notes:

Element 113 - Paint Stl Stringer

	1	2	819	m.		90	5	5	0	0
						%	%	%	%	%

Previous Inspection Notes :

06/14/2012 - Minor paint loss and rust with very light corrosion. Most of the rust is along the top flanges of the steel stringers. No changes noted in the condition states. OZMY

06/18/2010 - A small amount of state 3 rust in the south bound side only. SFMZ

07/09/2008 - Areas of topcoat fading or gone. Occasional areas of rust or corrosion on the top flange. KZHH

04/17/2006 - LIGHT RUST ALONG EMBEDDED EDGE OF UPPER FLANGE. YSCZ

04/25/2005 - None ZZEE

04/15/2003 - None EZHU

04/12/2001 - None IKHK

02/04/1999 - _ CCBL

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

U08113000+02381

Continue

* * * * * * * * * * Span : **Main-0 - Riveted Pl. Girder Spans 9, 10 and 11 (cont.)** * * * * * * * * * *

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 152 - Paint Stl Floor Beam										
	1	2	320	m.		80	10	5	5	0
						%	%	%	%	%

Previous Inspection Notes :

06/14/2012 - The pack rust and swelling between the bearing stiffeners appears to be unchanged. The worst rust on the floor beams is on the top flanges under the joints. Paint loss with minor rusting and some small spot of corrosion but no measurable section loss seen. There is some spots of primer showing thorougout. OZMY

06/18/2010 - Pack rust and swelling between the bearing stiffeners is common. State 3 rust on the top flange only is common under the joints. Some state 3 rust and small spots of corrosion along the right edge of the web of the floor beam at B10 in the span 9 side under the south bound lanes. Paint chipping is common in spans 9 and 11. SFMZ

07/09/2008 - Pack rust on the SB B9, B10 floorbeam and between the stiffener plates. Rust and some pack rust all along the vertical stiffener of the right girder at B11. See photos. Areas of rust throughout. KZHH

04/17/2006 - AREAS OF LIGHT FRECKLED RUST. YSCZ

04/25/2005 - None ZZEE

04/15/2003 - None EZHU

04/12/2001 - None IKHK

02/04/1999 - _ CCBL

Inspection Notes:

Element 205 - R/Conc Column B9 and B12										
	1	3	8	ea.		90	5	5	0	
						%	%	%	%	%

Previous Inspection Notes :

06/14/2012 - The colunms at bent 12 span 12 left has cracking with delaminations. No problems noted with the bent 9 columns. OZMY

06/18/2010 - One delaminated area in the top of the right south bound B12 column under a larger delaminated area in the cap. Horizontal cracks and delaminations in the tiebeam between the B12 north bound columns. SFMZ

07/09/2008 - No problems noted. KZHH

04/17/2006 - B9 AND B12. UNCHANGED. YSCZ

04/25/2005 - Columns show some minor cracking. No problems noted. ZZEE

04/15/2003 - None EZHU

04/12/2001 - None IKHK

02/04/1999 - _ CCBL

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

U08113000+02381

Continue

* * * * * * * * * * Span : **Main-0 - Riveted Pl. Girder Spans 9, 10 and 11 (cont.)** * * * * * * * * * *

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 210 - R/Conc Pier Wall B10 and B11										
	1	3	38	m.		95	5	0	0	
						%	%	%	%	%

Previous Inspection Notes :

06/14/2012 - Vertical cracking in the pier wall at bent 11. Bent 10 pier wall has minor cracking. Large drift at bent 11 pier wall needs removed. No changes no other problems noted. OZMY

06/18/2010 - No changes noted. Logs are drifted against the B11 pier wall. SFMZ

07/09/2008 - B10-One small vertical crack comes up out of the water and dissappears 3/4 of the way up next to two shallow spalls with no exposed rebar on the span 10 side. One vertical crack at B11 under the NB lanes 3 feet inside the median bearing. The crack is full depth on both sides and crosses the top of the cap. Crack measures 2.0mm halfway down the cap. Similar large amounts of drift against both walls needs to be removed KZHH

04/17/2006 - B10 AND B11. UNCHANGED. B11 FULL HEIGHT CRACK MEASURED AT 2 mm. YSCZ

04/25/2005 - No significant changes noted. ZZEE

04/15/2003 - DRIFT AT B11. EZHU

04/12/2001 - None IKHK

02/04/1999 - DRIFT AT B11. VERTICAL CRACKS AT B10 AND B11 FROM CAP TO WATER LINE. CCBL

09/30/1996 - None SITT

12/01/1993 - None REFI

Inspection Notes:

Element 234 - R/Conc Cap B9 - B12										
	1	4	74	m.		90	5	5	0	
						%	%	%	%	%

Previous Inspection Notes :

06/14/2012 - The caps at bent 12 have cracking and large delaminations. No changes noted with the crack in the cap at bent 11 and no other problems noted. No problems noted with the caps at bent 10. The caps at bent 9 have some delaminations. OZMY

06/18/2010 - Large delaminations on the span 12 side of the south bound cap at B12. Delaminations on both B9 caps on the span 9 faces under both median bearings. No changes 2mm crack at B11. SFMZ

Inspection Notes:

Element 301 - Pourable Joint Seal B10 and B11										
	1	4	40	m.		0	0	100		
						%	%	%	%	%

Previous Inspection Notes :

06/14/2012 - The joints are full of material and there is some leakage. The edge members are tipped towards the center of the joint. Some minor spalling along the edge members. No changes with the seals from the last inspection. OZMY

06/18/2010 - Pourable joints in the overlay on top of open joints in the deck. No seals found but leakage is minimal. There are no problems with the adjoining deck concrete or with the armored edges. SFMZ

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

U08113000+02381

Continue

* * * * * * * * * * Span : **Main-0 - Riveted Pl. Girder Spans 9, 10 and 11 (cont.)** * * * * * * * * * *

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 305 - Assm Jt w/o Seal B9 AND B12										
	1	4	40	m.		80	15	5		
						%	%	%	%	%

Previous Inspection Notes :

06/14/2012 - The sliding plate joints are full of material. The leveling strips welded on the sliding portion of the joints are broken loose or missing. There is spalling and delamination at the tread plates on the sidewalks on both sides of both joints. The left tread has a 100 percent section losse. OZMY

06/18/2010 - The sliding plate over the B12 joint on the left sidewalk has rusted through and is in two pieces with some spalling and delaminations along bothe edges. No changes noted over the road for either joint. No delaminations or spalls along either joint in the road. The strips welded to the tops are unchanged. SFMZ

07/09/2008 - No changes noted. Joint are packed with dirt. KZHH

04/17/2006 - SLIDING PLATE JOINTS AT B9 AND B12. LEVELING STRIPS WELDED ON TOP PF SLIDER HAVE BROKEN LOOSE (PHOTO). YSCZ

04/12/2001 - None IKHK

02/04/1999 - _ CCBL

Inspection Notes:

Element 311 - Moveable Bearing B9 span 9, B11 and B12 span 11

	1	2	12	ea.		80	20	0		
						%	%	%	%	%

Previous Inspection Notes :

06/14/2012 - The bearing at bent 9 left still has one broken bolt from the pack rust between the top of the bearing and the bottom flange of the girder. The bearing have paint loss, peeling with some primer showing and minor rust. The exterior bearings have the worst rust on them. No changes noted with the condition states. OZMY

06/18/2010 - No change at the B9 left bearing with the pack rust and broken bolt. Some peeling paint and rust. SFMZ

07/09/2008 - Corrosion and rusting. Pack rust on the top of one bearing at B9 has broken the bolt holding onto the girder flange. See photo. No other changes noted. KZHH

04/17/2006 - UNCHANGED. YSCZ

04/25/2005 - None ZZEE

04/15/2003 - None EZHU

04/12/2001 - None IKHK

02/04/1999 - None CCBL

09/30/1996 - None SITT

12/01/1993 - None REFI

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

U08113000+02381

Continue

* * * * * * * * * * Span : **Main-0 - Riveted Pl. Girder Spans 9, 10 and 11 (cont.)** * * * * * * * * * *

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 313 - Fixed Bearing B10										
	1	2	4	ea.		80	20	0		
						%	%	%	%	%

Previous Inspection Notes :

06/14/2012 - Minor paint loss and minor rust, no changes noted. OZMY
06/18/2010 - Some rust. No other problems. SFMZ
07/09/2008 - Rust. No other problems. KZHH
04/17/2006 - UNCHANGED. YSCZ
04/25/2005 - None ZZEE
04/15/2003 - None EZHU
04/12/2001 - None IKHK
02/04/1999 - None CCBL
09/30/1996 - None SITT
12/01/1993 - None REFI

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 334 - Metal Rail Coated Pedestrian Rail										
	1	2	273	m.		30	40	20	5	5
						%	%	%	%	%

Previous Inspection Notes :

06/14/2012 - Some of the metal posts have rusted off at the concrete. The rail is mostly rusted throughout. OZMY
06/18/2010 - No significant collision damage but a few of the posts are rusted through at the bases. Most of the rail does not have any topcoat left but a few areas may have been replaced because the topcoat is in good shape. SFMZ
07/09/2008 - Pedestrian rail between sidewalk and traffic. Occasional collision damage has bent the rail and sometimes broken the posts off at the concrete. Some of the posts appear to have separated from the concrete from corrosion. Very little paint left. KZHH
04/17/2006 - PEDESTRIAN RAIL - APPROX. 20 M COLLISION DAMAGE TO DOWNSTREAM RAIL AND 3 M TO UPSTREAM RAIL, YSCZ
04/25/2005 - None ZZEE
04/15/2003 - None EZHU
04/12/2001 - _PEDESTRIAN RAIL IKHK

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

U08113000+02381

Continue

* * * * * * * * * * Span : **Main-0 - Riveted Pl. Girder Spans 9, 10 and 11 (cont.)** * * * * * * * * * *

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 334 - Metal Rail Coated Bridge Rail										
	1	4	273	m.		45	25	25	5	0
						%	%	%	%	%

Previous Inspection Notes :

06/14/2012 - No changes noted with the metal bridge rail. OZMY

06/18/2010 - The right side rail has almost no topcoat left. The left side has more topcoat. Some corrosion on the posts. Scattered rust throughout. SFMZ

07/09/2008 - Very little paint left with some corrosion and pack rust on the posts for rail at edge of deck. KZHH

04/17/2006 - BRIDGE RAIL - LIGHT FRECKLED RUST. YSCZ

04/25/2005 - Some minor collision damage. ZZEE

04/15/2003 - None EZHU

04/12/2001 - None IKHK

02/04/1999 - None CCBL

09/30/1996 - None SITT

12/01/1993 - None REFI

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 357 - Sup Pack Rust SmFlag										
X	1	4	1	ea.	X	0	0	100	0	
						%	%	%	%	%

Previous Inspection Notes :

06/14/2012 - No changes noted with the pack rust. OZMY

06/18/2010 - No changes noted. The pack rust between the bottom two plates at both bottom flange splice plates at the right girder in span 10 is very minor. SFMZ

07/09/2008 - At the left exterior girder at B9 span 9, pack rust on top of the bearing has forced up the bottom flange enough to bend it and break one of the four bolts. This is the only place where a connector has been broken and I don't think it needs to be set at state 4. Pack rust between the bottom two plates at both bottom flange splice plates at the right girder in span 10 is starting to distort the plates but the bolts are all there. Frequent pack rust between the bearing stiffeners on the girders and transverse girders. No connectors hold these plates together. Lots of pack rust between the bearing plates but not in the main spans. Pack rust under the NB lanes between the top flanges of the knee braces and the bottom flanges of the approach span girders at the transverse girder at B9. I am eliminating this element in the approach span - 2. KZHH

Inspection Notes:

* * * * * * * * * * Span : **Appr-1 - P/S Conc. Beam Spans 1 - 7** * * * * * * * * * *

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 12 - Bare Concrete Deck Sidewalk spans 1 - 7										
	1	4	372	sq.m.	X	0	0	100	0	0
						%	%	%	%	%

Previous Inspection Notes :

06/14/2012 - The sidewalks on both sides have spalling with exposed rebar and delaminations throughout. Did not chain the sidewalks. No changes noted from the 2010 inspection. OZMY

06/18/2010 - Chaining found about 6 percent of these spans to be delaminated or have shallow spalls. SFMZ

07/09/2008 - Occasional shallow spalls. KZHH

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

U08113000+02381

Continue

* * * * * * * * * * Span : **Appr-1 - P/S Conc. Beam Spans 1 - 7 (cont.)** * * * * * * * * * *

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 22 - P Conc Deck/Rigid Ov Spans 1 - 7										
	1	4	1750	sq.m.	X	0	0	100	0	0
						%	%	%	%	%

Previous Inspection Notes :

06/14/2012 - Chained the deck and found 56.9 M2 of delaminations. 57/1750 = 3.3 precent. Heavy cracking of large size near the joints at both ends of span 7 in the south bound lanes. There is cracking throughout. The soffit has patched areas and spalling with exposed rusty rebar in the overhangs at all the joint locations. OZMY

06/18/2010 - Chained the driving lanes and found few spalls but about 1 percent delaminations. Some were present in the passing lanes but we were not able to quantify them. The worst cracking is in the south bound approach spans at the north end. There were lots of large cracks near the joints at both ends of span 7 in the south bound lanes. The soffit in the overhang over the caps typically has large spalls with lots of corroded rebar. Most of the soffit area has light cracking but there are areas of patches and a couple areas of severe cracking and white efflorescence. SFMZ

07/09/2008 - Deleted quantity of 1.52mx245m=372m2 for adding element 12 for sidewalks. 2122-372=1750m2 2 small spalls found in span 2 of SB. See main span comments. KZHH

04/17/2006 - UNCHANGED. YSCZ

04/25/2005 - See main span element notes. ZZEE

04/15/2003 - FREQUENT CRACKING AND SOME DELAMINATION IN HIGH DENSITY OVERLAY. EZHU

04/12/2001 - None IKHK

02/04/1999 - _ CCBL

Inspection Notes:

Element 109 - P/S Conc Open Girder										
	1	2	867	m.		90	5	5	0	
						%	%	%	%	%

Previous Inspection Notes :

06/14/2012 - Used a 25 foot extension ladder to inspect spans 1-7. There is spalling at most of the beam ends with exposed corroded steel and the ends of the prestressed strands are exposed. The spalling and exposed bar and prestressing is past the bearing location on the beams. Most of the end diaphragms have spalling with exposed corroded rebar. The right beam ends at bent 2 are covered with sheet metal and not visible. The interior right 3 beam ends at bent 3 span 2 and span 3 are covered with sheet metal and are not visible. OZMY

06/18/2010 - No changes noted. A few of the spalls at the bottom ends past the bearing plates have exposed and corroded steel including the ends of the prestressing strands but does not affect the serviceability or strength of the girders. North bound has 4 lines prestressed girders in spans 1 - 7. South bound has 5 lines in spans 1 and 2 and 4 lines in spans 3 - 7. Most of the end diaphragms have the bottom rebar exposed and it is corroded. SFMZ

07/09/2008 - Almost all the diaphragms at the bents are badly spalled on the bottom with exposed rusty rebar. Some of the girders have short cracks and occasionally spalled at the ends at the bearing plates. One of the girders in span 5 has two small areas of exposed aggregate on the bottom from poor vibrating. No other problems noted. KZHH

04/17/2006 - SEVERAL DIAPHRAGMS ARE CRACKED AND SPALLING (PHOTOS). YSCZ

04/25/2005 - Most diaphragms show significant spalling with exposed rebar. No significant changes noted. ZZEE

04/15/2003 - SIGNIFICANT SPALLING AT DIAPHRAGMS. (DELAMINATED AREAS CHIPPED BACK TO SOUND CONCRETE 5/03) EZHU

04/12/2001 - None IKHK

02/04/1999 - _DIAPHRAGMS SPALLED WITH EXPOSED REBAR. CCBL

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

U08113000+02381

Continue

* * * * * * * * * * Span : **Appr-1 - P/S Conc. Beam Spans 1 - 7 (cont.)** * * * * * * * * * *

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 205 - R/Conc Column										
	1	3	28	ea.		90	5	5	0	
						%	%	%	%	%

Previous Inspection Notes :

06/14/2012 - Columns at bent 3 have spalling with no exposed rebar and some delaminations. Column at bent 4 the right exterior on the span 4 side has a delamination. Column at bent 5 right exterior on the span 5 side has cracking and delamination. Column at bent 6 right exterior has cracking and delamination. Columns at bent 7 the third from the left has a delamination and the right exterior column has cracking and delamination. Column at bent 8 has spalling with no exposed rebar and delamination. OZMY

06/18/2010 - No changes noted. Not much delamination found around the cracked right column at B6. SFMZ

07/09/2008 - One 3' to 4' long vertical crack in the span 5 side of the right col. at B6. One shallow spall and delam at the base at B8 right. No other changes noted. KZHH

04/17/2006 - SOME DRAINAGE PIPES BROKEN OR JOINTS SEPARATED (PHOTOS). SEVERAL PIPES REPAIRED EARLY IN 2006, BUT WITH ALL DECK DRAINS PLUGGED SOLID, NO WATER CAN GET TO THE PIPES. YSCZ

04/25/2005 - See main span element notes. ZZEE

04/15/2003 - None EZHU

04/12/2001 - None IKHK

02/04/1999 - _DRAINAGE PIPES BROKEN. CCBL

Inspection Notes:

Element 215 - R/Conc Abutment B1 only										
	1	2	33	m.		90	5	5	0	
						%	%	%	%	%

Previous Inspection Notes :

06/14/2012 - The abutment at bent 1 has a spall under the left exterior beam with no exposed rebar. There is cracking and delamination under the 2nd beam from the left. There is a delamination near the bottom of the backwall under the 7th beam from the left and also under the 8th and 9th beams from the left. There are 9 lines of beams in span 1. The bearings at bent 1 are embedded in the backwall. OZMY

06/18/2010 - No problems noted. The bearings are embedded in the backwall. SFMZ

07/09/2008 - No problems noted at B1. KZHH

04/17/2006 - UNCHANGED. YSCZ

04/25/2005 - Abutment components show some minor cracking. ZZEE

04/15/2003 - None EZHU

04/12/2001 - None IKHK

02/04/1999 - _ CCBL

Inspection Notes:

Element 234 - R/Conc Cap B2 - B8										
	1	4	104	m.		85	5	10	0	
						%	%	%	%	%

Previous Inspection Notes :

06/14/2012 - There are 2 caps at each bent. All the caps have cracking, spalling and delaminations on them. Most of the caps have more than one delamination on them with some of the delaminations being large in size. A lot of the delaminations are under the bearings devices. The cap at bent 7 also has a delaminated patch on the left side in the span 7 side. No changes noted in the large vertical crack of a 1/4" wide under the bearing at bent 3 south bound lane. OZMY

06/18/2010 - One delaminated area in the bottom center of the B6 south bound cap. Minor vertical cracking under one bearing on the left end of the B7 north bound cap. Delaminations found on the span 5 side of the B5 south bound over the left column. There is some delamination around the cracking at the right end at B5. One small spall at B2 north bound. Some minor cracking on the span 3 side of B3 right south bound. There is minor spalling with out exposed rebar and a large delamination all along the top of the north bound left bay on the span 3 side of the B3 cap. The median end of the south bound B3 cap has a large vertical crack 1/4" wide under one bearing. These caps get a lot of moisture from the leaking joints. SFMZ

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

U08113000+02381

Continue

* * * * * * * * * * Span : **Appr-1 - P/S Conc. Beam Spans 1 - 7 (cont.)** * * * * * * * * * *

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 302 - Compressn Joint Seal B2 - B8										
	1	4	121	m.		60	20	20		
						%	%	%	%	%

Previous Inspection Notes :

06/14/2012 - All the compression joints seals at bents 2 - 8 have minor top tearing with some edge separation and minor edge spalling. The joints appear to be leaking moisture on to the caps. The seals in the sidewalk on the right side are gone. The joint at bent 3 has about 10 feet of patched header on the right. The joint header at bent 7 is badly cracked with delaminations in the right side driving lane. The joint header at bent 8 is badly cracked with delaminations in both the right driving and passing lanes. No changes noted in the condition states from the last inspection. OZMY

06/18/2010 - A small part of the top of the south bound B3 joint has been shredded. The seals are gone in the right sidewalk. There are areas of edge separation and minor edge spalling. The span 7 side of the deck is badly cracked at both the B7 and B8 joints. Overall, the seals don't look that bad on the surface but most of the caps were getting dripped on during the rain during the inspection. No major spalls along the edges. SFMZ

07/09/2008 - B2 - B8. Joints aren't armored and are all tightly compressed. The joints at B3 through B5 are the worst with some gaps along the edges and tears from being compressed up into traffic. KZHH

04/17/2006 - SEALS DAMAGED BY TRAFFIC (PHOTO). YSCZ

04/25/2005 - Seals mostly full of material and sagging. No significant changes. ZZEE

04/15/2003 - SEALS FAILING. EZHU

04/12/2001 - None IKHK

02/04/1999 - Slab and Curb Joints above Bents 2 - 7. CCBL

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 313 - Fixed Bearing B2 - B8 span 7										
	1	4	94	ea.		45	55	0		
						%	%	%	%	%

Previous Inspection Notes :

06/14/2012 - A total of 94 fixed bearing visible for inspection. All bearing show lots of paint loss with rusting. The left exterior bearing have the most rust with some corrosion on them. Several of the bearings have pack rust and swelling at the sole plates with some of the sole plates being bowed. The spans 1 and 2 bearing have the least amount of rust on them. OZMY

06/18/2010 - The bearings visible for inspection under the concrete girders in spans 1 - 7 are all the same type of fixed bearings. Deleted the moveable bearing element. Changed the fixed bearing quantity from 59 to 94. The south bound caps at B2 and B3 are covered with metal and only 2 median exterior bearings are visible for inspection on the south bound cap at B2 so the B2 quantity is 10. Only the four exterior bearings are visible on the southbound cap at B3 so the B3 quantity is 12. B4 - B7 quantity is 16 each and the span 7 side of B8 has a quantity of 8. Most bearings have no paint left and some have pack rust and swelling between the sole plate and the masonry plate. A few of the sole plates were bowed slightly in the middle from the swelling. The fixed bearings at B1 are embedded in the abutment. The welds on the B7 right exterior sole plates were soft and the tops were rubbed off with a hammer. SFMZ

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 334 - Metal Rail Coated Bridge Rail										
	1	2	245	m.		45	25	25	5	0
						%	%	%	%	%

Previous Inspection Notes :

06/14/2012 - The bridge rail has lots of paint loss with rust. The posts have paint loss rusting and corrosion. No changes noted from the last inspection. OZMY

06/18/2010 - See the comments for the main spans. SFMZ

07/09/2008 - Same as main span element comments. KZHH

04/17/2006 - PEDESTRIAN RAIL. COLLISION DAMAGE. YSCZ

04/25/2005 - None ZZEE

04/15/2003 - None EZHU

04/12/2001 - _PEDESTRIAN RAIL IKHK

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

U08113000+02381

Continue

* * * * * * * * * * Span : **Appr-1 - P/S Conc. Beam Spans 1 - 7 (cont.)** * * * * * * * * * *

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 334 - Metal Rail Coated Pedestrian Rail										
	1	4	245	m.		50	20	20	5	5
						%	%	%	%	%

Previous Inspection Notes :

06/14/2012 - Lots of paint loss with rusting and corrosion on the pedestrian rail. Some of the posts have been rusted off at the concrete. No changes noted from the last inspection. OZMY

06/18/2010 - See comments for the main spans. SFMZ

07/09/2008 - Same as main span element comments. KZHH

04/17/2006 - BRIDGE RAIL. YSCZ

04/25/2005 - See main span element notes. ZZEE

04/15/2003 - None EZHU

04/12/2001 - None IKHK

02/04/1999 - _ CCBL

Inspection Notes:

Element 358 - Deck Cracking SmFlag

X	1	4	1	ea.	X	0	0	100	0	
						%	%	%	%	%

Previous Inspection Notes :

06/14/2012 - No changes noted the south bound lanes at the joints in span 7. The deck is badly cracked in these areas. OZMY

06/18/2010 - The cracking in span 7 in the south bound lanes at both joints is in state 4. The remaining cracking is in state 2 or 3. Overall the worst of the cracking was mostly in the north approach span group and in the south bound lanes. SFMZ

Inspection Notes:

* * * * * * * * * * Span : **Appr-2 - WF Girder Spans, Spans 8, 12 and 13** * * * * * * * * * *

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 12 - Bare Concrete Deck Sidewalk										
	1	4	114	sq.m.	X	0	0	100	0	0
						%	%	%	%	%

Previous Inspection Notes :

06/14/2012 - No changes noted from 2010 inspection. Did not chain the sidewalks. The sidewalks have spalling with exposed rebar and delaminations. OZMY

06/18/2010 - Chained the sidewalks and found over 4 percent spalling and delaminations in spans 8, 12 and 13. SFMZ

07/09/2008 - Quantity is 75m(for 2 lengths of rail)x1.52m=114m2. Same comments as for main span. KZHH

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

U08113000+02381

Continue

* * * * * * * * * * Span : **Appr-2 - WF Girder Spans, Spans 8, 12 and 13 (cont.)** * * * * * * * * * *

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 22 - P Conc Deck/Rigid Ov Spans 8, 12 and 13										
	1	4	989	sq.m.	X	0	0	0	100	0
						%	%	%	%	%

Previous Inspection Notes :

06/14/2012 - Chained the deck and found 171.1 M2 of delaminations. 171/989 = 17.3 precent. The soffit has cracking and some delaminations and patched areas. OZMY

06/18/2010 - Chained the driving lanes and found 4 percent delaminations and no spalls. Delaminations were found in the passing lanes but we weren't able to quantify. Frequent cracking. Some cracking and delaminations in the span 12 median soffit. One area of spalling and corroded rebar in the median soffit at B8. The first half of the north bound side in the span 8 soffit has an area of bad cracking and some delaminations. SFMZ

07/09/2008 - Changed quantity by (-)114m2 to remove sidewalk. 1103-114=989m2 Same comments as for main span. KZHH

04/17/2006 - UNCHANGED. YSCZ

04/25/2005 - See main span element notes. ZZEE

04/15/2003 - FREQUENT CRACKING AND DELAMINATIONS IN HIGH DENSITY OVERLAY. EZHU

04/12/2001 - None IKHK

02/04/1999 - _ CCBL

Inspection Notes:

Element 107 - Paint Stl Opn Girder Spans 8, 12 and 13										
	1	4	474	m.		80	5	5	5	5
						%	%	%	%	%

Previous Inspection Notes :

06/14/2012 - There is section loss of 7/32" on the 5/8" thick web of the bent 8 span 8 inside of left exterior girder just above the bottom flange. There is also section loss of 6/32" on the 3/8" thick diaphragm knee brace in the left exterior bay at bent 8 span 8. There is section loss of 4/32" in the web of the right exterior girder at bent 9 span 8 near the bottom flange 1' 3" BOL from the bearing stiffener. The 7/32" section loss on the right side of the left NB median span 13 girder at bent 13 was re-measured and no changes were found. There is additional section loss of 8/32" BOL from the bearing at the same bent. All girders have peeling paint, primer showing, paint loss with rust and corrosion along the top flanges and girder ends. The end diaphragms and diaphragms connections have rust corrosion and section loss on them. The span 13 girders have a slight negative camber. No changes noted in the condition states from last inspection. OZMY

06/18/2010 - Spans 8 and 13 have 8 lines and span 12 has 10 lines. The right side of the left NB median span 13 girder at B13 has section loss up to 7/32" around the bolts over the bearing in the bottom flange which is 15/16" thick. The right exterior SB span 13 girder has 8/32" section loss in the same place; the girder next to it has 3/32" section loss in the same place and the girder next to that has 2/32" section loss in the same place. There is corrosion on both flanges near the B13 ends of the girders. Girders 6 and 7 9measured from the left) have some corrosion in the first inch of the web coming out of the backwall. Span 13 girder 4 has some corrosion on the web at B13. The end diaphragms at B13 for span 13 have lots of state 3 and 4 rust and possibly state 5, all on the backside where access and visibilty is limited. Spans 8 and 12 have some state 2 and 3 rust only. SFMZ

Inspection Notes:

Element 178 - Painted Trans Girder B9 and B12										
	1	4	32	m.		80	5	5	5	5
						%	%	%	%	%

Previous Inspection Notes :

06/14/2012 - The T-Girder at bent 9 has corrosion and pitting along the bottom of the web on the right side. Heavy pitting on the top of the right T-Girder at bent 9. Pack rust is common between the bearing stiffeners at all the transverse girders. The T-Girder at bent 12 has areas of section loss. No changes noted in the 7/32" section loss in the web at the left exterior end of the north bound at bent 12. Section loss of 3/32", 6/32" and 2 spots of 3/32" along the bottom of the web on the right side of the left transverse girder at bent 12 span 11 side. There is also section loss of 3/32" on the right and left sides of the right transverse girder at bent 12 span 11 side. There is also pack rust between the web and bottom flange of the transverse girder at bent 12. OZMY

06/18/2010 - Pack rust and swelling between the bearing stiffeners is common. 7/32" section loss on the very end of the 12/32" thick web at the left exterior end of the north bound B12 transverse girder. Some corrosion and possible section loss nearer the bearing on the same side of the same web at the bottom. See photo. No access due to large powerline. A small amount of corrosion on the span 11 side of the south bound B12 T. girder. SFMZ

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

U08113000+02381

Continue

* * * * * * * * * * Span : **Appr-2 - WF Girder Spans, Spans 8, 12 and 13 (cont.)** * * * * * * * * * *

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 205 - R/Conc Column B13										
	1	4	4	ea.		90	5	5	0	
						%	%	%	%	%

Previous Inspection Notes :

06/14/2012 - Cracking and spalling with a delamination on the right column at bent 13. OZMY

06/18/2010 - Several vertical cracks just above the tiebeam with a small amount of delamination at the B13 SB right column. A delamination full width of the column at the top of the span 13 side of the same column goes up into the bottom of the cap. SFMZ

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 215 - R/Conc Abutment B14										
	1	2	24	m.		90	5	5	0	
						%	%	%	%	%

Previous Inspection Notes :

06/14/2012 - A small spall on the right exterior side of the cap with no exposed rebar. There is a small delam at the centerline of the caps at bent 14. OZMY

06/18/2010 - The girders are embedded in the backwall and the bearings are not. No problems noted. SFMZ

07/09/2008 - No problems noted at B14. KZHH

04/17/2006 - UNCHANGED. YSCZ

04/25/2005 - Abutment components show some minor cracking. ZZEE

04/15/2003 - None EZHU

04/12/2001 - None IKHK

02/04/1999 - _ CCBL

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 234 - R/Conc Cap B13										
	1	4	35	m.		95	0	5	0	
						%	%	%	%	%

Previous Inspection Notes :

06/14/2012 - Cap at bent 13 has cracking and delamination on the left side of the left cap. OZMY

06/18/2010 - One large delamination at the top of the right south bound column of B13 on the span 13 side. Water was leaking onto the B13 caps from the rain during the inspection and running down the columns. SFMZ

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

U08113000+02381

Continue

* * * * * * * * * * Span : **Appr-2 - WF Girder Spans, Spans 8, 12 and 13 (cont.)** * * * * * * * * * *

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 305 - Assm Jt w/o Seal B13 SLIDING PLATE										
	1	4	20	m.		100	0	0		
						%	%	%	%	%

Previous Inspection Notes :

06/14/2012 - No changes noted from the last inspection. OZMY

06/18/2010 - One of the transverse strips of steel welded to the south bound top plate has come off since the last inspection. No delaminations or spalls along the edges. SFMZ

07/09/2008 - No changes noted. KZHH

04/17/2006 - None YSCZ

04/25/2005 - See main span element notes. ZZEE

04/15/2003 - None EZHU

04/12/2001 - None IKHK

02/04/1999 - Sliding Plate Joint at Bent 13. CCBL

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 311 - Moveable Bearing B9 span 8, B12 span 12 and B13 span 13										
	1	4	16	ea.		60	40	0		
						%	%	%	%	%

Previous Inspection Notes :

06/14/2012 - The median at bent 12 same as last inspection. No changes noted from the last inspection. OZMY

06/18/2010 - The median bearing under the transverse girder (two bearings per transverse girder only!)under the south bound (SB) lanes at B12 is leaning enough that the anchor bolts are broken. The median bearing under the transverse girder under the NB lanes at B12 is leaning almost as much and the anchor bolts are bent but not broken. The exterior rockers under these transverse girders are almost vertical and the anchors are ok except for lots of rust. The rockers at B13 are of a different type and have very little paint left. Pack rust is typical on the top and bottom between the rocker and the plate and one of the top plates under the NB lanes has a slight bend caused by the pack rust. Four under the T Beams at B9 span 8 and at B12 span 12 and 8 at B13 span 13. Changed quantity from 26 to 16. SFMZ

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 313 - Fixed Bearing B8 span 8, B13 span 12 and B14										
	1	4	26	ea.		80	20	0		
						%	%	%	%	%

Previous Inspection Notes :

06/14/2012 - No changes noted from the last inspection. OZMY

06/18/2010 - Changed quantity from 28 to 26. 8 at B8 span 8, 10 at B12 span 12 and 8 at B14. The girders are embedded in the B14 abutment backwall but not the bearings. Lots of rust at the B8 bearings and almost none at the B14 bearings. No other problems noted. SFMZ

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 334 - Metal Rail Coated Pedestrian Rail										
	1	3	75	m.		50	20	20	5	5
						%	%	%	%	%

Previous Inspection Notes :

06/14/2012 - Rust and corrosion with some of the posts rusted off at the concrete. No changes noted from the last inspection. OZMY

06/18/2010 - See main span comments for the pedestrian rail. SFMZ

07/09/2008 - See main span element. KZHH

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

U08113000+02381

Continue

* * * * * * * * * * Span : **Appr-2 - WF Girder Spans, Spans 8, 12 and 13 (cont.)** * * * * * * * * * *

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 334 - Metal Rail Coated Bridge Rail										
	1	4	75	m.		45	25	25	5	0
						%	%	%	%	%

Previous Inspection Notes :

06/14/2012 - The rail have little paint left on it. The posts has paint loss, rusting and corrosion on them. No changes noted from the last inspection. OZMY

06/18/2010 - See main span comments for the bridge rail. SFMZ

07/09/2008 - See comments in main span. KZHH

04/17/2006 - BRIDGE RAIL. LIGHT RUST. YSCZ

04/25/2005 - See main span element notes. ZZEE

04/15/2003 - None EZHU

04/12/2001 - None IKHK

02/04/1999 - _ CCBL

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 363 - Sup Sect Loss SmFlag										
X	1	1	1	ea.	X	0	100	0	0	
						%	%	%	%	%

Previous Inspection Notes :

06/14/2012 - Section loss on the bent 13 girder. Section loss on the bottom flange and web of the transverse girder at bent 12. OZMY

06/18/2010 - Minor section loss in the bottom flanges over the bearings at B13. Section loss in the web of the B12 transverse girder. See these elements and photos for more details. SFMZ

07/09/2008 - See comments for girders, transverse girders and x frames in main spans and steel approach spans. KZHH

04/17/2006 - TRANSVERSE GIRDERS AND AT B13 (PHOTOS). YSCZ

04/25/2005 - None ZZEE

04/15/2003 - None EZHU

04/12/2001 - None IKHK

02/04/1999 - _ CCBL

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

U08113000+02381

Continue

General Inspection Notes

06/14/2012 - None	OZMY
06/18/2010 - About 8 hours each for two people for traffic control. Time for the snooper driver on this bridge was 4 days. Measured 4.36m minimum vertical clearance over the road under span 3. The lateral clearance on the right of the road is the sidewalk width of 4.4m and 0 on the left.	SFMZ
07/09/2008 - There is no access to some of the concrete spans from the SB side because of trees and the stairwell. Access to B12 from span 11 is restricted because of the powerline. Access is limited at the banks because of trees. Deleted element 357 Pack Rust Smart Flag from 2nd approach span group because it is in the main span group and only one per bridge allowed. Time for snooper driver on this bridge was three days.	KZHH
04/17/2006 - None	YSCZ
04/25/2005 - None	ZZEE
04/15/2003 - None	EZHU
04/12/2001 - None	IKHK
02/04/1999 - None	CCBL
09/30/1996 - Sufficiency Rating Calculation Accepted by ops$a0241 at 9/3/97 12:41:10 OPS$A0241 inspection comments - Structure U08113000+02381 - Date 9/30/96 - Previous comments > Sufficiency Rating Calculation Accepted by ops$u5963 at 3/11/97 10:47:03 Sufficiency Rating Calculation Accepted by OPS$U9004 at 2/19/97 12:35:37	SITT
12/01/1993 - Sufficiency Rating Calculation Accepted by ops$u5963 at 3/11/97 10:47:03 Sufficiency Rating Calculation Accepted by OPS$U9004 at 2/19/97 12:35:37	REFI
07/01/1991 - Updated with tape 1994	NB94
08/01/1989 - Updated with tape 1991	NB91
03/01/1988 - Updated with tape 1989	NB89
01/01/1987 - Updated with tape 1988	NB88
08/01/1985 - Updated with tape 1986	NB86
03/01/1983 - Updated with tape 1984	NB84
09/01/1980 - Updated with tape 1983	NB83
10/01/1977 - Updated with tape 1980	NB80

Montana Department of Transportation

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00007095+00581

Location : MISSOULA - MADISON ST. Structure Name: none

General Location Data

District Code, Number, Location : **01** **Dist 1** **MISSOULA**

County Code, Location : **063** **MISSOULA**

Kind fo Hwy Code, Description : **2** **2 U.S. Numbered Hwy**

Str Owner Code, Description : **1** **State Highway Agency**

Intersecting Feature : **CLARK FORK**

Structure on the State Highway System : [X]

Structure on the National Highway System : [X]

Str Meet or Exceed NBIS Bridge Length : [X]

Latitude : **46°52'01"**

Longitude : **113°59'16"**

Division Code, Location : **11** **MISSOULA**

City Code, Location : **50200** **MISSOULA**

Signed Route Number : **00012**

Maintained by Code, Description : **1** **State Highway Agency**

Kilometer Post, Mile Post : **152.97 km** **95.05**

Construction Data

Construction Project Number : **U UG-405 2**

Construction Station Number : **28+82.00**

Construction Drawing Number : **3928**

Construction Year : **1958**

Reconstruction Year : **1981**

Traffic Data

Current ADT : **22,160** ADT Count Year : **2009** Percent Trucks : **2 %**

Structure Loading, Rating and Posting Data

Loading Data :

Design Loading :		**5 MS 18 (HS 20)**
Inventory Load, Design :	**31.0 mton**	**2 AS Allowable Stress**
Operating Load, Design :	**54.0 mton**	**2 AS Allowable Stress**
Posting :		**5 At/Above Legal Loads**

Rating Data :

	Operating	Inventory	Posting
Truck 1 Type 3 :	**55**	**35**	
Truck 2 Type 3-S3 :	**73**	**47**	
Truck 3 Type 3-3 :	**80**	**51**	

Structure, Roadway and Clearance Data

Structure Deck, Roadway and Span Data :

Structure Length : **168.25 m**

Deck Area : **3,496.00 m sq**

Deck Roadway Width : **18.29 m**

Approach Roadway Width : **26.82 m**

Median Code, Description : **2 Closed median (no barrier)**

Structure Vertical and Horizontal Clearance Data :

Vertical Clearance Over the Structure : **99.99 m**

Reference Feature for Vertical Clearance : **N Feature not hwy or RR**

Vertical Clearance Under the Structure : **0.00 m**

Reference Feature for Lateral Underclearance : **N Feature not hwy or RR**

Minimum Lateral Under Clearance Right : **0.00 m**

Minimum Lateral Under Clearance Left : **0.00 m**

Span Data

Main Span

Number Spans : **3**

Material Type Code, Description : **4 Steel continuous**

Span Design Code, Description : **3 Girder and Floorbeam System**

Deck

Deck Structure Type : **1 Concrete Cast-in-Place**

Deck Surfacing Type : **3 Latex Concrete or similar additive**

Deck Protection Type : **0 None**

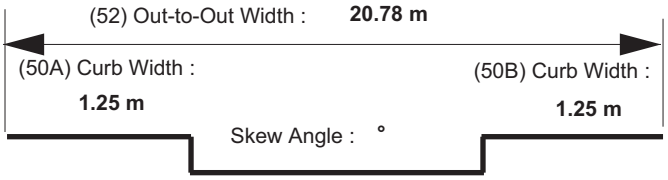
Deck Membrain Type : **0 None**

Approach Span

Number of Spans : **3**

Material Type Code, Description : **3 Steel**

Span Design Code, Description : **2 Stringer/Multi-beam or Girder**



Structure Vertical and Horizontal Clearance Data Inventory Route :

Over / Under Direction Name	Inventory Route	South, West or Bi-directional Travel			North or East Travel		
		Direction	Vertical	Horizontal	Direction	Vertical	Horizontal
Route On Structure	P00007	Both	99.99 m	8.53 m	N/A		
MADISON STREET							

Montana Department of Transportation

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00007095+00581

Continue

Inspection Data

Sufficiency Rating : **35.5**
Structure Status : **Struc Def - Elg Repl**

Inspection Due Date : 27 June 2014
(91) Inspection Fequency (months) : **24**
Next Fracture Critical Due Date : **27 Jun 2014**
Fracture Critical Detail : **1 or 2 Stl-girder systms**

NBI Inspection Data

(90) Date of Last Inspection : 27 June 2012
Last Inspected By : Darrel Reich - 2051
(90) Inspection Date :
Inspected By :

(58) Deck Rating : 3
(59) Superstructure Rating : 3
(60) Substructure Rating : 5
(72) App Rdwy Align : 6
(68) Deck Geometry : 5
(67) Structure Rating : 3
(69) Under Clearance : N
(41) Posting Status : A
(36C) Approach Rail Rating : N
(36A) Bridge Rail Rating : 0
(36B) Transition Rating : 0
(36D) End Rail Rating : 0
(62) Culvert Rating : N
(61) Channel Rating : 8
(71) Waterway Adequacy : 9
(113) Scour Critical : 5

Unrepaired Spalls : 61 m sq
Deck Surfacing Depth : 1.80 in

Inspection Hours

Crew Hours for inspection : 28
Helper Hours : -1
Special Crew Hours : -1
Special Equipment Hours : -1
Snooper Required : Y
Snooper Hours for inspection : 11
Flagger Hours : -1

Inspection Work Candidates

Candidate ID	Date Requested	Status	Priority	Effected Structure Unit	Scope of Work	Action	Covered Condition States
D11-FY2008-000006	**10 December 2007**	**Approved**	**Low**	All Spans	22 P Conc Deck/Rigid Ov	Min Repair	
Unplug the deck drains. Clean the sliding plate joints. Approved. DRC Same for 2012 inspection.							
D11-FY2010-000201	**29 July 2010**	**Approved**	**Medium**	A Approach	234 R/Conc Cap	Rehab Elem	
Repair the spalls and delaminations on the caps, primarily the NB B3 cap. There are spalls and/or delaminations on some of the other caps but the NB B3 cap is by far in the worst shape. Approved. DRC Same for 2012 inspection.							
D11-FY2010-000202	**29 July 2010**	**Approved**	**High**	A Approach	334 Metal Rail Coated	Rehab Elem	
The area with collision damage in span 2 has a post that is no longer securely attached to the deck. Approved. DRC Same for 2012 inspection.							

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00007095+00581

Continue

Element Inspection Data

* * * * * * * * * * Span : **Main-0 - Riveted Plate Girder, Spans 4 - 6** * * * * * * * * * *

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 12 - Bare Concrete Deck Sidewalk B4 - B7										
	1	4	298	sq.m.	X	0	0	100	0	0
						%	%	%	%	%

Previous Inspection Notes :

06/27/2012 - Did not chain the sidewalks. There is lots of spalls with exposed rebar, cracking, delaminations and patched areas throughout both right and left sides. No changes noted from last inspection.	ZEBZ
07/06/2010 - Chained the sidewalk and found 7 percent to be spalled, patched or delaminated in spans 4 through 6. There are lots of spalls with rusty rebar, cracks, delaminations and staining in the sidewalk soffit.	GNDR
07/18/2008 - Numerous spalls and patches scattered throughout. Quantity = 238m x 1.245m = 298m2.	XPHF

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 22 - P Conc Deck/Rigid Ov Spans 4 - 6										
	1	4	2173	sq.m.	X	0	100	0	0	0
						%	%	%	%	%

Previous Inspection Notes :

06/27/2012 - The south bound lanes were to wet to chain, no spalls or patched areas seen. Chained the north bound lanes and found 19.6 square meters of delaminations with no spalls or patches seen. Assuming the south bound lanes are about the same for delaminations as the north bound the distressed area is still less than 2 percent. 40/2173 = 1.8 percent. The soffit has cracking, patched areas with forms left in place, spalling with exposed rusty rebar and delaminations throughout with the north bound soffit being the worst. The edge of sidewalks/overhangs have cracking, spalling with exposed rusty rebar and delaminations throughout on both sides.	ZEBZ
07/06/2010 - Chained the driving lanes and found 0.4 percent delaminations with no spalls or patches found in spans 4 - 6. Some areas with lots of cracking. The soffit looks bad with lots of delaminations, occasional spalls with rusty rebar, a few rust stains, cracking and some forms left in place from patching.	GNDR
07/18/2008 - Decreased quantity from 2470m2 by (238m x 1.25m) 298m2 = 2173m2 for sidewalk element. Chained NB deck and a few delams found mostly in span 3. Numerous spalls with exposed rusty bare rebar and patches in the soffit. Numerous wood forms from previous deck patching still in place. No changes noted from the last inspection.	XPHF
11/14/2007 - No changes noted from last inspection except that the deck cracking includes longitudinal cracks also. Deck drains remain plugged. See photo. Sidewalk shows surface patches, delaminated areas, spalling and exposed rebar on the top surface.	ORDZ
09/08/2005 - Deck show some spalling and delamination scattered throughout. Numerous to frequent transverse cracking with some efflorescence. Generally medium wear throughout. Drains are plugged. Overhangs show some serious spalling with exposed rebar. No significant changes noted.	JZJL
04/14/2003 - OCCASIONAL DELAMS IN OVERLAY.	GIBK
04/13/2001 - SIDEWALK SPALLS REPAIRED WITH POLYMER CONC. OCCASIONAL DELAMS IN OVERLAY.	IKKR
01/05/1999 - SCATTERED SPALLS ON BOTTOM OF DECK. SIDEWALKS HAVE NUMEROUS SPALLS.	ECJK
10/02/1996 - None	CZTA
12/01/1993 - None	REFI

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00007095+00581

Continue

* * * * * * * * * * Span : **Main-0 - Riveted Plate Girder, Spans 4 - 6 (cont.)** * * * * * * * * * *

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 107 - Paint Stl Opn Girder 2-2girder systems										
	1	4	475	m.		80	5	5	5	5
						%	%	%	%	%

Previous Inspection Notes :

06/27/2012 - The section loss of 9/32" on the 22/32" top flange of the right girder at bent 4 in the north bound was re-measured and no changes were found. No changes in the 100 percent section loss on the cross brace end at the north bound right girder. Re-measured the 4/32" section loss on the 14/32" thick outside web of the south bound left exterior girder at bent 4 span 4 and found no changes. Found additional section loss of 6/32" near the bottom inside of the same girder web. The small amount of pack rust between the bottom flange plates of the south bound exterior girder on the exterior side at bent 6 span 6 and bent 5 span 5 appears unchanged. The top flanges show some paint loss and rusting with minor corrosion along the top flanges. The left exterior span 4 girder in the south bound is the worst for rust along the bottom flange. All girders also show minor paint peeling with primer showing and minor state 2 and 3 rust. ZEBZ

07/06/2010 - 9/32" section loss on the very end of the top flange on the north bound right girder at B4; see photo. The top flange is 22/32" thick. The horizontal cross brace end at the north bound right girder has 100 percent section loss and a small amount of section loss on the connecting gusset plate at B5; see photo. A minor amount of pack rust between the bottom flange plates of the south bound exterior girder on the exterior side only at the span 6 side of the B6 bearing and at the span 5 side of the B5 bearing. Some corrosion at bents 4, 6 and 7. Some state 3 rust at the bents and a little scattered throughout. Some state 3 rust along the median top flanges. A little state 2 rust scattered throughout between the bents. GNDR

07/18/2008 - Heavy rust, corrosion and minor section loss at the bents. A small amount of pack rust between the plates attached to the bottom of the bottom flange at B5 and B6 left girder SB and between the bearing stiffener plates at B6 SB left. XPHF

11/14/2007 - No changes noted. ORDZ

Inspection Notes:

Element 113 - Paint Stl Stringer

	1	3	713	m.		85	5	5	5	0
						%	%	%	%	%

Previous Inspection Notes :

06/27/2012 - The steel stringers have some areas of peeling paint, paint loss with rust and corrosion along the top flanges. The rusting and corrosion is more common at the bents. No changes noted from the last inspection. ZEBZ

07/06/2010 - State 3 and 4 rust common along the edges of the top flanges. Some areas of fading top coat throughout. A small amout of state 2 rust. GNDR

07/18/2008 - Occasional heavy rust along the edge of the top flange. Small areas of topcoat failure and both coats failing with rust. Small amounts of rust on the bottom flange. XPHF

11/14/2007 - No changes noted. ORDZ

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00007095+00581

Continue

* * * * * * * * * * Span : **Main-0 - Riveted Plate Girder, Spans 4 - 6 (cont.)** * * * * * * * * * *

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 152 - Paint Stl Floor Beam										
	1	3	259	m.		80	5	5	5	5
						%	%	%	%	%

Previous Inspection Notes :

06/27/2012 - The section loss of 5/32" on the top center connecting plate that is 14/32" thick on the floor beam at north bound bent 4 span 4 was re-measured and no changes were found from last inspection. The section loss of 7/32" on a plate that is 1/2" thick in the median end of the same floor beam at bent 4 north bound was re-measured and no changes were found from last inspection. There is 2 spots of 6/32" section loss at bent 4 span 4 north bound center connecting plate. There is 7/32" section loss at bent 5 span 5 right side north bound. Re-measured the section loss of 6/32" on the south bound bent 4 span 4 side left on the 1/2" thick connecting plate and found no changes from last inspection. Re-measured the section loss of 4/32", 6/32" and 5/32" on the 1/2" thick center plate south bound bent 4 span 4 and found no changes from last inspection. Not much rust seen at the intermediate floor beams most of the rust is at the bents. ZEBZ

07/06/2010 - Corrosion and one spot of 5/32" section loss on the top center connecting plate on the open floor beam at north bound bent 4; see photo. 7/32" section loss on one area of the median connection plate of the same floor beam; see photo. Lots of state 4 rust on this floor beam. Some state 3 and 4 rust on the NB and SB B5 and B6 floor beams. The SB bent 4 open floor beam has spots of section loss of 4/32", 5/32" and 6/32" on the bottom center connecting plate and an area of 6/32" section loss on the bottom left connectiong plate; see photos with notes on the plate thicknesses. There is pack rust and swelling and standing water on another connecting plate at this location where the horizontal brace connects. A small amount of state 2 is common on the intermediate floor beams and occasional state 3 rust mostly at the bents. The photos show all the areas of section loss found on this bridge. GNDR

07/18/2008 - Rust, corrosion and some pack rust and section loss along the ends of the webs at the connections to the girders at bents 4, 5 and to a lesser extent at B6. The same on the gussets that are part of the floorbeams at B4 as the floorbeams at B4 are not solid. Intermediate floorbeams between the bents are in much better shape. Corrosion on the flanges at the bents also. XPHF

11/14/2007 - No changes noted. ORDZ

Inspection Notes:

Element 205 - R/Conc Column

	1	3	9	ea.		95	0	5	0	
						%	%	%	%	%

Previous Inspection Notes :

06/27/2012 - The column at bent 4 span 4 on the right exterior has a small delamination. No other problems noted. ZEBZ

07/06/2010 - One very small delam at the top of a patch on the span 5 side of the left B6 column. The tiebeams noted in the previous inspection is a pier wall as it is slightly wider than the columns. They are also mostly buried. No other problems at B4 through B6. GNDR

07/18/2008 - Spall with exposed rebar on the tiebeams at B4. Note: main span columns at B4, B5 and B6 with 3 at each bent. XPHF

11/14/2007 - No changes noted. ORDZ

09/08/2005 - No significant changes noted. JZJL

04/14/2003 - None GIBK

04/13/2001 - None IKKR

01/05/1999 - _ ECJK

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00007095+00581

Continue

* * * * * * * * * * Span : **Main-0 - Riveted Plate Girder, Spans 4 - 6 (cont.)** * * * * * * * * * *

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 210 - R/Conc Pier Wall										
	1	3	59	m.		90	5	5	0	
						%	%	%	%	%

Previous Inspection Notes :

06/27/2012 - The pierwall at bent 5 north bound has cracking and delaminations in both spans. The pier wall at bent 6 span 6 side south bound has cracking and delamination at a patched area on the left. The pier wall at bent 4 span 4 side north bound has a large area of cracking spalling with exposed rebar and delamination along the top. ZEBZ

07/06/2010 - The north bound B4 pier wall is partly exposed along the top and has two spalls with rusty rebar with some cracks and delaminations. The NB B5 pier wall has some cracks and delaminations on the top right upstream nose. There are patches and small delams and a crack at or near the center column at B5. The SB end at B6 has a larger area that is delaminated and cracked with some dark stains. Some cracks in the middle between the columns. GNDR

07/18/2008 - B5 has a crack across the top and down both sides near the center column under the NB lanes. The pier wall has also been patched. A similar crack in the middle of the middle of the NB wall. No changes noted. The cracks are small. XPHF

11/14/2007 - No changes noted. ORDZ

09/08/2005 - Cracks and spall unchanged. No problems noted. JZJL

04/14/2003 - CRACKS UNCHANGED. SPALL ON NORTH SIDE OF B6 PIER WALL. GIBK

04/13/2001 - None IKKR

01/05/1999 - B5 AND B6 HAVE VERTICAL CRACKS FROM TOP TO WATERLINE FULL THICKNESS OF PIER WALL. ECJK

10/02/1996 - None CZTA

12/01/1993 - None REFI

Inspection Notes:

Element 215 - R/Conc Abutment

	1	3	25	m.		85	5	10	0	
						%	%	%	%	%

Previous Inspection Notes :

06/27/2012 - The cap at bent 7 on the north bound side has a large area of spalling with exposed rebar and delaminations at the ground line that extends up to the top of the cap. The backwall has a small delamination on the left north bound side near the top. The south bound side of the cap has cracking and a delamination along the top edge. ZEBZ

07/06/2010 - The spall with exposed rusty rebar on the NB cap at B7 is about 9 feet long. The SB cap has about 3 feet in the top center that is cracked and delaminated. No change in the left backwall spall. There is rusty rebar exposed here also. GNDR

07/18/2008 - Bent 7 only for the main spans. A large nasty looking spall and delaminated area with efflorescence in the center of the NB cap. Spall on the backwall left side next to the deck overhang spall, XPHF

11/14/2007 - No changes noted ORDZ

09/08/2005 - Abutment components show some minor cracking. No problems noted. JZJL

04/14/2003 - None GIBK

04/13/2001 - None IKKR

01/05/1999 - None ECJK

10/02/1996 - None CZTA

12/01/1993 - None REFI

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00007095+00581

Continue

* * * * * * * * * * Span : **Main-0 - Riveted Plate Girder, Spans 4 - 6 (cont.)** * * * * * * * * * *

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 234 - R/Conc Cap B4, B5 and B6										
	1	2	56	m.		90	5	5	0	
						%	%	%	%	%

Previous Inspection Notes :

06/27/2012 - The cap at bent 4 span 4 side north bound has 3 small delamination on the top of the cap. The cap at bent 4 span 3 side south bound left has a small spall with some delaminations. The bent 5 span 4 side has a delamination at center line. Bent 5 span 5 side has a delamination. The cap at bent 6 span 6 north bound has a small delamination. The bent 6 cap on the left exterior has a delamination. Minor cracking throughout all the caps.	ZEBZ
07/06/2010 - Some cracks and small delaminations on the top of the NB B4 cap and some patches and delaminations on the span 4 side. A delaminated area under the NB median bearing on the span 5 side of the B5 cap. The NB B6 cap has one small delam about 1 sq. ft. under the left beam at the top of the span 6 face. One large and one smaller delam at the exterior plate on the span 3 face of the SB B4 cap. Occasional vertical cracks on the SB ends with white efflorescence.	GNDR
07/18/2008 - Main span caps at B4, B5 and B6. Spalling and delaminated areas at B4. One large delam area at one of the plates for the walk bridge. Cracks with rust stains at B5 and minor cracking on all.	XPHF
11/14/2007 - No changes noted on main span.	ORDZ
09/08/2005 - Spalling at B3 continues to worsen, see pic.. Some other minor spalls on other caps.	JZJL
04/14/2003 - B4 - SPALL ALONG TO EDGE OF CAP.	GIBK
04/13/2001 - None	IKKR
01/05/1999 - None	ECJK
10/02/1996 - None	CZTA
12/01/1993 - None	REFI

Inspection Notes:

Element 301 - Pourable Joint Seal B5 and B6

	1	4	42	m.		0	0	100		
						%	%	%	%	%

Previous Inspection Notes :

06/27/2012 - No changes noted from the last inspection. The gaps are full of material.	ZEBZ
07/06/2010 - No changes noted. The edges are steel and the gaps are about 1 inch and full of dirt.	GNDR
07/18/2008 - Joints at B5 and B6 are 301 joints without a seal and are on top of a 304 joint. Joints are full of dirt. Except for the missing seal everything else appears ok.	XPHF
11/14/2007 - Filled with dirt. No other problems noted.	ORDZ
09/08/2005 - Mostly filled with material. Need cleaned periodically.	JZJL
04/14/2003 - None	GIBK
04/13/2001 - None	IKKR
01/05/1999 - None	ECJK
10/02/1996 - None	CZTA
12/01/1993 - None	REFI

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00007095+00581

Continue

* * * * * * * * * * Span : **Main-0 - Riveted Plate Girder, Spans 4 - 6 (cont.)** * * * * * * * * * *

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 305 - Assm Jt w/o Seal B4 and B7										
	1	4	42	m.		95	5	0		
						%	%	%	%	%

Previous Inspection Notes :

06/27/2012 - No changes noted from last inspection. Some header delams at bent 4. And some south bound leveling strips missing at bent 4. ZEBZ

07/06/2010 - A few more of the transverse leveling strips welded to the tops of the joints at B4 south bound lanes are missing. About 10 percent of one edge at B4 NB joint has cracks and delaminations. GNDR

07/18/2008 - Sliding plate joints at B3, B4 and B7. Some of the modified tops are steel transverse strips (about 30 percent) that have been caught by plows and bent to a longitudinal direction. Joints are full of dirt. XPHF

11/14/2007 - There are cracks in the concrete along the 2nd joint AOL of B1. The south bound lanes may be a little loose at the joint south of the river. All are full of dirt. ORDZ

09/08/2005 - Joints allow material and moisture thru onto tops of caps. See pics.. JZJL

04/14/2003 - None GIBK

04/13/2001 - None IKKR

01/05/1999 - _ ECJK

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 311 - Moveable Bearing B4 span 4, B5 and B7										
	1	4	12	ea.		85	15	0		
						%	%	%	%	%

Previous Inspection Notes :

06/27/2012 - No changes noted from last inspection. The bent 4 bearings have the most rust on them. ZEBZ

07/06/2010 - The rocker bearings at B7 were cleaned and painted. No other changes noted. GNDR

07/18/2008 - Main span moveable bearings at B4, B5 and B7. NB B5 median bearing does not have any nuts on the bolts holding the base of the rocker. Pack rust on the base under the rocker at the NB B7 median bearing. The right bearing SB B5 is missing a nut on the inside only of the rocker. Generally rusty throughout. XPHF

11/14/2007 - No changes noted. ORDZ

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 313 - Fixed Bearing B6										
	1	4	4	ea.		90	10	0		
						%	%	%	%	%

Previous Inspection Notes :

06/27/2012 - No changes noted, very little rust seen. ZEBZ

07/06/2010 - Same for SB bearings. The NB bearings have very little rust. No other changes noted. GNDR

07/18/2008 - One bolt has a nut at the top of the bolt instead of down on the plate. Estimate 20 percent paint loss and rust. XPHF

11/14/2007 - No changes noted. ORDZ

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00007095+00581

Continue

* * * * * * * * * * Span : **Main-0 - Riveted Plate Girder, Spans 4 - 6 (cont.)** * * * * * * * * * *

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 334 - Metal Rail Coated										
	1	3	238	m.		60	20	20	0	0
						%	%	%	%	%

Previous Inspection Notes :

06/27/2012 - The rail has paint loss with rusting and primer showing. No changes noted to the damaged area. No measurable section loss found on the rail or the posts. No changes noted to the condition states. ZEBZ

07/06/2010 - The collision damage is unchanged. The post in the damaged section in span 2 is barely attached to the deck. Post spacing at about 8 1/2' and revised lengths of damage is 17' both areas. Lots of primer still on the rail with scattered state 2 and 3 rust throughout. GNDR

07/18/2008 - Collision damage unchanged. Twelve feet in span 2 and twelve in span 4 on the southbound side. Rail is generally rusty with little paint left. XPHF

11/14/2007 - Collision damage remains. General rust throughout. ORDZ

09/08/2005 - Some areas of minor collsion damage on both sides. JZJL

04/14/2003 - UNCHANGED GIBK

04/13/2001 - COLLISION DAMAGE TO DOWNSTREAM RAIL. IKKR

01/05/1999 - None ECJK

10/02/1996 - None CZTA

12/01/1993 - None REFI

Inspection Notes:

Element 358 - Deck Cracking SmFlag

X	1	4	1	ea.	X	0	100	0	0	
						%	%	%	%	%

Previous Inspection Notes :

06/27/2012 - No changes noted from the last QA inspection. ZEBZ

07/06/2010 - Added to match the QA report, 1/28/11 Darrel Reich. GNDR

Inspection Notes:

Element 359 - Soffit Smart Flag

X	1	4	1	ea.	X	0	0	0	100	0
						%	%	%	%	%

Previous Inspection Notes :

06/27/2012 - No changes noted. The north bound soffits are the worst. ZEBZ

07/06/2010 - Lots of spalls with rusty rebar exposed in both sidewalk soffits and occasional spalls with rusty rebar exposed in the road soffits. Small spots of rust stains and areas of heavy cracking, transverse and random or map cracking with lots of white efflorescence. Lots of wood forms still in place from previous patching. Some soffit areas showed lots of delaminations when hammered. GNDR

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00007095+00581

Continue

* * * * * * * * * * Span : **Main-0 - Riveted Plate Girder, Spans 4 - 6 (cont.)** * * * * * * * * * *

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 363 - Sup Sect Loss SmFlag										
X	1	4	1	ea.	X	0	0	100	0	
						%	%	%	%	%

Previous Inspection Notes :

06/27/2012 - No changes noted in the areas of section loss that was re-measured. There were a few areas of additional section loss found on the girder ends and floor beams. See elements and photos for addition measurements. Changed to condition state 3 to better match the condition states of the elements. ZEBZ

07/06/2010 - The right north bound main span girder has 9/32" section loss on the end of the top flange at B4. The flange is 22/32" thick. See photo sheet 5. The left south bound main span girder has a spot of 4/32" section loss at the very end of the web at B4. The web is 14/32" thick. See photo sheet 6. Both open floor beams at bent 4 north bound and south bound have several spots of measureable section loss on some of the connecting plates. See photo sheets 7-10 and 12 for measurements and locations. The horizontal brace has 100 percent section loss at the very end at the right north bound girder B5 floor beam connection and the 10/32" thick connecting plate below the brace has section loss of 3/32". The south bound transverse girder at B4 has 2 small spots of 2/32" section loss near the bottom of the span 4 side of the web. This web is 1/2" thick. See photo sheet 12. GNDR

07/18/2008 - Some section loss at the ends of the webs of the floorbeams and on gussets at the girder connections at B4, B5 and B6. The x frame type of floorbeam at B4 has section loss on most of it. See also pack rust smart flag element and photos. XPHF

Inspection Notes:

* * * * * * * * * * Span : **Appr-1 - WF Girders, span 3 only** * * * * * * * * * *

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 12 - Bare Concrete Deck Sidewalk span 3 only										
	1	4	48	sq.m.	X	0	0	0	0	100
						%	%	%	%	%

Previous Inspection Notes :

06/27/2012 - Did not chain the sidewalks. Cracking, spalling with exposed rusty rebar, delaminations and patched areas throughout. No changes noted from last inspection. ZEBZ

07/06/2010 - Chained all the sidewalk and found 41 percent delaminations, spalls and patches for the span 3 sidewalks. Staining and spalls with exposed rusty rebar and some nasty looking concrete seen in the sidewalk soffits. GNDR

07/18/2008 - Quantity for sidewalks for span 3 approach elements is 1.25m x 38m = 48m2. Spalls, scaling and patches scattered throughout on top with spalls, delams and some cracking in the soffit. XPHF

Inspection Notes:

Element 22 - P Conc Deck/Rigid Ov Span 3 only										
	1	4	344	sq.m.	X	0	100	0	0	0
						%	%	%	%	%

Previous Inspection Notes :

06/27/2012 - Chained the north bound lane and found no changes. The south bound lane was to wet to chain. ZEBZ

07/06/2010 - One small delamination found in the deck. Lots of delams found in parts of the NB soffit. Areas of cracking and staining in the soffit with spalling in the median at B3. GNDR

07/18/2008 - Decreased quantity for sidewalks in span 3 from 392 by 48 to 344m2. See main span comments. XPHF

11/14/2007 - Same as last inspection with spalls and exposed rebar on the top surface of the sidewalk. ORDZ

09/08/2005 - See main span element notes. JZJL

04/14/2003 - OCCASIONAL DELAMS IN OVERLAY GIBK

04/13/2001 - None IKKR

01/05/1999 - _ ECJK

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00007095+00581

Continue

* * * * * * * * * * Span : **Appr-1 - WF Girders, span 3 only (cont.)** * * * * * * * * * *

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 107 - Paint Stl Opn Girder 8 lines										
	1	3	151	m.		85	5	5	5	0
						%	%	%	%	%

Previous Inspection Notes :

06/27/2012 - The span 3 girders have paint loss with state 3 and 4 rust and corrosion and some primer showing throughout. The worst rust and corrosion is on the top and bottom flanges at the bents with the north bound girders having the most rust on them. No measurable section loss seen. ZEBZ

07/06/2010 - State 3 and 4 rust and corrosion on the end diaphragms and girder ends at B3. the north bound girders have some state 3 and 4 rust and corrosion mostly at the ends and on the flanges. Less rust on the south bound girders. A small amount of state 2 rust between the bents. GNDR

07/18/2008 - No problems noted at the ends of the cover plates. Two ends aren't visible for close inspection because of the blast plates for the old RR tracks. Blast plates are full of bird poop with increased dead load. Corrosion on both flanges near the bents and on the ends of the webs beyond the bearing stiffeners. No significant rust midspan. XPHF

11/14/2007 - No changes noted. ORDZ

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 178 - Painted Trans Girder 2 girders at B4 span 3										
	1	4	16	m.		80	5	5	5	5
						%	%	%	%	%

Previous Inspection Notes :

06/27/2012 - Re-measured the 2 small spots of section loss of 2/32" in the lower web that is 1/2" thick on the span 4 side of the south bound transverse girder and found no changes from last inspection. The cracks in the bottom flanges at the bearing anchor bolts and the missing or broken anchor bolts on the transverse girder south bound appear unchanged since last inspection. ZEBZ

07/06/2010 - The trees have been cut down and access is good. Two small spots of section loss of 2/32" in the lower web which is 1/2" thick, on the span 4 side of the SB girder. See photo sheet 12. Small spots of corrosion on both girders seen. No section loss seen on the north bound girder. No cracks found in the bottom flanges of the NB girder. The cracks in the bottom flanges at the bearing anchor bolts and the missing or broken anchor bolts appear unchanged since the last inspection. See photo sheets 13 - 17 and attached notes. GNDR

07/18/2008 - NB span 3 side - some rust on the flanges. The span 4 side is worse. Can't get any closer than 15' because of trees. Heavier rust on the flanges and on the web with possible section loss on the lower web and bottom flange midspan girder. SB girder - Pack rust between the bottom flange and the top of the right bearing has bent the flange and broken one and possibly both bolts on the span 4 side. At the left bearing pack rust between the bottom flange and the top of the bearing has broken both bolts on the span 3 side and the bottom flange on this side has cracked through at one bolt location. On the span 4 side one bolt is broken and probably both and the bottom flange is cracked through at one of the bolt locations. The flange sections are riveted to the bottom of the web. Some corrosion and section loss on the lower web and bottom flange on the span 4 side on the end beyond the left bearing. Small spots of corrosion and section loss on the lower web midspan of the girder. On the span 3 side there is rust along both flanges and speckled on the web. XPHF

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 205 - R/Conc Column B3										
	1	3	4	ea.		95	0	5	0	
						%	%	%	%	%

Previous Inspection Notes :

06/27/2012 - No changes noted from the last inspection. ZEBZ

07/06/2010 - The crack in the top of the NB tiebeam has delaminations along it for 1/2 or more of the distance between the columns. The crack and delaminated area on the right column is unchanged. No rust stains seen at either location. GNDR

07/18/2008 - A moderate crack along the top of both tiebeams at B3. One cracked and delaminated area ready to pop off on the right column B3 NB. XPHF

11/14/2007 - No changes noted. ORDZ

09/08/2005 - Columns show some minor cracking. No problems noted. JZJL

04/14/2003 - None GIBK

04/13/2001 - None IKKR

01/05/1999 - _ ECJK

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00007095+00581

Continue

* * * * * * * * * * Span : **Appr-1 - WF Girders, span 3 only (cont.)** * * * * * * * * * *

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 234 - R/Conc Cap B3										
	1	4	17	m.		70	5	25	0	
						%	%	%	%	%

Previous Inspection Notes :

06/27/2012 - Delaminations and spalling with exposed rusty rebar at bent 3 cap both spans appears unchanged from last inspection. ZEBZ

07/06/2010 - Lots of delamination found around the spalling with exposed rusty rebar on the span 3 face of the NB bent 3 cap. Estimate at least 40 percent of this face has these spalls and delaminations. Spalls with exposed rusty rebar and cracking and delaminations found on the ends. The SB B3 cap also has spalling on one end. A smaller amount of spalling and delaminations along the top and faces. Lots of patching some cracking and delaminations along the tops edges and an area of heavy rust stains under the second girder from the left on the span 3 face. GNDR

07/18/2008 - Heavy spalling with exposed rebar on the span 3 side and the corners of the NB B3 cap. Spalling and cracks with staining on the top and corners of the SB cap. XPHF

Inspection Notes:

Element 305 - Assm Jt w/o Seal B3

	1	4	21	m.		70	30	0		
						%	%	%	%	%

Previous Inspection Notes :

06/27/2012 - The joint at bent 3 has about 24' of header delam and 3 small spalls. The leveling strips on the southbound lanes appear unchanged. ZEBZ

07/06/2010 - Found 16 feet of delaminations and spalls along the NB bent 3 joint. No change was seen in the leveling strips welded on top of the SB side. GNDR

07/18/2008 - About 40 percent of the top plate on the sliding plate joint is gone and transverse metal strips are in its place. B3 joint is full of dirt. No other problems noted. XPHF

11/14/2007 - No changes noted. ORDZ

09/08/2005 - Joints allow material and moisture thru onto tops of caps. JZJL

04/14/2003 - B3 - SLIDING PLATE GIBK

04/13/2001 - None IKKR

01/05/1999 - _ ECJK

Inspection Notes:

Element 311 - Moveable Bearing B4 Span 3

	1	4	4	ea.		70	30	0		
						%	%	%	%	%

Previous Inspection Notes :

06/27/2012 - The bearing hsve paint loss rusting with some pack rust. No changes noted from the last inspection. ZEBZ

07/06/2010 - Some rust on all four bearings under the transverse girders. The bearings under the SB girder have missing or broken bolts on the top to the girder and the exterior SB has a lot of pack rust and swelling between the top of the bearing and the bottom flange. The tops of the SB bearings have rotated slightly AOL. GNDR

07/18/2008 - Generally rusty. Alignment ok. See comments for transverse girder for comments on pack rust above the bearings breaking the bolts attaching the girder to the bearings. XPHF

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00007095+00581

Continue

* * * * * * * * * * Span : **Appr-1 - WF Girders, span 3 only (cont.)** * * * * * * * * * *

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 313 - Fixed Bearing B3 span 3										
	1	3	8	ea.		60	40	0		
						%	%	%	%	%

Previous Inspection Notes :

06/27/2012 - Bearings have paint loss with rust and some corrosion. No changes noted. ZEBZ
07/06/2010 - Over half of the paint is intact. No other problems noted. GNDR
07/18/2008 - No paint left and medium to heavy corrosion. Spalling on the cap has not effected the bearings. XPHF
11/14/2007 - No changes noted. ORDZ
09/08/2005 - Paint losses and rusting with material accumulations. No significant changes noted. No problems noted. JZJL
04/14/2003 - B3 - MEDIUM TO HEAVY CORROSION GIBK
04/13/2001 - None IKKR
01/05/1999 - _ ECJK

Inspection Notes:

Element 334 - Metal Rail Coated Span 3										
	1	4	38	m.		60	20	20	0	0
						%	%	%	%	%

Previous Inspection Notes :

06/27/2012 - No changes noted from the last inspection. ZEBZ
07/06/2010 - General rusting throughout with lots of primer coat exposed. No section loss seen. GNDR
07/18/2008 - See main span comments. XPHF
11/14/2007 - Collision damage unchanged. See photo. General rusting throughout. ORDZ
09/08/2005 - See main span element notes. JZJL
04/14/2003 - UNCHANGED GIBK
04/13/2001 - None IKKR
01/05/1999 - _ ECJK

Inspection Notes:

Element 356 - Sup Steel Fat SmFlag										
X	1	4	1	ea.	X	0	100	0		
						%	%	%	%	%

Previous Inspection Notes :

06/27/2012 - No changes seen in the cracking of the southbound transverse girder. ZEBZ
07/06/2010 - No changes noted. The bottom flanges of both transverse girders are riveted to each side of the web. The south bound girder bottom flange on the span 3 side is broken or cracked across the entire member at the exterior anchor bolt to the exterior bearing. On the other side at the same location in span 4 the bottom flange is cracked across the bottom and up about to the rivet attaching it to the web. The span 3 bottom flange at the same bearing is cracked at the interior anchor bolt from the bottom edge to the bolt attaching the girder to the bearing. See photo sheets 13 - 16. GNDR
07/18/2008 - The bottom flange of the SB transverse girder at the left bearing has cracked through. See the transverse girder element or the pack rust element and photos. See also comments on cracked horizontal sway brace, and pack rust smart flag element. XPHF

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00007095+00581

Continue

* * * * * * * * * * Span : **Appr-1 - WF Girders, span 3 only (cont.)** * * * * * * * * * *

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 357 - Sup Pack Rust SmFlag										
X	1	4	1	ea.	X	0	0	0	100	
						%	%	%	%	%

Previous Inspection Notes :

06/27/2012 - No changes noted in the pack rust from the last inspection. ZEBZ

07/06/2010 - No changes noted. The only place the pack rust has broken the connection is between the bottom flanges of the south bound bent 4 transverse girder and the top of the left bearing and at the right bearing on the span 4 side. All four bolts connecting the bottom flange to the left bearing are broken and one, possibly both bolts at the right or inside bearing on the span 4 side. GNDR

07/18/2008 - Pack rust between the bottom flange of the southbound transverse girder and the top plate of the moveable bearings has broken at least 3 of the 4 bolts attaching the flange to the bearing on the left bearing and broken, possibly 2 of the bolts on the right bearing. The bottom flange to the transverse girder is constructed in 2 pieces and riveted to the bottom of the web. The flange is cracked through on both sides of the web at the left bearing. XPHF

Other pack rust - there is a broken horizontal sway brace attached to the top of a gusset plate at B5 NB (main span) with lots of pack rust between the bottom of the brace and the gusset. Heavy pack rust between the bearing plates under the concrete girders at B3. There is no gap between the top of the bearing and the washers under the nut, and the bearing can't move. There is a very small amount of pack rust between bearing stiffener plates at the left exterior girder at B6. There is a small amount of pack rust below the bottom flange of the girder between the plates at B5 left with no distortion of the plates or connections.

Inspection Notes:

* * * * * * * * * * Span : **Appr-2 - C.I.P. Tee Beams, spans 1 and 2** * * * * * * * * * *

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 12 - Bare Concrete Deck Sidewalk spans 1 and 2										
	1	4	75	sq.m.	X	0	0	100	0	0
						%	%	%	%	%

Previous Inspection Notes :

06/27/2012 - Did not chain the sidewalks. Cracking, spalling with exposed rebar, delaminations and patched areas. No changes noted from last inspection. ZEBZ

07/06/2010 - Chained the sidewalks and found almost 6 percent delaminations, spalls and patches in both sidewalks of spans 1 and 2. The sidewalk soffits had some cracking, staining and some spalling with exposed rusty rebar. GNDR

07/18/2008 - Quantity = 30m x 2.5m = 75m2. Numerous spalls, patches and cracks. XPHF

Inspection Notes:

Element 72 - P Top Flang/Rigid Ov Spans 1 and 2										
	1	4	548	sq.m.	X	0	0	100	0	0
						%	%	%	%	%

Previous Inspection Notes :

06/27/2012 - Chained the north bound lanes. The south bound lanes were to wet to chain. Found 41 square meters of delams. 41/548 = 7.5 percent. No open spalls or patched areas seen. The soffit has spalling with exposed rebar, delams and patched areas with old forms left in place. The nort bound soffit is the worst. ZEBZ

07/06/2010 - Chained the driving lanes and found 1.3 percent delaminations, mostly in the NB lane. Some heavier transverse cracking in the NB center bay of span 1. Some patches with the forms left in place and a couple of spalls with exposed rusty rebar. A lot of these two spans looked better than other parts of this bridge. GNDR

07/18/2008 - Quantity = 30m x (20.78m - 2.5m) = 548.4m2. Same comments as main spans. XPHF

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00007095+00581

Continue

* * * * * * * * * * Span : **Appr-2 - C.I.P. Tee Beams, spans 1 and 2 (cont.)** * * * * * * * * * *

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 110 - R/Conc Open Girder 8 lines										
	1	2	240	m.		100	0	0	0	
						%	%	%	%	%

Previous Inspection Notes :

06/27/2012 - Frequent vertical cracking with cracking at the beam ends. No changes noted. ZEBZ
07/06/2010 - No changes noted. GNDR
07/18/2008 - Frequent hairline vertical cracking and some cracks at the beam ends at B3. XPHF
11/14/2007 - No changes noted. ORDZ
09/08/2005 - Cast girders show some minor hairline cracking. No problems noted. JZJL
04/14/2003 - None GIBK
04/13/2001 - None IKKR
01/05/1999 - _ ECJK

Inspection Notes:

Element 205 - R/Conc Column B2										
	1	3	4	ea.		100	0	0	0	
						%	%	%	%	%

Previous Inspection Notes :

06/27/2012 - columns at bent 2 no problems noted. No changes noted. ZEBZ
07/06/2010 - No problems noted. GNDR
07/18/2008 - No problems noted for the B2 columns. Previous inspection report describing a spall at B2 was in error; no spalls at B2 columns. XPHF
11/14/2007 - One spall with exposed rebar in the lower column at B2 is unchanged. No other problems noted. ORDZ
09/08/2005 - Columns show some minor cracking. No problems noted. JZJL
04/14/2003 - None GIBK
04/13/2001 - None IKKR
01/05/1999 - _ ECJK

Inspection Notes:

Element 215 - R/Conc Abutment B1										
	1	4	23	m.		100	0	0	0	
						%	%	%	%	%

Previous Inspection Notes :

06/27/2012 - Minor cracking no other problems noted. ZEBZ
07/06/2010 - No problems found. The girders are cast into the abutment so there are no bearings at B1. GNDR
07/18/2008 - No problems noted. XPHF
11/14/2007 - Still full of dirt. Needs cleaning. No changes noted. ORDZ

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00007095+00581

Continue

* * * * * * * * * * Span : **Appr-2 - C.I.P. Tee Beams, spans 1 and 2 (cont.)** * * * * * * * * * *

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 234 - R/Conc Cap B2										
	1	2	18	m.		100	0	0	0	
						%	%	%	%	%

Previous Inspection Notes :

06/27/2012 - No changes no problems noted. ZEBZ
07/06/2010 - No problems found. GNDR
07/18/2008 - No problems noted with B2. No joint over B2. For B3 comments see approach 1. XPHF
11/14/2007 - Spalling on caps remain the same. ORDZ
09/08/2005 - See main span element notes. JZJL
04/14/2003 - None GIBK
04/13/2001 - None IKKR
01/05/1999 - _ ECJK

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 313 - Fixed Bearing B2 and B3 span 2										
	1	4	16	ea.		45	55	0		
						%	%	%	%	%

Previous Inspection Notes :

06/27/2012 - No changes noted. The bent 3 bearings have very little paint left and the bent 2 bearings have lots of paint left. ZEBZ
07/06/2010 - These are fixed bearings. Changed element from moveable to fixed. No changes were noted. The bent 3 bearings had little paint left with some corrosion between the plates. There is not a joint over B2 and the bearing paint is in good condition. GNDR

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 334 - Metal Rail Coated										
	1	4	60	m.		60	20	20	0	0
						%	%	%	%	%

Previous Inspection Notes :

06/27/2012 - No changes noted. No changes from the other spans. ZEBZ
07/06/2010 - No changes noted. Same comments as other spans. GNDR
07/18/2008 - See main span element comments. XPHF
11/14/2007 - General rusting throughout and collision damage remains. ORDZ
09/08/2005 - See main span element notes. JZJL
04/14/2003 - None GIBK
04/13/2001 - None IKKR
01/05/1999 - _ ECJK

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00007095+00581

Continue

General Inspection Notes

06/27/2012 - None	ZEBZ
07/06/2010 - North bound approach rail on the south end has concrete posts at 12 1/2 foot centers.	GNDR
07/18/2008 - Snooper driver time = 2 days. Total traffic control hours = 4 hours.	XPHF
11/14/2007 - None	ORDZ
09/08/2005 - None	JZJL
04/14/2003 - None	GIBK
04/13/2001 - None	IKKR
01/05/1999 - None	ECJK
10/02/1996 - Sufficiency Rating Calculation Accepted by ops$a0241 at 8/14/97 15:27:15 OPS$A0241 inspection comments - Structure P00007095+00581 - Date 10/2/96 - Previous comments > Sufficiency Rating Calculation Accepted by ops$u5963 at 3/11/97 10:45:08 Sufficiency Rating Calculation Accepted by OPS$U9004 at 2/19/97 12:34:07	CZTA
12/01/1993 - Sufficiency Rating Calculation Accepted by ops$u5963 at 3/11/97 10:45:08 Sufficiency Rating Calculation Accepted by OPS$U9004 at 2/19/97 12:34:07	REFI
07/01/1991 - Updated with tape 1994	NB94
08/01/1989 - Updated with tape 1991	NB91
03/01/1988 - Updated with tape 1989	NB89
02/01/1987 - Updated with tape 1988	NB88
07/01/1985 - Updated with tape 1986	NB86

Analysis, Conclusion, and Recommendation
(Clark Fork River at Missoula –P00007 095+0.0058-1)

BACKGROUND

1. Structure built in 1958.

2. USGS Level II Scour report lists flood flows are estimated as follows Q_{100} = 43,100cfs and Q_{500} = 56,800cfs

3. From Initial scour analysis performed by TJC Aug 1999
   - A Level II scour analysis has been performed for this structure by the USGS.
   - The USGS estimated total pier scour is 16.8 ft.
   - The D_{50} was determined to be 64 mm and the D_{84} was determined to be 165 mm. The depth to armoring was calculated at 1.05 ft. and is considered to mitigate pier scour.
   - Abutments scour is mitigated by riprap and natural stream armoring
   - Recommend moving to NBIS Code 5 – continue regularly scheduled bridge inspections currently on a 2-year cycle

ANALYSIS

1. Initial USGS Level II analysis completed in 1997 is based on scour equations from HEC-18 published in November 1995.

2. Pier scour analysis performed by RJB using the modeling results from the USGS Level II scour report, the stream bed sample collected by TJC, and the CSU equation in HEC-18 published in May 2001 estimates pier scour at 7.8-feet without debris and 9.4-feet with debris. Estimated pier scour plots within the footing. The major difference in these evaluations lies within the K_4 coefficient in the CSU pier scour equation. The K_4 coefficient is a correction factor for armoring potential of the scour hole based on streambed material size and gradation. The new method for estimating the K_4 coefficient reduces the estimated scour by nearly half. The updated scour numbers indicate pier scour will not penetrate below the bottom of the footing.

3. Contraction Scour is estimated at 0.0-feet by the USGS level II scour analysis.

4. Contraction Scour is estimated at 4.4-feet and Pier Scour is estimated at 6.1-feet by the WGM Group Inc. Data obtained from the Preliminary Hydraulics Report May 2004.

5. Total Pier scour estimates from revised Level II analysis and data reported by WGM Group Inc plots within footing elevations of pier 5 and above footing elevations for pier 6

CONCLUSION

This site is considered **low-risk** due to the following conditions:

- Total Pier scour estimates from revised Level II analysis and data reported by WGM Group Inc., plots within footing elevations of pier 5 and above footing elevations for pier 6
- Abutment scour is mitigated by riprap and natural stream armoring.

RECOMMENDATION

Concur with initial scour analysis conducted for this site. Maintain structure at NBIS Code 5 and continue regular scheduled inspections currently on a 2-year cycle.

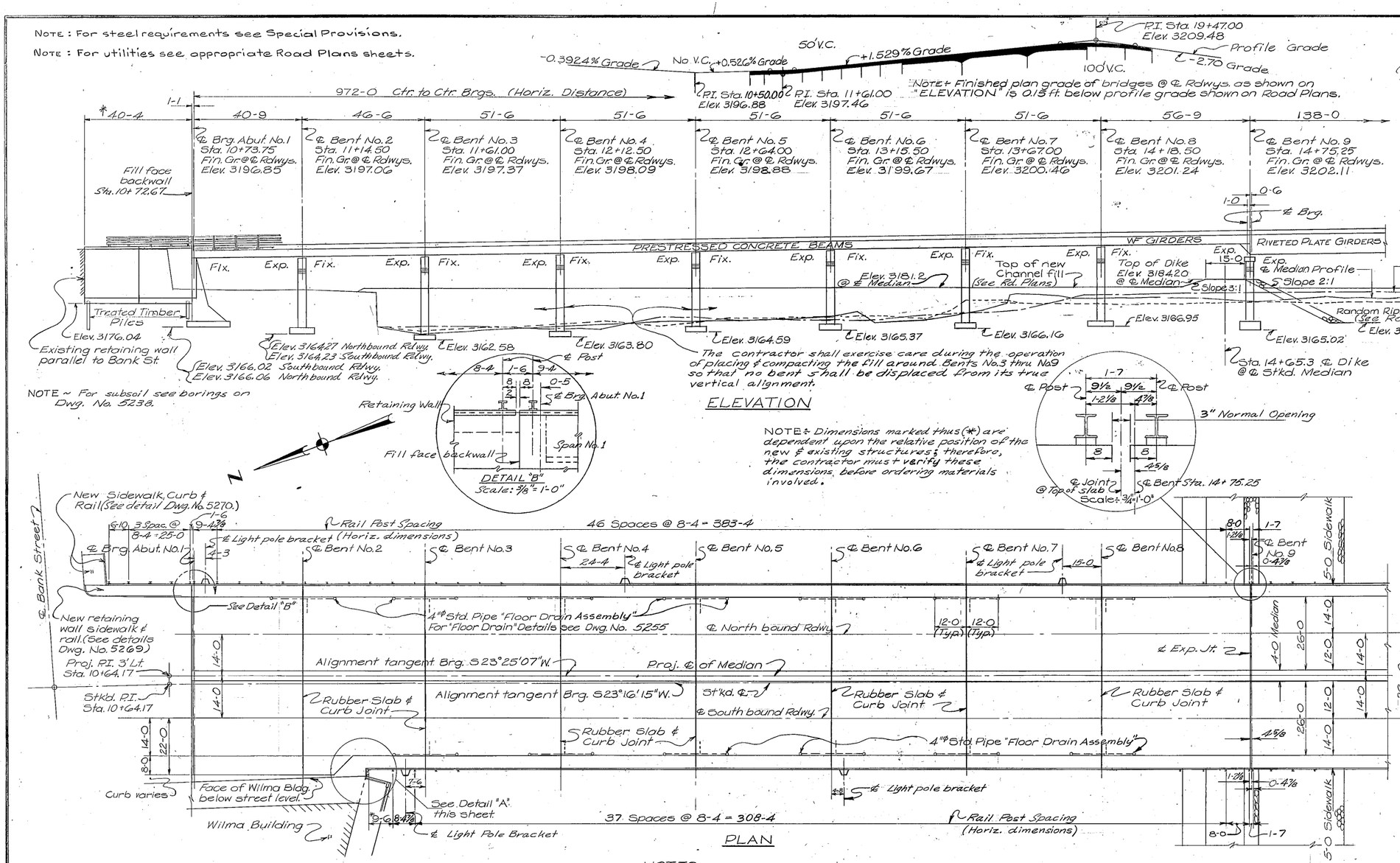
Appendix 4

Bridge Record Drawings

FED. ROAD DIV. NO.	STATE	FED. AID PROJ. NO.		SHEET NO.	TOTAL SHEETS
8	MONT.	F-FG 215(7)		1	38

NOTE: For steel requirements see Special Provisions.

NOTE: For utilities see appropriate Road Plans sheets.



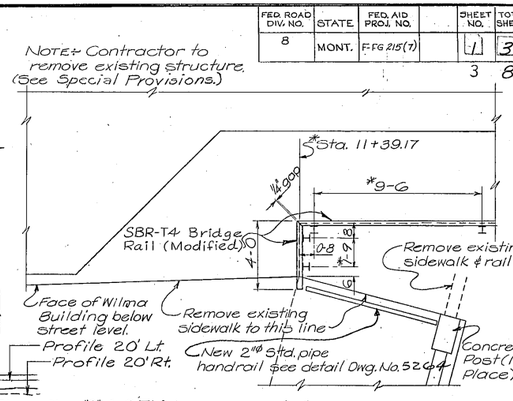
ELEVATION

NOTE: For subsoil see borings on Dwg. No. 5238.

DETAIL "B"
Scale: 3/8" = 1'-0"

NOTE: Dimensions marked thus (*) are dependent upon the relative position of the new & existing structures; therefore, the contractor must verify these dimensions before ordering materials involved.

Scale: 3/4" = 1'-0"



DETAIL "A"
Scale: 1/4" = 1'-0"

REFERENCES	
DWG. NO.	DESCRIPTION
5237	General Layout - South End
5238	Footing Plan - North End
5239	Footing Plan - South End
5240	Abutment No. 1 - Northbound Rdwy.
5241	Abutment No. 1 - Southbound Rdwy.
5242	Bent No. 2
5243	Bents No. 3 Thru No. 7
5244	Bent No. 8
5245	Bent No. 9
5246	Pier No. 10
5247	Pier No. 11
5248	Bent No. 12
5249	Bent No. 13 - Northbound Rdwy.
5250	Bent No. 13 - Southbound Rdwy.
5251	Bent No. 14
5252	Span No. 1
5253	Span No. 2
5254	Span No. 2 - Reinforcing Steel
5255	Spans No. 3 Thru No. 7 & 4" Floor Drain Details
5256	Girder Details & Shoes For Spans No. 8 & No. 13
5257	Transverse Girder & Shoe Details
5258	Girders - Spans No. 9, No. 10, & No. 11
5259	Girder Details - Spans No. 9, No. 10, & No. 11 & Camber Diagrams
5260	Sway Bracing - Spans No. 9, No. 10, & No. 11 & Rail Details
5261	Shoe Details
5262	Slab & 6" Floor Drain Details - Spans No. 9, No. 10, & No. 11
5263	Span No. 12
5264	Slab Details - Spans No. 8, No. 12 & No. 13 & 2" ø Pipe Handrail
5265	Slab & Curb Joints
5266	Slab Joint Details & Light Post Bracket Details
5267	Blast Plate & Guard Fence Details
5268	Stairway Details
5269	Retaining Wall - North End
5270	Bank St. Sidewalk Remodeling
SBR-T4	Standard Steel Bridge Rail Type No. 4
PRES. BEAM STD. NO. 1 TYPE-A	Standard Pre-Tensioned & Post-Tensioned Prestressed Concrete Beams (Rev. 7-1-61)
PRES.-S&C JOINTS	Standard Slab & Curb Joints for Prestressed Concrete Beam Spans (Rev. 1-10-61)

PLAN

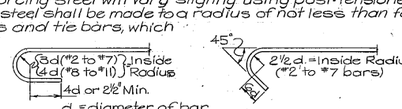
NOTES

SPECIFICATIONS:— Montana State Highway Commission Standard Specifications for Road and Bridge Construction, 1959 Edition, and any amendments thereto, and Special Provisions shall govern unless otherwise noted. Design prepared in accordance with AASHO. Specifications, 1957 Edition, and any amendments thereto.

LIVE LOAD:— Standard H20-S16 loading.

CAST IN PLACE CONCRETE:— All cast in place concrete of superstructure and as noted on Bents No. 1, No. 14 & Retaining wall shall be Class "AD". All other concrete shall be Class "A" except as otherwise noted. An "Air Entraining Agent" shall be added to all concrete except Class "S". Chamfer all exposed edges of concrete 3/4" and fillet entrant angles 3/4" unless otherwise noted. Quantities of Class "AD" concrete have been computed using pretensioned beams. Quantities of Class "AD" concrete and reinforcing steel will vary slightly using post-tensioned beams.

REINFORCING STEEL:— Bends in reinforcing steel shall be made to a radius of not less than four (4) diameters of the bar except for stirrups and tie bars, which shall be bent around a pin having a diameter of not less than two (2) bar diameters. Hooks shall conform to the dimensions shown in the following sketches except as otherwise noted.



STRUCTURAL STEEL:— For requirements governing structural steels and their fabrication, see the Standard Specifications. To avoid oversight, these requirements shall be clearly noted on the shop drawings. Structural steel shall receive one (1) shop coat of red lead or zinc chromate primer and two (2) field coats consisting of first field or primer coat and one (1) coat of aluminum paint as specified in the Standard Specifications, on all surfaces not in contact with concrete, except as noted in the Standard Specifications.

STRUCTURAL STEEL (Method of Measurement and Payment):— All structural steel shall be measured and paid for as set forth in the Special Provisions.

APPROVAL:— Shop drawings shall be approved by the Montana State Highway Department before fabrication is begun.

SETTING OF MASONRY PLATES:— Care shall be taken in placing reinforcing steel so as to clear anchor bolts. Contractor shall finish concrete under girder masonry plates slightly high and bush-hammer to exact elevation shown. Masonry plates shall be placed on three (3) layers of canvas thoroughly swabbed with red lead, as called for in the Standard Specifications.

SOILS AND FOUNDATION MATERIALS:— Borings were taken by the Montana State Highway Department at the points shown, to obtain information on the subsoil at this Bridge site so that a more reasonable conclusion could be reached as to the type and approximate elevation of bottom of foundation that should be used. The State Highway Department's interpretation of the materials encountered from the results of the borings is shown on Dwgs. No. 5238 and No. 5239. The State Highway Department does not guarantee that the material which will be encountered in the course of excavation for the structure will be as listed in the log of borings; neither does the State assume any responsibility for any variation or misinterpretation of the classes of materials. No claim or adjustment in the unit price bid for excavation or shoring or cribs will be made if the materials found do not agree with those shown in the log of borings.

Materials shown as sand and gravel may be of varying degrees of compactness or cementation.

OTHER NOTES:— For other notes see Dwg. No. 5237

DESIGNED	R.D.K.	11-1-60
DRAWN	L.E.P.	11-9-60
TRACED		
CHECKED	C.A.M.	7-27-61
** REVISED	M.L.R.	11-10-80
REVISED		

**Note: Bridge overlay added as shown on Dwg. No. 12854 & Dwg. No. 12855

**Note: The finished roadway elevation shown do not reflect the 1½" overlay to be accomplished by this contract.

STATE OF MONTANA
STATE HIGHWAY COMMISSION

HIGGINS AVENUE BRIDGE
OVER CLARK FORK & C.M. ST. P. & P. RR. IN MISSOULA
FEDERAL AID PROJECT NO. F-FG 215(7)
MISSOULA COUNTY

GENERAL LAYOUT-NORTH END
Scale: 1" = 20'-0" Except As Noted

APPROVED BY _____ BRIDGE ENGINEER

DRAWING NO. 5236

J.R.B.

STATE OF MONTANA

STATE HIGHWAY COMMISSION

BRIDGE PLANS & QUANTITIES

FEDERAL AID PROJECT NO. F-FG-215 (7) P.E., R/W & CONST.

FLORENCE - MISSOULA

MISSOULA COUNTY

LIST OF DRAWINGS

SHEET NO.	DWG. NO.	TITLE
1.	5236	GENERAL LAYOUT - NORTH END
2.	5237	GENERAL LAYOUT - SOUTH END
3.	5238	FOOTING PLAN - NORTH END
4.	5239	FOOTING PLAN - SOUTH END
5.	5240	ABUTMENT NO. 1 NORTHBOUND RDWY.
6.	5241	ABUTMENT NO. 1 SOUTHBOUND RDWY.
7.	5242	BENT NO. 2
8.	5243	BENTS NO.3 THRU NO. 7
9.	5244	BENT NO. 8
10.	5245	BENT NO. 9
11.	5246	PIER NO. 10
12.	5247	PIER NO. 11
13.	5248	BENT NO. 12
14.	5249	BENT NO. 13 NORTHBOUND RDWY.
15.	5250	BENT NO. 13 SOUTHBOUND RDWY.
16.	5251	BENT NO. 14
17.	5252	SPAN NO. 1
18.	5253	SPAN NO. 2
19.	5254	SPAN NO. 2 REINFORCING STEEL
20.	5255	SPANS NO. 3 THRU NO. 7 AND 4" FLOOR DRAIN DETAILS
21.	5256	GIRDER DETAILS AND SHOES FOR SPANS NO. 8 & NO. 13
22.	5257	TRANSVERSE GIRDER AND SHOE DETAILS
23.	5258	GIRDERS - SPANS NO. 9, NO. 10 & NO. 11
24.	5259	GIRDER DETAILS - SPANS NO. 9, NO. 10 & NO. 11 & CAMBER DIAGRAMS
25.	5260	SWAY BRACING - SPANS NO. 9, NO. 10 & NO. 11 & RAIL DETAILS
26.	5261	SHOE DETAILS
27.	5262	SLAB AND 6" FLOOR DRAIN DETAILS - SPANS NO. 9, NO. 10 & NO. 11
28.	5263	SPAN NO. 12
29.	5264	SLAB DETAILS - SPANS NO. 8, NO. 12 & NO. 13 & 2" Ø PIPE HANDRAIL
30.	5265	SLAB AND CURB JOINTS
31.	5266	SLAB JOINT DETAILS AND LIGHT POST BRACKET DETAILS
32.	5267	BLAST PLATE AND GUARD FENCE DETAILS
33.	5268	STAIRWAY DETAILS
34.	5269	RETAINING WALL - NORTH END
35.	5270	BANK STREET SIDEWALK REMODELING
36.	SBR - T4	STANDARD STEEL BRIDGE RAIL TYPE NO. 4
37.	PRES. - BEAM STD. NO. 1 TYPE - A (Rev. 7-1-61)	STANDARD PRE-TENSIONED AND POST-TENSIONED PRESTRESSED CONCRETE BEAMS
38.	PRES. - S & C JOINTS (Rev. 1-10-61)	STANDARD SLAB AND CURB JOINTS FOR PRESTRESSED CONCRETE BEAM SPANS

REPAIRED 12854

ESTIMATED BRIDGE PLAN QUANTITIES

5% Swell in Class "A" Concrete
15% Swell in Structure Excavation

LOCATION	LENGTH IN FEET	REINFORCING STEEL LBS.	STRUCTURAL STEEL LUMP SUM	CLASS "A" CONCRETE CU. YDS.	CLASS "AD" CONCRETE CU. YDS.	STEEL BRIDGE RAIL LIN. FT.	STAIRWAY LUMP SUM	STRUCTURE EXCAVATION CU. YDS.	TREATED TIMBER PILES FURNISHING LIN. FT.	TREATED TIMBER PILES DRIVING LIN. FT.	TREATED TIMBER TEST PILES LUMP SUM	PRESTRESSED BEAMS TYPE-A (EACH) 40'	45'	50'	GUARD FENCE LIN. FT.	CORR. ASBESTOS CEMENT SHEETS LUMP SUM	REMOVAL OF EXISTING STRUCTURE LUMP SUM	FLOOR DRAINS 6" EACH	DRAINAGE SYSTEM LUMP SUM	SHORING AND CRIBS LUMP SUM
ABUTMENT NO. 1		16,946		125	12.7			500												
BENT NO. 2		9,216		81				370												
BENT NO. 3		8,386		79				60												
BENT NO. 4		8,344		79				75												
BENT NO. 5		8,344		79				85												
BENT NO. 6		8,344		79				95												
BENT NO. 7		8,344		79				145												
BENT NO. 8		8,525	LUMP SUM	79			LUMP SUM	210			LUMP SUM					LUMP SUM	LUMP SUM	20	LUMP SUM	LUMP SUM
BENT NO. 9		9,999		115				305												
PIER NO. 10		6,932		458				640												
PIER NO. 11		7,213		453				555												
BENT NO. 12		11,606		130				330												
BENT NO. 13		9,257		85				115												
BENT NO. 14		13,267		93	15.8			110												
RETAINING WALL		7,432		74	9.5	33.17		395	580.0	565.5										
SUPERSTRUCTURE	972.00	330,414			1,690.7	1,881.51						9	9	40	118.0					
TOTAL	972.00	472,569	LUMP SUM	2,088	1,728.7	1,914.68	LUMP SUM	3,990	580.0	565.5	LUMP SUM	9	9	40	118.0	LUMP SUM	LUMP SUM	20	LUMP SUM	LUMP SUM

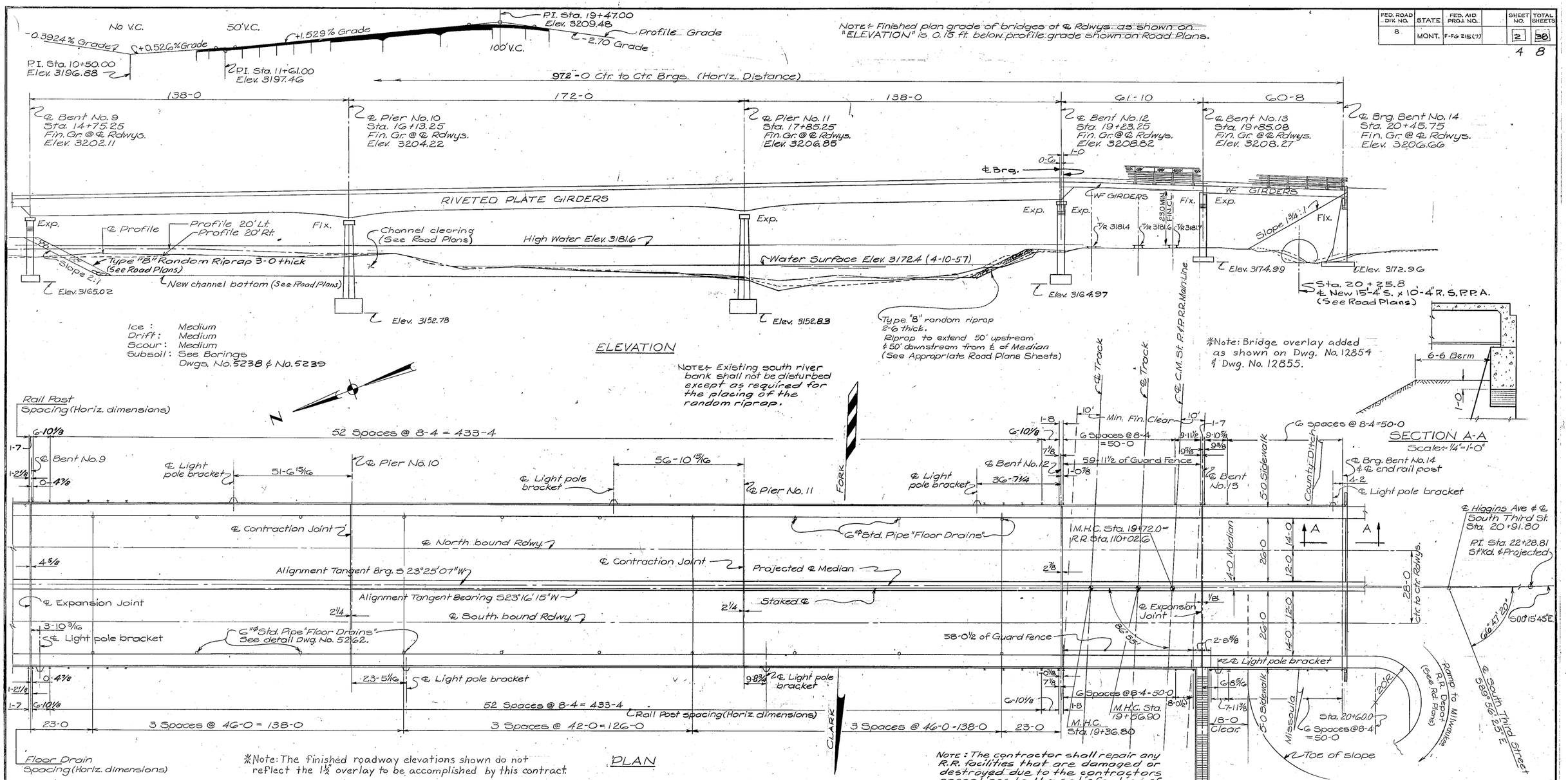
Drawn By G.C.S. 8-3-61 Checked By Hes. 8-16-61

J.R.B.

DRAWING NO. 5236 Q

FED. ROAD DIV. NO.	STATE	FED. AID PROJ. NO.		SHEET NO.	TOTAL SHEETS
8	MONT.	F-FG 215(7)		2	38

4 8



*Note: The finished roadway elevations shown do not reflect the 1½" overlay to be accomplished by this contract.

NOTE: The contractor shall repair any R.R. facilities that are damaged or destroyed due to the contractors operations to the satisfaction of the C.M.St.P. & P. R.R. Co. & @ no additional cost to the State.

PLAN

NOTES

BACKFILL:— The backfill @ Abutment No. 1 may be complete up to Elev. 3181.0 before the superstructure is in place. The backfill @ Bent No. 14 may be complete up to the bottom of the backwall before the superstructure is in place. The backfill above Elev. 3181.0 @ Abutment No. 1 and against the backwall @ Bent No. 14 shall not be placed until after the concrete roadway slab has been placed.

PRECAST PRESTRESSED CONCRETE:— All precast prestressed concrete shall have a minimum compressive strength of 5000 p.s.i. at the age of 28 days. (See Special Provisions for Precast Prestressed Concrete Beams.) An "Air Entraining Agent" may be added to any precast prestressed concrete. Chamfer all exposed edges of concrete ¾ inch and do not fillet entrant angles unless otherwise noted.

SHAFTS:— Shafts of piers shall be poured in not more than two continuous runs; other construction joints shall be made only as noted on the plans or as determined by the Engineer.

CONSTRUCTION JOINTS:— Construction joints shall be made on a true horizontal line at the surfaces of the piers and left rough in the interior with satisfactory shear keys.

CHAMFER:— Chamfer all exposed corners with enclosed angle less than 120°, ¾ inch and fillet all entrant angles ¾ inch except as otherwise noted.

NOTES

PIER NOSE ANGLES:— Pier nose angles shall be paid for as structural steel. One (1) shop coat and two (2) field coats of paint as specified for structural steel shall be applied to exposed surfaces of nose angles before erection.

WELDS:— All welds shall be continuous fillet shop welds unless otherwise noted. All welds shall be paid for as Structural Steel, except as otherwise noted.

STEEL BRIDGE RAIL:— The Steel Bridge Rail shall be fabricated and erected in accordance with the details on Dwg. No. SBR-T4 except as modified on Dwg. No. 5260 and as follows:
(1.) Floor drains shall be used in lieu of curb openings, see "Floor Drain Details" Dwg. No. 5255 & No. 5262
(2.) No markers or reflector signals required on this Bridge.

STRUCTURE EXCAVATION:— Only that excavation below the limits of the unclassified excavation for Piers No. 10 & No. 11, shall be paid for as Structure Excavation. Only that excavation below natural ground line for all other bents, shall be paid for as Structure Excavation.

OTHER NOTES:— For other notes see Dwg. No. 5236.

DESIGNED	R.D.K.	11-1-60
DRAWN	L.E.P.	11-7-60
TRACED		
CHECKED	C.A.M.	7-27-61
* REVISED	M.L.R.	11-10-80
REVISED		

STATE OF MONTANA
STATE HIGHWAY COMMISSION

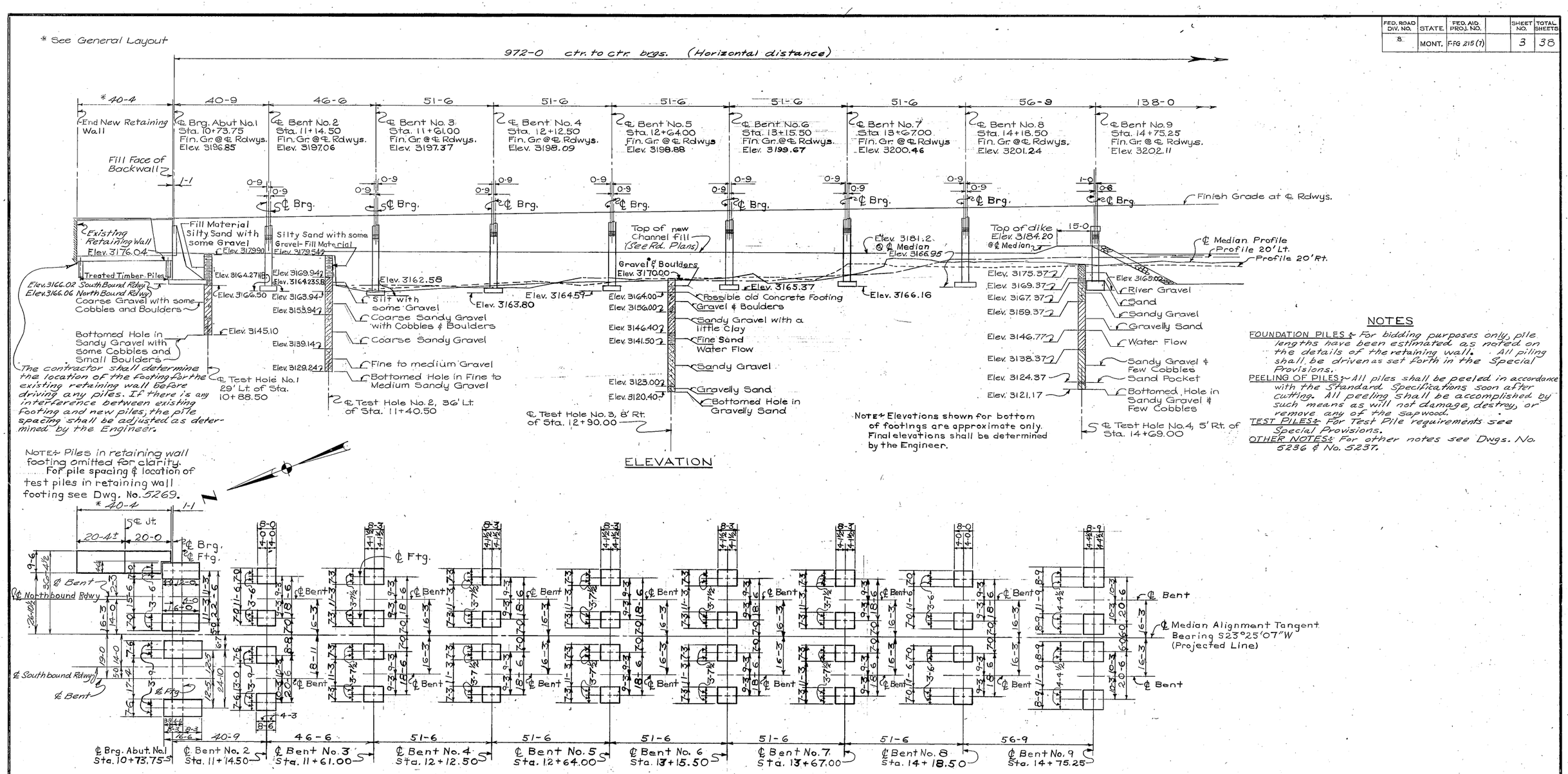
HIGGINS AVENUE BRIDGE
OVER CLARK FORK & C.M.St.P.&P. R.R. IN MISSOULA
FEDERAL AID PROJECT NO. FFG 215(7)
MISSOULA COUNTY
GENERAL LAYOUT—SOUTH END
Scale: 1" = 20'-0" Except As Noted

APPROVED BY — BRIDGE ENGINEER

DRAWING NO. 5237

J.R.B.

FED. ROAD DIV. NO.	STATE	FED. AID PROJ. NO.		SHEET NO.	TOTAL SHEETS
8.	MONT.	F-FG 215 (7)		3	38



STATE OF MONTANA
STATE HIGHWAY COMMISSION

HIGGINS AVENUE BRIDGE
OVER CLARK FORK & C.M. ST. P. & P. R.R. IN MISSOULA
FEDERAL AID PROJECT NO. F-FG 215(7)
MISSOULA COUNTY
FOOTING PLAN-NORTH END

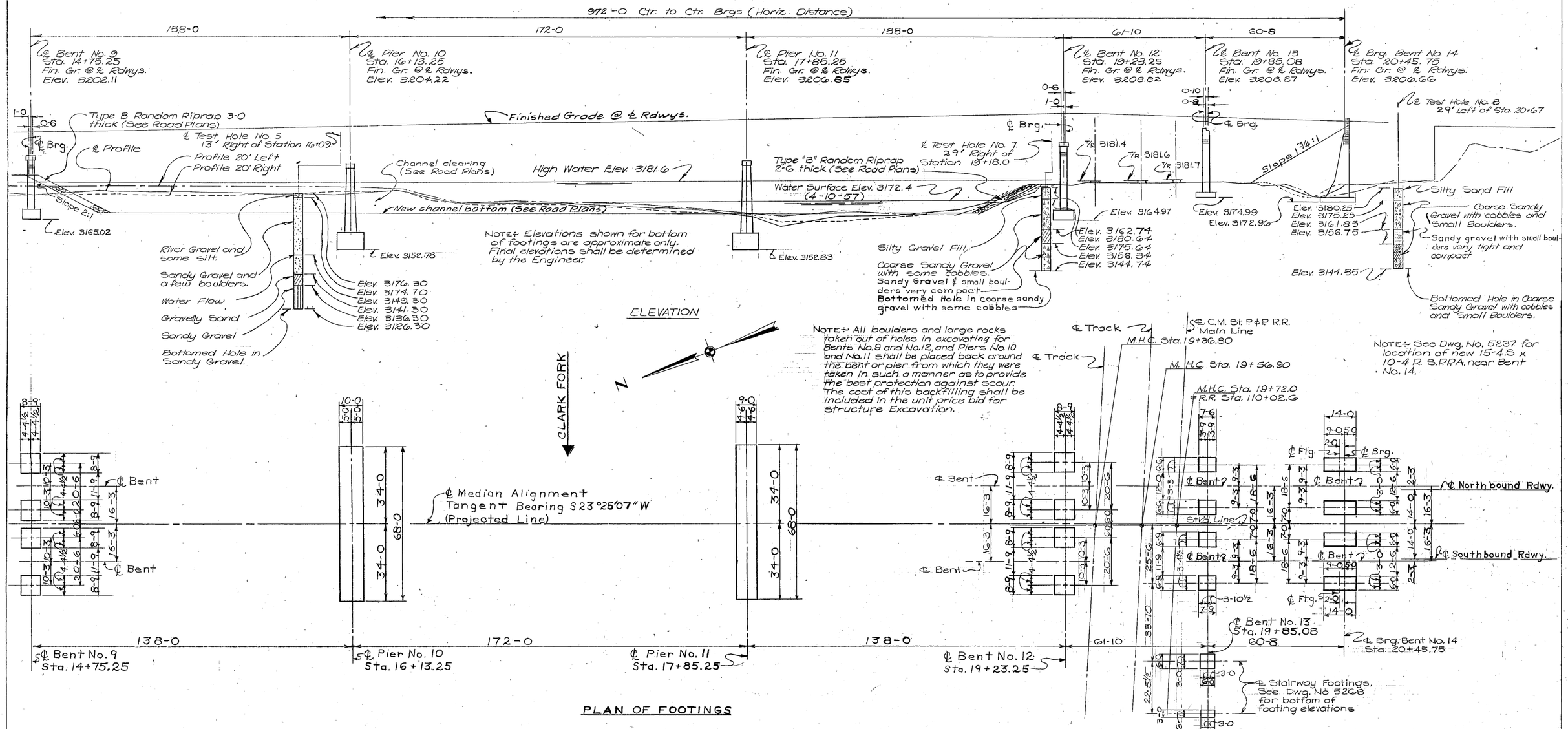
Scale: 1" = 20'-0"

DESIGNED		
DRAWN	L.E.P.	3-8-61
TRACED		
CHECKED	C.A.M.	7-28-61
REVISED		
REVISED		

DRAWING NO. 5238

J.R.B.

FED ROAD DIV. NO.	STATE	FED AID PROJ. NO.		SHEET NO.	TOTAL SHEET
8	MONT.	F-FG 215(7)		4	38



NOTES

OTHER NOTES:— For other notes see Dwgs. No. 5236, No. 5237 and No. 5238.

DESIGNED	G.O.-D.N.-R.K.	11-14-60
DRAWN	K.L.F.	11-14-60
TRACED		
CHECKED	C.A.M.	8-3-61
REVISED		
REVISED		

STATE OF MONTANA
STATE HIGHWAY COMMISSION

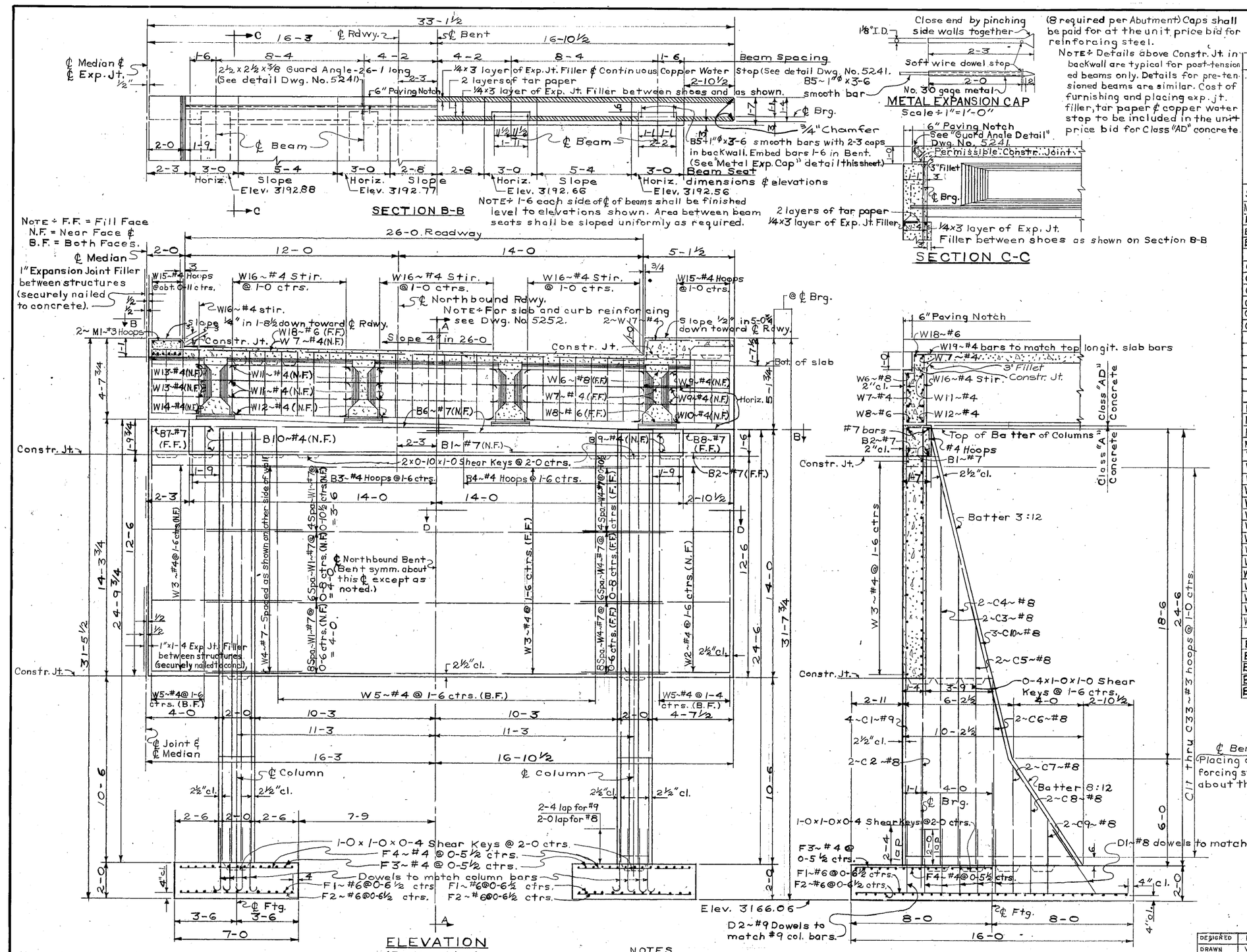
HIGGINS AVENUE BRIDGE
OVER CLARK FORK & C.M. ST. P.&P. R.R. IN MISSOULA
FEDERAL AID PROJECT NO. F-FG 215(7)
MISSOULA COUNTY

FOOTING PLAN-SOUTH END
Scale-1"=20'-0"

DRAWING NO. 5239

J.R.B.

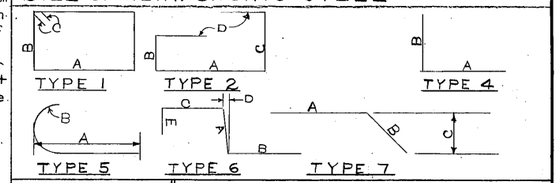
FED. ROAD DIV. NO.	STATE	FED. AID PROJ. NO.		SHEET NO.	TOTAL SHEETS
8	MONT.	F-FG 215(7)		5	38



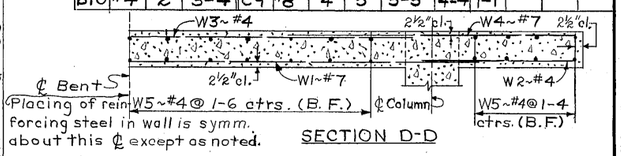
(8 required per Abutment) Caps shall be paid for at the unit price bid for reinforcing steel.

NOTE: Details above Constr. Jt. in backwall are typical for post-tensioned beams only. Details for pre-tensioned beams are similar. Cost of furnishing and placing exp. jt. filler, tar paper ℄ copper water stop to be included in the unit price bid for Class "AD" concrete.

BILL OF REINFORCING STEEL



STRAIGHT BARS				BENT BARS (All dimensions are out to out)									
MARK	SIZE	No.	LENGTH	MARK	SIZE	No.	TYPE	LENGTH	A	B	C	D	E
B1	#7	1	27-8"	B3	#4	10	1	5'-11"	1'-3"	1'-4"	0'-4½"		
B2	7	1	32-9	B4	4	9	1	5-7	1-3	1-2	0-4½		
B5	1"ϕ sm.	8	3-6										
				C10	8	6	7	26-2	19-1	7-1	2-4		
C1	9	8	24-4	C11	3	2	1	7-6	1-9	1-8	0-4		
C2	8	4	24-4	C12	↑	↑	↑	8-0	2-0	↑	↑		
C3	↑	↑	21-9	C13				8-6	2-3				
C4			17-9	C14				9-0	2-6				
C5	↓	↓	13-9	C15				9-6	2-9				
C6	8	4	9-9	C16				10-0	3-0				
				C17				10-6	3-3				
				C18				11-0	3-6				
				C19				11-6	3-9				
				C20				12-0	4-0				
				C21				12-6	4-3				
				C22				13-0	4-6				
F1	6	26	15-4	C23				13-6	4-9				
F2	6	58	6-4	C24				14-0	5-0				
F3	4	30	7-8	C25				14-6	5-3				
F4	4	36	6-4	C26				15-0	5-6				
W1	7	19	24-6	C27				15-6	5-9				
W2	4	9	5-9	C28				16-4	6-2				
W3	4	9	21-0	C29				17-8	6-10				
W4	7	38	10-7	C30				19-0	7-6				
W5	4	40	13-7	C31				20-4	8-2				
W6	8	1	32-9	C32	↓	↓	↓	21-8	8-10	↓	↓		
W7	4	3	32-9	C33	3	2	1	23-0	9-6	1-8	0-4		
W8	6	1	32-9										
W9	4	3	3-6										
W10	↑	1	3-4										
W11		9	6-10	D1	8	26	5	4-9	3-8	1-1			
W12		3	6-6	D2	9	8	5	5-3	4-0	1-3			
W13	↑	3	2-10	M1	3	2	1	5-4	1-6	0-10	0-4		
W14	4	1	2-8	W15	4	7	1	10-1	1-0	3-8	0-4½		
W18	6	1	32-9	W16	4	25	2	8-0	1-0	2-9	3-9	0'-3"	
				W17	4	2	6	8-2	1-4	1-3	4-9	0-1	0'-10"
B6	7	2	14-9	W19	4	18	4	3-3	2-0	1-3			
B7	7	1	17-0										
B8	7	1	17-8	C7	8	4	5	8-5	7-4	1-1			
B9	4	2	4-0	C8	8	4	5	6-11	5-10	1-1			
B10	#4	2	3-4	C9	#8	4	5	5-5	4-4	1-1			



NOTE: F.F. = Fill Face
N.F. = Near Face ℄
B.F. = Both Faces.

1" Expansion Joint Filler between structures (securely nailed to concrete).

NOTE: For slab and curb reinforcing see Dwg. No. 5252.

NOTES
OTHER NOTES: For other notes see Dwgs. No. 5236 & No. 5237.

NOTE: Max. Footing Pressure under: D.L.+H.E. = 3.50 tons/sq. ft.

J.R.B.

STATE OF MONTANA
STATE HIGHWAY COMMISSION

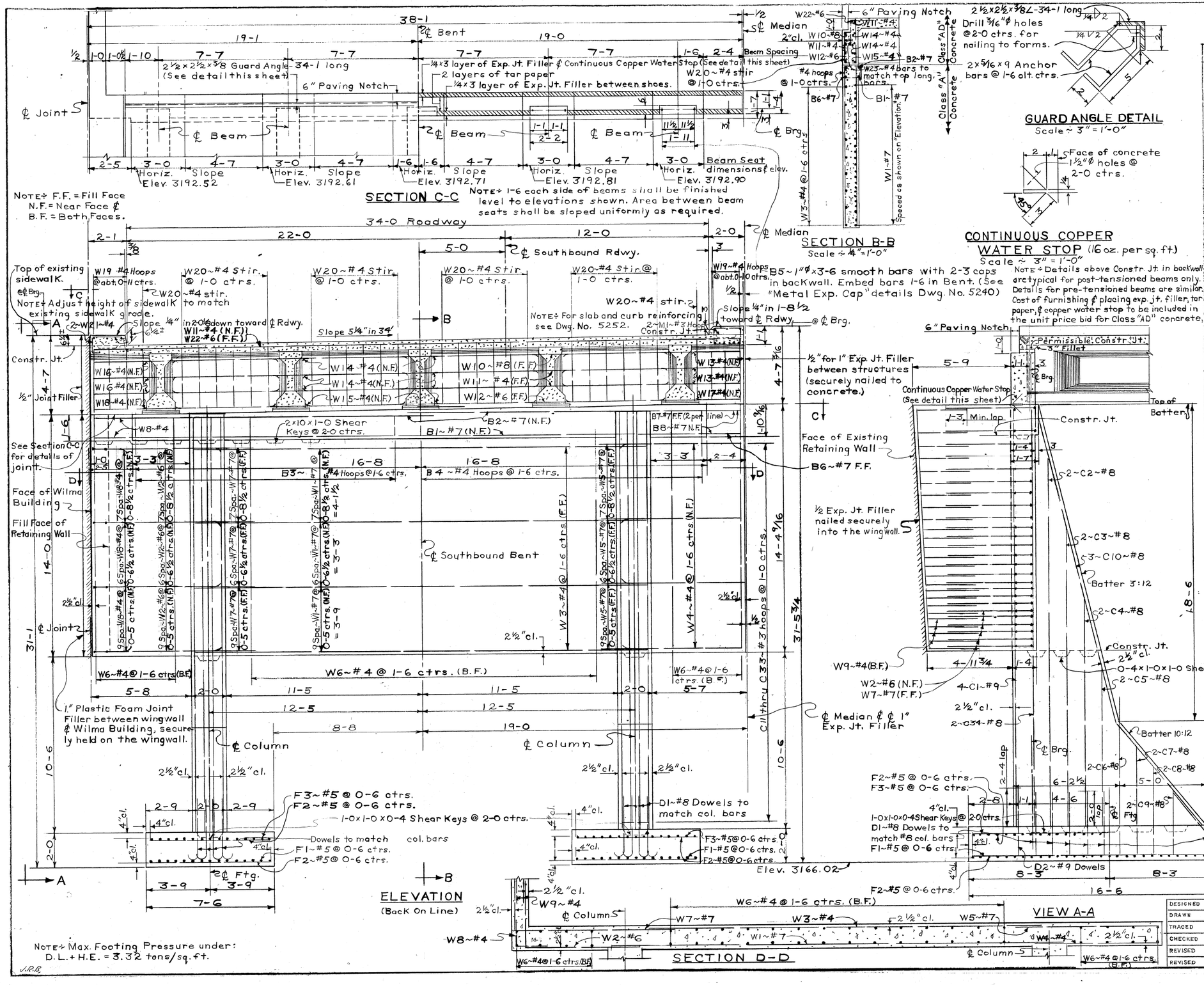
HIGGINS AVENUE BRIDGE
OVER CLARK FORK & C.M. ST. P. & P. R.R. IN MISSOULA
FEDERAL AID PROJECT NO. F-FG 215(7)
MISSOULA COUNTY
ABUTMENT NO. 1
NORTHBOUND RDWY.

Scale: 3/8"=1'-0" Except as Noted

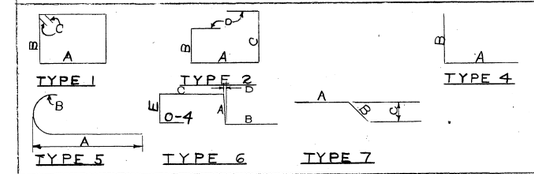
DESIGNED	R.D.K.	3-3-61
DRAWN	W.C.O.	4-27-61
TRACED		
CHECKED	C.A.M.	7-31-61
REVISED		
REVISED		

DRAWING NO. 5240

FED. ROAD DIV. NO.	STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
8	MONT.	F-FG-215(7)	6	38



BILL OF REINFORCING STEEL



STRAIGHT BARS

Mark	Size	No.	Length
B1	#7	1	33-0"
B2	7	2	17-5
B5	1 1/8 ϕ	10	3-6
C1	9	8	24-4
C2	8	4	21-9
C3	↑	↑	17-9
C4			13-9
C5	↓	↓	9-9
C34	8	4	24-4
F1	5	30	15-10
F2	5	98	6-10
F3	5	30	8-0
W1	7	23	26-6
W3	4	9	25-4
W4	4	9	7-0
W5	7	23	10-9
W6	4	44	13-7
W9	4	50	3-0
W10	8	1	37-8
W11	4	3	37-8
W12	6	1	37-8
W13	4	3	2-10
W14	↑	12	6-2
W15		4	5-10
W16		3	3-0
W17	↓	1	2-6
W18	4	1	2-9
W22	6	1	37-8
B6	7	1	37-8
B7	7	2	19-10
B8	#7	2	4-0

BENT BARS (All dimensions are out to out)

Mark	Size	No.	Type	Length	A	B	C	D	E
B3	#4	11	1	5-7	1-3	1-2	0-4½		
B4	4	12	1	5-11	1-3	1-4	0-4½		
C10	8	6	7	26-8	19-0	7-8	3-5		
C11	3	2	1	7-6	1-9	1-8	0-4		
C12	↑	↑	↑	8-0	2-0	↑	↑		
C13				8-6	2-3				
C14				9-0	2-6				
C15				9-6	2-9				
C16				10-0	3-0				
C17				10-6	3-3				
C18				11-0	3-6				
C19				11-6	3-9				
C20				12-0	4-0				
C21				12-6	4-3				
C22				13-0	4-6				
C23				13-6	4-9				
C24				14-0	5-0				
C25				14-6	5-3				
C26				15-0	5-6				
C27				15-6	5-9				
C28				16-6	6-3				
C29				18-2	7-1				
C30				19-10	7-11				
C31				21-6	8-9				
C32	↓	↓	↓	23-2	9-7	↓	↓		
C33	3	2	1	24-10	10-5	1-8	0-4		
D1	8	26	5	4-9	3-8	1-1			
D2	9	8	5	5-3	4-0	1-3			
M1	3	2	1	5-4	1-6	0-10	0-4		
W2	6	25	4	11-10	6-8	5-2			
W7	7	25	4	14-10	10-10	4-0			
W8	4	25	4	4-2	1-11	2-3			
W19	4	6	1	10-1	1-0	3-8	0-4½		
W20	4	26	2	8-0	1-0	2-9	3-9	0'-3"	
W21	4	2	6	5-7	1-7	1-3	1-8	0-1	0'-9"
C6	8	4	5	8-6	7-5	1-1			
C7	8	4	5	7-4	6-3	1-1			
C8	8	4	5	6-2	5-1	1-1			
C9	8	4	5	5-0	3-11	1-1			
W23	#4	22	4	3-3	2-0	1-3			

NOTES

OTHER NOTES: For other notes see Dwgs. No. 5236 & No. 5237.

STATE OF MONTANA
STATE HIGHWAY COMMISSION

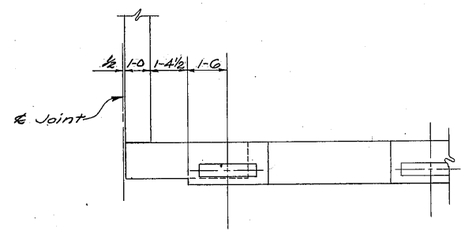
HIGGINS AVENUE BRIDGE
OVER CLARK FORK & C.M.ST. P&P.R.R. IN MISSOULA
FEDERAL AID PROJECT NO. F-FG 215(7)
MISSOULA COUNTY
ABUTMENT NO. 1
SOUTHBOUND RDWY.

Scale ~ 3/8" = 1'-0"
Except As Noted

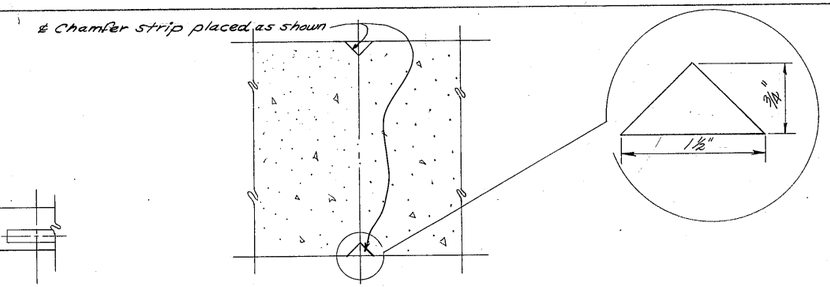
DESIGNED	G.D.O.	3-27-61
DRAWN	W.C.O.	4-20-61
TRACED		
CHECKED	C.A.M.	7-31-61
REVISED		
REVISED		

DRAWING NO. 5241

FED. ROAD DIV. NO.	STATE	FED. AID. PROJ. NO.		SHEET NO.	TOTAL SHEETS
8	MONT.				



SECTION A-A



CHAMFERED DOORWAY OUTLINE DETAIL

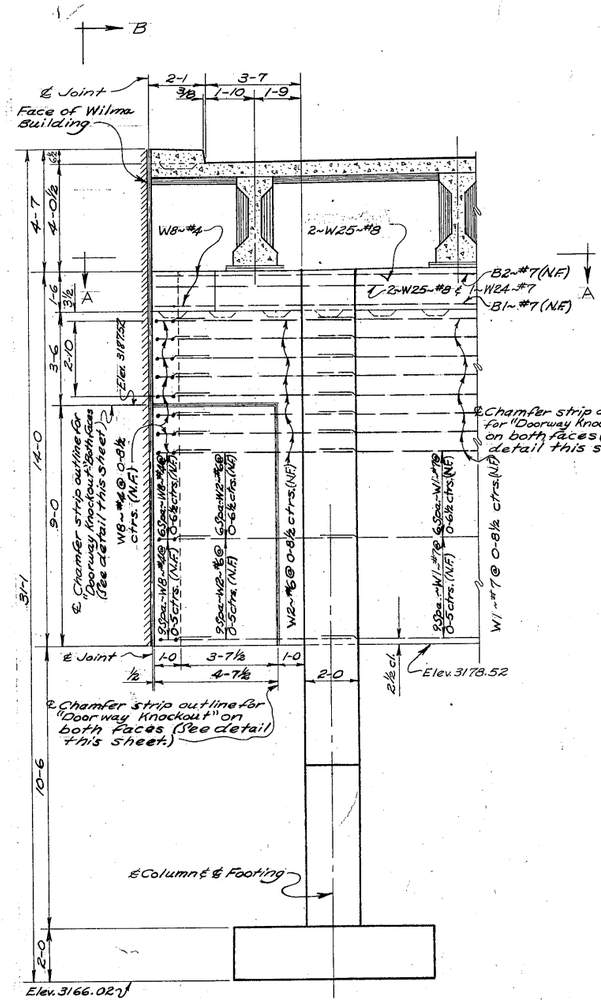
~ No Scale ~

BILL OF REINFORCING STEEL (Additional Steel Only)			
STRAIGHT BARS			
MARK	SIZE	No.	LENGTH
W24	#7	1	8-5"
W25	#8	4	8-5

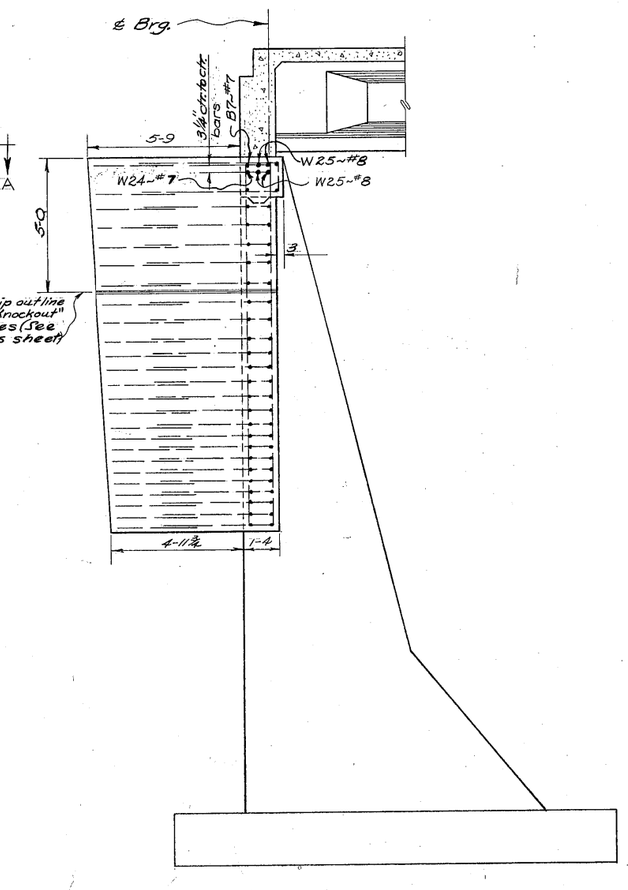
NOTE:- This drawing has been prepared to show the additional reinforcing steel required to be placed in the original construction and to outline the limits of the maximum permissible cutting should a permit for the installation of a door be granted at some future date.

All of the aforementioned materials and work to be arranged between the building owner (Mr. Oakley E. Coffee) and the contractor (Sletten Construction Co.), all at no cost to the state.

This drawing will furnish the authority for placing the additional reinforcing steel and for placing the chamfered doorway outline, but shall not be considered as a permit for placing the door.



ELEVATION



SECTION B-B

STATE OF MONTANA
STATE HIGHWAY COMMISSION

HIGGINS AVENUE BRIDGE
OVER CLARK FORK & C.M.St.P.& P.R.R. IN MISSOULA
FEDERAL AID PROJECT NO. F-FG 215(7)
MISSOULA COUNTY

ABUTMENT NO. 1
SOUTHBOUND RDWY.

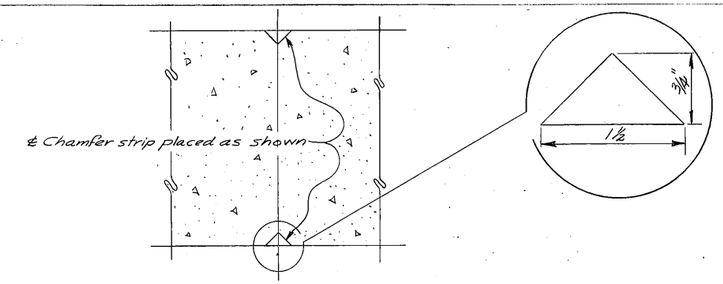
DESIGNED		
DRAWN	R.E.W.	1-30-62
CHECKED	G.D.O.	2-5-62

Scale: ⅜" = 1'-0"
Except as Noted.

DRAWING NO. 5241-A

J.R.D.

FED. ROAD DIV. NO.	STATE	FED. AID PROJ. NO.		SHEET NO.	TOTAL SHEETS
8	MONT.				



CHAMFERED DOORWAY OUTLINE DETAIL

~No Scale~

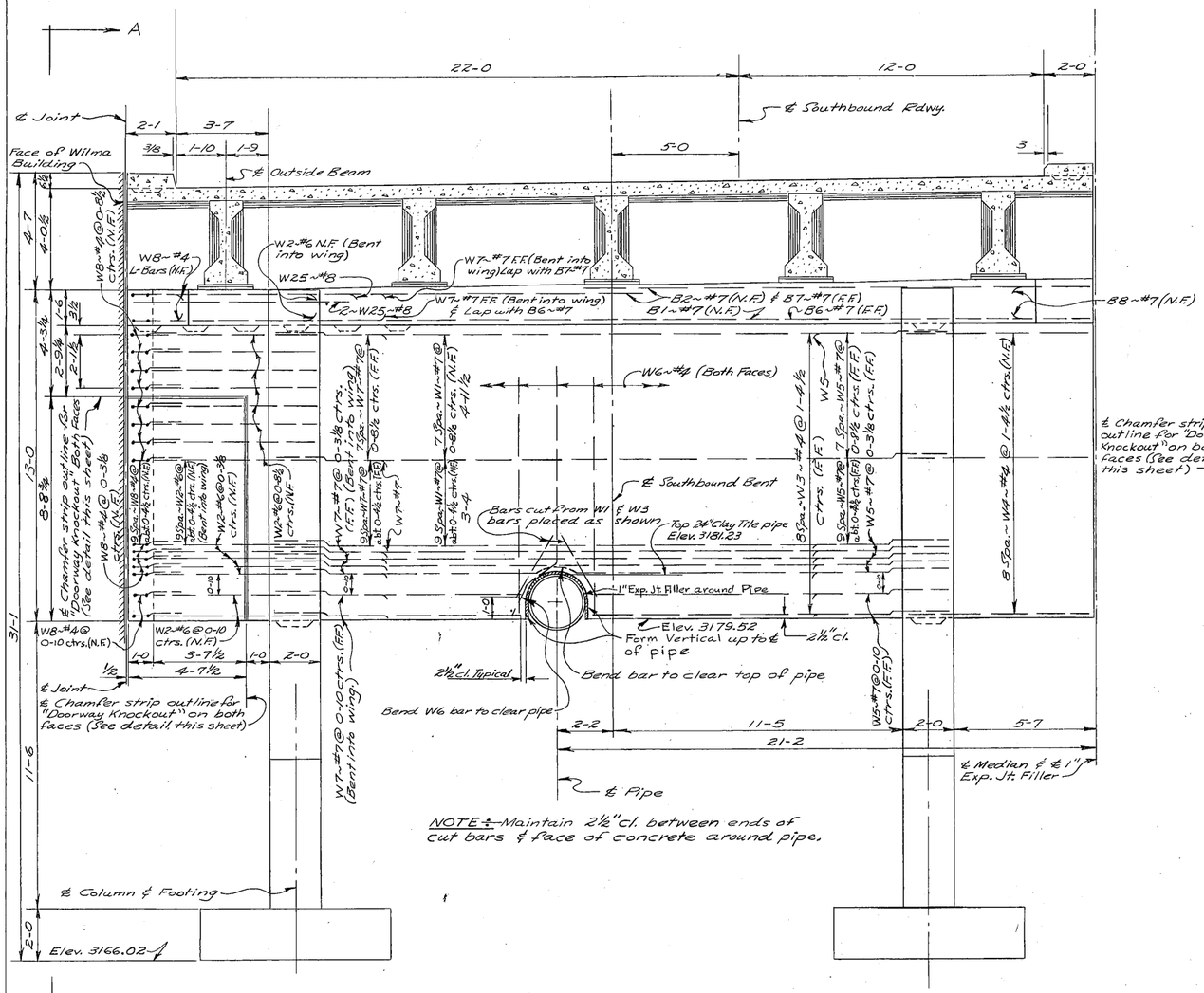
BILL OF REINFORCING STEEL *(Additional Steel Only)			
STRAIGHT BARS			
MARK	SIZE	NO.	LENGTH
W25	#8	3	8'-5"

*This additional reinforcing steel to be used only if chamfered doorway outline is installed.

NOTE:- Chamfered doorway outline & additional reinforcing steel to be arranged by others.

NOTE:- This drawing supercedes Dwg. No. 5241A & shall be used in conjunction with Dwg. No. 5241.

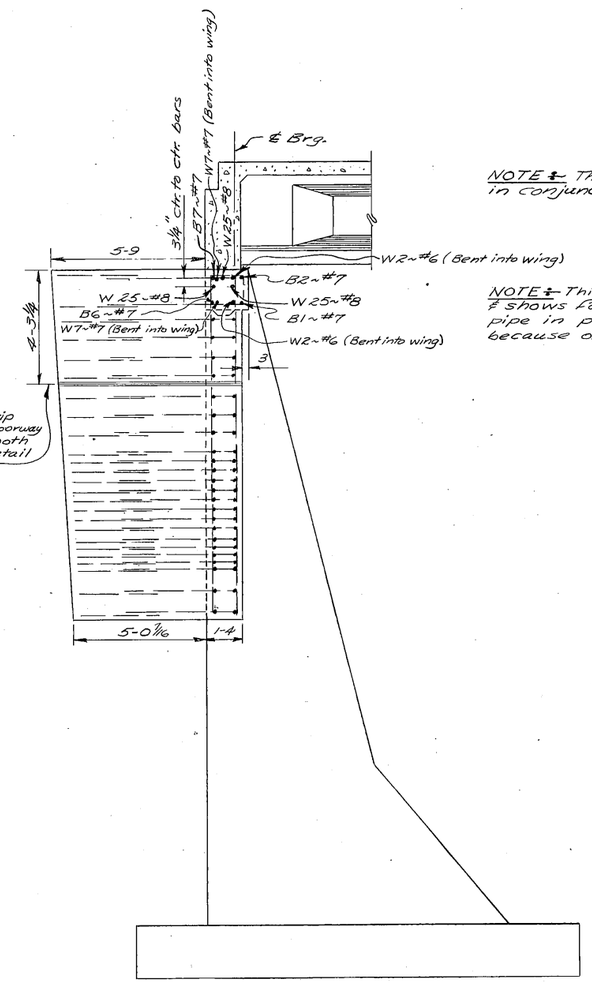
NOTE:- This drawing revises abutment wall height from 14-0 to 13-0 & shows forming & reinforcing steel around 24" clay tile storm sewer pipe in place. No additional reinforcing steel is required because of this revision.



ELEVATION

NOTE:- Maintain 2 1/2" cl. between ends of cut bars & face of concrete around pipe.

NOTE:- All W6~#4 vertical reinforcing bars shall be reduced 1-0 in length due to the reduction in height of wall.



VIEW A-A

STATE OF MONTANA
STATE HIGHWAY COMMISSION

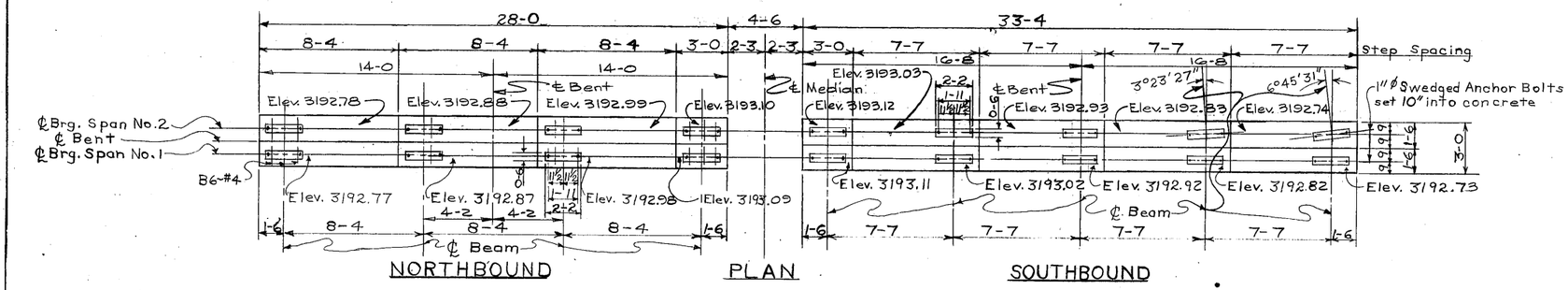
HIGGINS AVENUE BRIDGE
OVER CLARK FORK & CM. St. P. & P. R.R. IN MISSOULA
FEDERAL AID PROJECT NO. F-FG 215(7)
MISSOULA COUNTY
ABUTMENT NO. 1
SOUTHBOUND RDWY.

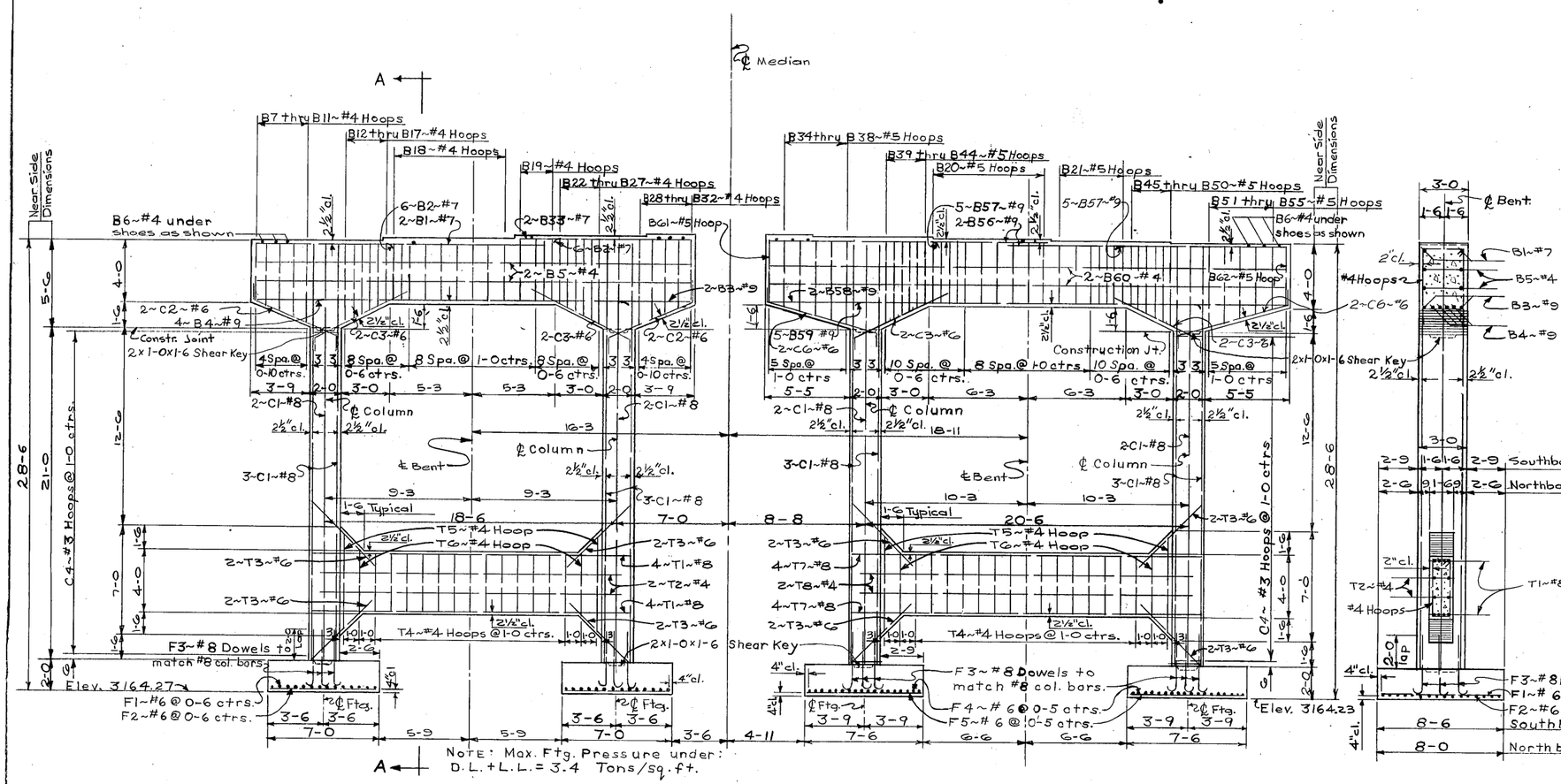
DESIGNED		
DRAWN	R.E.W.	4-11-62
TRACED		
CHECKED	E.D.K.	4-12-62
REVISED		
REVISED		

Scale:- 3/8" = 1'-0" Except As Noted

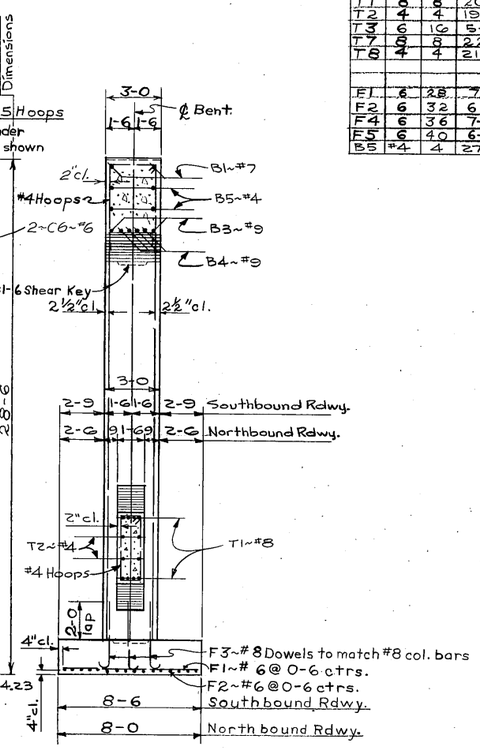
DRAWING NO. 5241B

FED. ROAD DIV. NO.	STATE	FED. AID PROJ. NO.		SHEET NO.	TOTAL SHEETS
8	MONT.	F-FG 215(7)		7	38



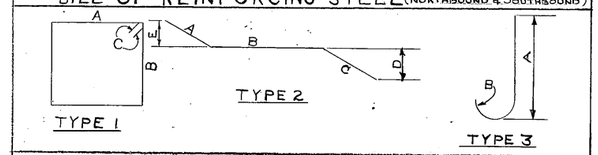


ELEVATION
(Ahead On Line)



SECTION A-A
(Northbound Shown Except As Noted)

BILL OF REINFORCING STEEL (Northbound & Southbound)



STRAIGHT BARS

Mark	Size	No.	Length
B1	#7	2	16'-6"
B2	7	12	5-0
B3	9	2	27-8
B4	9	4	20-6
B6	4	16	2-8
B33	7	2	11-2
B56	9	4	17-8
B57	9	10	11-11
B58	9	2	33-0
B59	9	5	22-6
B60	4	4	33-0
C1	8	32	26-4
T1	8	8	20-1
T2	4	4	19-0
T3	6	16	5-6
T7	8	8	22-1
T8	4	4	21-0
F1	6	28	7-4
F2	6	32	6-4
F4	6	36	7-10
F5	6	40	6-10
B5	#4	4	27-8

BENT BARS (All dimensions are out to out)

Mark	Size	No.	Type	Length	A	B	C	D	E	F
B7	#4	1	1	13'-6"	2'-8	3'-8½	0'-4½"			
B8	↑	1	↑	14-2	↑	4-0½	↑			
B9		1		14-10		4-4½				
B10				15-6		4-8½				
B11				16-2		5-0½				
B12				16-2		5-0½				
B13				15-8		4-9½				
B14				15-2		4-6½				
B15				14-8		4-3½				
B16		↓		14-2		4-0½				
B17		1		13-8		3-9½				
B18	↓	9		13-5		3-8	↓			
B19	4	4		13-10		3-10½	0-4½			
B20	5	10		14-0		3-11	0-5			
B21	5	7		13-6		3-8	0-5			
B22	4	1		14-0		3-11½	0-4½			
B23	↑	↑		14-6		4-2½	↑			
B24				15-0		4-5½				
B25				15-6		4-8½				
B26				16-0		4-11½				
B27				16-6		5-2½				
B28				16-7		5-3				
B29				15-11		4-11				
B30		↓		15-3		4-7				
B31	↓	1		14-7		4-3	↓			
B32	4	1		13-11		3-11	0-4½			
B34	5	1		14-8		4-3	0-5			
B35	↑	↑		15-2		4-6	↑			
B36				15-8		4-9				
B37				16-3		5-0½				
B38				16-9		5-3½				
B39				16-8		5-3				
B40				16-2		5-0				
B41				15-8		4-9				
B42				15-2		4-6				
B43				14-8		4-3				
B44				14-2		4-0				
B45				13-8		3-9				
B46				14-2		4-0				
B47				14-8		4-3				
B48				15-2		4-6				
B49				15-8		4-9				
B50				16-2		5-0				
B51				16-3		5-0½				
B52				15-9		4-9½				
B53				15-2		4-6				
B54				14-8		4-3				
B55				14-2		4-0				
B61	↓	↓	↓	14-1		3-11½	↓			
B62	5	1	1	13-7	2-8	3-8½	0-5			
C2	6	4	2	7-9	1-0	5-9	1-0	0'-11"	0'-11"	
C3	6	8	2	8-0	1-0	7-0	—	—	0-11	
C4	3	84	1	9-4	1-8	2-8	0-4			
C6	6	4	2	9-3	1-0	7-3	1-0	0-11¾	0-11¾	
T4	4	28	1	10-5	1-2	3-8	0-4½			
T5	4	4	1	15-1	1-2	6-0	0-4½			
T6	4	4	1	11-1	1-2	4-0	0-4½			
F3	#8	32	3	4-9	3-8	1-1				

STATE OF MONTANA
STATE HIGHWAY COMMISSION

HIGGINS AVENUE BRIDGE
OVER CLARK FORK & C.M.St.P.&P. R.R. IN MISSOULA
FEDERAL AID PROJECT NO. F-FG 215(7)
MISSOULA COUNTY
BENT NO. 2

Scale: 1/4" = 1'-0"

NOTES

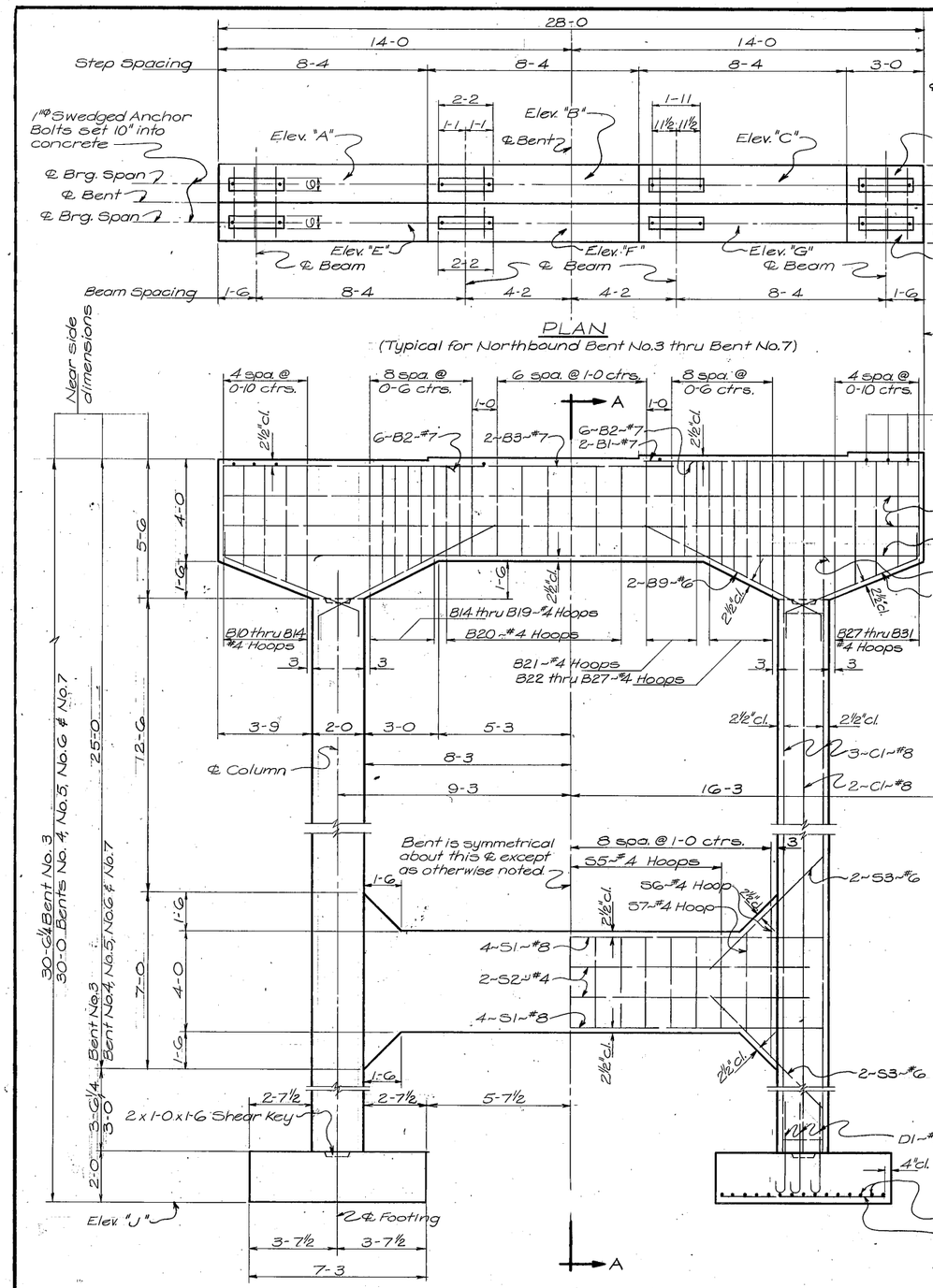
CHAMFER :~ Chamfer all exposed corners with enclosed angle less than 120°, ¾ inch and fillet all entrant angles ¾ inch except as otherwise noted.
OTHER NOTES :~ For other notes see Dwgs. No. 5236 & No. 5237

DESIGNED	D. N.	3-27-61
DRAWN	W. C. O.	4-10-61
TRACED		
CHECKED	C. A. M.	8-3-61
REVISED		
REVISED		

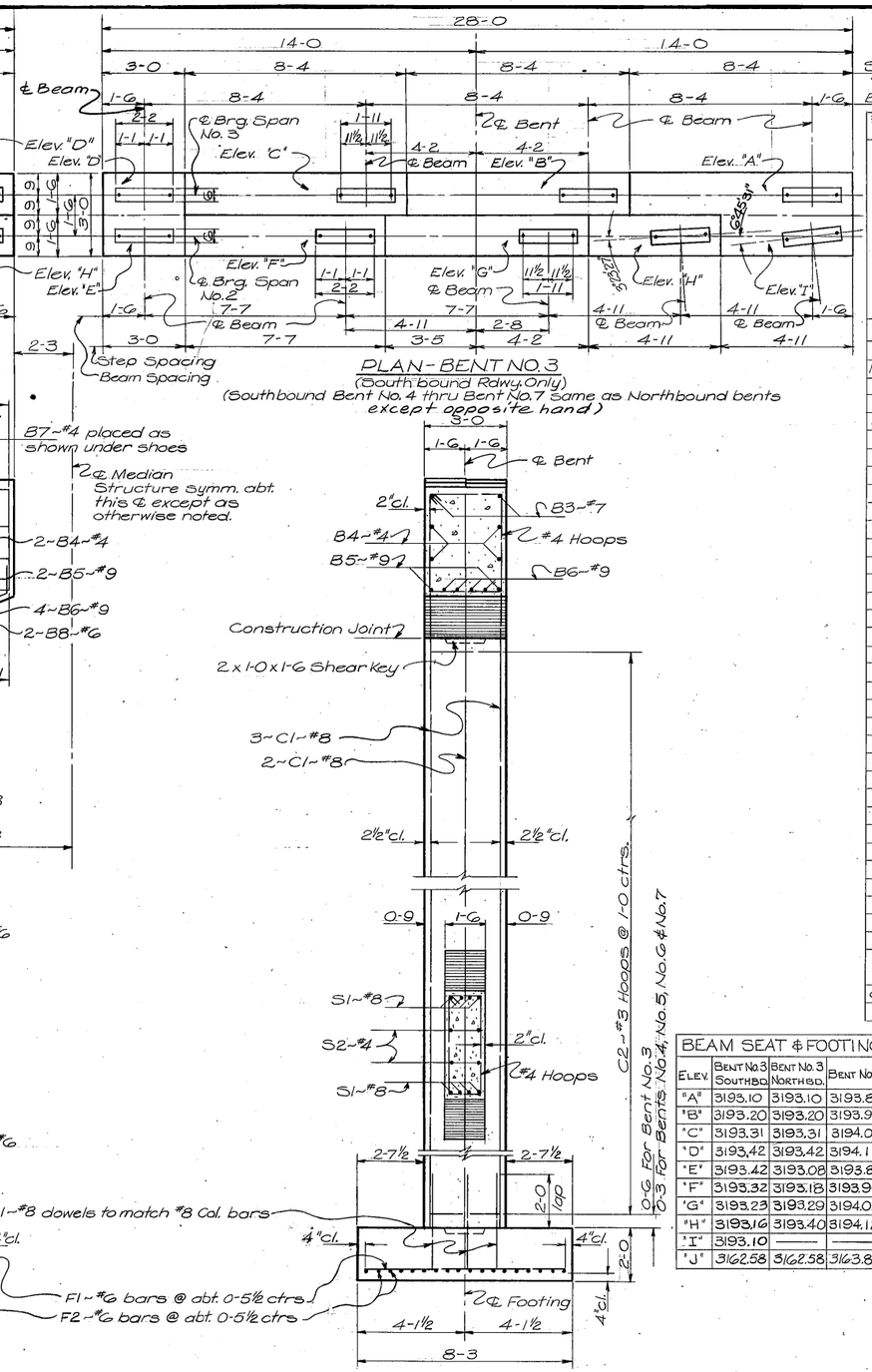
DRAWING NO. 5242

J.R.B.

FED. ROAD DIV. NO.	STATE	FED. AID PROJ. NO.		SHEET NO.	TOTAL SHEETS
8	MONT.	F-FG 215(7)		8	38



ELEVATION

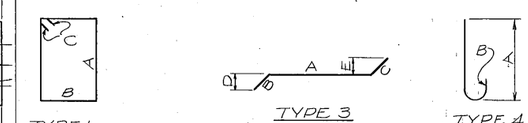


SECTION A-A

NOTE:- For beam seat elevations and footing elevations see table of "Beam Seat and Footing Elevations" this sheet.

NOTE:- Maximum Footing Pressure Under: D.L. + L.L. = 3.37 Tons/sq. ft.

* BILL OF REINFORCING STEEL (One Bent Only)



STRAIGHT BARS				BENT BARS (All dimensions are out to out)									
BENT NO. 3 Northbound													
MARK	SIZE	No.	LENGTH	MARK	SIZE	No.	TYPE	LENGTH	A	B	C	D	E
B1	#7	2	11'-0"	B8	#6	4	3	7'-9"	5'-9"	1'-0"	1'-0"	0'-11"	0'-11"
B2	7	12	9-0	B9	6	4	3	8-0	7-0	1-0		0-11	
B3	7	2	18-6	B10	4	1	1	13-6	3-8½	2-8	0-4½		
B4	4	4	27-8	B11	↓	↓	↓	14-2	4-0½	↓	↓		
B5	9	2	27-8	B12		↓		14-10	4-4½				
B6	9	4	20-6	B13		1		15-6	4-8½				
B7	4	8	2-8	B14		2		16-2	5-0½				
				B15		1		15-8	4-9½				
				B16		↓		15-2	4-6½				
C1	8	16	28-4	B17				14-8	4-3½				
				B18		↓		14-2	4-0½				
S1	8	8	20-1	B19		1		13-8	3-9½				
S2	4	4	19-0	B20		9		13-5	3-8				
S3	6	8	5-6	B21		4		13-10	3-10½				
				B22		1		14-1	4-0				
				B23		↓		14-7	4-3				
				B24				15-1	4-6				
				B25		↓		15-7	4-9				
F1	6	30	7-7	B26		1		16-1	5-0				
F2	#6	36	6-7	B27		2		16-7	5-3				
				B28		1		15-11	4-11				
				B29		↓		15-3	4-7				
				B30	↓	↓	↓	14-7	4-3	↓	↓		
				B31	4	1	1	13-11	3-11	2-8	0-4½		
				C2	3	46	1	9-4	2-8	1-8	0-4		
				D1	8	16	4	4-9	3-8	1-1			
				S5	4	13	1	10-5	3-8	1-2	0-4½		
				S6	4	2	1	15-1	6-0	1-2	0-4½		
				S7	#4	2	1	11-1	4-0	1-2	0-4½		
BENTS NO. 4 THRU NO. 7 (Same as Bent No. 3 Except for the following changes)													
C1	#8	16	27'-10"										

BEAM SEAT & FOOTING ELEVATIONS						
ELEV.	BENT No.3 SOUTHBD.	BENT No.3 NORTHBD.	BENT No.4	BENT No.5	BENT No.6	BENT No.7
"A"	3193.10	3193.10	3193.82	3194.61	3195.40	3196.18
"B"	3193.20	3193.20	3193.92	3194.71	3195.50	3196.28
"C"	3193.31	3193.31	3194.03	3194.82	3195.61	3196.39
"D"	3193.42	3193.42	3194.14	3194.93	3195.72	3196.50
"E"	3193.42	3193.08	3193.80	3194.59	3195.37	3196.16
"F"	3193.32	3193.18	3193.90	3194.69	3195.47	3196.26
"G"	3193.23	3193.29	3194.01	3194.80	3195.58	3196.37
"H"	3193.16	3193.40	3194.12	3194.91	3195.69	3196.48
"I"	3193.10	—	—	—	—	—
"J"	3162.58	3162.58	3163.80	3164.59	3165.37	3166.16

*NOTE:- Bill of Reinforcing Steel for Southbound Rdwy. Bent, same as Northbound Rdwy. Bent.

NOTES

OTHER NOTES :- For other notes see Dwgs. No. 5236 & No. 5237

STATE OF MONTANA
STATE HIGHWAY COMMISSION

HIGGINS AVENUE BRIDGE
OVER CLARK FORK & C.M.St. P.&P. R.R. IN MISSOULA
FEDERAL AID PROJECT NO. F-FG 215(7)
MISSOULA COUNTY
BENTS NO. 3 THRU NO. 7

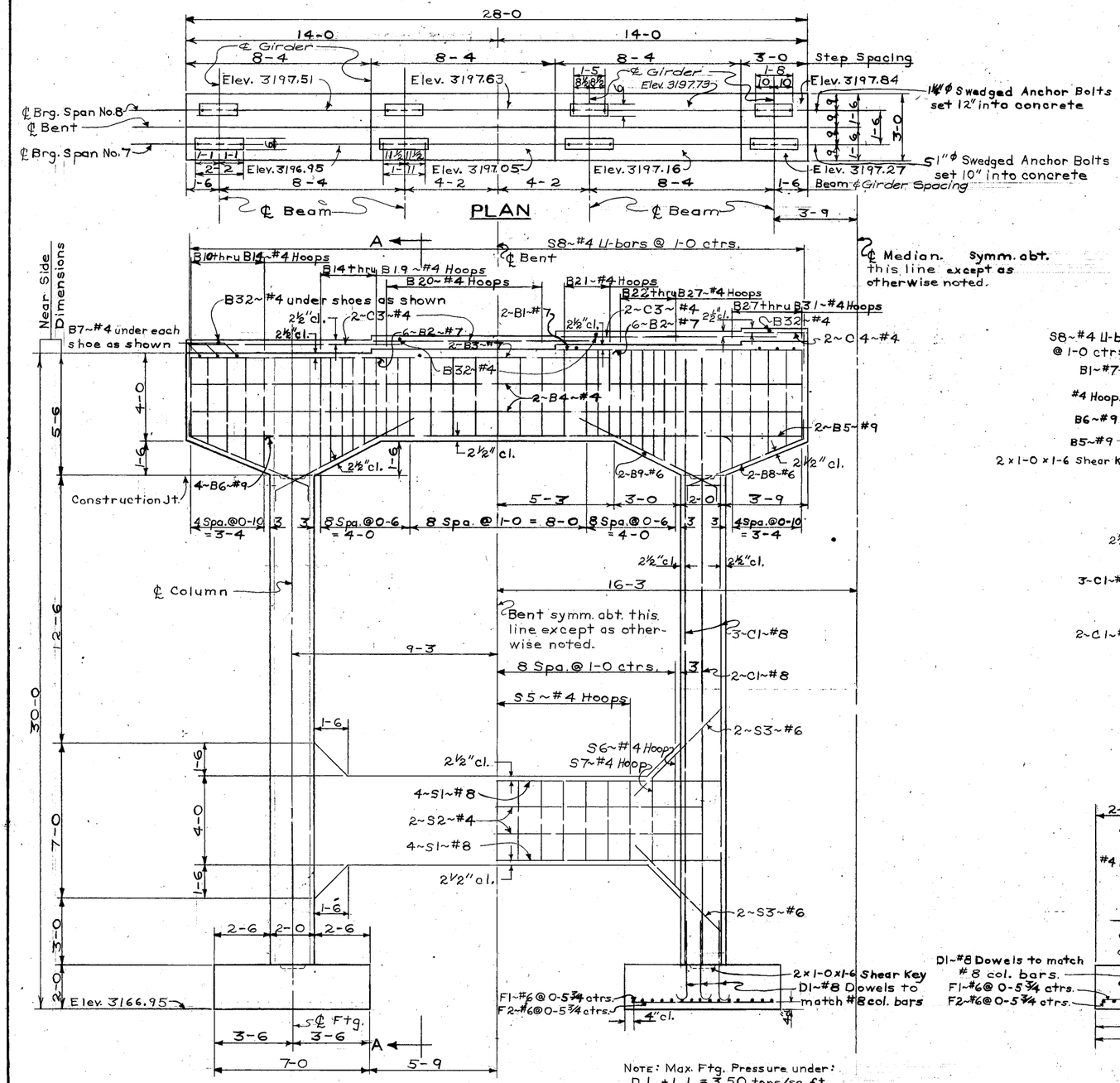
Scale:- 3/8" = 1'-0"

DESIGNED	R.K.	3-14-61
DRAWN	L.E.P.	3-23-61
TRACED		
CHECKED	C.A.M.	5-19-61
REVISED		
REVISED		

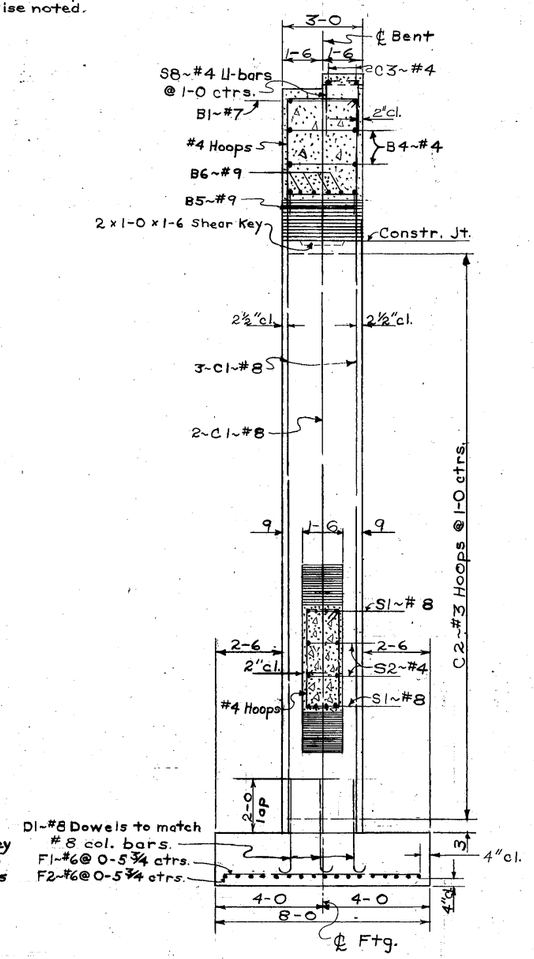
DRAWING NO. 5243

J.P.B.

FED. ROAD DIV. NO.	STATE	FED. AID PROJ. NO.		SHEET NO.	TOTAL SHEETS
8	MONT.	F-FG 215(7)		9	38

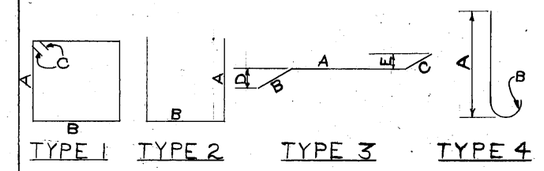


Note: Max. Ftg. Pressure under: D.L. + L.L. = 3.50 tons/sq. ft.



SECTION A-A

BILL OF REINFORCING STEEL (Northbound Rdwy. Bent Only)



STRAIGHT BARS				BENT BARS (All dimensions are out to out)									
MARK	SIZE	NO.	LENGTH	MARK	SIZE	NO.	TYPE	LENGTH	A	B	C	D	E
B1	#7	2	11'-0"	B8	#6	4	3	7'-9"	5'-9"	1'-0"	1'-0"	0'-11"	0'-11"
B2	7	12	9-0	B9	6	4	3	8-0	7-0	1-0		0-11	
B3	7	2	18-6	B10	4	1	1	13-6	3-8½	2-8	0-4½		
B4	4	4	27-8	B11	↓	1	↓	14-2	4-0½	↓	↓		
B5	9	2	27-8	B12		1		14-10	4-4½				
B6	9	4	20-6	B13		1		15-6	4-8½				
B7	4	8	2-8	B14		2		16-2	5-0½				
B32	4	4	1-2	B15		1		15-8	4-9½				
				B16		1		15-2	4-6½				
C1	8	16	27-10	B17		1		14-8	4-3½				
C3	4	6	9-7	B18		1		14-2	4-0½				
C4	4	2	2-8	B19		1		13-8	3-9½				
F1	6	30	7-4	B20		9		13-5	3-8				
F2	6	34	6-4	B21		4		13-10	3-10½				
				B22		1		14-1	4-0				
				B23		1		14-7	4-3				
S1	8	8	20-1	B24		1		15-1	4-6				
S2	4	4	19-0	B25		1		15-7	4-9				
S3	#6	8	5-6	B26		1		16-1	5-0				
				B27		2		16-7	5-3				
				B28		1		15-11	4-11				
				B29		1		15-3	4-7				
				B30	↓	1	↓	14-7	4-3	↓	↓		
				B31	4	1	1	13-11	3-11	2-8	0-4½		
				C2	3	46	1	9-4	2-8	1-8	0-4		
				D1	8	16	4	4-9	3-8	1-1			
				S5	4	13	1	10-5	3-8	1-2	0-4½		
				S6	4	2	1	15-1	6-0	1-2			
				S7	4	2	1	11-1	4-0	1-2			
				S8	#4	29	2	4-8	1-9	1-2			

*Note: Southbound Rdwy. Bent "Bill of Reinforcing Steel" same as Northbound Rdwy.

NOTES:

Other Notes: For other notes see Dwgs. No. 5236 & No. 5237

STATE OF MONTANA
STATE HIGHWAY COMMISSION

HIGGINS AVENUE BRIDGE
OVER CLARK FORK & C.M.St.P.&P.R.R. IN MISSOULA
FEDERAL AID PROJECT NO. FFG 215(7)
MISSOULA COUNTY
BENT NO. 8

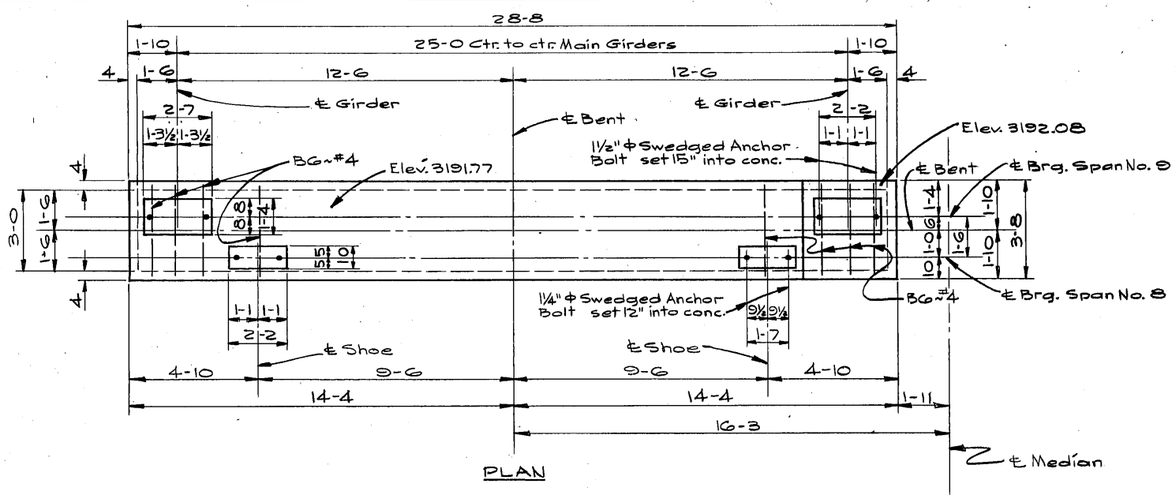
DESIGNED	D.N.	3-16-61
DRAWN	W.C.Q.	3-23-61
TRACED		
CHECKED	C.A.M.	8-3-61
REVISED		
REVISED		

Scale: 3/8" = 1'-0"

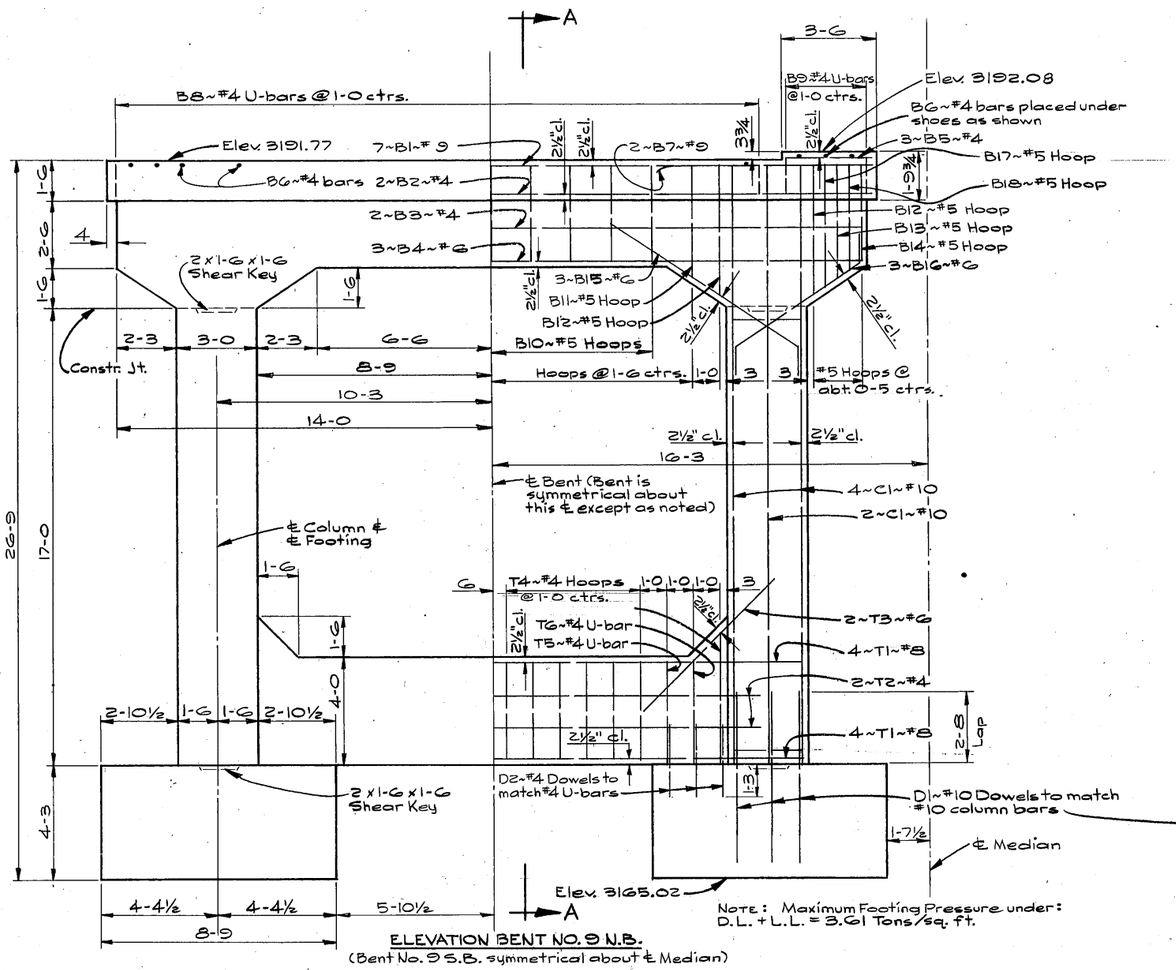
DRAWING NO. 5244

J.R.B.

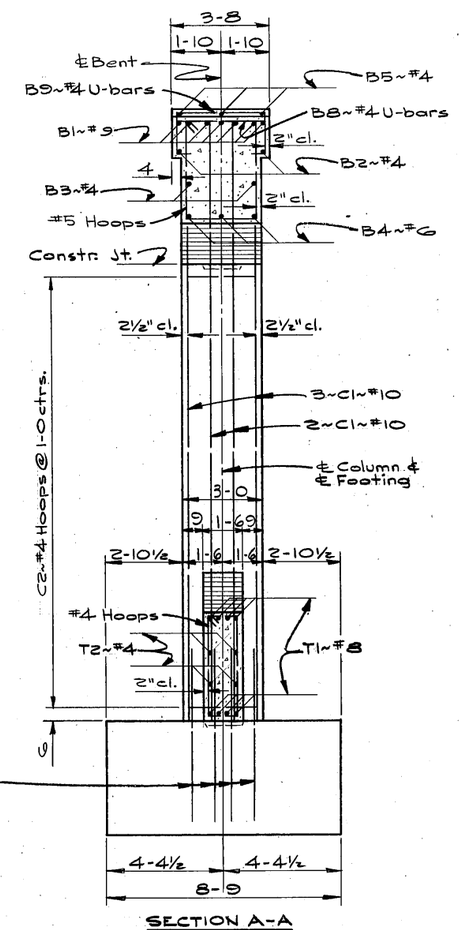
FED. ROAD DIV. NO.	STATE	FED. AID PROJ. NO.		SHEET NO.	TOTAL SHEETS
8	MONT.	F.F.G.215(7)		10	38



PLAN

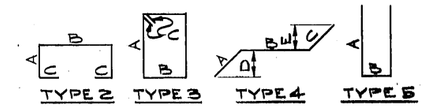


ELEVATION BENT NO. 9 N.B.
(Bent No. 9 S.B. symmetrical about ℄ Median)



SECTION A-A

*BILL OF REINFORCING STEEL (N.B. Bent Only)



STRAIGHT BARS				BENT BARS (All dimensions are out to out)									
MARK	SIZE	NO.	LENGTH	MARK	SIZE	NO.	TYPE	LENGTH	A	B	C	D	E
B1	#9	7	28'-4"										
B2	4	2	28-4	B8	#4	25	2	6'-8"	1'-2"	3'-4"	0'-6"		
B3	4	2	27-8	B9	4	4	2	7-4	1-6	3-4	0-6		
B4	6	3	27-8	B10	5	9	3	13-6	3-8	2-8	0-5		
B5	4	3	3-2	B11	5	2	3	14-10	4-4	2-8	0-5		
B6	4	8	3-4	B12	5	4	3	16-2	5-0	2-8	0-5		
B7	9	4	8-0	B13	5	2	3	14-11	4-4½	2-8	0-5		
				B14	5	2	3	13-8	3-9	2-8	0-5		
C1	10	20	22-4	B15	6	6	4	8-9	1-0	7-9		0'-10"	
				B16	6	6	4	7-10	1-0	5-10	1-0	0-10	0'-10"
				B17	5	2	3	15-7	4-8½	2-8	0-5		
D1	10	20	6-0	B18	5	2	3	14-4	4-1	2-8	0-5		
D2	4	12	2-8	C2	4	34	3	11-5	2-8	2-8	0-4½		
T1	8	8	23-2	T4	4	12	3	10-5	3-8	1-2	0-4½		
T2	4	4	20-0	T5	4	2	5	8-10	3-10	1-2			
T3	#6	4	5-6	T6	4	2	5	9-2	4-0	1-2			
				T7	#4	2	5	11-2	5-0	1-2			

*Note: Southbound Rdwy. Bent "Bill of Reinforcing Steel" same as Northbound Rdwy. Bent.

NOTES

OTHER NOTES: For other notes see Dwgs. No. 5236, No. 5237 & No. 5246.

STATE OF MONTANA
STATE HIGHWAY COMMISSION

HIGGINS AVENUE BRIDGE
OVER CLARK FORK & C.M.St. P.&P.R.R. IN MISSOULA
FEDERAL AID PROJECT NO. F-FG 215(7)
MISSOULA COUNTY
BENT NO. 9

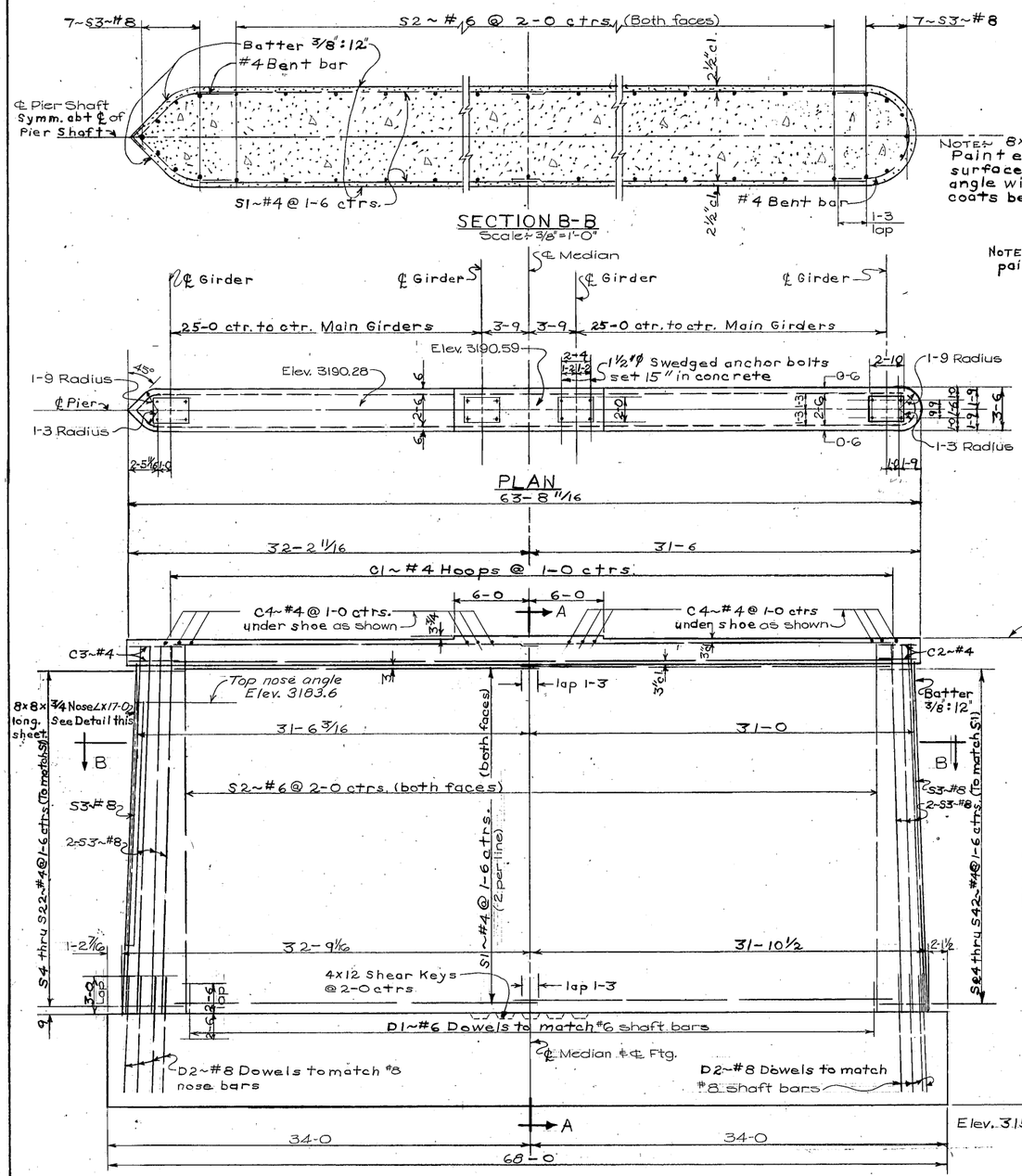
Scale: 3/8" = 1'-0"

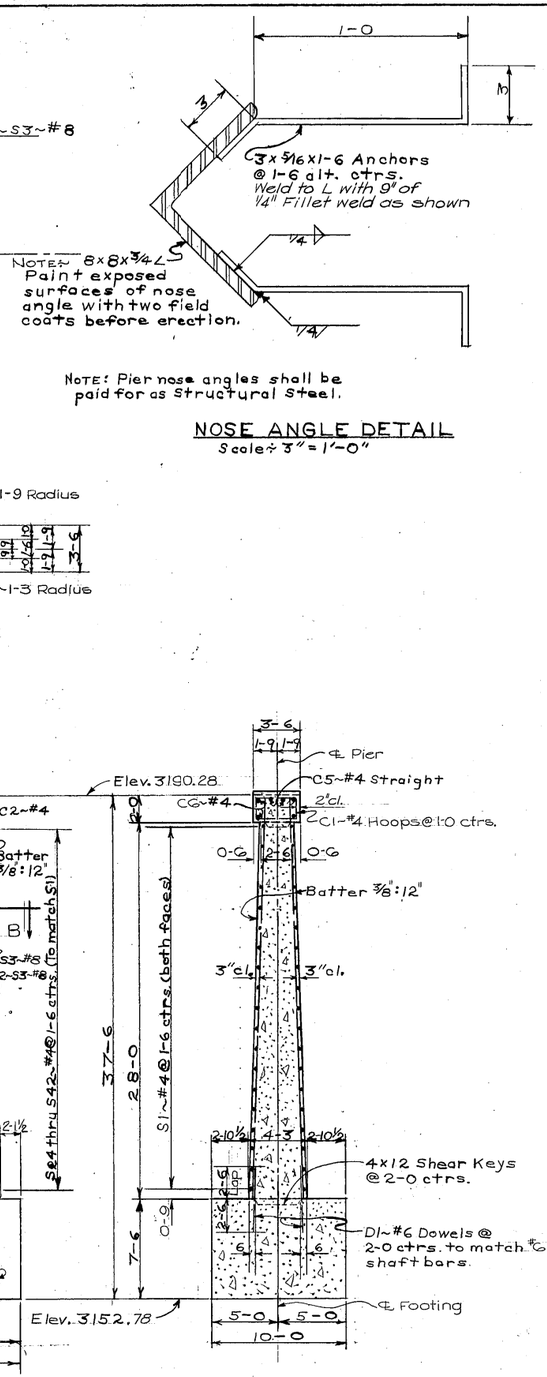
DESIGNED	G. D. O.	4-21-61
DRAWN	G. N. M.	425-61
TRACED		
CHECKED	C. A. M.	8-3-61
REVISED		
REVISED		

DRAWING NO. 5245

J.R.B.

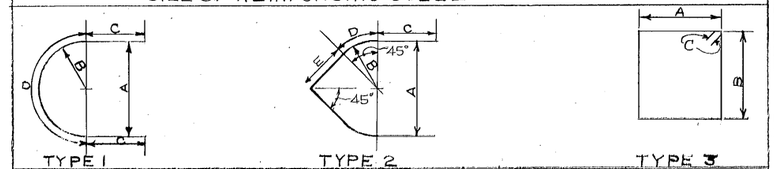
FED. ROAD DIV. NO.	STATE	FED. AID PROJ. NO.		SHEET NO.	TOTAL SHEETS
8	MONT.	F-FG 215(7)		11	38





NOTE: Max. Foundation Pressure under: D.L.+L.L.+B.+L.F.+.3W+W.L. = 4.40 Tons per sq. ft.

BILL OF REINFORCING STEEL



BENT BARS (All dimensions are out to out)

Mark	Size	No.	Type	Length	A	B	C	D	E
C1	#4	60	3	10-3	3-2½	1-7	0-4½		
C2	4	2	1	7-4	3-1	1-6½	1-3	4-10	
C3	4	2	2	8-0	3-1	1-6½	1-3	1-2½	1-6½
S4	4	1	2	6-3	2-1	1-0½	1-3	0-10	1-0½
S5	↑	↑	↑	6-5	2-2	1-1	↑	0-10½	1-1
S6				6-6	2-3	1-1½		0-10½	1-1½
S7				6-8	2-4	1-2		0-11	1-2
S8				7-0	2-6	1-3		1-0	1-3
S9				7-1	2-7	1-3½		1-0	1-3½
S10				7-3	2-8	1-4		1-0½	1-4
S11				7-5	2-9	1-4½		1-1	1-4½
S12				7-7	2-10	1-5		1-1½	1-5
S13				7-10	3-0	1-6		1-2	1-6
S14				8-0	3-1	1-6½		1-2½	1-6½
S15				8-2	3-2	1-7		1-3	1-7
S16				8-4	3-3	1-7½		1-3½	1-7½
S17				8-5	3-4	1-8		1-3½	1-8
S18				8-7	3-5	1-8½		1-4	1-8½
S19				8-9	3-6	1-9		1-4½	1-9
S20				8-11	3-7	1-9½		1-5	1-9½
S21	↓	↓	↓	9-1	3-8	1-10	↓	1-5½	1-10
S22	#4	1	2	9-4	3-10	1-11	1-3	1-6	1-11

Mark	Size	No.	Length	A	B	C	D	E
S24	#4	1	1	5-10	2-1	1-0½	1-3	3-3½
S25	↑	↑	↑	5-11	2-2	1-1	↑	3-5
S26				6-1	2-3	1-1½		3-6½
S27				6-2	2-4	1-2		3-8
S28				6-5	2-6	1-3		3-11
S29				6-7	2-7	1-3½		4-0½
S30				6-8	2-8	1-4		4-2
S31				6-10	2-9	1-4½		4-4
S32				7-0	2-10	1-5		4-6
S33				7-3	3-0	1-6		4-8½
S34				7-4	3-1	1-6½		4-10
S35				7-5	3-2	1-7		4-11
S36				7-7	3-3	1-7½		5-1
S37				7-9	3-4	1-8		5-3
S38				7-11	3-5	1-8½		5-4½
S39				8-0	3-6	1-9		5-6
S40				8-2	3-7	1-9½		5-8
S41	↓	↓	↓	8-3	3-8	1-10	↓	5-9
S42	#4	1	1	8-6	3-10	1-11	1-3	6-0

STRAIGHT BARS

Mark	Size	No.	Length	Mark	Size	No.	Length
C4	#4	12	3-2	S1	#4	76	30-5
C5	4	4	31-11	S2	6	58	29-9
C6	4	8	30-5	S3	#8	14	29-9
D1	6	58	5-0				
D2	#8	14	9-6				

NOTES

CONCRETE:- All concrete in Bent No. 9, Pier No. 10, Pier No. 11 & Bent No. 12 shall be Class "A". When approved by the Engineer, the contractor will be permitted to deposit Class "S" concrete for a portion or all of each footing of the above mentioned piers & bents as a seal course in which case he shall place it in accordance with the requirements for "Depositing Concrete Under Water" as called for in the Standard Specifications. Concrete placed outside of neat lines shown on the plans, or neat lines as modified by the Engineer as well as the change in mix for the seal will be for the contractors convenience and he shall include all cost connected therewith in the unit price bid for Class "A" concrete. All reinforcing bars shown to extend to below top of approved seal shall be in place and securely fastened before any concrete placing operations are started.

OTHER NOTES:- For other notes see Dwgs. No. 5236 & No. 5237.

STATE OF MONTANA
STATE HIGHWAY COMMISSION

HIGGINS AVENUE BRIDGE
OVER CLARK FORK & C.M.St. P.&P. R.R. IN MISSOULA
FEDERAL AID PROJECT NO. F-FG 215(7)
MISSOULA COUNTY
PIER NO. 10

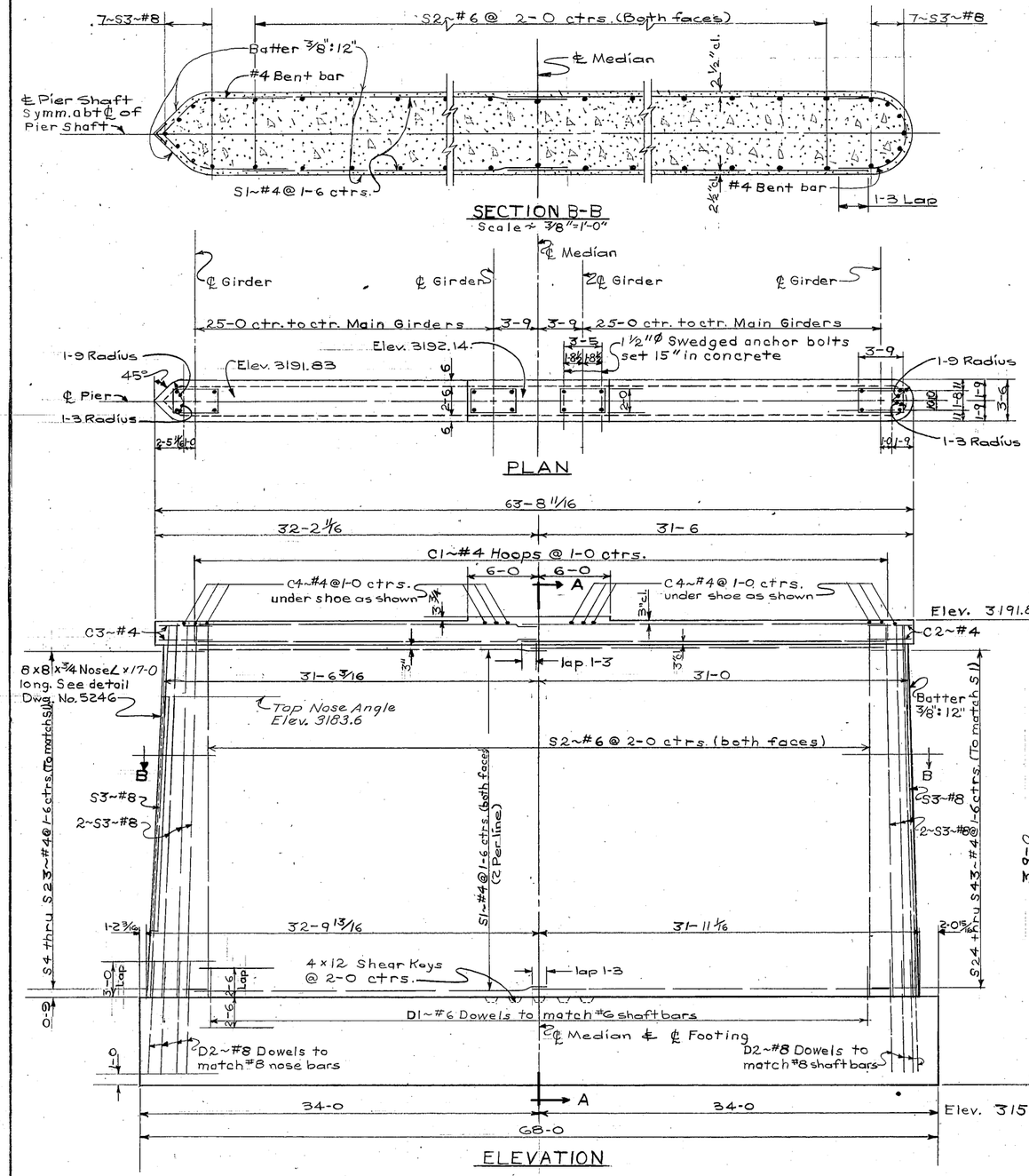
Scale: 3/16"=1'-0" Except As Noted.

DESIGNED	D.N.	2-28-61
DRAWN	W.C.O.	3-8-61
TRACED		
CHECKED	C.A.M.	8-4-61
REVISED		
REVISED		

DRAWING NO. 5246

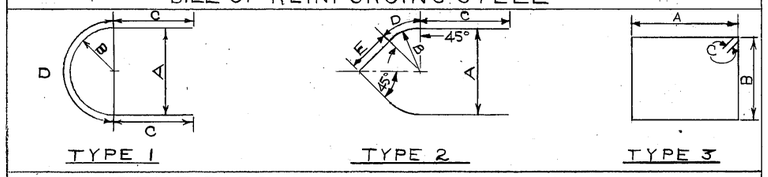
J.R.B.

FED. ROAD DIV. NO.	STATE	FED. AID PROJ. NO.		SHEET NO.	TOTAL SHEETS
8	MONT.	F-FG 215(7)		12	38



NOTE: Max. Foundation Pressure under: D.L.+L.L.+B. = 3.46 Tons per sq. ft.

BILL OF REINFORCING STEEL



TYPE 1 TYPE 2 TYPE 3

BENT BARS (All dimensions are out to out)

Mark	Size	No.	Type	Length	A	B	C	D	E
C1	#4	60	3	10'-3"	3'-2"	1'-7"	0'-4½"		
C2	4	2	1	7-4	3-1	1-6½	1-3	4'-10"	
C3	4	2	2	8-0	3-1	1-6½	1-3	1-2½	1'-6½"
S4	4	1	2	6-3	2-1	1-0½	1-3	0-10	1-0½
S5	▲	▲	▲	6-5	2-2	1-1	▲	0-10½	1-1
S6				6-6	2-3	1-1½		0-10½	1-1½
S7				6-8	2-4	1-2		0-11	1-2
S8				7-0	2-6	1-3		1-0	1-3
S9				7-1	2-7	1-3½		1-0	1-3½
S10				7-3	2-8	1-4		1-0½	1-4
S11				7-5	2-9	1-4½		1-1	1-4½
S12				7-7	2-10	1-5		1-1½	1-5
S13				7-10	3-0	1-6		1-2	1-6
S14				8-0	3-1	1-6½		1-2½	1-6½
S15				8-2	3-2	1-7		1-3	1-7
S16				8-4	3-3	1-7½		1-3½	1-7½
S17				8-5	3-4	1-8		1-3½	1-8
S18				8-7	3-5	1-8½		1-4	1-8½
S19				8-9	3-6	1-9		1-4½	1-9
S20				8-11	3-7	1-9½		1-5	1-9½
S21				9-1	3-8	1-10		1-5½	1-10
S22	▼	▼	▼	9-4	3-10	1-11	▼	1-6	1-11
S23	#4	1	2	9-6	3-11	1-11½	1-3	1-6½	1-11½

Mark	Size	No.	Type	Length	A	B	C	D	E
S24	#4	1	1	5'-10"	2'-1"	1'-0½	1'-3"	3'-3½"	
S25	▲	▲	▲	5-11	2-2	1-1	▲	3-5	
S26				6-1	2-3	1-1½		3-6½	
S27				6-2	2-4	1-2		3-8	
S28				6-5	2-6	1-3		3-11	
S29				6-7	2-7	1-3½		4-0½	
S30				6-8	2-8	1-4		4-2	
S31				6-10	2-9	1-4½		4-4	
S32				7-0	2-10	1-5		4-6	
S33				7-3	3-0	1-6		4-8½	
S34				7-4	3-1	1-6½		4-10	
S35				7-5	3-2	1-7		4-11	
S36				7-7	3-3	1-7½		5-1	
S37				7-9	3-4	1-8		5-3	
S38				7-11	3-5	1-8½		5-4½	
S39				8-0	3-6	1-9		5-6	
S40				8-2	3-7	1-9½		5-8	
S41				8-3	3-8	1-10		5-9	
S42	▼	▼	▼	8-6	3-10	1-11	▼	6-0	
S43	#4	1	1	8-8	3-11	1-11½	1-3	6-2	

STRAIGHT BARS

Mark	Size	No.	Length	Mark	Size	No.	Length
C4	#4	12	3'-2"	S1	#4	80	30'-5"
C5	4	4	31-11	S2	6	58	31-3
C6	4	8	30-5	S3	#8	14	31-3
D1	6	58	5-0				
D2	#8	14	9-6				

NOTES

OTHER NOTES:~ For other notes see Dwgs. No. 5236, No. 5237 & No. 5246.

STATE OF MONTANA
STATE HIGHWAY COMMISSION

HIGGINS AVENUE BRIDGE
OVER CLARK FORK & C.M.St.P.&P.R.R. IN MISSOULA
FEDERAL AID PROJECT NO. F-FG 215(7)
MISSOULA COUNTY
PIER NO. 11

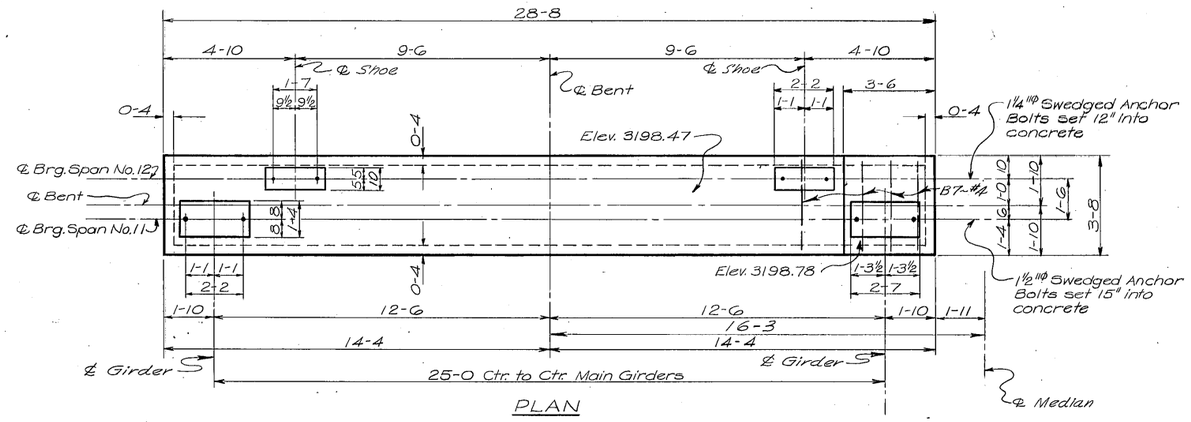
Scale:- 3/16" = 1'-0"

DESIGNED	D. N.	2-28-61
DRAWN	W. C. O.	3-13-61
TRACED		
CHECKED	C.A.M.	8-4-61
REVISED		
REVISED		

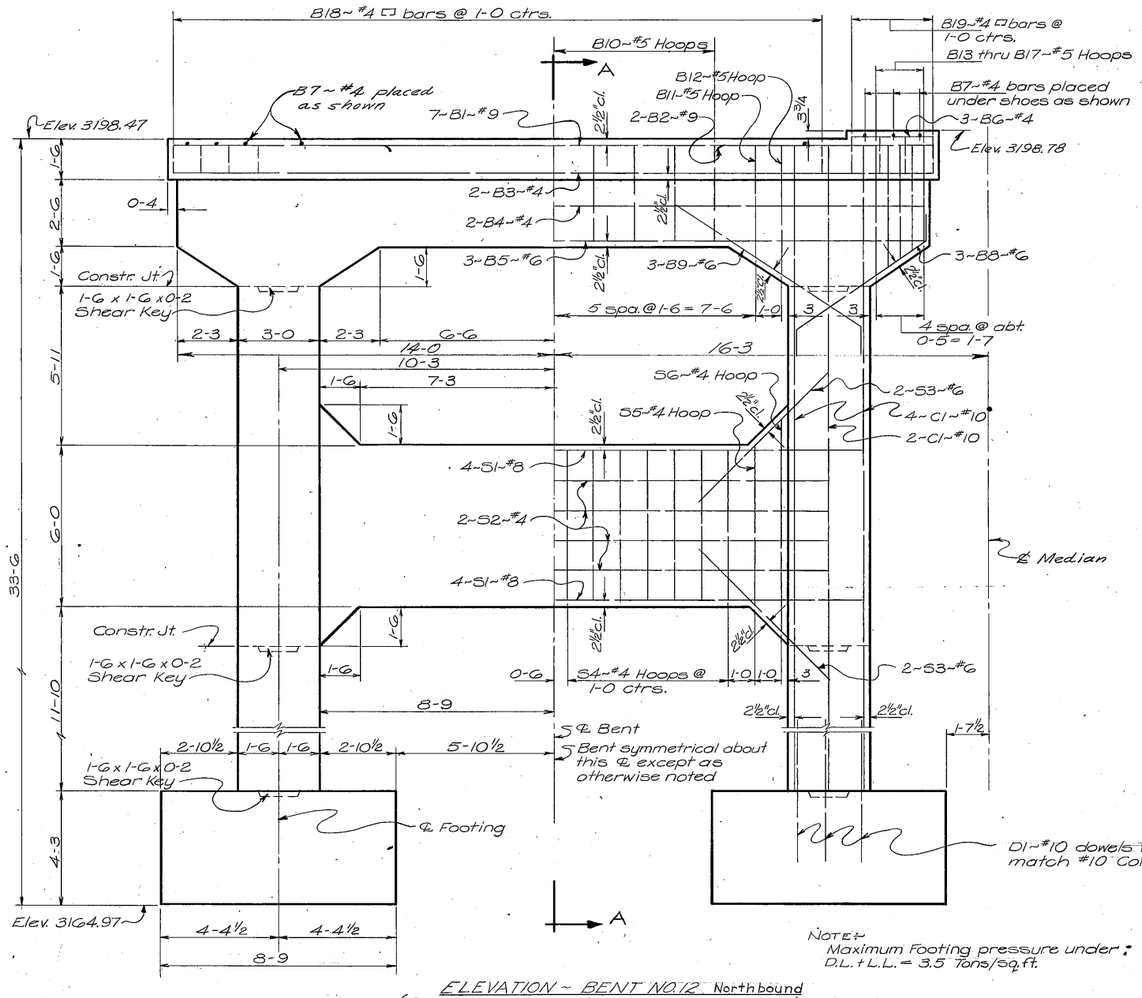
DRAWING NO. 5247

J.R.B.

FED. ROAD DIV. NO.	STATE	FED. AID PROJ. NO.		SHEET NO.	TOTAL SHEETS
8	MONT.	F-FG 215(7)		13	38

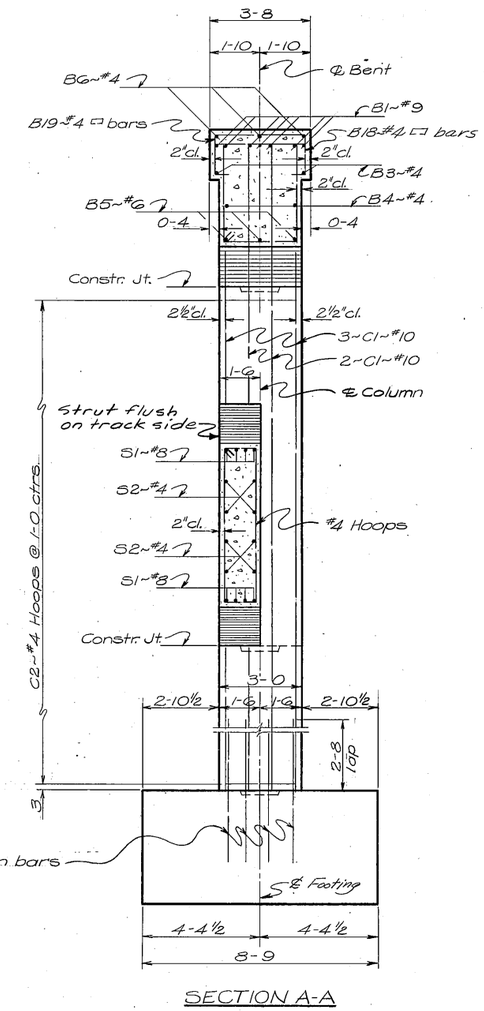


PLAN



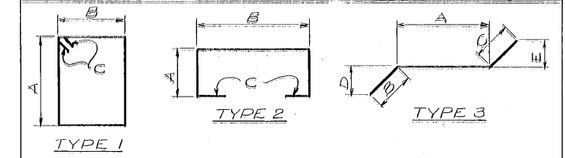
ELEVATION ~ BENT NO. 12 Northbound
(BENT NO. 12 Southbound Symm. About ℄ Median)

NOTE:
Maximum Footing pressure under:
D.L. + L.L. = 3.5 Tons/sq. ft.



SECTION A-A

* BILL OF REINFORCING STEEL (N.B. Bent Only)



STRAIGHT BARS				BENT BARS (All dimensions are out to out)									
MARK	SIZE	NO.	LENGTH	MARK	SIZE	NO.	TYPE	LENGTH	A	B	C	D	E
B1	#9	7	28'-4"	B8	#6	6	3	7'-10"	5'-10"	1'-0"	1'-0"	0'-10"	0'-10"
B2	9	4	8-0	B9	6	6	3	8-9	7-9	1-0	—	0-10	—
B3	4	2	28-4	B10	5	9	1	13-6	3-8	2-8	0-5		
B4	4	2	27-8	B11	5	2	↓	14-10	4-4	↓	0-5		
B5	6	3	27-8	B12	5	↓		16-2	5-0		0-5		
B6	4	3	3-2	B13	5			16-2	5-0		0-5		
B7	4	8	3-4	B14	5			15-7	48½		↓		
				B15	5			14-11	4-4½				
C1	10	20	29-1	B16	5	↓	↓	14-4	4-1	↓	↓		
				B17	5	2	1	13-8	3-9	2-8	0-5		
D1	10	20	5-4	B18	4	25	2	6-8	1-2	3-4	0-6		
				B19	4	4	2	7-4	1-6	3-4	0-6		
S1	8	8	23-2	C2	4	48	1	11-5	2-8	2-8	0-4½		
S2	4	8	20-0										
S3	#6	8	5-6	S4	4	14	1	14-5	1-2	5-8	0-4½		
				S5	4	2	1	15-1	1-2	6-0	0-4½		
				S6	#4	2	1	19-1	1-2	8-0	0-4½		

* Note: South bound Rdwy. Bent "Bill of Reinforcing Steel" same as North bound Rdwy. Bent.

NOTES

OTHER NOTES: For other notes see Dwgs. No. 5236 & No. 5237.

STATE OF MONTANA
STATE HIGHWAY COMMISSION

HIGGINS AVENUE BRIDGE
OVER CLARK FORK & C.M. St. P. & P. R.R. IN MISSOULA
FEDERAL AID PROJECT NO. F-FG 215(7)
MISSOULA COUNTY
BENT NO. 12

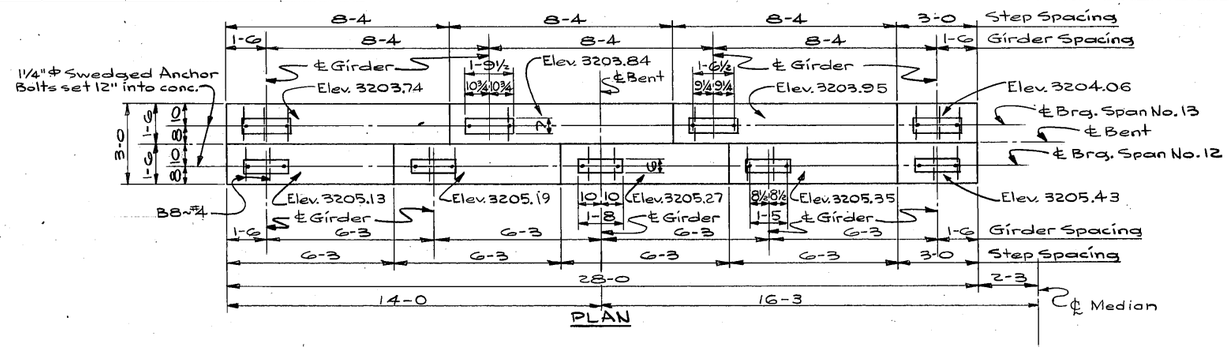
DESIGNED	D. N.	4-18-61
DRAWN	L.E.P.	4-21-61
TRACED		
CHECKED	C.A.M.	7-31-61
REVISED		
REVISED		

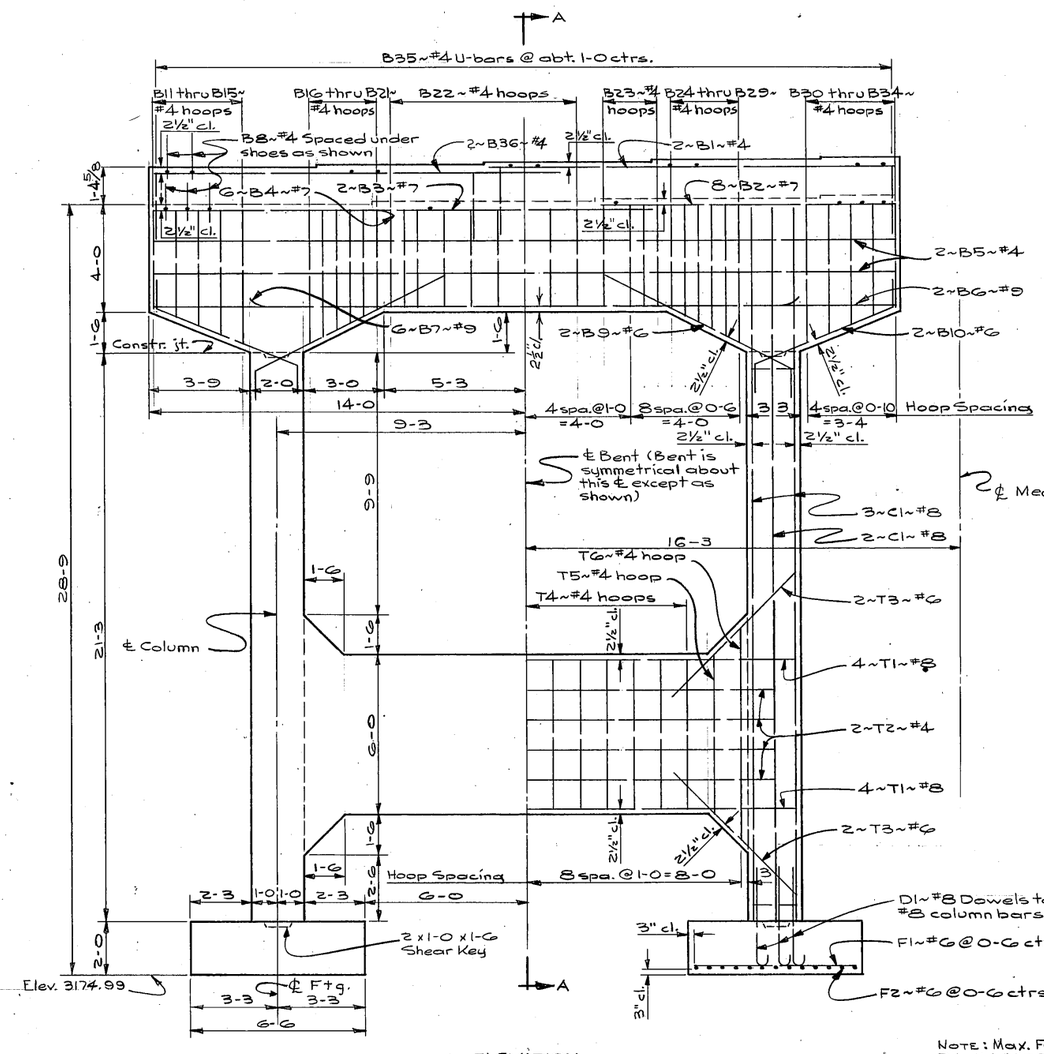
Scale: 3/8" = 1'-0"

DRAWING NO. 5248

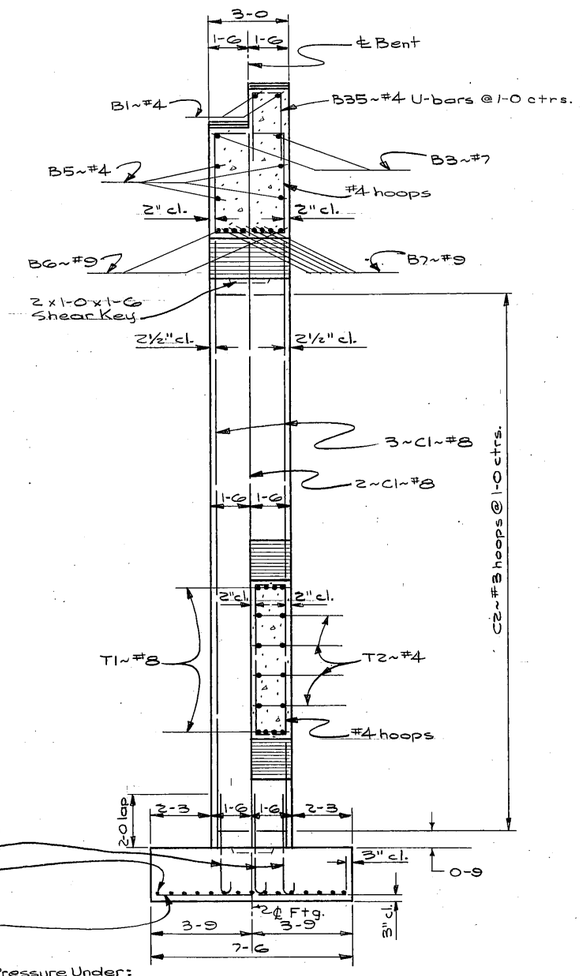
J.R.B.

FED. ROAD DIV. NO.	STATE	FED. AID PROJ. NO.		SHEET NO.	TOTAL SHEETS
8	MONT.	F-FG215(7)		14	38





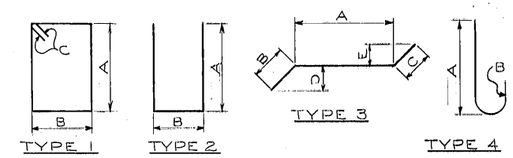
ELEVATION
(Ahead on Line)



SECTION A-A

NOTE: Max. Footing Pressure Under: D.L. + L.L. = 3.43 Tons/sq. ft.

BILL OF REINFORCING STEEL



STRAIGHT BARS				BENT BARS (All dimensions are out to out)									
MARK	SIZE	NO.	LENGTH	MARK	SIZE	NO.	TYPE	LENGTH	A	B	C	D	E
B1	#4	2	15'-2"	B9	#6	4	3	8'-0"	7'-0"	1'-0"	—	0'-11"	—
B2	7	8	11-0	B10	6	4	3	7-9	5-9	1-0	1'-0"	0-11	0'-11"
B3	7	2	18-7	B11	4	1	1	13-6	3-8½	2-8	0-4½		
B4	7	6	9-0	B12	↑	↑	↑	14-2	4-0½	↑	↑		
B5	4	4	27-8	B13				14-10	4-4½				
B6	9	2	27-8	B14				15-6	4-8½				
B7	9	6	20-6	B15				16-2	5-0½				
B8	4	18	1-2	B16				16-2	5-0½				
B36	4	2	13-9	B17				15-8	4-9½				
				B18				15-2	4-6½				
C1	8	16	26-7	B19				14-8	4-3½				
				B20		↓		14-2	4-0½				
F1	6	30	6-0	B21		1		13-8	3-9½				
F2	6	26	7-0	B22		9		13-5	3-8				
				B23		4		13-10	3-10½				
T1	8	8	20-2	B24		1		14-1	4-0				
T2	4	8	19-0	B25		↑		14-7	4-3				
T3	#6	8	5-6	B26				15-1	4-6				
				B27				15-7	4-9				
				B28				16-1	5-0				
				B29				16-7	5-3				
				B30				16-7	5-3				
				B31				15-11	4-11				
				B32				15-3	4-7				
				B33		↓		14-7	4-3	↓	↓		
				B34	↓	1	1	13-11	3-11	2-8	0-4½		
				B35	4	29	2	6-2	2-6	1-2			
				C2	3	42	1	9-4	2-8	1-8	0-4		
				D1	8	16	4	4-10	3-9	1-1			
				T4	4	13	1	14-5	5-8	1-2	0-4½		
				T5	4	2	1	15-1	6-0	1-2	0-4½		
				T6	#4	2	1	19-1	8-0	1-2	0-4½		

NOTES

OTHER NOTES + For other notes see Dwgs No. 5236 & No. 5237

STATE OF MONTANA
STATE HIGHWAY COMMISSION

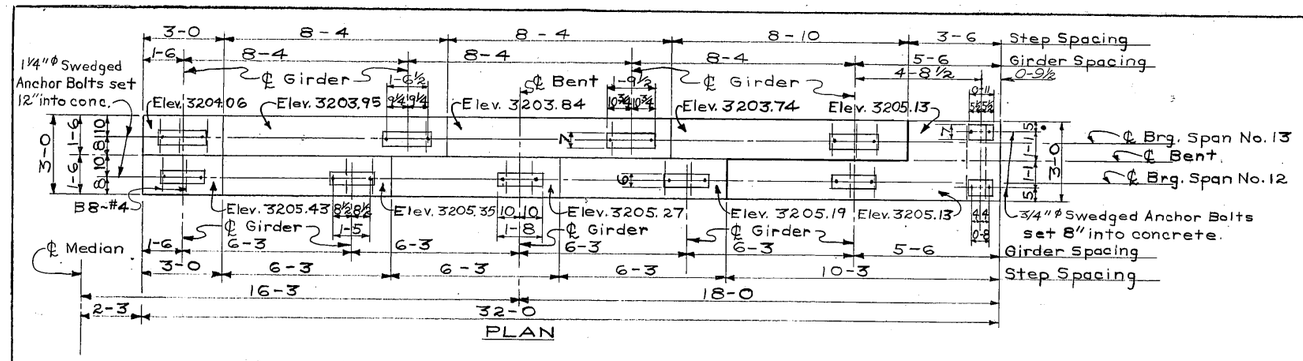
HIGGINS AVENUE BRIDGE
OVER CLARK FORK & C.M. ST. P. & P. R.R. IN MISSOULA
FEDERAL AID PROJECT NO. F-FG 215(7)
MISSOULA COUNTY
BENT NO. 13 NORTHBOUND RDWY.
Scale: 3/8" = 1'-0"

DESIGNED	D.N.	6-21-61
DRAWN	G.N.M.	6-23-61
TRACED		
CHECKED	C.A.M.	8-4-61
REVISED		
REVISED		

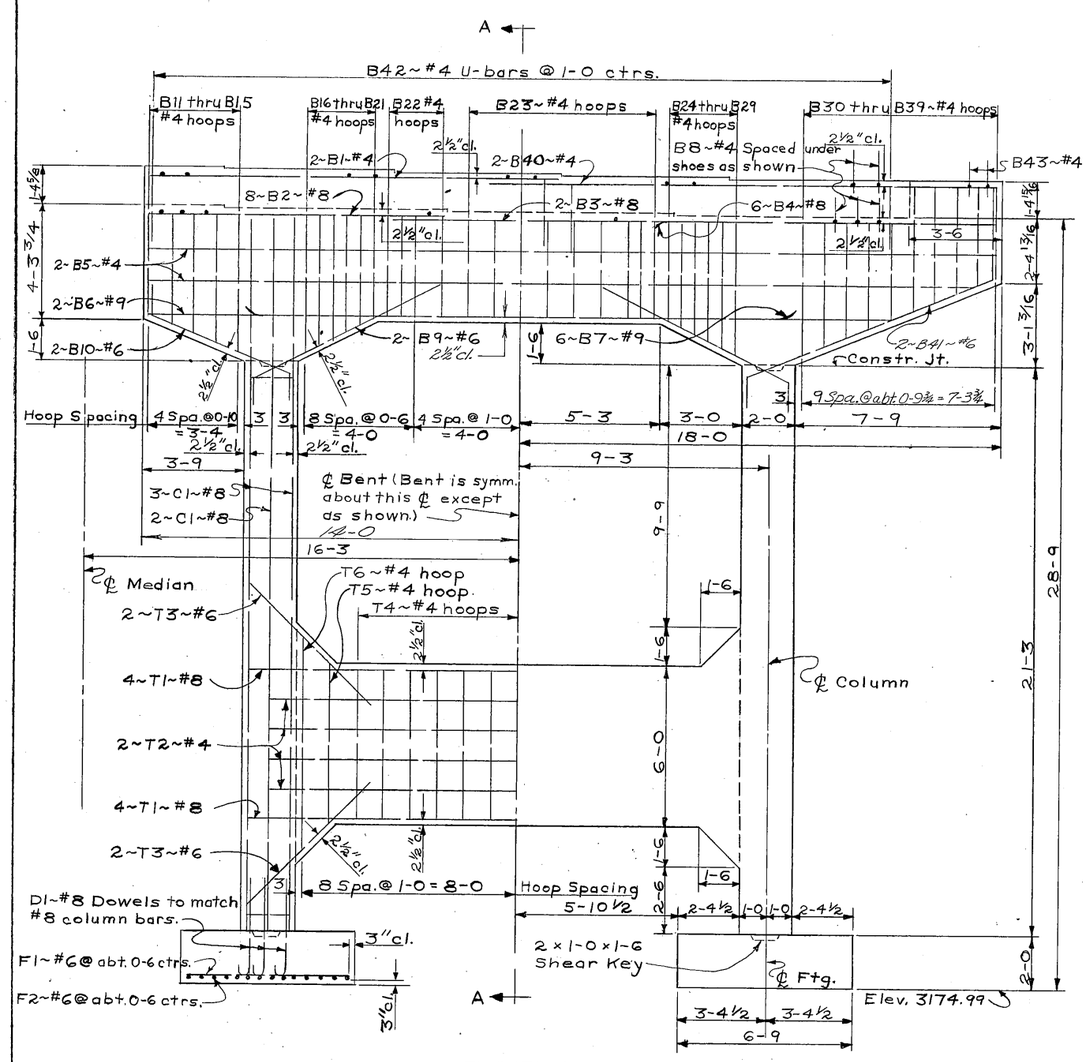
DRAWING NO. 5249

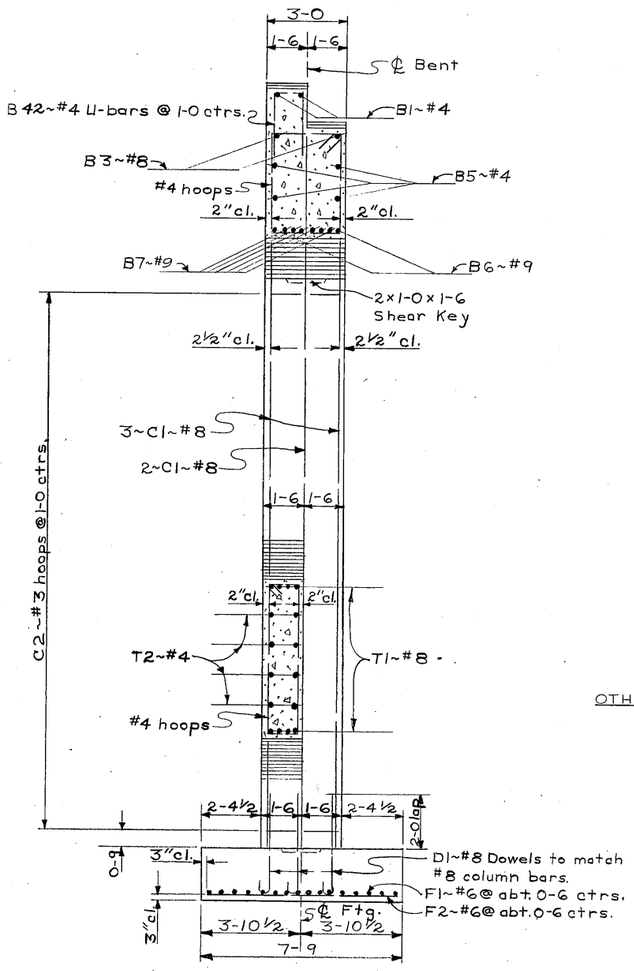
J.R.B.

FED. ROAD DIV. NO.	STATE	FED. AID PROJ. NO.		SHEET NO.	TOTAL SHEETS
8	MONT.	F-FG215(7)		15	38

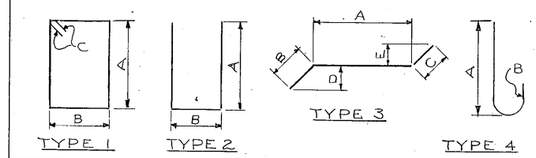


NOTE: Contractor shall finish concrete under stairway supporting masonry plates slighty high and bush hammer to exact elevation shown. These masonry plates shall be placed on 3 layers of canvas thoroughly swabbed with red lead, as called for in the Standard Specifications.





BILL OF REINFORCING STEEL



STRAIGHT BARS

MARK	SIZE	NO.	LENGTH
B1	#4	2	15'-2"
B2	8	8	11-0
B3	8	2	22-7
B4	8	6	13-3
B5	4	4	31-8
B6	9	2	27-10
B7	9	6	20-6
B8	4	18	1-2
B40	4	2	17-9
B43	4	2	2-8
C1	8	16	26-7
F1	6	32	6-3
F2	6	28	7-3
T1	8	8	20-2
T2	4	8	19-0
T3	#6	8	5-6

BENT BARS (All dimensions are out to out)

MARK	SIZE	NO.	TYPE	LENGTH	A	B	C	D	E
B9	#6	4	3	8'-0"	7'-0"	1'-0"		0'-11"	
B10	6	2	3	7-9	5-9	1-0	1'-0"	0-11	0'-11"
B11	4	1	1	13-11	3-11	2-8	0-4½		
B12	↑	↑	↑	14-7	4-3	↑	↑		
B13				15-3	4-7				
B14				15-11	4-11				
B15				16-7	5-3				
B16				16-7	5-3				
B17				16-1	5-0				
B18				15-7	4-9				
B19				15-1	4-6				
B20		↓		14-7	4-3				
B21		1		14-1	4-0				
B22		4		13-10	3-10½				
B23		9		13-5	3-8				
B24		1		13-8	3-9½				
B25		↑		14-2	4-0½				
B26				14-8	4-3½				
B27				15-2	4-6½				
B28				15-8	4-9½				
B29				16-2	5-0½				
B30				16-3	5-1				
B31				15-8	4-9½				
B32				15-0	4-5½				
B33				14-5	4-2				
B34				13-9	3-10				
B35				15-11	4-11				
B36				15-3	4-7				
B37				14-7	4-3				
B38	↓	↓	↓	13-11	3-11	↓	↓		
B39	4	1	1	13-3	3-7	2-8	0-4½		
B41	6	2	3	12-0	10-0	1-0	1-0	0-11	0-11
B42	4	29	2	6-2	2-6	1-2			
C2	3	42	1	9-4	2-8	1-8	0-4		
D1	8	16	4	4-10	3-9	1-1			
T4	4	13	1	14-5	5-8	1-2	0-4½		
T5	4	2	1	15-1	6-0	1-2	0-4½		
T6	#4	2	1	19-1	8-0	1-2	0-4½		

NOTES

OTHER NOTES: For other notes see Dwgs. No. 5236 & No. 5237.

NOTE: Max. Footing Pressure Under: D.L. + L.L. = 3.36 Tons/sq. ft.

STATE OF MONTANA
STATE HIGHWAY COMMISSION

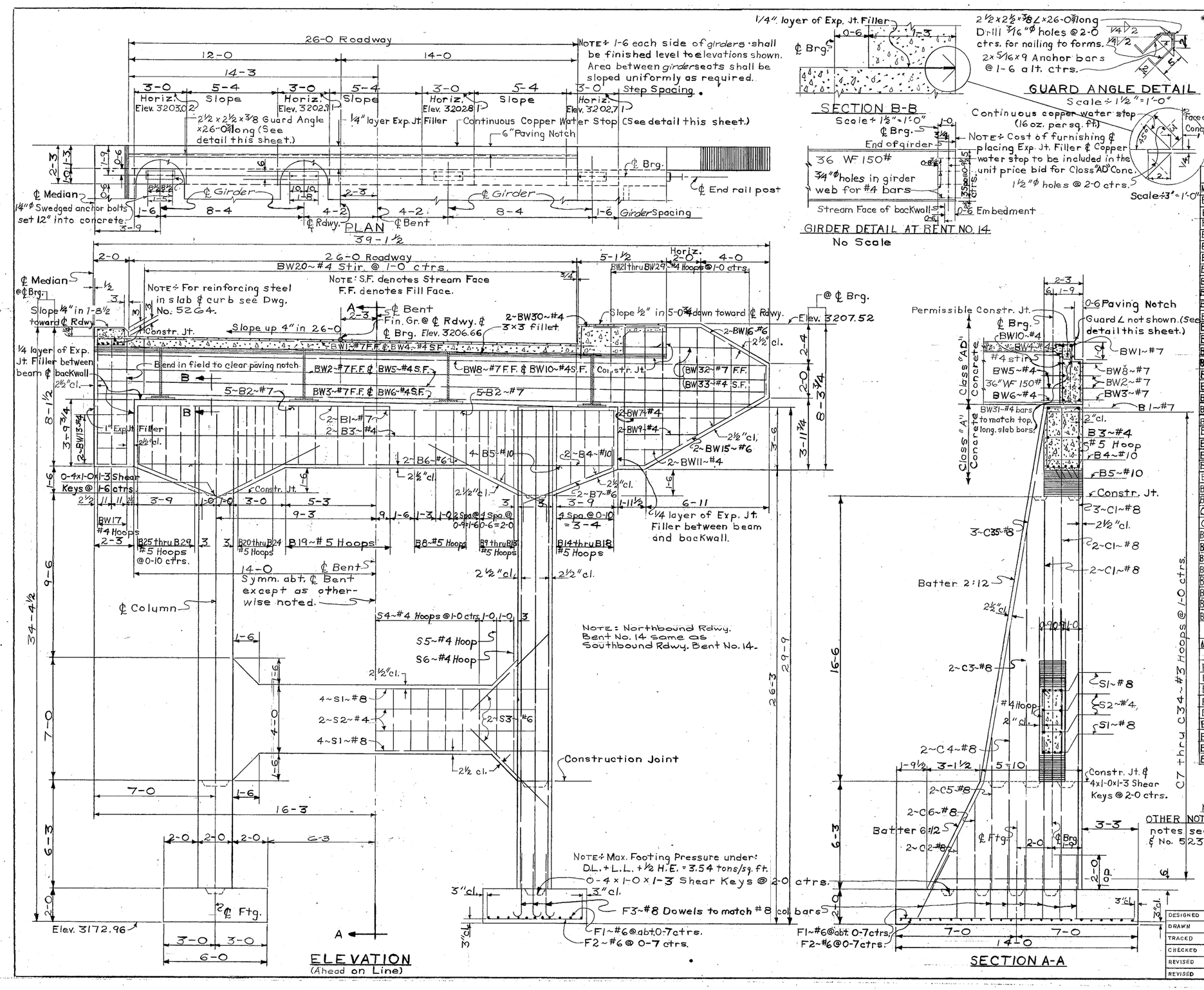
HIGGINS AVENUE BRIDGE
OVER CLARK FORK & C.M. St. P. & P. R.R. IN MISSOULA
FEDERAL AID PROJECT NO. F-FG 215(7)
MISSOULA COUNTY
BENT NO. 13 SOUTHBOUND ROWY.
Scale: 3/8" = 1'-0"

DESIGNED	GDO	7-13-61
DRAWN	WCO	7-17-61
TRACED		
CHECKED	C.A.M.	7-31-61
REVISED		
REVISED		

DRAWING NO. 5250

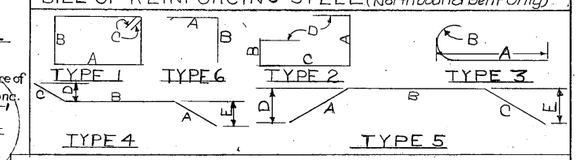
J.R.B.

FED. ROAD DIV. NO.	STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
8	MONT.	F-FG 215(7)	16	38



*NOTE: Southbound Rdwy. Bent "Bill of Reinforcing Steel" same as Northbound Rdwy. Bent.

*BILL OF REINFORCING STEEL (Northbound Bent Only)



BENT BARS (All dimensions are out to out)

Mark	Size	No.	Type	Length	A	B	C	D	E	Mark	Size	No.	Type	Length	A	B	C	D	E
B6	#6	4	4	8'-6"	1'-0"	7-6"				BW26	#4	1	1	11'-1"	0'-11"	4'-3"	0'-4½"		
B7	6	4	4	7-9	1-0	5-9	1'-0"	0'-11"	0'-11"	BW29	4	1	1	8-7	0-11	3-0	0-4½		
B8	5	4	1	11-0	1-11	3-2	0-5			BW30	4	2	6	6-9	4-8	2-1			
B9	↑	1	↑	11-9	↑	3-6½	↑			C7	3	2	1	7-11	1-11½	1-8	0-4		
B10		↑		12-3		3-9½				C8	↑	↑	↑	8-3	2-1½	↑	↑		
B11				12-9		4-0½				C9				8-7	2-3½				
B12				13-3		4-3½				C10				8-11	2-5½				
B13				13-9		4-6½				C11				9-3	2-7½				
B14				11-1		3-2½				C12				9-7	2-9½				
B15				11-9		3-6½				C13				9-11	2-11½				
B16				12-5		3-10½				C14				10-3	3-1½				
B17		↓		13-1		4-2½				C15				10-7	3-3½				
B18		1		13-9		4-6½				C16				10-11	3-5½				
B19		6		11-6		3-5				C17				11-3	3-7½				
B20		1		12-5		3-10½				C18				11-7	3-9½				
B21		↑		12-10		4-1				C19				11-11	3-11½				
B22				13-4		4-4				C20				12-3	4-1½				
B23				13-10		4-7				C21				12-7	4-3½				
B24				14-4		4-10				C22				12-11	4-5½				
B25				11-7		3-5½				C23				13-3	4-7½				
B26				12-3		3-9½				C24				13-7	4-9½				
B27				13-0		4-2				C25				13-11	4-11½				
B28	↓	↓	↓	13-9	↓	4-6½	↓			C26				14-3	5-1½				
B29	5	1	1	14-5	1-11	4-10	0-5			C27				14-7	5-3½				
BW15	6	2	5	11-4	1-9	7-10	1-9	0-10½	0-10½	C28				14-11	5-5½				
BW16	6	2	5	8-10	3-5	4-5	1-0	1-10	0-10	C29				15-8	5-10				
BW17	4	3	1	17-3	0-11	7-4	0-4½			C30				16-8	6-4				
C2	8	4	3	6-1	5-0	1-1				C31				17-8	6-10				
C6	8	4	3	8-1	7-0	1-1				C32				18-8	7-4				
BW20	4	25	2	7-1	3-4	2-4	0-11	0-3		C33	↓	↓	↓	19-8	7-10	↓	↓		
BW21	↑	1	1	11-11	0-11	4-8	0-4½			C34	3	2	1	20-8	8-4	1-8	0-4		
BW22		↑	↑	18-7	↑	8-0	↑			C35	8	6	4	28-6		2-8	6-10	2'-0"	—
BW23				18-7		8-0				F3	8	32	3	4-10	3-9	1-1			
BW24				18-1		7-9				S4	4	13	1	10-5	1-2	3-8	0-4½		
BW25				16-9		7-1				S5	4	2	1	11-1	1-2	4-0	0-4½		
BW26	↓	↓	↓	15-7	↓	6-6	↓			S6	4	2	1	15-1	1-2	6-0	0-4½		
BW27	#4	1	1	13-7	0-11	5-6	0-4½			BW31	#4	19	6	3-3	2-0	1-3			

STRAIGHT BARS

Mark	Size	No.	Length	Mark	Size	No.	Length	Mark	Size	No.	Length
B1	#7	4	14'-9"	BW6	#4	1	37'-11"				
B2	7	10	8-7	BW7	4	2	6-1	C3	#8	4	21'-3"
B3	4	2	27-8	BW8	7	1	38-7	C4	8	4	15-3
B4	10	2	27-8	BW9	4	2	4-8	C5	8	4	9-3
B5	10	4	20-6	BW10	4	1	38-2				
BW1	7	1	32-9	BW11	4	2	3-2	F1	6	22	13-6
BW2	7	2	38-9					F2	6	48	5-6
BW3	7	1	37-11	BW13	4	8	1-10	S1	8	8	20-2
BW4	4	1	32-9					S2	4	4	19-0
BW5	#4	2	38-9	C1	#8	14	27-7	S3	6	8	5-6
								BW32	7	1	5-3
								BW33	#4	1	5-3

NOTES

OTHER NOTES: For other notes see Dwgs. No. 5236 & No. 5237.

STATE OF MONTANA
STATE HIGHWAY COMMISSION

HIGGINS AVENUE BRIDGE
OVER CLARK FORK & C.M.ST. P.&P. R.R. IN MISSOULA
FEDERAL AID PROJECT NO. F-FG 215(7)
MISSOULA COUNTY

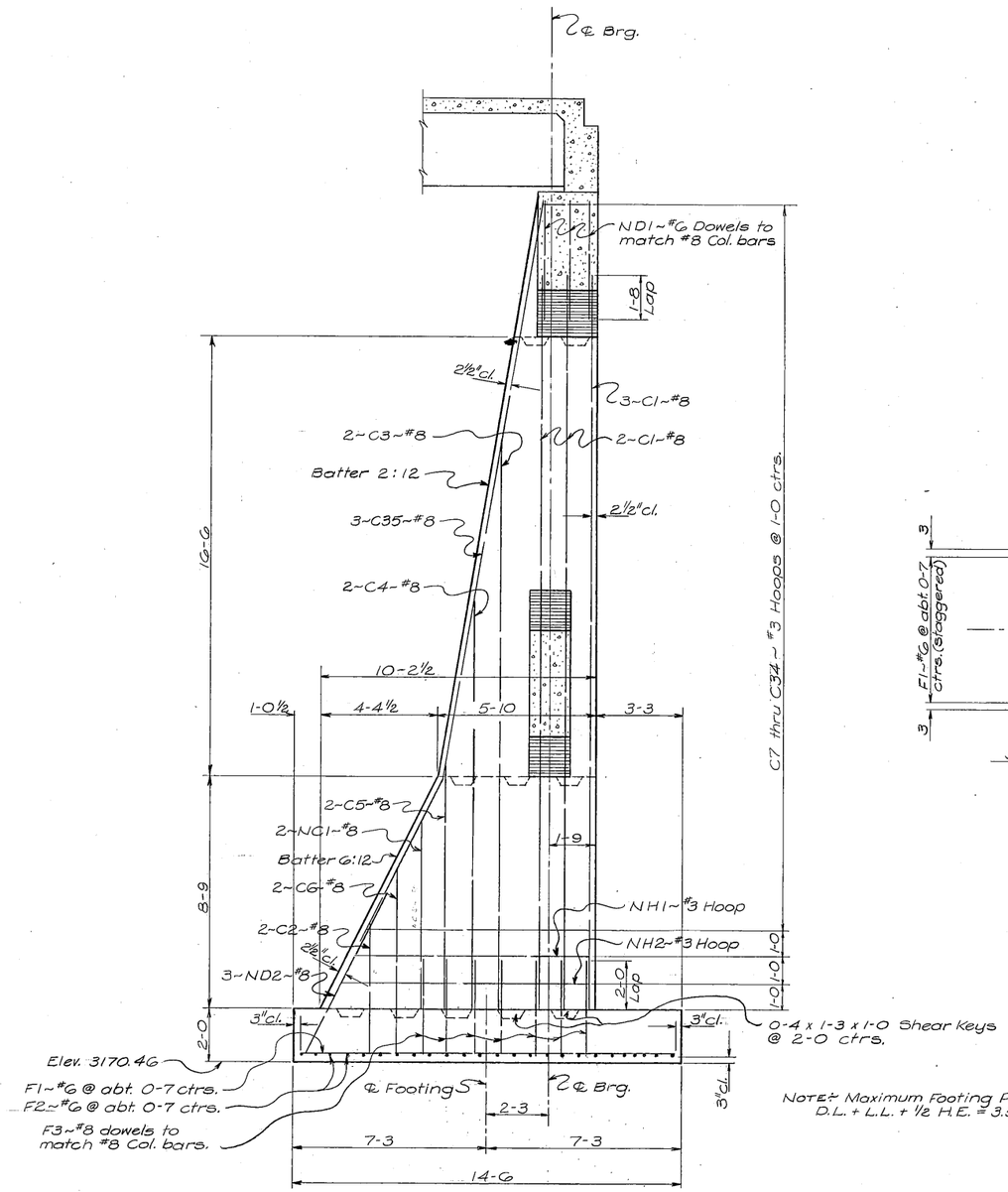
BENT NO. 14

Scale: ⅜" = 1'-0" Except As Noted

DESIGNED	G.D.O.	6-20-61
DRAWN	W.C.O.	6-29-61
TRACED		
CHECKED	C.A.M.	7-31-61
REVISED		
REVISED		

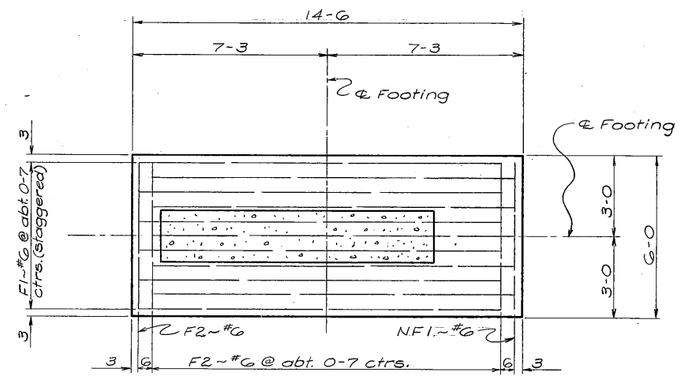
DRAWING NO. 5251

FED. ROAD DIV. NO.	STATE	FED. AID PROJ. NO.		SHEET NO.	TOTAL SHEETS
8	MONT.	F-FG 215(7)			



ELEVATION OF COLUMN

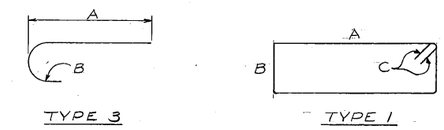
NOTE:- Maximum Footing Pressure under: D.L. + L.L. + ½ H.E. = 3.59 TONS/sq.ft.



PLAN VIEW OF FOOTING

NOTE:-
The details on this drawing shall be used in conjunction with those on Dwg. No. 5251.

*BILL OF REINFORCING STEEL (For Northbound Bent Only)



STRAIGHT BARS				BENT BARS (All dimensions are out to out)									
MARK	SIZE	No.	LENGTH	MARK	SIZE	No.	TYPE	LENGTH	A	B	C	D	E
NC1	#8	4	7'-3"	ND2	#8	6	3	7'-9"	6'-8"	1'-1"			
ND1	6	14	4-2	NH1	3	2	1	21-8	8-10	1-8	0'-4"		
NF1	#6	2	5-6	NH2	#3	2	1	22-8	9-4	1-8	0-4		

*This "Bill Of Reinforcing Steel" is for additional bars required by footing & column revision, to be used in conjunction with the "Bill Of Reinforcing Steel" shown on Dwg. No. 5251. Southbound bent reinforcing steel same as Northbound bent.

STATE OF MONTANA
STATE HIGHWAY COMMISSION

HIGGINS AVENUE BRIDGE
OVER CLARK FORK & C.M. ST. P.& P. R.R. IN MISSOULA
FEDERAL AID PROJECT NO. F-FG 215(7)
MISSOULA COUNTY

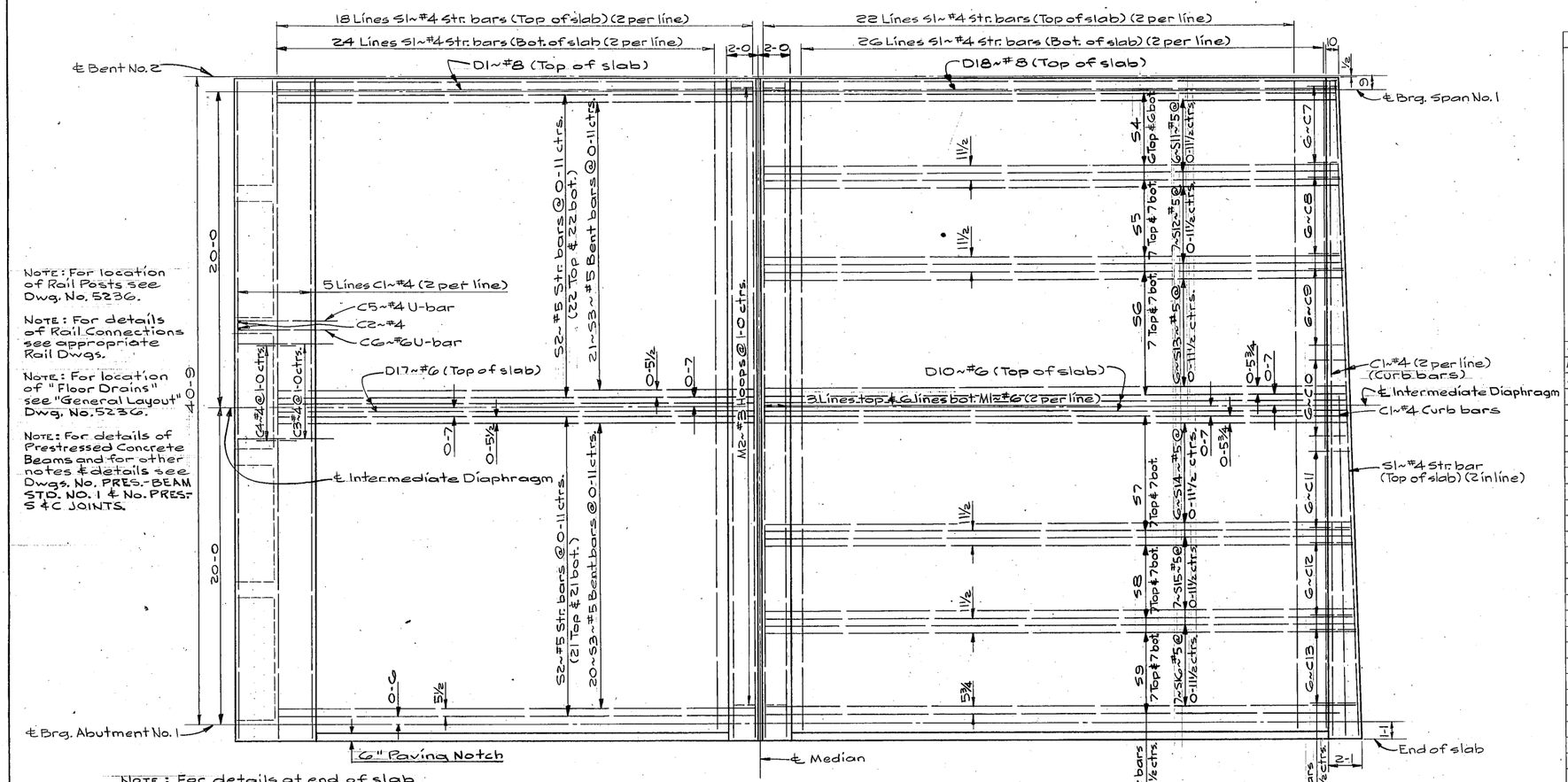
BENT NO. 14
FOOTING & COLUMN REVISION

Scale:- 3/8" = 1'-0"

DESIGNED	R.D.K.	3-1-62
DRAWN	L.E.P.	3-1-62
TRACED		
CHECKED	R.E.W.	3-1-62
REVISED		
REVISED		

DRAWING NO. 5251 A

FED. ROAD DIV. NO.	STATE	FED. AID PROJ. NO.		SHEET NO.	TOTAL SHEETS
8	MONT.	F-FG 215(7)		17	38



NOTE: For location of Rail Posts see Dwg. No. 5236.

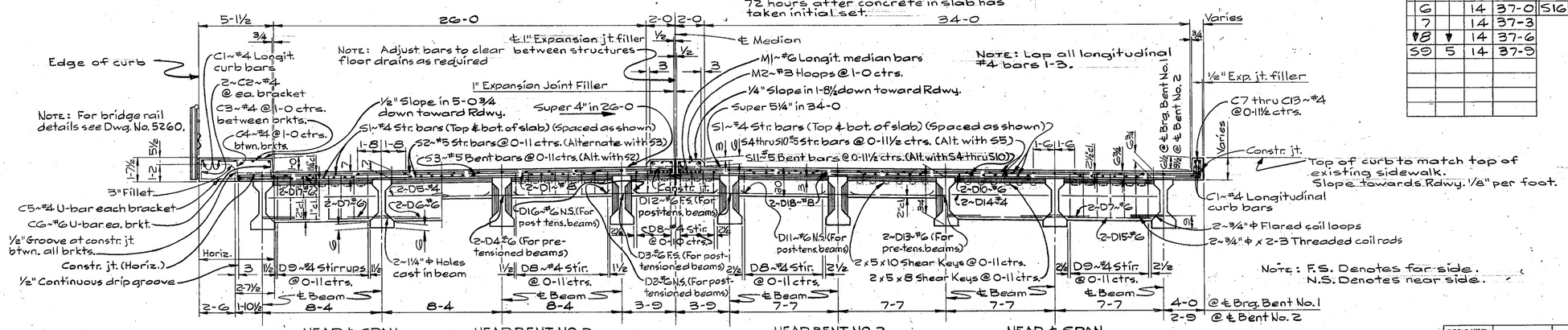
NOTE: For details of Rail Connections see appropriate Rail Dwgs.

NOTE: For location of "Floor Drains" see "General Layout" Dwg. No. 5236.

NOTE: For details of Prestressed Concrete Beams and for other notes & details see Dwgs. No. PRES.-BEAM STD. NO. 1 & No. PRES-S & C JOINTS.

NOTE: For details at end of slab near Abutment No. 1 see Dwgs. No. 5240 & No. 5241

NOTE: Concrete sidewalk shall not be poured on this span for at least 72 hours after concrete in slab has taken initial set.

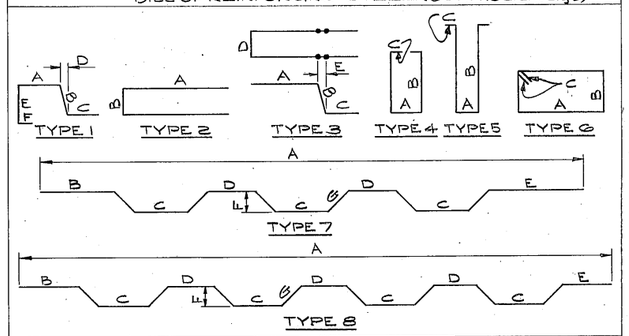


Note: For sections thru end diaphragms & interior diaphragms and details see Dwg. No. 5255. These details are similar except as noted.

ROADWAY SECTION SPAN NO. 1
(Ahead on Line)

Note: F.S. Denotes far side. N.S. Denotes near side.

BILL OF REINFORCING STEEL (Both Roadways)



STRAIGHT BARS				BENT BARS (All dimensions are out to out)											
MARK	SIZE	NO.	LENGTH	MARK	SIZE	NO.	TYPE	LENGTH	A	B	C	D	E	F	G
C1	#4	15	21'-7"	C3	#4	34	1	7'-5"	4'-10	1'-4"	1'-3"	0'-1"			
C2	4	8	1-4	4	4	34	1	3-10	1-3	1-4	1-3				
				5	4	4	2	7-10	3-7	0-8					
				6	6	4	3	16-4	4-10	1-4	1-8	0-8	0'-1"		
				7	4	6	1	4-2	0-6	1-1	1-3	0-0 3/4	1-1	0'-3"	
D1	8	2	30-4	8				4-4	0-8 1/2	1-0 1/2			1-0 1/2		
2	6	3	6-11	9				4-5	0-11	1-0			1-0		
3	6	1	29-1	10				4-7	1-1 1/2	0-11 1/2			0-11 1/2		
4	6	2	29-1	11				4-8	1-4	0-11			0-11		
5	4	6	7-8	12				4-10	1-6 1/2	0-10 1/2			0-10 1/2		
6	6	6	6-10	C13	4	6	1	4-11	1-9	0-10	1-3	0-0 3/4	0-10	0-3	
7	6	10	4-10												
10	6	2	36-6												
11	6	4	6-2												
12	6	1	34-5	D8	4	60	4	4-7	0-8	1-8 1/2	0-3				
13	6	2	34-5	D9	4	52	5	7-3	0-6	3-1 1/2	0-3				
14	4	8	6-11												
15	6	8	6-1												
16	6	2	2-10												
17	6	2	30-4	M2	3	80	6	5-4	1-6	0-10	0-4				
D18	8	2	36-6												
M1	6	36	21-11												
				S3	5	41	7	31-4	30-4	3-5	4-3 1/2	3-4	5-3	0'-4 3/4	0'-6 3/4
				S11	5	6	8	37-10	36-6	5-1	3-10	3-0	4-1	0-4 1/2	0-6 1/2
S1	4	182	21-1	S12	5	7	8	38-1	36-9				4-4		
2	5	86	30-4	S13	5	6	8	38-4	37-0				4-7		
4		12	36-6	S14	5	6	8	38-7	37-3				4-10		
5		14	36-9	S15	5	7	8	38-10	37-6				5-1		
6		14	37-0	S16	#5	7	8	39-1	37-9	5-1	3-10	3-0	5-4	0-4 1/2	0-6 1/2
7		14	37-3												
8		14	37-6												
S9	5	14	37-9												

NOTE: D2, D3, D11 & D12 & D16 bars to be used with Post-tensioned beams only. D4 & D13 bars to be used with Pre-tensioned beams only.

NOTES

OTHER NOTES: For other notes see Dwgs. No. 5236 & No. 5237.

STATE OF MONTANA
STATE HIGHWAY COMMISSION

HIGGINS AVENUE BRIDGE
OVER CLARK FORK & C.M.St.P.&P.R.R. IN MISSOULA
FEDERAL AID PROJECT NO. FFG 215(7)
MISSOULA COUNTY
SPAN NO. 1

Scale: 1/4" = 1'-0"

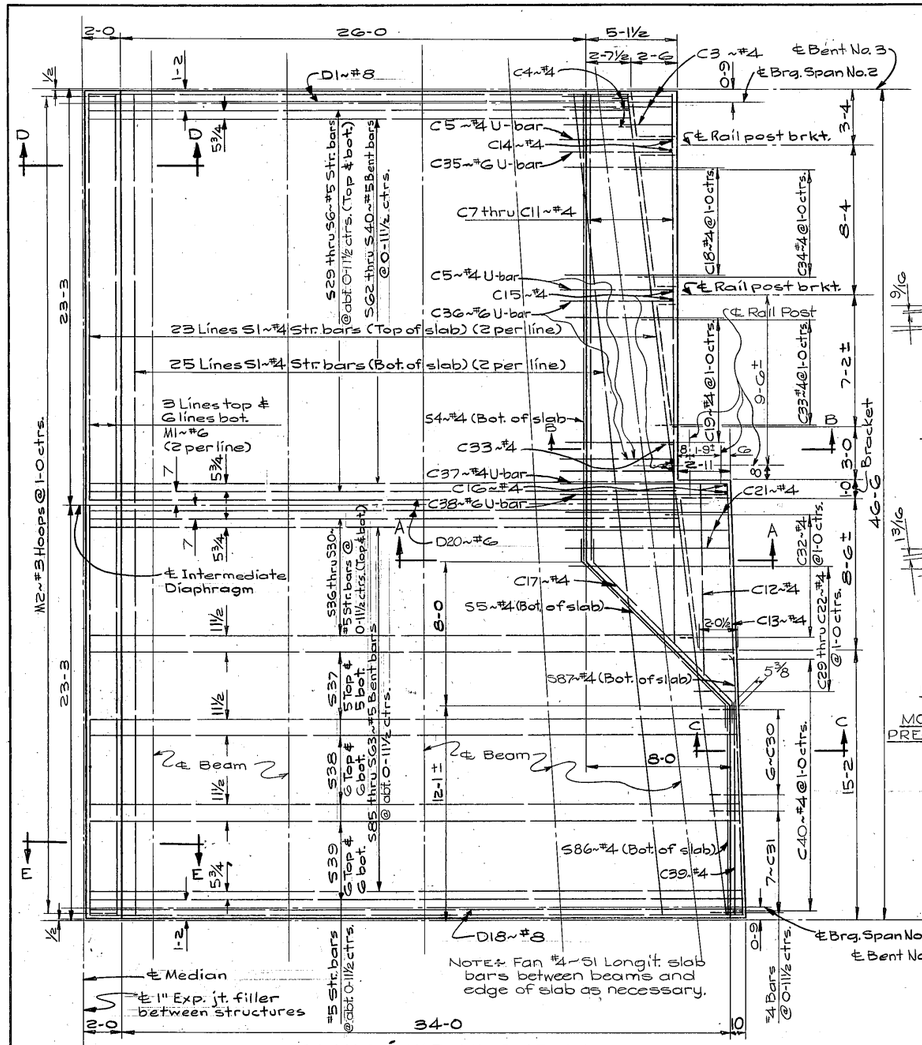
DESIGNED		
DRAWN	G.N.M.	3-31-61
TRACED		
CHECKED	C.A.M.	8-4-61
REVISED		
REVISED		

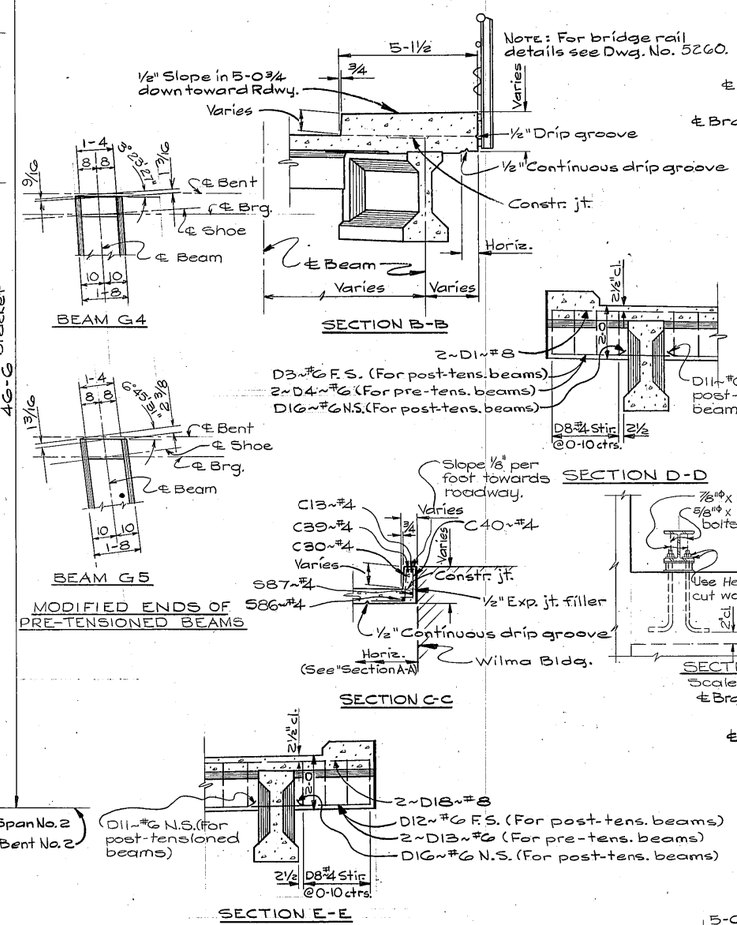
DRAWING NO. 5252

J.R.B.

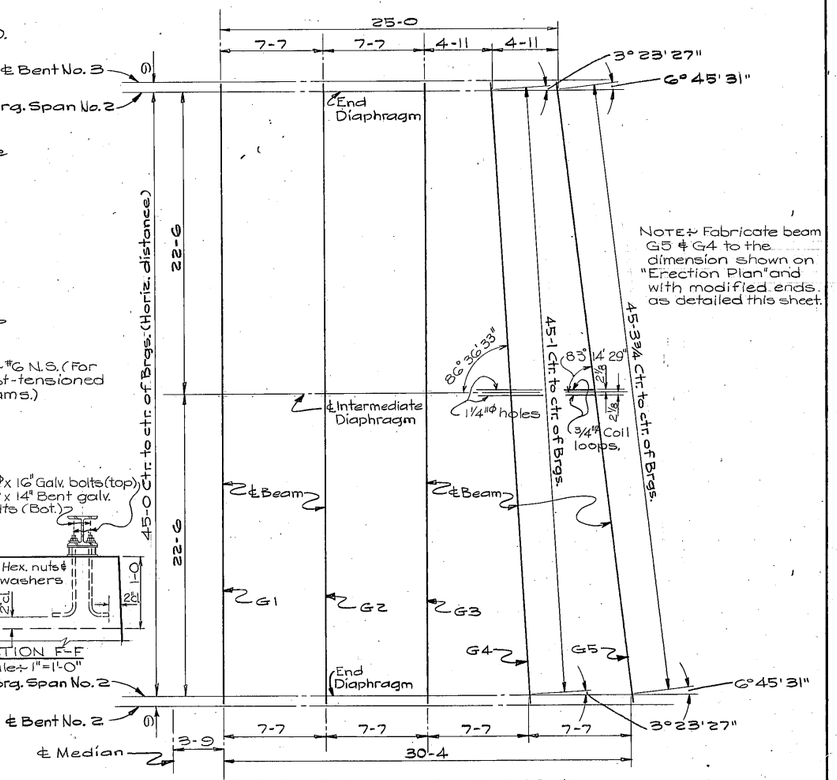
FED. ROAD DIV. NO.	STATE	FED. AID PROJ. NO.		SHEET NO.	TOTAL SHEETS
8	MONT.	F-FG 215 (7)		18	38

NOTE: Concrete sidewalk shall not be poured on this span until at least 72 hours after the concrete roadway slab has taken initial set.





Note: For bridge rail details see Dwg. No. 5260.

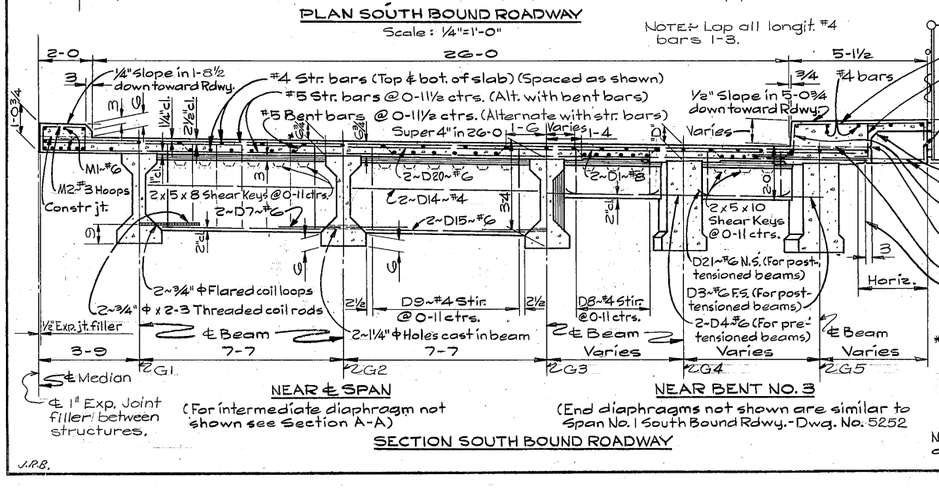


NOTE: For bridge rail details see Dwg. No. 5260.

NOTE: Fabricate beam G5 & G4 to the dimension shown on "Erection Plan" and with modified ends as detailed this sheet.

NOTE: Adjust slab bars to clear floor drains as required

NOTE: Lap all longit. #4 bars 1-8.

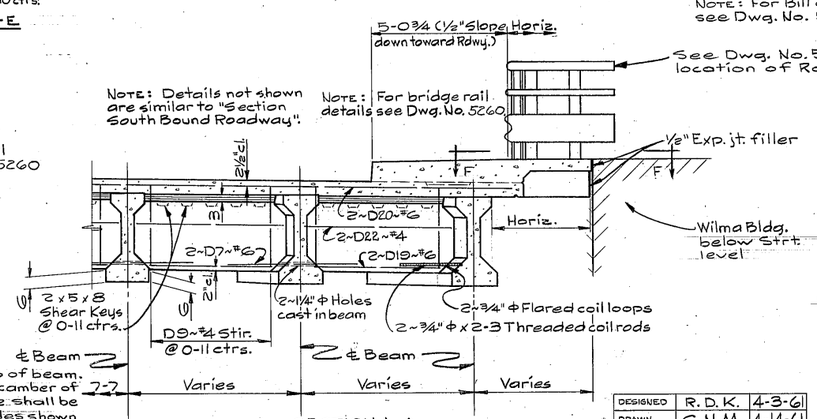


NOTE: For vertical dimensions that are shown as "Varies" see Grade Diagram Dwg. No. 5254.

* NOTE: "D" = Depth of slab to top of beam. Varies due to vertical curve & camber of beams. (Top of slab surface shall be finished to elevations & grades shown on vertical curve data on Dwg. No. 5236)

NOTE: Details not shown are similar to "Section South Bound Roadway".

NOTE: For bridge rail details see Dwg. No. 5260.



NOTE: For Bill of Reinforcing Steel see Dwg. No. 5254.

NOTES

OTHER NOTES - For other notes see Dwgs. No. 5236 & No. 5237.

STATE OF MONTANA
STATE HIGHWAY COMMISSION

HIGGINS AVENUE BRIDGE
OVER CLARK FORK & C.M.St.P.&P.R.R. IN MISSOULA
FEDERAL AID PROJECT NO. F-FG 215(7)
MISSOULA COUNTY
SPAN NO. 2

Scale: 3/8"=1'-0" Except As Noted

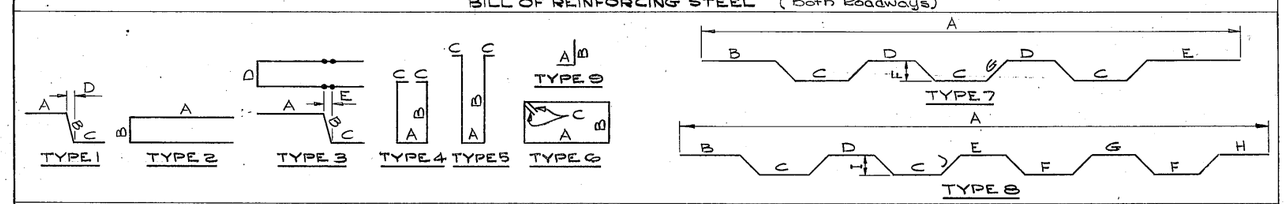
DESIGNED	R. D. K.	4-3-61
DRAWN	G. N. M.	4-14-61
TRACED		
CHECKED	C.A.M.	8-1-61
REVISED		
REVISED		

DRAWING NO. 5253

J.P.B.

FED. ROAD DIV. NO.	STATE	FED. AID PROJ. NO.		SHEET NO.	TOTAL SHEETS
8	MONT.	F-FG215(7)		19	38

BILL OF REINFORCING STEEL (Both Roadways)



STRAIGHT BARS

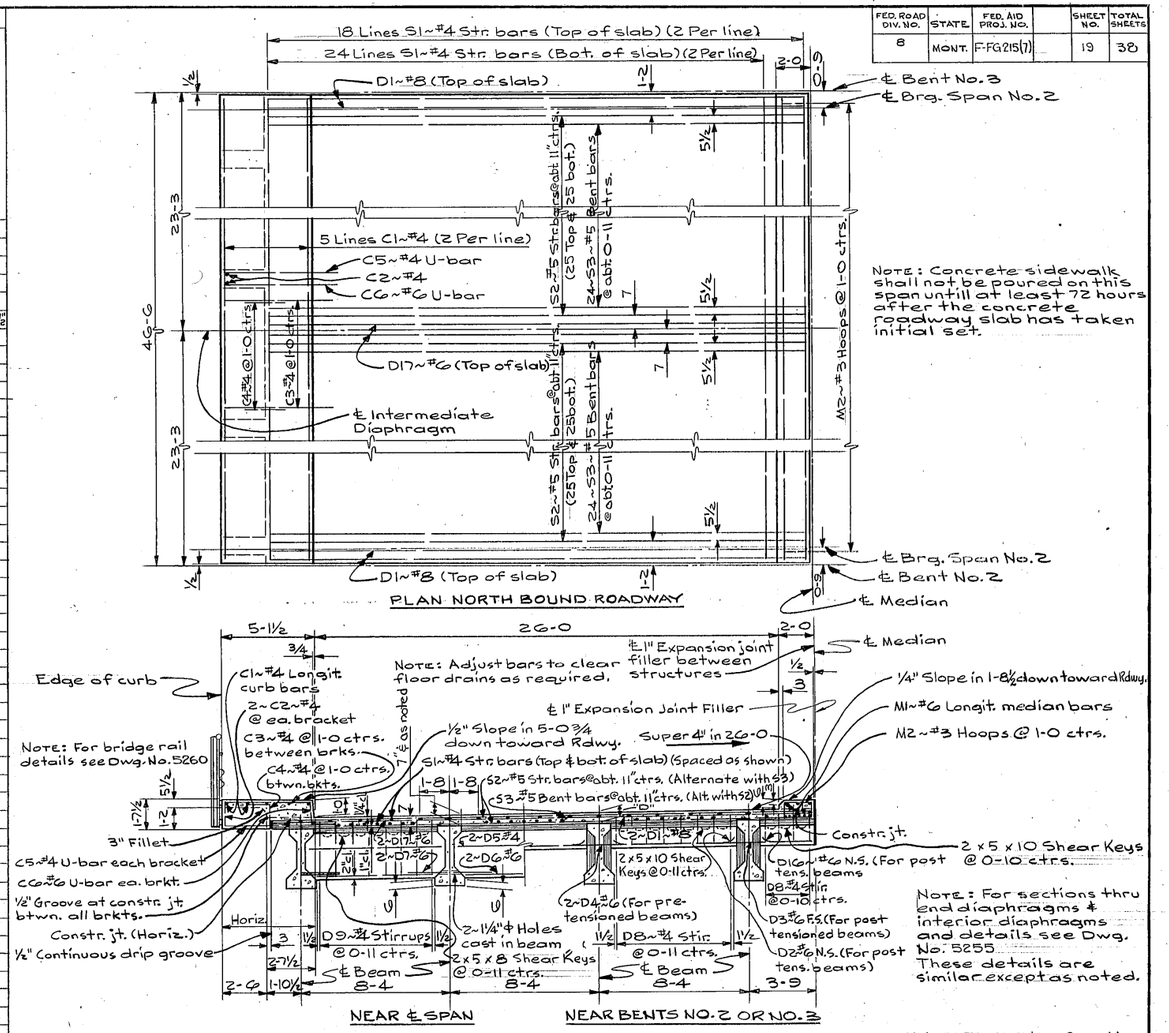
Mark	Size	No.	Length	Mark	Size	No.	Length
C1	#4	10	23'-8"	S1	#4	180	23'-8"
2		10	1-4	2	5	100	30-4
7		1	26-2	4	4	1	26-3
8			27-4	6	5	2	30-3
9			28-6	7	5	2	30-4
10			29-8	8			30-5
11			30-10	9			30-6
12			10-8	10			30-8
13		1	24-4	11			30-9
14		2	1-3	12			30-10
15		4	1-2	13			31-0
16		2	1-1	14			31-1
C39	4	1	12-0	15			31-2
				16			31-4
				17			31-5
				18			31-6
D1	8	6	30-4	19			31-8
*2	6	6	6-11	20			31-9
*3	6	3	29-1	21			31-10
*4	6	6	29-1	22			32-0
5	4	6	7-8	23			32-1
6	6	6	6-10	24			32-2
7	6	10	4-10	25			32-4
				26			32-9
*11	6	6	6-2	27			32-9
*12	6	1	31-4	28			32-9
*13	6	2	31-4	29			32-9
14	4	4	6-11	30			33-1
15	6	4	6-1	31			33-3
*16	6	3	8-10	32			33-4
17	6	4	30-4	33			33-5
*18	8	2	36-6	34			33-7
D19	6	4	4-9	35			33-8
D20	6	2	32-10	36		2	33-9
*D21	6	2	3-6	37		10	36-0
D22	4	4	5-7	38		12	36-2
M1	#6	36	23-8	*39	5	12	36-4
				S86	4	1	12-0
				S87	#4	1	14-10

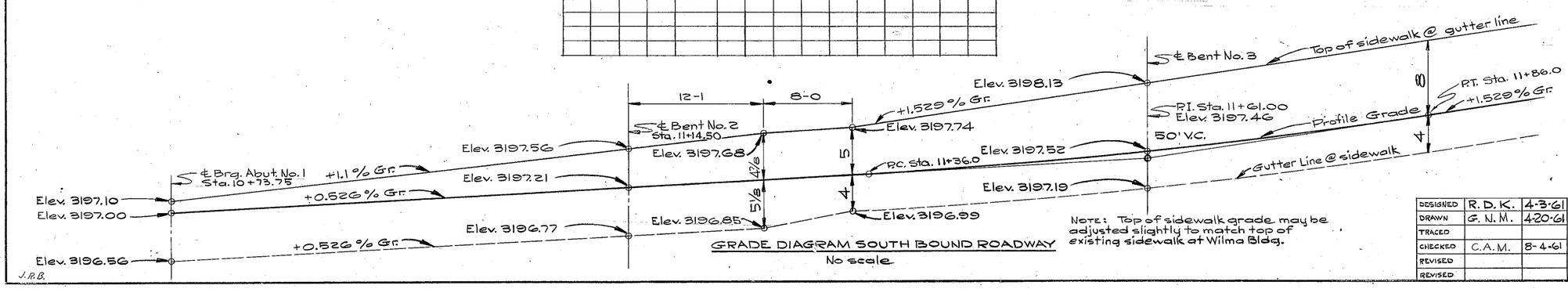
BENT BARS

Mark	Size	No.	Type	Length	A	B	C	D	E
C3	#4	38	1	7'-5"	4'-10"	1'-4"	1'-3"	0'-1"	
4	4	38	1	3-9	1-3	1-3	1-3	0-0	
5	4	8	2	8-4	3-9	0-10			
6	6	5	3	16-2	4-10	1-4	1-6	0-10	0'-1"
17	4	1	1	13-10	1-3	11-4	1-3	8-0	
18	4	7	1	7-4	4-10	1-3	1-3	0-1	
19	4	8		7-3	4-10	1-2	1-3	0-1	
21	4	3		10-2	7-10	1-1	1-3	0-1	
22		1		9-10	7-6				
23				8-10	6-6				
24				7-11	5-7				
25				6-11	4-7				
26				6-0	3-8				
27				5-0	2-8				
28				4-1	1-9				
29				3-1	0-9				
30		6		2-7	0-3				
31		7	1	2-9	0-5		1-3	0-1	
32		8	1	3-7	1-3	1-1	1-3	0-0	
33		8	1	3-8	1-3	1-2	1-3	0-0	
34	4	7	1	3-9	1-3	1-3	1-3	0-0	
35	6	1	3	16-0	4-10	1-3	1-6	0-10	0-1
36	6	2	3	15-10	4-10	1-2	1-6	0-10	0-1
37	4	1	2	9-2	4-2	0-10			
C38	6	1	3	21-6	7-9	1-1	1-6	0-10	0-1
C40	4	15	9	2-4	1-3	1-1			
D8	4	86	4	4-7	0-8	1-8½	0-3		
D9	4	50	5	7-3	0-6	3-1½	0-3		
M2	#3	94	6	5-6	1-7	0-10	0-4		

Mark	Size	No.	Type	Length	A	B	C	D	E	F	G	H	I	J
S3	#5	48	7	31'-4"	30'-4	3'-5"	4'-3½"	3'-4"	5'-3"	0'-4¾"	0'-6¾			
5	4	1	1	13-10	1-3	11-4	1-3	8-0						
40	5	4	8	31-9	30-5	5-1	3-10½	3-0	2-6	2-2	2-0	2-10"	0'-4½"	0'-6½"
41				31-10	30-6				2-6	2-2½	2-0½			
42				32-0	30-8				2-6½	2-3	2-0½			
43				32-1	30-9				2-6½	2-3½	2-1			
44				32-2	30-10				2-6½	2-4	2-1			
45				32-4	31-0				2-6½	2-4	2-1½			
46				32-5	31-1				2-7	2-4½	2-1½			
47				32-6	31-2				2-7	2-5	2-2	2-10		
48				32-8	31-4				2-7	2-5½	2-2	2-11		
49				32-9	31-5				2-7	2-6	2-2½			
50				32-10	31-6				2-7½	2-6½	2-2½			
51				33-0	31-8				2-7½	2-7	2-3			
52				33-1	31-9				2-7½	2-7½	2-3			
53				33-2	31-10				2-7½	2-8	2-3½			
54				33-4	32-0				2-8	2-8	2-3½			
55				33-5	32-1				2-8	2-8½	2-4			
56				33-6	32-2				2-8	2-9	2-4	2-11		
57				33-8	32-4				2-8	2-9½	2-4½	3-0		
58				33-9	32-5				2-8½	2-10	2-4½			
59				33-10	32-6				2-8½	2-10½	2-5			
60				34-0	32-8				2-8½	2-11	2-5			
61				34-1	32-9				2-8½	2-11½	2-5½			
62				34-3	32-11				2-9	3-0	2-5½			
63				34-5	33-1				2-9	3-0½	2-6			
64				34-7	33-3				2-9	3-1	2-6½	3-0		
65				34-8	33-4				2-9½	3-1½	2-6½	3-1		
66				34-9	33-5				2-9½	3-2	2-7			
67				34-11	33-7				2-9½	3-2½	2-7			
68				35-0	33-8				2-9½	3-3	2-7½			
69				35-1	33-9				2-10	3-3	2-7½			
70				35-3	33-11				2-10	3-3½	2-8	3-1		
71				37-5	36-1				2-10	3-4	2-8	5-1		
72				37-5	36-1				2-10	3-4½	2-8½	5-0		
73				37-5	36-1				2-10½	3-5	2-8½	4-11		
74				37-6	36-2				2-10½	3-5½	2-9	4-10½		
75				37-6	36-2				2-10½	3-6	2-9	4-9½		
76				37-6	36-2				2-10½	3-6	2-9½	4-8½		
77				37-7	36-3				2-11	3-6½	2-9½	4-8		
78				37-7	36-3				2-11	3-7	2-10	4-7		
79				37-7	36-3				2-11	3-7½	2-10	4-6		
80				37-8	36-4				2-11	3-8	2-10½	4-5		
81				37-8	36-4				2-11½	3-8½	2-10½	4-4½		
82				37-8	36-4				2-11½	3-9	2-11	4-3½		
83				37-9	36-5				2-11½	3-9	2-11	4-2½		
*84				37-9	36-5				2-11½	3-9½	2-11½	4-2		
585	#5	1	8	37-9	36-5	5-1	3-10½	3-0	3-0	3-10	2-11½	4-2	0-4½	0-6½

*D2, D3, D11, D12, D16 & D21 bars to be used with post-tensioned beams only. D4 & D13 bars to be used with pre-tensioned beams only.





NOTES

OTHER NOTES: For other notes see Dwgs. No. 5236 & No. 5237

STATE OF MONTANA
STATE HIGHWAY COMMISSION

HIGGINS AVENUE BRIDGE
OVER CLARKFORK & C.M.St. P.&P. R.R. IN MISSOULA
FEDERAL AID PROJECT NO. F-FG 215(7)
MISSOULA COUNTY
SPAN NO. 2
REINFORCING STEEL

Scale ~ 1/4" = 1'-0" except as noted.

DESIGNED	R. D. K.	4-3-61
DRAWN	G. N. M.	4-20-61
TRACED		
CHECKED	C.A.M.	8-4-61
REVISED		
REVISED		

DRAWING NO. 5254

J.R.B.

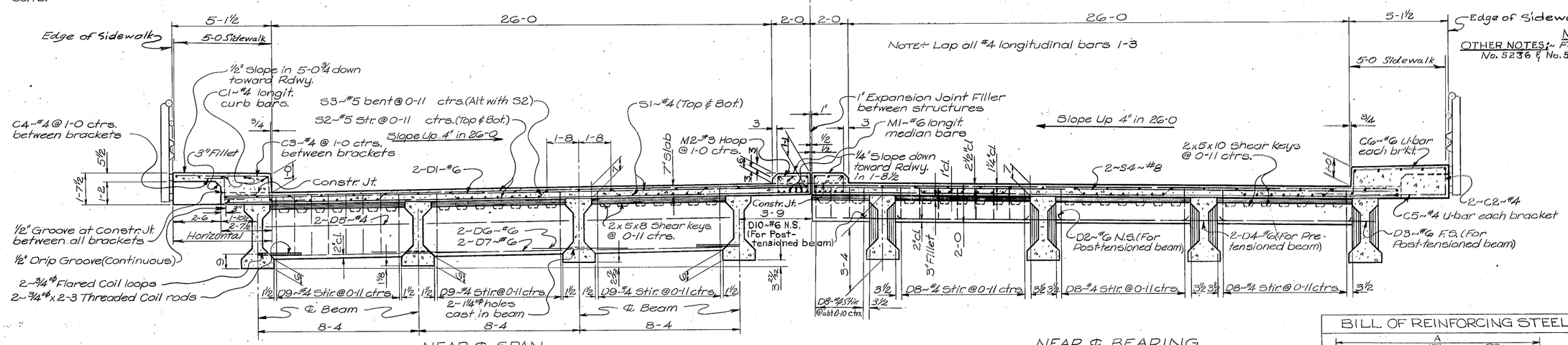
FED. ROAD DIV. NO.	STATE	FED. AID PROJ. NO.		SHEET NO.	TOTAL SHEETS
8	MONT.	F-FG-215(7)		20	38

NOTE: N. S. indicates near side
F. S. indicates far side

NOTE ÷ See Dwg. No. SBR-T4 and No. 5260 for details of Bridge Rail & Bridge Rail supporting bolts.

NOTE ÷ Concrete sidewalk shall not be poured on these spans until at least 72 hours after the concrete roadway slab has taken initial set.

℄ Median Structure Symm. abt. ℄ Median except as otherwise noted.



NOTES

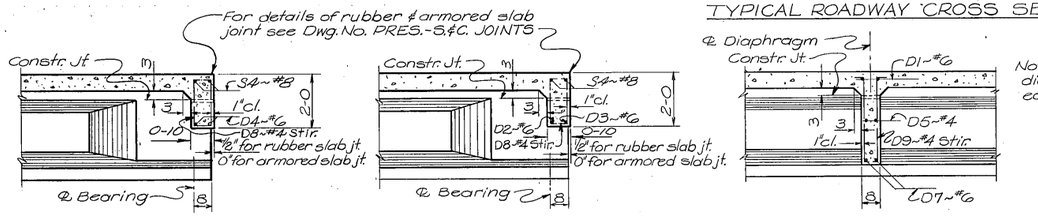
OTHER NOTES:- For other notes see Dwgs. No. 5236 & No. 5237.

NEAR ℄ SPAN

NEAR ℄ BEARING

TYPICAL ROADWAY CROSS SECTION OF SPANS NO. 3 THRU NO. 7

*NOTE: D2, D3, & D10 bars to be used with Post-tensioned beams only.

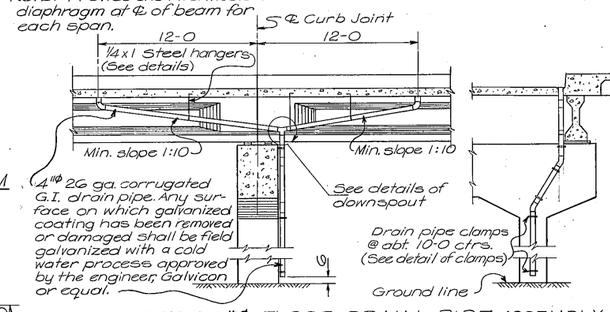


SECTION THRU END DIAPHRAGM FOR PRE-TENSIONED BEAM AT INTERMEDIATE BENT

SECTION THRU END DIAPHRAGM FOR POST-TENSIONED BEAM AT INTERMEDIATE BENT

SECTION THRU INTERMEDIATE DIAPHRAGM

NOTE ÷ Provide one intermediate diaphragm at ℄ of beam for each span.

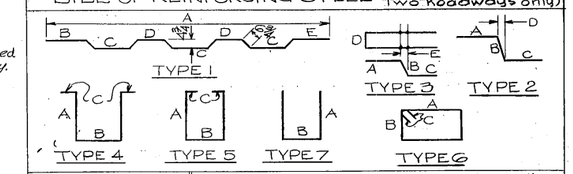


ELEVATION 4"ϕ FLOOR DRAIN PIPE ASSEMBLY
Scale ÷ 3/16" = 1'-0"

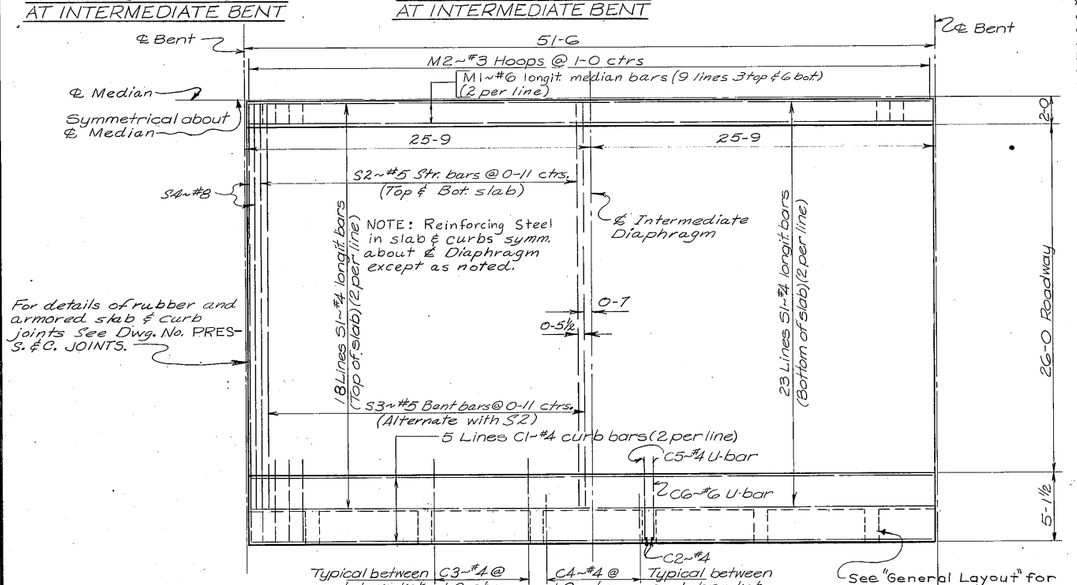
NOTE ÷ All downspouts to be 4"ϕ 26 ga. corrugated G.I. pipe. Fittings to be 26 ga. & galvanized after fabrication.

NOTE: All 3½"ϕ pipe floor drain assemblies, 4"ϕ downspouts, fittings, hangers, etc. for Spans No. 1 thru No. 8 to be included in the "Lump Sum" price bid for "Drainage System."

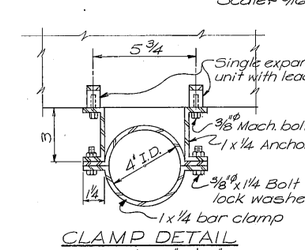
BILL OF REINFORCING STEEL (One Span & Two Roadways only)



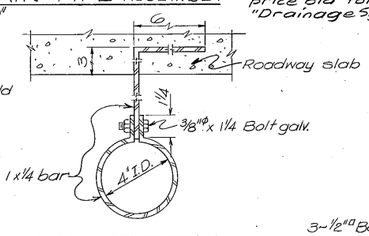
STRAIGHT BARS				BENT BARS (All dimensions are out to out)									
MARK	SIZE	NO.	LENGTH	MARK	SIZE	NO.	TYPE	LENGTH	A	B	C	D	E
S1	#4	164	26'-2"	S3	#5	108	1	31'-4"	30'-4"	5'-3"	4'-3½	3'-4"	3'-5"
S2	5	216	30-4										
S4	8	8	30-4	C3	4	84	2	7-5	4-10	1-4	1-3	0-1	
C1	4	20	26-2	C4	4	84	2	3-10	1-3	1-4	1-3		
C2	4	24	1-4	C5	4	12	7	7-10	3-7	0-8			
				C6	6	12	3	16-4	4-10	1-4	1-8	0-8	0-1
D1	6	4	30-4										
D2	6	12	6-11	D8	4	112	5	4-7	1-8½	0-8	0-3		
D3	6	4	29-1	D9	4	48	4	7-3	3-1½	0-6	0-3		
D4	6	8	29-1										
D5	4	12	7-8	M2	#3	104	6	5-4	1-6	0-10	0-4		
D6	6	8	4-10										
D7	6	12	6-10										
M1	6	36	26-5										
* D10	#6	4	2-10										



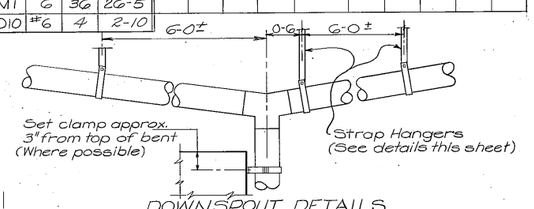
REINFORCING STEEL PLACING DIAGRAM
Scale ÷ 3/16" = 1'-0"



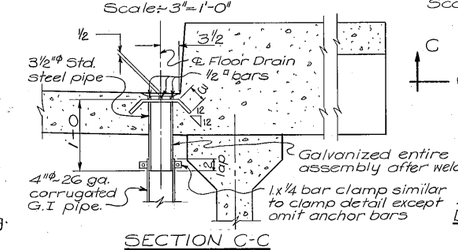
CLAMP DETAIL
Scale ÷ 3" = 1'-0"



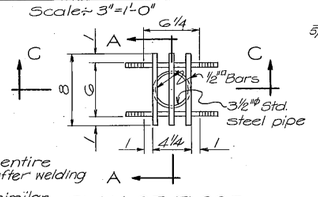
HANGER DETAIL
Scale ÷ 3" = 1'-0"



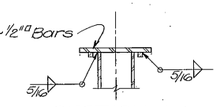
DOWNSPOUT DETAILS
Scale ÷ 1" = 1'-0"



SECTION C-C
Scale ÷ 1" = 1'-0"



PLAN OF FLOOR DRAIN ASSEMBLY
Scale ÷ 1½" = 1'-0"



SECTION A-A
Scale ÷ 1½" = 1'-0"

STATE OF MONTANA
STATE HIGHWAY COMMISSION

HIGGINS AVENUE BRIDGE
OVER CLARK FORK & C.M. ST. P. & P. R.R. IN MISSOULA
FEDERAL AID PROJECT NO. F-FG 215(7)
MISSOULA COUNTY

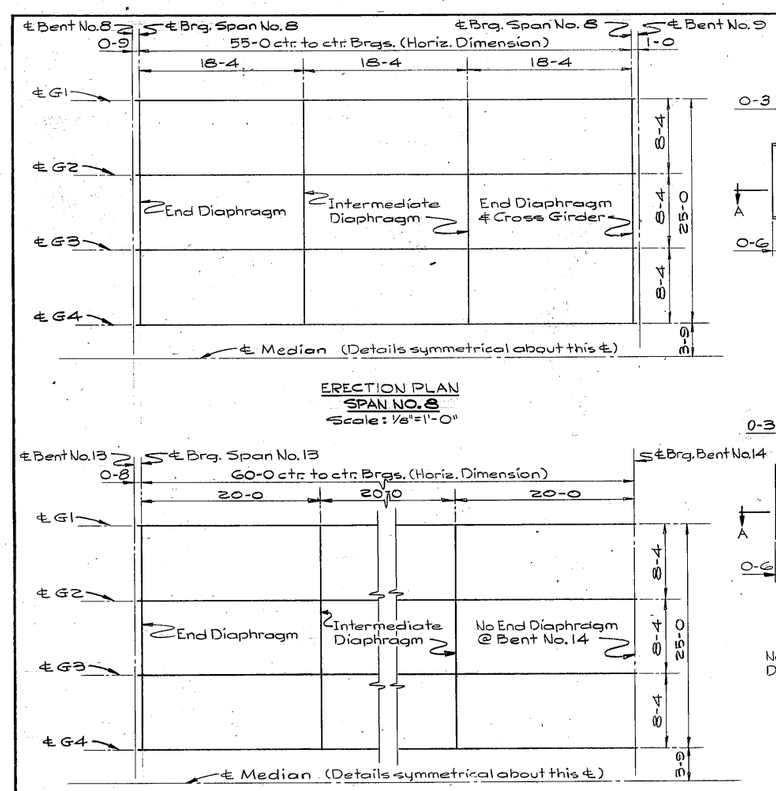
SPANS NO. 3 THRU NO. 7
& 4" FLOOR DRAIN DETAILS

Scale ÷ ⅜" = 1'-0" Except As Noted.

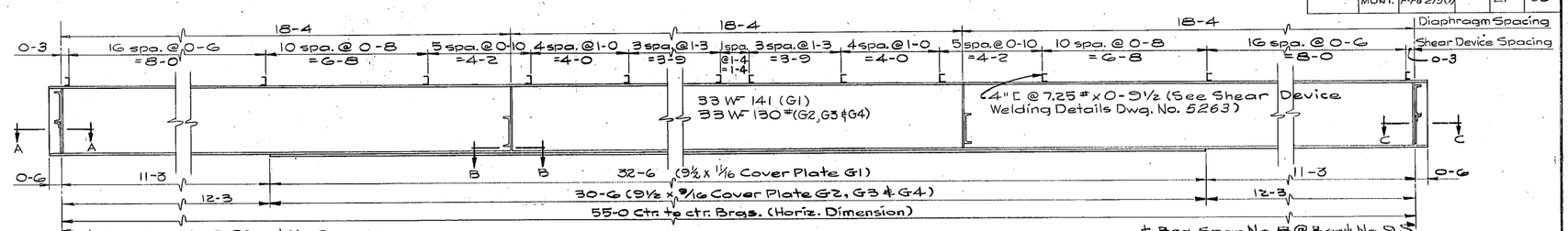
DESIGNED		
DRAWN	L.E.P.	3-8-61
TRACED		
CHECKED	C.A.M.	8-7-61
REVISED		
REVISED		

DRAWING NO. 5255

FED. ROAD DIV. NO.	STATE	FED. AID PROJ. NO.		SHEET NO.	TOTAL SHEETS
8	MONT.	F-F6 215(7)		21	38

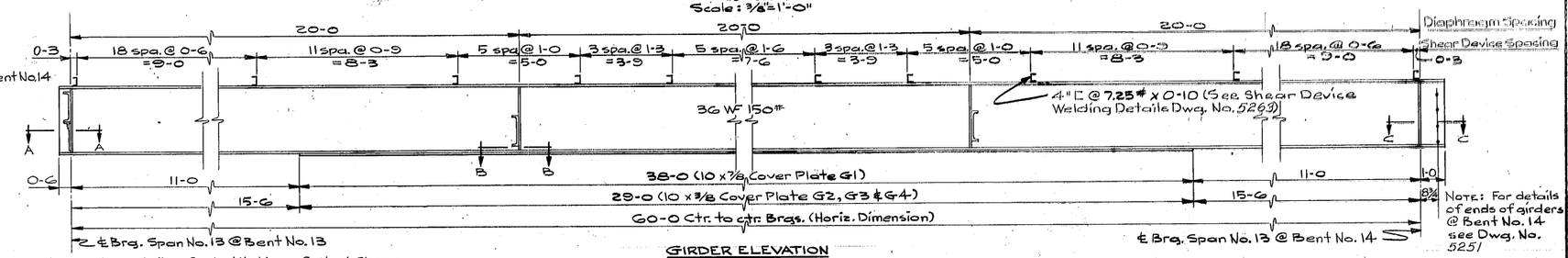


ERECTION PLAN
SPAN NO. 8
Scale: 1/8"=1'-0"



GIRDER ELEVATION
SPAN NO. 8
(G1 same as G2, G3 & G4 except as noted)
Scale: 3/8"=1'-0"

ERECTION PLAN
SPAN NO. 13
Scale: 1/8"=1'-0"

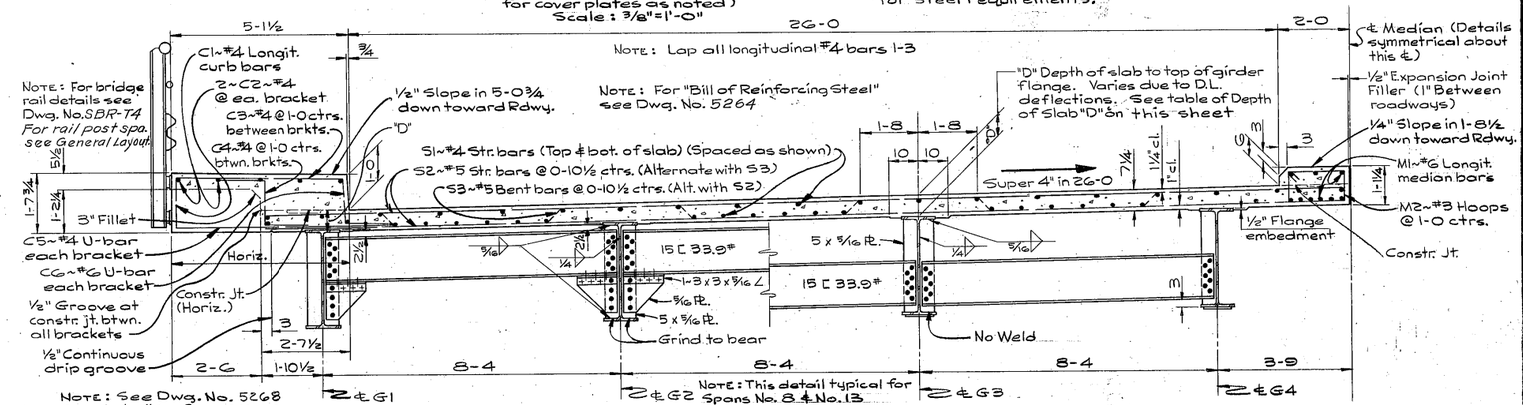


Note: For details of ends of girders @ Bent No. 14 see Dwg. No. 5251

Note: For details of substitution of Stud Shear Devices for 4" [7.25# see Dwg. No. 5263

GIRDER ELEVATION
SPAN NO. 13
(G1 same as G2, G3 & G4 except for cover plates as noted)
Scale: 3/8"=1'-0"

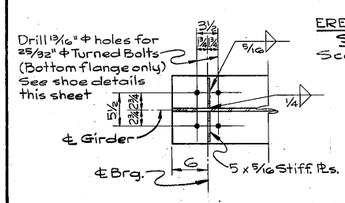
Note: See Special Provisions for steel requirements.



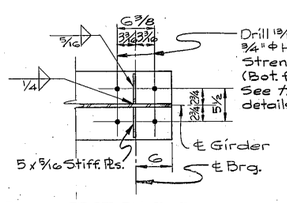
Note: See Dwg. No. 5268 for details of recess on sidewalk for stairway checkered plate on Span No. 13.

Note: For floor drain details see Dwg. No. 5255

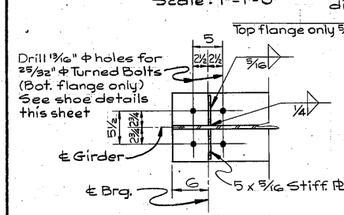
HALF SECTION AT END DIAPHRAGM
FOR INTERMEDIATE BENT
Scale: 1/2"=1'-0"



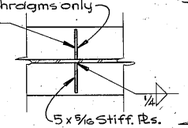
SECTION A-A
SPAN NO. 8
Scale: 1"=1'-0"



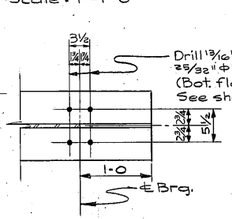
SECTION C-C
SPAN NO. 8
Scale: 1"=1'-0"



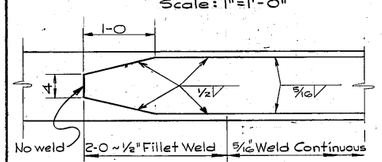
SECTION A-A
SPAN NO. 13
Scale: 1"=1'-0"



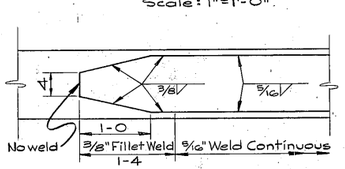
SECTION B-B
SPANS NO. 8 & NO. 13
Scale: 1"=1'-0"



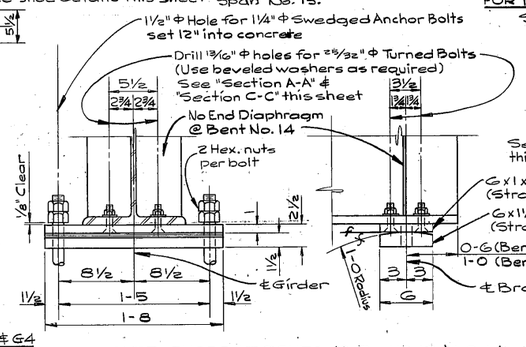
SECTION C-C
SPAN NO. 13
Scale: 1"=1'-0"



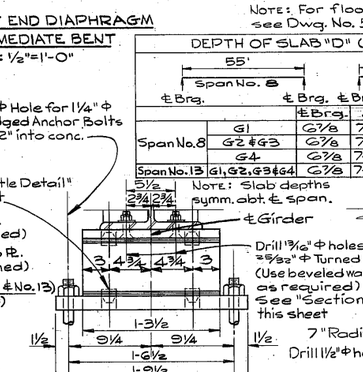
COVER PLATE WELDING DETAIL G1
(Spans No. 8 & No. 13)
Scale: 1"=1'-0"



COVER PLATE WELDING DETAIL G2, G3 & G4
(Spans No. 8 & No. 13)
Scale: 1"=1'-0"



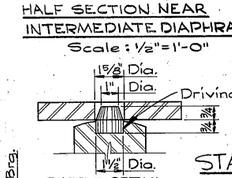
FIXED SHOES AT BENTS NO. 8, NO. 13 & NO. 14
Scale: 1½"=1'-0"



EXPANSION SHOE AT BENT NO. 13
Scale: 1½"=1'-0"

DEPTH OF SLAB "D" (In inches)

		55'			60'		
		Span No. 8			Span No. 13		
		℄ Brg.	℄ Brg.	℄ Brg.			℄ Brg.
			℄ Brg.	.1	.2	.3	.4	.5
Span No. 8	G1	G7/8	7 1/8	7 3/8	7 1/2	7 5/8	7 11/16
	G2 & G3	G7/8	7 3/16	7 7/16	7 5/8	7 3/4	7 13/16
	G4	G7/8	7 3/16	7 1/2	7 11/16	7 13/16	7 7/8
Span No. 13	G1, G2, G3 & G4	G7/8	7 3/16	7 1/2	7 11/16	7 13/16	7 7/8



PINTLE DETAIL
Scale: 3"=1'-0"

HALF SECTION NEAR INTERMEDIATE DIAPHRAGM
Scale: 1/2"=1'-0"

NOTES
OTHER NOTES:~ For other notes see Dwgs. No. 5236 & No. 5237.

STATE OF MONTANA
STATE HIGHWAY COMMISSION

HIGGINS AVENUE BRIDGE
OVER CLARK FORK & C.M.St. P.&P.R.R. IN MISSOULA
FEDERAL AID PROJECT NO. F-FG 215(7)
MISSOULA COUNTY
GIRDER DETAILS & SHOES
FOR SPANS NO. 8 & NO. 13

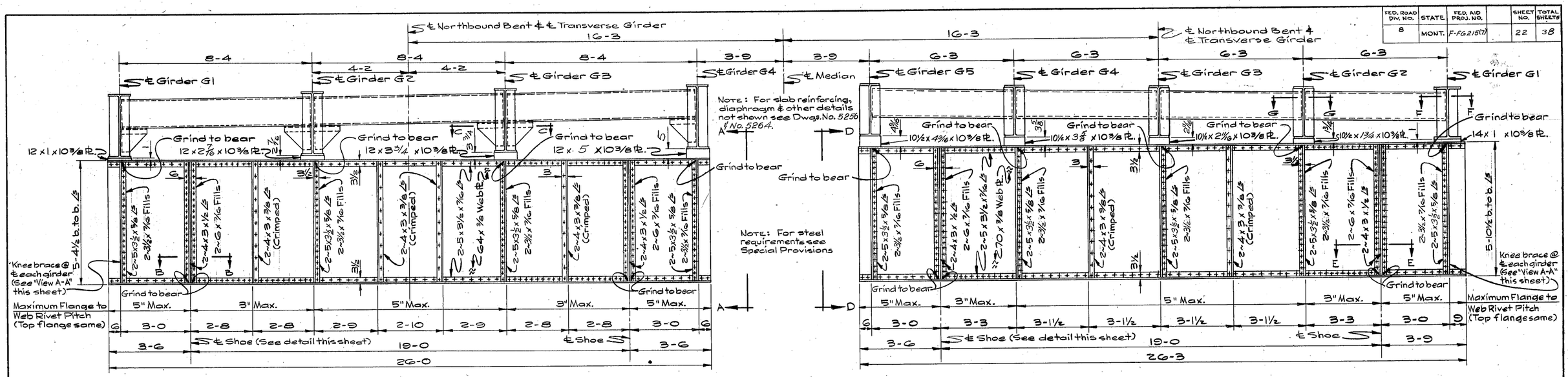
Scale:- As Noted

DESIGNED	R. D. K.	2-17-61
DRAWN	G. N. M.	3-1-61
TRACED		
CHECKED	C.A.M.	8-2-61
REVISED		
REVISED		

DRAWING NO. 5256

J.R.B.

FED. ROAD DIV. NO.	STATE	FED. AID PROJ. NO.		SHEET NO.	TOTAL SHEETS
8	MONT.	F-FG215(7)		22	38



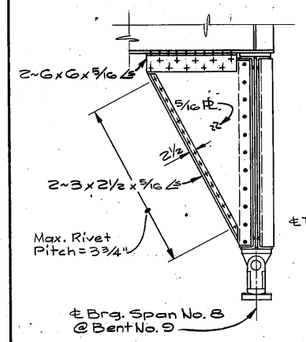
Note: For slab reinforcing, diaphragm & other details not shown see Dwgs. No. 5256 & No. 5264.

Note: For steel requirements see Special Provisions

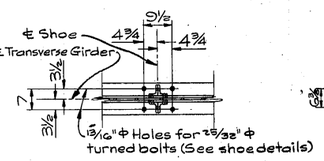
TRANSVERSE GIRDER AT BENT NO. 9
(Ahead on Line)

TRANSVERSE GIRDER AT BENT NO. 12
(Back on Line)

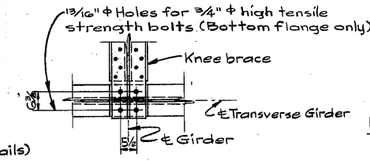
Note: The symbol "+" denotes shop rivet. The symbol "•" denotes field rivet.



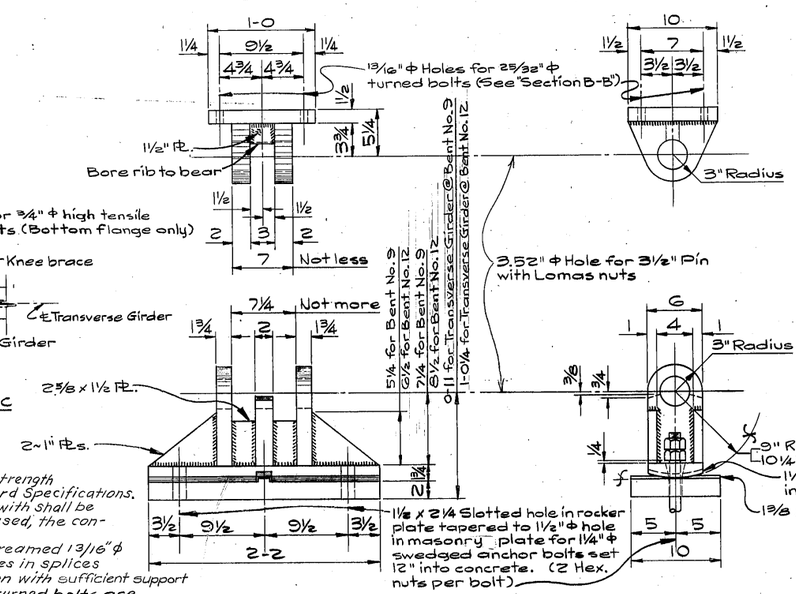
VIEW A-A



SECTION B-B



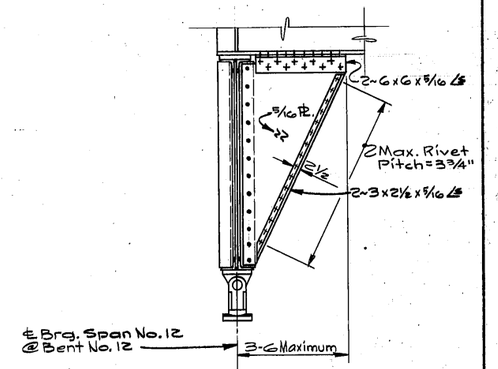
SECTION C-C



Note: Material ~ Carbon Structural Steel, Straightened
Welds ~ Weld all around with 1/2" fillet weld

ROCKER SHOE AT TRANSVERSE GIRDERS
Scale: 1 1/2" = 1'-0"

SECTION F-F
SECTION G-G
(Section F-F & Section G-G are similar to Section C-C)



SECTION E-E
(Section E-E is same as Section B-B)

VIEW D-D

NOTES

RIVETS: 3/4" ϕ unless otherwise noted.

HIGH TENSILE STRENGTH BOLTS: The contractor will be permitted to use High Tensile Strength Bolts in place of 3/4" ϕ rivets for all field connections if he so desires. See the Standard Specifications. This substitution would be for the contractor's convenience and all costs connected therewith shall be included in the payment for Structural Steel. If High Tensile Strength Bolts are to be used, the contractor shall so notify the engineer within 30 days after award of contract.

REAMING: All field holes in girder and stringer splices shall be sub-punched 11/16" ϕ and reamed 13/16" ϕ or drilled in the shop as called for in the Standard Specifications. In reaming field holes in splices the adjacent sections of the girders or stringers must be assembled in exact position with sufficient support throughout the entire length to maintain members in proper position. Where 25/32" ϕ turned bolts are used, holes shall be sub-punched 11/16" ϕ and reamed to 13/16" ϕ or drilled. For 29/32" ϕ turned bolts, sub-punch to 13/16" ϕ and ream to 15/16" ϕ or drill.

COUNTERSUNK RIVETS: Rivets in outstanding legs of flange angles may be countersunk where necessary to clear stiffener angles.

INTERMEDIATE STIFFENERS: Intermediate stiffener angles shall be crimped except that those carrying sway frames shall not be crimped.

SPLICE ANGLES: Splice angles shall be ground to fit fillet of flange angles.

FLOOR MEMBERS: Sway frames shall be set in a plane normal to the grade of the top flange of the main girders. Stringers shall be set with webs vertical.

ERECTION: Girders shall be supported at splice points & at sufficient intervals throughout their entire length to maintain girders at exact elevation and proper alignment during riveting of field splices, except as otherwise approved by the engineer. All splices shall be pinned and bolted in accordance with the Standard Specifications before riveting is begun.

OTHER NOTES: For other notes see Dwgs. No. 5236 & No. 5237

STATE OF MONTANA
STATE HIGHWAY COMMISSION

HIGGINS AVENUE BRIDGE
OVER CLARK FORK & C.M.St.P.&P.R.R. IN MISSOULA
FEDERAL AID PROJECT NO. F-FG 215(7)
MISSOULA COUNTY
TRANSVERSE GIRDER & SHOE DETAILS

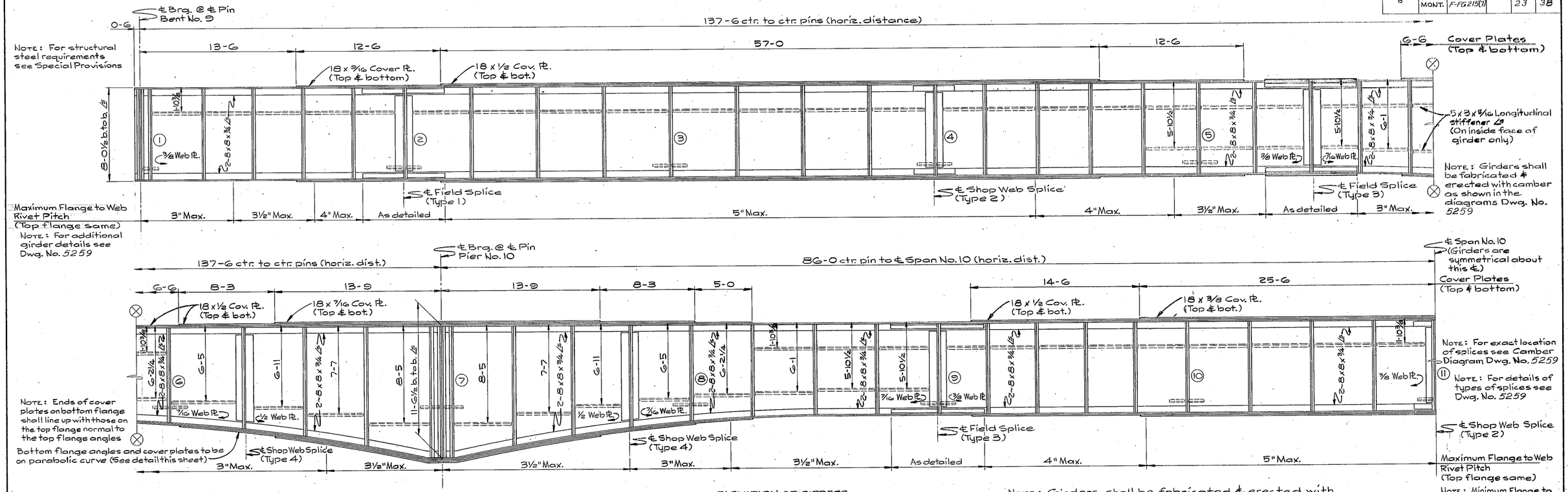
DESIGNED	D. N.	1-17-61
DRAWN	G. N. M.	3-22-61
TRACED		
CHECKED	C. A. M.	7-31-61
REVISED		
REVISED		

Scale: 1/2" = 1'-0" Except As Noted

DRAWING NO. 5257

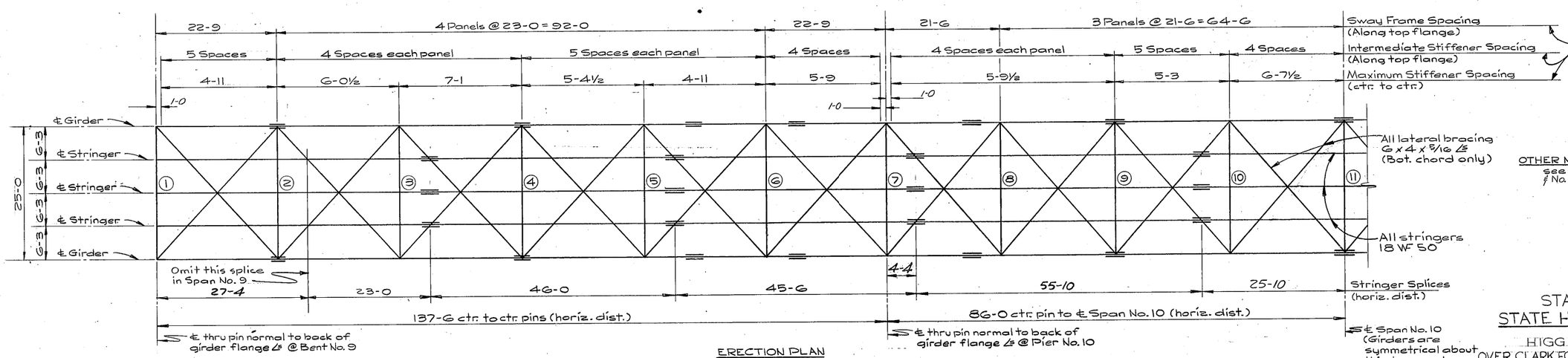
J.R.R.

FED. ROAD DIV. NO.	STATE	FED. AID PROJ. NO.		SHEET NO.	TOTAL SHEETS
8	MONT.	F-FG215(7)		23	38



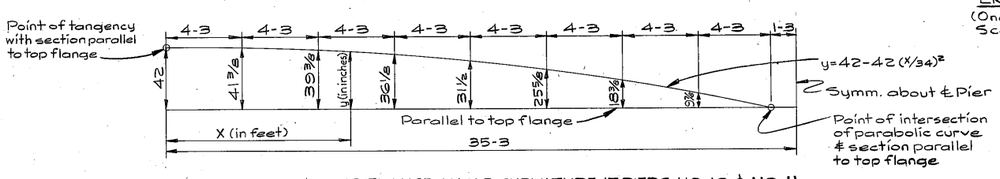
ELEVATION OF GIRDERS
Scale: 1/4" = 1'-0"

Note: Girders shall be fabricated & erected with camber as indicated in the diagram on Dwg. No. 5259.



NOTES
OTHER NOTES For other notes see Dwgs. No. 5236, No. 5237, & No. 5257

ERECTION PLAN
(One Rdwy. only)
Scale: 1" = 10'-0"



LOWER FLANGE ANGLE CURVATURE AT PIERS NO. 10 & NO. 11

Note: All intermediate stiffeners unless otherwise noted are 6 x 3½ x 3/8 ∠s in pairs. Reaction stiffeners and splices are as detailed on Dwg. No. 5259. Use fills under reaction stiffeners and stiffeners @ intermediate panel points. All other stiffeners are crimped. All longitudinal stiffeners are 5 x 3 x 5/16 ∠s on inside face of girder only.

DESIGNED	D. N.	2-9-61
DRAWN	G. N. M.	3-8-61
TRACED		
CHECKED	C. A. M.	7-31-61
REVISED		
REVISED		

STATE OF MONTANA
STATE HIGHWAY COMMISSION

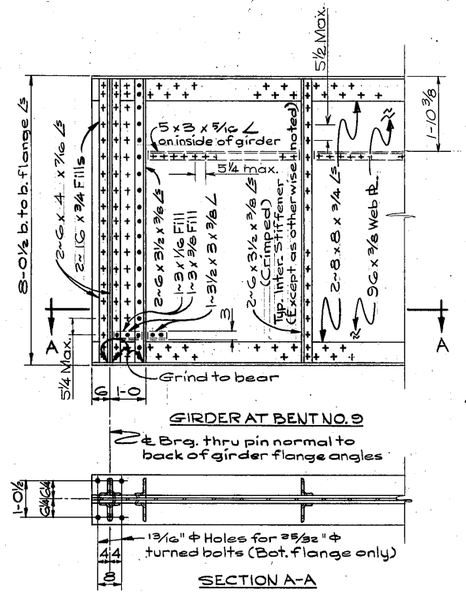
HIGGINS AVENUE BRIDGE
OVER CLARK FORK & C.M.St. P.&P. R.R. IN MISSOULA
FEDERAL AID PROJECT NO. F-FG 215(7)
MISSOULA COUNTY
GIRDERS
SPANS NO. 9, NO. 10 & NO. 11

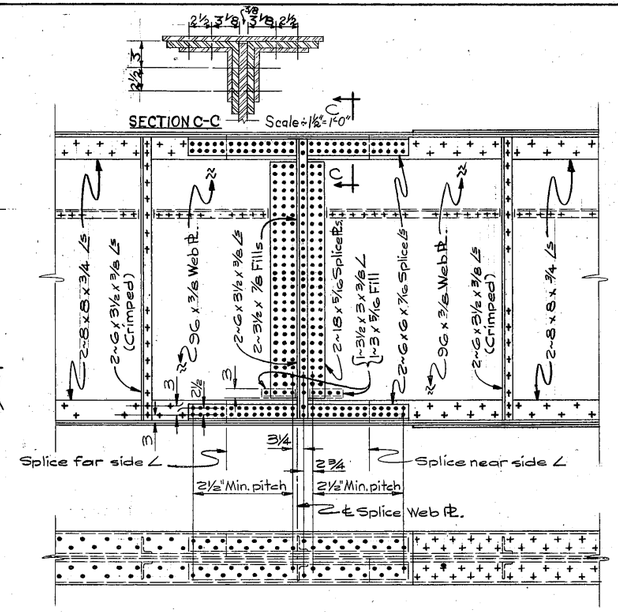
Scale: 1/4" = 1'-0" Except As Noted

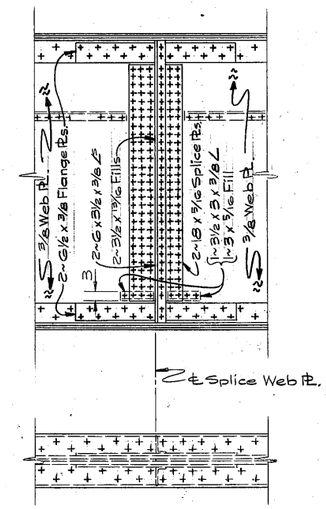
DRAWING NO. 5258

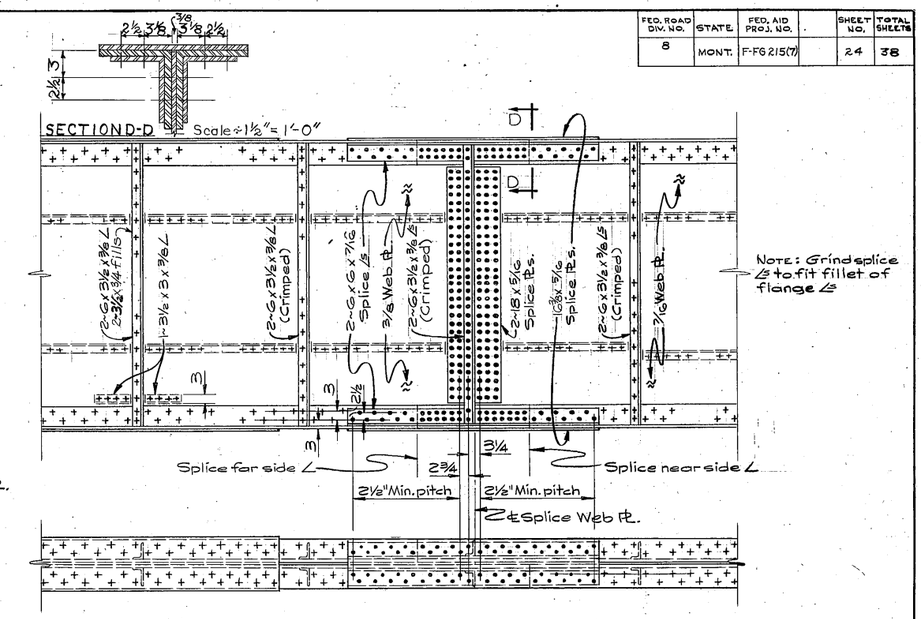
J.R.B.

FED. ROAD DIV. NO.	STATE	FED. AID PROJ. NO.		SHEET NO.	TOTAL SHEETS
8	MONT.	F-FG 215(7)		24	38

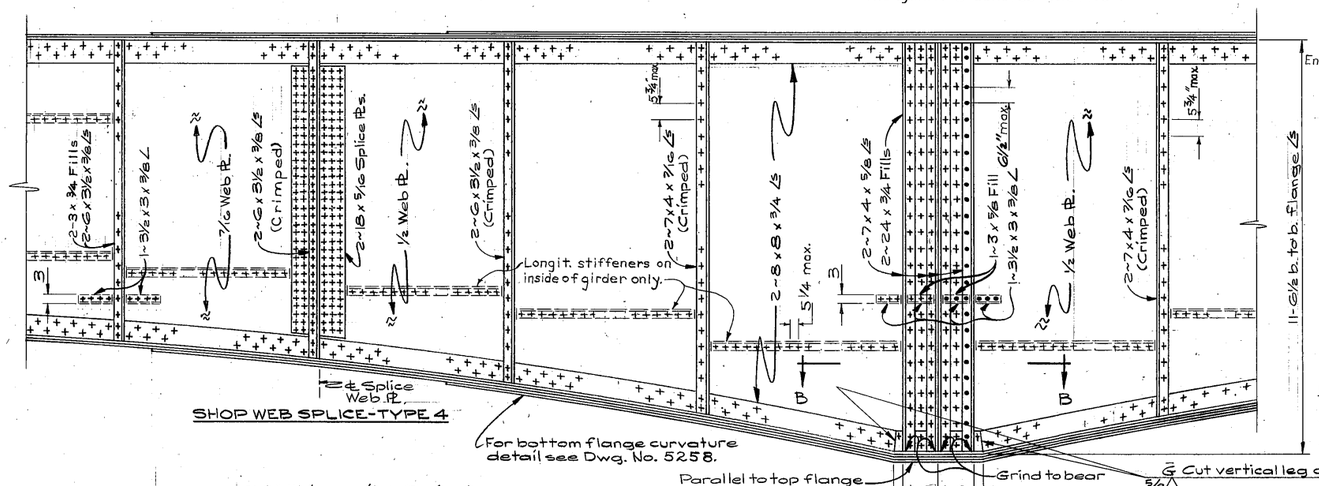


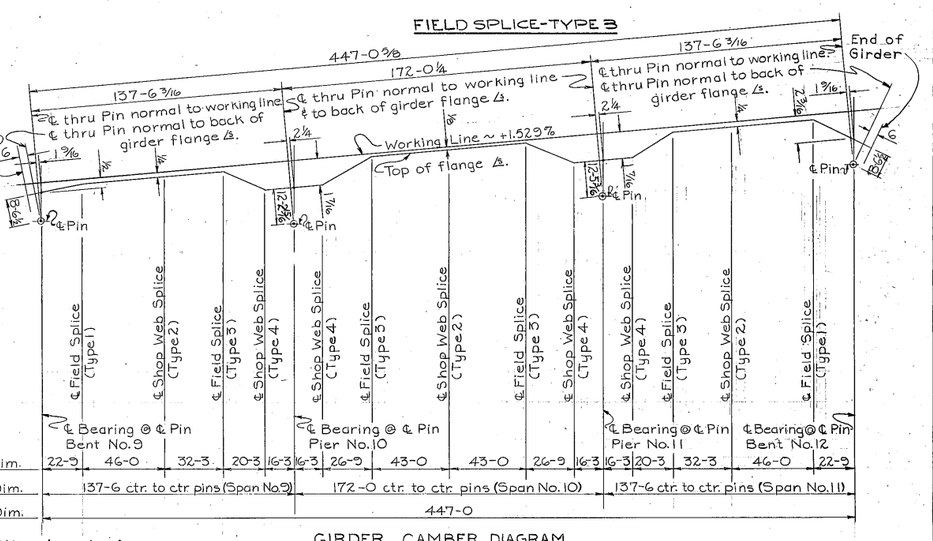


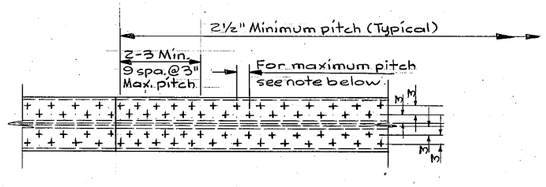




Note: The symbol "+" denotes shop rivet.
The symbol "●" denotes field rivet.

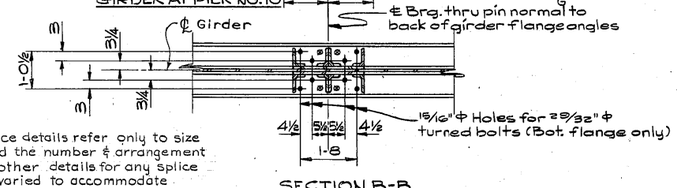




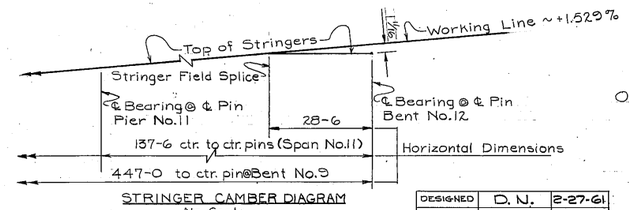


TYPICAL RIVETING AT ENDS OF COVER PLS.

Note: Max. pitch of rivets in cover plates is as follows:
3/8" Cover Plate = 3¼
7/16" Cover Plate = 3½
½" Cover Plate = 3¾
9/16" Cover Plate = 4



Note: The splice details refer only to size of members and the number & arrangement of rivets. The other details for any splice point shall be varied to accommodate stiffeners or sway frame connections as required.



Note: Only those field splices on stringers at grade changes are shown here.

NOTES

OTHER NOTES — For other notes see Dwgs. No. 5236, No. 5237, & No. 5257.

STATE OF MONTANA
STATE HIGHWAY COMMISSION

HIGGINS AVENUE BRIDGE
OVER CLARK FORK & C.M.St. P.&P. R.R. IN MISSOULA
FEDERAL AID PROJECT NO. F-FG 215(7)
MISSOULA COUNTY

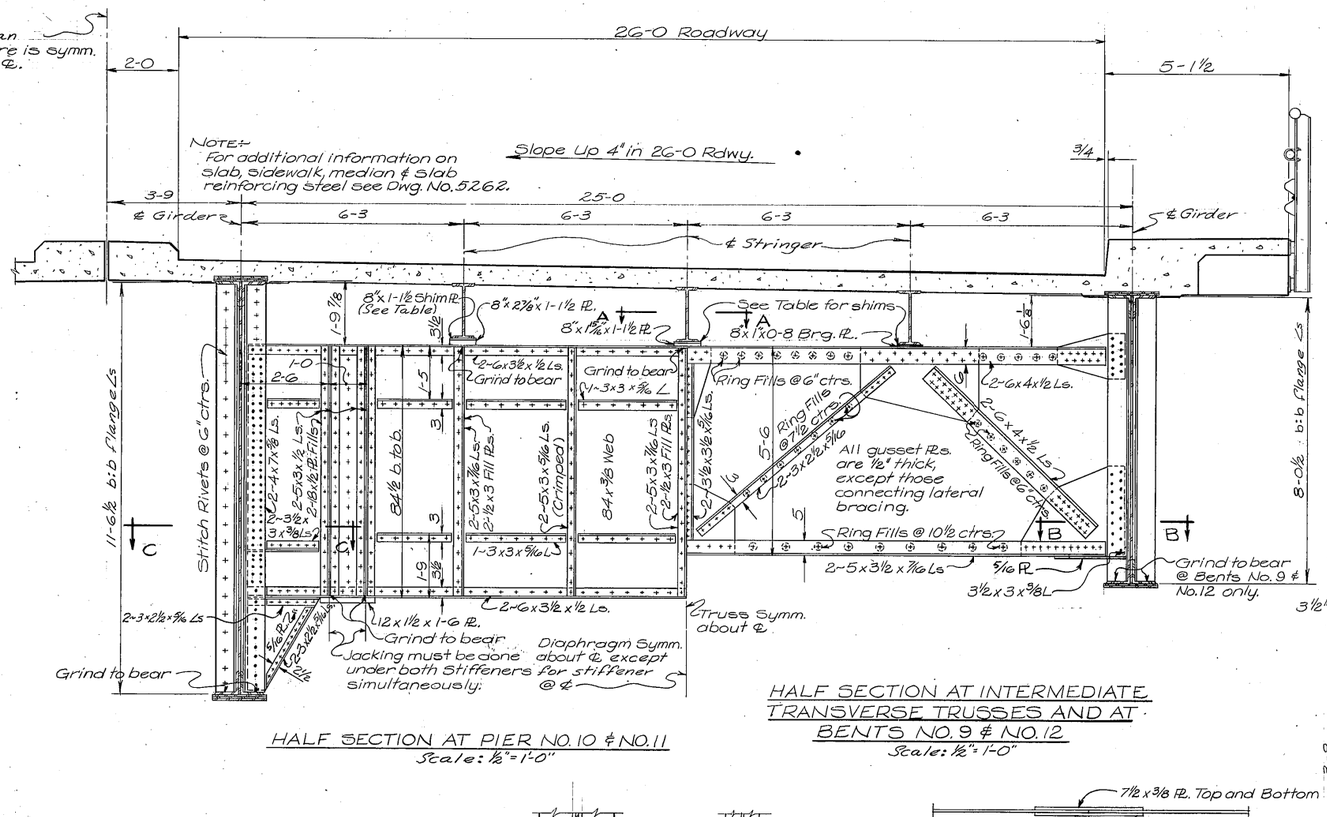
GIRDER DETAILS
SPANS NO. 9, NO. 10 & NO. 11
AND CAMBER DIAGRAMS
Scale: ½" = 1'-0"
Except as noted

DESIGNED	D. N.	2-27-61
DRAWN	G. N. M.	3-17-61
TRACED		
CHECKED	C. A. M.	8-1-61
REVISED		
REVISED		

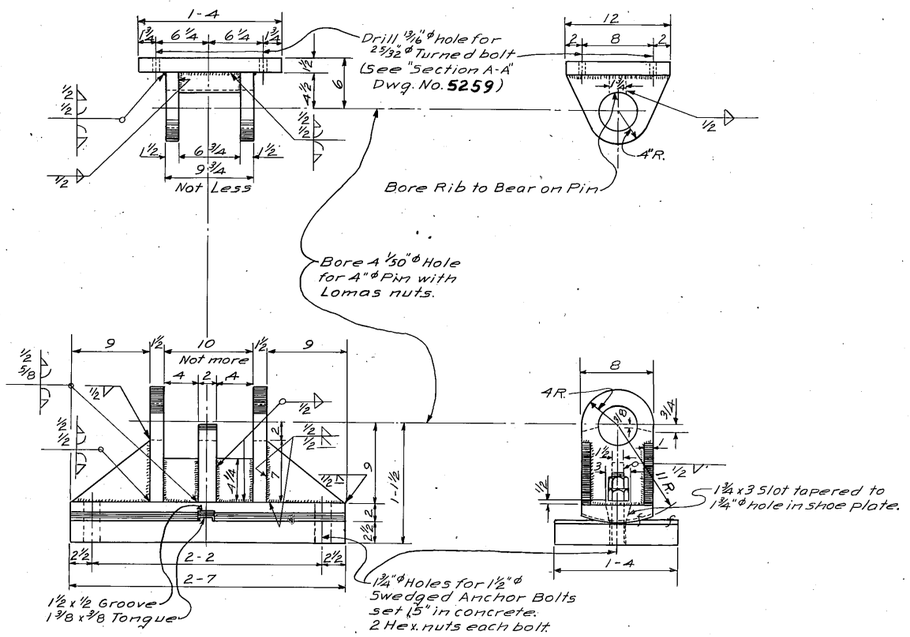
DRAWING NO. 5259

J.R.B.

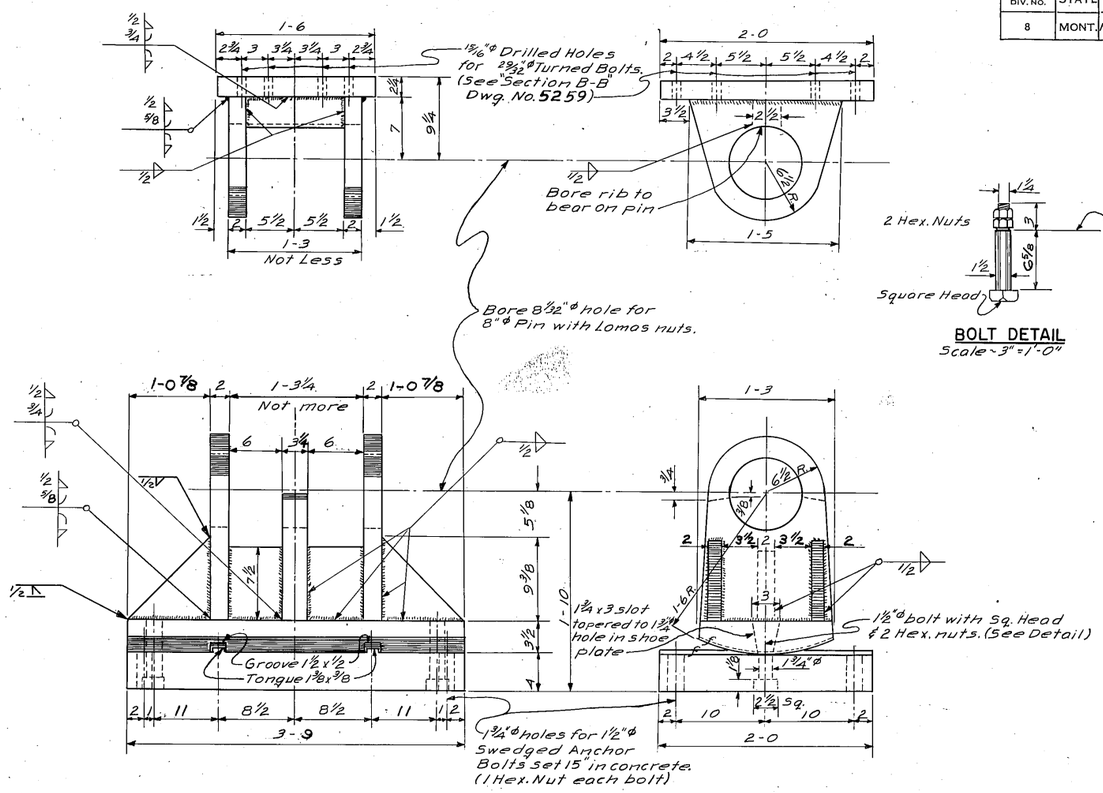
FED. ROAD DIV. NO.	STATE	FED AID PROJ. NO.		SHEET NO.	TOTAL SHEETS
8	MONT.	F-FG 215 (7)		25	38


℄ Median Structure is symm. abt. this ℄.
26-0 Roadway
2-0
5-1½
NOTE:- For additional information on slab, sidewalk, median & slab reinforcing steel see Dwg. No. 5262.
Slope Up 4" in 26-0 Rdwy.
3/4
3-9
25-0
6-3
6-3
6-3
6-3
℄ Girder
℄ Girder
℄ Stringer
8"x1-½ Shim Pl. (See Table)
8"x2⅞"x1-1½ Pl.
8"x1⅞"x1-1½ Pl.
See Table for shims
8"x1"x0-8 Brg. Pl.
2-6x3½"x½ Ls.
Grind to bear
Grind to bear
1-3x3x5/16 L
Ring Fills @ 6" ctrs.
Ring Fills @ 1½ ctrs.
2-6x4x½ Ls.
2-6x4x½ Ls.
All gusset Pls. are ½" thick, except those connecting lateral bracing.
Ring Fills @ 6" ctrs.
Ring Fills @ 10½ ctrs.
2-5x3½x7/16 Ls
5/16 Pl.
3½x3x⅜ L
Grind to bear @ Bents No. 9 & No. 12 only.
Stitch Rivets @ 6" ctrs.
11-6½ b.b Flange Ls
8-0½ b.b Flange Ls
84½ b. to b.
84x⅜ Web
2-5x3x7/16 Ls
2-½x3 Fill Pls.
2-5x3x5/16 Ls. (Crimped)
2-5x3x7/16 Ls
2-½x3 Fill Pls.
2-3x2½x5/16
2-3x2½x5/16
2-3x2½x5/16

FED. ROAD DIV. NO.	STATE	FED. AID PROJ. NO.		SHEET NO.	TOTAL SHEETS
8	MONT.	F-FG215(7)		26	38

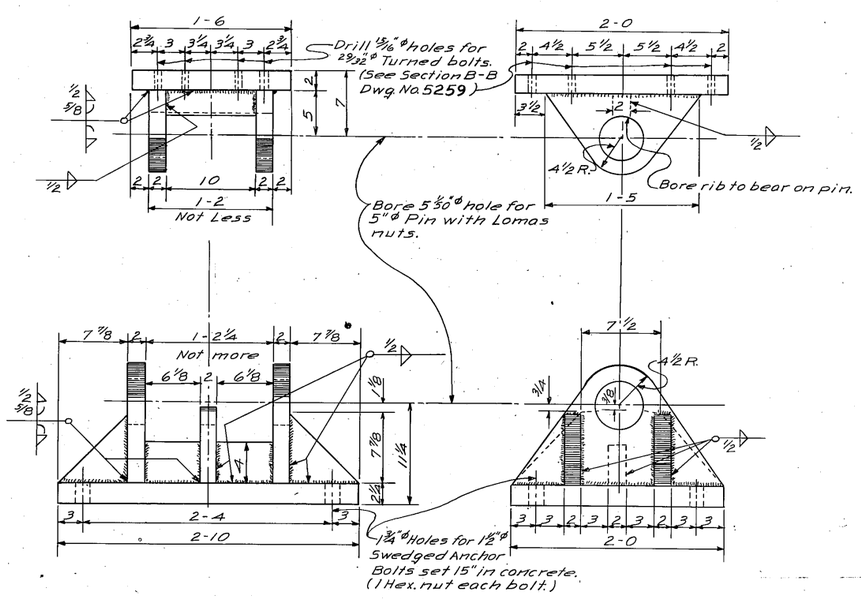


ROCKER SHOE AT BENTS NO. 9 & NO. 12



ROCKER SHOE AT PIER NO. 11

No Scale



FIXED SHOE AT PIER NO. 10

DESIGN INFORMATION

D.L. = Dead Load
L.L. = Live Load
S.L. = Sidewalk L.L.
Moment in Kip Ft.
Shears & Reactions in Kips
Deflections in Inches

137'-6 | 172'-0 | 137'-6
Span No. 9 | Span No. 10 | Span No. 11
R_9 | R_{10} | R_{11} | R_{12}

		Span No. 9 & Span No. 11	Span No. 10	R_9 & R_{12}	R_{10} & R_{11}
Moment	D.L.	3304	3020		-7218
	L.L.	2174	2052		-3133
	S.L.	485	489		-800
Reactions	D.L.			129.9	462.9
	L.L.			90.0	180.2
	S.L.			16.1	47.7
Shear	D.L.			129.9	234.9
	L.L.			90.0	104.2
	S.L.			16.1	23.1
Deflection	D.L.	1.18	0.99		
	L.L.	1.20	1.50		

NOTES

FINISHING:— To assure full bearing, all surfaces in contact shall be edge planed or otherwise finished before welding.
Shoes are to be stress relieved after all welding is completed and before pin holes are drilled or curved bearing surfaces are finished, all in accordance with the Standard Specifications, Article 42.06 (F.F).
Base plates under rockers are to be hot straightened before finishing.

WELDING:— Welding is symmetrical about the ℄s of shoes.

SHOES:— All material for shoes for Spans No. 9, No. 10 & No. 11 shall conform to the Special Provisions for Structural Steel F-FG-215(7).

SETTING OF SHOES:— Rocker shoes shall be set vertical under full dead load of 60°F. If rockers are not in correct position with final dead load on spans, spans shall be jacked and adjustments made.

OTHER NOTES:— For other notes see Dwgs. No. 5236 & No. 5237

STATE OF MONTANA
STATE HIGHWAY COMMISSION

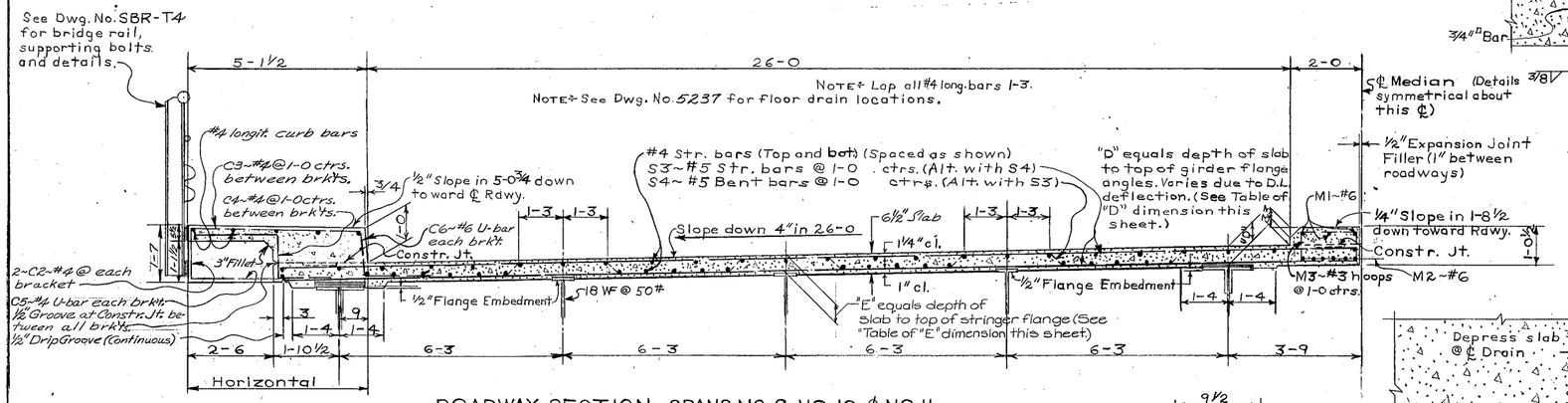
HIGGINS AVENUE BRIDGE
OVER CLARK FORK & C.M.St.P.&P.R.R. IN MISSOULA
FEDERAL AID PROJECT NO. F-FG 215(7)
MISSOULA COUNTY
SHOE DETAILS
Scale - 1 1/2" = 1'-0"
Except As Noted

DESIGNED	D. N.	1-17-61
DRAWN	G. N. M.	3-22-61
TRACED		
CHECKED	C. A. M.	8-1-61
REVISED		
REVISED		

DRAWING NO. 5261

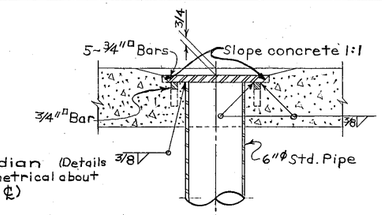
J.R.B.

FED. ROAD DIV. NO.	STATE	FED. AID PROJ. NO.		SHEET NO.	TOTAL SHEETS
8	MONT	FFG 215 (7)		27	38



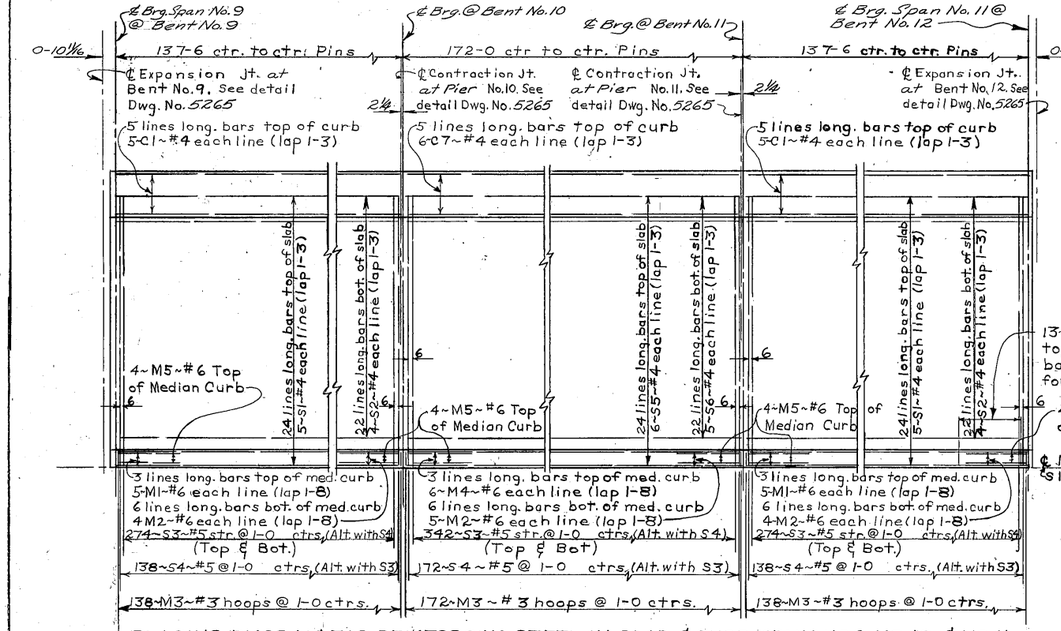
ROADWAY SECTION—SPANS NO. 9, NO. 10, & NO. 11

Scale: ½" = 1'-0"



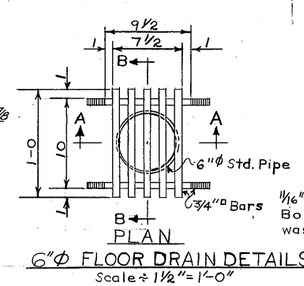
SECTION B-B

Scale: 1½" = 1'-0"



PLACING DIAGRAM FOR REINFORCING STEEL IN SLAB & CURB—SPANS NO. 9, NO. 10, & NO. 11

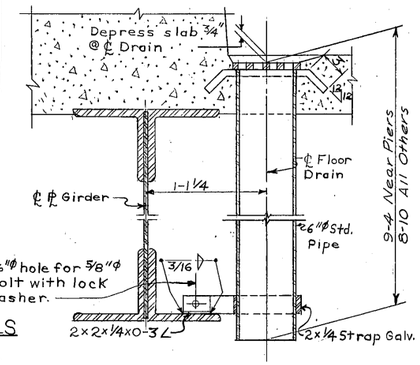
No Scale



PLAN

6"φ FLOOR DRAIN DETAILS

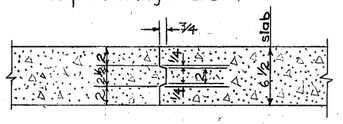
Scale: 1½" = 1'-0"



SECTION A-A

Scale: 1½" = 1'-0"

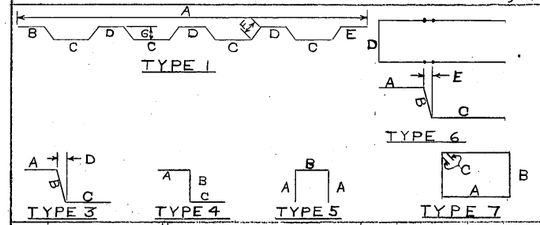
NOTE: Top of drain assembly shall be set horizontal. See "General Layout" for Floor Drain spacing & location. Drain assemblies shall be galvanized after welding is completed. The unit price bid for "6" Floor Drains" shall be full payment for the drains complete in place, including galvanizing, welding, pipe, bars and all incidentals pertaining thereto.



SHEAR KEY AT CONSTRUCTION JOINTS IN SLAB

Scale: 1½" = 1'-0"

BILL OF REINFORCING STEEL (Both Roadways)



STRAIGHT BARS				BENT BARS (All dimensions are out to out)											
MARK	SIZE	No.	LENGTH	MARK	SIZE	No.	TYPE	LENGTH	A	B	C	D	E	F	G
SPANS NO. 9, NO. 10, & NO. 11															
C1	#4	100	28-6												
C7	4	60	29-8	C3	#4	752	3	7-4	4-10	1-3	1-3	0-1			
C2	4	220	1-4	C4	4	752	4	3-9	1-3	1-3	1-3				
				C5	4	220	5	7-10	3-7	0-8					
M1	6	60	28-10	C6	6	220	6	16-2	4-10	1-3	1-8	0-8	0-1		
M2	6	156	35-8												
M4	6	36	30-0												
M5	6	48	6-0	M3	3	896	7	5-4	1-6	0-10	0-4				
S1	4	480	28-6	S4	#5	896	1	31-6	30-4	3-0	3-3	2-6	4-10	0-6	0-4¼
S2	4	352	35-4												
S3	5	1780	30-4												
S5	4	288	29-8												
S6	4	220	35-4												
S7	#6	156	5-3												

TABLE OF "D" DIMENSION (In Inches)

GIRDER POINT	R1	.1	.2	.3	.4	.5	.6	.7	.8	.9
DEPTH OF SLAB "D"	6	6¼	6 9/16	6⅞	6 15/16	6⅞	6⅝	6 5/16	6½	6 15/16
GIRDER POINT	R2	.1	.2	.3	.4	.5	.6	.7	.8	.9
DEPTH OF SLAB "D"	6 15/16	6⅞	6 5/16	6¼	6½	6⅝	6½	6¼	6 5/16	6⅞
GIRDER POINT	R3	.1	.2	.3	.4	.5	.6	.7	.8	.9	R4
DEPTH OF SLAB "D"	6 15/16	6 15/16	6½	6 5/16	6⅝	6⅞	6 15/16	6⅞	6 9/16	6⅝	6

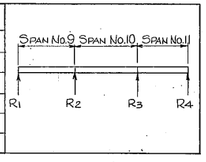
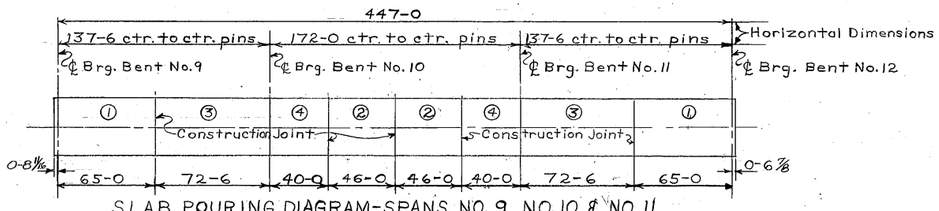


TABLE OF "E" DIMENSION (In Inches)

STRINGER POINT	R1		R2		R3		.6	.7	.8	.9	R4
DEPTH OF SLAB "E"	6		6		6		6	6	6 1/16	6½	6



SLAB POURING DIAGRAM—SPANS NO. 9, NO. 10, & NO. 11

No Scale

NOTE: The numbers inscribed in the circles represent the sequence of pouring sections of the slab. Sections of the same number need not be poured simultaneously. A combination of sections numbered successively may be poured continuously but all sections of one number must be poured before pouring is started on any sections of the succeeding number. All slab reinforcing bars and slab forms for Spans No. 9, No. 10, & No. 11 shall be in place before any slab concrete of these spans is placed.

J.R.B.

NOTES

OTHER NOTES :— For other notes see Dwgs. No. 5236 & No. 5237.

STATE OF MONTANA
STATE HIGHWAY COMMISSION

HIGGINS AVENUE BRIDGE
OVER CLARK FORK & C.M.St.P.&P.R.R. IN MISSOULA
FEDERAL AID PROJECT NO. FFG 215(7)
MISSOULA COUNTY

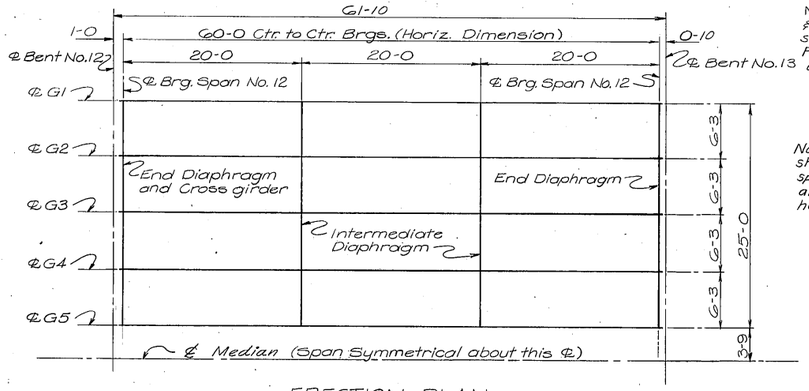
SLAB & 6" FLOOR DRAIN DETAILS
SPANS NO. 9, NO. 10 & NO. 11

Scale: As Noted

DESIGNED		
DRAWN	W.C.O.	3-2-61
TRACED		
CHECKED	C.A.M.	8-2-61
REVISED		
REVISED		

DRAWING NO. 5262

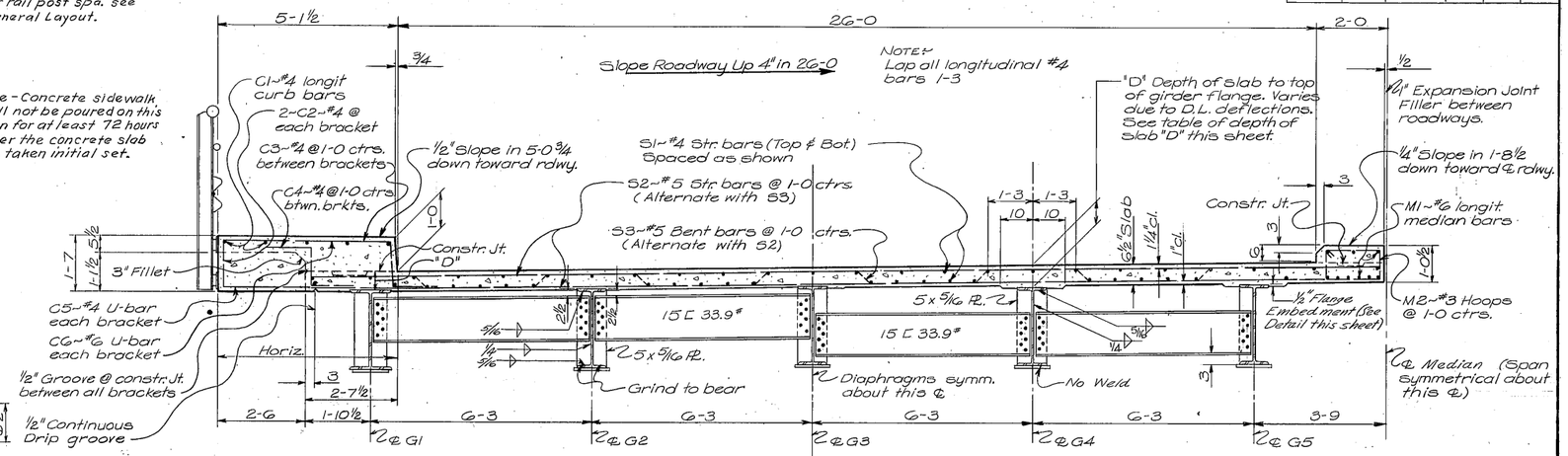
FED. ROAD DIV. NO.	STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
8	MONT.	F-FG215(7)	28	38



ERECTION PLAN
Scale:- 1/8" = 1'-0"

Note: For rail posts & supporting bolts see Dwg. No. SBR-T4. For rail post spa. see General Layout.

Note:- See Special Provisions for Steel requirements.



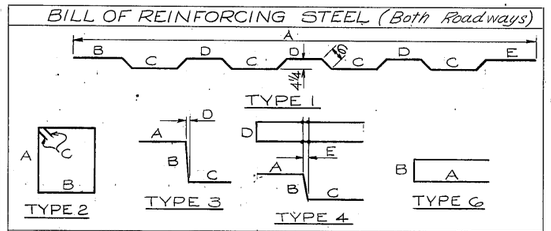
HALF SECTION AT END DIAPHRAGM

HALF SECTION NEAR INTERMEDIATE DIAPHRAGM

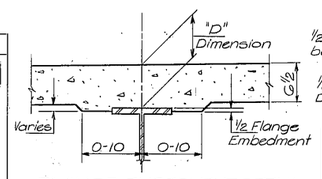
TYPICAL ROADWAY SECTION
Scale:- 1/2" = 1'-0"

Note: See Dwg. No. 5268 for details of recess on sidewalk for stairway checkered plate.

BILL OF REINFORCING STEEL (Both Roadways)

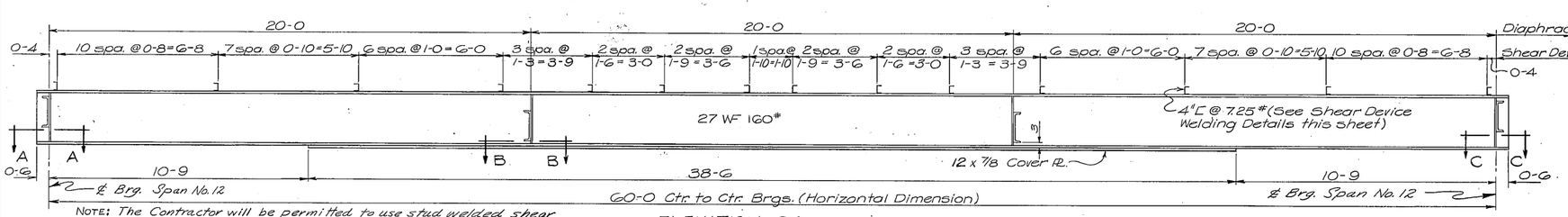


STRAIGHT BARS				BENT BARS (All dimensions are out to out)									
MARK	SIZE	NO.	LENGTH	MARK	SIZE	NO.	TYPE	LENGTH	A	B	C	D	E
S1	#4	188	30'-11"	S3	#5	120	1	31'-5"	30'-3	3'-0"	3'-0½	2'-6"	4'-10"
S2	5	244	30-3										
C1	4	20	31-1	C3	4	102	3	7-4	4-10	1-3	1-3	0-1	
C2	4	32	1-4	C4	4	124	3	3-9	1-3	1-3	1-3		
				C5	4	16	6	7-10	3-7	0-8			
M1	6	36	31-3	C6	6	16	4	16-2	4-10	1-3	1-8	0-8	0-1
M5	#6	16	6-0	M2	#3	124	2	5-4	1-6	0-10	0-4		



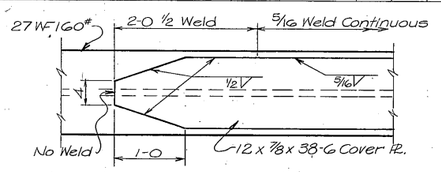
FLANGE EMBEDMENT DETAIL
Scale:- 1" = 1'-0"

TABLE OF "D" DIMENSION						
Point	℄ Brg.	.1	.2	.3	.4	.5
G1	G	7 3/16	8 3/16	9	9 7/16	9 5/8
G2, G3 & G4	G	7¼	8¼	9	9 7/16	9 7/16
G5	G	7 5/16	8 3/8	9 3/16	9 9/8	9 7/8

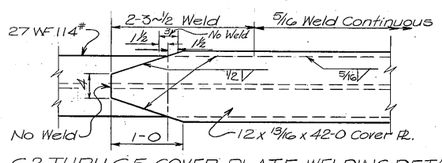


Note: The Contractor will be permitted to use stud welded shear connectors in place of the 4" [@ 7.25# shear devices if he so desires; in which case he shall comply with the requirements & conditions set forth on this sheet.

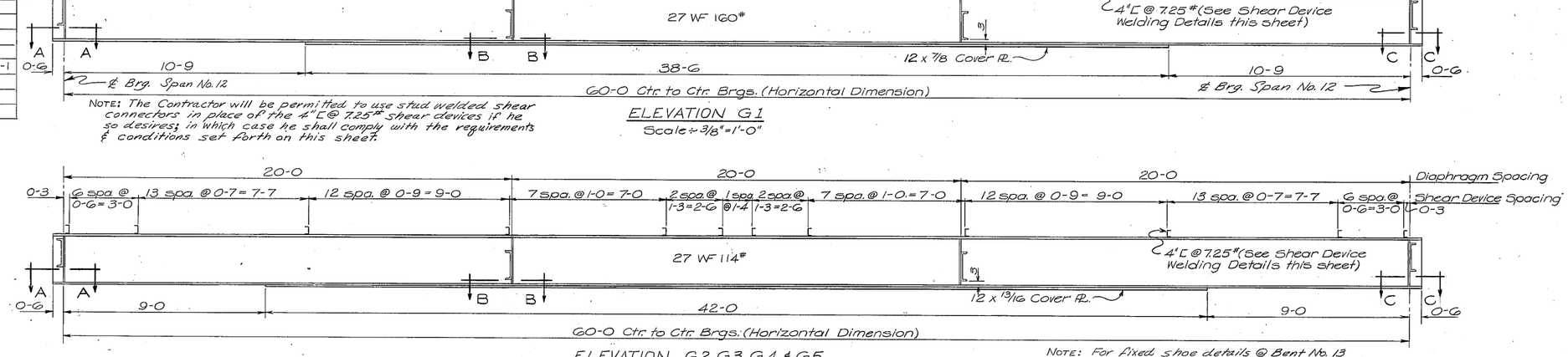
ELEVATION G1
Scale:- 3/8" = 1'-0"



G1 COVER PLATE WELDING DETAILS
Scale:- 1" = 1'-0"

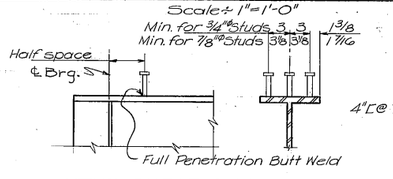


G2 THRU G5 COVER PLATE WELDING DETAILS
Scale:- 1" = 1'-0"

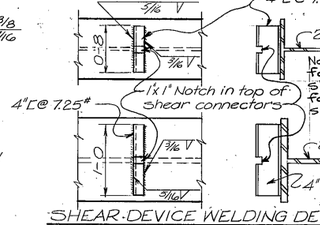


ELEVATION G2, G3, G4 & G5
Scale:- 3/8" = 1'-0"

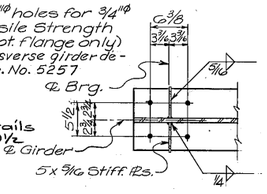
Note: For fixed shoe details @ Bent No. 13 see Dwg. No. 5256



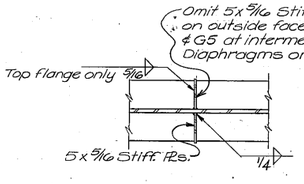
STUD SHEAR DEVICE WELDING DETAILS
Scale:- 1" = 1'-0"



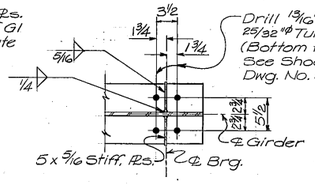
SHEAR-DEVICE WELDING DETAILS
Scale:- 1" = 1'-0"



SECTION A-A
(At G2, G3, G4 & G5)
(G1 Similar)
Scale:- 1" = 1'-0"



SECTION B-B
(At G2, G3, G4 & G5)
(G1 Similar)
Scale:- 1" = 1'-0"



SECTION C-C
(At G2, G3, G4 & G5)
(G1 Similar)
Scale:- 1" = 1'-0"

NOTES

OTHER NOTES:- For other notes see Dwgs. No. 5236 & No. 5237.

DESIGNED	R. K.	4-3-61
DRAWN	L. E. P.	4-19-61
TRACED		
CHECKED	C. A. M.	8-2-61
REVISED		
REVISED		

STATE OF MONTANA
STATE HIGHWAY COMMISSION

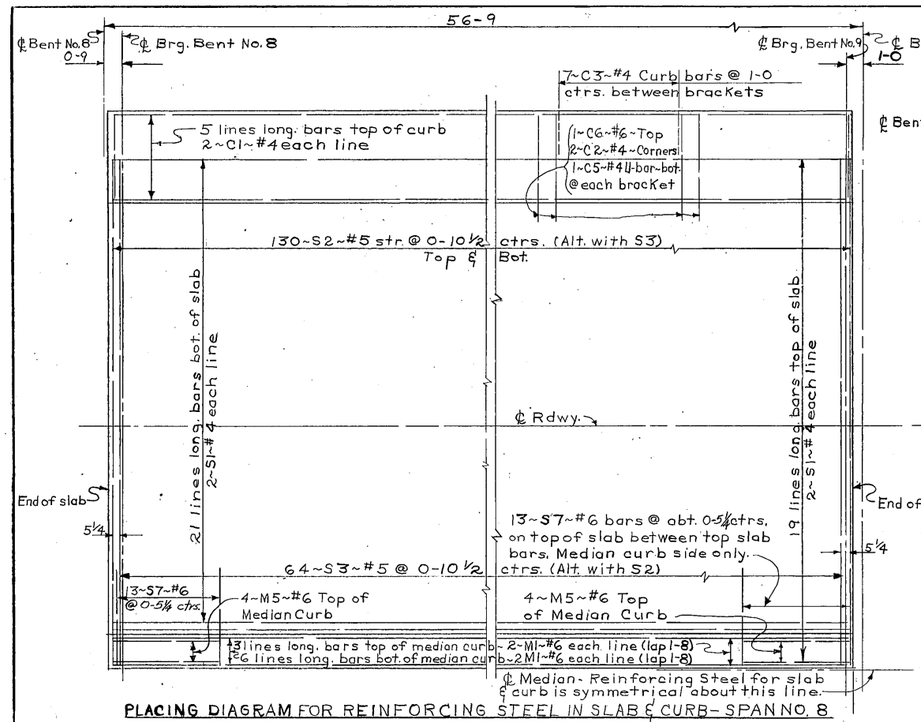
HIGGINS AVENUE BRIDGE
OVER CLARK FORK & C.M.St. P.&P. R.R. IN MISSOULA
FEDERAL AID PROJECT NO. F-FG 215(7)
MISSOULA COUNTY
SPAN NO. 12

Scale:- As Noted

DRAWING NO. 5263

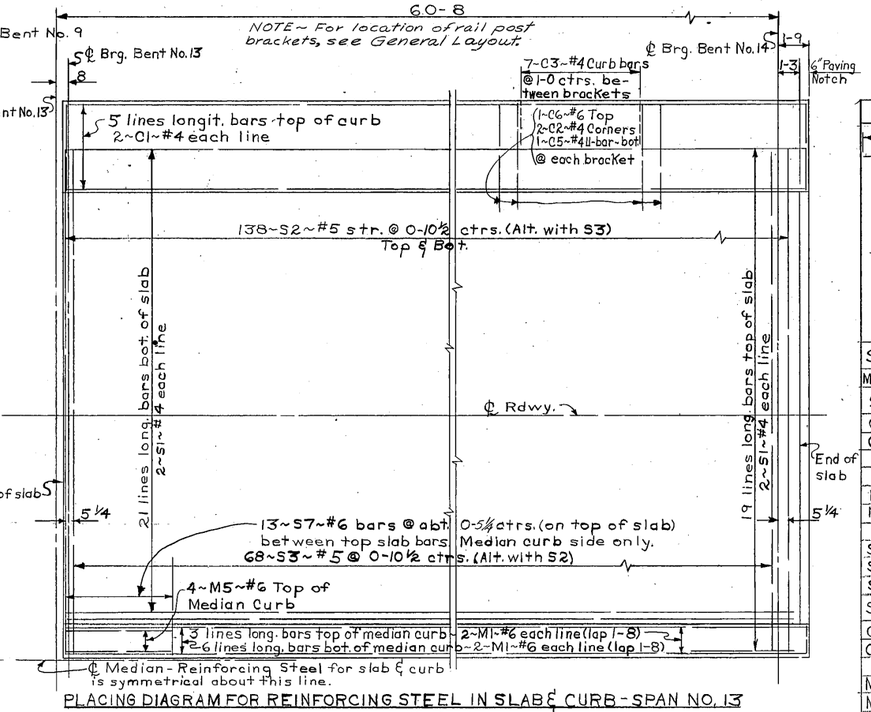
J.R.B.

FED. ROAD DIV. NO.	STATE	FED. AID PROJ. NO.		SHEET NO.	TOTAL SHEETS
8	MONT.	F-FG 215(7)		29	38



PLACING DIAGRAM FOR REINFORCING STEEL IN SLAB & CURB - SPAN NO. 8

No Scale

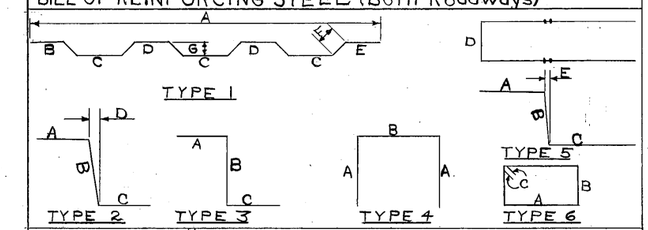


PLACING DIAGRAM FOR REINFORCING STEEL IN SLAB & CURB - SPAN NO. 13

No Scale

NOTE: Lap all #4 longit. bars 1-3.

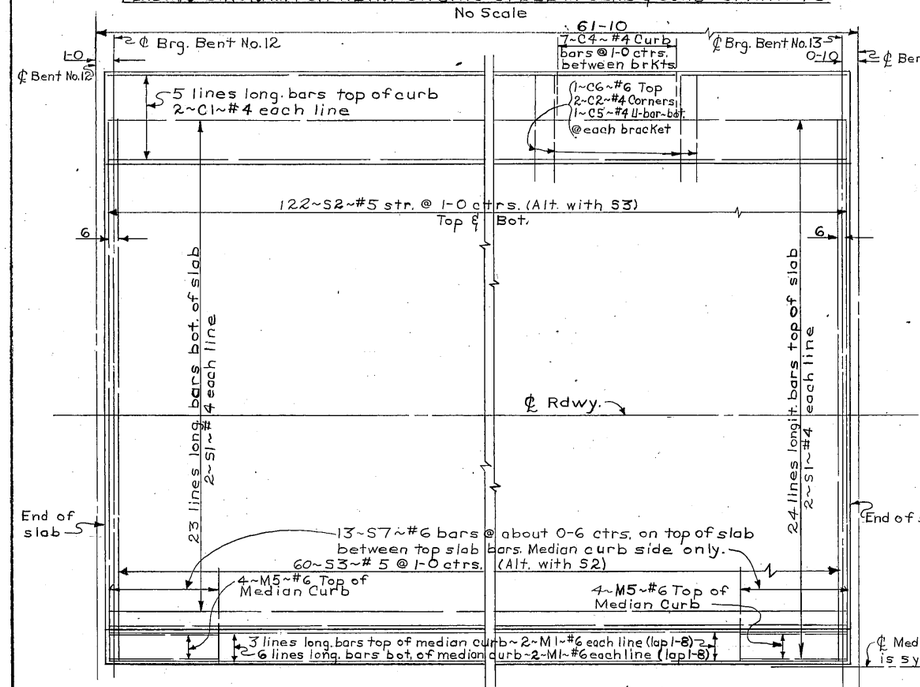
BILL OF REINFORCING STEEL (Both Roadways)



STRAIGHT BARS				BENT BARS (All dimensions are out to out)											
MARK	SIZE	No.	LENGTH	MARK	SIZE	No.	TYPE	LENGTH	A	B	C	D	E	F	G
SPAN NO. 8 (Both Roadways)															
C1	#4	20	28'-8"	C3	#4	91	2	7'-4"	4'-10"	1'-3"	1'-3"	0'-1"			
C2	4	28	1-5	C4	4	91	3	3-9	1-3	1-3	1-3				
				C5	4	14	4	7-10	3-7	0-8					
				C6	6	14	5	16-2	4-10	1-3	1-8	0-8	0'-1"		
M1	6	36	28-10												
M5	6	16	6-0	M2	3	112	6	5-4	1-6	0-10	0-4				
S1	4	160	28-8	S3	#5	128	1	31-4	30-4	3-5	4-2	3-4	5-3	0'-7"	0'-5"
S2	5	260	30-4												
S7	#6	52	5-3												
SPAN NO. 13 (Both Roadways)															
C1	#4	20	31'-2"	C3	#4	98	2	7'-4"	4'-10"	1'-3"	1'-3"	0'-1"			
C2	4	32	1-5	C4	4	98	3	3-9	1-3	1-3	1-3				
				C5	4	16	4	7-10	3-7	0-8					
M1	6	36	31-4	C6	6	16	5	16-2	4-10	1-3	1-8	0-8	0'-1"		
M5	6	8	6-0												
				M2	3	122	6	5-4	1-6	0-10	0-4				
S1	4	160	31-2												
S2	5	276	30-4	S3	#5	136	1	31-4	30-4	3-5	4-2	3-4	5-3	0'-7"	0'-5"
S7	#6	26	5-3												

NOTES

OTHER NOTES: For other notes see Dwgs. No. 5236 & No. 5237.

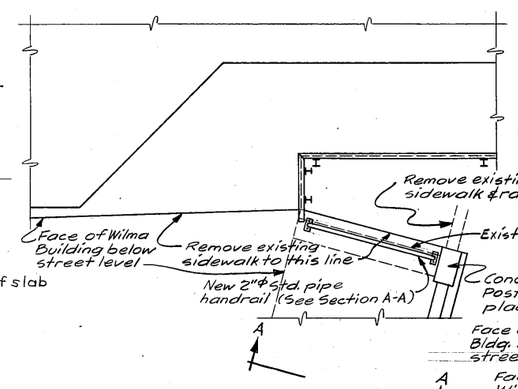


PLACING DIAGRAM FOR REINFORCING STEEL IN SLAB & CURB - SPAN NO. 12

No Scale

NOTE: For "Bill of Reinforcing Steel" for Span No. 12 see Dwg. No. 5263.

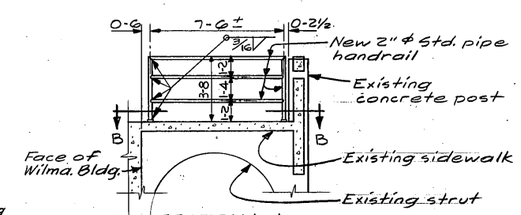
J.R.B.



PLAN OF 2" ϕ STD. PIPE HANDRAIL

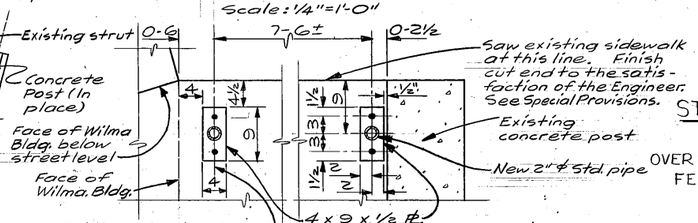
(To be used in conjunction with Detail "A" Dwg. No. 5236)

Scale: ¼" = 1'-0"



SECTION A-A

Scale: ¼" = 1'-0"



SECTION B-B

Scale: 1" = 1'-0"

NOTE: The cost of New 2" ϕ Std. pipe handrail to be included in the unit price bid for Class "AD" concrete in the superstructure. All exposed surfaces of 2" ϕ Std. pipe handrail shall receive 3 coats of paint as specified for structural steel.

DESIGNED		
DRAWN	W.C.O.	7-31-61
TRACED		
CHECKED	C.A.M.	7-31-61
REVISED		
REVISED		

STATE OF MONTANA
STATE HIGHWAY COMMISSION

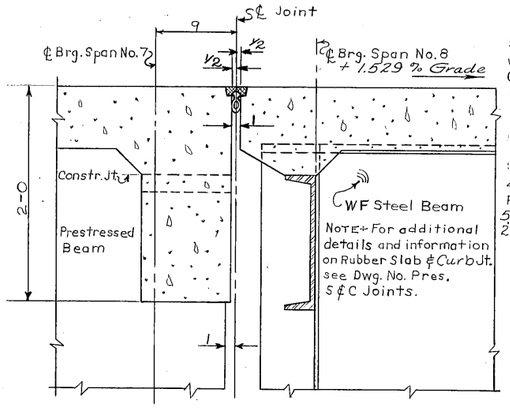
HIGGINS AVENUE BRIDGE
OVER CLARK FORK & C.M.St.P.&P. R.R. IN MISSOULA
FEDERAL AID PROJECT NO. F-FG 215(7)
MISSOULA COUNTY

SLAB DETAILS
SPANS NO. 8, NO. 12 & NO. 13
& 2" ϕ PIPE HANDRAIL

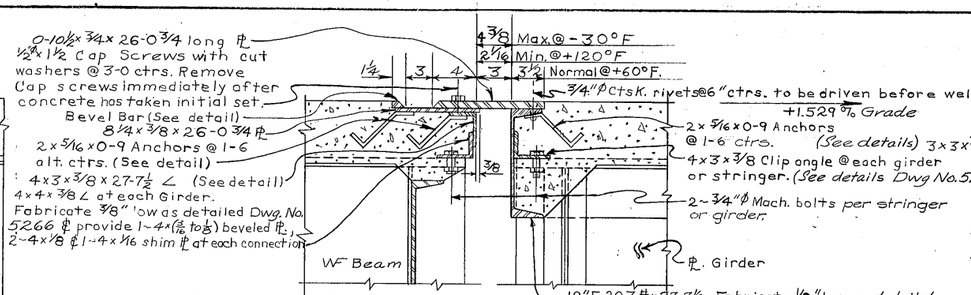
Scale: As Noted

DRAWING NO. 5264

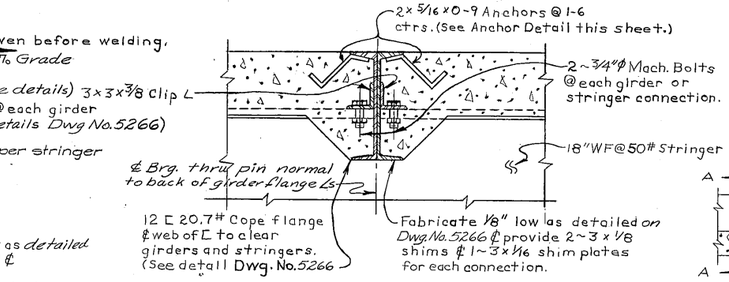
FED. ROAD DIV. NO.	STATE	FED. AID PROJ. NO.		SHEET NO.	TOTAL SHEETS
8	MONT.	FFG 215(7)		30	38



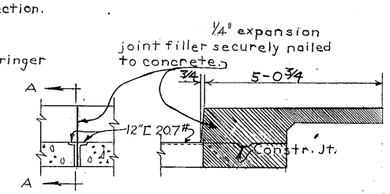
RUBBER SLAB JOINT DETAIL
(At Bent No. 8)



EXPANSION JOINT
(At Bent No. 9)



CONTRACTION JOINT
(At Piers No. 10 & No. 11)

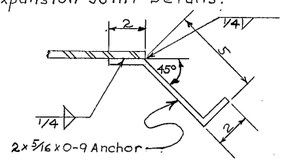


CURB CONTRACTION JOINT @ PIERS NO. 10 & NO. 11
Scale ~ ½" = 1'-0"

SECTION A-A
Scale ~ ½" = 1'-0"

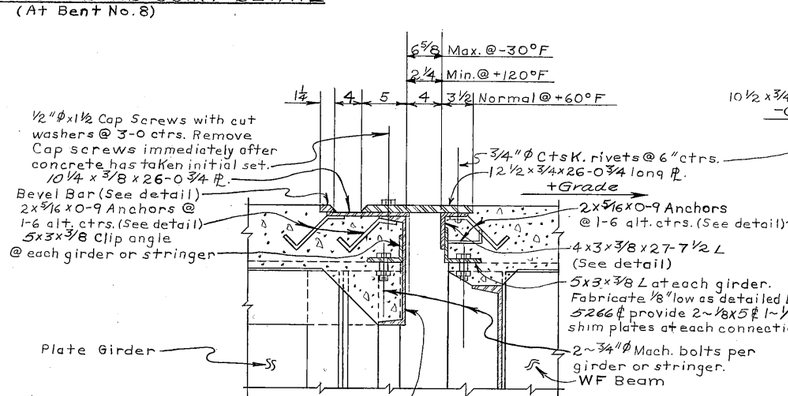
NOTE: Median contraction joints @ Piers No. 10 & No. 11 similar.

NOTE: Welding typical for all anchors except as noted. Bend as shown in "Expansion Joint Details."

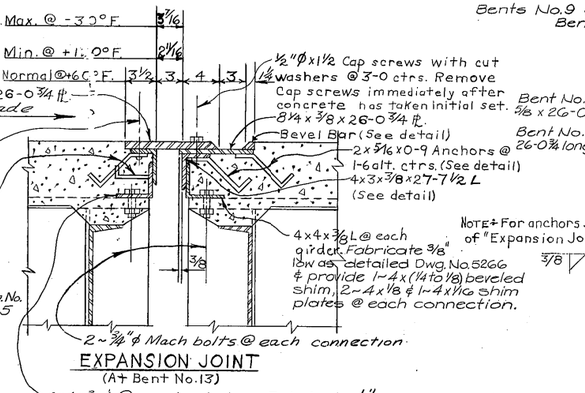


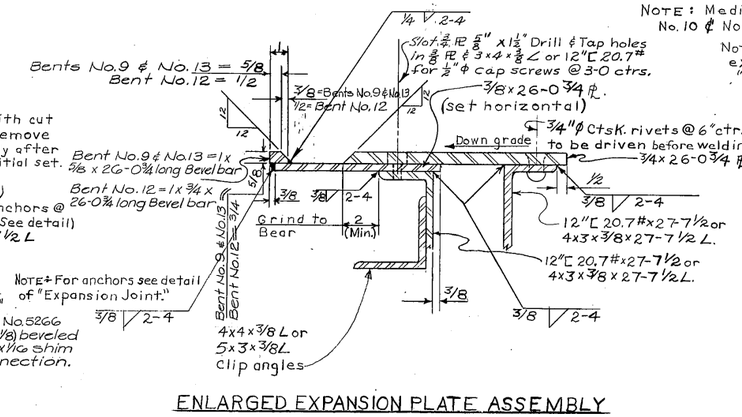
TYPICAL ANCHOR DETAIL
Scale ~ 3" = 1'-0"

NOTE: "Typical Anchor Detail" for all anchors except at sidewalk Exp. Jt. and as otherwise shown.

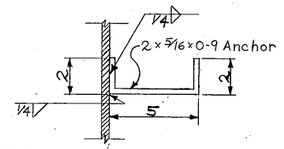


EXPANSION JOINT
(At Bent No. 13)

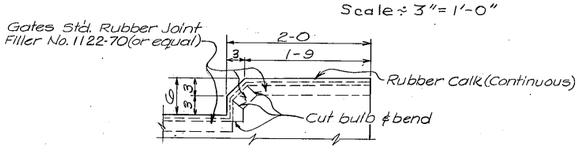




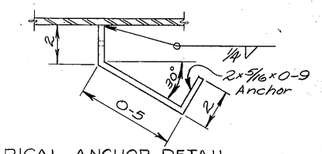
ENLARGED EXPANSION PLATE ASSEMBLY
Scale ~ 3" = 1'-0"



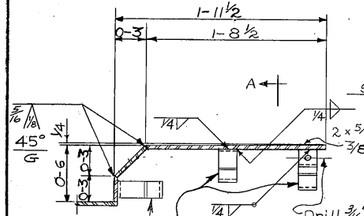
TYPICAL ANCHOR DETAIL
(For Expansion Joints @ Bents No. 12 & No. 13.)
Scale ~ 3" = 1'-0"



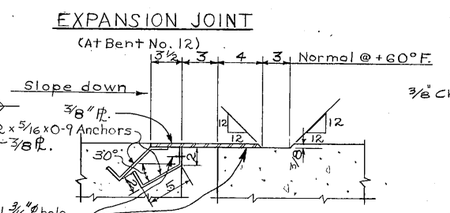
RUBBER MEDIAN JOINT DETAIL
Scale ~ 1" = 1'-0"



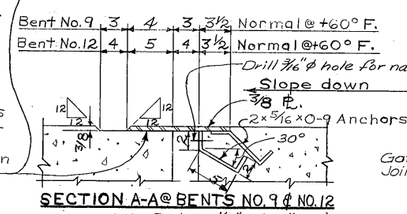
TYPICAL ANCHOR DETAIL
(For Median Expansion Joints @ Bents No. 9, No. 12, & No. 13)
Scale ~ 3" = 1'-0"



DETAILS OF MEDIAN EXPANSION JOINT
BENTS NO. 9, NO. 12 & NO. 13
Scale ~ 1½" = 1'-0"

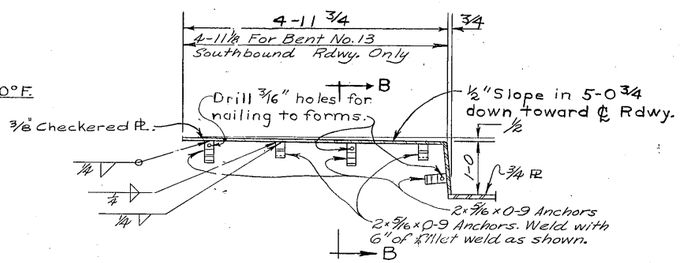


SECTION A-A @ BENT NO. 13
Scale ~ 1½" = 1'-0"

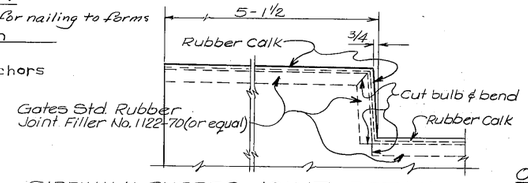


SECTION A-A @ BENTS NO. 9 & NO. 12
Scale ~ 1½" = 1'-0"

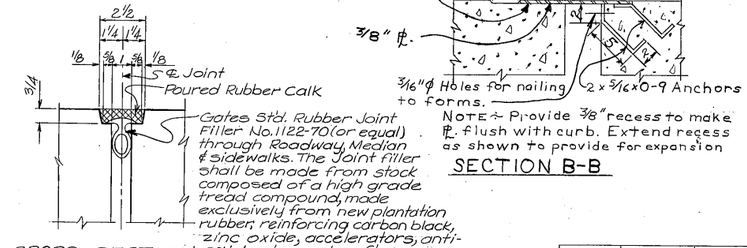
One layer of tar paper to be placed under ℔ where it rubs on concrete. Provide ⅜" recess to make ℔. flush with median. Extend recess as shown to provide for expansion.



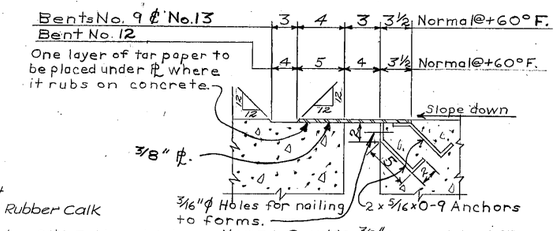
SIDEWALK EXPANSION JOINT
(Bents No. 9, No. 12 & No. 13)
Scale ~ ¾" = 1'-0"



SIDEWALK RUBBER JOINT DETAIL
Scale ~ 1" = 1'-0"



CROSS SECTION OF RUBBER JOINT
Scale ~ 3" = 1'-0"



NOTE: Provide ⅜" recess to make ℔. flush with curb. Extend recess as shown to provide for expansion

SECTION B-B

STATE OF MONTANA
STATE HIGHWAY COMMISSION

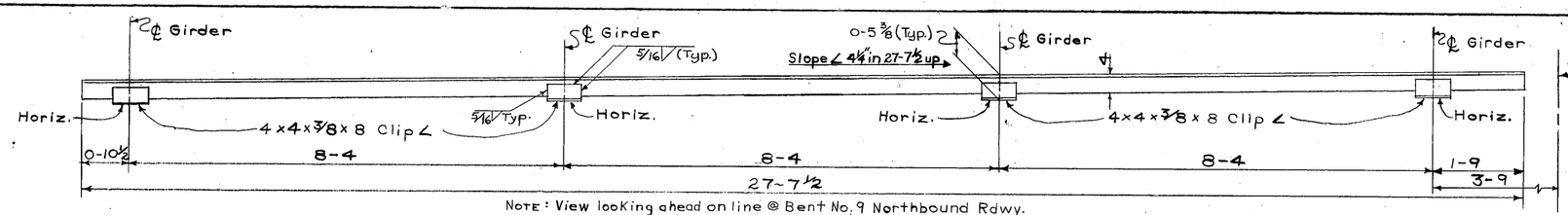
HIGGINS AVENUE BRIDGE
OVER CLARK FORK & C.M.St.P.&P. R.R. IN MISSOULA
FEDERAL AID PROJECT NO. FFG 215(7)
MISSOULA COUNTY
SLAB & CURB JOINTS

Scale ~ 1½" = 1'-0" Except As Noted

DESIGNED		
DRAWN	W.C.O.	1-31-61
TRACED		
CHECKED	C.A.M.	8-4-61
REVISED		
REVISED		

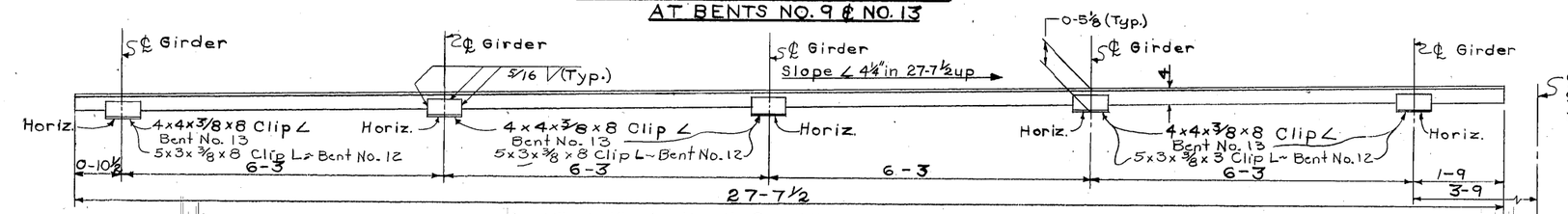
DRAWING NO. 5265

FED. ROAD DIV. NO.	STATE	FED AID PROJ. NO.		SHEET NO.	TOTAL SHEETS
8	MONT.	F-FG 215(7)		31	38



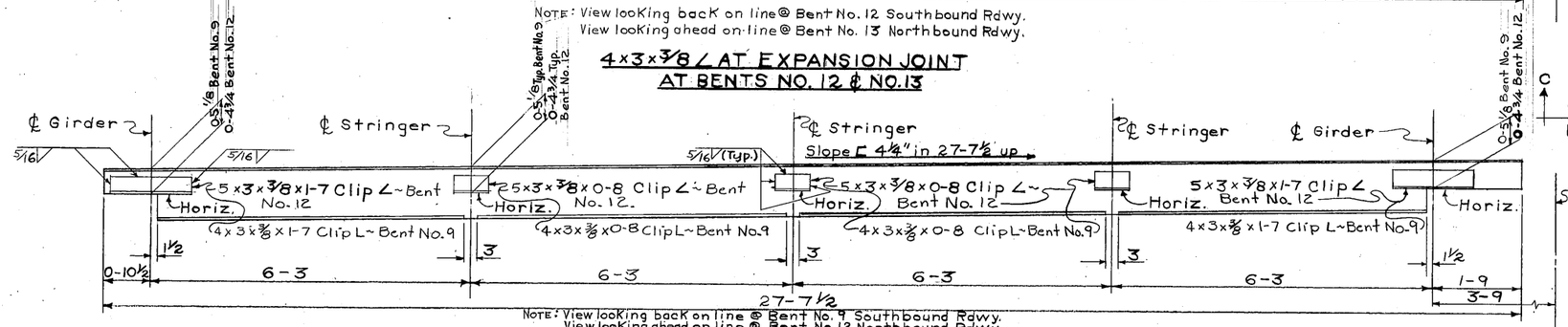
NOTE: View looking ahead on line @ Bent No. 9 Northbound Rdwy.
View looking back on line @ Bent No. 13 Southbound Rdwy.

4x3x3/8 ∠ AT EXPANSION JOINT AT BENTS NO. 9 ℄ NO. 13



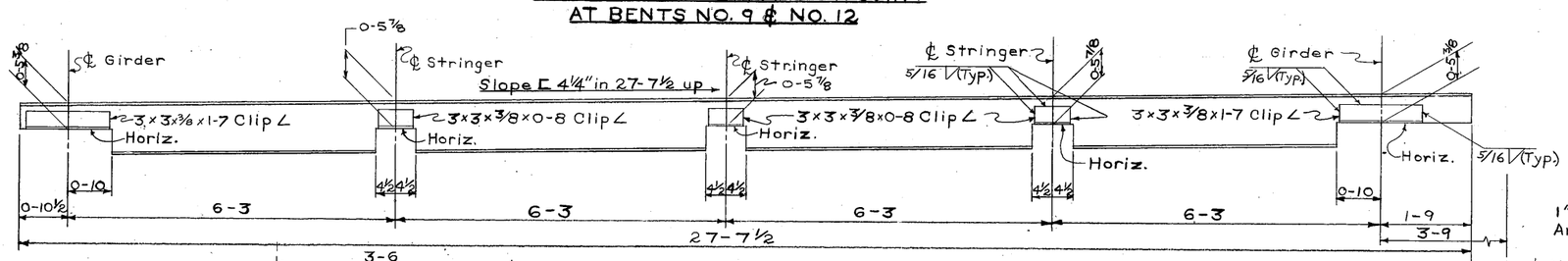
NOTE: View looking back on line @ Bent No. 12 Southbound Rdwy.
View looking ahead on line @ Bent No. 13 Northbound Rdwy.

4x3x3/8 ∠ AT EXPANSION JOINT AT BENTS NO. 12 ℄ NO. 13

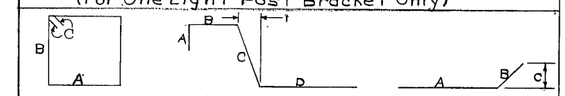


NOTE: View looking back on line @ Bent No. 9 Southbound Rdwy.
View looking ahead on line @ Bent No. 12 Northbound Rdwy.

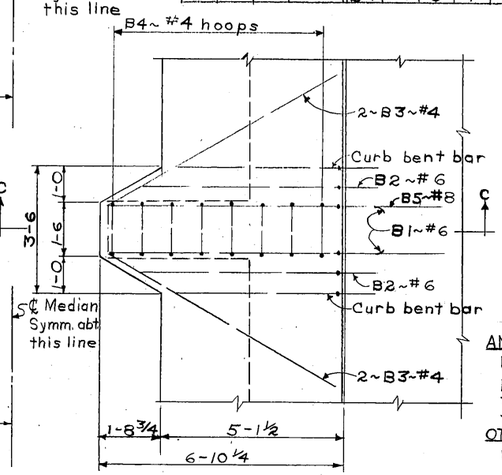
12" CHANNEL AT EXPANSION JOINT AT BENTS NO. 9 ℄ NO. 12



BILL OF REINFORCING STEEL
(For One Light Post Bracket Only)



STRAIGHT BARS				BENT BARS (All dimensions are out to out)									
MARK	SIZE	No.	LENGTH	MARK	SIZE	No.	TYPE	LENGTH	A	B	C	D	E
B5	#8	2	8'-8"	B1	#6	2	2	9'-2"	—	6'-6"	1'-0"	1'-8"	
B6	#6	2	8-5	B2	6	2	2	9-5	1'-3"	5'-6	1-0	1-8	
				B3	4	4	3	8-9	7-5	1-4	1-2		
				B4	#4	8	1	5-9	1-4	1-2	0-4½		

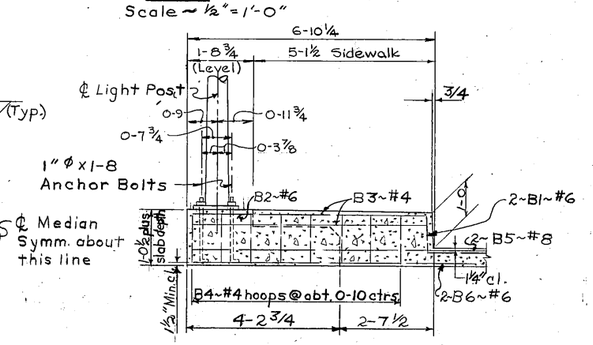


NOTES

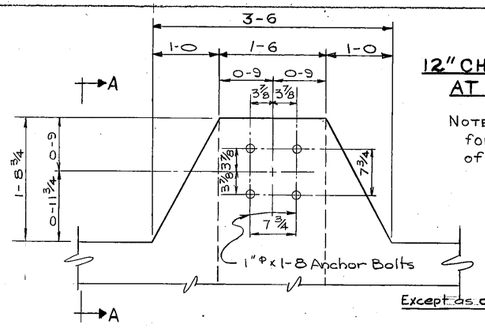
ANCHOR BOLTS:- Anchor Bolts required for light pole brackets will be paid for at the unit price bid for reinforcing steel.

OTHER NOTES:- For other notes see Dwgs No. 5236 & No. 5237.

PLAN
Scale ~ ½" = 1'-0"



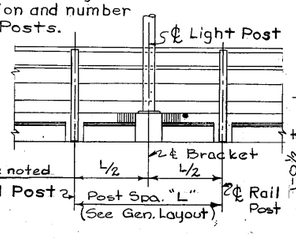
SECTION C-C
BRACKET REINFORCING DETAILS
Scale ~ ½" = 1'-0"



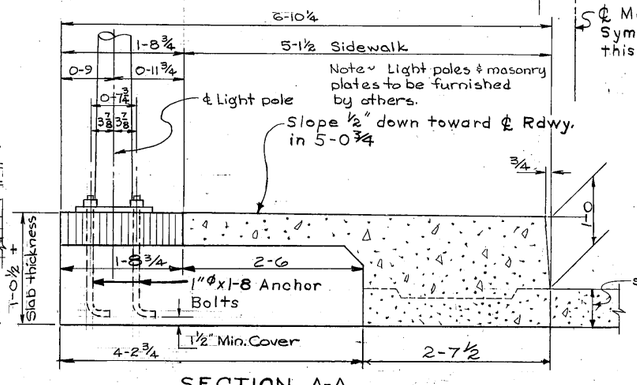
LIGHTING BRACKET PLAN
Scale ÷ 1" = 1'-0"

12" CHANNEL AT CONTRACTION JOINT AT PIERS NO. 10 ℄ NO. 11

NOTE ÷ See General Layout for location and number of Light Posts.



LAYOUT DETAIL
Scale ÷ ¼" = 1'-0"



SECTION A-A
Scale ÷ 1" = 1'-0"

DESIGNED		
DRAWN	W.C.O.	5-2-61
TRACED		
CHECKED	C.A.M.	8-1-61
REVISED		
REVISED		

STATE OF MONTANA
STATE HIGHWAY COMMISSION

HIGGINS AVENUE BRIDGE
OVER CLARK FORK & C.M. ST. P. & P. R.R. IN MISSOULA
FEDERAL AID PROJECT NO. F-FG 215(7)
MISSOULA COUNTY

SLAB JOINT DETAILS & LIGHT POST BRACKET DETAILS

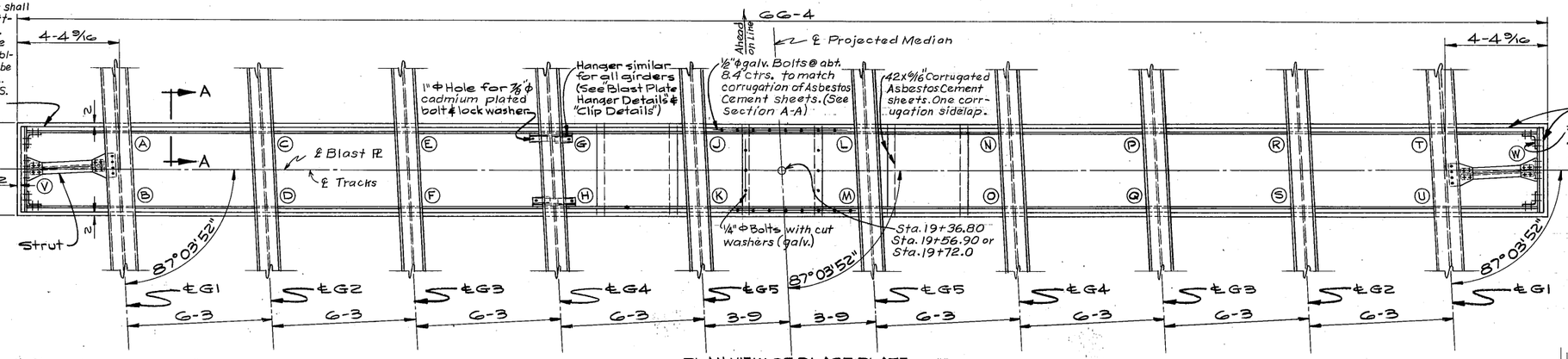
Scale ÷ ¾" = 1'-0" Except As Noted

DRAWING NO. 5266

FED. ROAD DIV. NO.	STATE	FED. AID PROJ. NO.		SHEET NO.	TOTAL SHEETS
8	MONT.	F-FG 215(7)		32	38

Note: 3x3x3/8 blast plate L's, 3x3x3/8 & 6x3½x3/8 hanger L's & 3x½ bent Pl's shall be Cor-Ten or equal. One splice permitted in each longitudinal angle of blast Pl. Location & details of the splice shall be approved by the Engineer. Clip assemblies, ½"φ mach. bolts, and 7/8"φ bolts shall be cadmium plated in accordance with A.S.T.M. Specification A165-55, Type N.S. All other bolts shall be galvanized as noted on the details.

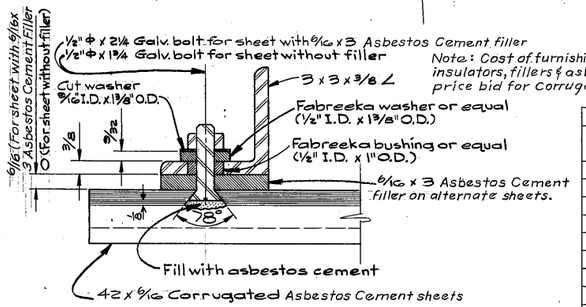
Note: Blast protection shall be Standard Corrugated Asbestos Cement sheets, or equal, 6/16" thick, weighing a minimum of 4.0# per sq. ft., with 4.2 inch pitch on corrugations. Corrugated Asbestos Cement sheets shall be painted with two coats of Valdura Asphalt Aluminum Paint, or equal. Cost of painting shall be included in the unit price bid for Corrugated Asbestos Cement sheets. Cor-Ten angles, bent plates, and 3/4"φ rivets & cadmium plated clips & bolts shall be paid for as structural steel.



Note: Corrugated Asbestos Cement sheets shall be erected with rough side towards the tracks and with alternate sheets bolted in contact with the steel frame. The remaining sheets shall be furred out from the steel frame with 6/16 x 3 Asbestos Cement fillers and shall be lapped over the alternate Asbestos Cement sheets one corrugation.

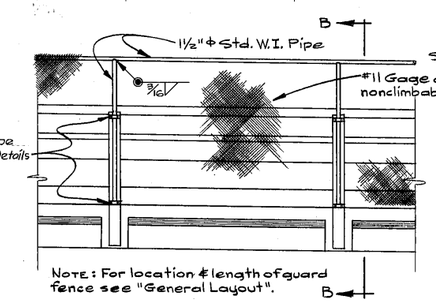
PLAN VIEW OF BLAST PLATE
(Three Blast Plates Required)
Scale: 3/8" = 1'-0"

Note: Cost of furnishing & placing ¼" & ½"φ galvanized bolts, washers, insulators, fillers & asbestos cement to be included in the unit price bid for Corrugated Asbestos Cement Sheets.



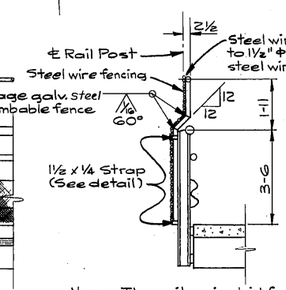
SECTION A-A
Scale: 6" = 1'-0"

CONNECTION POINT	TRACK @ STA. 19+36.80 "V" Dim.	"X" Dim.	"Z" Dim.	TRACK @ STA. 19+56.90 "V" Dim.	"X" Dim.	"Z" Dim.	C.M. ST. P & P. R.R. Main Line "V" Dim.	"X" Dim.	"Y" Dim.	"Z" Dim.
A	3	1 15/16		3	1 15/16		3 1/16	1 1/16	1	
B	3 7/16	1 15/16		3 1/4	1 15/16		3 1/4	1 1/16	1 11/16	
C	3 13/16	1 3/4		3 3/4	1 3/4		3 5/8	1 3/4	1 1/8	
D	4 1/4	↑		4	↑		3 13/16	↑	15/16	
E	4 13/16			4 3/4			4 5/8		1/8	
F	5 1/4			5			3			
G	5 13/16			5 3/4			3 7/8			
H	6 1/4			6			4			
J	6 11/16			6 9/16			4 5/8			
K	7 3/16			6 13/16			4 3/4			
L	6 3/4			6 9/16			4 5/8			
M	7 3/16			6 7/8			4 3/4			
N	6			5 13/16			3 7/8			
O	6 7/16			6 1/8			4 1/16			
P	5 1/16			4 7/8			4 1/16		1/16	
Q	5 9/16			5 3/16			3 1/8			
R	4 3/16	↓		4	↓		3 3/4	↓	1	
S	4 5/8	1 3/4		4 1/4	1 3/4		3 15/16	1 3/4	1 3/16	
T	3 7/16	1 15/16		3 1/4	1 15/16		3 1/4	1 1/16	1 11/16	
U	4 13/16	1 1/16		3 9/16	1 15/16		3 3/8	1 1/16	1 9/16	
V			2-7			2-7 1/16				2-5 1/8
W			2-7 9/16			2-7 3/8				2-5 5/16



Note: For location & length of guard fence see "General Layout".

ELEVATION OF GUARD FENCE
Scale: 3/8" = 1'-0"

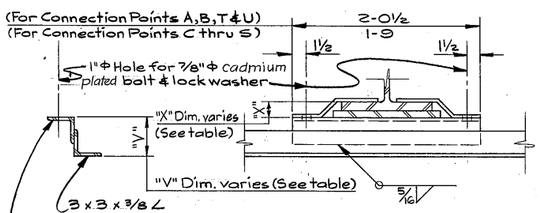


Steel wire fencing to be fastened to 1½"φ pipe by means of #8 galv. steel wire ties @ abt. 8" ctrs.

Note: All pipes shall be Standard Wrought Iron Pipe. All pipe fittings shall be Malleable Iron. Galvanized steel wire fencing shall be "Continental Chain Link Fence, Style N B-R" or equal. All exposed surfaces of fence, except steel wire fencing, shall receive three coats of paint as specified for Structural Steel.

Note: The unit price bid for Guard Fence shall be payment for fence complete in place.

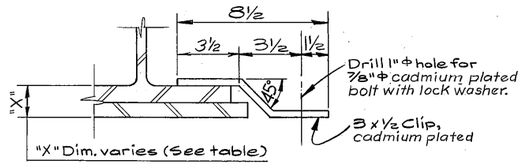
SECTION B-B
Scale: 3/8" = 1'-0"



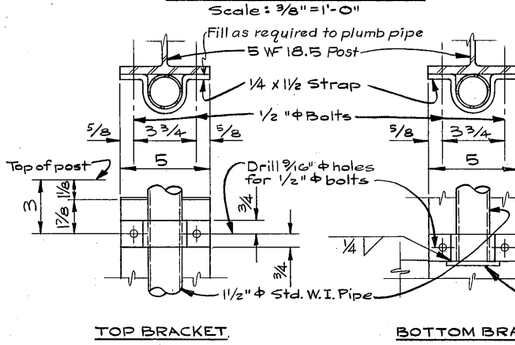
3 x 3 x 3/8 ∠ @ connection points { A,B,C,R & T ~ Track @ Sta. 19+36.80; A,B,C,D,R,T & U ~ Track @ Sta. 19+56.90; F,G,H,N,O & Q ~ C.M. St. P & P. R.R. Main Line }

3½ x 6 x 3/8 ∠ @ connection points (Cut 6" leg to "V" dimension) { D thru Q, S & U ~ Track @ Sta. 19+36.80; E thru Q, & S ~ Track @ Sta. 19+56.90; J, K, L & M ~ C.M. St. P & P. R.R. Main Line }

UN-NOTCHED HANGER
(At connection points A thru U ~ Track @ Sta. 19+36.80 & Track @ Sta. 19+56.90 and for F thru O, & Q ~ C.M. St. P & P. R.R. Main Line



FOR UN-NOTCHED HANGERS



TOP BRACKET

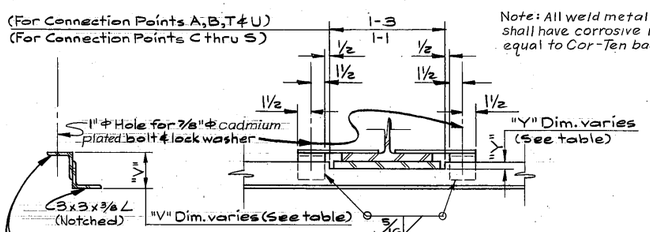
BOTTOM BRACKET

PIPE BRACKET DETAILS
Scale: 3" = 1'-0"

OTHER NOTES — NOTES
For other notes see Dwgs. No. 5236 & No. 5237

(For Connection Points A,B,T & U)
(For Connection Points C thru S)
1-3
1-1
½
1½

Note: All weld metal on hangers shall have corrosive resistance equal to Cor-Ten base metal.

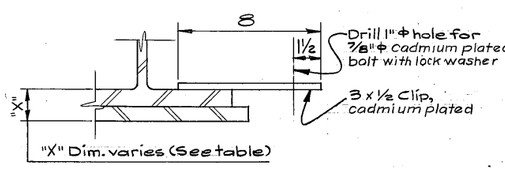


3 x 3 x 3/8 ∠ 3" Long @ connection points A,B,C,D,R,S,T & U ~ C.M. St. P & P. R.R. Main Line

3½ x 6 x 3/8 ∠ 3" Long @ connection points E & P ~ C.M. St. P & P. R.R. Main Line (Cut 6" leg to "V" dim.)

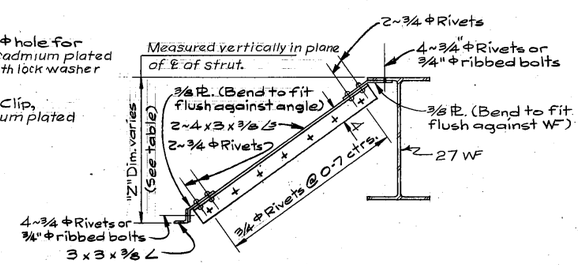
NOTCHED HANGER
(At connection points A,B,C,D,E,P,R,S,T & U ~ C.M. St. P & P. R.R. Main Line

BLAST PLATE HANGER DETAILS
Scale: 1½" = 1'-0"



FOR NOTCHED HANGERS

CLIP DETAILS
Scale: 3" = 1'-0"



TYPICAL BLAST PLATE END CONNECTION
Scale: ¾" = 1'-0"

STATE OF MONTANA
STATE HIGHWAY COMMISSION

HIGGINS AVENUE BRIDGE
OVER CLARK FORK & C.M. St. P & P. R.R. IN MISSOULA
FEDERAL AID PROJECT NO. F-FG 215(7)
MISSOULA COUNTY
BLAST PLATE & GUARD FENCE DETAILS

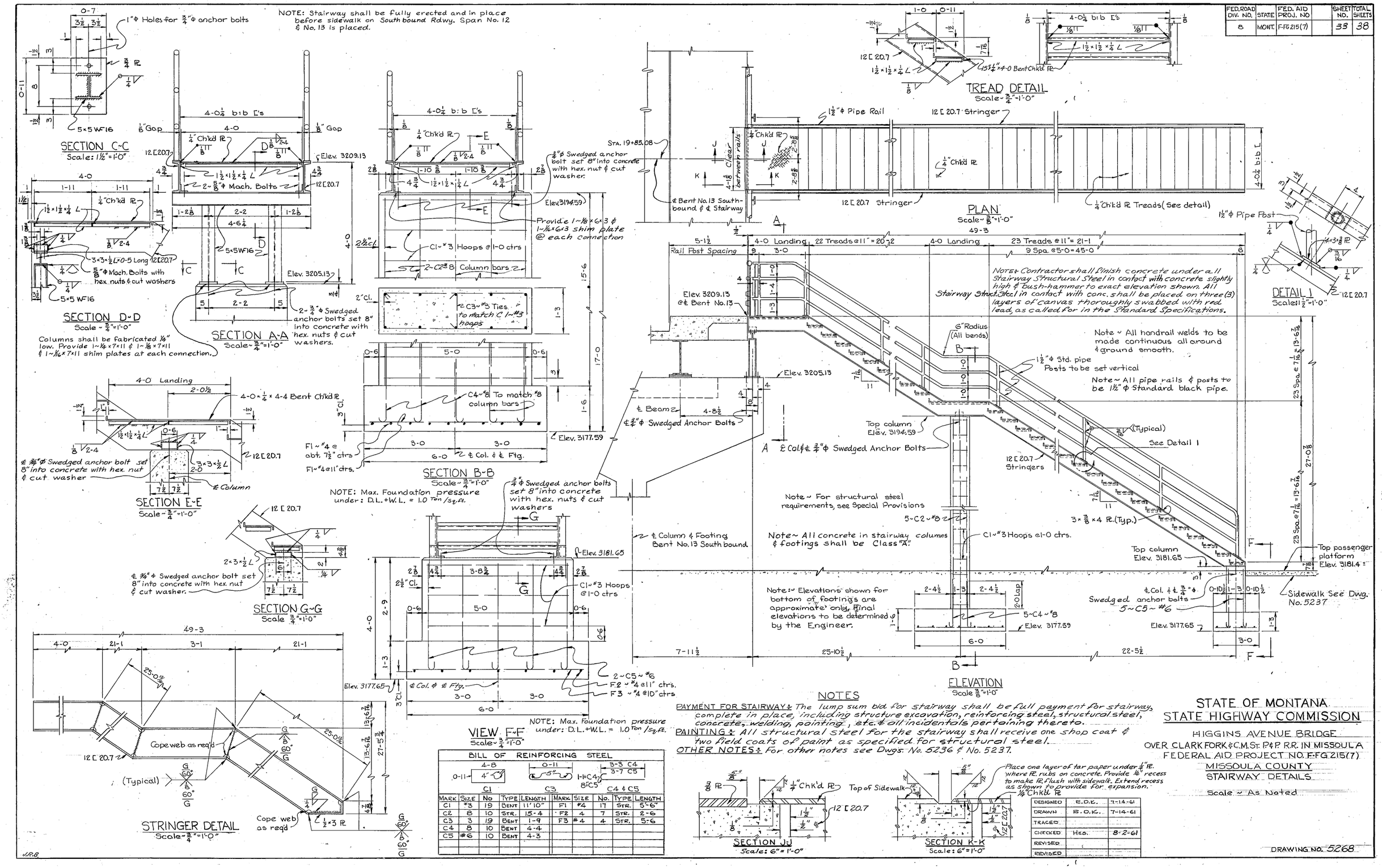
Scale: As Noted

DESIGNED	R. D. K.	4-5-61
DRAWN	G. N. M.	5-11-61
TRACED		
CHECKED	H. E. D.	7-31-61
REVISED		
REVISED		

DRAWING NO. 5267

FED. ROAD DIV. NO.	STATE	FED. AID PROJ. NO	SHEET NO.	TOTAL SHEETS
8	MONT.	F-FG 215(7)	33	38

NOTE: Stairway shall be fully erected and in place before sidewalk on South bound Rdwy. Span No. 12 & No. 13 is placed.



BILL OF REINFORCING STEEL

MARK	SIZE	NO	TYPE	LENGTH	MARK	SIZE	NO.	TYPE	LENGTH
C1	#3	19	BENT	11' 10"	F1	#4	17	STR.	5'-6"
C2	8	10	STR.	15-4	F2	4	7	STR.	2-6
C3	3	19	BENT	1-9	F3	#4	4	STR.	5-6
C4	8	10	BENT	4-4					
C5	#6	10	BENT	4-3					

NOTES

PAYMENT FOR STAIRWAY: The lump sum bid for stairway shall be full payment for stairway, complete in place, including structure excavation, reinforcing steel, structural steel, concrete, welding, painting, etc. & all incidentals pertaining thereto.

PAINTING: All structural steel for the stairway shall receive one shop coat & two field coats of paint as specified for structural steel.

OTHER NOTES: For other notes see Dwgs. No. 5236 & No. 5237.

STATE OF MONTANA
STATE HIGHWAY COMMISSION

HIGGINS AVENUE BRIDGE
OVER CLARK FORK & C.M.St.P.&P. R.R. IN MISSOULA
FEDERAL AID PROJECT NO. F-FG 215(7)
MISSOULA COUNTY
STAIRWAY DETAILS

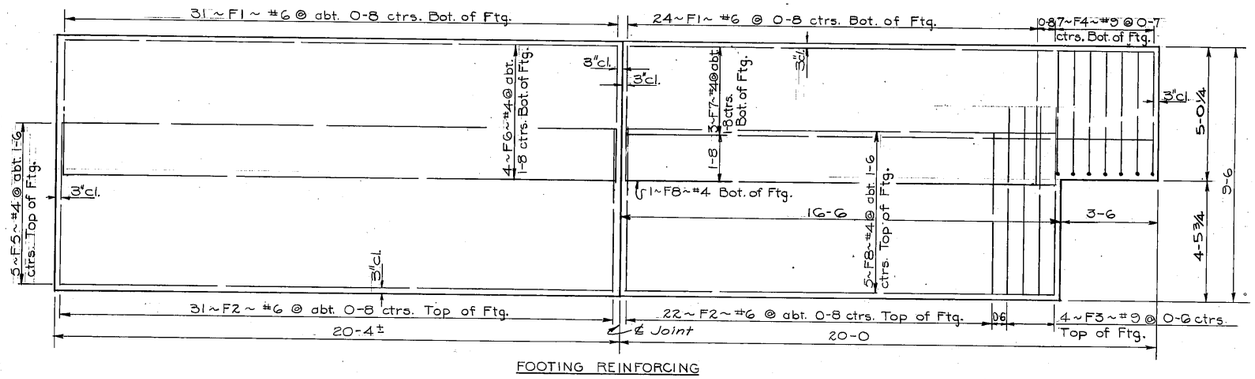
Scale ~ As Noted

DESIGNED	E.D.L.	7-14-61
DRAWN	R.O.K.	7-14-61
TRACED		
CHECKED	H.E.S.	8-2-61
REVISED		
REVISED		

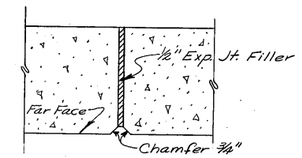
DRAWING NO. 5268

FED. ROAD DIV. NO.	STATE	FED. AID PROJ. NO.		SHEET NO.	TOTAL SHEETS
8	MONT.	F-FG 215(7)		34	38

NOTE: Dimensions shown for length of retaining wall & footings are approximate only. The Contractor shall measure existing structure, and obtain true dimensions before ordering reinforcing steel.

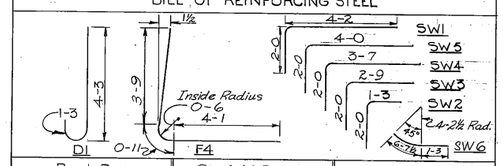


FOOTING REINFORCING



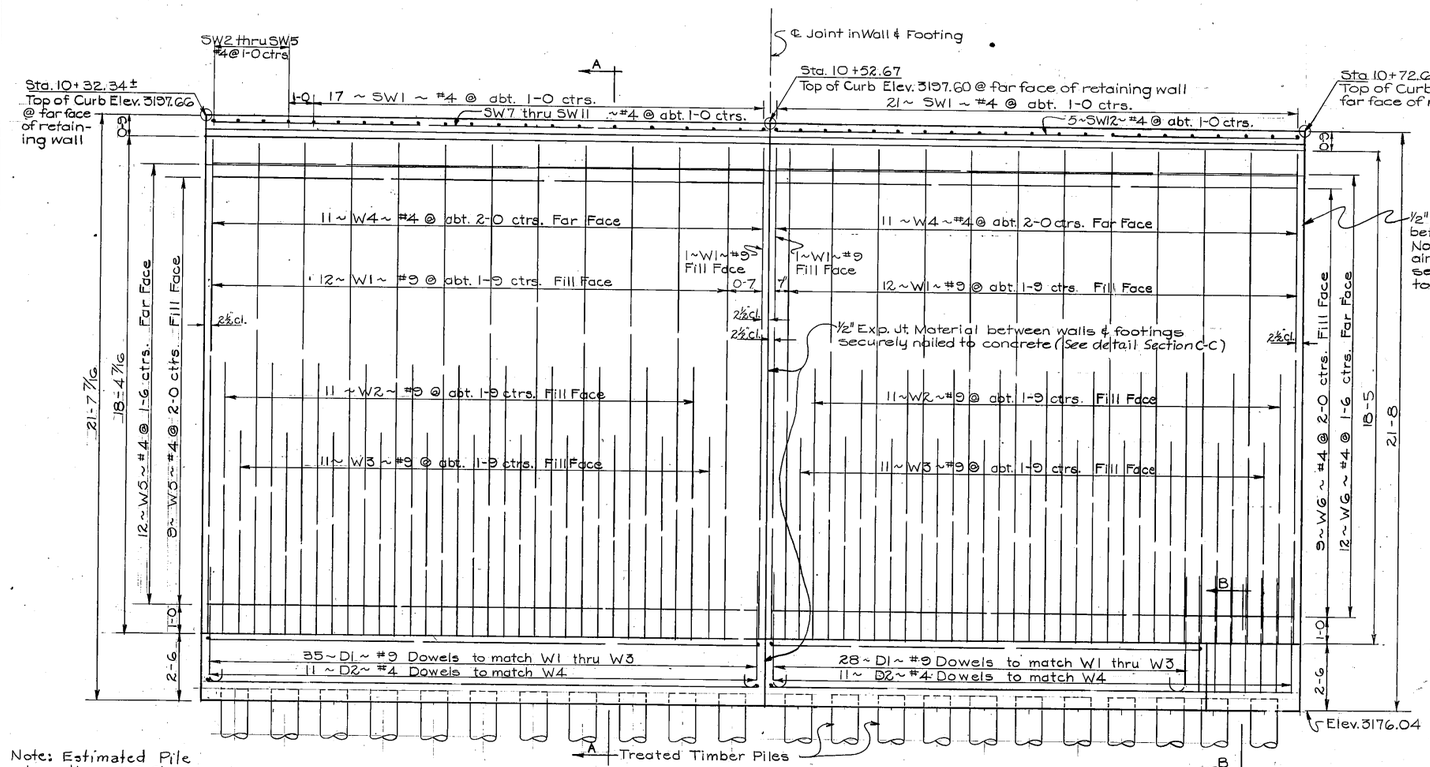
SECTION C-C
No Scale

BILL OF REINFORCING STEEL



Bent Bars				Straight Bars				Straight Bars			
MARK	SIZE	No.	LENGTH	MARK	SIZE	No.	LENGTH	MARK	SIZE	No.	LENGTH
D1	#9	63	5'-6"	D2	#4	22	2'-6"	SW9	#4	1	19'-3"
				F1	6	55	3-0	↑ 10	↑	1	19-9
F4	9	7	8-9	↑ 2	6	53	6-3	↓ 11	↓	1	19-11
				3	9	4	7-7	SW12	4	5	19-7
SW1	4	38	6-2	5	4	5	19-11	W 1	9	26	18-11
↑ 2	↑	1	3-3	6	4	4	19-11	↑ 2	9	22	10-0
3		1	4-9	↓ 7	4	3	19-7	3	9	22	7-6
4		1	5-7	F8	4	6	16-1	4	4	22	18-11
↓ 5		1	6-0	SW7	4	1	15-11	↓ 5	4	21	19-11
SW6	#4	1	7-11	SW8	#4	1	18-5	W 6	#4	21	19-7

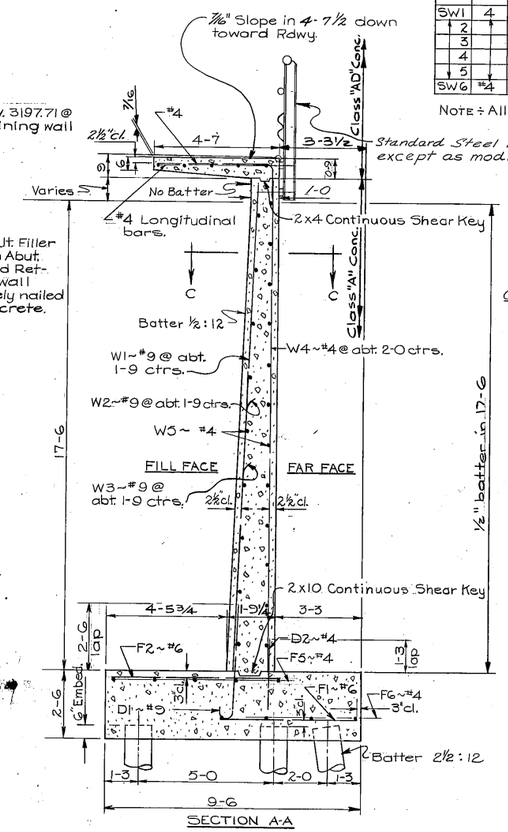
NOTE: All bent bar dimensions are out to out.



Note: Estimated Pile Lengths = 20 ft.

NOTE: For footing reinforcing see diagram on this sheet.

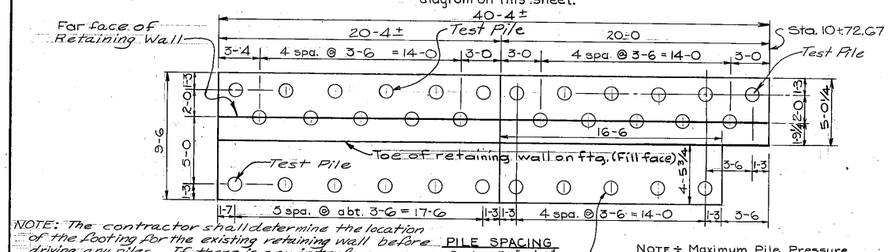
ELEVATION



SECTION A-A

NOTES

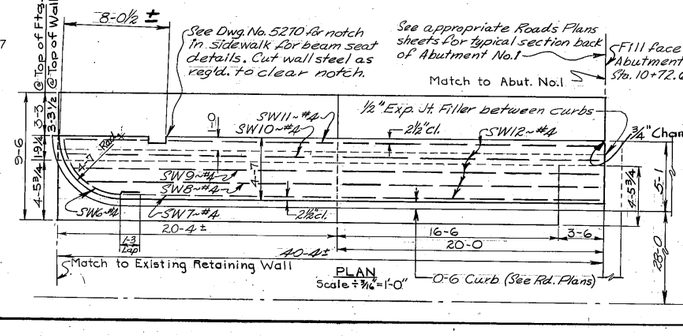
OTHER NOTES: For other notes see Dwgs. No. 5236 & No. 5237.



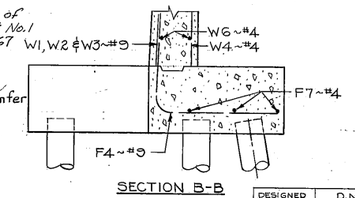
NOTE: The contractor shall determine the location of the footing for the existing retaining wall before driving any piles. If there is any interference between existing footing and new piles, the pile spacing shall be adjusted as determined by the Engineer.

PILE SPACING
Scale: ⅜" = 1'-0"

NOTE: Maximum Pile Pressure under: D.L. + L.L. + I.E. = 18.3 Tons/Pile.



PLAN
Scale: ⅜" = 1'-0"



SECTION B-B

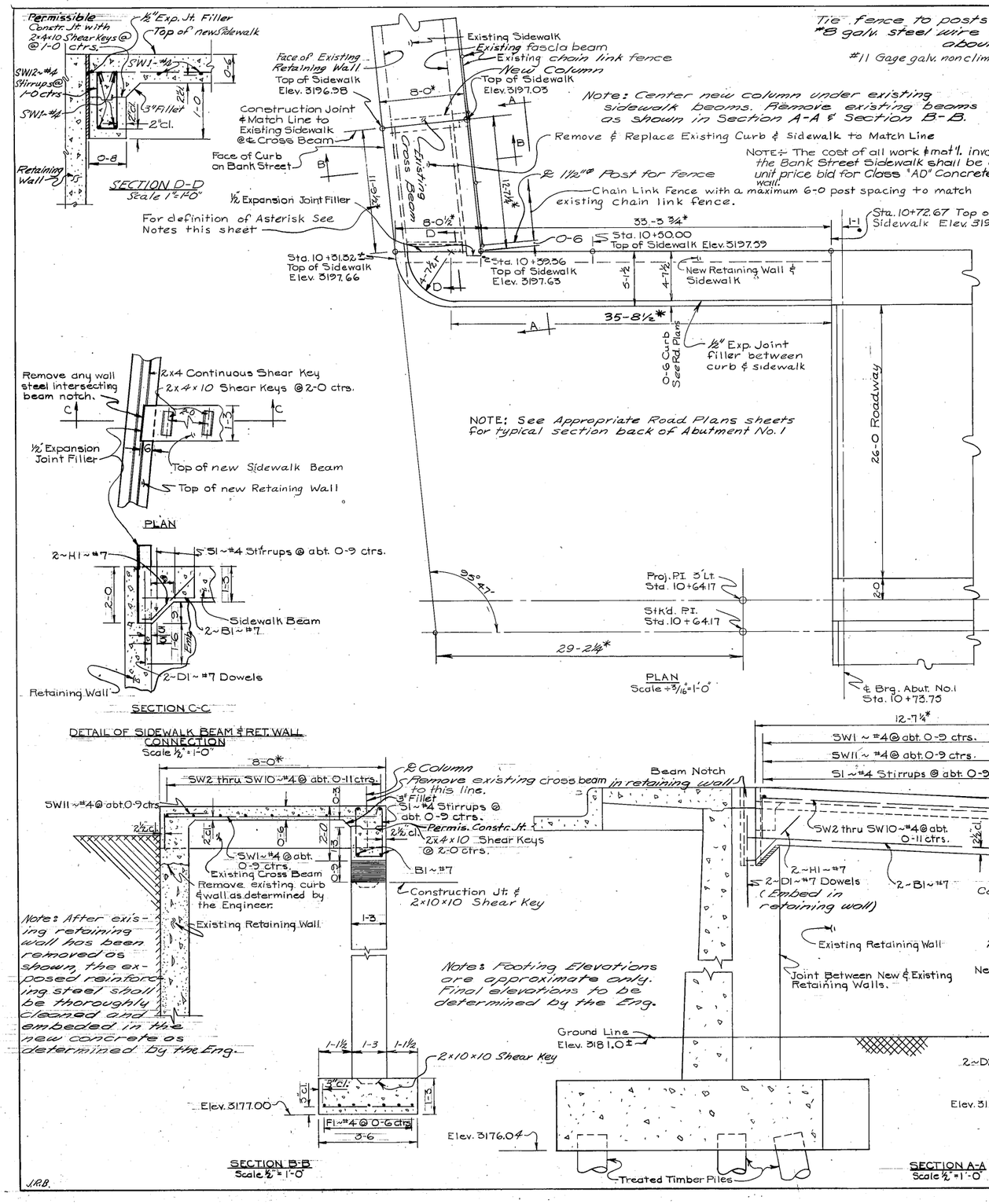
STATE OF MONTANA
STATE HIGHWAY COMMISSION

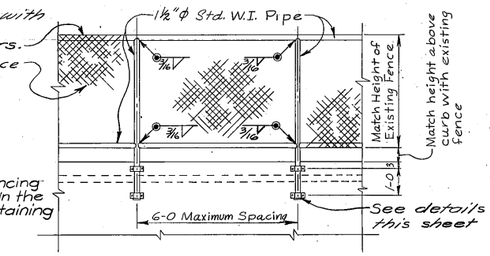
HIGGINS AVENUE BRIDGE
OVER CLARK FORK & C.M. ST. P. & P. R.R. IN MISSOULA
FEDERAL AID PROJECT NO. F-FG 215(7)
MISSOULA COUNTY
RETAINING WALL - NORTH END
Scale: ⅜" = 1'-0" Except As Noted

DESIGNED	D.N.	6-23-61
DRAWN	D.N.	6-28-61
TRACED		
CHECKED	C.A.M.	8-2-61
REVISED		
REVISED		

DRAWING NO. 5269

FED. ROAD DIV. NO.	STATE	FED. AID. PROJ. NO.		SHEET NO.	TOTAL SHEETS
8	MONT.	F.F.G. 215(7)		35	38





ELEVATION OF NEW FENCE TO MATCH EXISTING FENCE

Scale: 3/8" = 1'-0"

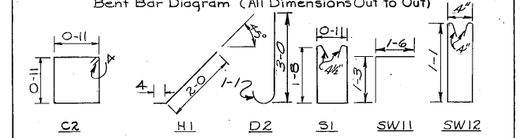
Note: Use new material for the fence posts, rails, & brackets. The fencing may be salvaged from existing structure if approved by the Engineer. New pipes shall be std. wrought iron pipe. Pipe fittings shall be malleable iron. New galvanized steel wire fencing shall match existing style. All exposed surfaces of fence, except galv. wire fencing, shall receive 3 coats of paint as specified for structural steel.

CONCRETE: All concrete in Bank Street Sidewalk Remodeling shall be Class "AD."

PAYMENT: Quantities for remodeling of Bank Street sidewalk are included in the estimated bridge plan quantities for the retaining wall.

BILL OF REINFORCING STEEL

Bent Bar Diagram (All Dimensions Out to Out)



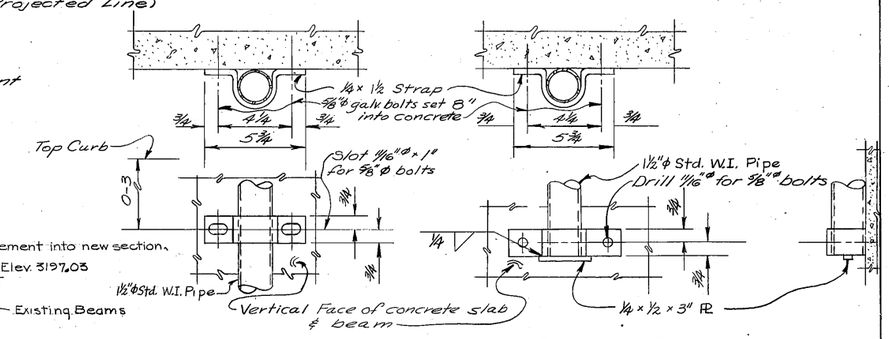
Bent Bars				Straight Bars				Straight Bars			
Mark	Size	No.	Length	Mark	Size	No.	Length	Mark	Size	No.	Length
C2	#3	17	4'-4"	B1	#7	2	13'-4"	SW1	#4	20	7'-7"
D2	8	4	4-1					2		1	11-5
H1	7	2	2-4	C1	8	4	17-10	3		1	11-6
								4		1	11-8
S1	4	17	5-0	D1	7	2	3-0	5		1	11-9
								6		1	11-10
SW11	4	17	2-9					7		1	11-11
SW12	#4	6	3-2	F1	4	14	3-0	8		1	12-0
								9		1	12-1
				H2	#7	2	4-0	SW10	#4	1	12-2

NOTES

CONSTRUCTION JOINTS: At construction joints between old and new concrete, roughen surface of old concrete to provide proper bond to new concrete. Soak the roughened surface thoroughly with water and point with neat cement mortar just before new concrete is poured. Construction joints in new work shall be made only at locations shown on the plans or as approved by the engineer. Provide adequate keys at all construction joints as noted on the plans or as determined by the engineer.

DIMENSIONS*: In case dimensions of existing structure are not as shown on this drawing, vary construction where necessary to match existing structure. The contractor shall measure existing structure and get required data before ordering reinforcing steel or structural steel.

OTHER NOTES: For other notes See Dwgs. No. 5236 & No. 5237



PIPE BRACKET DETAILS

Scale: 3" = 1'-0"

Note: After existing beams have been removed as shown, the exposed reinforcing steel shall be thoroughly cleaned and embeded in the new concrete as determined by the Engineer.

STATE OF MONTANA
STATE HIGHWAY COMMISSION

HIGGINS AVENUE BRIDGE
OVER CLARK FORK & C.M. ST. P. & P. R.R. IN MISSOULA
FEDERAL AID PROJECT NO. F.F.G. 215(7)
MISSOULA COUNTY

BANK ST. SIDEWALK REMODELING

Scale: As Noted

DESIGNED	D.N.	6-23-61
DRAWN	D.N.	7-14-61
TRACED		
CHECKED	C.A.M.	7-31-61
REVISED		
REVISED		

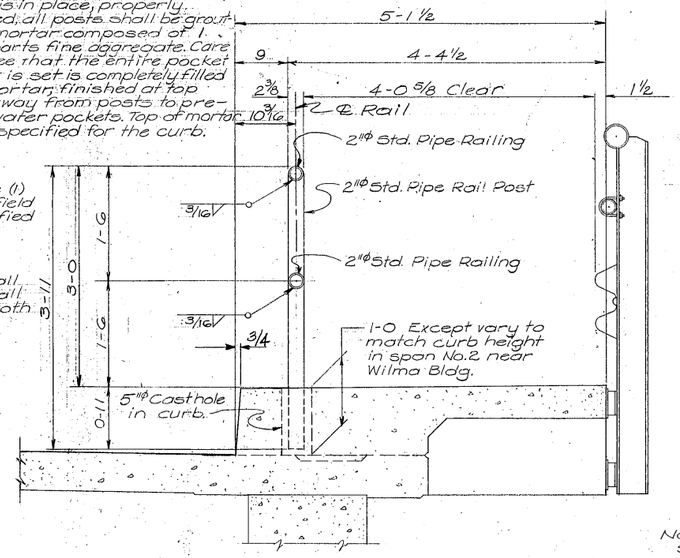
DRAWING NO. 5270

FED. ROAD DIV. NO.	STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
8	MONT	F-FG 215(7)		

GROUTING PIPE RAIL POSTS :— After Pipe Rail for structure is in place, properly adjusted and aligned, all posts shall be grouted in place, using a mortar composed of 1 part cement & 3 parts fine aggregate. Care shall be taken to see that the entire pocket in which each post is set is completely filled with well tamped mortar, finished at top with a slight slope away from posts to prevent formation of water pockets. Top of mortar shall be finished as specified for the curb.

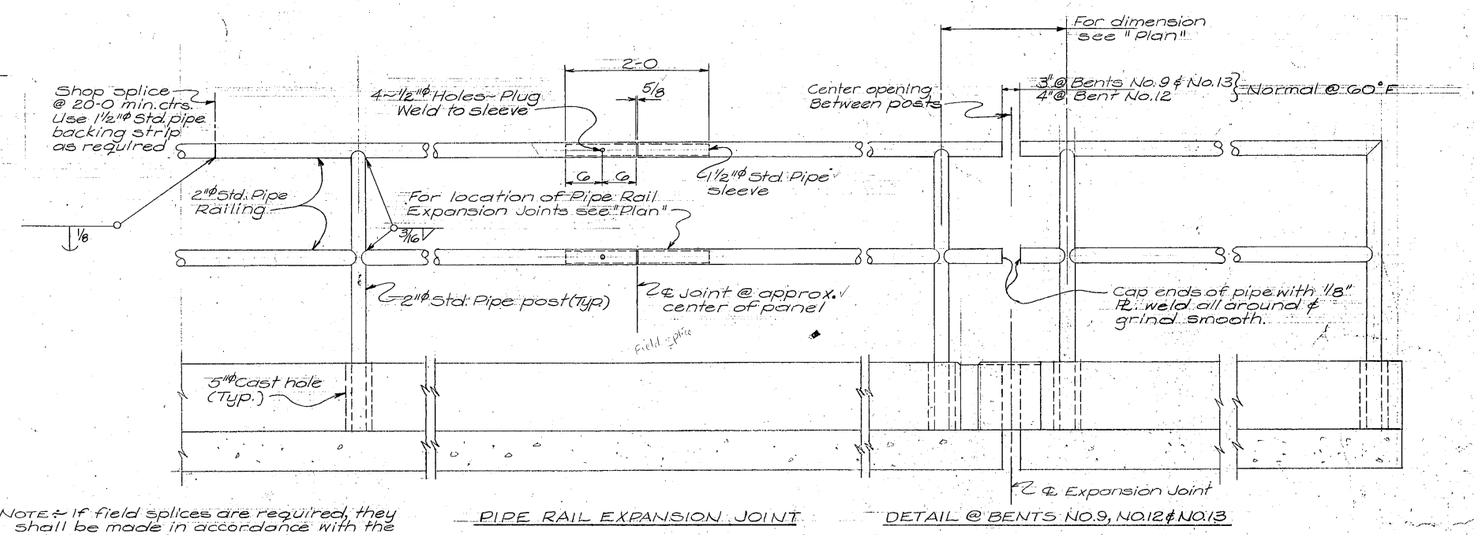
PAINT :— All handrail shall recieve (1) one shop coat & (2) two field coats of paint as specified for Structural Steel.

WELDS :— All welds shall be made continuous all around & ground smooth.



TYPICAL SECTION
Scale:- 1"=1'-0"

NOTE:- Field welding will not be permitted.



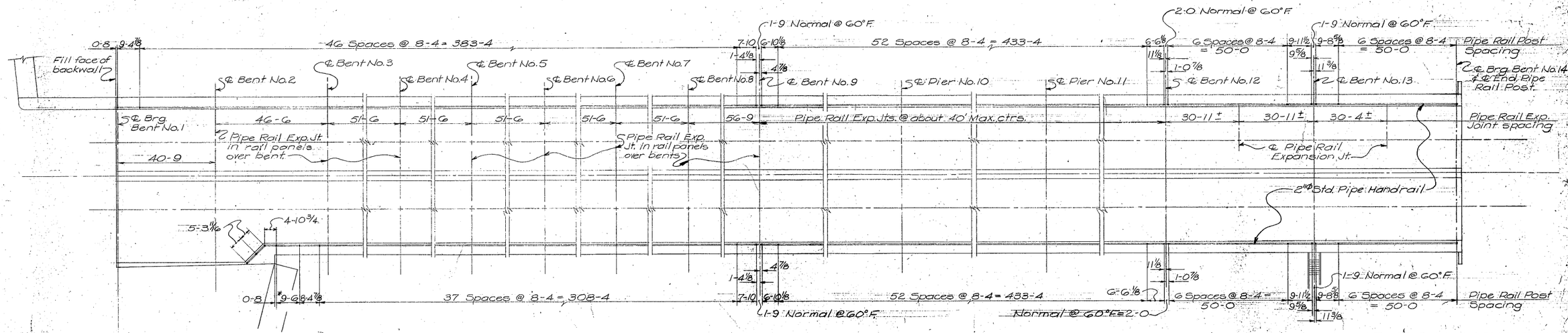
PIPE RAIL EXPANSION JOINT

DETAIL @ BENTS NO.9, NO.12 & NO.13

ELEVATION
Scale:- 1"=1'-0"

NOTE:- If field splices are required, they shall be made in accordance with the details shown for "Pipe Rail Expansion Joint" No field splices shall be closer than 20-0 from a pipe rail expansion joint.

NOTE:- 2"ϕ Std. pipe posts to be set vertical rails to be parallel to top of curb.



PLAN
Scale:- 1"=20'-0"

* This dimension must be varified before rail is fabricated (See Dwg. No. 5236)

NOTE:- The cost of all pipe, welding, painting, setting of posts, and all incidentals pertaining thereto shall be included in the "Lump Sum" bid for "Handrail" which shall be full payment for Handrail complete in place.

STATE OF MONTANA
STATE HIGHWAY COMMISSION

HIGGINS AVENUE BRIDGE
OVER CLARK FORK & C.M.St.P.&P.R.R. IN MISSOULA
FEDERAL AID PROJECT NO. F-FG 215(7)
MISSOULA COUNTY

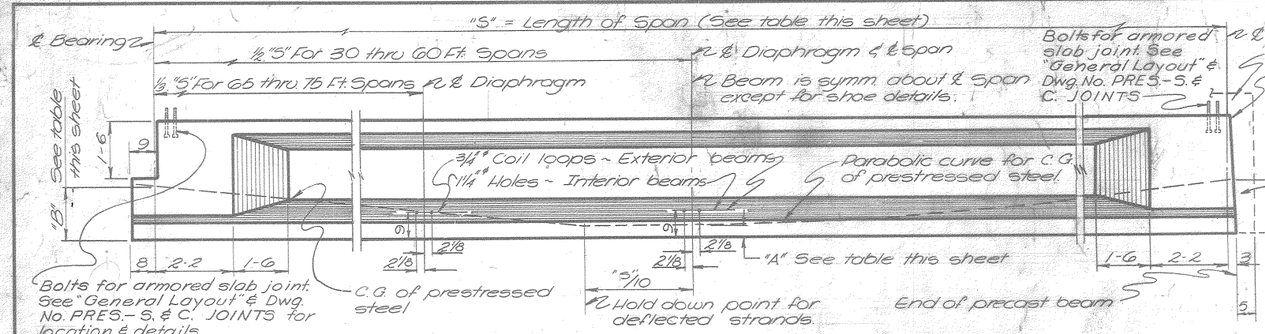
HAND RAIL

Scale:- As Noted

DESIGNED	R.D.K.	3-30-62
DRAWN	L.E.P.	4-2-62
TRACED		
CHECKED	E.D.E.	4-3-62
REVISED		
REVISED		

DRAWING NO. 5270 A

FED. ROAD DIV. NO.	STATE	FED. AID PROJ. NO.		SHEET NO.	TOTAL SHEETS
8	MONT.	AR 1120-1248-1200		7	10



HALF ELEVATION – PRE-TENSIONED BEAM

HALF ELEVATION – POST-TENSIONED BEAM

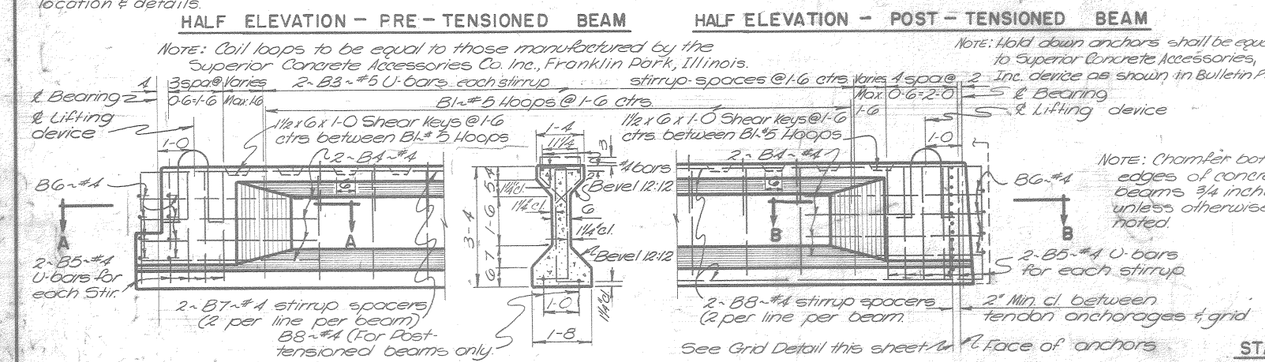
NOTE: Coil loops to be equal to those manufactured by the Superior Concrete Accessories Co. Inc., Franklin Park, Illinois.

NOTE: Hold down anchors shall be equal to Superior Concrete Accessories, Inc. device as shown in Bulletin P51.

NOTE: "B" dimension for post-tensioned beams is the minimum required. This dimension may be increased to provide adequate spacing between end anchorages.

NOTE: Location of diaphragms not shown for the Post-tensioned beam shall be as shown for Pre-tensioned beam.

NOTE:- Details for post-tensioned beams shall be as shown for the pre-tensioned beams except as otherwise noted. Prestressing details are shown for the pre-tensioned beams using 7/16" deflected strands. Any modification of the pre-tensioned prestressing system shown, and all post-tensioned prestressing systems shall be approved by the engineer prior to the fabrication of the beams. See Special Provisions.

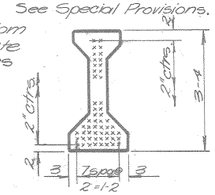


PRE-TENSIONED BEAM

POST-TENSIONED BEAM

DETAILS OF REINFORCING STEEL

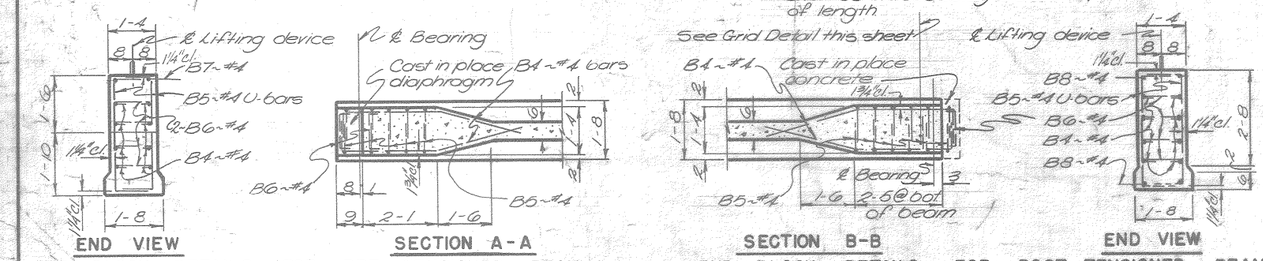
NOTE: Chamfer bottom edges of concrete beams 3/4 inches unless otherwise noted.



NOTE: For Slab, Curb & Diaphragm details see "Standard Slab Drawings."

NOTE: To allow for elastic shortening, concrete shrinkage and creep of beams the overall length of beams shall be increased by 0.0075 in. per ft. of length

STANDARD GRID SYSTEM FOR LOCATION OF 7/16" ø STRANDS AT ℄ SPAN OR ℄ BEARING FOR PRE-TENSIONED BEAMS



END VIEW

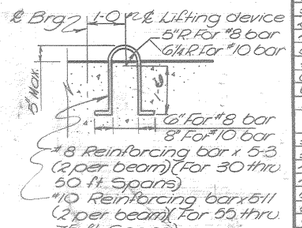
SECTION A-A

END BLOCK DETAILS FOR PRE-TENSIONED BEAM

SECTION B-B

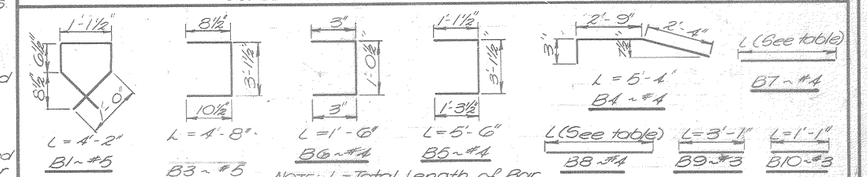
END VIEW

END BLOCK DETAILS FOR POST-TENSIONED BEAM



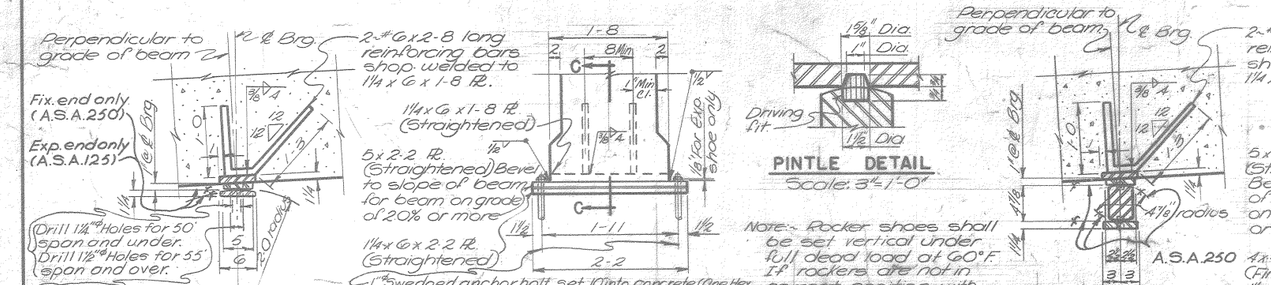
LIFTING DEVICE

SCHEDULE OF PRESTRESSED BEAMS



NOTE:- L = Total Length of Bar

Span "S"	No. Of Beams Per Span	Min. Concrete Strength Req'd. At Transfer of Prestressing	Prestressing Steel (Per Beam): Pre-tensioned Beam: Final Force Req'd. At ℄ Beam (Lbs.)	No. Of 7/16" ø Strands	Dimensions To C.G. Of Prestress Force "A"	"B"	Post-tensioned Beam: Final Force Req'd. At ℄ Beam (Lbs.)	Dimensions To C.G. Of Prestress Force "A"	"B"	Reinforcing Steel (No. Of Bars Per Beam): For Pre-tensioned Beam Or Post-tensioned Beam: B1	B3	B4	B5	B6	For Pre-tensioned Beam Only: B7 No.	B7 Length	B8	B8 No.	B8 Length	For Post-tensioned Beam Only: B9	B10
Beam Details For 24 Ft. Roadway H15-S12 Loading																						
30-0	4	4000	76.0	10	3 1/8	10	67.5	4	10	17	- 34	16	20	16	4	16-2	24	8	8	16-2	8	24
35-0			91.0	12	4		85.0			20	- 40					18-8				18-8		
40-0			121.0	16	5 1/2		120.0			24	- 48					21-2				21-2		
45-0			151.5	20	5 1/2		145.0			27	- 54					23-8				23-8		
50-0			166.5	22	5		160.0	4		30	- 60					26-2				26-2		
55-0		4000	196.5	26	5 1/2		195.0	4 1/2		34	- 68					28-8				28-8		
60-0	4	4500	227.0	30	5 1/2	10	222.5	4 1/2		37	- 74					31-2				31-2		
65-0	5	4500	212.5	28	5	10	210.0	5	10	40	- 80					33-8				33-8		
70-0	5	4500	242.5	32	5 1/8	10	242.5	5	10	44	- 88	16	20	16	4	36-2	24	8	8	36-2	8	24
75-0	6	4500	272.0	36	6	12	267.5	5	12	47	- 94	16	20	16	4	38-8	24	8	8	38-8	8	24
Beam Details For 24 Ft. Roadway H20-S16 Loading																						
30-0	4	4000	91.0	12	4"	10	80.0	4 1/2	10	17	- 34	16	20	16	4	16-2	24	8	8	16-2	8	24
35-0			106.0	14	5		105.0	5		20	- 40					18-8				18-8		
40-0			136.0	18	5 1/2		130.0	5		24	- 48					21-2				21-2		
45-0			166.5	22	5 1/2		157.5	5		27	- 54					23-8				23-8		
60-0		4000	196.5	26	5 1/2		195.0	5 1/2		30	- 60					26-2				26-2		
55-0	4	4500	227.0	30	5 1/2		222.5	5 1/2		34	- 68					28-8				28-8		
60-0	5		212.5	28	5		210.0	5		37	- 74					31-2				31-2		
65-0	5		242.5	32	5 1/8	10	242.5	5	10	40	- 80					33-8				33-8		
70-0	6	4500	267.5	36	6	12	267.5	5	12	44	- 88	16	20	16	4	36-2	24	8	8	36-2	8	24
Beam Details For 28 Ft. Roadway H20-S16 Or Alternate Loading																						
30-0	4	4000	106.0	14	5"	10	105.0	5"	10	17	- 34	16	20	16	4	16-2	24	8	8	16-2	8	24
35-0			136.0	18	5 1/2		130.0	5		20	- 40					18-8				18-8		
40-0			166.5	22			157.5	5 1/2		24	- 48					21-2				21-2		
45-0		4000	196.5	26			195.0	5 1/2		27	- 54					23-8				23-8		
60-0	4	4500	227.0	30	5 1/2		222.5	5 1/2		30	- 60					26-2				26-2		
55-0	5		212.5	28	5		205.0	5		34	- 68					28-8				28-8		
60-0	5		242.5	32	5 1/8		242.5	5		37	- 74					31-2				31-2		
65-0	6		242.5	32	5 1/8	10	242.5	5	10	40	- 80					33-8				33-8		
70-0	6	4500	272.0	36	6	12	267.5	5 1/2	12	44	- 88	16	20	16	4	36-2	24	8	8	36-2	8	24
Beam Details For 38 Ft. Roadway H20-S16 Or Alternate Loading																						
30-0	5	4000	106.0	14	5"	10	105.0	5"	10	17	- 34	16	20	16	4	16-2	24	8	8	16-2	8	24
35-0			136.0	18	5 1/2		130.0	5		20	- 40					18-8				18-8		
40-0			166.5	22	5 1/2		157.5	5		24	- 48					21-2				21-2		
45-0		4000	196.5	26	5 1/2		195.0	5 1/2		27	- 54					23-8				23-8		
60-0	5	4500	242.5	32	6		232.5	5 1/2		30	- 60					26-2				26-2		
55-0	6		227.0	30	5 1/2		222.5	5		34	- 68					28-8				28-8		
60-0	7		227.0	30	5 1/2	10	222.5	5		37	- 74					31-2				31-2		
65-0	7		257.0	34	5 1/2	11	248.0	5	10	40	- 80					33-8				33-8		
70-0	8	4500	272.0	36	6"	12	267.5	5 1/2	11	44	- 88	16	20	16	4	36-2	24	8	8	36-2	8	24
Beam Details For 44 Ft. Roadway H20-S16 Or Alternate Loading																						
30-0	6	4000	106.0	14	5"	10	105.0	5	10	17	- 34	16	20	16	4	16-2	24	8	8	16-2	8	24
35-0			136.0	18	5 1/2		130.0	5		20	- 40					18-8				18-8		
40-0			166.5	22	5 1/2		157.5	5 1/2		24	- 48					21-2				21-2		
45-0		4000	196.5	26	5 1/2		195.0	5 1/2		27	- 54					23-8				23-8		
50-0	6	4500	227.0	30	5 1/2		222.5	5 1/2		30	- 60					26-2				26-2		
55-0	7		227.0	30	5 1/2	10	222.5	5		34	- 68					28-8				28-8		
60-0	7		257.0	34	5 1/2	11	250.0	5		37	- 74					31-2				31-2		
65-0	8		257.0	34	5 1/2	11	265.0	5	10	40	- 80					33-8				33-8		
70-0	9	4500	272.0	36	6"	12	267.5	5 1/2	11	44	- 88	16	20	16	4	36-2	24	8	8	36-2	8	24



SECTION C-C

END VIEW

FIX. SHOE DETAILS FOR ALL BEAMS

EXP. SHOE DETAILS FOR 30-50 FT. BEAMS

Scale: 1" = 1'-0"

PINTLE DETAIL

Scale: 3" = 1'-0"

NOTE:- Rocker shoes shall be set vertical under full dead load at 60°F. If rockers are not in correct position with final dead load on spans, spans shall be jacked and adjustments made.

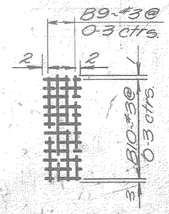
NOTE: For post-tensioning notes and General Notes, see Special Provisions.

SECTION D-D

END VIEW

EXP. SHOE DETAILS FOR 55-75 FT. BEAMS

Scale: 1" = 1'-0"



GRID DETAIL

(2 ~ Grids per beam)

NOTE:- Grid reinforcing steel placement subject to change due to placement of prestressing steel.

DESIGNED	HEE	12-25-59
DRAWN	HKL	1-28-59
TRACED	KLF	2-3-59
CHECKED	HES.	2-10-59
REVISED	HES.	8-23-60
REVISED	HES.	7-1-61

STATE OF MONTANA
STATE HIGHWAY COMMISSION

STANDARD PRE-TENSIONED & POST-TENSIONED PRESTRESSED CONCRETE BEAMS

24 FT. RDWY. H15-S12 LOADING
24 FT. RDWY. H20-S16 LOADING
28, 38, & 44 FT. RDWY. H20-S16 SPECIAL LOADING

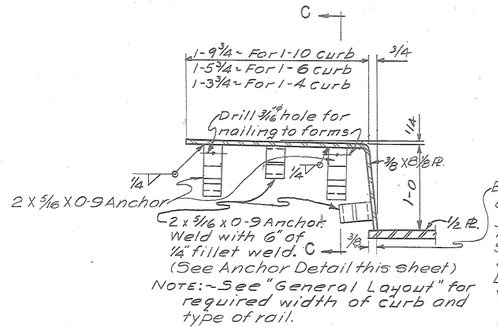
Scale - 1/4" = 1'-0" Except As Otherwise Noted

APPROVED BY _____ BRIDGE ENGINEER

DRAWING NO. PRES.-BEAM STD. NO. 1 TYPE-A

JRA

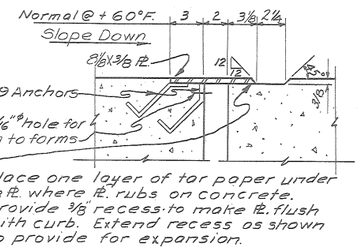
FED. ROAD DIV. NO.	STATE	FED. AID PROJ. NO.		SHEET NO.	TOTAL SHEETS
8	MONT.	AR 1120-1248-1200		9	10



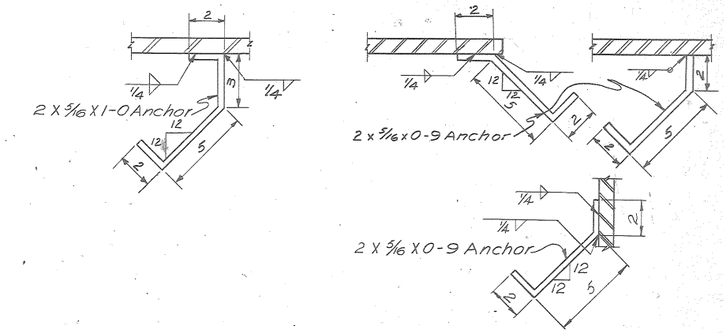
ARMORED CURB JOINT DETAIL
1-10 CURB & STANDARD STEEL BRIDGE RAIL-TYPE NO. 4
1-6 CURB & STEEL BEAM BRIDGE RAIL OR STANDARD STEEL BRIDGE RAIL TYPE NO. 4
1-4 CURB & STEEL BEAM BRIDGE RAIL OR STANDARD STEEL BRIDGE RAIL TYPE NO. 4

Scale ~ 1 1/2" = 1'-0"

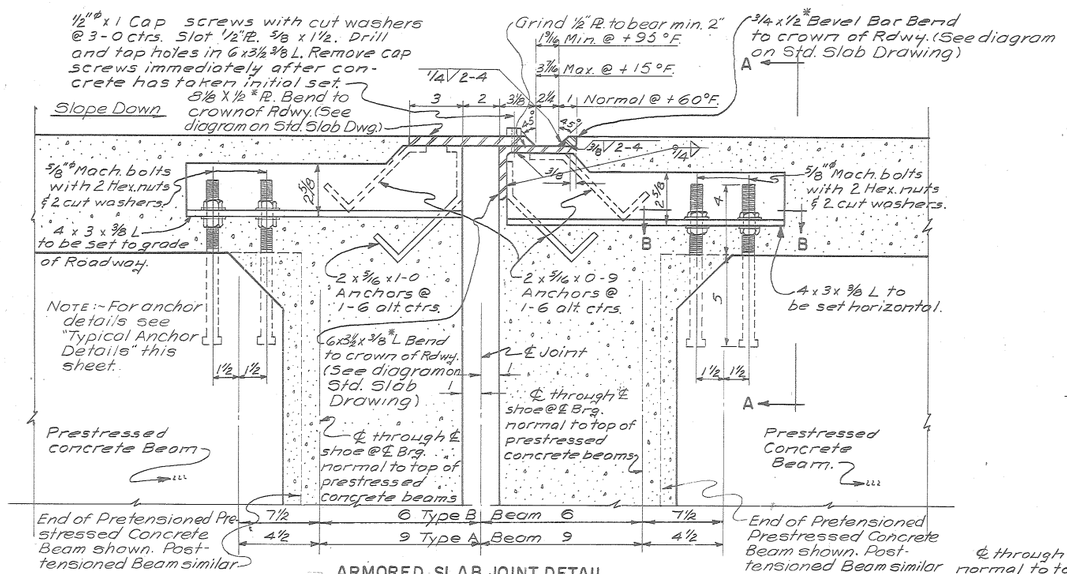
Ends of all members of armored slab joint to extend 3/8" inside face of curb. See "General Layout" & Appropriate Slab Drawing for Rdwy. width



SECTION C-C
Scale ~ 1 1/2" = 1'-0"

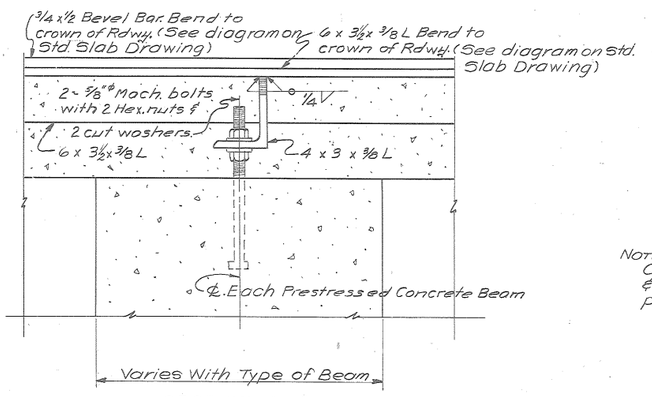


TYPICAL ANCHOR DETAILS
Scale: 3" = 1'-0"

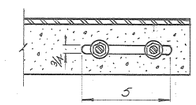


ARMORED SLAB JOINT DETAIL
Scale ~ 3" = 1'-0"

NOTE: Armored Slab Joint is to accommodate Prestressed Concrete Beam Expansion of Spans Totaling 71 Feet or more.)
* See "Armored Curb Joint Detail" (this sheet) for length. 1/2" PL., 6 x 3 1/2 x 3/8 L. & 3/4 X 1/2 Bevel Bar all same length.

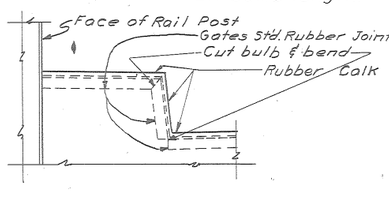


SECTION A-A
Scale ~ 3" = 1'-0"

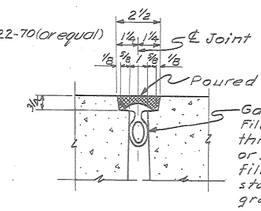


SECTION B-B
Scale: 3" = 1'-0"

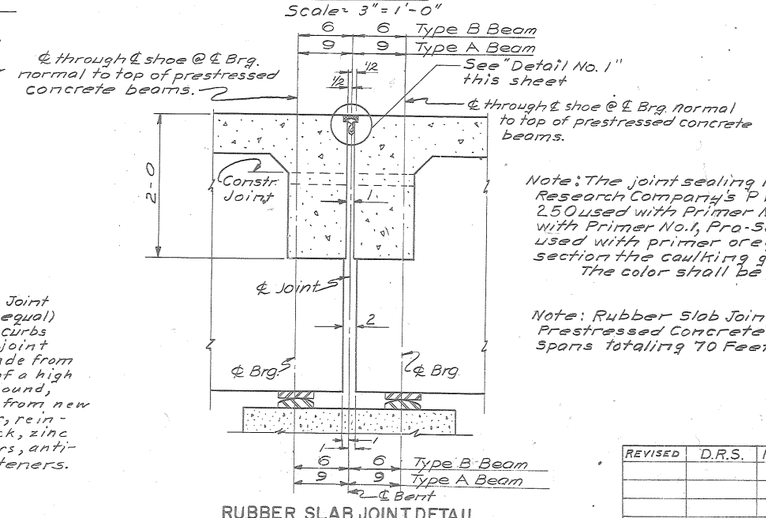
NOTE: Cost of furnishing & placing Rubber Curb & Slab Joint Filler, rubber calk, primer & tar paper to be included in the unit price bid for Class "AD" concrete.



RUBBER CURB JOINT DETAIL
Scale ~ 1" = 1'-0"



DETAIL NO. 1
Scale ~ 3" = 1'-0"



RUBBER SLAB JOINT DETAIL
Scale ~ 1" = 1'-0"

Note: The joint sealing material shall be Products Research Company's PRC. Rubber Calk 250 used with Primer No. 1, Chem. Seal 2414 used with Primer No. 1, Pro-Seal pourable compound used with primer or equal. For sealing the curb section the caulking grade may be used. The color shall be gray.

Note: Rubber Slab Joint is to accommodate Prestressed Concrete Beam Expansion of Spans Totaling 70 Feet or less.

STATE OF MONTANA
STATE HIGHWAY COMMISSION

STANDARD SLAB & CURB JOINTS
FOR PRESTRESSED CONCRETE BEAM SPANS
Scale: As Noted

REVISED	D.R.S.	1-10-61	DESIGNED	J.C.B.	4-1-59
			DRAWN	H.K.L.	4-15-59
			TRACED	E.R.T.	4-20-59
			CHECKED	H.E.S.	5-7-59
			REVISED	J.C.B.	10-23-59
			REVISED	H.E.S.	2-24-60

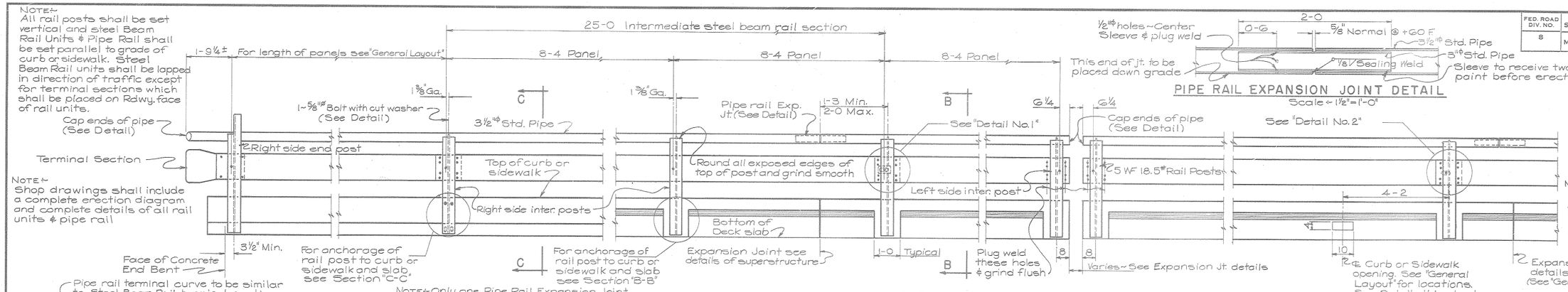
APPROVED BY [signature] BRIDGE ENGINEER

DRAWING NO. PRES.-S. & C. JOINTS

FED. ROAD DIV. NO.	STATE	FED. AID PROJ. NO.		SHEET NO.	TOTAL SHEETS
8	MONT.	AR 3190 -029		86	

NOTE:- All rail posts shall be set vertical and steel Beam Rail Units & Pipe Rail shall be set parallel to grade of curb or sidewalk. Steel Beam Rail units shall be lapped in direction of traffic except for terminal sections which shall be placed on Rdwy. face of rail units.

NOTE:- Shop drawings shall include a complete erection diagram and complete details of all rail units & pipe rail

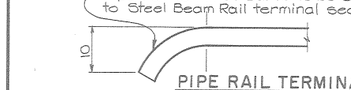


NOTE:- Type of steel beam bridge rail expansion joint for each location shall be selected which permits utilization of the greatest number of full length sections.

NOTE:- Only one Pipe Rail Expansion Joint will be permitted in any rail panel. All pipe rail shall be continuous over a minimum of three rail posts between splices.

ELEVATION OF STEEL BRIDGE RAIL

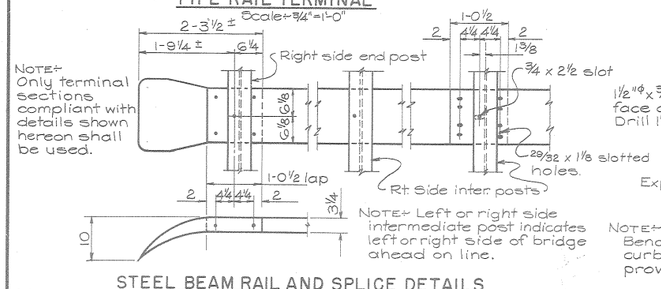
Scale:- ½" = 1'-0"



PIPE RAIL TERMINAL

Scale:- ¾" = 1'-0"

Pipe rail terminal curve to be similar to Steel Beam Rail terminal section

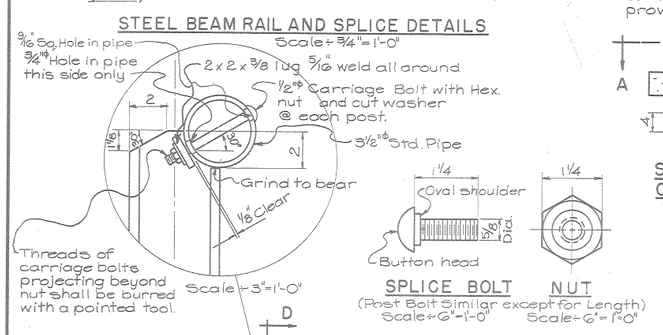


NOTE:- Only terminal sections compliant with details shown hereon shall be used.

NOTE:- Left or right side intermediate post indicates left or right side of bridge ahead on line.

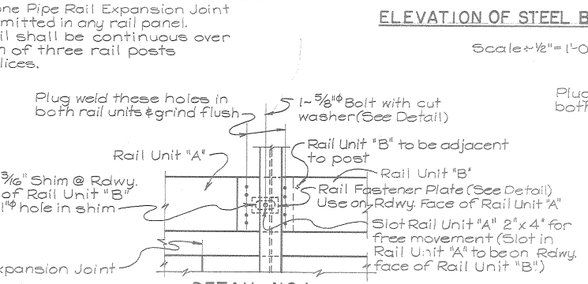
STEEL BEAM RAIL AND SPLICE DETAILS

Scale:- ¾" = 1'-0"



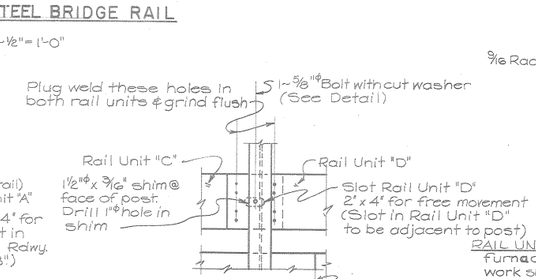
SPLICE BOLT (Post Bolt Similar except for Length) Scale:- 6" = 1'-0"

NUT Scale:- 6" = 1'-0"



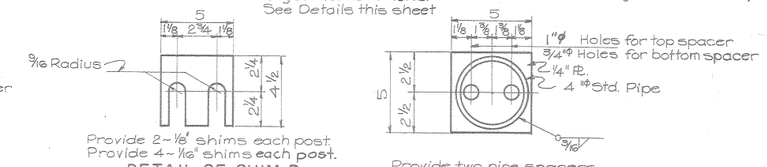
DETAIL NO. 1

Scale:- ¾" = 1'-0"



DETAIL NO. 2

Scale:- ¾" = 1'-0"



Provide 2 - ⅛" shims each post. Provide 4 - 1/16" shims each post.

DETAIL OF SHIM PL.

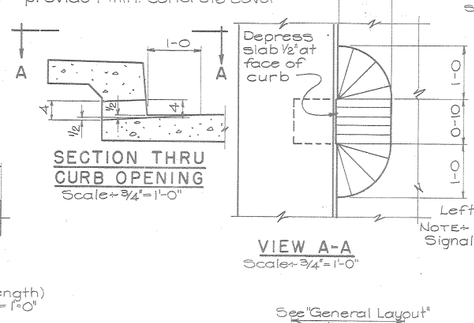
Scale:- 3" = 1'-0"

Provide two pipe spacers for each post.

DETAIL OF PIPE SPACER

Scale:- 3" = 1'-0"

NOTE:- Bend slab reinforcing steel at curb openings as required to provide 1" min. concrete cover



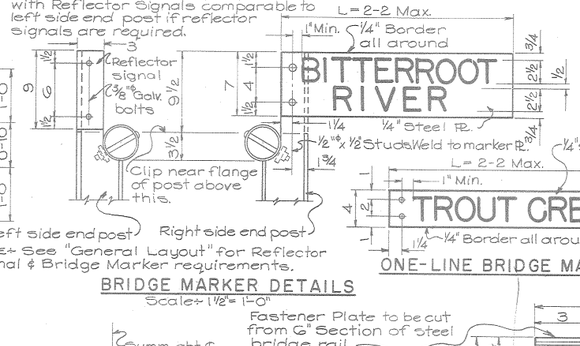
SECTION THRU CURB OPENING

Scale:- ¾" = 1'-0"

VIEW A-A

Scale:- ¾" = 1'-0"

NOTE:- Where "Markers" are not called for they shall be replaced with Reflector Signals comparable to left side end post if reflector signals are required.



NOTE:- See "General Layout" for Reflector Signal & Bridge Marker requirements.

BRIDGE MARKER DETAILS

Scale:- 1½" = 1'-0"

ONE-LINE BRIDGE MARKER

NOTES

RAIL UNITS: The steel beam rail units and special bolts shall be made of open hearth or electric furnace steel. A two-inch specimen shall elongate not less than 12 per cent. All metal work shall be fabricated in the shop. No punching cutting or welding shall be done in the field except that holes for special details in exceptional cases may be drilled in the field when approved by the Engineer.

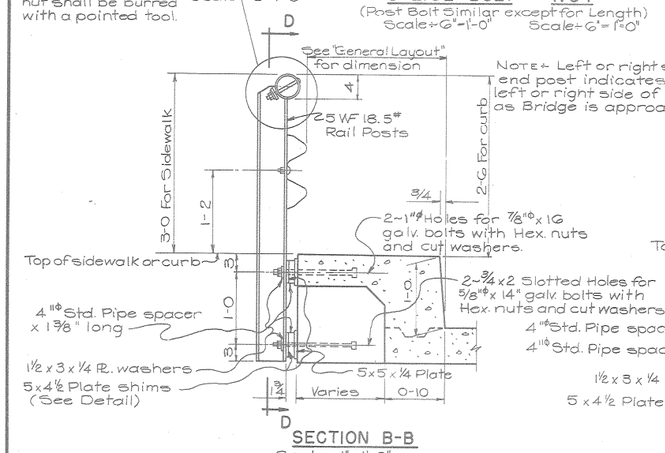
PAYMENT: The unit price bid per lineal foot for Steel Bridge Rail shall be full payment for steel beam rail units, pipe rail and posts, complete in place, including painting, all bolts, shims, spacers and all incidentals pertaining thereto. The number of lineal feet of Steel Bridge Rail for payment shall be computed as the distance between ends of terminal sections measured parallel to ℄ roadway for each line of rail.

PAINTING: All steel beam rail units, pipe rail and posts shall be given one shop coat of paint before shipping, see Standard Specifications. Before erection in the field the first field coat shall be applied. After erection, all abrasions on steel bridge rail, bolts and bolt heads shall be spotted with first field coat before final application of second field coat of aluminum paint. All paint used shall conform to the Montana State Highway Standard Specifications for Road and Bridge Construction.

REFLECTOR SIGNALS: Reflector signals shall be placed on left end posts of bridge except as otherwise noted. Signals shall be made with "Silver Scotchlite," or equal, reflective material applied with waterproof glue to a 3" x 9" x 16 gage flat steel plate. Paint steel plate one prime coat and two enamel coats both sides before reflective material is applied. Fasten signal to end posts with 2 - ⅜"φ x 1¼" galv. bolts. The cost of furnishing and placing bridge reflector signals shall be included in the unit price bid per lineal foot for Steel Bridge Rail.

BRIDGE MARKERS: Prior to painting, the bridge marker plates shall be cleaned with gasoline. One coat of flat white and two coats of white enamel shall be applied over the entire surface of the plate, "Silver Scotchlite" or equivalent reflectorizing material shall then be applied to the entire face of the marker plate with special waterproof adhesive as recommended by the manufacturers of the reflectorizing material. For name on marker, see the "General Layout" sheet. Lettering and ¼" border shall be of sign writer's "Lettering Black." Length "L" of bridge marker plate shall be of sufficient length to properly proportion the Gothic letters on the marker using ⅜" brush width and ½ inch space between letters. If "L" should exceed 2'-2" for one line bridge marker for proper proportion of the letters, use the two line marker as detailed above. All corners of the bridge marker plates shall be rounded and smoothed. Bridge marker plates shall be bolted to the webs of the steel end posts as detailed above, with ½"φ studs (welded to marker plates) nuts & washers. Cost of furnishing and placing bridge marker plates shall be included in the unit price bid per lineal foot for Steel Bridge Rail.

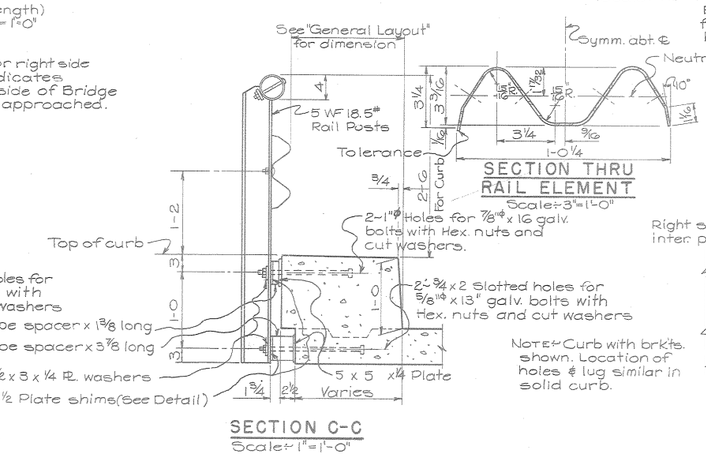
STEEL BEAM RAIL: 12 Gage material may be used provided that the yield point equals or exceeds 40,000 p.s.i. 10 Gage material may be used provided that the yield point equals or exceeds 33,000 p.s.i. All rail units and special bolts shall conform to Section 53 of the Standard Specifications. References in Sect. 53 to Dwg. No. SBBR shall apply equally to similar details on Dwg. No. SBRT4.



NOTE:- Left or right side end post indicates left or right side of Bridge as Bridge is approached.

SECTION B-B

Scale:- 1" = 1'-0"



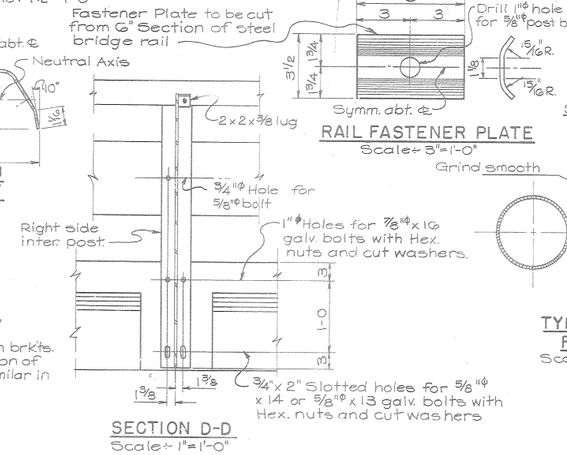
SECTION C-C

Scale:- 1" = 1'-0"

SECTION THRU RAIL ELEMENT

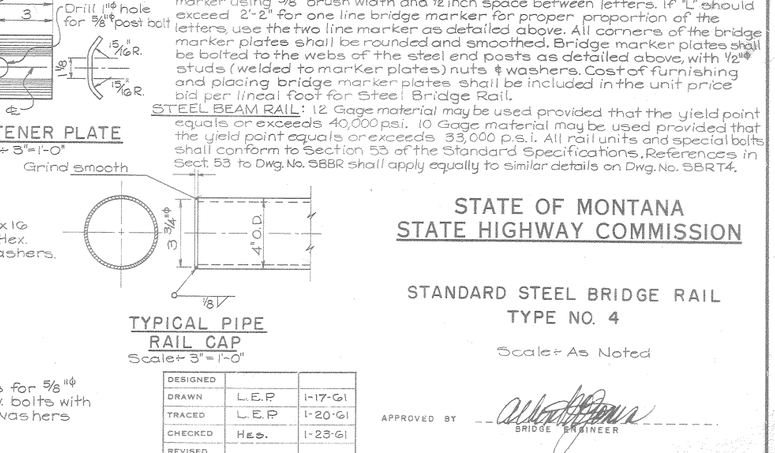
Scale:- 3" = 1'-0"

NOTE:- Curb with brk'ts. shown. Location of holes & lug similar in solid curb.



SECTION D-D

Scale:- 1" = 1'-0"



RAIL FASTENER PLATE

Scale:- 3" = 1'-0"

TYPICAL PIPE RAIL CAP

Scale:- 3" = 1'-0"

STATE OF MONTANA
STATE HIGHWAY COMMISSION

STANDARD STEEL BRIDGE RAIL
TYPE NO. 4

Scale:- As Noted

DESIGNED		
DRAWN	L.E.P.	1-17-61
TRACED	L.E.P.	1-20-61
CHECKED	H.E.S.	1-23-61
REVISED		
REVISED		

APPROVED BY _____ BRIDGE ENGINEER

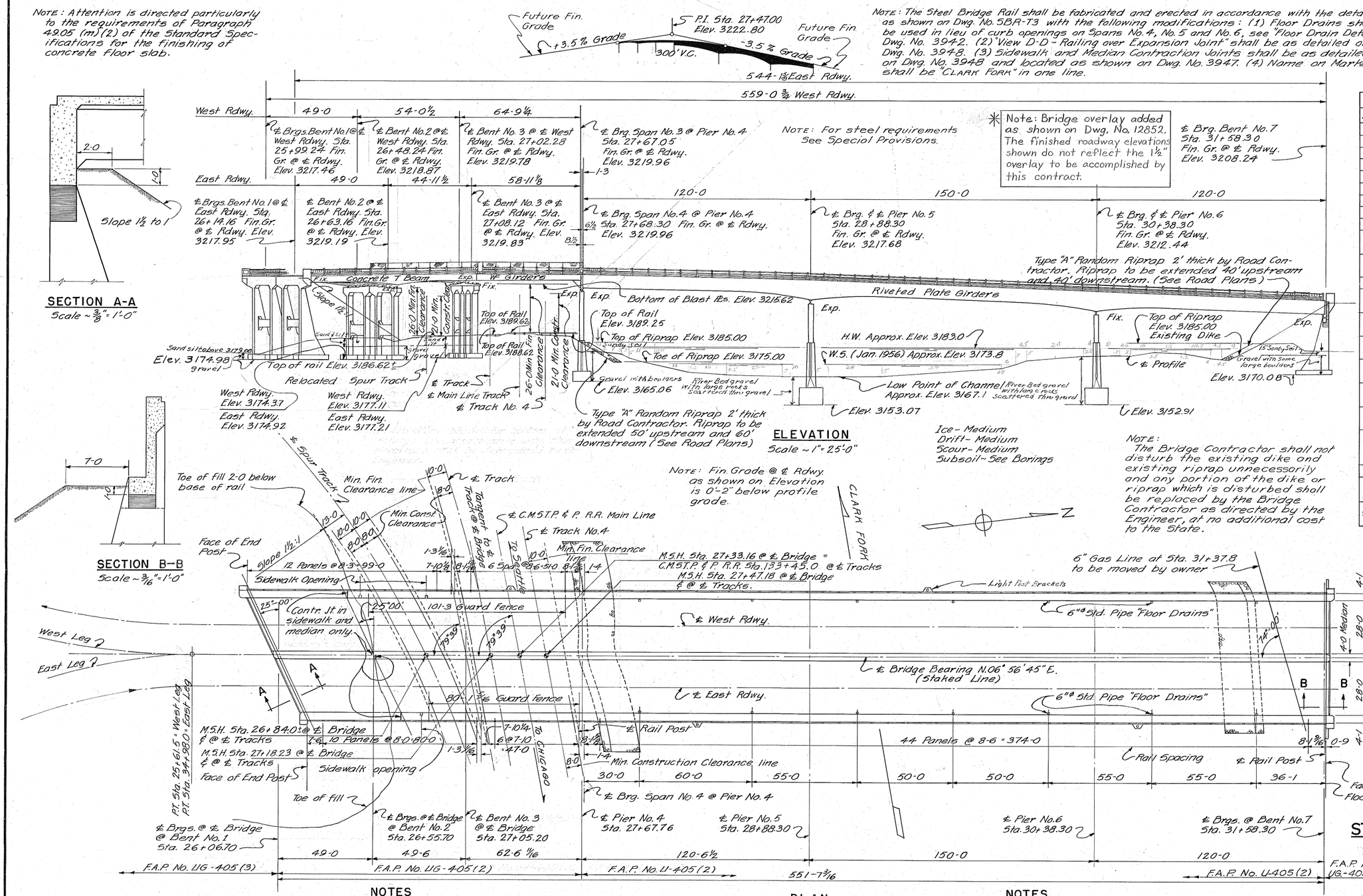
DRAWING NO. SBR-T4

FED. ROAD DIV. NO.	STATE	FED. AID PROJ. NO.		SHEET NO.	TOTAL SHEETS
8	MONT.	UG-405(2) U-405(2)		7	23

3 6

NOTE: Attention is directed particularly to the requirements of Paragraph 49.05 (m)(2) of the Standard Specifications for the finishing of concrete floor slab.

NOTE: The Steel Bridge Rail shall be fabricated and erected in accordance with the details as shown on Dwg. No. SBR-T3 with the following modifications: (1) Floor Drains shall be used in lieu of curb openings on Spans No. 4, No. 5 and No. 6, see "Floor Drain Details" Dwg. No. 3942. (2) "View D-D - Railing over Expansion Joint" shall be as detailed on Dwg. No. 3948. (3) Sidewalk and Median Contraction Joints shall be as detailed on Dwg. No. 3948 and located as shown on Dwg. No. 3947. (4) Name on Markers shall be "CLARK FORK" in one line.



NOTE: No Reflectorized bridge delineators will be required on this bridge.

NOTE: Existing river banks shall not be disturbed 200' upstream nor 100' downstream without the written permission of the Engineer, except as shown here on.

REFERENCES

Dwg. No.	DESCRIPTION
3929	Footing Plan
3930	Bent No. 1
3931	Bent No. 2
3932	Bent No. 3
3933	Pier No. 4
3934	Pier No. 5
3935	Pier No. 6
3936	Bent No. 7
3937	Girder Details Spans No. 1 & No. 2
3938	Slab & Girder Details Spans No. 1 & No. 2
3939	Reinforcing Steel & Shoe Details Spans No. 1 & No. 2
3940	Girders for Span No. 3
3941	Sway Bracing & Shoe Details Span No. 3
3942	Span No. 3 Slab Details, Reinforcement and Floor Drain Details.
3943	Girders, Erection Plan and Camber Diagram Spans No. 4, No. 5 & No. 6.
3944	Girder Details Spans No. 4, No. 5 & No. 6.
3945	Sway Frame & Stringer Details Spans No. 4, No. 5 & No. 6
3946	Shoe Details Spans No. 4, No. 5 & No. 6.
3947	Slab Reinforcing Steel & Slab Pouring Diagram Spans No. 4, No. 5 & No. 6
3948	Floor Joint Details
3949	Blast Plate & Guard Fence Details
SBR-T3	Standard Steel Bridge Rail Type No. 3

NOTES

SPECIFICATIONS :— Montana State Highway Commission Standard Specifications for Road and Bridge Construction adopted Jan. 1, 1946, and any amendments thereto, and Special Provisions shall govern unless otherwise noted. Design prepared in accordance with A.A.S.H.O. Specifications, 1953 Edition.

LIVE LOAD :— Standard H20-S16 Loading.

CONSTRUCTION JOINTS :— Construction Joints shall be made only at locations shown on the plans or as approved by the Engineer. Adequate keys shall be provided at all Construction Joints as noted on the plans or determined by the Engineer.

STRUCTURAL STEEL :— For requirements governing structural steels and their fabrication, see the Special Provisions. To avoid oversight, these requirements shall be clearly noted on the shop drawings.

Structural steel shall receive one shop coat of red lead and two field coats consisting of first field or primer coat and one coat of aluminum paint as specified in the Standard Specifications, on all surfaces not in contact with concrete, except as noted under paragraph 45.10 (d).

OTHER NOTES :— For other notes see Dwg. No. 3929.

SEE DWG. NO. 3928A

DESIGNED	R.D.K.	6-22-56
DRAWN	R.D.K.	7-20-56
TRACED	F.L.S.	9-5-56
CHECKED	H.E.S.	9-28-56
* REVISED	M.L.R.	11-10-80
REVISED		

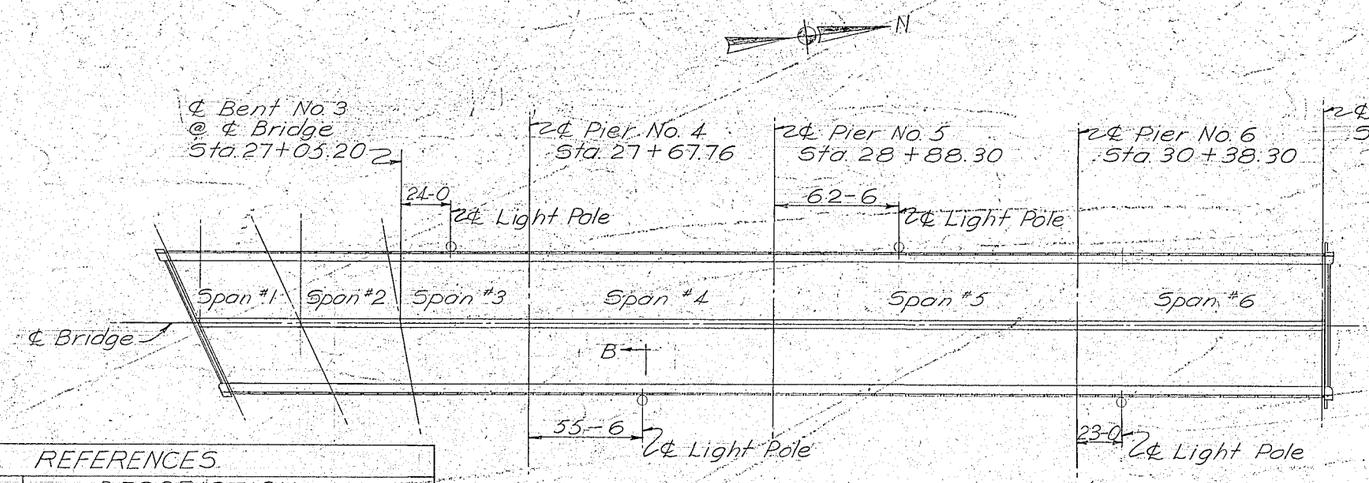
STATE PRECONST. NUMBER 5405-01

STATE OF MONTANA
STATE HIGHWAY COMMISSION

BRIDGE OVER CLARK FORK & C.M.S.T.P. & P. R.R.
AT MISSOULA
FED. AID PROJ. NO. UG-405(2) & NO. U-405(2)
MISSOULA COUNTY
GENERAL LAYOUT
Scale ~ As Noted

APPROVED BY Albert Rooney
BRIDGE ENGINEER

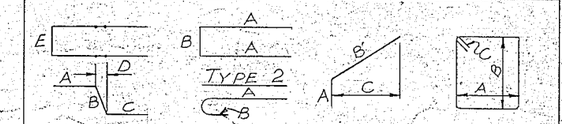
DRAWING NO. 3928



PLAN
Scale: 1" = 50'-0"

REFERENCES	
DWG. No.	DESCRIPTION
3928	Fed. Aid Proj. No. U-UG405 (General Layout)
3942	Span No. 3 Slab Detail
3947	Span No. 4 No. 5 No. 6 Slab Details
SBR-T3	Standard Steel Bridge Rail-Type No. 3

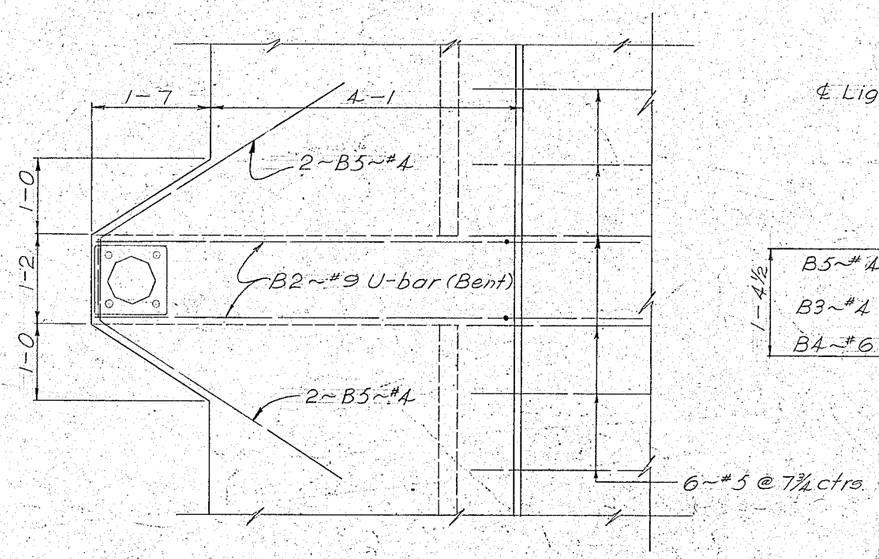
BILL OF REINFORCING STEEL
FOR FOUR LIGHT POST SUPPORTS



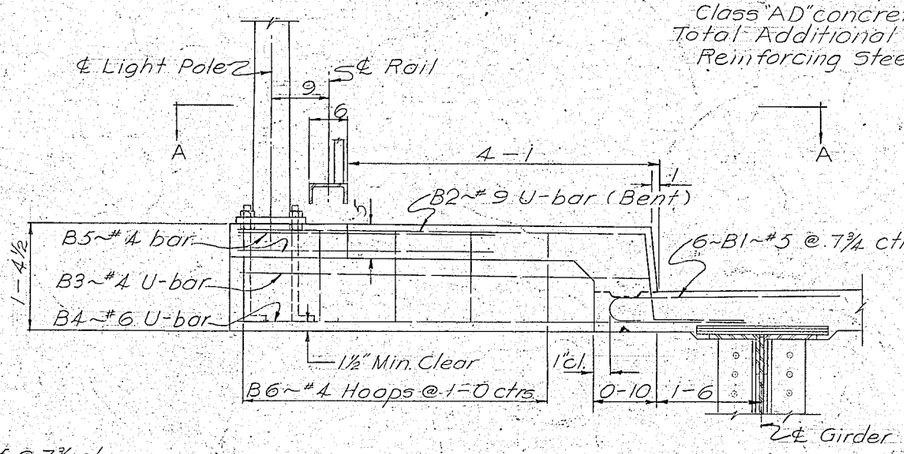
Bent Bars (All dimensions are out to out)

MARK	SIZE	NO.	TYPE	LENGTH	A	B	C	D	E
B1	#5	24	3	3'-10"	3'-3"	0'-7"			
B2	9	4	1	17-0	5-4	1-2	1'-6"	0'-1½	1'-0"
B3	4	4	2	11-8	5-4	1-0			
B4	6	4	2	14-10	6-11	1-0			
B5	4	16	4	4-8	0-11	3-9	3-2		
B6	#4	20	5	5-2	1-0	1-2½	0-4½		

Total Additional:
Class "AD" concrete for four supports = 1.00 yd³
Total Additional:
Reinforcing Steel for four supports = 566 lbs



SECTION A-A
Scale: ¾" = 1'-0"



NOTE ~ Light Pole details in span No. 3 similar.

LIGHT POLE SUPPORT DETAIL
AT SECTION B-B
Scale: ¾" = 1'-0"

LIGHTING FOR
MADISON STREET BRIDGE
MISSOULA, MONTANA

Scale As Noted

J.R.P.

DRAWING NO. 3928A

Drawn HKL 12-10-57
Checked HEE 12-13-57

STATE OF MONTANA

STATE HIGHWAY COMMISSION

BRIDGE PLANS & QUANTITIES

FED. AID PROJECT NO. U-UG405(1) P.E. & R/W UG-405(2) & U405(2) CONSTRUCTION

FIFTH STREET, SIXTH STREET, & MADISON STREET, MISSOULA

MISSOULA COUNTY

REPAIRED 12-8-52

LIST OF DRAWINGS

SHEET NO.	DWG. NO.	TITLE
1	3928	GENERAL LAYOUT
2	3929	FOOTING PLAN
3	3930	BENT NO. 1
4	3931	BENT NO. 2
5	3932	BENT NO. 3
6	3933	PIER NO. 4
7	3934	PIER NO. 5
8	3935	PIER NO. 6
9	3936	BENT NO. 7
10	3937	GIRDER DETAILS SPANS NO. 1 & NO. 2
11	3938	SLAB & GIRDER DETAILS SPANS NO. 1 & NO. 2
12	3939	REINFORCING STEEL & SHOE DETAILS SPANS NO. 1 & NO. 2
13	3940	GIRDERS FOR SPAN NO. 3
14	3941	SWAY BRACING & SHOE DETAILS SPAN NO. 3
15	3942	SPAN NO. 3 SLAB DETAILS, REINFORCENT & FLOOR DRAIN DETAILS
16	3943	GIRDERS, ERECTION PLAN & CAMBER DIAGRAM SPANS NO. 4, NO. 5 & NO. 6
17	3944	GIRDER DETAILS SPANS NO. 4, NO. 5 & NO. 6
18	3945	SWAY FRAME & STRINGER DETAILS SPANS NO. 4, NO. 5 & NO. 6
19	3946	SHOE DETAILS SPANS NO. 4, NO. 5 & NO. 6
20	3947	SLAB REINFORCING STEEL & SLAB POURING DIAGRAM SPANS NO. 4, NO. 5 & NO. 6
21	3948	FLOOR JOINT DETAILS
22	3949	BLAST PLATE & GUARD FENCE DETAILS
23	SBR-T3	STANDARD STEEL BRIDGE RAIL TYPE NO. 3

ESTIMATED BRIDGE PLAN QUANTITIES

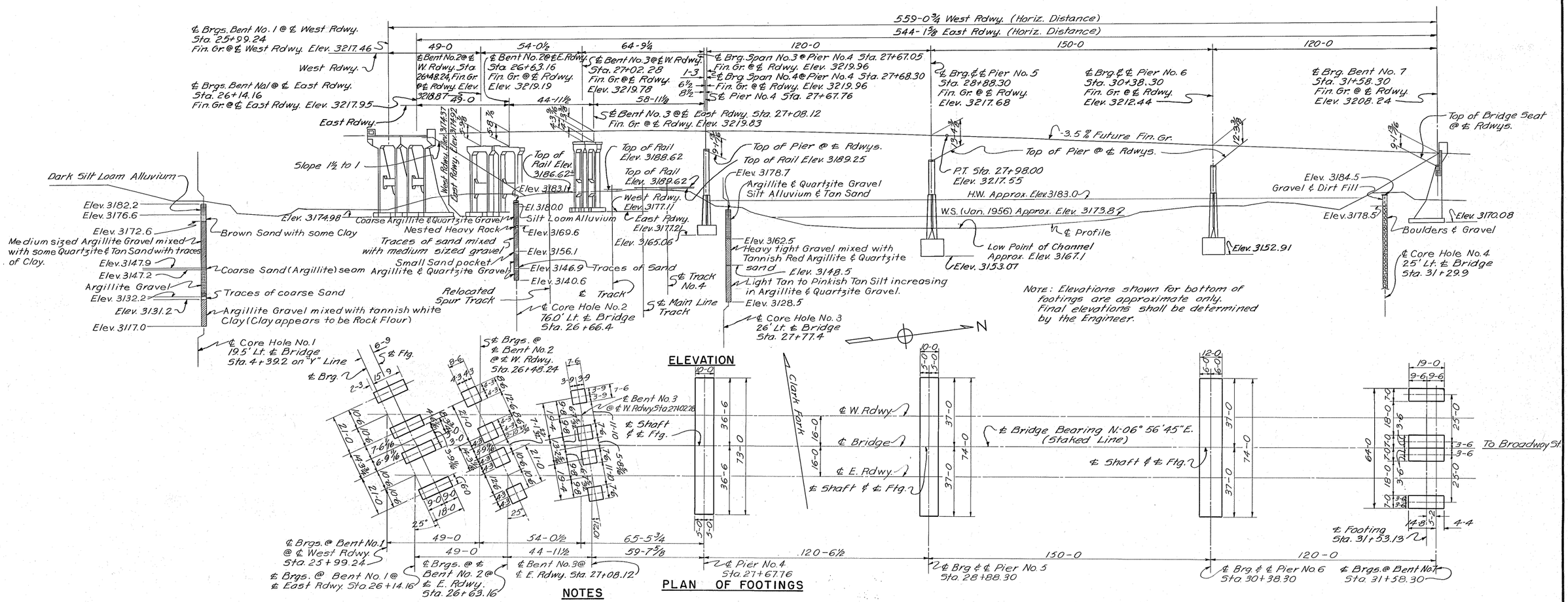
5% Swell in Class "A" Concrete
15% Swell in Structure Excavation

PROJECT NO.	LOCATION	LENGTH IN FEET	STRUCTURAL STEEL UG 405(2)	STRUCTURAL STEEL U 405(2)	REINFORCING STEEL LBS.	CLASS "A" CONCRETE CU. YDS.	CLASS "AD" CONCRETE CU. YDS.	STEEL BRIDGE RAIL LIN. FT.	GUARD FENCE LIN. FT.	CORRUGATED TRANSITE SHEET SQ. FT.	FLOOR DRAINS EACH	SHORING AND CRIBS LUMP SUM	STR. EXCAV. CU. YDS. TYPE 1	STR. EXCAV. CU. YDS. TYPE 2
UG405(2)	BENT NO. 1		LUMP SUM		14,450	132	30.3						305	
	BENT NO. 2				10,255	104							285	
	BENT NO. 3				8,504	103							210	
	1/2 PIER NO. 4				5,828	179						.1 LUMP SUM		380
	SUPERSTRUCTURE	161.06			88,659		378.3	320.34	181.36	862.1				
TOTAL PROJECT NO. UG 405(2)		161.06	LUMP SUM		127,696	518	408.6	320.34	181.36	862.1		.1 LUMP SUM	800	380
U 405(2)	1/2 PIER NO. 4			LUMP SUM	5,828	179						.9 LUMP SUM		380
	PIER NO. 5				11,225	546								600
	PIER NO. 6				10,577	591								1280
	BENT NO. 7				16,270	215								450
	SUPERSTRUCTURE	390.54			92,300		569.0	783.37			14			
TOTAL PROJECT NO. U 405(2)		390.54		LUMP SUM	136,200	153.1	569.0	783.37			14	.9 LUMP SUM		2710
GRAND TOTAL		551.60	LUMP SUM	LUMP SUM	263,896	204.9	977.6	1103.71	181.36	862.1	14	1.0 LUMP SUM	800	3090

Made by E.R.T. 1-30-57 Checked by J.R.B. 2-28-57

DRAWING NO. 3928Q

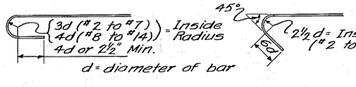
FED. ROAD DIV. NO.	STATE	FED. AID PROJ. NO.		SHEET NO.	TOTAL SHEETS
8	MONT.	UG-405(2) & U-405(2)		2	23



NOTES

REINFORCING STEEL :— All reinforcing bars shall be of intermediate grade billet steel. Deformations shall conform to A.S.T.M. Specifications A 305-50 except as otherwise approved. Slab bars shall be supported on steel chairs placed sufficiently close together to maintain bars in proper position. All other bars shall be supported on either steel chairs or precast concrete blocks. The unit price bid for reinforcing steel shall include the cost of furnishing and placing chairs, precast blocks and all other materials used to fasten reinforcing steel in place.

Splicing of main reinforcing bars shall not be permitted except as shown on the plans. Bends in reinforcing steel shall be made to a radius of not less than four diameters of the bar except for stirrups and tie bars, which shall be bent around a pin having a diameter of not less than two bar diameters. Hooks shall conform to the dimensions shown in the above sketches, except as otherwise noted.



STRUCTURAL STEEL (Method of Measurement and Payment) :— All structural steel shall be measured and paid for as set forth in the Special Provisions.

BACKFILL :— The backfill at end bents may be complete up to the bottoms of the backwalls before superstructure is in place. The backfill against the backwalls shall not be placed until after the concrete roadway slab has been placed.

REINFORCING COVERING :— Minimum covering from surface of concrete to face of any reinforcing bar shall be 2 inches except in slabs where the minimum covering shall be 1 inch. In footings of bents the minimum covering shall be 3 inches.

PREFORMED EXPANSION JOINT FILLER :— Preformed expansion joint fillers shall comply with the requirements set forth in A.A.S.H.O. Designation M-153, and, unless otherwise indicated on the plans, the contractor shall furnish material conforming to Type I or Type II. Cost of furnishing and placing shall be included in the unit price bid for Class "AD" concrete.

APPROVAL :— Shop plans shall be approved by the Montana State Highway Department before fabrication is begun.

SOILS & FOUNDATION MATERIALS :— Borings were taken by the Montana State Highway Department at the points shown, to obtain information on the subsoil at this bridge site so that a more reasonable conclusion could be reached as to the type and approximate elevation of bottom of foundation that should be used. The State Highway Department's interpretation of the materials encountered from the results of the borings is shown on this sheet.

The State Highway Department does not guarantee that the material which will be encountered in the course of excavation for the structure will be as listed in the log of borings shown hereon; neither does the State assume any responsibility for any variation or misinterpretation of the classes of materials.

No claim or adjustment in the unit price bid for excavation or shoring and cribs will be made if the materials found do not agree with those shown on this sheet in the log of borings.

Materials shown as sand and gravel may be of varying degrees of compactness or cementation.

CONCRETE :— All concrete in superstructure and as noted on Bent No. 1 shall be Class "A.D." All other concrete in Bents No. 1, No. 2 and No. 3 and in Piers No. 4, No. 5 and No. 6 and in Bent No. 7 shall be Class "A" except as otherwise noted. An "Air Entraining Agent" shall be added to all concrete except Class "S." Chamfer all exposed edges of concrete ¾ inches and fillet entrant angles ¾ inches unless otherwise noted.

OTHER NOTES :— For other notes see Dwg. No. 3928.

DESIGNED	R.D.K.	6-22-56
DRAWN	R.D.K.	5-2-56
TRACED	H.K.L.	7-2-56
CHECKED	H.E.S.	10-5-56
REVISED		
REVISED		

STATE OF MONTANA
STATE HIGHWAY COMMISSION

BRIDGE OVER CLARK FORK
& C.M.ST.P. & P. R.R.
AT MISSOULA

FED. AID PROJ. NO. UG-405(2) & NO. U-405(2)

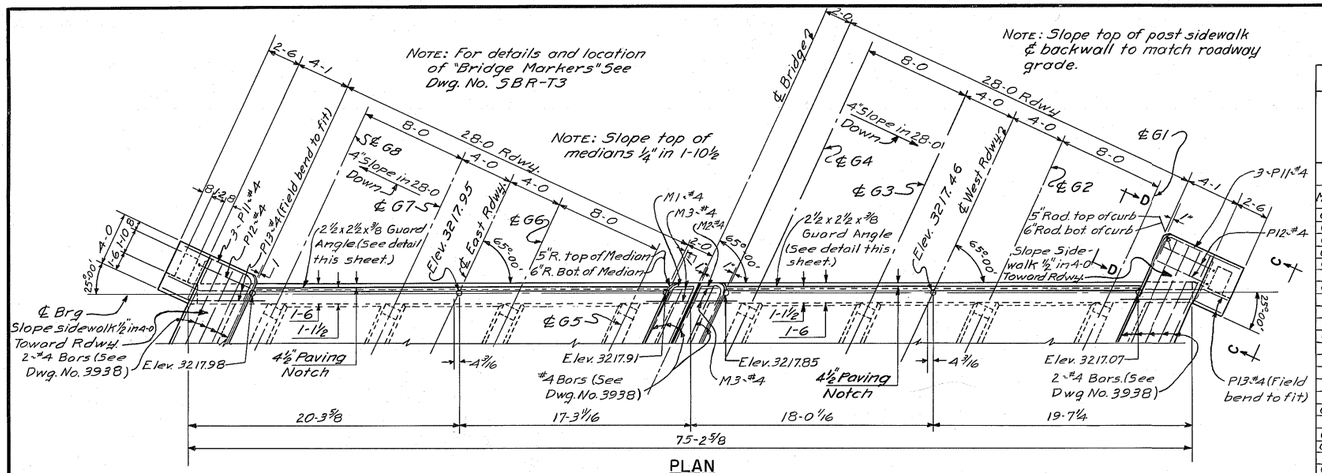
MISSOULA COUNTY

FOOTING PLAN
Scale ~ 1" = 25'-0"

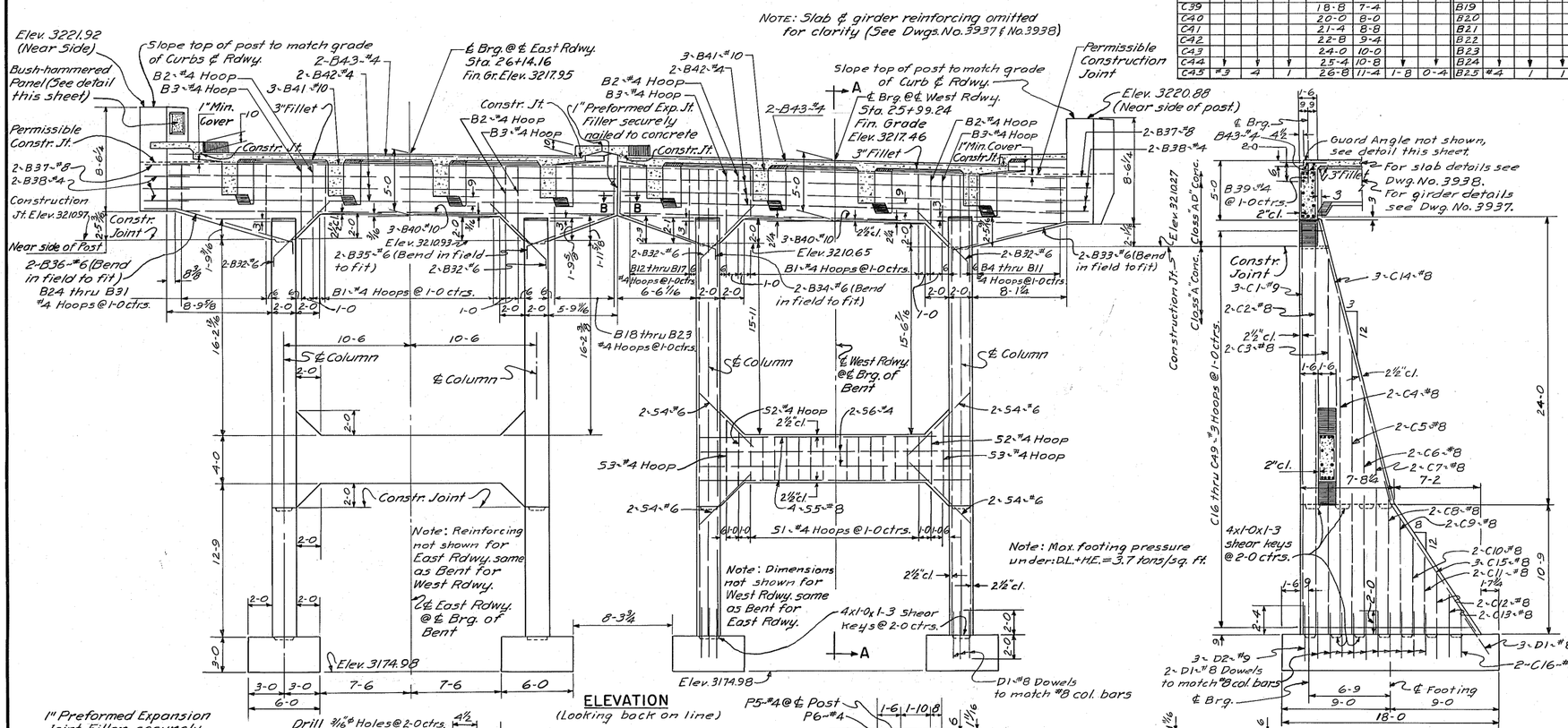
STATE PRECONST. NUMBER 5405-01

DRAWING NO. 3929

FED. ROAD DIV. NO.	STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
8	MONT.	UG-405(2) & U-405(2)	3	23



PLAN

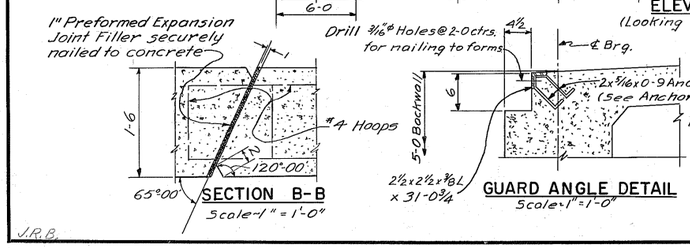


ELEVATION (Looking back on line)

SECTION A-A

VIEW C-C Scale 1/4" = 1'-0"

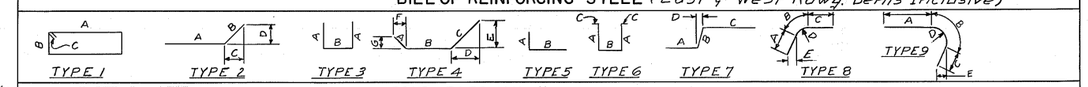
VIEW D-D Scale 1/4" = 1'-0"



SECTION B-B Scale 1" = 1'-0"

GUARD ANGLE DETAIL Scale 1" = 1'-0"

BILL OF REINFORCING STEEL (East & West Rdwy. Bents Inclusive)



BENT BARS (All dimensions are out to out)

MARK	SIZE	NO.	TYPE	LENGTH	A	B	C
C16	#3	4	1	7'-2"	1'-7"	1'-8"	0'-4"
C17				7-8	1-10		
C18				8-2	2-1		
C19				8-8	2-4		
C20				9-2	2-7		
C21				9-8	2-10		
C22				10-2	3-1		
C23				10-8	3-4		
C24				11-2	3-7		
C25				11-8	3-10		
C26				12-2	4-1		
C27				12-8	4-4		
C28				13-2	4-7		
C29				13-8	4-10		
C30				14-2	5-1		
C31				14-8	5-4		
C32				15-2	5-7		
C33				15-8	5-10		
C34				16-2	6-1		
C35				16-8	6-4		
C36				17-2	6-7		
C37				17-8	6-10		
C38				18-2	7-1		
C39				18-8	7-4		
C40				20-0	8-0		
C41				21-4	8-8		
C42				22-8	9-4		
C43				24-0	10-0		
C44				25-4	10-8		
C45	#3	4	1	26-8	11-4	1-8	0-4

MARK	SIZE	NO.	TYPE	LENGTH	A	B	C
C46	#3	4	1	28'-0"	12'-0"	1'-8"	0'-4"
C47				29-4	12-8		
C48				30-8	13-4		
C49	3	4	1	32-0	14-0	1-8	0-4
B1	4	30	1	11-1	4-0	1-2	0-4½
B2		4		11-11	4-5		
B3		4		13-11	5-5		
B4		1		14-7	5-9		
B5				14-1	5-6		
B6				13-5	5-2		
B7				12-11	4-11		
B8				12-5	4-8		
B9				11-9	4-4		
B10				11-3	4-1		
B11				10-9	3-10		
B12				14-11	5-11		
B13				14-3	5-7		
B14				13-7	5-3		
B15				12-11	4-11		
B16				12-3	4-7		
B17				11-7	4-3		
B18				14-9	5-10		
B19				13-11	5-3		
B20				13-5	5-2		
B21				12-9	4-10		
B22				11-11	4-5		
B23				11-3	4-1		
B24				14-9	5-10		
B25	#4	1	1	14-1	5-6	1-2	0-4½

MARK	SIZE	NO.	TYPE	LENGTH	A	B	C	D	E	F	G
B26	#4	1	1	13'-7"	5'-3"	1'-2"	0'-4½				
B27				12-11	4-11						
B28				12-3	4-7						
B29				11-9	4-4						
B30				11-1	4-0						
B31	4	1	1	10-5	3-8	1-2	0-4½				
B32	6	8	2	8-0	7-0	1-0	0-8½	0-8½			
B33	6	2	2	13-8	12-8	1-0	0-3½	0-11½			
B34	6	2	2	13-6	12-6	1-0	0-3½	0-11¼			
B35	6	2	2	13-0	12-0	1-0	0-4	0-11½			
B36	6	2	2	14-7	13-7	1-0	0-3½	0-11½			
B37	8	4	2	4-4	2-0	2-4	2-1½	1-0			
B38	4	12	2	4-4	2-0	2-4	2-1½	1-0			
B39	4	62	5	3-3	1-3	2-0					
S1	4	30	1	10-5	3-8	1-2	0-4½				
S3	4	4	1	16-1	6-6	1-2	0-4½				
S2	4	4	1	12-1	4-6	1-2	0-4½				
P7	3	12	1	12-4	3-8	2-2	0-4				
P8	3	2	3	8-8	3-3	2-2					
P9	3	2	3	6-8	2-3	2-2					
P10	4	4	4	10-2	1-2	3-5	5-7	3-11½	3-11½	0'-10"	0'-10"
P11	4	6	9	7-7	5-11	0-5	1-3	0-3	0-0		
P12	4	3	6	10-6	4-3	1-3	0-4½				
P13	4	4	7	8-10	1-6	0-10	6-6	0-1			
C15	8	12	2	14-10	12-10	2-0	1-10½	0-8			
M1	4	1	8	3-1	1-3	0-3½	1-7	0-3	0-6½		
M2	4	1	9	3-1	1-4	0-6	1-3	0-3	0-6½		
M3	#4	4	7	4-1	1-6	0-10	1-9	0-1			

STRAIGHT BARS

MARK	SIZE	NO.	LENGTH	MARK	SIZE	NO.	LENGTH
C1	#9	12	38'-5"	S4	#6	16	6'-3"
C2	8	8	38-3	S5	8	16	22-8
C3		8	31-8	S6	4	8	21-6
C4			27-8	B40	10	6	36-6
C5			23-8	B41	10	6	37-3
C6			19-8	B42	4	12	37-3
C7			15-8	B43	4	4	36-0
C8			11-8				
C9			9-6				
C10			8-0	P1	4	4	7-5
C11			6-6	P2	4	4	6-6
C12			7-0	P3	4	2	5-7
C13		8	5-6	P4	4	12	8-2
C14	8	12	24-6	P5	4	2	3-8
C16	8	8	4-0	P6	#4	4	2-2
D2	9	12	4-8				
D1	#8	92	4-0				

NOTES

CONCRETE :— All concrete for Bent No. 1 below construction joint at bottom of backwall haunches shall be Class "A" concrete. Concrete above this construction joint shall be Class "AD" concrete as noted. Chamfer post and curbs ¾" and do not fillet entrant angles.

FORMS :— All forms for end bents above construction joint at bottom of beam haunches shall be made of tongue and groove matched lumber, surfaced inside or shall be lined with plywood. See Special Provisions.

SETTING OF SHOES :— Care shall be taken in placing reinforcing steel so as to clear anchor bolts. Contractor shall finish concrete under girder shoes slightly high and bush-hammer to exact elevation shown. Shoes shall be placed on three (3) layers of canvas thoroughly swabbed with red lead, as called for in the Standard Specifications.

OTHER NOTES :— For other notes see Dwgs. No. 3928, No. 3929 & 3935.

STATE OF MONTANA
STATE HIGHWAY COMMISSION

BRIDGE OVER CLARK FORK
& C.M.ST.P. & P. R.R.
AT MISSOULA

FED. AID PROJ. NO. UG-405(2) & NO. U-405(2)

MISSOULA COUNTY

BENT NO. 1

Scale 3/16" = 1'-0" & As Noted

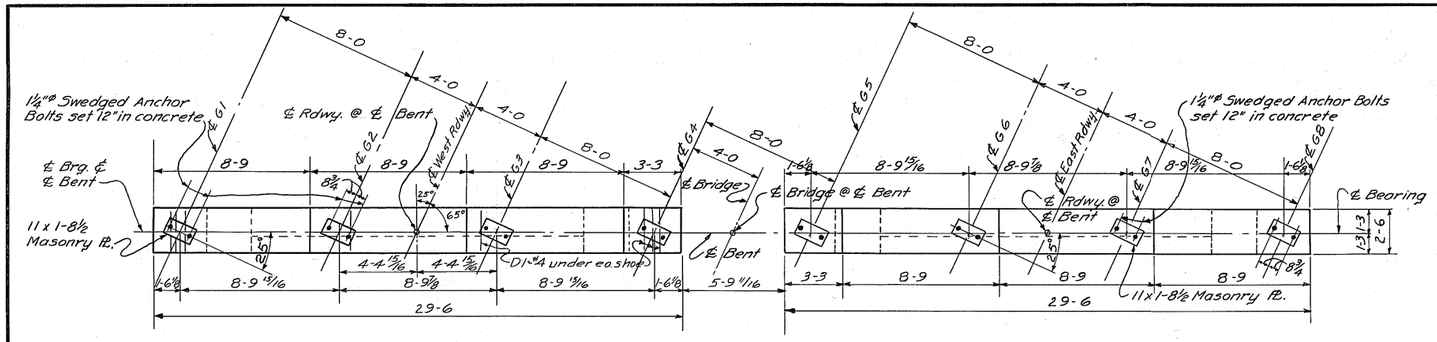
DESIGNED	R.D.K.	10-5-56
DRAWN	R.D.K	10-18-56
TRACED	E.R.T.	11-1-56
CHECKED	H.E.S.	11-14-56
REVISED		
REVISED		

STATE PRECONST. NUMBER 5405-01

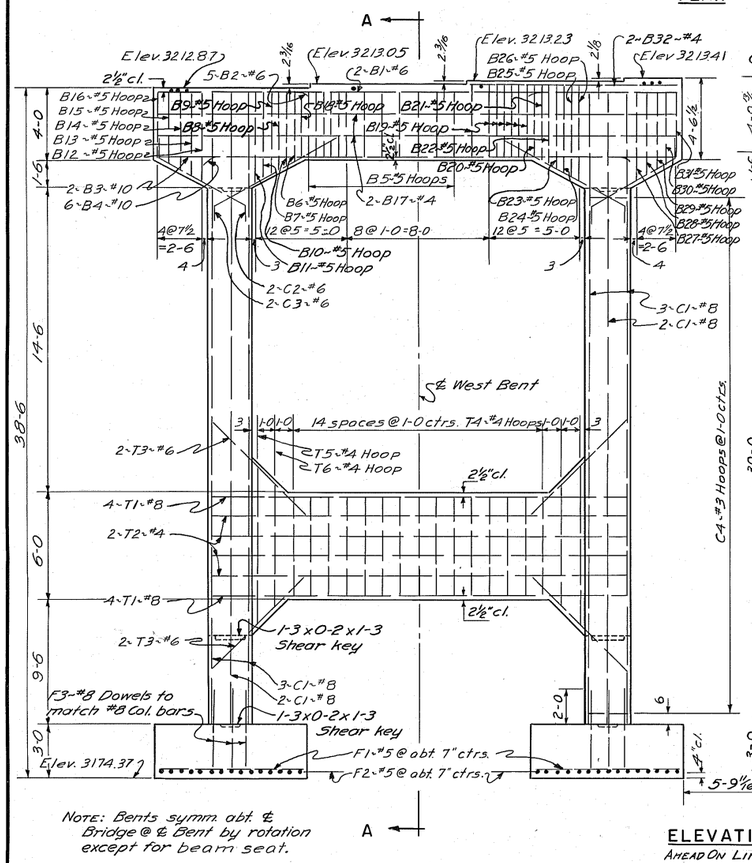
DRAWING NO. 3930

J.R.B.

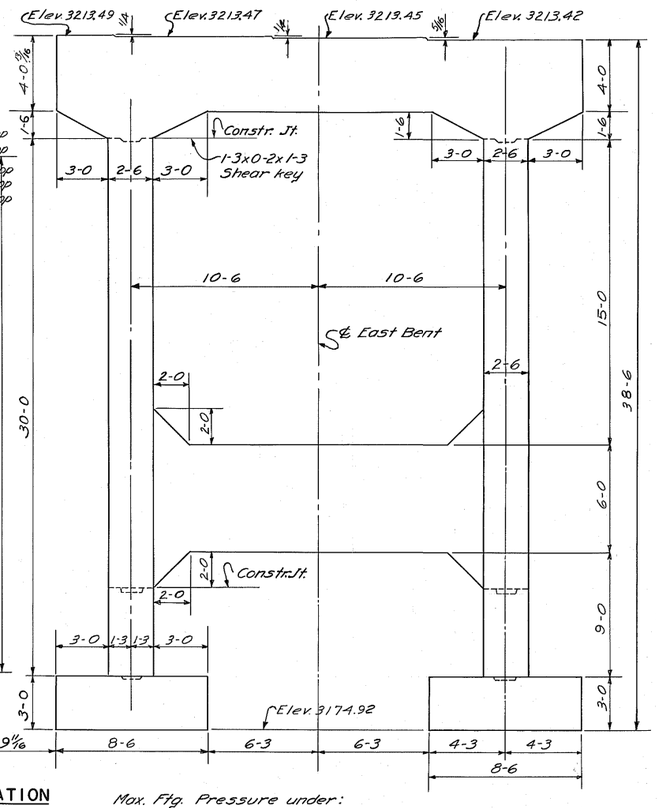
FED. ROAD DIV. NO.	STATE	FED. AID PROJ. NO.		SHEET NO.	TOTAL SHEETS
8	MONT.	UG-405(2) & U-405(2)		4	23



PLAN

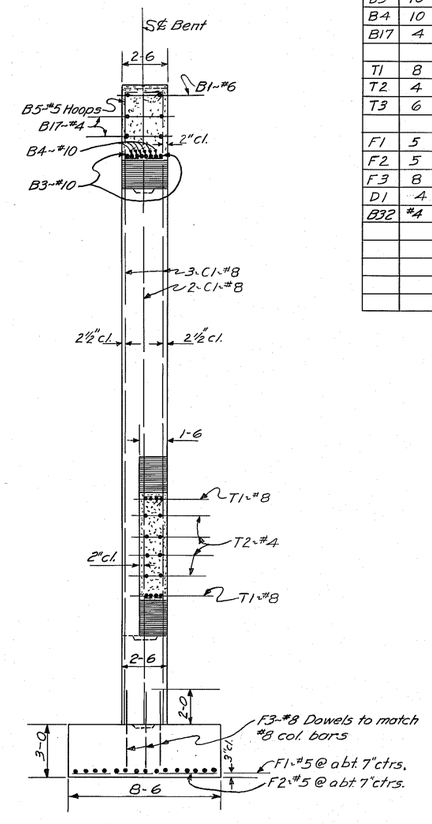


Note: Bents symm. abt. ℄ Bridge @ ℄ Bent by rotation except for beam seat.



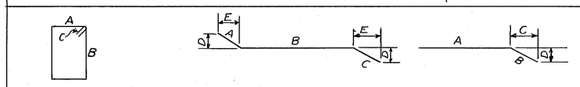
ELEVATION
AHEAD ON LINE

Max. Ftg. Pressure under: D.L.+L.L. = 3.40 Tons/sq. ft.



SECTION A-A

BILL OF REINFORCING STEEL (West Rdwy.-Bent Only)



STRAIGHT BARS				BENT BARS (All dimensions are out to out)											
Mark	Size	No.	Length	Mark	Size	No.	Type	Length	A	B	C	D	E	F	G
C1	#8	16	35'-3"	C2	#6	4	2	7'-8"	1'-0"	5'-8"	1'-0"	0'-10¾"	0'-5⅜"		
B1	6	2	29-2	C3	6	4	3	8-6	7-6	1-0	0-5⅜	0-10¾			
B2	6	10	8-4	C4	3	60	1	9-4	2-2	2-2	0-4				
B3	10	2	29-2	B5	5	12	1	12-6	2-2	3-8	0-5				
B4	10	6	23-10	B6	↑	1	↑	13-1	↑	3-11½	↑				
B17	4	4	29-2	B7		1		13-7		4-2½					
				B8		1		14-0		4-5					
T1	8	8	22-8	B9		1		14-5		4-7½					
T2	4	8	21-0	B10		1		14-9		4-9½					
T3	6	8	6-2	B11		1		15-2		5-0					
				B12		1		15-2		5-0					
F1	5	30	8-0	B13		1		14-6		4-8					
F2	5	30	8-0	B14		1		13-11		4-4½					
F3	8	16	4-0	B15	↓	1		13-4	↓	4-1	↓				
D1	4	8	2-2	B16	5	1		12-8	2-2	3-9	0-5				
B32	#4	2	11-8	B18	5	1		12-9	2-2	3-9½	0-5				
				T4	4	15		14-5	1-2	5-8	0-4½				
				T5	4	2		17-1	1-2	7-0	0-4½				
				T6	4	2		21-1	1-2	9-0	0-4½				
				B19	5	7		13-3	2-2	4-0½	0-5				
				B20	↑	1		13-6	↑	4-2	↑				
				B21		↑		13-10		4-4					
				B22				14-4		4-7					
				B23				14-9		4-9½					
				B24				15-2		5-0					
				B25				15-7		5-2½					
				B26				16-0		5-5					
				B27				15-11		5-4½					
				B28				15-3		5-0½					
				B29				14-8		4-9					
				B30	↓	↓	↓	14-1	↓	4-5½	↓				
				B31	#5	1	1	13-5	2-2	4-1½	0-5				

Bar List For East Rdwy. Bent Same As For West Rdwy. Bent Except For The Following Changes: Delete Bars Numbers B19 Thru B32

B5	#5	19	1	12'-6"	2'-2"	3'-8"	0'-5"								
B6	↑	2	↑	13-1	↑	3-11½	↑								
B7		↑		13-7		4-2½									
B8				14-0		4-5									
B9				14-5		4-7½									
B10				14-9		4-9½									
B11				15-2		5-0									
B12				15-2		5-0									
B13				14-6		4-8									
B14				13-11		4-4½									
B15				13-4		4-1									
B16	↓	↓	↓	12-8	↓	3-9	↓								
B18	#5	2	1	12-9	2-2	3-9½	0-5								

NOTES

CONCRETE :— All concrete for Bents No. 2 & No. 3 shall be Class "A". Chamfer all exposed edges of concrete 1½ inches, but do not fillet entrant angles.

FORMS :— All forms for Bents No. 2 & No. 3 above top of footings shall be made of tongue and groove matched lumber, surfaced inside or shall be lined with plywood. See Special Provisions.

OTHER NOTES :— For other notes see Dwgs. No. 3928, No. 3929, No. 3930 & No. 3935.

STATE OF MONTANA
STATE HIGHWAY COMMISSION

BRIDGE OVER CLARK FORK
& C.M.ST.P. & P. R.R.
AT MISSOULA

FED. AID PROJ. NO. UG-405 (2) & NO. U-405(2)

MISSOULA COUNTY

BENT NO. 2

Scale - 1/4" = 1'-0"

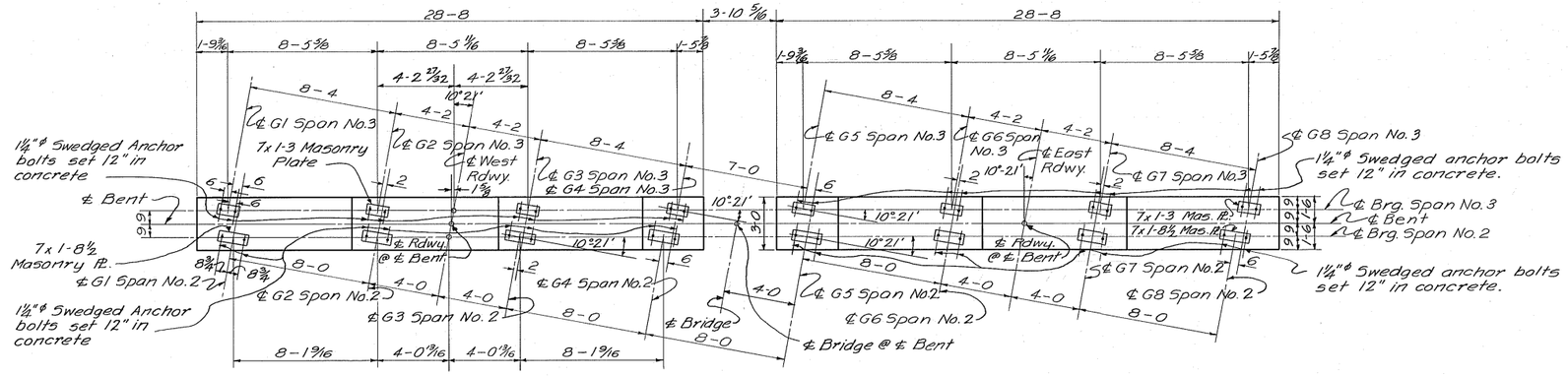
DESIGNED	R.D.H.	10-10-56
DRAWN	D.D.G.	10-19-56
TRACED	E.R.T.	10-29-56
CHECKED	H.E.S.	11-13-56
REVISED		
REVISED		

STATE PRECONST. NUMBER 5405-01

DRAWING NO. 3931

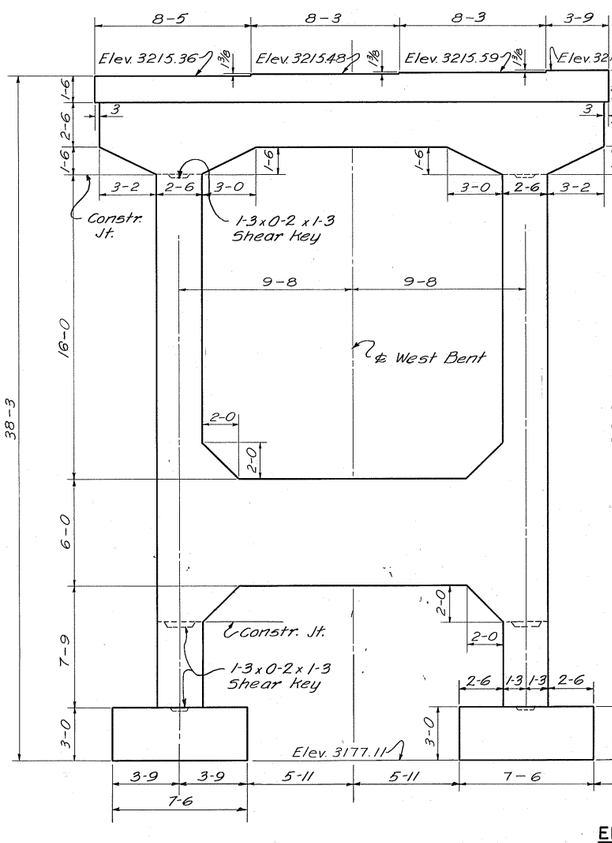
J.R.B.

FED. ROAD DIV. NO.	STATE	FED. AID PROJ. NO.		SHEET NO.	TOTAL SHEETS
8	MONT.	UG-405(2) & U-405(2)		5	23

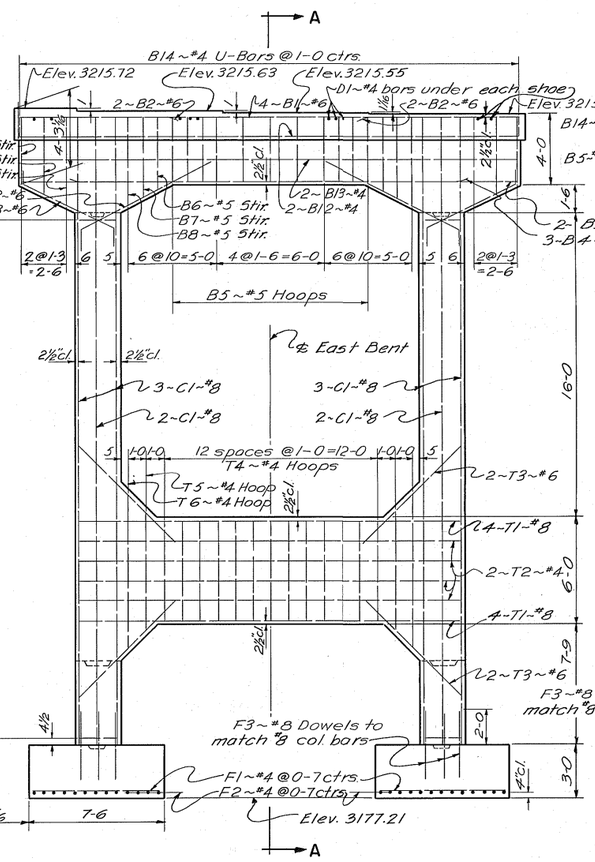


NOTE: Bents symmetrical about ℄ Bridge @ ℄ Bent by rotation except for coping.

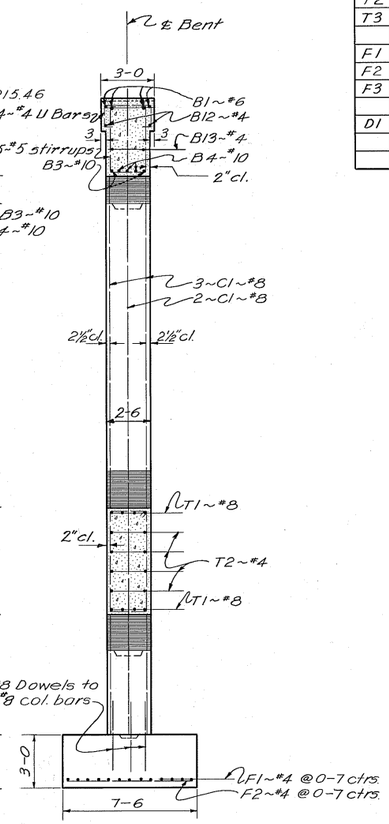
PLAN



ELEVATION
(Ahead on Line)

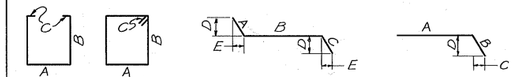


Max. Ftg. Pressure under: D.L. + L.L. = 3.23 Tons / sq. ft.



SECTION A-A

BILL OF REINFORCING STEEL (EAST & WEST RDWY. BENTS INCLUSIVE.)



STRAIGHT BARS				BENT BARS (All dimensions are out to out)											
MARK	SIZE	No.	LENGTH	MARK	SIZE	No.	TYPE	LENGTH	A	B	C	D	E	F	G
B1	#6	8	28'-4"	B5	#5	22	1	10'-2"	2'-2"	3'-8"	0'-4"				
B2	6	8	8-4	B6	↑	4	1	11-0	2-2	4-1	0-4				
B3	10	4	27-10	B7		↑	1	11-10	2-2	4-6	0-4				
B4	10	6	22-2	B8			1	12-8	2-2	4-11	0-4				
B12	4	4	28-4	B9			1	10-4	2-2	3-9	0-4				
B13	4	4	27-10	B10	↑	↑	1	11-6	2-2	4-4	0-4				
				B11	5	4	1	12-8	2-2	4-11	0-4				
C1	8	32	35-0	B14	4	58	1	5-8	2-8	1-2	0-4				
T1	8	16	21-0	T4	4	26	2	16-5	2-2	5-8	0-4½				
T2	4	16	19-4	T5	4	4	2	18-5	2-2	6-8	0-4½				
T3	6	16	6-2	T6	4	4	2	22-5	2-2	8-8	0-4½				
F1	4	52	7-0	C2	6	8	4	8-6	7-6	1-0	0-3 3/16	0'-10 3/16"			
F2	4	52	7-0	C3	6	8	3	7-9	1-0	5-9	1-0	0-11	0'-5 1/4"		
F3	8	32	4-0	C4	#3	120	2	9-4	2-2	2-2	0-4				
D1	#4	20	2-8												

NOTES

OTHER NOTES: - For other notes see Dwgs. No. 3928, No. 3929, No. 3930, No. 3931 & No. 3935.

STATE OF MONTANA
STATE HIGHWAY COMMISSION

BRIDGE OVER CLARK FORK
& C. M. ST. P. & P. R. R.
AT MISSOULA

FED. AID PROJ. NO. UG-405 (2) & NO. U-405(2)

MISSOULA COUNTY

BENT NO. 3

Scale: ¼" = 1'-0"

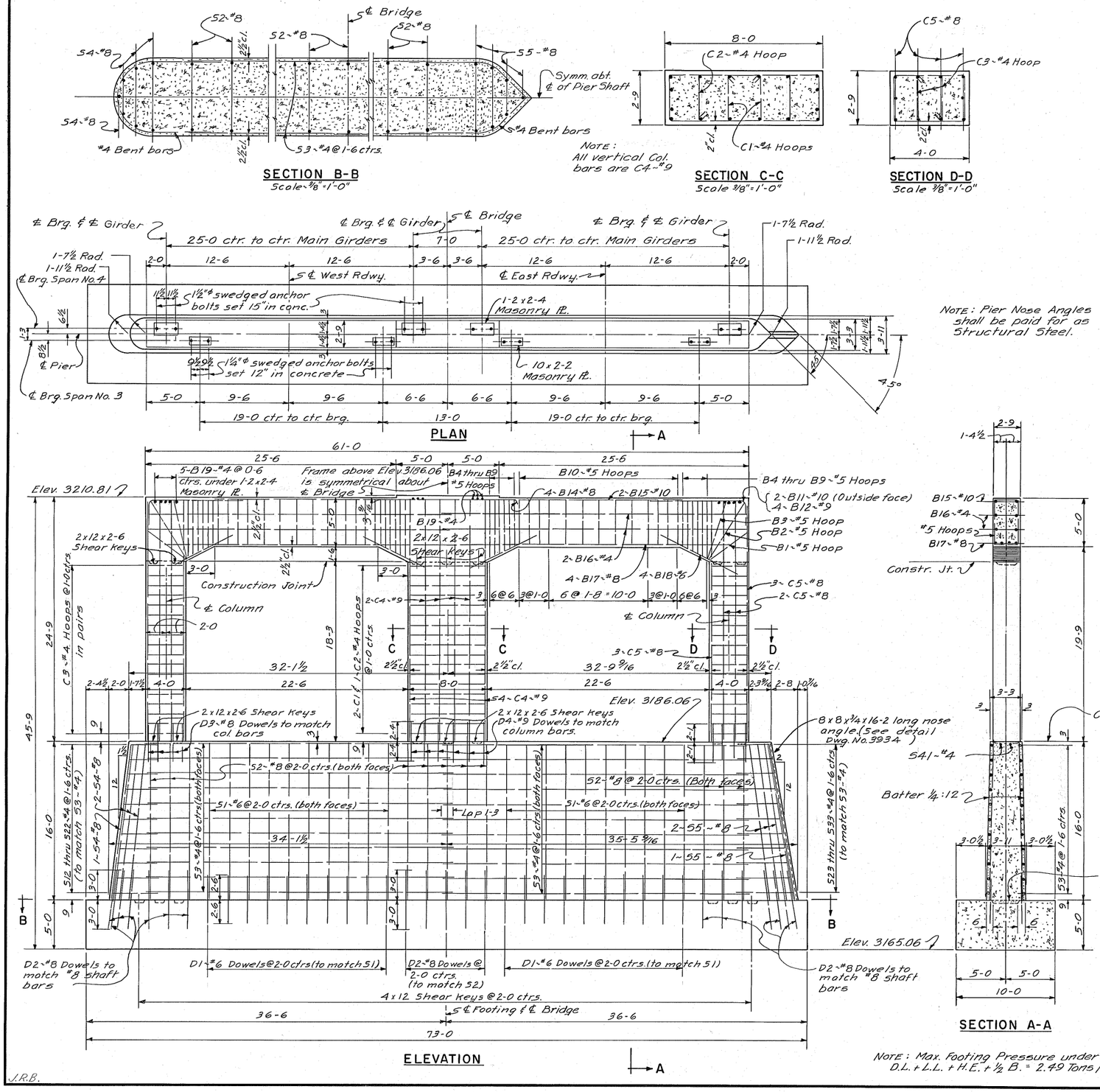
DESIGNED	R. D. K.	10-10-56
DRAWN	D. D. G.	10-23-56
TRACED	H. K. L.	10-25-56
CHECKED	H. E. S.	11-7-56
REVISED		
REVISED		

STATE PRECONST. NUMBER 5405-01

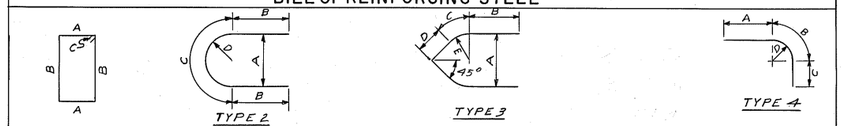
DRAWING NO. 3932

J.R.B.

FED. ROAD DIV. NO.	STATE	FED. AID PROJ. NO.		SHEET NO.	TOTAL SHEETS
8	MONT.	UG-405(2) & U-405(2)		6	23



BILL OF REINFORCING STEEL



BENT BARS (All dimensions are out to out)

MARK	SIZE	NO.	TYPE	LENGTH	A	B	C	D	E	F	MARK	SIZE	NO.	TYPE	LENGTH	A	B	C	D	E	F
S12	#4	1	2	7'-0"	2'-10"	1'-3½"	4'-5½"	1'-5"			S32	#4	1	3	12'-5"	3'-5"	3'-2"	1'-4"	1'-8½"	1'-8½"	
S13	↑	↑	↑	7-5	2-11	1-5	4-7	1-5½			S33	4	1	3	12-9	3-5	3-4	1-4	1-8½	1-8½	
S14				7-9	2-11	1-7	4-7	1-5½			C1	4	36	1	11-11	2-5	3-2	0-4½			
S15				8-2	3-0	1-9	4-8½	1-6			C2	4	18	1	14-11	2-5	4-8	0-4½			
S16				8-8	3-1	1-11	4-10	1-6½			C3	4	72	1	10-7	2-5	2-6	0-4½			
S17				9-1	3-2	2-1	4-11½	1-7													
S18				9-4	3-2	2-2½	4-11½	1-7			B1	5	2	1	15-8	2-5	5-0	0-5			
S19				9-10	3-3	2-4½	5-1½	1-7½			B2	↑	2	↑	19-4	↑	6-10	↑			
S20				10-4	3-4	2-6½	5-3	1-8			B3		2		18-0		6-2				
S21			↓	10-8	3-5	2-8	5-4½	1-8½			B4		4		17-8		6-0				
S22			2	11-0	3-5	2-10	5-4½	1-8½			B5		4		17-2		5-9				
S23			3	7-8	2-10	1-3½	1-1½	1-5	1'-5"		B6		4		16-8		5-6				
S24			↑	8-2	2-11	1-6	1-1½	1-5½	1-5½		B7		4		16-2		5-3				
S25				8-7	2-11	1-8½	1-1½	1-5½	1-5½		B8		4		15-8		5-0				
S26				9-2	3-0	1-11	1-2	1-6	1-6		B9		4		15-2		4-9				
S27				9-9	3-1	2-1½	1-2½	1-6½	1-6½		B10	5	26	1	15-0	2-5	4-8	0-5			
S28				10-4	3-2	2-4	1-3	1-7	1-7		B11	10	4	4	12-8	8-5	1-7	2-8	1-0		
S29				10-9	3-2	2-6½	1-3	1-7	1-7		B12	#9	8	4	12-0	8-1	1-7	2-4	1-0		
S30	↓	↓	↓	11-4	3-3	2-9	1-3½	1-7½	1-7½												
S31	#4	1	3	11-10	3-4	2-11½	1-3½	1-8	1-8												

STRAIGHT BARS

MARK	SIZE	NO.	LENGTH	MARK	SIZE	NO.	LENGTH
S1	#6	40	15'-10"	S41	#4	4	34'-0"
S2	8	22	15-10				
S3	4	44	31-2				
S4	8	7	15-11				
S5	8	7	16-0				
C4	9	16	24-7				
C5	8	20	24-7				
B14	8	4	18-0				
B15	10	2	47-1				
B16	4	8	31-0				
B17	8	4	57-0				
B18	6	16	7-0				
B19	4	16	2-5				
D1	6	40	5-0				
D2	8	36	6-0				
D3	8	20	4-2				
D4	#9	16	4-8				

NOTES

OTHER NOTES — For other notes see Dwgs. No. 3928, No. 3929, No. 3930 & No. 3935.

NOTE: The Contractor will be permitted to deposit, for his convenience all of the footings for Pier No. 4 under water as a seal course if he desires, in which case he shall comply with the requirements and conditions set forth on Dwg. No. 3935.

STATE OF MONTANA
STATE HIGHWAY COMMISSION

BRIDGE OVER CLARK FORK
& C.M.ST.P. & P. R.R.
AT MISSOULA

FED. AID PROJ. NO. UG-405(2) & NO. U-405(2)

MISSOULA COUNTY

PIER NO. 4

Scale - 3/16" = 1'-0" Except As Noted

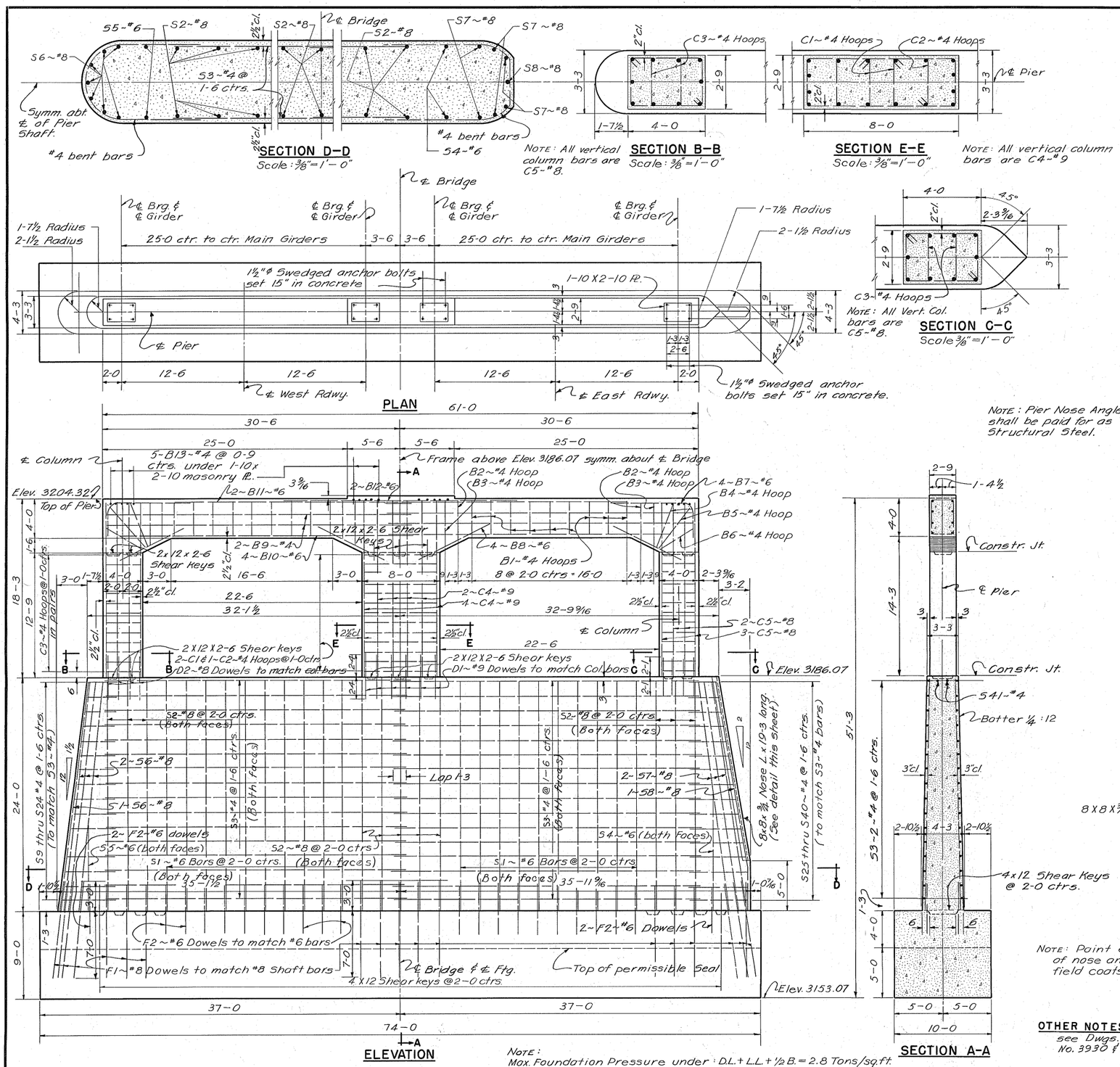
DESIGNED	R.D.K.	7-17-56
DRAWN	R.D.K.	8-13-56
TRACED	E.R.T.	8-21-56
CHECKED	H.E.S.	10-1-56
REVISED		
REVISED		

STATE PRECONST. NUMBER 5405-01

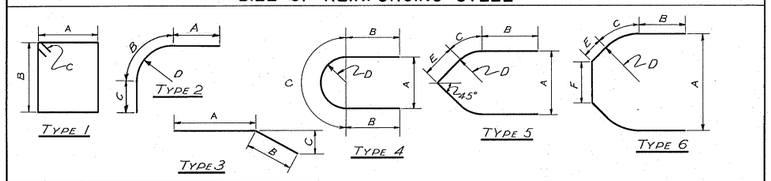
DRAWING NO. 3933

J.R.B.

FED. ROAD DIV. NO.	STATE	FED. AID PROJ. NO.		SHEET NO.	TOTAL SHEETS
8	MONT.	UG-405(2) & U-405(2)		7	23



BILL OF REINFORCING STEEL

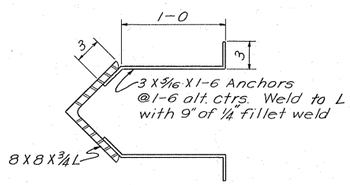


BENT BARS (All dimensions are out to out)

MARK	SIZE	NO.	TYPE	LENGTH	A	B	C	D	MARK	SIZE	NO.	TYPE	LENGTH	A	B	C	D	E	F
S8	#8	1	3	24'0"	19'-6	4'-6"	0'-9"		S25	#4	1	5	7'-8"	2'-10	1'-3½	1'-1½	1'-5	1'-5	
S9	4		4	7-0	2-10	1-3½	4-5½	1'-5"	S26				8-2	2-11	1-6	1-1½	1-5½	1-5½	
S10				7-5	2-11	1-5	4-7	1-5½	S27				8-7	2-11	1-8½	1-1½	1-5½	1-5½	
S11				7-9	2-11	1-7	4-7	1-5½	S28				9-2	3-0	1-11	1-2	1-6	1-6	
S12				8-2	3-0	1-9	4-8½	1-6	S29				9-9	3-1	2-1½	1-2½	1-6½	1-6½	
S13				8-8	3-1	1-11	4-10	1-6½	S30				10-4	3-2	2-4	1-3	1-7	1-7	
S14				9-1	3-2	2-1	4-11½	1-7	S31				10-9	3-2	2-6½	1-3	1-7	1-7	
S15				9-4	3-2	2-2½	4-11½	1-7	S32				11-4	3-3	2-9	1-3½	1-7½	1-7½	
S16				9-10	3-3	2-4½	5-1½	1-7½	S33				11-10	3-4	2-11½	1-3½	1-8	1-8	
S17				10-4	3-4	2-6½	5-3	1-8	S34				12-5	3-5	3-2	1-4	1-8½	1-8½	
S18				10-8	3-5	2-8	5-4½	1-8½	S35				12-9	3-5	3-4	1-4	1-8½	1-8½	
S19				11-0	3-5	2-10	5-4½	1-8½	S36				13-4	3-6	3-6½	1-4½	1-9	1-9	
S20				11-6	3-6	3-0	5-6	1-9	S37			5	13-11	3-7	3-9	1-5	1-9½	1-9½	
S21				11-11	3-7	3-2	5-7½	1-9½	S38			6	14-5	3-8	3-11½	1-5½	1-10	1-9	0'-1½"
S22				12-4	3-8	3-3½	5-9	1-10	S39			6	14-10	3-9	4-2	1-6	1-10½	1-5½	0-7
S23				12-9	3-9	3-5½	5-10½	1-10½	S40	4	1	6	15-1	3-9	4-4½	1-6	1-10½	1-1½	1-1
S24	#4	1	4	13-1	3-9	3-7½	5-10½	1-10½											
									B1	4	18	1	12-11	2-5	3-8	0-4½			
									B2		4		13-10		4-1½				
									B3		4		15-1		4-9				
									B4		2		15-11		5-2				
									B5		2		17-6		5-11½				
									B6	4	2	1	14-7	2-5	4-6	0-4½			
									B7	6	8	2	10-9	7-6	1-7	1-8	1-0		
									C1	4	26	1	11-11	2-5	3-2	0-4½			
									C2	4	13	1	14-11	2-5	4-8	0-4½			
									C3	#4	52	1	10-7	2-5	2-6	0-4½			

STRAIGHT BARS

MARK	SIZE	NO.	LENGTH	MARK	SIZE	NO.	LENGTH
B8	#6	16	7'-0"	S6	#8	7	23'-11"
B9	4	8	31-1	S7	8	6	24-1
B10	6	8	29-0				
B11	6	4	24-4				
B12	6	2	17-4				
B13	4	20	2-5				
				C4	9	16	18-1
				C5	8	20	18-1
S1	6	40	23-10				
S2	8	22	23-10	D1	9	16	4-8
S3	4	64	31-2	D2	8	20	4-2
S4	6	2	17-6	S41	4	4	34-0
S5	#6	2	9-9	F1	8	36	10-0
				F2	#6	44	5-0



NOSE ANGLE DETAIL
Scale: 1½"=1'-0"

NOTE: Paint exposed surfaces of nose angle with two field coats before erection.

NOTES

OTHER NOTES: — For other notes see Dwgs. No. 3928, No. 3929, No. 3930 & No. 3935.

STATE OF MONTANA
STATE HIGHWAY COMMISSION

BRIDGE OVER CLARK FORK
& C.M.ST.P. & P. R.R.
AT MISSOULA
FED. AID PROJ. NO. UG-405(2) & NO. U-405(2)
MISSOULA COUNTY
PIER NO. 5
Scale - 3/16"=1'-0" Except As Noted

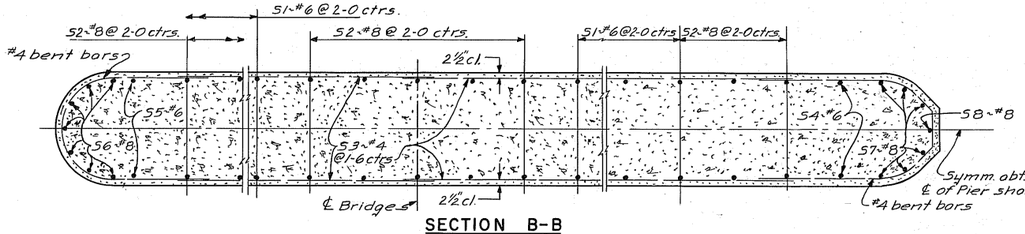
DESIGNED	R.D.K.	7-17-56
DRAWN	C.A.M.	7-24-56
TRACED	H.K.L.	7-30-56
CHECKED	H.E.S.	9-28-56
REVISED		
REVISED		

STATE PRECONST. NUMBER 5405-01

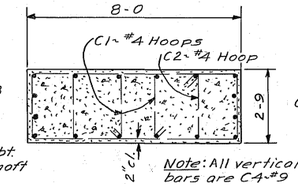
DRAWING NO. 3934

J.R.B.

FED. ROAD DIV. NO.	STATE	FED. AID PROJ. NO.		SHEET NO.	TOTAL SHEETS
8	MONT.	UG-405(2) & U-405(2)		8	23

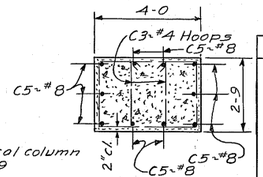


SECTION B-B
Scale 3/8" = 1'-0"

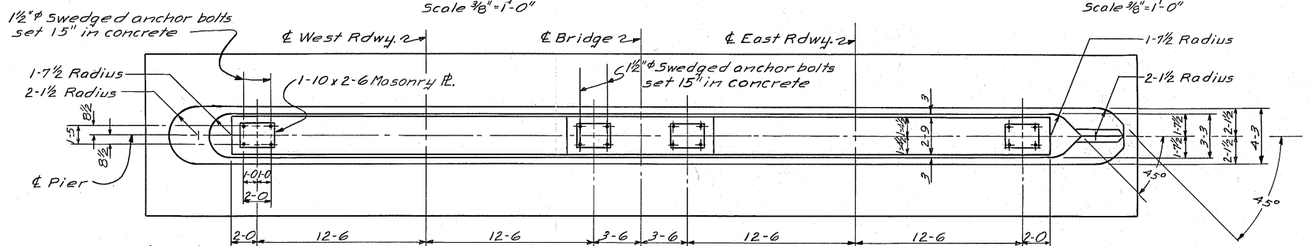


Note: All vertical column bars are C4-#9

SECTION C-C
Scale 3/8" = 1'-0"

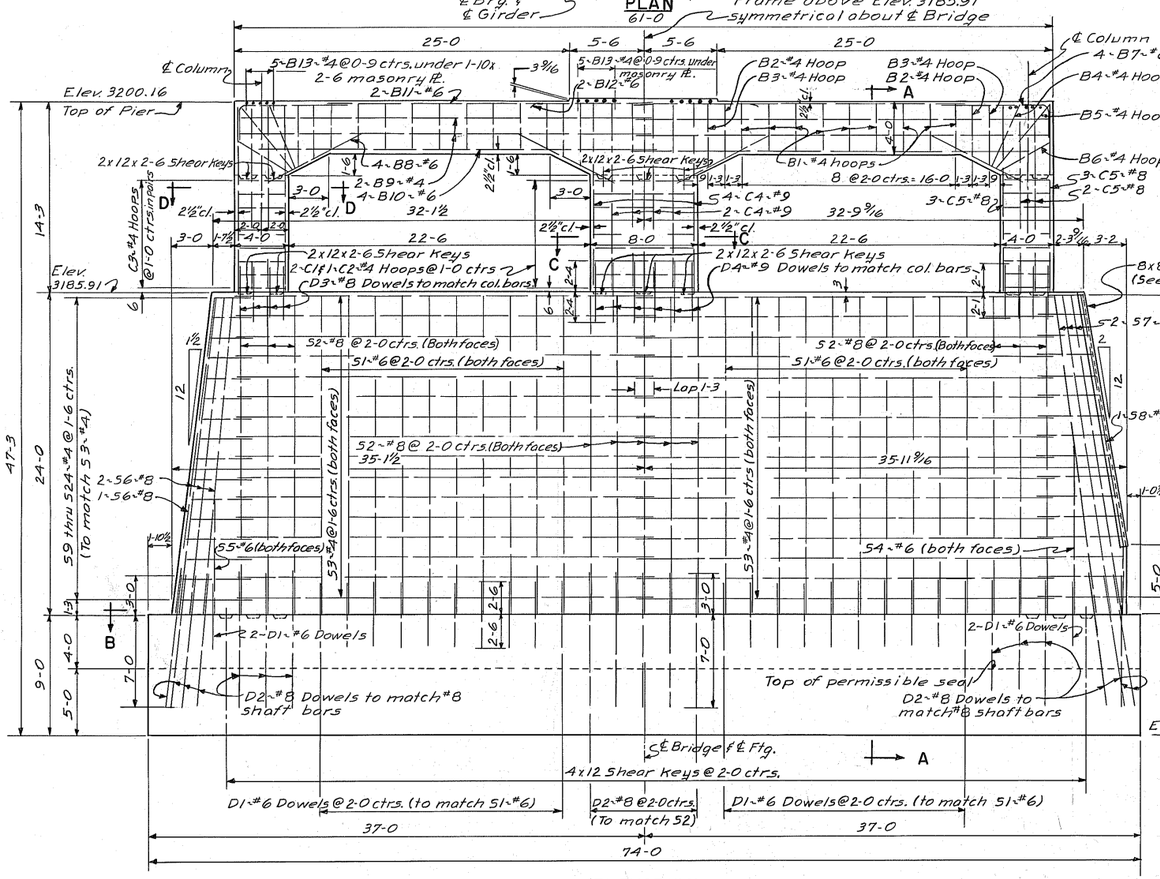


SECTION D-D
Scale 3/8" = 1'-0"



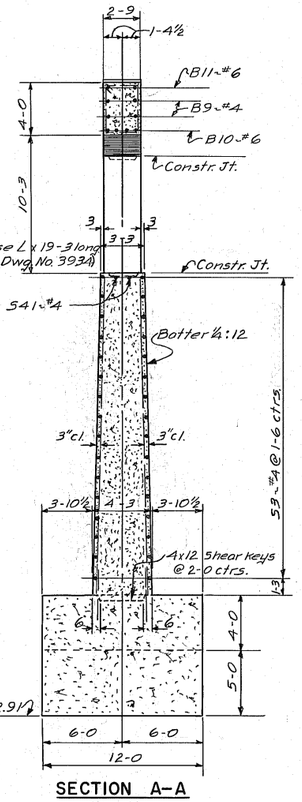
PLAN

Note: Pier Nose Angles shall be paid for as Structural Steel.



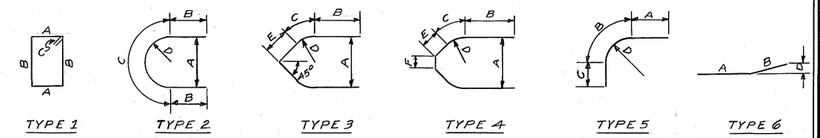
ELEVATION

Note: Max. Footing Pressure under: DL+LL+Wind+LF+Bouy. = 3.67 T/□'



SECTION A-A

BILL OF REINFORCING STEEL



BENT BARS (All dimensions are out to out)

MARK	SIZE	NO.	TYPE	LENGTH	A	B	C	D	E	F	MARK	SIZE	NO.	TYPE	LENGTH	A	B	C	D	E	F
C1	#4	18	1	11'-11"	2'-5"	3'-2"	0'-4½"				522	#4	1	2	12'-4"	3'-8"	3'-3½"	5'-9"	1'-10"		
C2	4	9		14-11		4-8					523			2	12-9	3-9	3-5½	5-10½	1-10½		
C3	4	36		10-7		2-6					524			2	13-1	3-9	3-7½	5-10½	1-10½		
B1	4	18		12-11		3-8					525			3	7-8	2-10	1-3½	1-1½	1-5	1'-5"	
B2		4		13-10		4-1½					526				8-2	2-11	1-6	1-1½	1-5½	1-5½	
B3		4		15-1		4-9					527				8-7	2-11	1-8½	1-1½	1-5½	1-5½	
B4		2		15-11		5-2					528				9-2	3-0	1-11	1-2	1-6	1-6	
B5		2		17-6		5-1½					529				9-9	3-1	2-1½	1-2½	1-6½	1-6½	
B6	4	2	1	14-7	2-5	4-6	0-4½				530				10-4	3-2	2-4	1-3	1-7	1-7	
B7	6	8	5	10-9	7-6	1-7	1-8	1'-0"			531				10-9	3-2	2-6½	1-3	1-7	1-7	
											532				11-4	3-3	2-9	1-3½	1-7½	1-7½	
B8	8	1	6	24-0	19-6	4-6		0-9			533				11-10	3-4	2-11½	1-3½	1-8	1-8	
B9	4	1	2	7-0	2-10	1-3½	4-5½	1-5			534				12-5	3-5	3-2	1-4	1-8½	1-8½	
B10				7-5	2-11	1-5	4-7	1-5½			535				12-9	3-5	3-4	1-4	1-8½	1-8½	
B11				7-9	2-11	1-7	4-7	1-5½			536				13-4	3-6	3-6½	1-4½	1-9	1-9	
B12				8-2	3-0	1-9	4-8½	1-6			537			3	13-11	3-7	3-5	1-5	1-9½	1-9½	
B13				8-8	3-1	1-11	4-10	1-6½			538			4	14-5	3-8	3-11½	1-5½	1-10	1-9	0'-1½"
B14				9-1	3-2	2-1	4-11½	1-7			539			4	14-10	3-9	4-2	1-6	1-10½	1-5½	0-7
B15				9-4	3-2	2-2½	4-11½	1-7			540	#4	1	4	15-1	3-9	4-4½	1-6	1-10½	1-1½	1-1
B16				9-10	3-3	2-4½	5-1½	1-7½													
B17				10-4	3-4	2-6½	5-3	1-8													
B18				10-8	3-5	2-8	5-4½	1-8½													
B19				11-0	3-5	2-10	5-4½	1-8½													
B20				11-6	3-6	3-0	5-6	1-9													
B21	#4	1	2	11-11	3-7	3-2	5-7½	1-9½													

STRAIGHT BARS

MARK	SIZE	NO.	LENGTH	MARK	SIZE	NO.	LENGTH
B8	#6	16	7'-0"	D1	#6	44	5'-0"
B9	4	8	31-1	D2	8	36	10-0
B10	6	8	29-0	D3	8	20	4-2
B11	6	4	24-4	D4	9	16	4-8
B12	6	2	17-4				
B13	4	20	2-5	51	6	40	23-10
				52	8	22	23-10
				53	4	64	31-2
				54	6	2	17-6
C4	9	16	14-1	55	6	2	9-9
C5	#8	20	14-1	56	8	7	23-11
				57	8	6	24-1
				541	#4	4	34-0

NOTES

STRUCTURE EXCAVATION: — Only the excavation below ground line for Pier No. 4 and below Elev. 3167.0 for Piers No. 5 and No. 6 and below ground line for Bent No. 7 need be restricted to the area inside the cofferdams. All boulders taken out of holes in excavating for bents and piers shall be placed back around the bent or pier from which they were taken in such a manner as to provide the best protection against scour. The cost of this backfilling shall be included in the unit price bid for excavation.

FORMS: — All forms for piers above top of footings shall be made of tongue and groove matched lumber, surfaced inside or shall be lined with plywood. (See spec. Prov.)

SHAFTS: — Shafts of piers shall be poured in not more than two continuous runs, other construction joints shall be made only as noted on the plans or as determined by the engineer.

CHAMFER: — Chamfer all exposed corners 1½ inches and fillet entrant angles 1½ inches except as otherwise noted.

CONCRETE: — All concrete in piers shall be Class "A." The Contractor will be permitted to deposit Class "S" concrete in that portion of the pier base shown as a seal course in which case he shall place it in accordance with the requirements for "Depositing Concrete Under Water" as called for in the Standard Specifications. Concrete placed outside of neat lines shown on the plans, or neat lines as modified by the Engineer, as well as the change in mix for the seal, will be for the Contractor's convenience, and he shall include all cost connected therewith in the unit price bid for Class "A" concrete.

CONSTRUCTION JOINTS: — Construction joints shall be made on a true horizontal line at the surfaces of the piers and left rough in the interior with satisfactory shear keys. (See details of shear keys).

NOSE ANGLES: — Pier nose angles shall be paid for as structural steel. One shop coat and two (2) field coats of paint as specified for structural steel shall be applied to exposed surfaces of nose angles before erection.

OTHER NOTES: — For other notes see Dwgs. No. 3928, No. 3929 & No. 3930.

DESIGNED	R.D.K. & C.A.M.	8-24-56
DRAWN	R.D.K.	8-27-56
TRACED	E.R.T.	8-29-56
CHECKED	H.E.S.	9-28-56
REVISED		
REVISED		

STATE OF MONTANA
STATE HIGHWAY COMMISSION

BRIDGE OVER CLARK FORK
& C.M.ST.P. & P. R.R.
AT MISSOULA
FED. AID PROJ. NO. UG-405(2) & NO. U-405(2)
MISSOULA COUNTY

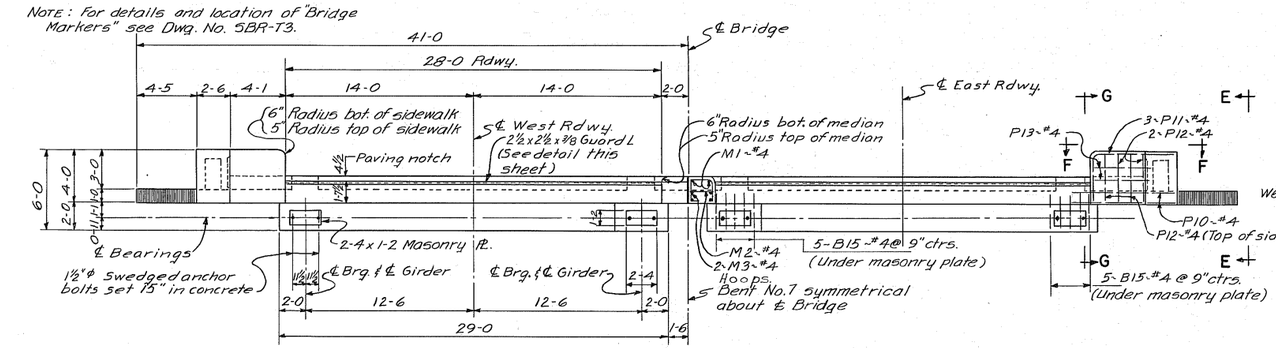
PIER NO. 6
Scale 3/16" = 1'-0"
Except As Noted

STATE PRECONST. NUMBER 5405-01

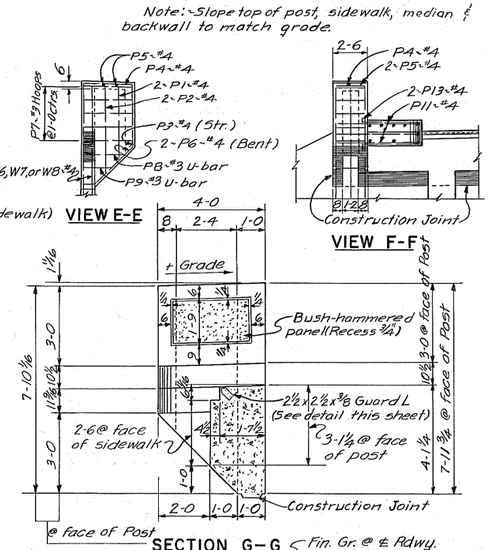
DRAWING NO. 3935

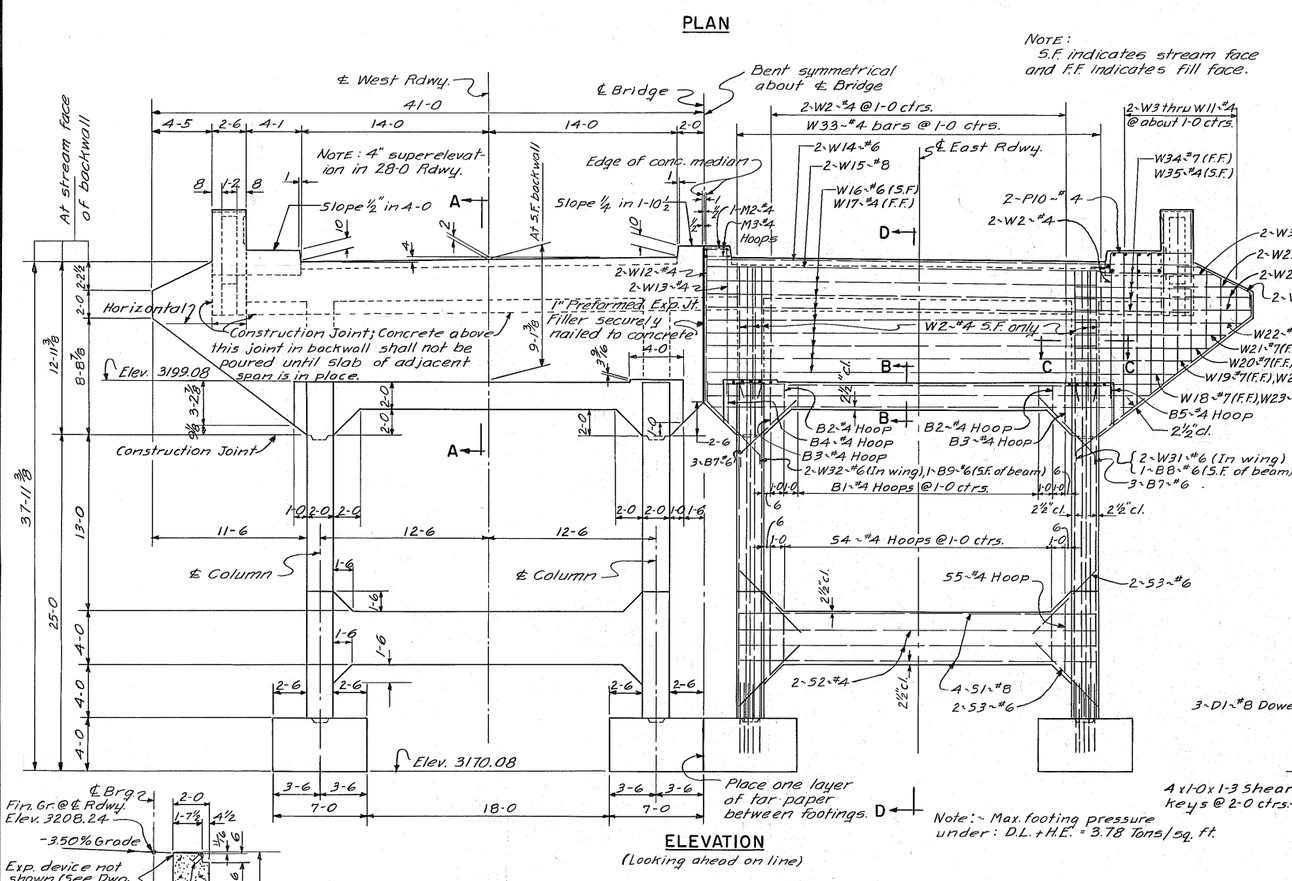
J.R.B.

FED. ROAD DIV. NO.	STATE	FED. AID PROJ. NO.		SHEET NO.	TOTAL SHEETS
8	MONT.	UG-405(2) & U-405(2)		9	23



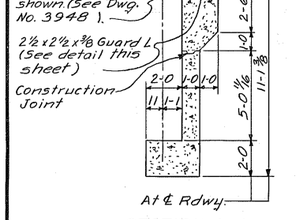
PLAN



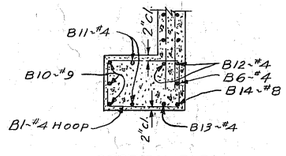


ELEVATION
(Looking ahead on line)

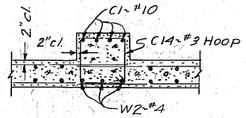
NOTE: S.F. indicates stream face and F.F. indicates fill face.



SECTION A-A
Scale ¼"=1'-0"



SECTION B-B
Scale ⅜"=1'-0"



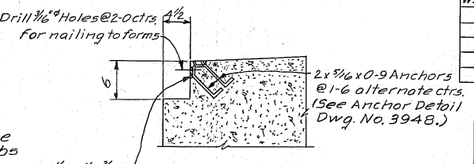
SECTION C-C
Scale ⅜"=1'-0"

NOTE: The contractor will be permitted to deposit, for his convenience all of the footings for Bent No. 7 under water as a seal course if he desires, in which case he shall comply with the requirements and conditions set forth on Dwg. No. 3935.

NOTES

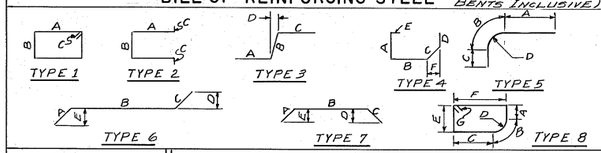
CONCRETE: — All concrete of Bent No. 7 shall be Class "A" concrete. Chamfer posts and curbs ¾ inch and do not fillet entrant angles.

OTHER NOTES: — For other notes see Dwgs. No. 3928, No. 3929, No. 3930 & No. 3935.



GUARD ANGLE DETAIL
Scale -1"=1'-0"

BILL OF REINFORCING STEEL (EAST & WEST RDWY. BENTS INCLUSIVE)



STRAIGHT BARS				BENT BARS (All dimensions are out to out)											
MARK	SIZE	NO.	LENGTH	MARK	SIZE	NO.	TYPE	LENGTH	A	B	C	D	E	F	G
B10	#9	6	28'-8"	B1	#4	38	1	9'-5"	2'-8"	1'-8"	0'-4½				
B11	4	4	28-8	B2	↑	4	↑	10-4	↓	2-1½	↑				
B12	4	4	33-11	B3		4		12-4		3-1½					
B13	4	2	31-6	B4		2		11-7		2-9					
B14	8	2	31-6	B5	4	2	1	11-11	2-8	2-11	0-4½				
B15	4	20	2-8												
B6	4	2	32-11	B7	6	12	7	7-10	1-0	6-10			0'-8½		
C1	10	16	33-4	B8	6	2	6	6-0	1-0	3-4	1-8	1'-4	0-9½		
C2	8	24	24-10	B9	6	2	6	6-4	1-0	3-8	1-8	1-2	0-8½		
C3	↑	8	21-4												
C4			17-4	C12	8	12	6	27-9	11-11	15-10	0-0	0-0	4-7½		
C5			13-4	C14	3	20	1	7-4	1-8	1-8	0-4				
C6			9-5	C15	↑	4	↑	11-4	3-8	↑	↑				
C7			8-1	C16				11-10	3-11						
C8			6-9	C17				12-4	4-2						
C9			7-5	C18				12-10	4-5						
C10	↓	↓	6-1	C19				13-4	4-8						
C11	8	8	4-9	C20				13-10	4-11						
				C21				14-4	5-2						
				C22				14-10	5-5						
D1	8	84	4-0	C23				15-4	5-8						
D2	10	16	5-4	C24				15-10	5-11						
				C25				16-4	6-2						
M1	4	4	1-11	C26				16-10	6-5						
M2	↑	2	1-7	C27				17-4	6-8						
P1		4	5-7	C28				17-10	6-11						
P2		4	6-7	C29				18-4	7-2						
P3		2	4-7	C30				18-10	7-5						
P4		2	3-8	C31				20-2	8-1						
P5	↓	4	2-2	C32				21-8	8-10						
P12	4	12	3-8	C33				23-2	9-7						
				C34				24-8	10-4						
S1	8	16	26-8	C35				26-2	11-1						
S2	4	8	25-6	C36				27-8	11-10						
S3	6	16	6-3	C37				29-2	12-7						
				C38	↓	↓	↓	30-8	13-4	↓	↓				
W2	4	108	10-4	C39	3	4	1	32-2	14-1	1-8	0-4				
W3	↑	4	12-0												
W4		↑	11-3	M3	4	4	8	7-0	1-4	0-5	1-4	0-3	1-7	1'-7"	0'-4½
W5			10-6												
W6			12-9	P6	4	4	7	9-5	0-9	4-1	4-7	3-2½	0-6½		
W7			11-11	P7	3	10	1	12-4	3-8	2-2	0-4				
W8			11-2	P8	3	2	2	8-2	3-0	2-2	0-0				
W9			5-11	P9	3	2	2	6-2	2-0	2-2	0-0				
W10			4-6	P10	4	4	3	8-5	1-6	0-10	6-1	0-1			
W11			3-2	P11	4	6	5	9-9	5-11	0-5	3-5	0-3			
W12	↑		11-5	P13	4	4	2	10-9	4-3	1-6	0-4½				
W13	4		12-11												
W14	6	↓	36-3	S4	4	42	1	10-5	3-8	1-2	0-4½				
W15	8	4	36-3	S5	4	4	1	14-5	5-8	1-2	0-4½				
W16	6	16	29-3												
W17	4	16	29-3												
W18	7	4	7-11	W31	6	4	6	19-0	1-0	16-4	1-8	1-4	0-9½		
W19	↑	↑	9-3	W32	6	4	6	8-5	1-0	5-9	1-8	1-2	0-8½		
W20			10-7	W33	4	56	4	6-3	1-8	2-3	1-4½	0-7	0-4½	0-11½	
W21	↓		11-11	W36	#6	4	7	8-1	1-8	4-9	1-8	0-9	1-6		
W22	7		13-2												
W23	4		7-3												
W24	↑		8-7												
W25			9-11												
W26		↓	11-3												
W27		4	12-6												
W28		8	5-6												
W29	↑	4	4-7												
W30	4	4	2-4												
W34	7	6	9-0												
W35	#4	6	8-5												

STATE OF MONTANA
STATE HIGHWAY COMMISSION

BRIDGE OVER CLARK FORK
& C.M.ST.P. & P. R.R.
AT MISSOULA
FED. AID PROJ. NO. UG-405(2) & NO. U-405(2)
MISSOULA COUNTY
BENT NO. 7
Scale 3/16"=1'-0" & As Noted

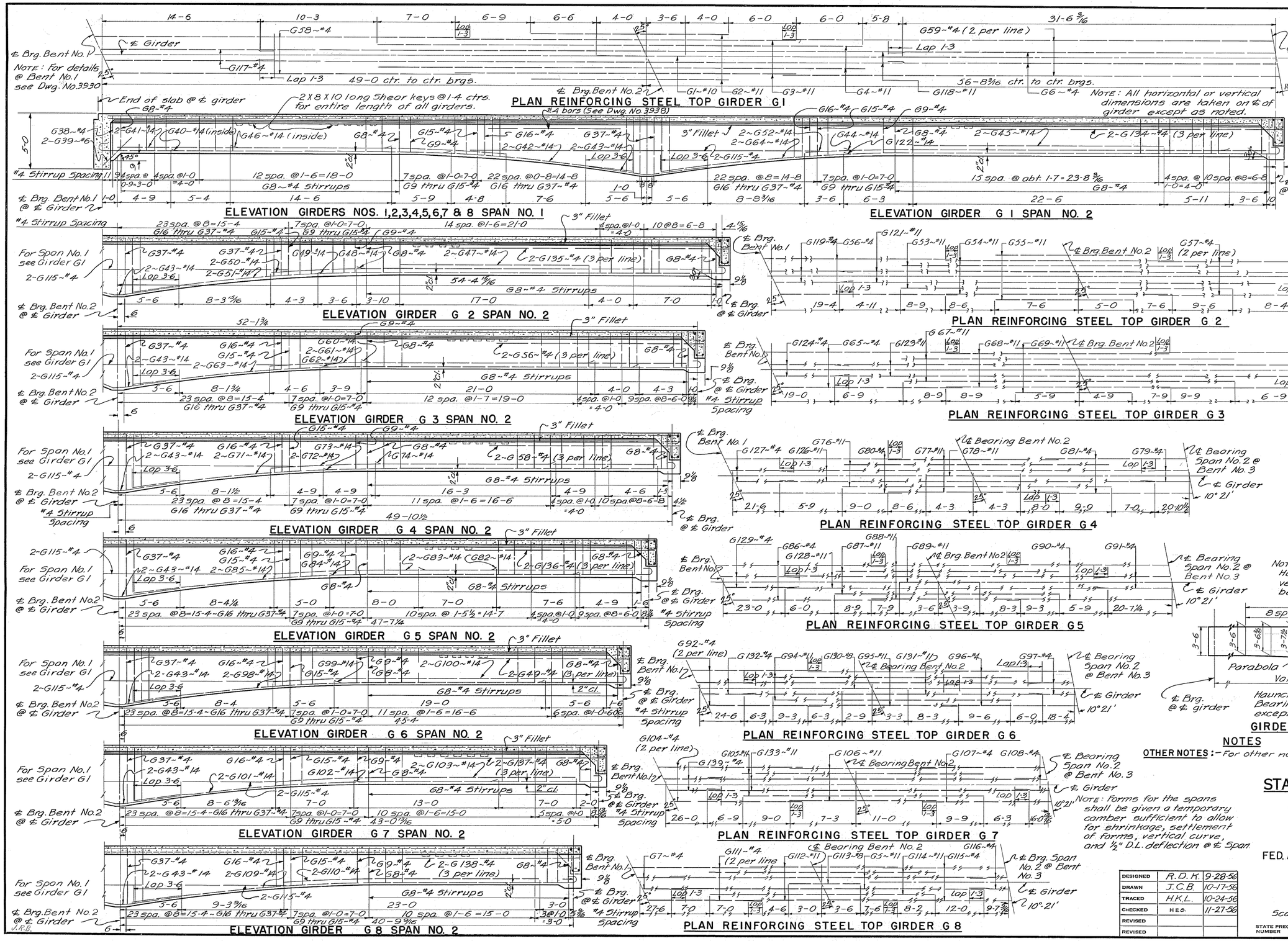
DESIGNED	R.D.K.	8-15-56
DRAWN	R.D.K.	8-20-56
TRACED	E.R.T.	8-23-56
CHECKED	H.E.S.	10-10-56
REVISED		
REVISED		

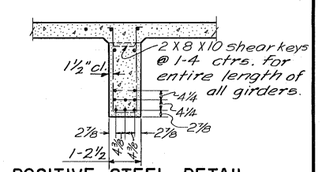
STATE PRECONST. NUMBER 5405-01

DRAWING NO. 3936

J.R.B.

FED. ROAD DIV. NO.	STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
8	MONT.	UG-405(2) & U-405(2)	10	23

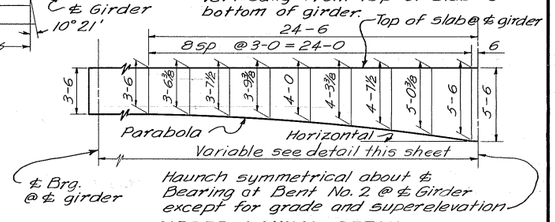




POSITIVE STEEL DETAIL

Scale- 3/8" = 1'-0"

NOTE: Girder depths given on "Girder Haunch Detail" are measured vertically from top of slab to bottom of girder.



Haunch symmetrical about ℄ Bearing at Bent No. 2 @ ℄ Girder except for grade and superelevation

GIRDER HAUNCH DETAIL

NOTES

Scale- 3/16" = 1'-0"

OTHER NOTES: - For other notes see Dwgs. No. 3928, No. 3929, & No. 3930.

NOTE: Forms for the spans shall be given a temporary camber sufficient to allow for shrinkage, settlement of forms, vertical curve, and ½" D.L. deflection @ ℄ Span.

STATE OF MONTANA
STATE HIGHWAY COMMISSION

BRIDGE OVER CLARK FORK & C. M. ST. P. & P. R. R. AT MISSOULA

FED. AID PROJ. NO. UG-405(2) & NO. U-405(2)

MISSOULA COUNTY

GIRDER DETAILS

SPANS NO. 1 & NO. 2

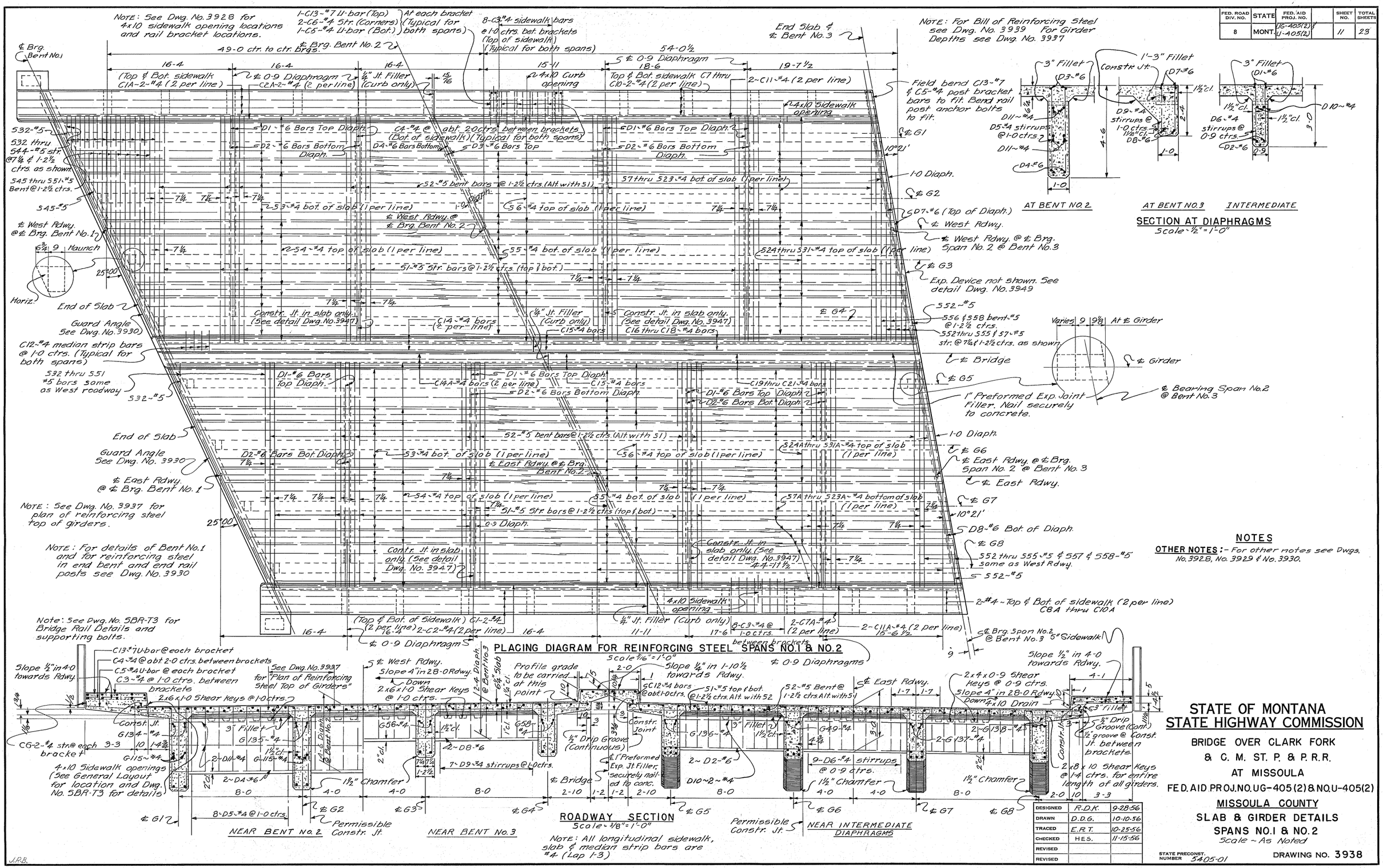
Scale- 1/4" = 1'-0" Except As Noted

DESIGNED	R. D. K.	9-28-56
DRAWN	J. C. B.	10-17-56
TRACED	H. K. L.	10-24-56
CHECKED	H. E. S.	11-27-56
REVISED		
REVISED		

STATE PRECONST. NUMBER 5405-01

DRAWING NO. 3937

FED. ROAD DIV. NO.	STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
8	MONT.	UG-405(2) & U-405(2)	11	23



AT BENT NO. 2 — AT BENT NO. 3 — INTERMEDIATE

SECTION AT DIAPHRAGMS

Scale ½" = 1'-0"

PLACING DIAGRAM FOR REINFORCING STEEL SPANS NO. 1 & NO. 2

ROADWAY SECTION

Scale ⅜" = 1'-0"

NOTES

OTHER NOTES: - For other notes see Dwgs. No. 3928, No. 3929 & No. 3930.

STATE OF MONTANA
STATE HIGHWAY COMMISSION

BRIDGE OVER CLARK FORK
& C. M. ST. P. & P. R.R.
AT MISSOULA
FED. AID PROJ. NO. UG-405(2) & NO. U-405(2)
MISSOULA COUNTY

SLAB & GIRDER DETAILS
SPANS NO. 1 & NO. 2

Scale - As Noted

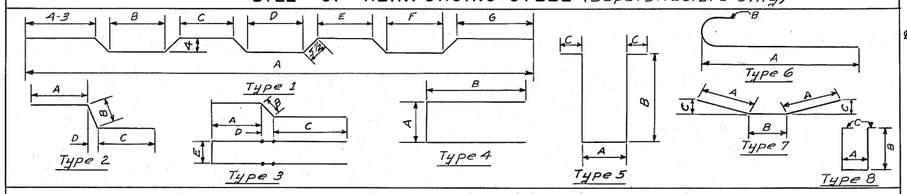
DESIGNED	R.D.K.	9-28-56
DRAWN	D.D.G.	10-10-56
TRACED	E.R.T.	10-25-56
CHECKED	H.E.S.	11-15-56
REVISED		
REVISED		

STATE PRECONST. NUMBER 5405-01

DRAWING NO. 3938

FED. ROAD DIV. NO.	STATE	FED. AID PROJ. NO.		SHEET NO.	TOTAL SHEETS
8	MONT.	UG-405(2) & U-405(2)		12	23

BILL OF REINFORCING STEEL (Superstructure Only)



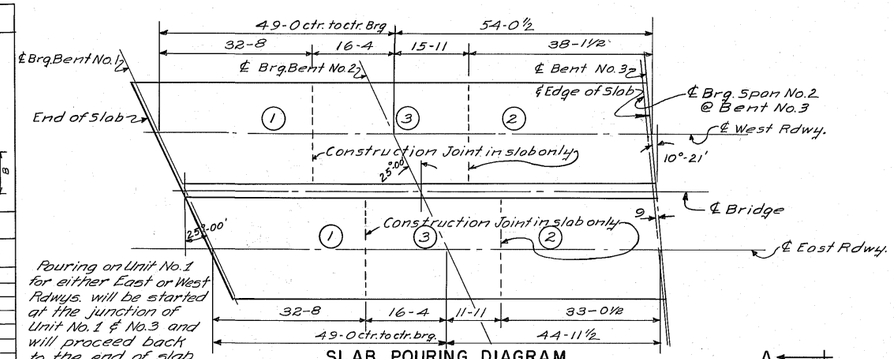
BENT BARS (All dimensions are out to out)

Type	Mark	Size	No.	Length	A	B	C	D	E	F	G
1	52	#5	151	30'-1"	29'-4	4'-3"	3'-2"	4'-3"	3-2	4'-3"	4'-3"
1	545	5	2	11-7	11-4	4-3	2-4				
1	546			14-6	14-3	4-3	5-1				
1	547			17-2	16-10	4-3	3-2	4-2			
1	548			19-11	19-5	4-3	3-2	4-3	2-3		
1	549			22-6	22-0	4-3	3-2	4-3	4-9		
1	550			25-1	24-6	4-3	3-2	4-3	3-2	4-3	
1	551	5	2	26-11	26-2	4-3	3-2	4-3	3-2	4-3	1-1
1	556	5	2	20-1	19-7	4-3	3-2	4-3	2-4		
1	558	5	2	27-1	26-4	4-3	3-2	4-3	3-2	4-3	1-3
2	C3	4	192	6-3	3-9	1-3	1-3	0-1½			
4	C5	4	24	9-8	0-8	4-6					
2	C12	4	198	4-1	1-7	1-3	1-3	0-1½			
3	C13	7	24	14-7	3-9	1-3	1-11	0-1½	0-9		
5	D5	4	48	9-8	0-9	4-2½	0-3				
5	D6	4	216	6-5	0-6	2-8½	0-3				
8	D9	4	42	5-4	0-9	2-0½	0-3				
5	G8	4	350	8-0	0-11½	3-3½					
	G9		16	8-0		3-3½					
	G10			8-1		3-4					
	G11			8-1		3-4					
	G12			8-3		3-5					
	G13			8-4		3-5½					
	G14			8-5		3-6					
	G15			8-6		3-6½					
	G16			8-7		3-7					
	G17			8-9		3-8					
5	G18	#4	16	8-10	0-11½	3-8½	0-3				

Type	Mark	Size	No.	Length	A	B	C	D	E	F	G
5	G19	#4	16	8'-11"	0-11½	3'-9"	0'-3"				
	G20			9-0		3-9½					
	G21			9-2		3-10½					
	G22			9-3		3-11					
	G23			9-5		4-0					
	G24			9-6		4-0½					
	G25			9-8		4-1½					
	G26			9-10		4-2½					
	G27			10-0		4-3½					
	G28			10-2		4-4½					
	G29			10-4		4-5½					
	G30			10-6		4-6½					
	G31			10-8		4-7½					
	G32			10-10		4-8½					
	G33			11-1		4-10					
	G34			11-3		4-11					
	G35			11-6		5-0½					
	G36			11-8		5-1½					
	G37	4	16	11-11		5-3					
5	G38	4	16	9-2	0-11½	3-10½	0-3				
6	G42	14	16	49-8	47-10	1-10					
7	G43	14	16	11-0	5-0	1-0	0-9				
6	G51	14	2	55-0	53-2	1-10					
6	G63	14	2	52-9	50-11	1-10					
6	G64	14	2	57-4	55-6	1-10					
6	G71	14	2	50-5	48-7	1-10					
6	G85	14	2	48-2	46-4	1-10					
6	G98	14	2	45-11	44-1	1-10					
6	G101	14	2	43-8	41-10	1-10					
6	G109	14	2	41-5	39-7	1-10					
6	G122	14	1	41-7	39-9	1-10					
6	G49	#14	1	38-11	37-1	1-10					

STRAIGHT BARS

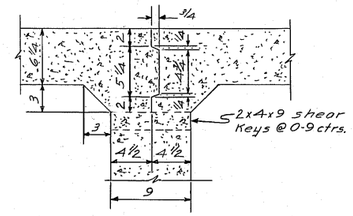
Mark	Size	No.	Length	Mark	Size	No.	Length	Mark	Size	No.	Length	Mark	Size	No.	Length
51	#5	286	29'-4"	524A	#4	1	30'-10"	C9A	#4	4	21'-2"	G76	#11	2	43'-9"
53	4	34	30-0	525A			29-2	C10A	4	4	21-1	G77	11	2	25-0
54		16	40-0	526A			28-10	C11A	4	4	21-0	G78	11	1	8-6
55		34	40-0	527A			26-10	C15	4	6	30-0	G79	11	2	22-10
56		16	30-0	528A			26-5	D1	6	16	29-5	G80	4	2	38-0
57		1	39-7	529A			24-5	D2		16	24-11	G81	4	2	40-0
58			38-5	530A			24-2	D3		2	32-6	G82	14	1	7-0
59			38-2	531A	4	1	22-6	D4		2	27-6	G83	14	2	32-3
510			37-10	D11	4	8	27-6	D7		2	29-11	G84	14	1	22-6
511			37-7	532	5	4	3-8	D8	6	2	25-4	G86	4	2	40-0
512			37-3	533			5-0	G132	4	2	26-3	G87	11	2	41-3
513			36-2	534			6-3	G133	11	2	50-0	G88	11	2	23-3
514			35-10	535			7-7	G138	4	6	31-1	G89	11	1	7-9
515			35-7	536			8-11	G1	10	1	7-6	G90	4	2	38-1
516			35-4	537			10-2	G2	11	2	18-0	G91	4	2	22-7
517			35-0	538			12-9	G3	11	2	30-9	G92	4	4	21-9
518			33-9	539			15-4	G4	11	2	43-9	G94	11	2	39-3
519			33-6	540			17-11	G5	11	2	52-8	G95	11	2	20-6
520			33-3	541			20-6	G6	4	2	33-6	G96	4	2	36-5
521			33-0	542			23-1	G7	4	2	29-3	G97	4	2	20-4
522			32-9	543			25-8	G39	6	16	3-6	G99	14	1	19-0
523			31-8	544			28-3	G40	14	8	25-7	G100	14	2	30-0
524			31-1	552			5-9	G41	14	16	35-0	G102	14	1	13-0
525			33-3	553			9-9	G44	14	2	34-8	G103	14	2	27-0
526			33-8	554			13-1	G45	14	2	22-6	G104	4	4	22-0
527			35-6	555			16-4	G46	14	8	14-6	G105	11	2	37-0
528			36-0	557	5	4	23-0	G47	14	2	17-0	G106	11	2	18-3
529			37-10	C1A	4	16	27-6	G48	14	1	24-10	G107	4	2	34-7
530			38-3	C1	4	16	25-8	G49	4	6	32-7	G108	4	2	18-1
531	4	1	40-0	C2		4	24-9	G50	14	2	39-7	G110	14	2	23-0
D10	4	16	24-11	C4		96	3-9	G52	14	2	41-8	G111	4	4	22-6
57A	4	1	22-7	C6		48	1-2	G53	11	2	46-9	G112	11	2	18-6
58A			23-9	C7		4	2-2	G54	11	2	28-6	G113	8	1	6-6
59A			24-1	C8		4	2-3	G55	11	2	12-6	G114	11	2	33-8
510A			24-4	C9		4	2-4	G56	4	8	35-3	G115	4	18	32-5
511A			24-6	C10		4	2-5	G57	4	4	23-4	G116	4	2	11-7
512A			24-9	C11		4	2-6	G58	4	8	34-0	G139	4	2	27-9
513A			25-11	C14		6	2-2	G59	4	4	23-6	G117	4	2	16-1
514A			26-2	C14A		6	2-9	G60	14	1	21-0	G118	11	2	59-8
515A			26-6	C16		1	21-2	G61	14	2	37-6	G119	4	2	21-1
516A			26-10	C17		1	21-4	G62	14	1	28-9	G120	4	2	26-0
517A			27-1	C18		1	21-6	G65	4	2	36-0	G121	11	2	60-0
518A			28-3	C19		1	19-8	G67	11	2	45-6	G123	11	2	59-0
519A			28-6	C20		1	19-10	G68	11	2	27-0	G124	4	2	20-9
520A			28-9	C21	4	1	20-0	G69	11	2	10-6	G125	4	2	25-2
521A			29-1	C2A	4	4	27-4	G70	4	4	22-9	G126	11	2	56-6
522A			29-4	C7A	4	4	21-3	G72	14	2	35-0	G127	4	2	23-3
523A	4	1	30-6	C8A	4	4	21-2	G73	14	1	25-9	G128	11	2	53-0
G135	4	6	35-7	G134	4	6	36-4	G74	14	1	16-3	G129	4	2	24-9
G136	#4	6	33-3	G137	#4	6	31-10	G131	#11	2	51-6	G130	#8	1	6-0



Pouring on Unit No. 1 for either East or West Rdwys. will be started at the junction of Unit No. 1 & No. 3 and will proceed back to the end of slab at Bent No. 1.

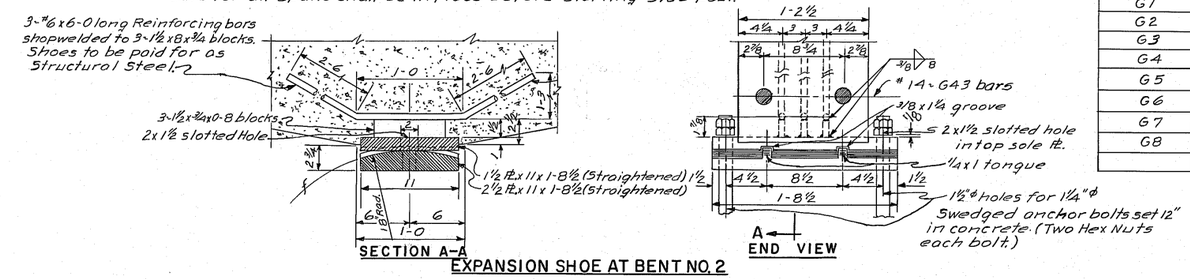
SLAB POURING DIAGRAM
No Scale

NOTE: Units of the same number need not be poured simultaneously. A combination of units numbered successively may be poured continuously but all units of one number must be poured before pouring is started on any unit of the succeeding number. All slab forms and reinforcing bars for all spans shall be in place before starting slab pour.

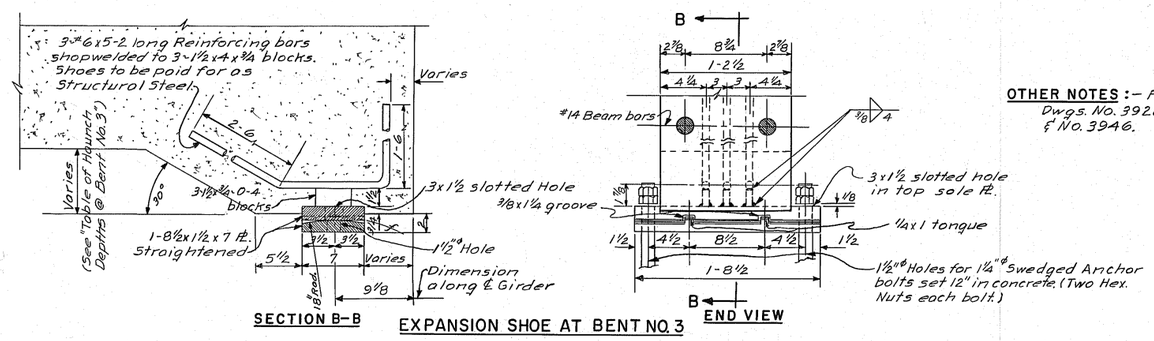


SHEAR KEYS AT CONSTRUCTION JOINTS IN SLAB

TABLE OF HAUNCH DEPTHS @ BENT No. 3	
LOCATION	DIMENSION
G1	6 13/16
G2	6 13/16
G3	6 3/4
G4	6 11/16
G5	6 3/4
G6	6 13/16
G7	6 13/16
G8	6 7/8



EXPANSION SHOE AT BENT NO. 2



EXPANSION SHOE AT BENT NO. 3

NOTES

OTHER NOTES: – For other notes see Dwgs. No. 3928, No. 3929, No. 3944 & No. 3946.

DESIGN INFORMATION

D.L. = Dead Load
L.L. = Live Load
S.L. = Sidewalk Live Load
Moments are in Ft. Kips
Reactions & Shears are in Kips

SPAN NO. 1: 49-0
SPAN NO. 2: Varies

		SPAN NO. 1				SPAN NO. 2				AT R_1				AT R_2				AT R_3			
		G1	G2	G7	G8	G1	G2	G7	G8	G1	G2	G7	G8	G1	G2	G7	G8	G1	G2	G7	G8
Moments	D.L.	169	150	193	248	323	233	110	110					-72.9	56.7	45.3	53.1				
	L.L.	379	485	458	354	442	522	396	290					-40.6	49.4	44.2	32.1				
	S.L.	52			49	66			36					-10.9			-7.9				
Reactions	D.L.									23.5	17.2	22.0	28.0	15.4	9.6.1	82.6	99.1	31.6	21.5	16.9	19.2
	L.L.									44.5	57.0	56.4	43.9	55.2	72.7	67.6	56.6	46.0	58.0	54.9	42.0
	S.L.									5.0			4.8	16.8			14.3	5.6			3.7
Shears	D.L.									23.5	17.2	22.0	28.0	59.5	49.1	42.2	51.4	31.6	21.5	16.9	19.2
	L.L.									44.5	57.0	56.4	43.9	52.4	66.5	65.3	51.4	46.0	58.0	54.9	42.0
	S.L.									5.0			4.8	8.7			7.5	5.6			3.7

DESIGNED	R.D.K.	10-3-56
DRAWN	D.D.G.	10-16-56
TRACED	E.R.T.	11-2-56
CHECKED	H.E.S.	11-28-56
REVISED		
REVISED		

STATE PRECONST. NUMBER 5405-01

STATE OF MONTANA
STATE HIGHWAY COMMISSION

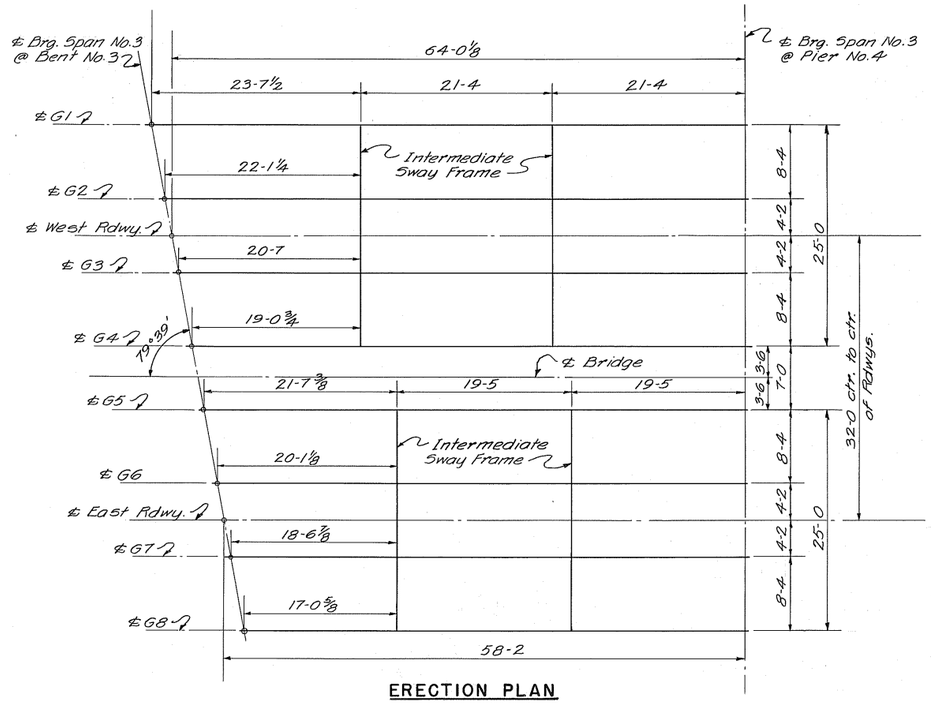
BRIDGE OVER CLARK FORK
& C.M.ST.P. & P. R.R.
AT MISSOULA

FED. AID PROJ. NO. UG-405(2) & NO. U-405(2)
MISSOULA COUNTY

REINFORCING STEEL & SHOE DETAILS
SPANS NO. 1 & NO. 2
Scale ~ 1½" = 1'-0"
Except As Noted

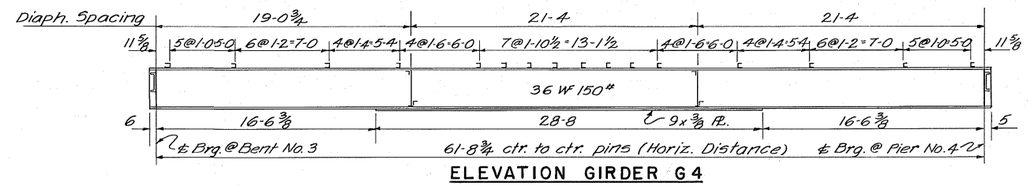
DRAWING NO. 3939

FED. ROAD DIV. NO.	STATE	FED. AID PROJ. NO.		SHEET NO.	TOTAL SHEETS
8	MONT.	UG-405(2) & U-405(2)		13	23

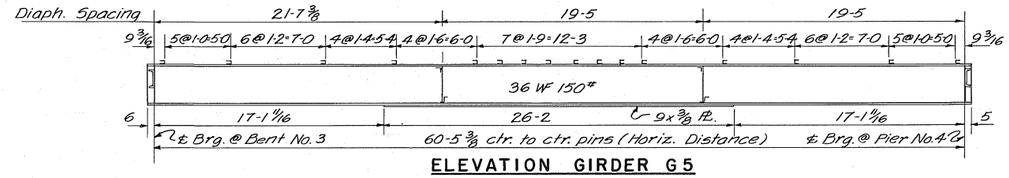


ERECTION PLAN

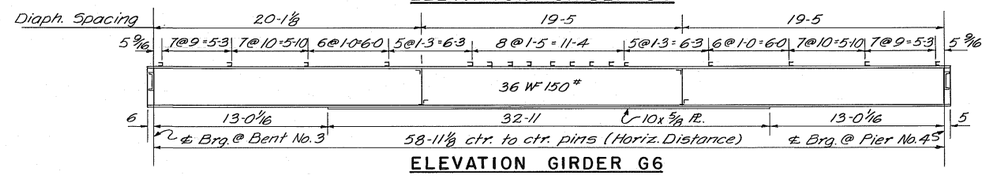
Scale ~ ⅛" = 1'-0"



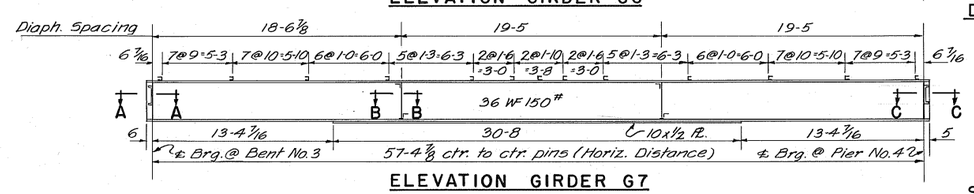
ELEVATION GIRDER G4



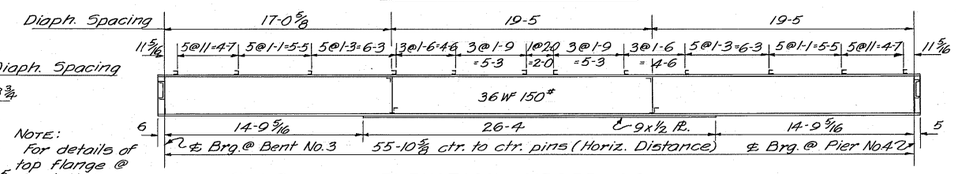
ELEVATION GIRDER G5



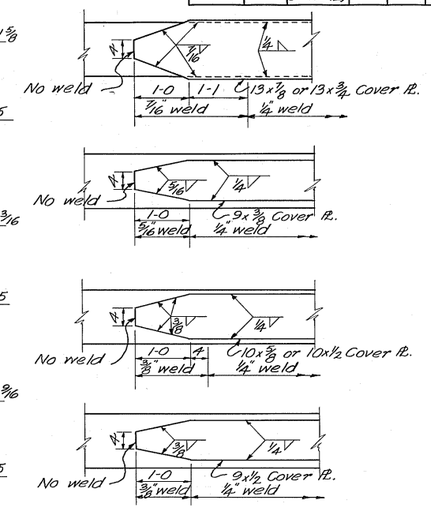
ELEVATION GIRDER G6



ELEVATION GIRDER G7



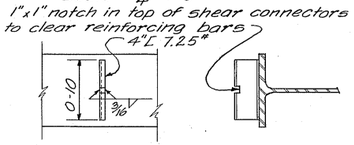
ELEVATION GIRDER G8



DETAIL OF COVER PLATE WELDING

Scale ~ ¾" = 1'-0"

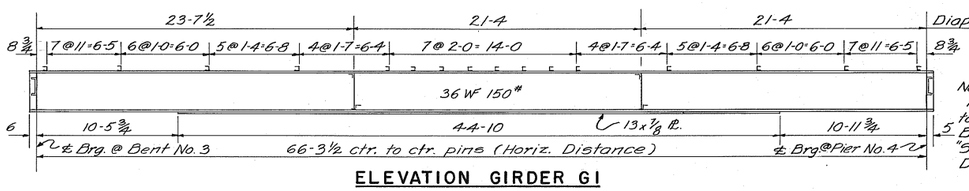
1"x1" notch in top of shear connectors to clear reinforcing bars



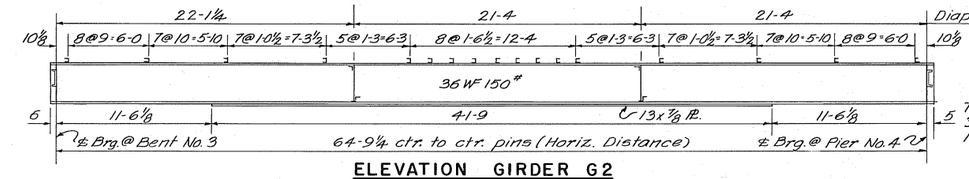
SHEAR DEVICE WELDING DETAILS

Scale ~ 1" = 1'-0"

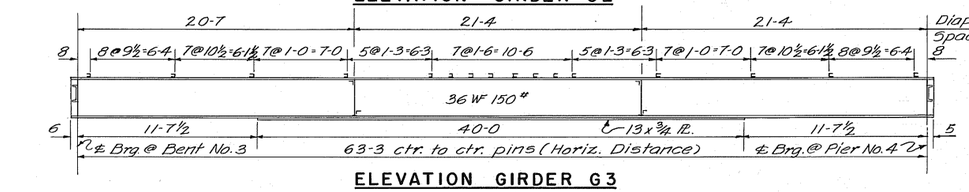
NOTE: The Contractor will be permitted to use ⅞"ø x 4" long Nelson Granular Flux-filled stud-welded shear connectors in place of the 4" L 7.25# shear devices as shown on this sheet. If the stud-welded shear connectors are used in place of the 4" L 7.25# shear devices, each 4" L will be replaced by one row of 5 studs spaced at 2¼" ctr. to ctr. Studs shall be automatically welded over entire end area plus fillet to the steel beams. All studs and stud welds shall be made in accordance with recommendations of the Nelson Stud Welding Division of Gregory Industries Inc., Lorain, Ohio.



ELEVATION GIRDER G1

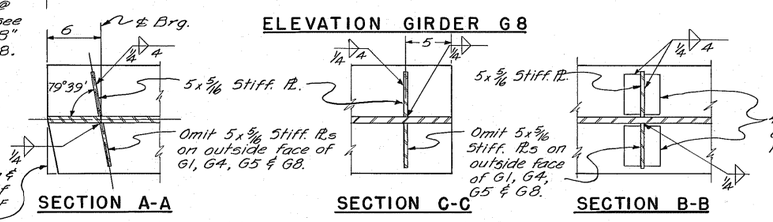


ELEVATION GIRDER G2



ELEVATION GIRDER G3

NOTE: For details of top flange @ Bent No. 3 see "Section B-B" Dwg. No. 3948.



SECTION A-A

SECTION C-C

SECTION B-B

TYPICAL STIFFENER DETAILS

Scale ~ 1½" = 1'-0"

DESIGN INFORMATION

D.L. = DEAD LOAD
L.L. = LIVE LOAD + IMPACT
S.L. = SIDEWALK LIVE LOAD
SHEARS & REACTIONS IN KIPS
MOMENTS IN FT. KIPS
DEFLECTIONS IN INCHES

Span No. 3 — L Varies

		G1	G2	G3	G4	G5	G6	G7	G8
MOMENTS	D.L.	608	446	426	437	419	369	351	432
	L.L.	666	932	907	611	596	829	802	537
	S.L.	132	—	—	—	—	—	—	94
REACTION & SHEAR	D.L.	36.6	27.6	26.9	28.3	27.7	25.1	24.4	30.9
	L.L.	46.6	66.9	66.6	46.1	45.9	65.8	65.5	45.2
	S.L.	8.0	—	—	—	—	—	—	6.7
DEFLECTION	D.L.	1.50	1.06	0.99	1.08	1.00	0.79	0.73	0.87
	L.L.	0.64	0.87	0.83	0.62	0.59	0.72	0.69	0.45

NOTES

OTHER NOTES: - For other notes see Dwgs. No. 3928, No. 3929 & No. 3944.

STATE OF MONTANA
STATE HIGHWAY COMMISSION

BRIDGE OVER CLARK FORK & C.M.ST.P. & P. R.R.
AT MISSOULA

FED. AID PROJ. NO. UG-405(2) & NO. U-405(2)

MISSOULA COUNTY

GIRDERS FOR SPAN NO. 3

Scale ~ 3/16" = 1'-0" Except As Noted

DESIGNED	R.D.K.	10-24-56
DRAWN	D.D.G.	10-26-56
TRACED	F.L.S.	10-31-56
CHECKED	H.E.S.	11-2-56
REVISED		
REVISED		

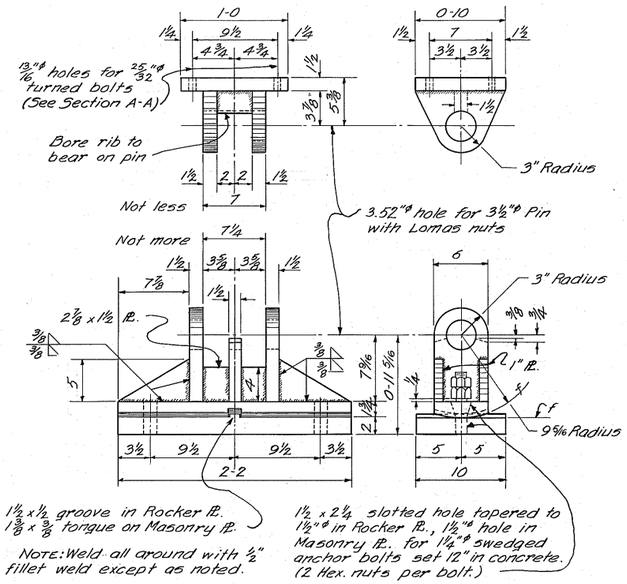
STATE PRECONST. NUMBER 5405-01

DRAWING NO. 3940

J.R.B.

FED. ROAD DIV. NO.	STATE	FED. AID PROJ. NO.		SHEET NO.	TOTAL SHEETS
8	MONT.	UG-405(2) & U-405(2)		14	23

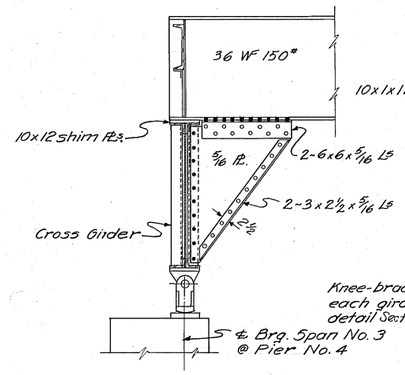
NOTE: See Special Provisions for Structural Steel requirements.



NOTE: Weld all around with ½" fillet weld except as noted.

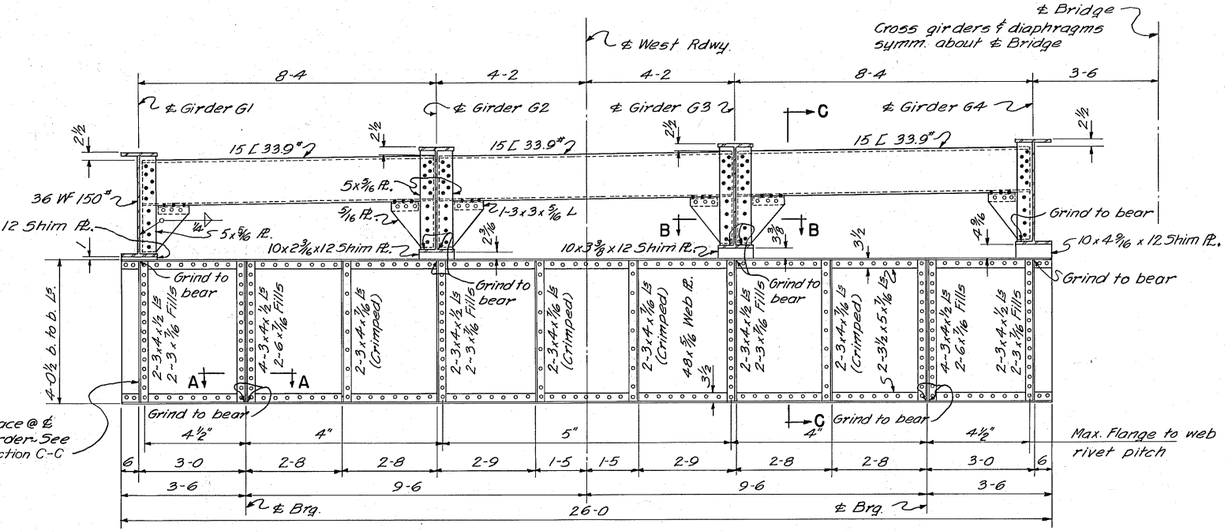
ROCKER SHOE AT PIER NO. 4

Scale ~ 1½" = 1'-0"



SECTION C-C

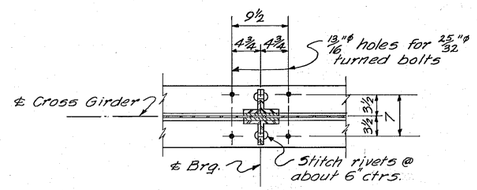
Scale ~ ½" = 1'-0"



DIAPHRAGM AND CROSS GIRDER AT PIER NO. 4

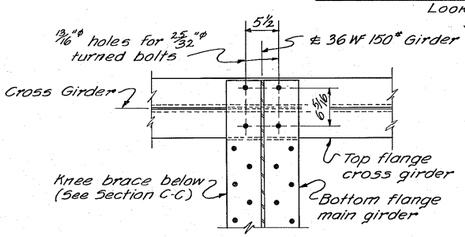
LOOKING AHEAD ON LINE

Scale ~ ½" = 1'-0"



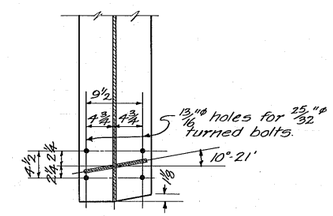
SECTION A-A

Scale ~ 1" = 1'-0"



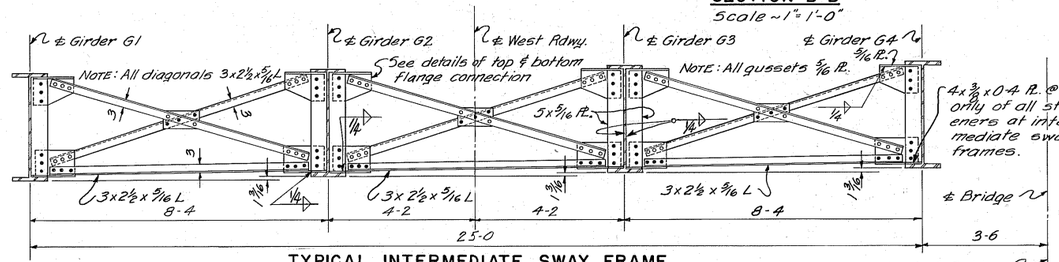
SECTION B-B

Scale ~ 1" = 1'-0"



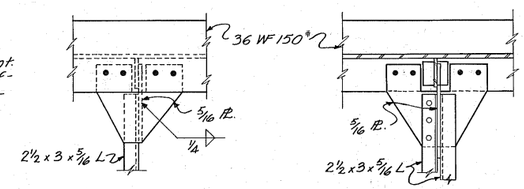
SECTION D-D

Scale ~ 1" = 1'-0"



TYPICAL INTERMEDIATE SWAY FRAME

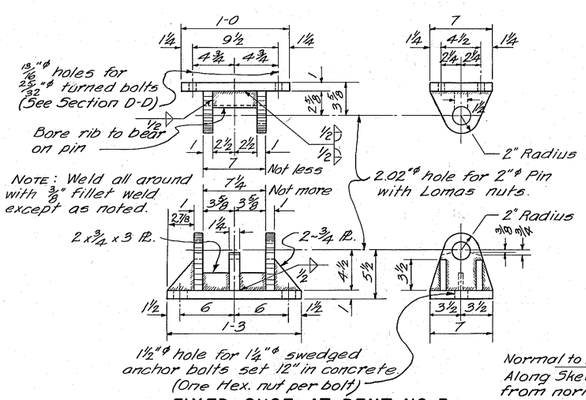
Scale ~ ½" = 1'-0"



TOP FLANGE CONNECTION — BOTTOM FLANGE CONNECTION

FOR INTERMEDIATE SWAY FRAME

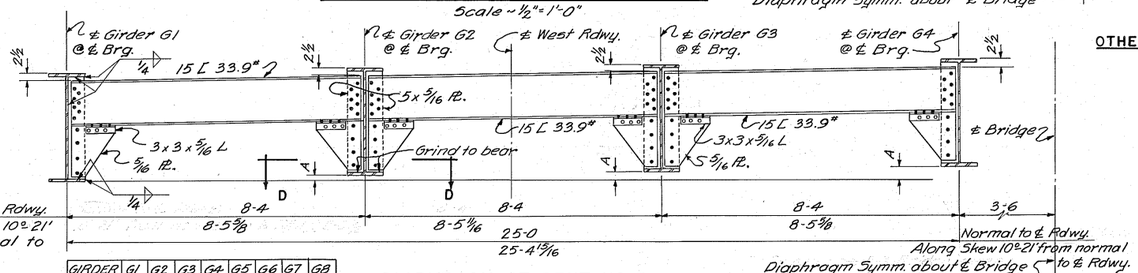
Scale ~ 1" = 1'-0"



NOTE: Weld all around with ⅜" fillet weld except as noted.

FIXED SHOE AT BENT NO. 3

Scale ~ 1½" = 1'-0"



Normal to ℄ Rdwy. Along Skew 10°-21' from normal to ℄ Rdwy.

GIRDER	G1	G2	G3	G4	G5	G6	G7	G8
"A" Dim.	0	1⅜	2¾	4⅛	4¼	3¼	2¼	1 3/16

NOTE: For location of girders G1 thru G8 See "Erection Plan" Dwg. No. 3940.

DIAPHRAGM AT BENT NO. 3

Scale ~ ½" = 1'-0"

(Looking ahead on line)

NOTE: See Dwg. No. 3949 for Blast Pl. Connections.

NOTES

OTHER NOTES: - For other notes see Dwgs. No. 3928, No. 3929, No. 3944 & No. 3946.

STATE OF MONTANA
STATE HIGHWAY COMMISSION

BRIDGE OVER CLARK FORK
& C.M.ST.P. & P. R.R.
AT MISSOULA

FED. AID PROJ. NO. UG-405(2) & NO. U-405(2)

MISSOULA COUNTY

SWAY BRACING & SHOE DETAILS SPAN NO. 3

Scale ~ As Noted

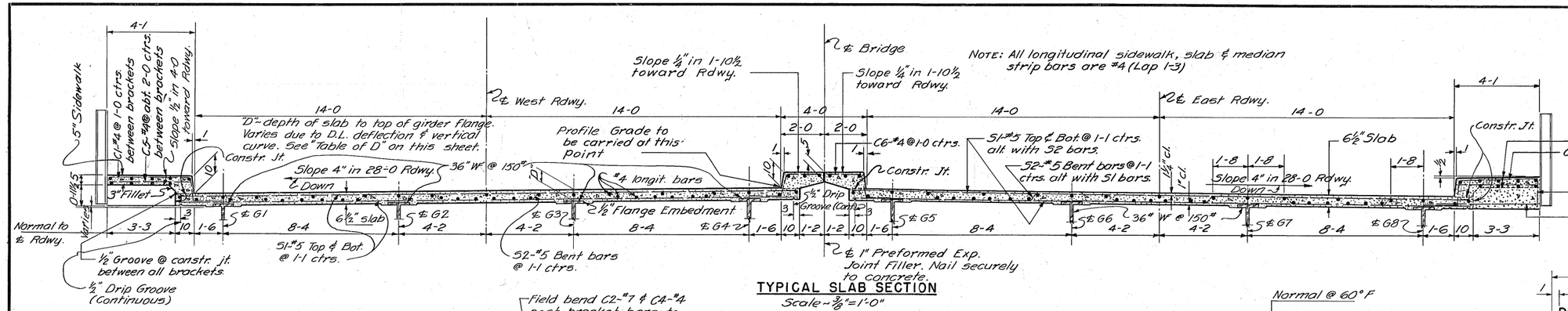
DESIGNED	R.D.K.	7-26-56
DRAWN	R.D.K.	7-28-56
TRACED	F.L.S.	8-1-56
CHECKED	H.E.S.	10-18-56
REVISED		
REVISED		

STATE PRECONST. NUMBER 5405-01

DRAWING NO. 3941

J.R.B.

FED. ROAD DIV. NO.	STATE	FED. AID PROJ. NO.		SHEET NO.	TOTAL SHEETS
8	MONT.	UG-405(2) & U-405(2)		15	23



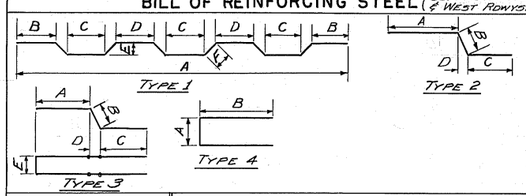
NOTE: All longitudinal sidewalk, slab & median strip bars are #4 (Lap 1-3)

NOTE: See Dwg. No. 5BR-T3 for bridge rail details and bridge rail supporting bolts.

TYPICAL SLAB SECTION

Scale ~ 3/8" = 1'-0"

BILL OF REINFORCING STEEL (SUPERSTRUCTURE ONLY - EAST & WEST RDWYS. INCLUSIVE)



STRAIGHT BARS				BENT BARS (All dimensions are out to out)											
MARK	SIZE	NO.	LENGTH	TYPE	MARK	SIZE	NO.	LENGTH	A	B	C	D	E	F	G
C3	#4	34	1'-2"	2	C1	#4	105	6'-3"	3'-9"	1'-3"	1'-3"	0-1½			
C5		60	3-9	3	C2	7	17	14-6	3-9	1-3	1-11	0-1½	0'-9"		
C7		24	40-0	4	C4	4	17	9-8	0-8	4-6					
C8		2	29-2	2	C6	4	124	4-1	1-7	1-3	1-3	0-1½			
C9		2	29-0												
C10		2	28-10	1	S2	#5	110	30-2	29-4	3-10	4-5	3-4	0-4½	0'-6"	
C11		2	28-8												
C12		1	28-6												
C13		1	23-4												
C14		1	23-2												
C15		1	23-1												
C16		1	23-0												
C17		1	22-10												
C18		1	22-8												
C19		1	17-7												
C20		2	17-5												
C21		2	17-3												
C22		2	17-1												
C23	4	2	16-11												
S1	5	222	29-4												
S3A	4	70	40-0												
S3		1	28-7												
S4		1	28-5												
S5		1	28-2												
S6		1	27-10												
S7		1	27-9												
S8		1	27-8												
S9		1	27-5												
S10		1	27-2												
S11		1	27-0												
S12		1	26-11												
S13		1	26-8												
S14		1	26-4												
S15		1	26-3												
S16		1	26-2												
S17		1	25-11												
S18		1	25-8												
S19		1	25-6												
S20		1	25-5												
S21		1	25-2												
S22		1	24-10												
S23		1	24-9												
S24		1	24-8												
S25		1	24-5												
S26		1	24-1												
S27		1	24-0												
S28		1	23-11												
S29		1	23-8												
S30		1	23-5												
S31		1	23-3												
S32		1	22-9												
S33		1	22-8												
S34		1	22-4												
S35		1	22-1												
S36		1	22-0												
S10A		1	27-4												
S8A	4	1	27-6												
S61	#4	4	29-10												

J.K.B.

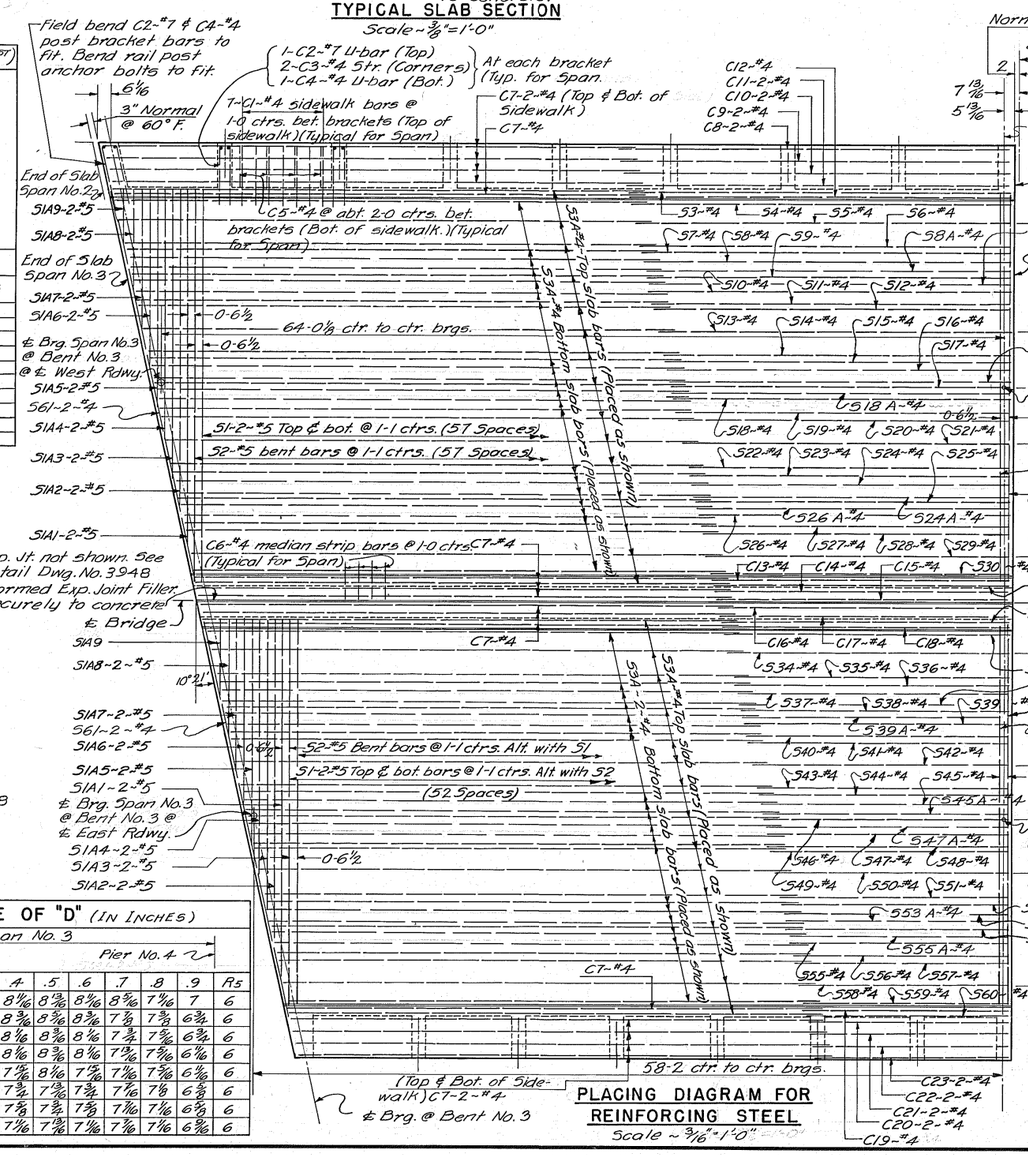
STRAIGHT BARS			
MARK	SIZE	NO.	LENGTH
S55A	#4	1	18'-6"
S53A	4	1	18-9
S47A	4	1	20-1
S1A1	5	4	27-0
S1A2			24-0
S1A3			21-0
S1A4			18-0
S1A5			16-0
S1A6			12-0
S1A7			9-0
S1A8			6-0
S1A9	5	4	3-0
S45A	4	1	20-2
S39A		1	21-7
S37A		1	21-8
S26A		1	24-4
S37		1	21-10
S38		1	21-7
S39		1	21-5
S40		1	21-2
S41		1	21-2
S42		1	20-11
S43		1	20-7
S44		1	20-6
S45		1	20-4
S46		1	20-2
S47		1	19-10
S48		1	19-3
S49		1	19-8
S50		1	19-4
S51		1	19-1
S52		1	19-0
S53		1	18-10
S54		1	18-8
S55		1	18-5
S56		1	18-3
S57		1	18-2
S58		1	17-10
S59		1	17-7
S60		1	17-6
S24A		1	24-6
S8A	4	1	25-10
S16A	#4	1	26-0

TABLE OF "D" (IN INCHES)

Span No. 3 — ℄ Bent No. 3 — Pier No. 4 ℄

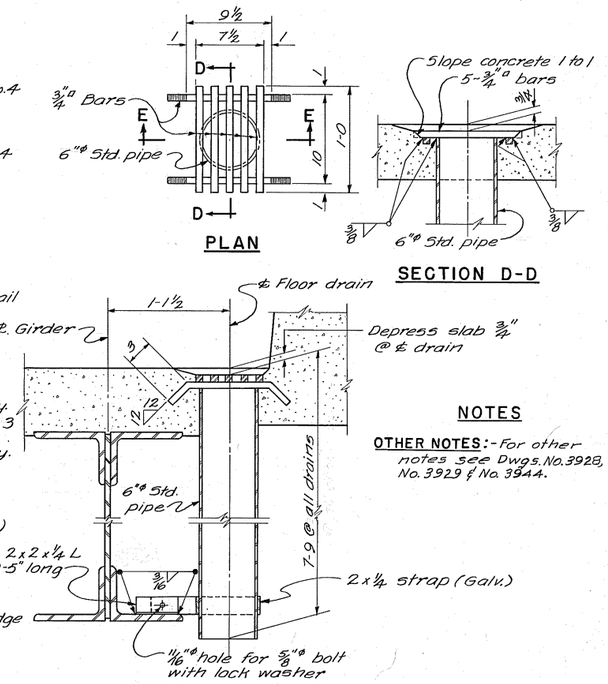
	Girder Point	R4	.1	.2	.3	.4	.5	.6	.7	.8	.9	R5
Depth of Slab	G1	6	7	7 1/16	8 5/16	8 11/16	8 13/16	8 11/16	8 5/16	7 11/16	7	6
	G2	6	6 3/4	7 3/8	7 7/8	8 3/16	8 5/16	8 3/16	7 7/8	7 3/8	6 3/4	6
	G3	6	6 3/4	7 5/16	7 13/16	8 1/16	8 3/16	8 1/16	7 3/4	7 5/16	6 3/4	6
	G4	6	6 11/16	7 5/16	7 13/16	8 1/16	8 3/16	8 1/16	7 13/16	7 5/16	6 11/16	6
	G5	6	6 11/16	7 3/16	7 3/4	7 15/16	8 1/16	7 15/16	7 11/16	7 3/16	6 11/16	6
	G6	6	6 5/8	7 1/8	7 1/2	7 3/4	7 13/16	7 3/4	7 7/16	7 1/8	6 5/8	6
	G7	6	6 5/8	7 1/16	7 7/16	7 5/8	7 11/16	7 5/8	7 7/16	7 1/16	6 5/8	6
	G8	6	6 9/16	7 1/8	7 1/2	7 7/16	7 9/16	7 7/16	7 7/16	7 1/16	6 9/16	6

NOTE: See Dwg. No. 392B for Rail Post bracket locations.



PLACING DIAGRAM FOR REINFORCING STEEL

Scale ~ 3/16" = 1'-0"



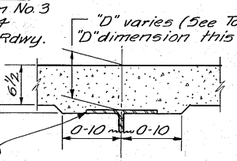
NOTES

OTHER NOTES:- For other notes see Dwgs. No. 392B, No. 392D & No. 394A.

NOTE: Top of drain assembly shall be set horizontal. Drain assemblies shall be galvanized after welding is completed. The unit price bid for "Floor Drains" shall be full payment for the drains complete in place, including pipe, bars, painting, welding, galvanizing and all incidentals pertaining thereto. See "General Layout" for Floor Drain location and spacing.

ROADWAY FLOOR DRAIN DETAILS ON SPANS NO. 4, NO. 5 & NO. 6

(14 Required)
Scale ~ 1½" = 1'-0"



FLANGE EMBEDMENT DETAIL

Scale ~ 1" = 1'-0"

DESIGNED	C.A.M.	6-7-56
DRAWN	C.A.M.	7-19-56
TRACED	J.W.A.	7-23-56
CHECKED	H.E.S.	11-20-56
REVISED		
REVISED		

STATE OF MONTANA
STATE HIGHWAY COMMISSION

BRIDGE OVER CLARK FORK & C.M.ST.P. & P. R.R. AT MISSOULA

FED. AID PROJ. NO. UG-405(2) & NO. U-405(2)

MISSOULA COUNTY

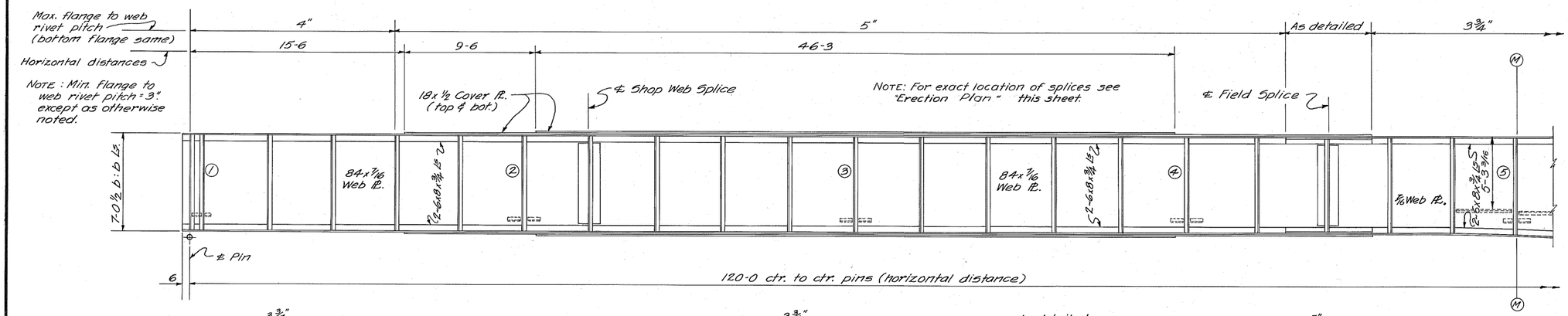
SPAN NO. 3 SLAB DETAILS, REINFORCEMENT AND FLOOR DRAIN DETAILS

Scale - As Noted

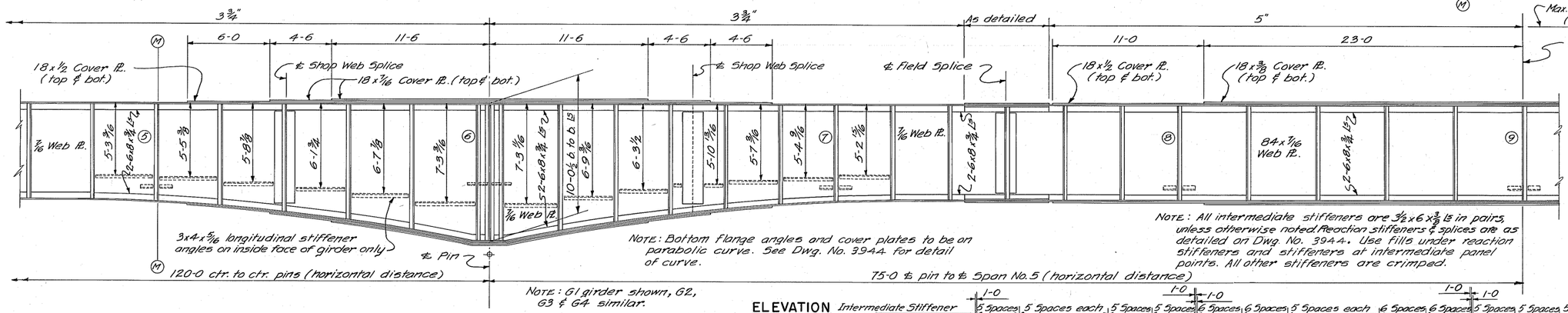
STATE PRECONST. NUMBER 5405-01

DRAWING NO. 3942

FED. ROAD DIV. NO.	STATE	FED. AID PROJ. NO.		SHEET NO.	TOTAL SHEETS
8	MONT.	UG-405(2) & U-405(2)		16	23



NOTE: Ends of cover plates on bottom flange shall line up with those on the top flange normal to the top flange Ls.



NOTE: Girders shall be fabricated and erected with camber as indicated in the diagram.

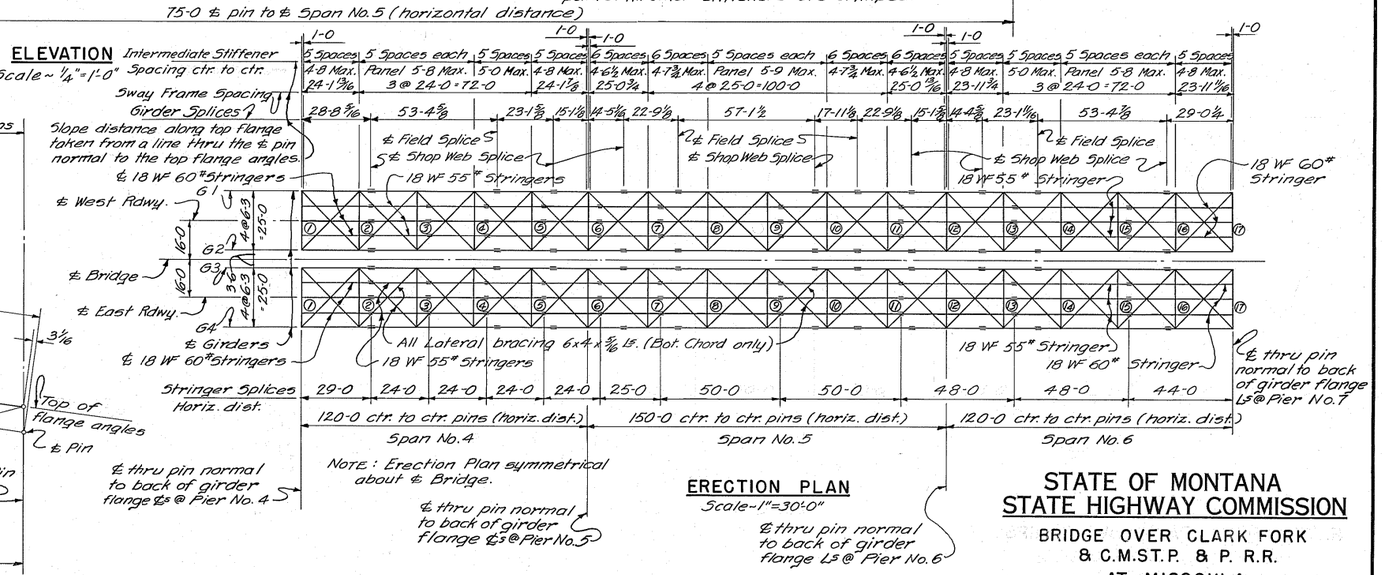
NOTE: Bottom flange angles and cover plates to be on parabolic curve. See Dwg. No. 3944. for detail of curve.

NOTE: All intermediate stiffeners are 3½x6x⅜ Ls in pairs, unless otherwise noted. Reaction stiffeners & splices are as detailed on Dwg. No. 3944. Use fills under reaction stiffeners and stiffeners at intermediate panel points. All other stiffeners are crimped.

NOTE: G1 girder shown, G2, G3 & G4 similar.

ELEVATION

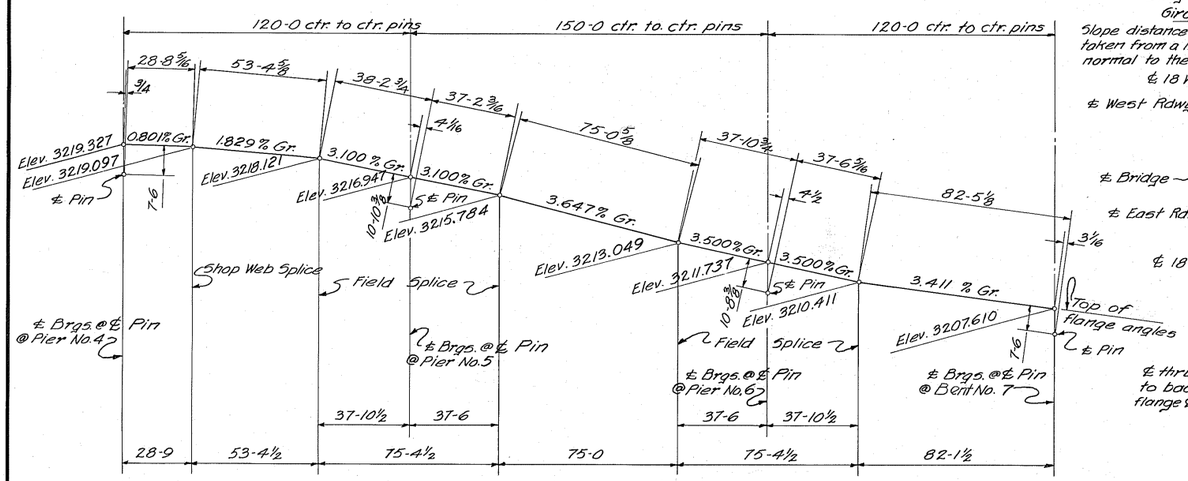
Scale ~ ¼" = 1'-0"



NOTE: Erection Plan symmetrical about ℄ Bridge.

ERECTION PLAN

Scale - 1" = 30'-0"



NOTE: Elevations shown are given at top of girder flange angles for Girders G1 & G4 only. Elevations for Girder G2 & G3 are 3 9/16" higher.

CAMBER DIAGRAM

No Scale

NOTE: Only those shop and field splices at grade changes are shown here.

NOTES

OTHER NOTES: - For other notes see Dwgs. No. 3928, No. 3929 & No. 3944.

DESIGNED	R.D.K.	6-22-56
DRAWN	D.D.G.	6-25-56
TRACED	F.L.S.	6-29-56
CHECKED	H.E.S.	9-26-56
REVISED		
REVISED		

STATE OF MONTANA
STATE HIGHWAY COMMISSION

BRIDGE OVER CLARK FORK & C.M.ST.P. & P. R.R.
AT MISSOULA
FED. AID PROJ. NO. UG-405(2) & NO. U-405(2)
MISSOULA COUNTY

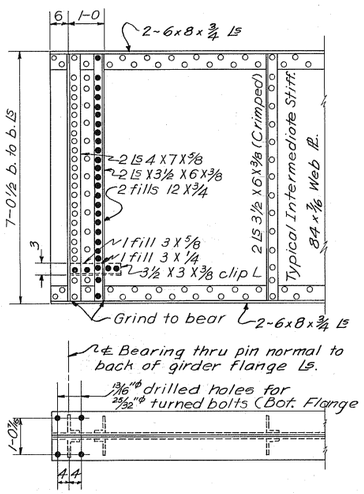
GIRDERS, ERECTION PLAN AND CAMBER DIAGRAM
SPANS NO. 4, NO. 5 & NO. 6
Scale - As Noted

STATE PRECONST. NUMBER 5405-01

DRAWING NO. 3943

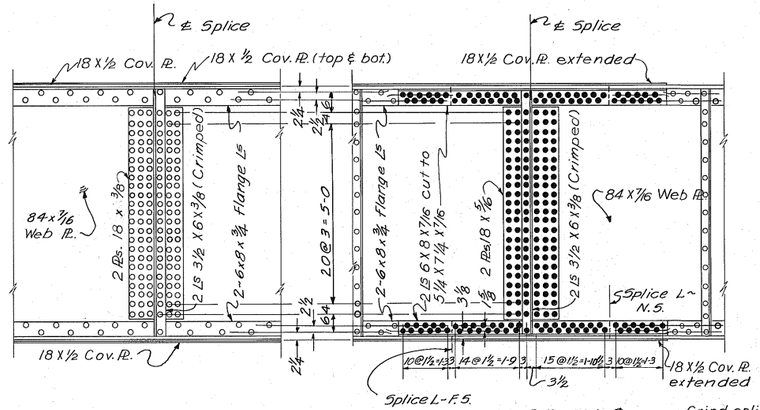
J.R.B.

FED. ROAD DIV. NO.	STATE	FED. AID PROJ. NO.		SHEET NO.	TOTAL SHEETS
8	MONT.	UG-405(2) & U-405(2)		17	23



TYPICAL GIRDER DETAILS AT PIER NO. 4

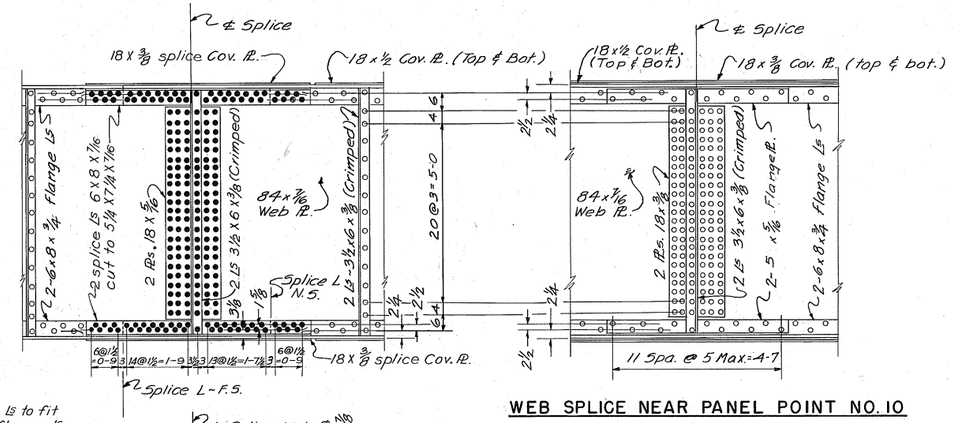
(Girder detail @ Bent No. 7 similar but opposite hand)



WEB SPLICE NEAR PANEL POINT NO. 2

(Web Splice near Panel Point No. 16 Similar)

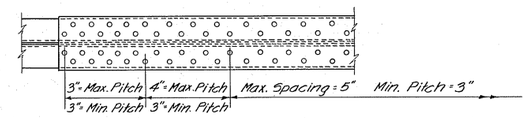
FIELD SPLICE IN SPANS NO. 4 & NO. 6



FIELD SPLICE NEAR PANEL POINT NO. 7

(Field Splice near Panel Point No. 11 Similar)

WEB SPLICE NEAR PANEL POINT NO. 10



TYPICAL RIVETING AT ENDS OF COVER Pls

NOTES

RIVETS :— 3/4" unless otherwise noted

REAMING :— All field holes in girder and stringer splices shall be sub-punched 11/16" ϕ and reamed 13/16" ϕ or drilled in shop as called for in the Standard Specifications. In reaming field holes in splices, the adjacent sections of the girders or stringers must be assembled in exact position with sufficient support throughout the entire length to maintain girders or stringers in proper position. Where turned bolts are used, holes shall be sub-punched 11/16" ϕ and reamed to 13/16" ϕ or drilled for 23/32" ϕ turned bolts. For 23/32" ϕ turned bolts sub-punch to 13/16" ϕ and ream to 15/16" ϕ or drill.

ERECTION :— Girders shall be supported at splice points and at sufficient intervals throughout their entire length to maintain girders at exact elevation and proper alignment during riveting of field splices. All splices shall be pinned and bolted in accordance with the Standard Specifications before riveting is begun.

COUNTERSUNK RIVETS :— Rivets in outstanding legs of flange angles may be countersunk where necessary to clear stiffener angles.

INTERMEDIATE STIFFENERS :— Intermediate stiffener angles shall be crimped except that those carrying sway frames shall not be crimped.

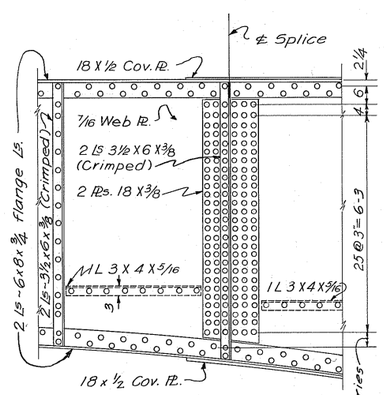
CAMBER :— Girders shall be fabricated and erected with camber as indicated in the diagram on Dwg. No. 3943

SWAY FRAMES :— Sway frames shall be set in a plane normal to the grade of the girders. Stringers shall be set with webs vertical.

WELDS :— All welds shall be continuous fillet shop welds unless otherwise noted. All welds shall be paid for as Structural Steel.

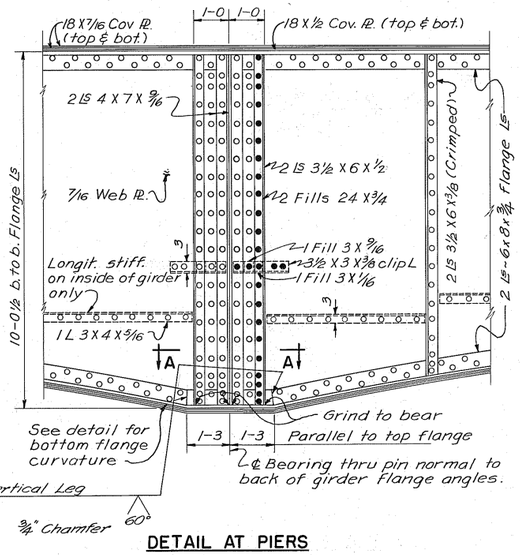
SPLICE ANGLES :— Splice angles shall be ground to fit fillet of flange angles.

OTHER NOTES :— For other notes see Dwg. No. 3928 & No. 3929.

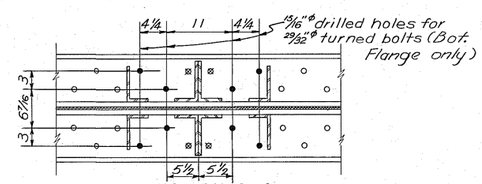


NOTE: Web Splices in Span No. 5 near Pier similar except for location of stiffener angle.

WEB SPLICE NEAR PIERS NO. 5 & NO. 6

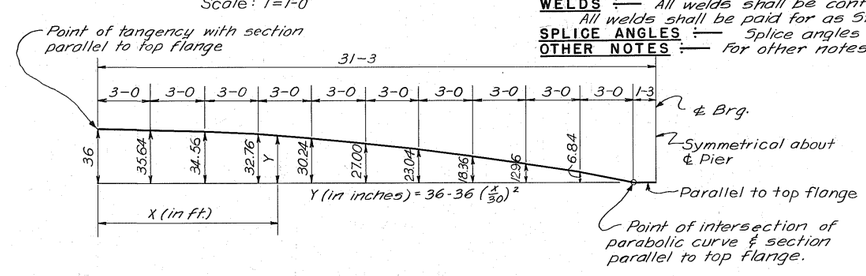


DETAIL AT PIERS NO. 5 & NO. 6



SECTION A-A

Scale: 1" = 1'-0"



DETAIL OF CURVATURE OF BACK OF LOWER FLANGE ANGLES AT PIERS NO. 5 & NO. 6

Scale: 1/4" = 1'-0"

DESIGNED	R.D.K.	6-22-56
DRAWN	R.R.L.	7-2-56
TRACED	H.K.L.	7-6-56
CHECKED	H.E.S.	9-25-56
REVISED		
REVISED		

STATE OF MONTANA
STATE HIGHWAY COMMISSION

BRIDGE OVER CLARK FORK & C.M.S.T.P. & P. R.R. AT MISSOULA

FED. AID PROJ. NO. UG-405(2) & NO. U-405(2)

MISSOULA COUNTY

GIRDER DETAILS

SPANS NO. 4, NO. 5 & NO. 6

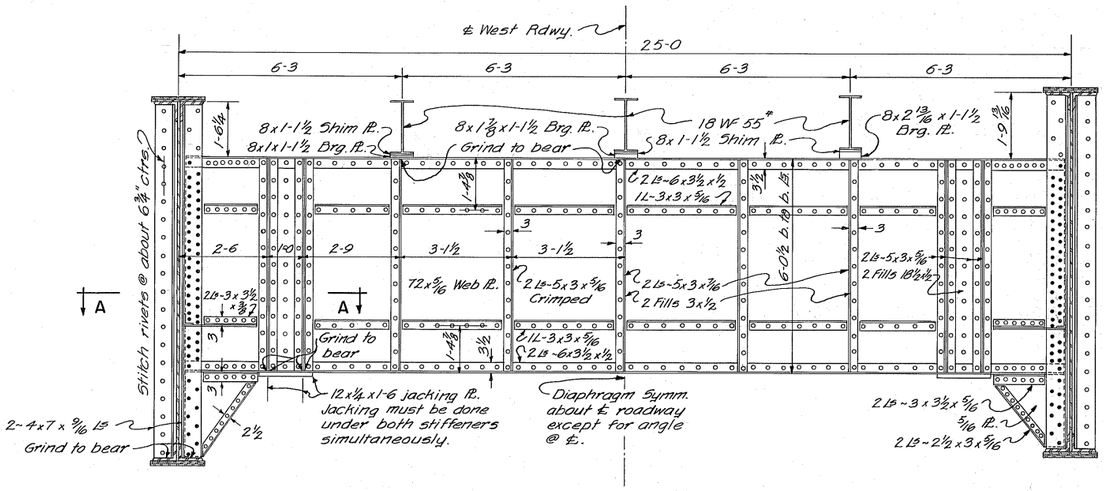
Scale ~ 1/2" = 1'-0" Except As Noted

STATE PRECONST. NUMBER 5405-01

DRAWING NO. 3944

J.R.B.

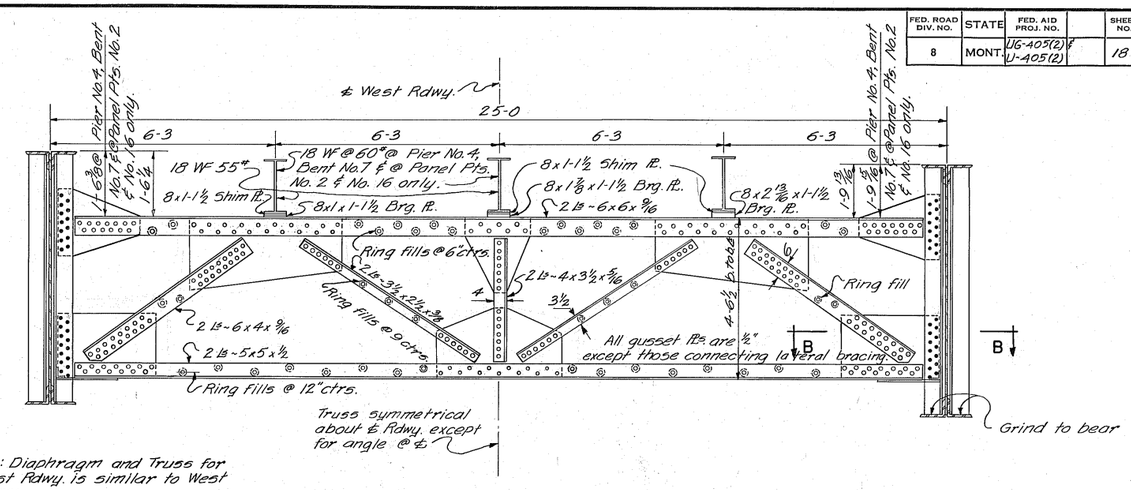
FED. ROAD DIV. NO.	STATE	FED. AID PROJ. NO.		SHEET NO.	TOTAL SHEETS
8	MONT.	UG-405(2) & U-405(2)		18	23



See Dwg. No. 3944 for additional details.

HALF SECTION AT PIERS NO.5 & NO.6

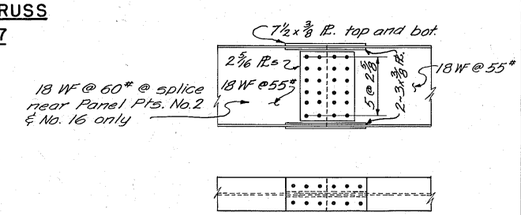
Scale ~ ½" = 1'-0"



NOTE: Diaphragm and Truss for East Rdwy. is similar to West Rdwy.

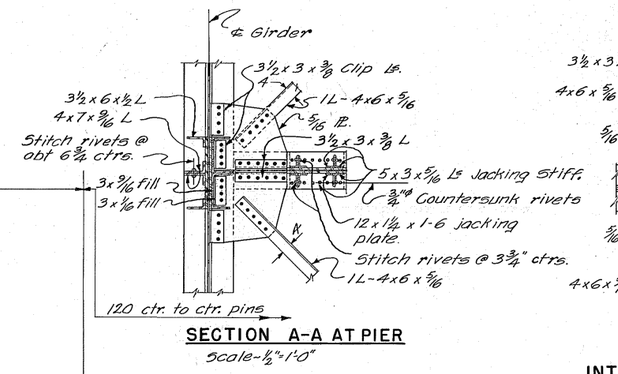
HALF SECTION AT PANEL POINT TRUSS AND AT PIER NO. 4 & BENT NO.7

Scale ~ ½" = 1'-0"



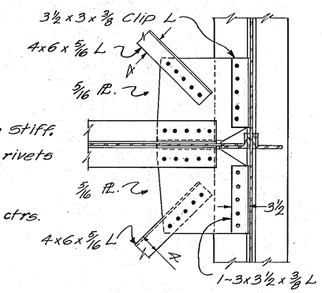
STRINGER SPLICE DETAIL

Scale ~ ¾" = 1'-0"



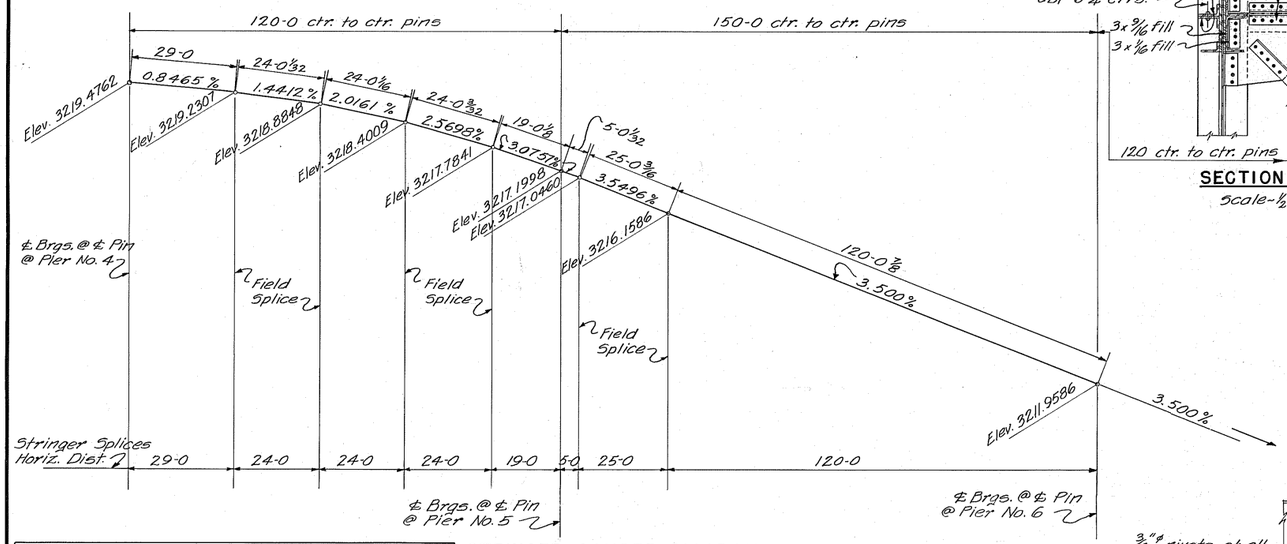
SECTION A-A AT PIER

Scale ~ ½" = 1'-0"



SECTION B-B AT INTERMEDIATE PANEL POINTS

Scale ~ ¾" = 1'-0"



STRINGER CAMBER DIAGRAM

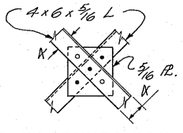
No Scale

TABLE OF SHIM THICKNESS (Under stringers)									
PANEL POINT	R6 1	2	3	4	5	R7 6	7	8	9
SHIM THICKNESS	0	7/16	1½	1⅛	1	1¼	5/16	5/16	15/16
PANEL POINT	10	11	R8 12	13	14	15	16	R9 17	
SHIM THICKNESS	1 3/16	1	⅞	1	1 5/16	1 5/16	13/16	0	

NOTE: Shims are equal under all six stringers at any panel point.

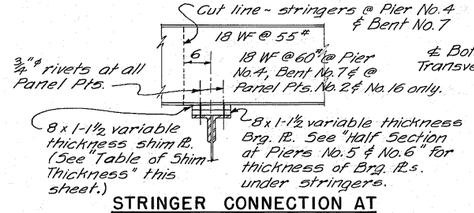
NOTE: Only those field splices on stringers at grade changes are shown here.

NOTE: Elevations shown are only for stringer @ ℄ Rdwys. and are given @ top of flange of stringer.



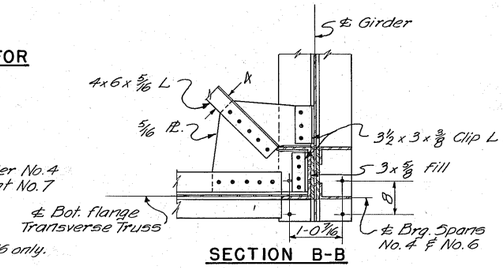
MIDDLE CONNECTION FOR LATERAL BRACING

Scale ~ ¾" = 1'-0"



STRINGER CONNECTION AT INTERMEDIATE PANEL POINTS AND AT PIERS NO.4, NO.5, NO.6 & BENT NO.7

Scale ~ ¼" = 1'-0"



SECTION B-B AT END OF GIRDER

Scale ~ ¾" = 1'-0"

NOTES

OTHER NOTES :- For other notes see Dwg. No. 3928, No. 3929 & No. 3944.

STATE OF MONTANA
STATE HIGHWAY COMMISSION

BRIDGE OVER CLARK FORK
& C.M.ST.P. & P. R.R.
AT MISSOULA
FED. AID PROJ. NO. UG-405(2) & NO. U-405(2)
MISSOULA COUNTY
SWAY FRAME & STRINGER DETAILS
SPANS NO. 4, NO. 5 & NO. 6
Scale ~ As Noted

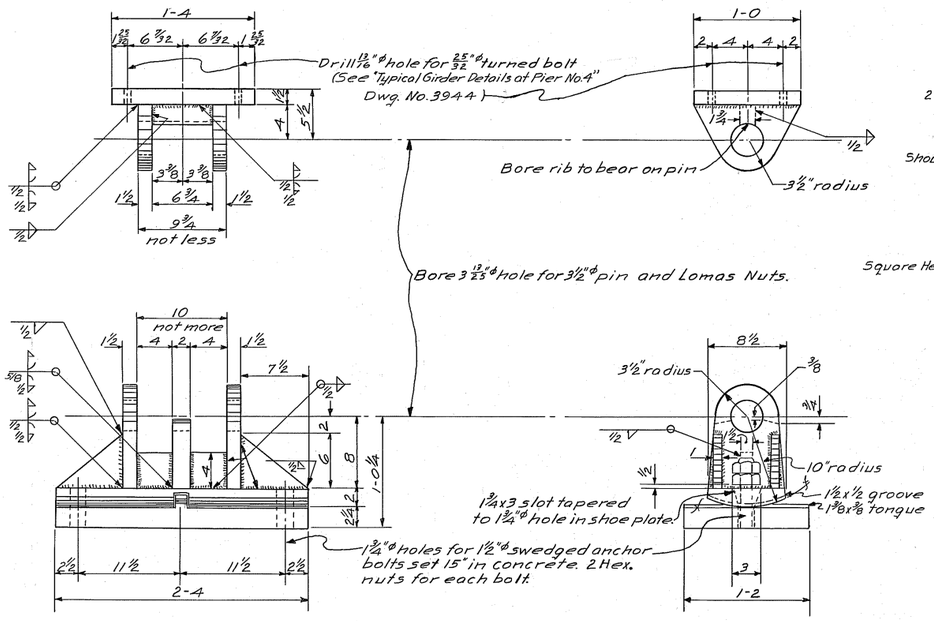
DESIGNED	R.D.K.	6-19-56
DRAWN	D.D.G. & R.R.L.	6-23-56
TRACED	F.L.S.	6-27-56
CHECKED	H.E.S.	10-8-56
REVISED		
REVISED		

STATE PRECONST. NUMBER 5405-01

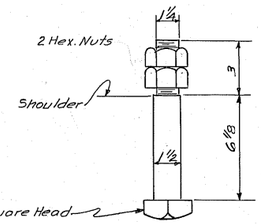
DRAWING NO. 3945

J.R.B.

FED. ROAD DIV. NO.	STATE	FED. AID PROJ. NO.		SHEET NO.	TOTAL SHEETS
8	MONT.	UG-405(2) & U-405(2)		19	23

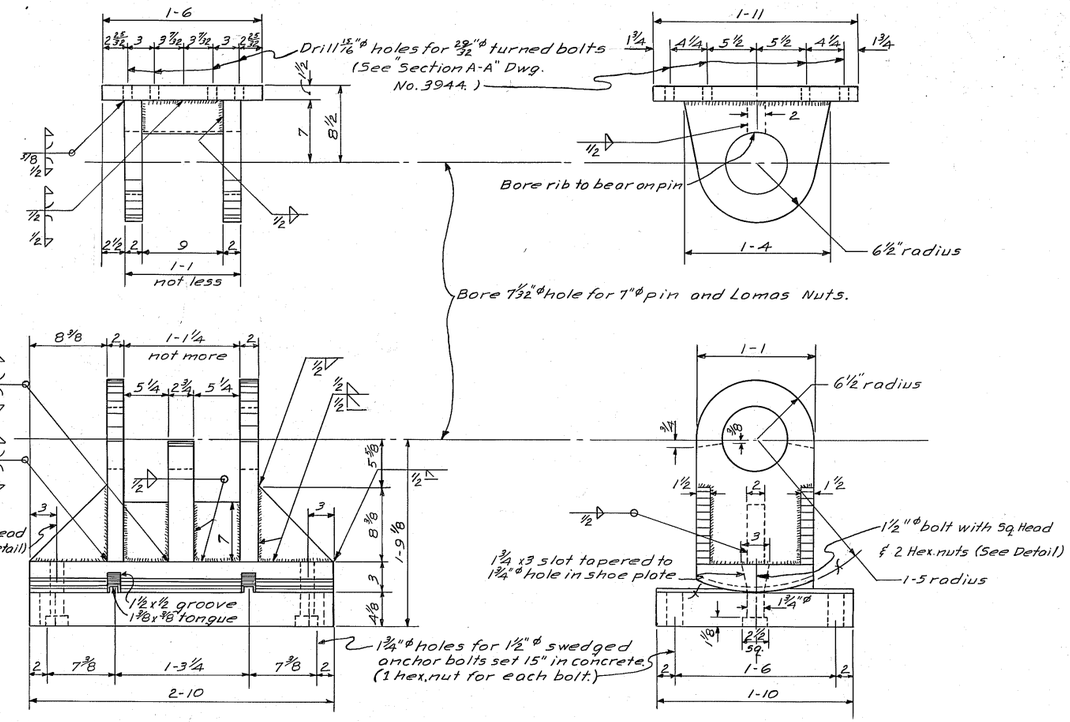


ROCKER SHOES AT PIER NO. 4 & BENT NO. 7

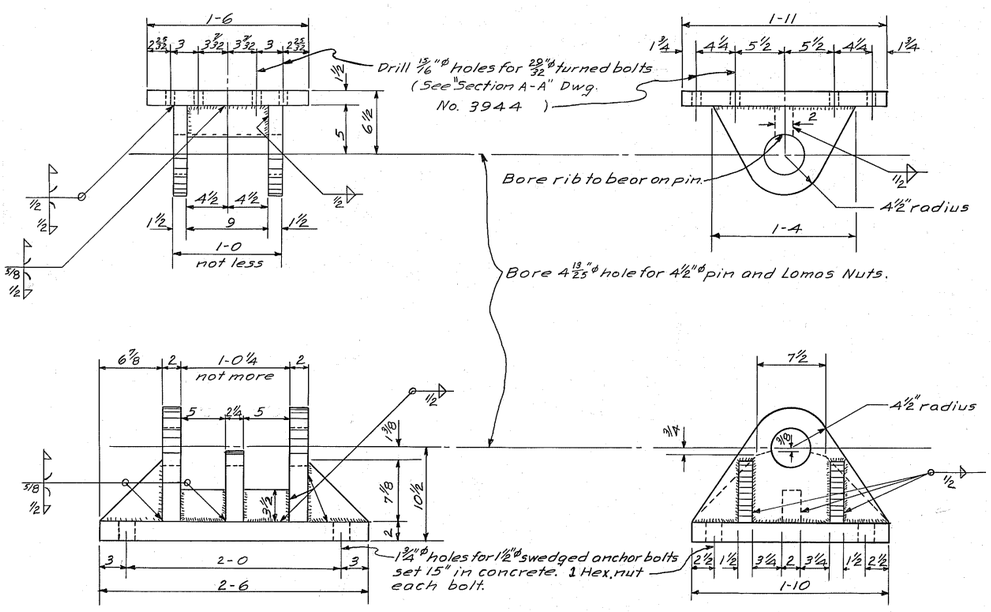


BOLT DETAIL

Scale: 3" = 1'-0"



ROCKER SHOES AT PIER NO. 5



FIXED SHOES AT PIER NO. 6

NOTES

FINISHING ÷ To assure full bearing, all surfaces in contact shall be edge planed or otherwise finished before welding. Shoes are to be fully annealed after all welding is completed and before pin holes are drilled or curved bearing surfaces are finished. Base plates under rockers are to be hot straightened before finishing.

WELDING ÷ Welding is symmetrical about ℄s of shoes. Welds shall be paid for as Structural Steel.

SETTING OF SHOES ÷ Rocker shoes shall be set vertical under full Dead load at 60°F. If rockers are not in correct position with final dead load on the spans, spans shall be jacked and adjustments made.

SHOES ÷ All material for shoes for Spans No.4, No.5 & No.6 shall conform to the Special Provisions for Structural Steel.

OTHER NOTES ÷ For other notes see Dwgs. No. 3928, No. 3929 & No. 3944.

DESIGN INFORMATION

D.L. = Dead Load
L.L. = Live Load
S.L. = Sidewalk Live Load
Moment in kip ft.
Shears & Reactions in Kips
Deflections in Inches

Span No. 4	Span No. 5	Span No. 6	
R6	R7	R8	R9
120'	150'	120'	

		Span No. 4 & Span No. 6	Span No. 5	R6 & R9	R7 & R8
Moment	D.L.	2092.0	1912.0		-4596.0
	L.L.	2064.0	1922.0		-2747.0
	S.L.	364.0	333.0		- 569.0
Reaction	D.L.			94.1	335.3
	L.L.			97.9	180.0
	S.L.			13.9	39.7
Shear	D.L.			94.1	170.1
	L.L.			97.9	106.3
	S.L.			13.9	20.1
Deflection	D.L.	0.80	0.76		
	L.L.	1.01	1.60		

DESIGNED	R.D.K.	6-20-56
DRAWN	H.E.E.	6-30-56
TRACED	E.R.T.	7-17-56
CHECKED	H.E.S.	9-26-56
REVISED		
REVISED		

STATE OF MONTANA
STATE HIGHWAY COMMISSION

BRIDGE OVER CLARK FORK & C.M.ST.P. & P. R.R. AT MISSOULA

FED. AID PROJ. NO. UG-405(2) & NO. U-405(2)

MISSOULA COUNTY

SHOE DETAILS
SPANS NO. 4, NO. 5 & NO. 6

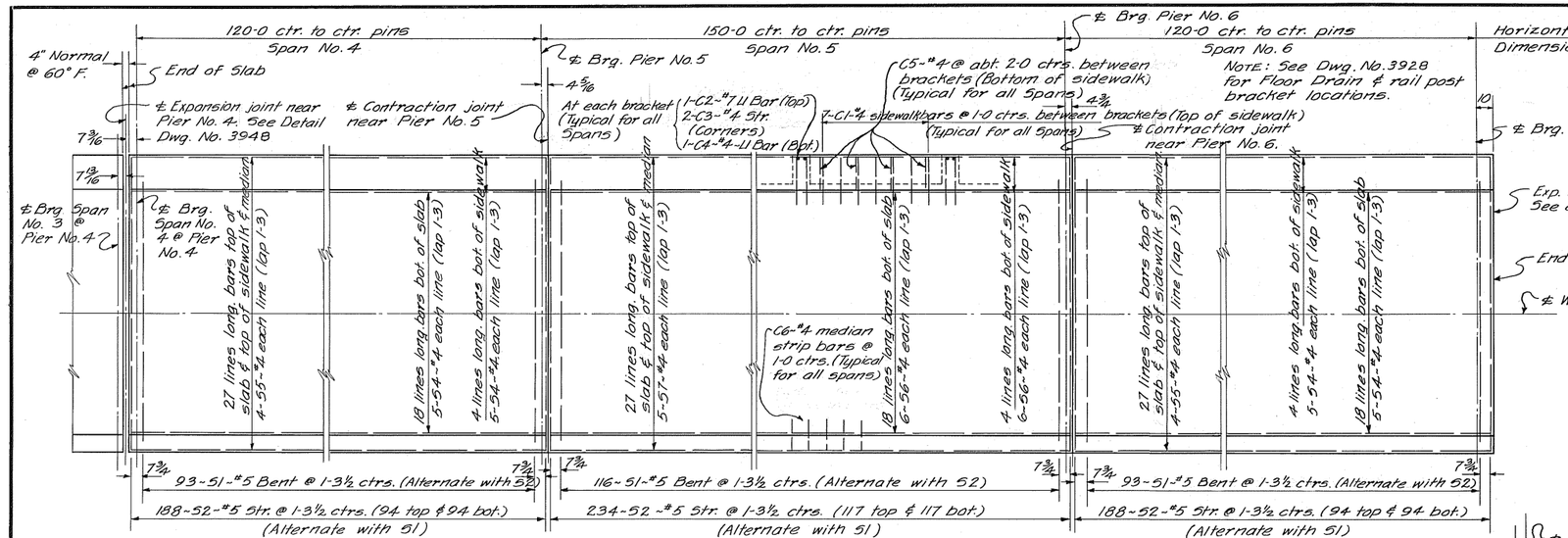
Scale: 1 1/2" = 1'-0" Except As Noted

STATE PRECONST. NUMBER 5405-01

DRAWING NO. 3946

J.R.B.

FED. ROAD DIV. NO.	STATE	FED. AID PROJ. NO.		SHEET NO.	TOTAL SHEETS
8	MONT.	UG-405(2) & U-405(2)		20	23

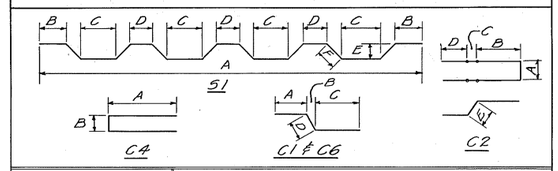


PLACING DIAGRAM FOR REINFORCING STEEL IN SLAB & SIDEWALK OF WEST RDWY. FOR SPANS NO. 4, NO. 5 & NO. 6

(East Rdwy. similar)
No Scale

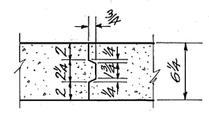
NOTE: Slab & sidewalk reinforcing for East Rdwy. same as West Rdwy.

BILL OF REINFORCING STEEL Slab & Sidewalk (One Rdwy. Only)



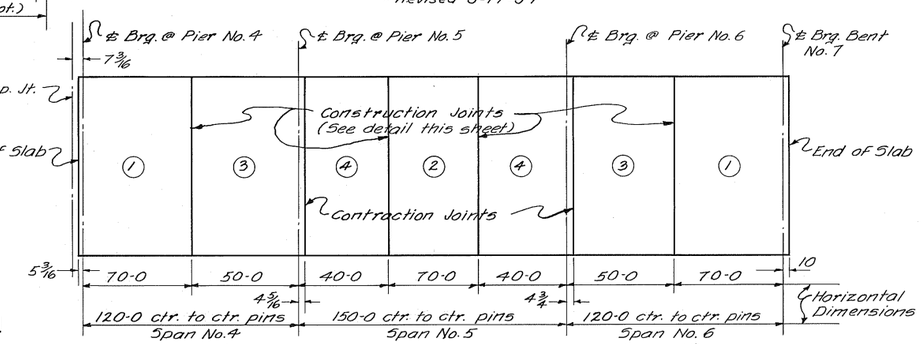
STRAIGHT BARS				BENT BARS (All dimensions are out to out)									
MARK	SIZE	NO.	LENGTH	MARK	SIZE	NO.	LENGTH	A	B	C	D	E	F
C3	#4	94	1'-2"	C1*	#4	322	6'-2"	3'-9"	0'-1½"	1'-3"	1'-2"		
52	5	610	29-5	C2*	7	47	14-4	0-8	3-9	0-1½	1-11	1'-2"	
54	4	220	25-0	C4	4	47	9-8	4-6	0-8				
55	4	216	31-0	C6*	4	392	4-0	1-7	0-1½	1-3	1-2		
56	4	132	26-0	51	#5	302	30-4	29-4	3-5	3-1	2-6	0-4	0'-5½"
57	4	135	31-0										
C5	#4	184	3-9										

* Revised 5-17-57



SHEAR KEY AT CONSTRUCTION JOINTS IN SLAB

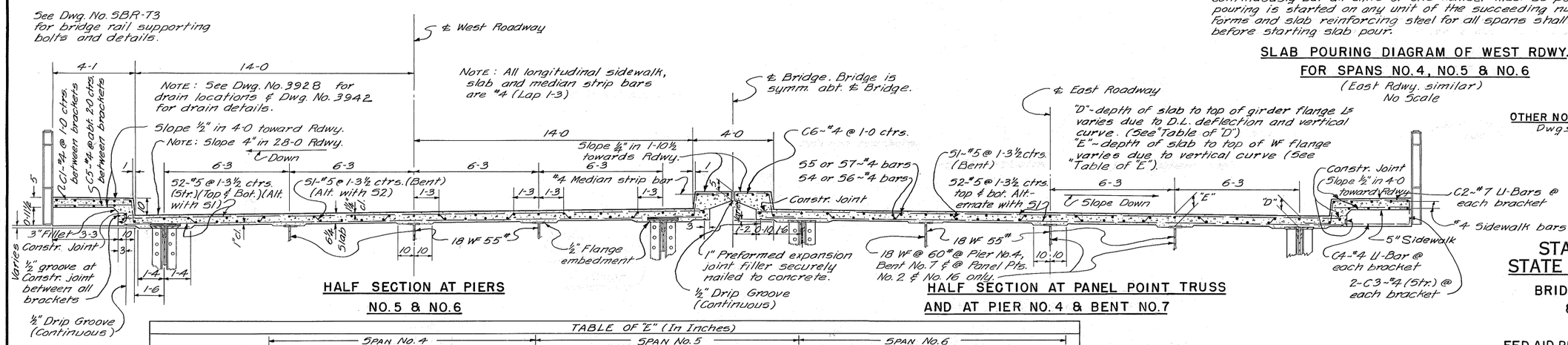
Scale ~ 1½" = 1'-0"



NOTE: Units of the same number need not be poured simultaneously. A combination of units numbered successively may be poured continuously but all units of one number must be poured before pouring is started on any unit of the succeeding number. Forms and slab reinforcing steel for all spans shall be in place before starting slab pour.

SLAB POURING DIAGRAM OF WEST RDWY. FOR SPANS NO. 4, NO. 5 & NO. 6

(East Rdwy. similar)
No Scale



HALF SECTION AT PIERS NO. 5 & NO. 6

HALF SECTION AT PANEL POINT TRUSS AND AT PIER NO. 4 & BENT NO. 7

TABLE OF "E" (In Inches)																																			
	SPAN No. 4										SPAN No. 5										SPAN No. 6														
STRINGER POINT	R6	.1	.2	.3	.4	.5	.6	.7	.8	.9	R7	.1	.2	.3	.4	.5	.6	.7	.8	.9	R8	.1	.2	.3	.4	.5	.6	.7	.8	.9	R9
DEPTH OF SLAB "E"	5¾	6 1/16	5 15/16	5 7/8	5 13/16	5 5/16	5⅜	5 3/16	5⅛	5 1/16	5	5⅛	5 1/16	5	5 1/16	5⅛	5 3/16	5¼	5 5/16	5⅜	5 7/16	5½	5 9/16	5⅝	5 11/16	5¾	5 13/16	5⅞	5 15/16	6	6 1/16

TABLE OF "D" (In Inches)																																			
	SPAN No. 4										SPAN No. 5										SPAN No. 6														
GIRDER POINT	R6	.1	.2	.3	.4	.5	.6	.7	.8	.9	R7	.1	.2	.3	.4	.5	.6	.7	.8	.9	R8	.1	.2	.3	.4	.5	.6	.7	.8	.9	R9
DEPTH OF SLAB "D"	5¾	6 5/16	6⅜	6⅛	7 1/16	7½	7 1/16	6⅜	6⅛	7 1/16	7	6⅜	5⅞	5 15/16	6⅜	6 1/16	6⅛	6 5/16	6 13/16	6 5/8	6⅝	6⅝	6 9/16	7	7⅛	7⅛	7 1/16	6⅞	6⅝	6 3/16	5¾

NOTES

OTHER NOTES: — For other notes see Dwgs. No. 3928, No. 3929 & No. 3944.

STATE OF MONTANA STATE HIGHWAY COMMISSION

BRIDGE OVER CLARK FORK & C.M.ST.P. & P. R.R.
AT MISSOULA
FED. AID PROJ. NO. UG-405(2) & NO. U-405(2)
MISSOULA COUNTY
SLAB REINFORCING STEEL & SLAB POURING DIAGRAM
SPANS NO. 4, NO. 5 & NO. 6
Scale - ⅜" = 1'-0" Except As Noted

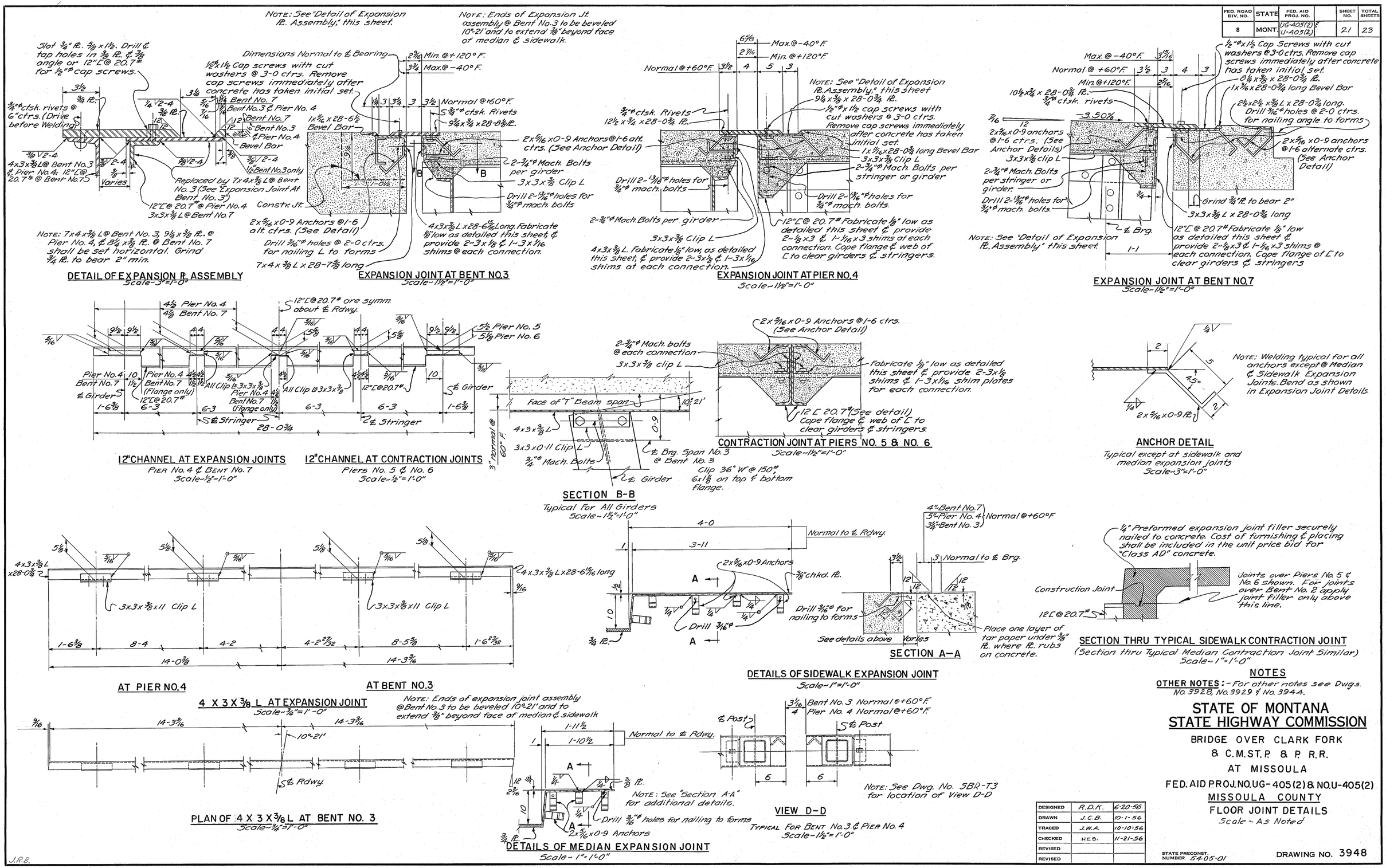
DESIGNED	R.D.K.	6-20-56
DRAWN	D.D.G.	7-16-56
TRACED	F.L.S.	7-20-56
CHECKED	H.E.S.	10-9-56
REVISED	J.R.B.	5-17-57
REVISED		

STATE PRECONST. NUMBER 5405-01

DRAWING NO. 3947

J.R.B.

FED. ROAD DIV. NO.	STATE	FED. AID PROJ. NO.		SHEET NO.	TOTAL SHEETS
8	MONT.	UG-405(2) U-405(2)	F	21	23



NOTES

OTHER NOTES: - For other notes see Dwgs. No. 3928, No. 3929 & No. 3944.

STATE OF MONTANA
STATE HIGHWAY COMMISSION

BRIDGE OVER CLARK FORK
& C.M.ST.P. & P. R.R.
AT MISSOULA

FED. AID PROJ. NO. UG-405(2) & NO. U-405(2)

MISSOULA COUNTY

FLOOR JOINT DETAILS

Scale - As Noted

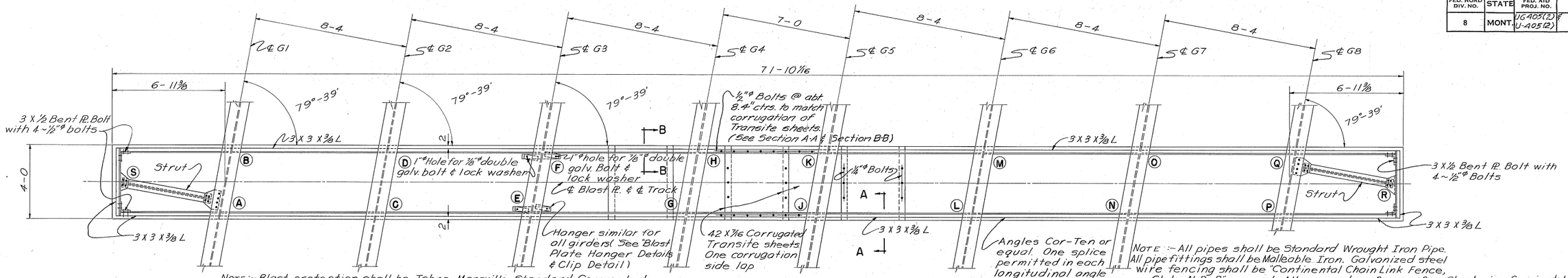
DESIGNED	R.D.K.	6-20-56
DRAWN	J.C.B.	10-1-56
TRACED	J.W.A.	10-10-56
CHECKED	H.E.S.	11-21-56
REVISED		
REVISED		

STATE PRECONST. NUMBER 54-05-01

DRAWING NO. 3948

J.R.B.

FED. ROAD DIV. NO.	STATE	FED. AID PROJ. NO.		SHEET NO.	TOTAL SHEETS
8	MONT.	UG 405(2) & U-405(2)		22	23



NOTE:- Blast protection shall be Johns-Manville Standard Corrugated Transite sheets, or equal, 7/16" thick with 4.2 inch pitch on corrugations.

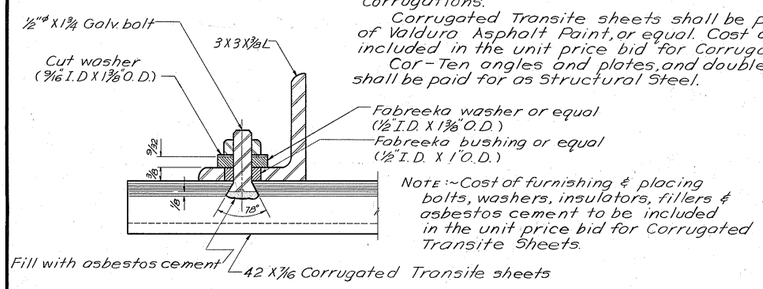
Corrugated Transite sheets shall be painted with two coats of Valduro Asphalt Paint, or equal. Cost of painting shall be included in the unit price bid for Corrugated Transite Sheets.

Cor-Ten angles and plates, and double galvanized bolts and clips shall be paid for as Structural Steel.

PLAN VIEW OF BLAST PLATE

Three Blast Plates Required
Scale: 3/8"=1'-0"

NOTE:- All pipes shall be Standard Wrought Iron Pipe. All pipe fittings shall be Malleable Iron. Galvanized steel wire fencing shall be "Continental Chain Link Fence, Style N B-R" or equal. All exposed surfaces of fence, except steel wire fencing, shall receive three coats of paint as specified for Structural Steel.



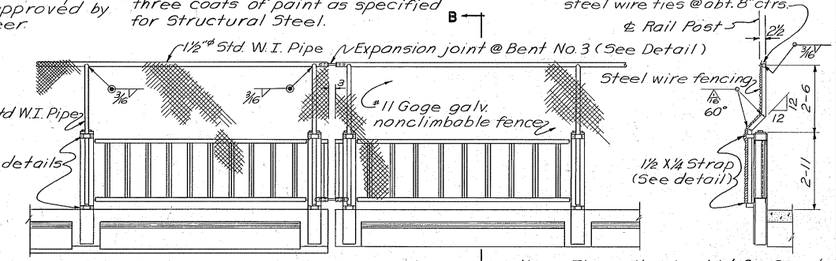
NOTE:- Cost of furnishing & placing bolts, washers, insulators, fillers & asbestos cement to be included in the unit price bid for Corrugated Transite Sheets.

SECTION A-A

Scale: 6"=1'-0"

HANGER AND CLIP TABLE (BLAST PLATE)

CONNECTION POINT	SIDING TRACK "V" Dim.	SIDING TRACK "X" Dim.	SIDING TRACK "Y" Dim.	C.M.ST.P. & P. MAIN LINE "V" Dim.	C.M.ST.P. & P. MAIN LINE "X" Dim.	C.M.ST.P. & P. MAIN LINE "Y" Dim.	TRACK NO. 4 "V" Dim.	TRACK NO. 4 "X" Dim.	TRACK NO. 4 "Y" Dim.
A	3 5/16	1 13/16		3 3/16	1 3/16		3 1/16	1 13/16	
B	3 1/4	1 3/16		3 1/4	1 3/16		3 7/8	1 3/16	
C	5 3/4	5/16		4 5/16	1 3/16		5 7/16	1 13/16	
D	4 7/8	1 13/16		5	1 3/16		5 5/8	1 13/16	
E	7 1/8	5/16		6 7/16	1 1/16		6 13/16	1 1/16	
F	6 3/8	1 1/16		6 1/2	1 1/16		7 1/16	1 1/16	
G	8 7/16	13/16		8 1/16	1 5/16		8 9/16	1 5/16	
H	8 3/8	7/16		8 1/8	1 3/16		8 1/16	1 3/16	
J	8 9/16	5/16		8 3/16	1 3/16		8 11/16	1 3/16	
K	8 9/16	5/16		8 1/4	1 3/16		8 7/8	1 3/16	
L	7 3/8	15/16		7 1/16	1 9/16		7 9/16	1 9/16	
M	7	1 9/16		7 1/8	1 9/16		7 7/16	1 9/16	
N	6 5/8	13/16		6 3/16	1 7/16		6 5/8	1 7/16	
O	6 1/8	1 7/16		6 1/4	1 7/16		6 3/4	1 7/16	
P	5 1/2	15/16		4 15/16	1 7/16		5 7/16	1 7/16	
Q	5 7/16	13/16		5	1 7/16		6 1/16	13/16	
R			3-5 1/4			3-5 3/8			3-5 5/16
S			3-4 1/16			3-3 15/16			3-4 7/16



NOTE:- See "General Layout" for location & length of guard fence.

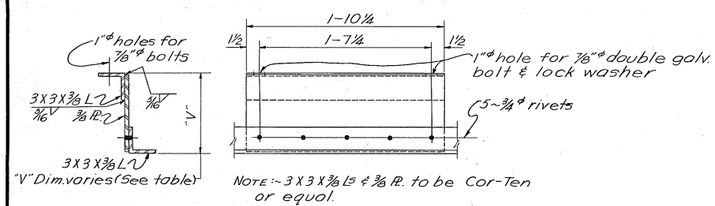
NOTE:- The unit price bid for Guard Fence shall be payment for fence complete in place.

SECTION B-B

Scale: 3/8"=1'-0"

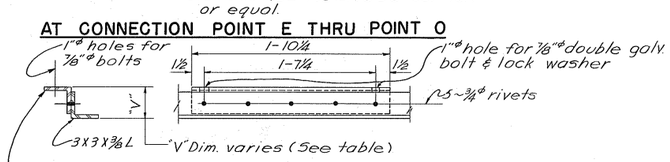
ELEVATION OF GUARD FENCE

Scale: 3/8"=1'-0"



NOTE:- 3 X 3 X 3/8 Ls & 3/8 Pl. to be Cor-Ten or equal.

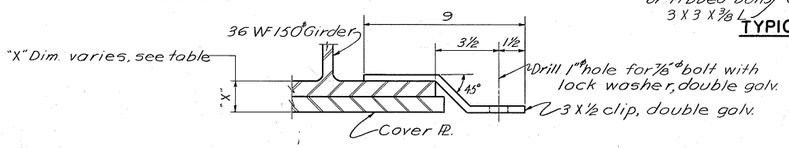
AT CONNECTION POINT E THRU POINT O



AT CONNECTION POINTS A,B,C,D,P & Q

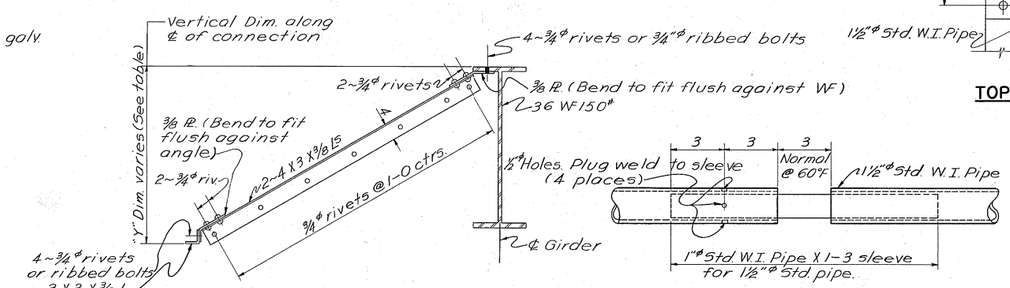
BLAST PLATE HANGER DETAILS

Scale: 1 1/2"=1'-0"



CLIP DETAIL

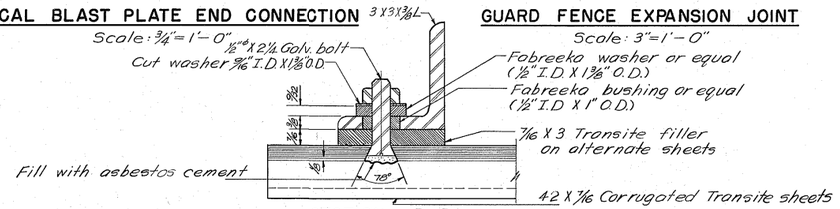
Scale: 3"=1'-0"



TYPICAL BLAST PLATE END CONNECTION

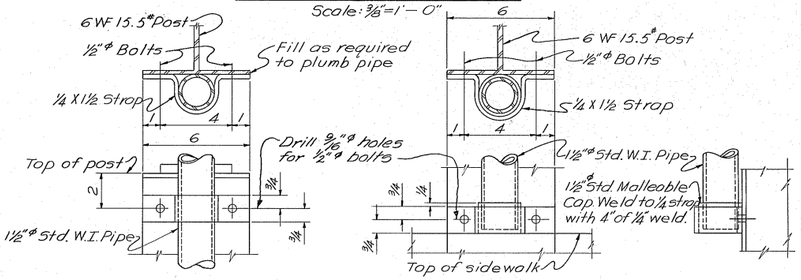
GUARD FENCE EXPANSION JOINT

Scale: 3"=1'-0"



SECTION B-B

Scale: 6"=1'-0"



TOP BRACKET

BOTTOM BRACKET

PIPE BRACKET DETAILS

Scale: 3"=1'-0"

NOTE: Corrugated Transite sheets shall be erected with rough side towards the tracks and with alternate sheets bolted in contact with the steel Frame. The remaining sheets shall be furred out from the steel frame with 7/16 X 3 transite fillers and shall be lapped over the alternate transite sheets one corrugation.

NOTES

OTHER NOTES:- For other notes see Dwgs. No. 3928, No. 3929, No. 3944.

STATE OF MONTANA
STATE HIGHWAY COMMISSION

BRIDGE OVER CLARK FORK & C.M.ST.P. & P. R.R.
AT MISSOULA
FED. AID PROJ. NO. UG-405(2) & NO. U-405(2)
MISSOULA COUNTY

BLAST PLATE & GUARD FENCE DETAILS

Scale: As Noted

DESIGNED	R.D.K.	10-25-56
DRAWN	R.D.K.	10-30-56
TRACED	H.K.L.	11-1-56
CHECKED	H.E.S.	11-19-56
REVISED		
REVISED		

STATE PRECONST. NUMBER 5405-01

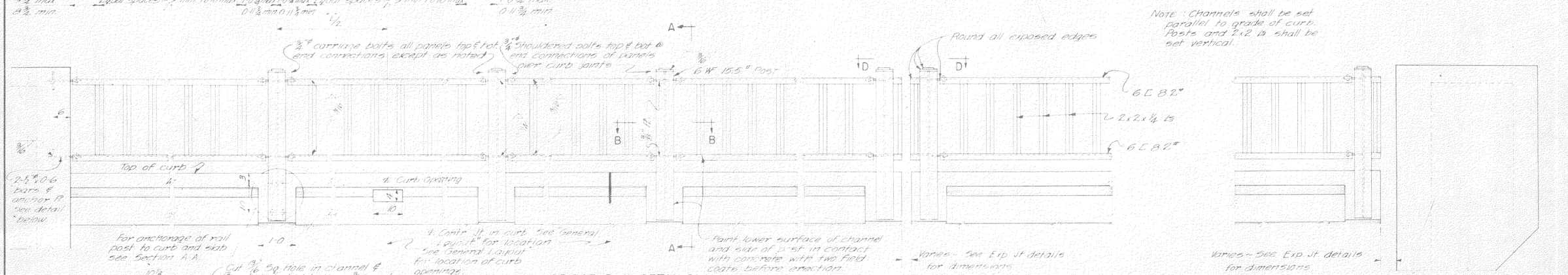
DRAWING NO. 3949

J.R.B.

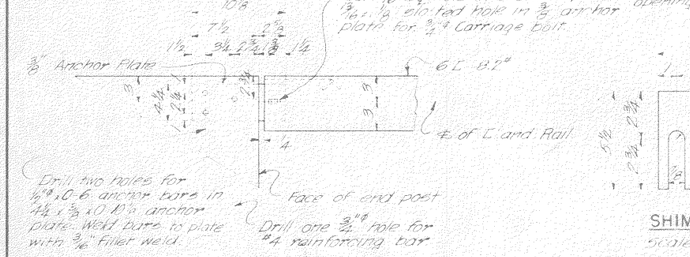
FED. ROAD DIV. NO.	STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
8	MONT.	[redacted]		

FOR REFERENCE ONLY — BHM 1020(10) B41

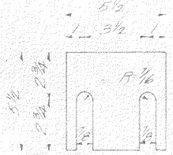
NOTE: All rail units and posts shall receive one shop coat and two field coats of paint on all surfaces. The price bid per linear foot for Steel Bridge Rail shall be full payment for the rail units and posts complete in place, including painting, all bolts, and all incidentals pertaining thereto.



STEEL BRIDGE RAIL DETAILS
Scale ~ ¾" = 1'-0"

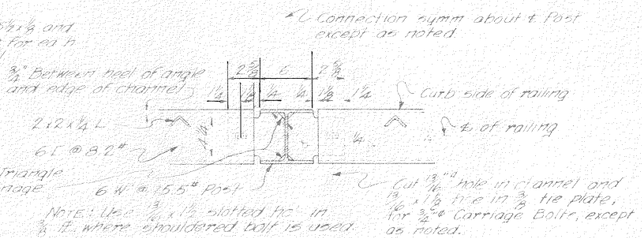


DETAIL OF RAIL CONNECTION AT END POSTS
Scale ~ 1½" = 1'-0"



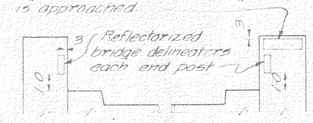
SHIM DETAIL
Scale ~ 3" = 1'-0"

NOTE: Provide 1-5½ x 5½ x ⅛ and 1-5 x 5½ x 1/16 shim for each post to align rail.



SECTION B-B
TYPICAL RAIL CONNECTION AT INTERMEDIATE POSTS
Scale ~ 1½" = 1'-0"

One or two line bridge marker. Right hand rail post as bridge is approached.



ELEVATION - END POSTS
Scale ~ ¼" = 1'-0"

REFLECTOR SIGNALS: Reflector signals shall be used at all four corners of bridge as indicated above. Signals shall be made with "Silver Scotchlite" or equal reflective material applied with waterproof glue to a 4" x 12" x 16 gage flat steel plate. Paint steel plate one prime coat and two enamel coats both sides before reflective material is applied. Fasten signal to end posts with 2-⅜" ø, 3" galv bolts embedded in concrete.

Cost of furnishing and placing bridge reflector signals shall be included in the unit price bid for Class "AD" Concrete.

BRIDGE MARKERS: Prior to painting, the bridge marker plates shall be cleaned with gasoline. One coat flat white and two coats of white enamel shall be applied over the entire surface of the plate. "Silver Scotchlite" or equivalent reflectorizing material shall then be applied to the entire face of the marker plate with special waterproof adhesive as recommended by the manufacturers of the reflectorizing material. For name on marker see General Layout.

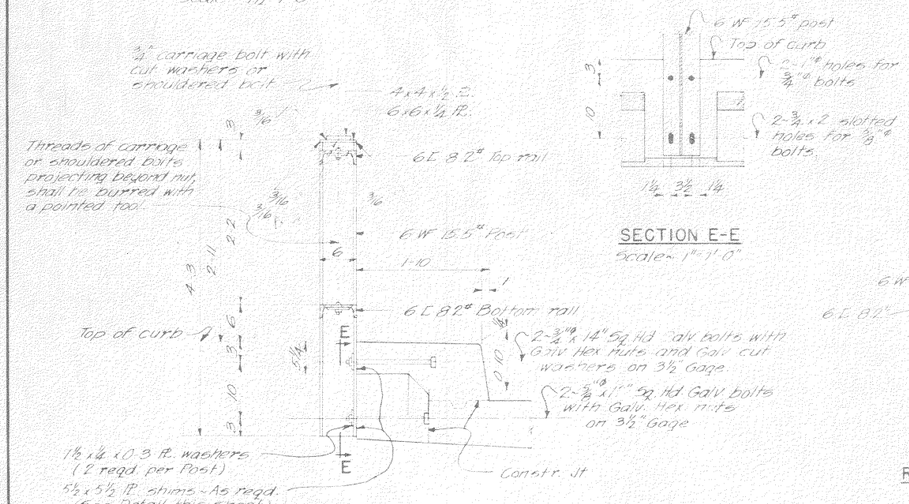
Lettering and ¼" border shall be of sign writer's "Lettering Black".

Length "L" of bridge marker plate shall be of sufficient length to properly proportion the Gothic letters on the marker using ⅜" brush width and ½" between letters. If "L" shall exceed 2-2 for one line bridge marker for proper proportion of letters, use the 2 line marker as detailed above.

All corners of the bridge marker plates shall be rounded and smoothed.

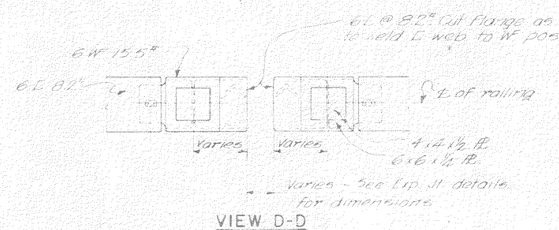
Bridge marker plates shall be fastened to end posts by four ½" ø x 6 galv. bolts, embedded in concrete, and held in place by nuts with cut washers each bolt.

Cost of furnishing and placing bridge marker plates shall be included in the unit price bid for Class "AD" Concrete.

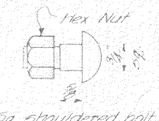


SECTION A-A
Scale ~ 1" = 1'-0"

SECTION E-E
Scale ~ 1" = 1'-0"



VIEW D-D
RAILING OVER EXPANSION JOINT
Scale ~ 1½" = 1'-0"



¾" Sq. shouldered bolt to be used at ends of Rail Panels as noted above.

SHOULDERED BOLT DETAIL
Scale ~ 6" = 1'-0"

STATE OF MONTANA
STATE HIGHWAY COMMISSION

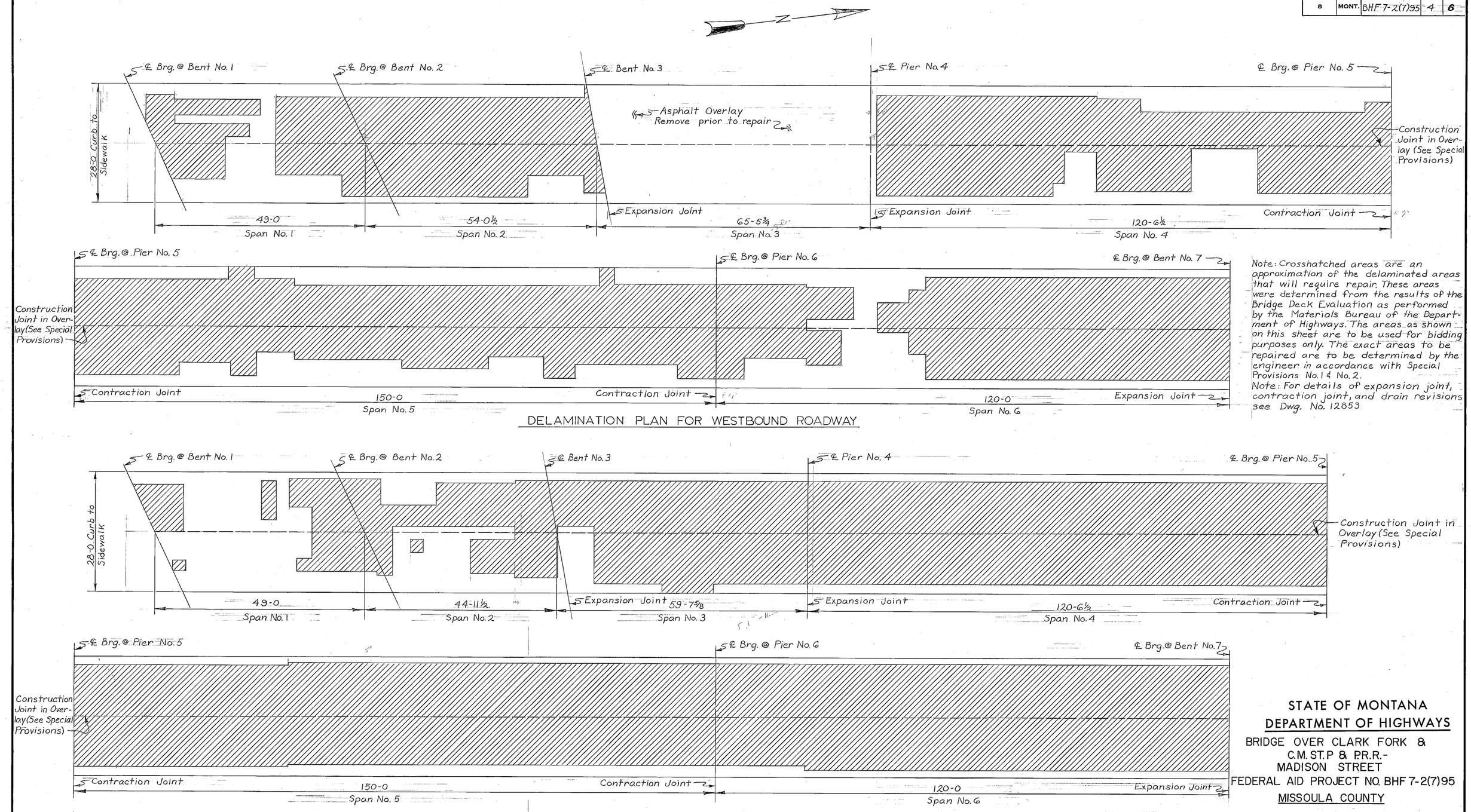
STANDARD STEEL BRIDGE RAIL
TYPE NO. 3
Scale ~ As Noted

DESIGNED		
DRAWN	R.F.M.	8-11-55
TRACED	F.L.S.	8-18-55
CHECKED	[illegible]	8-22-55
REVISED		
REVISED		

APPROVED BY [illegible] BRIDGE ENGINEER

DRAWING NO. SBR-T3

FED. ROAD DIV. NO.	STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
8	MONT.	BHF 7-2(7)95	4	6



DELAMINATION PLAN FOR WESTBOUND ROADWAY

DELAMINATION PLAN FOR EASTBOUND ROADWAY

Note: Crosshatched areas are an approximation of the delaminated areas that will require repair. These areas were determined from the results of the Bridge Deck Evaluation as performed by the Materials Bureau of the Department of Highways. The areas as shown on this sheet are to be used for bidding purposes only. The exact areas to be repaired are to be determined by the engineer in accordance with Special Provisions No. 1 & No. 2.

Note: For details of expansion joint, contraction joint, and drain revisions see Dwg. No. 12853

DESIGNED	7-2-80	M.L.R.
DRAWN	10-6-80	J.R.P.
CHECKED	11-25-80	L.G.P.
REVISED		
REVISED		
REVISED		

STATE OF MONTANA

DEPARTMENT OF HIGHWAYS

BRIDGE OVER CLARK FORK &
C.M. ST. P & P.R.R.-
MADISON STREET

FEDERAL AID PROJECT NO. BHF 7-2(7)95

MISSOULA COUNTY

DELAMINATION OF EASTBOUND & WESTBOUND ROADWAY

Scale: 1" = 10-0

DRAWING NO. 12852

FED. ROAD DIV. NO.	STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
8	MONT.	BHF-7-2(7)95	2	6

TABLE OF CONTENTS

BRIDGE PLANS	SHEET NO.	DWG. NO.
TITLE SHEET	1	
TABLE OF CONTENTS	2	
SUMMARY	2 & 6	
GENERAL LAYOUT	3	3928
DELAMINATION OF EASTBOUND & WESTBOUND ROADWAY	4	12852
JOINT, FLOOR DRAIN, APPROACH TREATMENT AND OVERLAY DEFINITION	5	12853
SUMMARY AND TRAFFIC CONTROL	6	

SUMMARY

ITEM	UNIT	QUANTITY N.B.	QUANTITY S.B.	REMARKS
BRIDGE FLOOR OVERLAY	SQ. YDS.	1,678.09 ~~2,813.3~~	1724.52 ~~2,864.3~~	COVER ENTIRE BRIDGE FLOOR
CONCRETE - CLASS DD	SQ. YDS	321.21		S.E = 15.48 SQ YDS & N.B = 305.73 SQ YDS.
CLASS A BRIDGE FLOOR REPAIR	SQ. YDS.	~~1,710~~ 926.94	1,768 753.24	REPAIR AREAS OF DELAMINATION
STRUCTURAL STEEL	LUMP SUM	$16602.39 ~~.502~~	$16602.40 ~~.498~~	ADDED AT JOINTS
REINFORCING STEEL	LBS.	0 ~~1,000~~	0 ~~1,000~~	REPLACE CORRODED STEEL
PROTECTIVE COATING	SQ. YDS.	2164.0 ~~3,720~~	2228.0 ~~3,752~~	COVER ENTIRE BRIDGE FLOOR, MEDIAN CURB & SIDEWALK
DETOUR - PREPARE	LUMP SUM	1.0 = $14,000		
TRAFFIC CONTROL - DEVICES	UNIT	3,649.2		
TRAFFIC CONTROL - FLAGGING	HOUR	205		
MOBILIZATION	LUMP SUM	0.4 = $2000		
CONTRACT BOND	LUMP SUM	0.23238 = $1,394.28		
CURB-CONC. MEDIAN TYPE A	LN. FT.	951.4		SE = 144 LF. & N.E = 807.40
MISCELLANEOUS WORK	LUMP SUM	.50 = $9,500		
WORK BY AGREEMENT — STRUCTURAL STEEL	LUMP SUM	1.0 = $33,204.79		

NOTE: S.E. = SOUTH END
N.E. = NORTH END

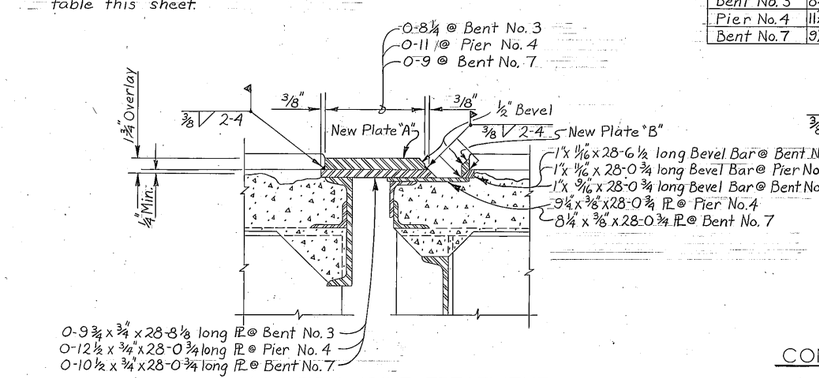
Rv By: DAVID C BALKOVETZ CONST. BR 1-18-84

DRAWING NO. 12852 Q

FED. ROAD DIV. NO.	STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
8	MONT.	BHF 7-2(7)95	5	6

Note: For plate size see table this sheet

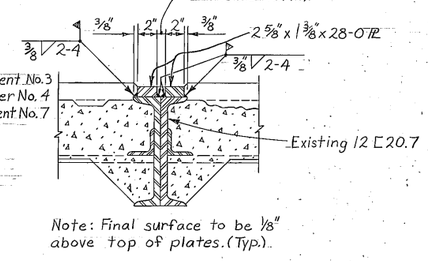
PLATE SIZE TABLE		
Location	Plate A	Plate B
Bent No. 3	8¼"x1⅜"x28-7⅜	2⅞"x¾"x28-5
Pier No. 4	11"x1⅜"x28-0	2⅞"x¾"x28-0
Bent No. 7	9"x1⅜"x28-0	1⅞"x¾"x28-0



EXPANSION JOINT TREATMENT

At Bents No. 3 & 7 and Pier No. 4

Scale: 1½" = 1'-0"

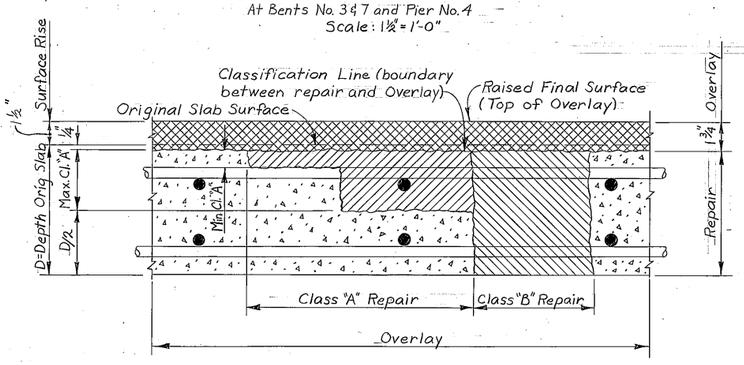


Note: Final surface to be ⅛" above top of plates. (Typ.).

CONTRACTION JOINT TREATMENT

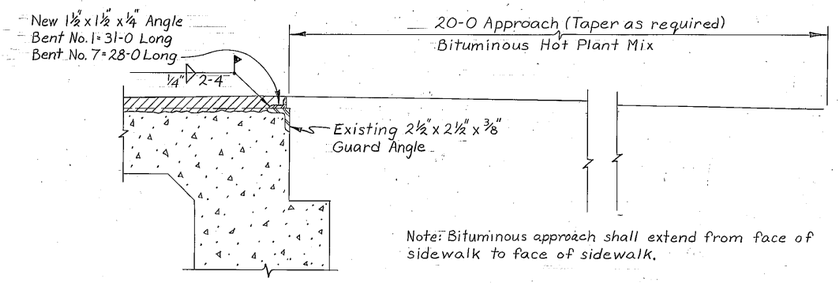
At Piers No. 5 & No. 6

Scale: 1½" = 1'-0"



REPAIR AND OVERLAY DEFINITION

Scale: 3" = 1'-0"



Note: Bituminous approach shall extend from face of sidewalk to face of sidewalk.

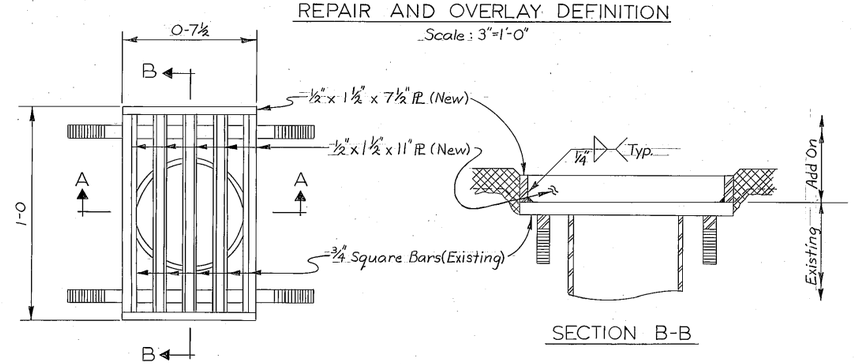
APPROACH TREATMENT (Typ. Both Ends)

Scale: 1½" = 1'-0"

Note: All material, labor, welding and painting necessary to make the required modifications to the drainage grates, expansion and contraction joints, and guard angles at the end bents shall be included in the Lump Sum bid for Structural Steel.

Note: Painting of structural steel shall conform to Standard Specifications. (See Section 91)

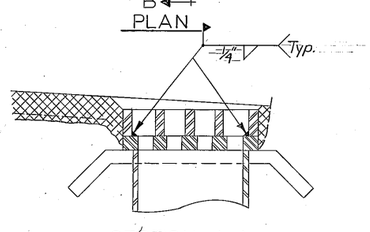
Note: In case dimensions of existing structure are not as shown on these drawings, vary construction as necessary to match existing structure. The contractor shall verify all dimensions of the existing structure in the field before ordering material.



SECTION B-B

B

PLAN



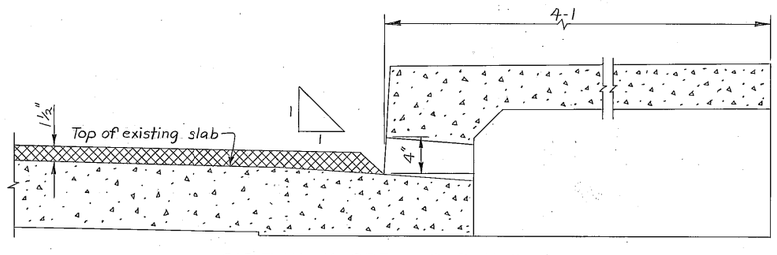
SECTION A-A

Note: Drainage Grate to be fabricated in shop then welded in place in field.

Note: Contractor shall verify all dimensions before fabrication of the new drain grates.

FLOOR DRAIN TREATMENT

Scale: 3" = 1'-0"



SIDEWALK OPENING DETAIL (Spans No. 1 & No. 3)

Scale: 1½" = 1'-0"

Notes

Specifications: Montana Department of Highways and the Montana Highway Commission Standard Specifications for Road and Bridge Construction, 1981 Edition, and any amendments thereto, and Special Provisions shall govern unless otherwise noted. Design prepared in accordance with A.A.S.H.T.O. Specifications, 1977 Edition and any amendments thereto.

Structural Steel: All structural steel shall be measured and paid for on the lump sum basis as set forth in the Standard Specifications. Estimated weight = 6,050 lbs.

Approach: Bituminous approaches to be bid as lump sum for miscellaneous work. (See Special Provisions)

Overlay Treatment: For definition of Class A and Class B repair and overlay see "Special Provisions".

Note: All new #4 reinforcing bars shall be lapped 1-4 min. and #5 bars shall be lapped 1-8 min. See "Special Provisions."

STATE OF MONTANA

DEPARTMENT OF HIGHWAYS

BRIDGE OVER CLARK FORK & C.M. ST. P. & P.R.R.-
MADISON STREET
FEDERAL AID PROJECT NO. BHF 7-2(7)95

MISSOULA COUNTY

DESIGNED	7-2-80	M.L.R.
DRAWN	10-8-80	JRP
CHECKED	11-25-80	LGP
REVISED		
REVISED		
REVISED		

JOINT, FLOOR DRAIN, APPROACH TREATMENT & OVERLAY DEFINITION

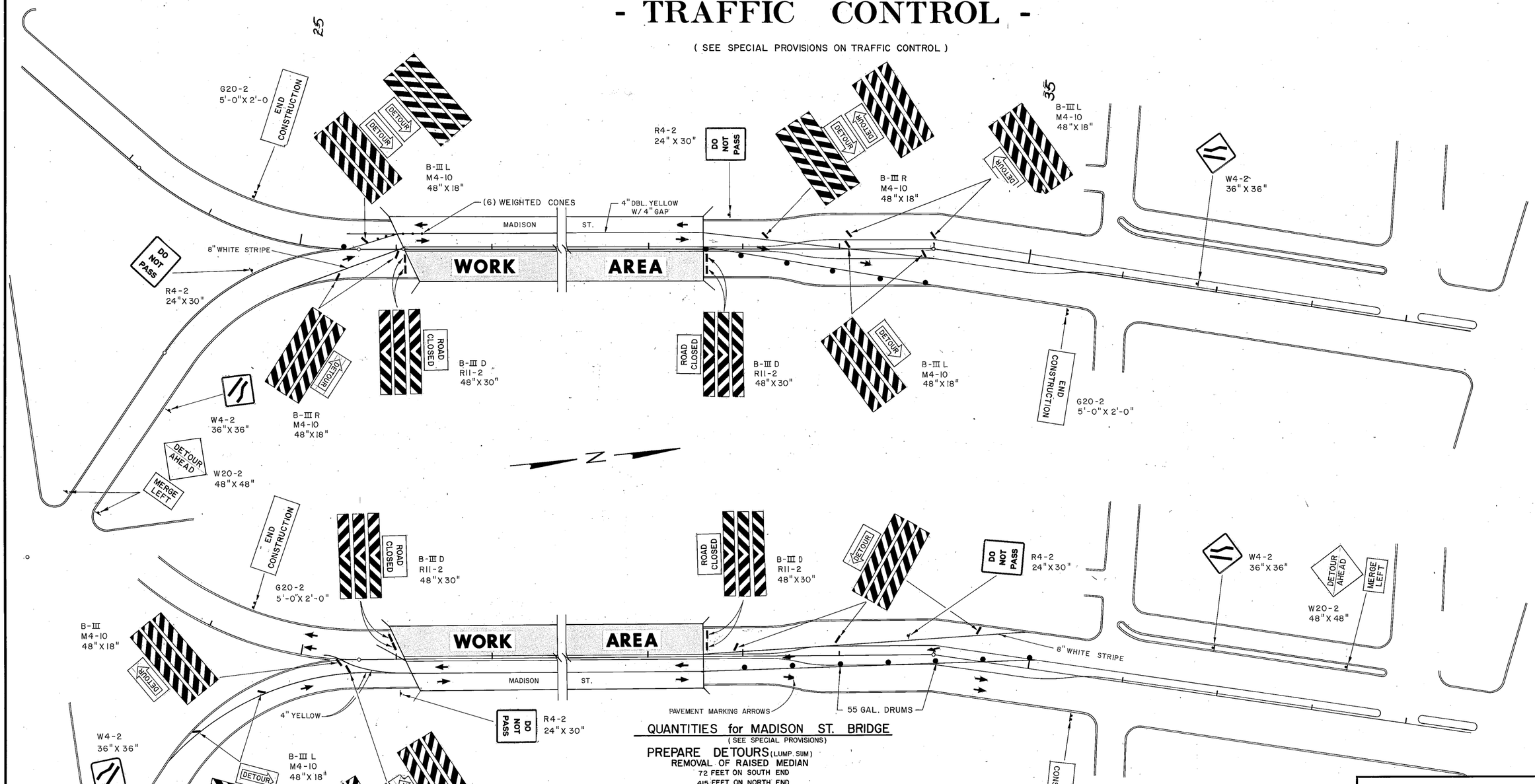
Scale as noted

DRAWING NO. 12853

STATE	PROJECT NUMBER	SHEET NO.
MONTANA	BHF - 7-2(7)95	6

SUMMARY
AND
- TRAFFIC CONTROL -

(SEE SPECIAL PROVISIONS ON TRAFFIC CONTROL)



QUANTITIES for MADISON ST. BRIDGE
(SEE SPECIAL PROVISIONS)

PREPARE DETOURS (LUMP SUM)

REMOVAL OF RAISED MEDIAN
- 72 FEET ON SOUTH END
- 415 FEET ON NORTH END

PLANT MIX SURFACING (GRADE "C" FOR PATCHING)
- 475 S.Y. OF SURFACING

NEW MEDIAN CURB (TYPE "A")
- 144 LINEAL FEET ON SOUTH END
- 846 LINEAL FEET ON NORTH END

NEW CONCRETE MEDIAN CAP - 4" DD CONCRETE
- 17 SQ. YDS. ON SOUTH END
- 323 SQ. YDS. ON NORTH END

0.2' CRUSHED TOP SURFACE-TYPE A, GRADE 2 (UNDER MED. CAP)
(INCLUDED IN UNIT PRICE BID FOR DD CONCRETE)

10,000 UNITS OF TRAFFIC CONTROL DEVICES

300 HOURS FLAGGING

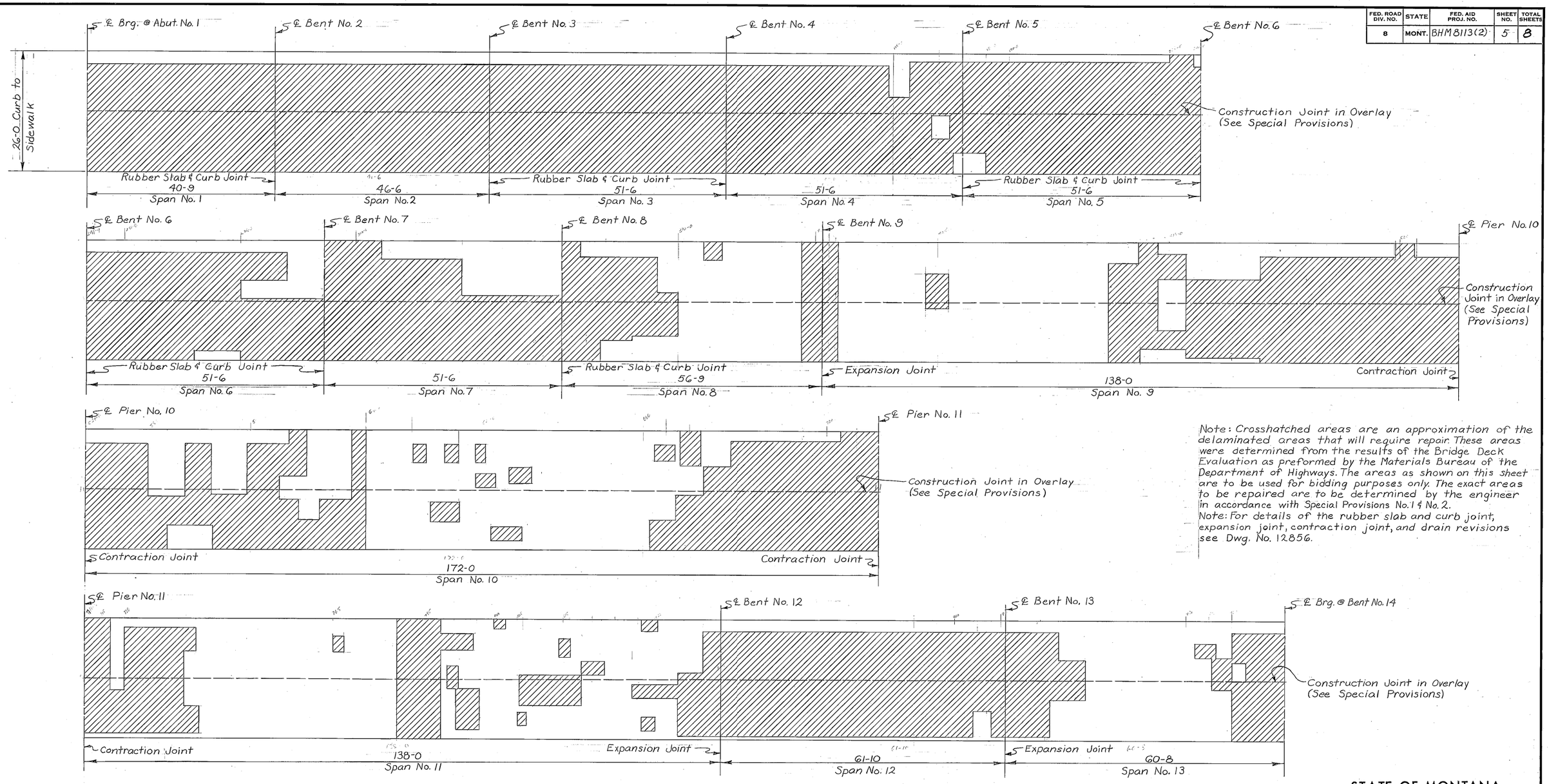
MADISON STREET BRIDGE

REDECKING

BHF - 7-2(7)95

Dwg. No. 12853 TC1

FED. ROAD DIV. NO.	STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
8	MONT.	BHM 8113(2)	5	8



Note: Crosshatched areas are an approximation of the delaminated areas that will require repair. These areas were determined from the results of the Bridge Deck Evaluation as preformed by the Materials Bureau of the Department of Highways. The areas as shown on this sheet are to be used for bidding purposes only. The exact areas to be repaired are to be determined by the engineer in accordance with Special Provisions No. 1 & No. 2.
Note: For details of the rubber slab and curb joint, expansion joint, contraction joint, and drain revisions see Dwg. No. 12856.

DELAMINATION PLAN

STATE OF MONTANA
DEPARTMENT OF HIGHWAYS

BRIDGE OVER CLARK FORK RIVER & C.M.S.T.P. & PR.R. IN MISSOULA - HIGGINS AVE

FEDERAL AID PROJECT NO. BHM 8113(2)

MISSOULA COUNTY

DELAMINATION OF NORTHBOUND ROADWAY

Scale: 1" = 10'-0"

DESIGNED	7-2-80	MLR
DRAWN	9-24-80	JRP
CHECKED	11-25-80	LGP
REVISED		
REVISED		
REVISED		

DRAWING NO. 12854

FED. ROAD DIV. NO.	STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
8	MONT.	BHM 8113(2)	2	8

TABLE OF CONTENTS

BRIDGE PLANS	SHEET NO.	DWG. NO.
TITLE SHEET	1	
TABLE OF CONTENTS	2	
SUMMARY	2 & 8	
GENERAL LAYOUT	3 & 4	5236 & 5237
DELAMINATION OF NORTHBOUND ROADWAY	5	12854
DELAMINATION OF SOUTHBOUND ROADWAY	6	12855
JOINT, FLOOR DRAIN, APPROACH TREATMENT AND OVERLAY DEFINITION	7	12856
SUMMARY AND TRAFFIC CONTROL	8	

SUMMARY

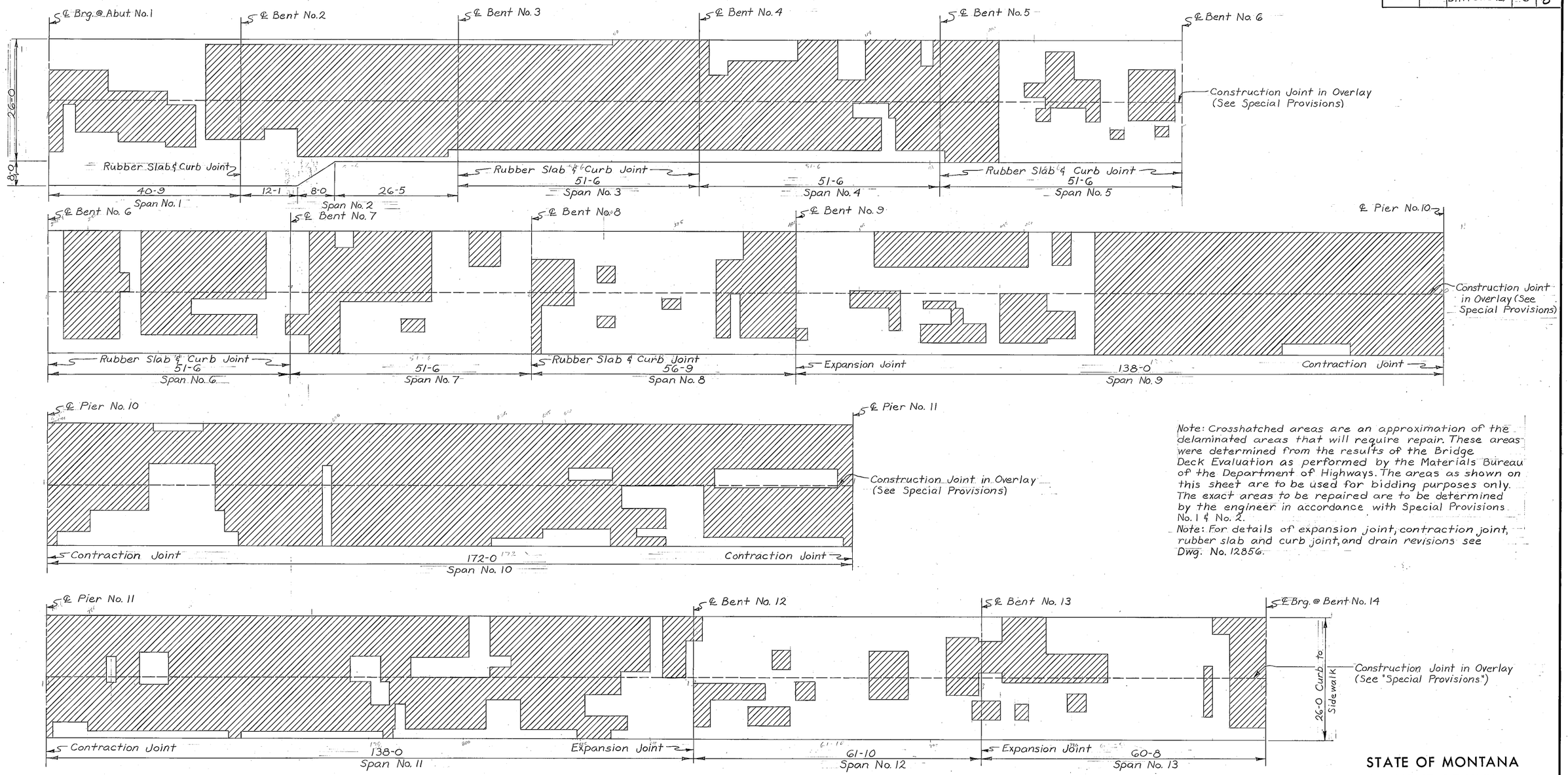
ITEM	UNIT	QUANTITY N.B.	QUANTITY S.B.	REMARKS
BRIDGE FLOOR OVERLAY	SQ. YDS.	~~2,813.3~~ 3,783.38	~~2,864.3~~ 2,840.23	COVER ENTIRE BRIDGE FLOOR
CLASS A BRIDGE FLOOR REPAIR	SQ. YDS.	~~1,710~~ 1083.32	~~1,768~~ 1555.95	REPAIR AREAS OF DELAMINATION
STRUCTURAL STEEL	LUMP SUM	~~.502=~~ $18,089.66	~~.498=~~ $17,945.31	ADDED AT JOINTS
REINFORCING STEEL	LBS.	~~1,000~~ 68.3	~~1,000~~ 0	REPLACE CORRODED STEEL
PROTECTIVE COATING	SQ. YDS.	~~3,720~~ 3743.0	~~3,752~~ 3776.0	COVER ENTIRE BRIDGE FLOOR, MEDIAN CURB & SIDEWALK
DETOUR - PREPARE	LUMP SUM	1.0 = $ 14,000		
TRAFFIC CONTROL DEVICES	UNIT	4,564.4		
TRAFFIC CONTROL FLAGGING	HOUR	280		
MOBILIZATION	LUMP SUM	0.6 = $3,000		
CONTRACT BOND	LUMP SUM	0.34857 = $2,091.42		
CONCRETE CLASS DD	SQ. YD.	98.05		S.B. = 57.69 CU. YDS & N.B. = 40.36 CU. YD.
CURB - CONC. MEDIAN TYPE A	LN. FT.	892		S.B. = 368 CU. YD. & N.B. = 524 CU. YD.
MISCELLANEOUS WORK	LUMP SUM	0.5 = $9,500		S.B. = .25 LS = $4,750 & N.B. = .25 L.S. = $4,750
WORK BY AGREEMENT ITEMS: STRUCTURAL STEEL	LUMP SUM	1.0 = $36,033.17		SEE C.O. #1
WORK BY AGREEMENT ITEMS: REMOVE & REPLACE SIDEWALK EXP. JT.	EACH	1		SEE C.O. #2
WORK BY AGREEMENT ITEMS: COMPRESSION SEALS	LUMP SUM	1.0 = $1,386.45		SEE C.O. #3 (NON-PARTICIPATING ITEM

R.V.E. COMPLETED BY: DAVID C. BALKOVETZ CONST. BR. 1-17-84

DRAWING NO. 12854 Q

K+E HERCULENE® DRAFTING FILM

FED. ROAD DIV. NO.	STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
8	MONT.	BHM 8113(2)	6	8

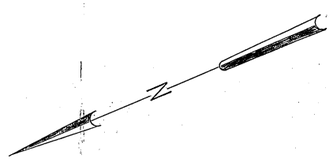


Note: Crosshatched areas are an approximation of the delaminated areas that will require repair. These areas were determined from the results of the Bridge Deck Evaluation as performed by the Materials Bureau of the Department of Highways. The areas as shown on this sheet are to be used for bidding purposes only. The exact areas to be repaired are to be determined by the engineer in accordance with Special Provisions No. 1 & No. 2.

Note: For details of expansion joint, contraction joint, rubber slab and curb joint, and drain revisions see Dwg. No. 12856.

DELAMINATION PLAN

S. B.



STATE OF MONTANA
DEPARTMENT OF HIGHWAYS

BRIDGE OVER CLARK FORK RIVER & C.M.ST.P. & PR.R. IN MISSOULA - HIGGINS AVE

FEDERAL AID PROJECT NO. BHM 8113(2)

MISSOULA COUNTY

DELAMINATION OF SOUTHBOUND ROADWAY

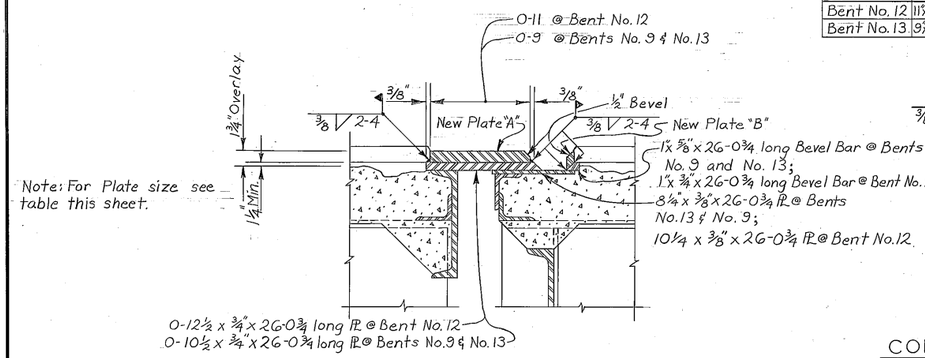
Scale: 1" = 10'-0"

DRAWING NO. 12855

DESIGNED	7-2-80	MLR
DRAWN	9-24-80	JRP
CHECKED	11-25-80	LGP
REVISED		
REVISED		
REVISED		

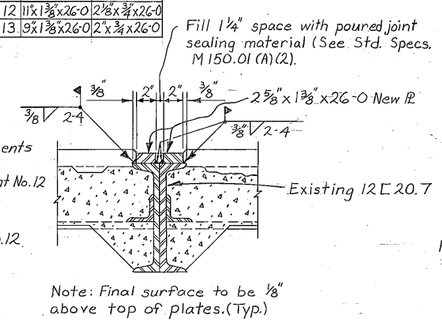
FED. ROAD DIV. NO.	STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
8	MONT.	BHM 8113(2)	7	8

PLATE SIZE TABLE		
Location	Plate A	Plate B
Bent No. 9	9"x1⅜"x26-0	2"x¾"x26-0
Bent No. 12	11"x1⅜"x26-0	2⅛"x¾"x26-0
Bent No. 13	9"x1⅜"x26-0	2"x¾"x26-0



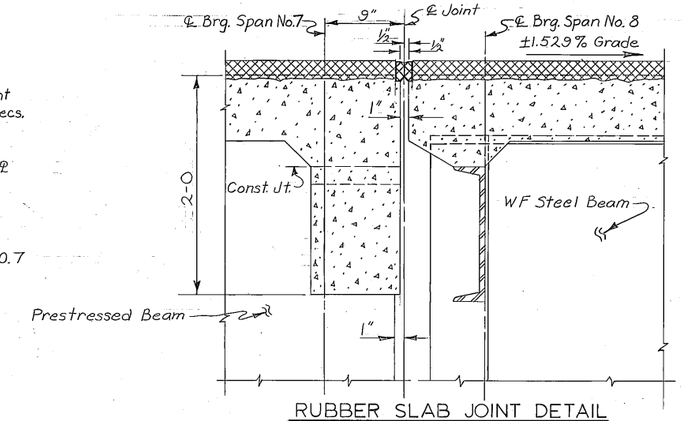
EXPANSION JOINT TREATMENT

At Bents No. 9, No. 12 and No. 13.
Scale: 1½" = 1'-0"



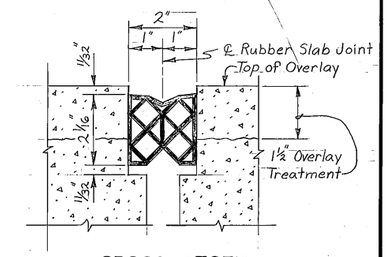
CONTRACTION JOINT TREATMENT

At Piers No. 10 & No. 11
Scale: 1½" = 1'-0"



RUBBER SLAB JOINT DETAIL

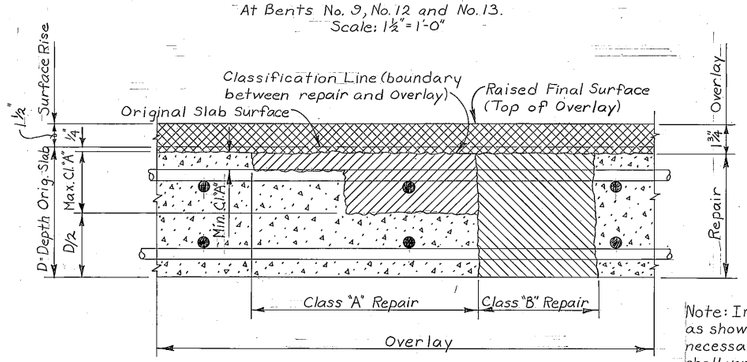
(Bent No. 8 shown, Bent No. 2 thru No. 8 similar)
Scale: 1½" = 1'-0"



CROSS SECTION OF RUBBER JOINT

Scale: ½" = 1"

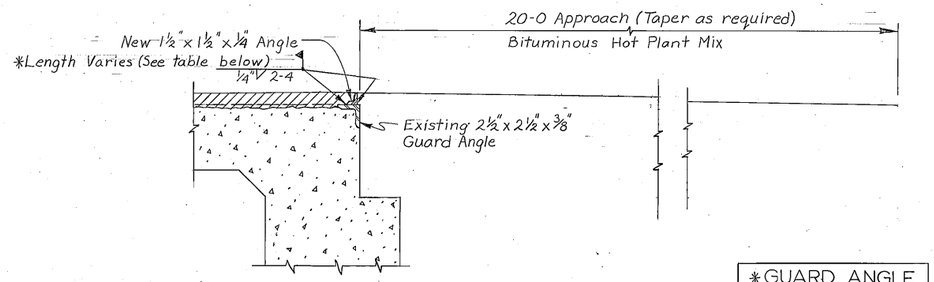
Note: For properties and specifications of rubber joint see "Special Provisions."



REPAIR AND OVERLAY DEFINITION

Scale: 3" = 1'-0"

Note: In case dimensions of existing structure are not as shown on these drawings, vary construction as necessary to match existing structure. The contractor shall verify all dimensions of the existing structure in the field before ordering material.



APPROACH TREATMENT

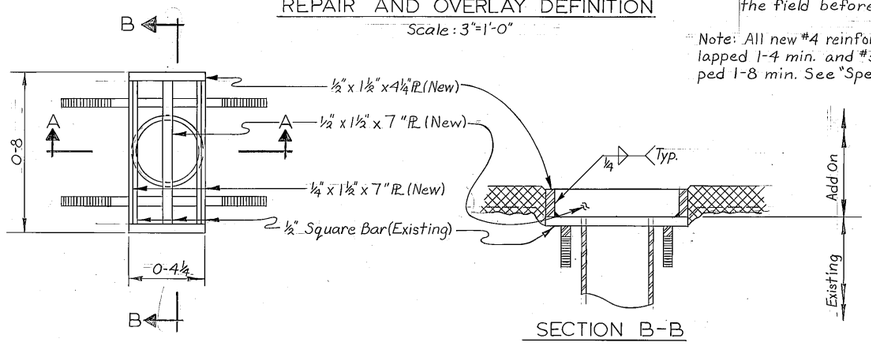
Scale: 1½" = 1'-0"

Note: Bituminus overlay shall extend from face of sidewalk to face of sidewalk.

*GUARD ANGLE LENGTH		
	Bent No. 1	Bent No. 14
S.B.	34-0	26-0
N.B.	26-0	26-0

Note: All new #4 reinforcing bars shall be lapped 1-4 min. and #5 bars shall be lapped 1-8 min. See "Special Provisions."

Note: All material, labor, welding and painting necessary to make the required modifications to the drainage grates, expansion joints, contr joints, rubber slab & curb joints, and guard angles at the end bents shall be included in the Lump Sum bid for Structural Steel.

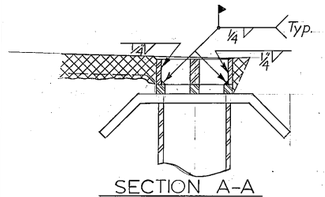


PLAN

SECTION B-B

Note: Drainage Grate to be fabricated in shop then welded in place in field.

Note: Contractor shall verify all dimensions before fabrication of the new drain grates.



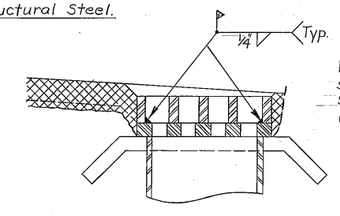
SECTION A-A

Note: Drainage Grate to be fabricated in shop then welded in place in field.

Note: Contractor shall verify all dimensions before fabrication of the new drain grates.

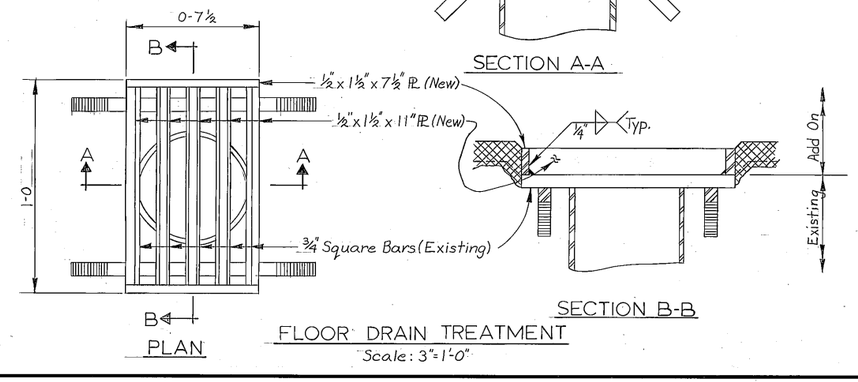
FLOOR DRAIN TREATMENT

Scale: 3" = 1'-0"



SECTION A-A

Note: Painting of structural steel shall conform to Standard Specifications, (See Section 91.)



PLAN

SECTION B-B

FLOOR DRAIN TREATMENT

Scale: 3" = 1'-0"

Notes

Specifications: Montana Department of Highways and the Montana Highway Commission Standard Specifications for Road and Bridge Construction, 1981 Edition, and any amendments thereto, and Special Provisions shall govern unless otherwise noted. Design prepared in accordance with A.A.S.H.T.O. Specifications, 1977 Edition, and any amendments thereto.

Structural Steel: All structural steel shall be measured and paid for on the lump sum basis as set forth in the Standard Specifications. Estimated weight = 5,914 lbs.

Approach: Bituminous approaches to be bid as lump sum for miscellaneous work (See Special Provisions)

Overlay Treatment: For definition of Class A and Class B repair and overlay see "Special Provisions".

Note: Existing rubber slab and curb joint shall be removed from face of curb to face of sidewalk. The existing concrete shall be removed to provide a 2" x 2¾" blockout from top of overlay. Payment for the new rubber slab joint shall be included in the lump sum price bid for Structural Steel.

STATE OF MONTANA
DEPARTMENT OF HIGHWAYS

BRIDGE OVER CLARK FORK RIVER & C.M.S.T.P. & P.R.R. IN MISSOULA - HIGGINS AVE.

FEDERAL AID PROJECT NO. BHM 8113(2)

MISSOULA COUNTY

JOINT, FLOOR DRAIN, APPROACH TREATMENT & OVERLAY DEFINITION

Scale as noted

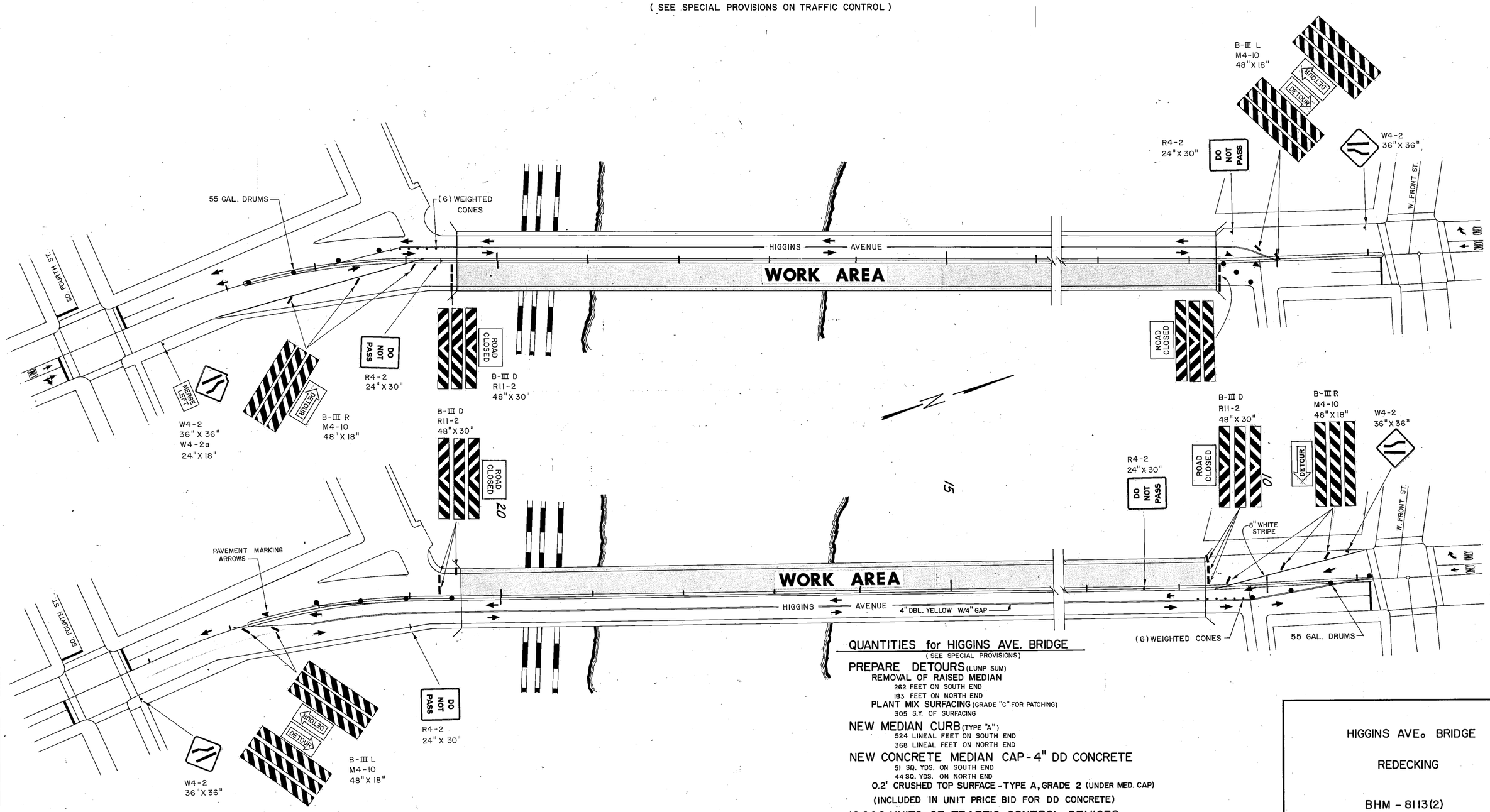
DESIGNED	11-12-80	MLR
DRAWN	10-2-80	JRP
CHECKED	11-25-80	LGP
REVISED		
REVISED		
REVISED		

DRAWING NO. 12856

STATE	PROJECT NUMBER	SHEET NO.
MONTANA	BHM-8113(2)	8

SUMMARY
AND
- TRAFFIC CONTROL -

(SEE SPECIAL PROVISIONS ON TRAFFIC CONTROL)



QUANTITIES for HIGGINS AVE. BRIDGE
(SEE SPECIAL PROVISIONS)

PREPARE DETOURS (LUMP SUM)
REMOVAL OF RAISED MEDIAN
262 FEET ON SOUTH END
183 FEET ON NORTH END
PLANT MIX SURFACING (GRADE "C" FOR PATCHING)
305 S.Y. OF SURFACING

NEW MEDIAN CURB (TYPE "A")
524 LINEAL FEET ON SOUTH END
368 LINEAL FEET ON NORTH END

NEW CONCRETE MEDIAN CAP - 4" DD CONCRETE
51 SQ. YDS. ON SOUTH END
44 SQ. YDS. ON NORTH END
0.2' CRUSHED TOP SURFACE - TYPE A, GRADE 2 (UNDER MED. CAP)
(INCLUDED IN UNIT PRICE BID FOR DD CONCRETE)

10,000 UNITS OF TRAFFIC CONTROL DEVICES
300 HOURS FLAGGING

HIGGINS AVE. BRIDGE

REDECKING

BHM - 8113(2)

Dwg. No 12856 TC1

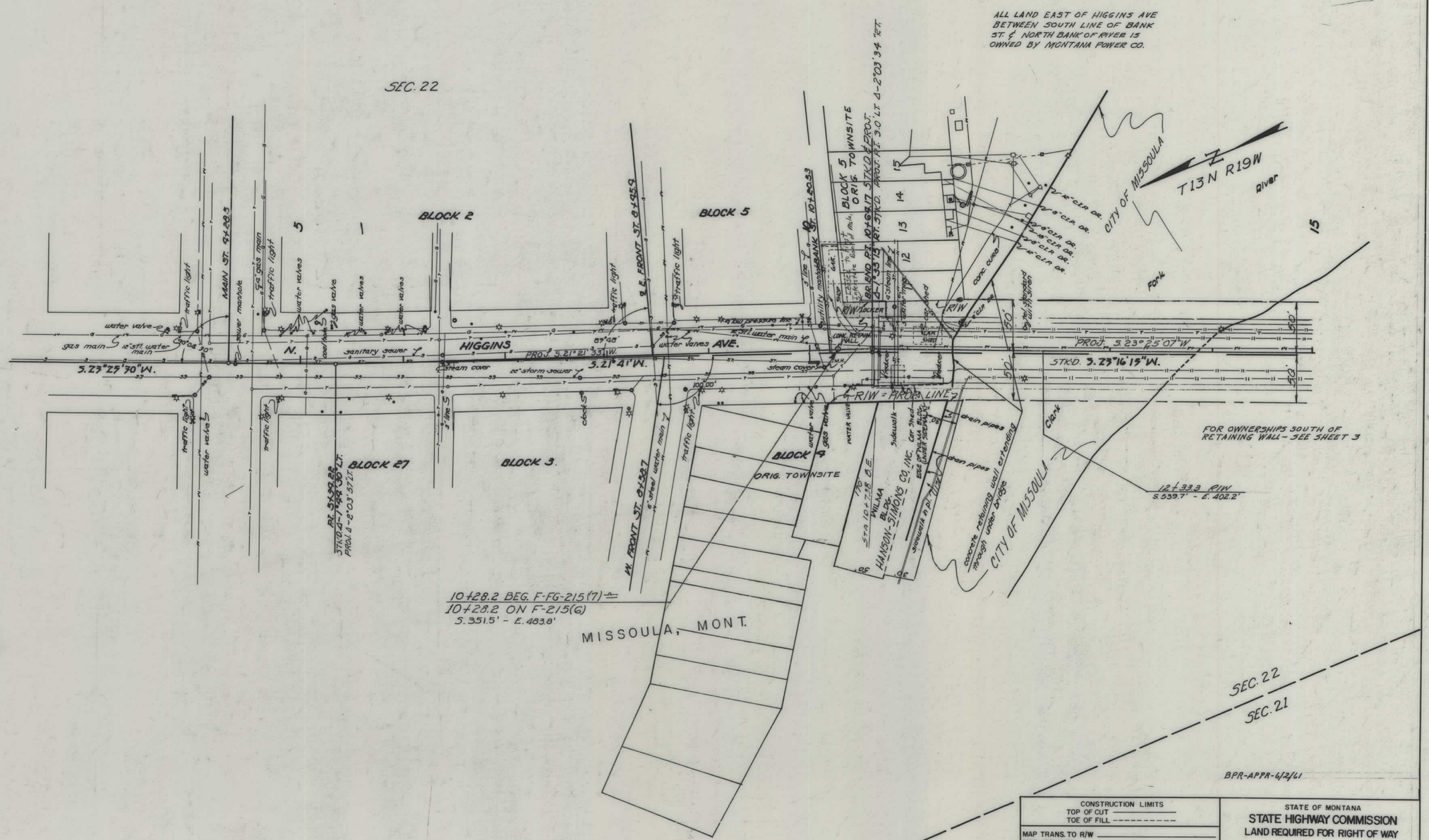
Appendix 5

Bridge Right-of-Way Plans

PLANS
NOT
TO
SCALE

FED. ROAD DIST. NO.	STATE	FED. AID PROJECT NUMBERS		STATE NO.	SHEET NO.	TOTAL SHEETS
		CONST. NO.	R/W NO.			
8	MONT		F-FG-215(7)	1215-07	1	3

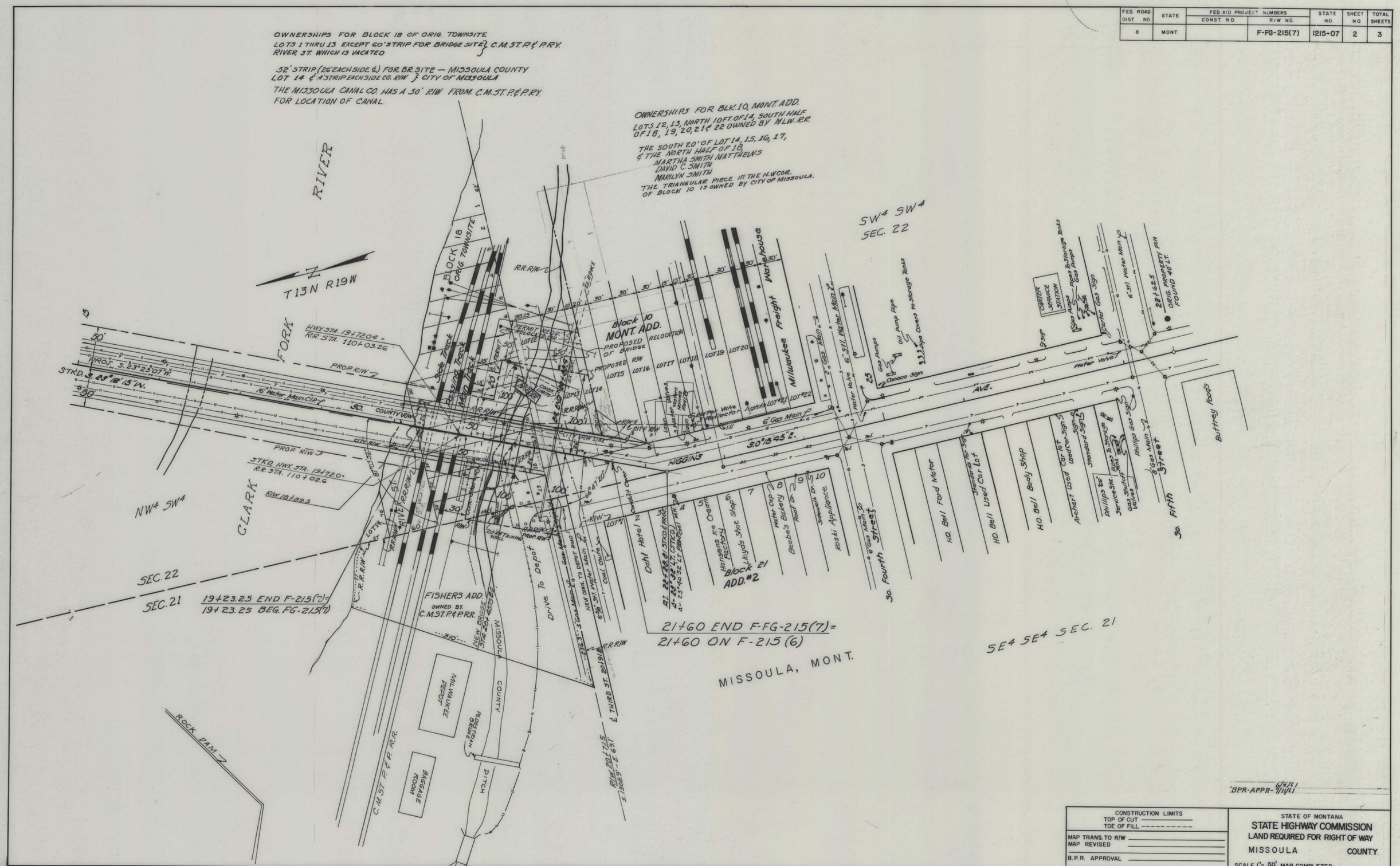
HIGGINS AVE. BRIDGE — MISSOULA



BPR-APPR-6/2/61

CONSTRUCTION LIMITS	STATE OF MONTANA
TOP OF CUT ———	STATE HIGHWAY COMMISSION
TOE OF FILL - - - - - - - -	LAND REQUIRED FOR RIGHT OF WAY
MAP TRANS. TO R/W ———	MISSOULA COUNTY
MAP REVISED ———	
B.P.R. APPROVAL ———	

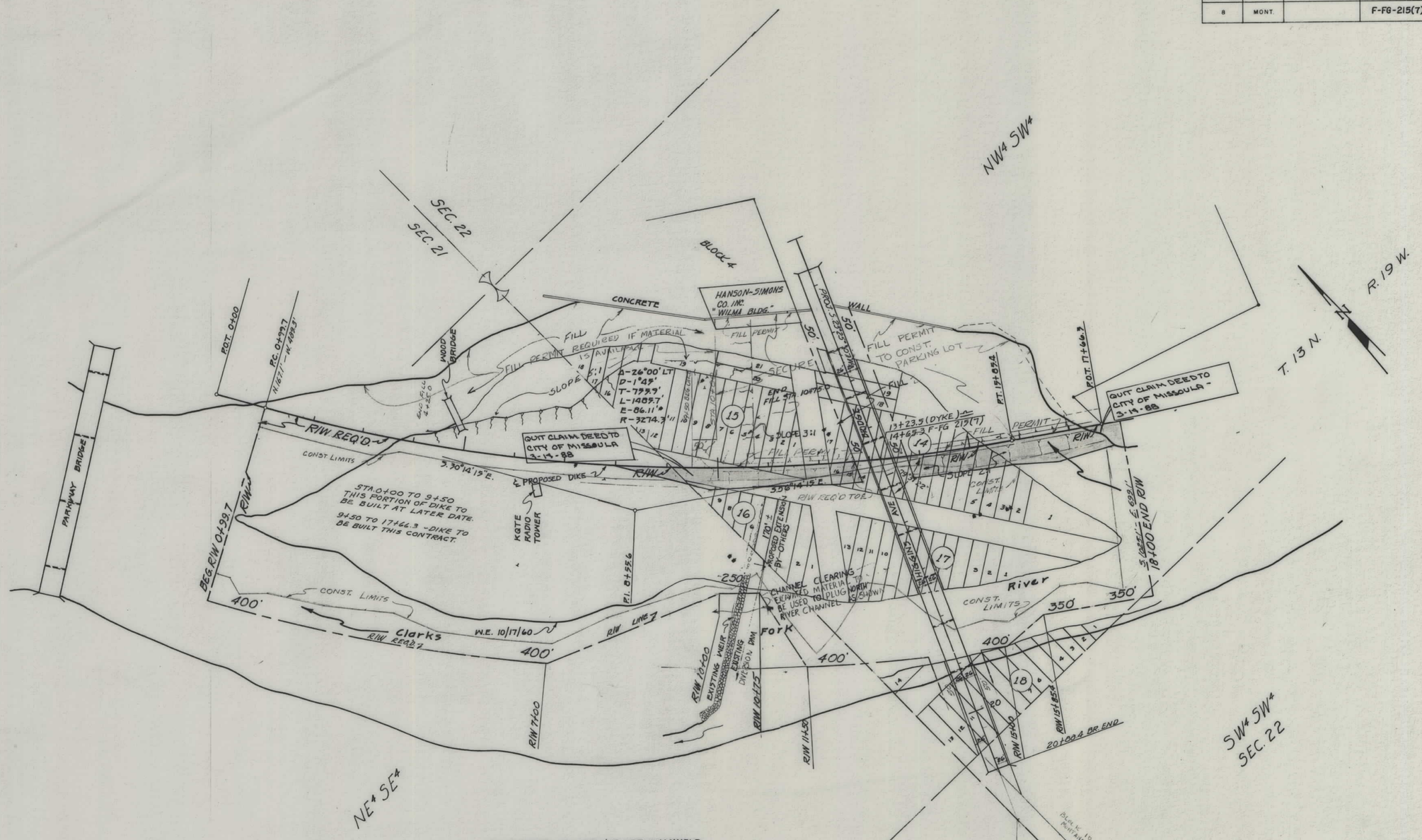
FED. ROAD DIST NO.	STATE	FED. AID PROJECT NUMBERS CONST. NO.	R/W NO.	STATE NO.	SHEET NO	TOTAL SHEETS
8	MONT.		F-FG-215(7)	1215-07	2	3



BPR-APPR-7/11/61

CONSTRUCTION LIMITS	STATE OF MONTANA
TOP OF CUT ———	STATE HIGHWAY COMMISSION
TOE OF FILL - - - - - - - -	LAND REQUIRED FOR RIGHT OF WAY
MAP TRANS. TO R/W ———	MISSOULA COUNTY
MAP REVISED ———	
B.P.R. APPROVAL ———	SCALE 1" = 50' MAP COMPLETED

FED. ROAD DIST. NO.	STATE	FED. AID PROJECT NUMBERS CONST. NO.	R/W NO.	STATE NO.	SHEET NO.	TOTAL SHEETS
8	MONT.		F-FG-215(7)	1215-07	3	3



ALL OF THE ISLAND & RIVER CHANNELS SHOWN BELONG TO THE CITY OF MISSOULA WITH THE FOLLOWING EXCEPTIONS:
A 52' STRIP OF LAND WHERE THE BRIDGE IS LOCATED WAS DEEDED TO MISSOULA COUNTY.
BLOCK 14
BLOCK 17
LOT 1 & LOTS 5 THRU 10 - BLOCK 16
LOTS 12 THRU 18 - BLOCK 15
} ½ INT. UNRESTRICTED CITY OF MISSOULA
½ INT. - CITY OF MISSOULA WITH RESTRICTION "TO BE USED FOR PUBLIC PARK ONLY," WITH REVERTER CLAUSE TO LENITA SPOTTSWOOD

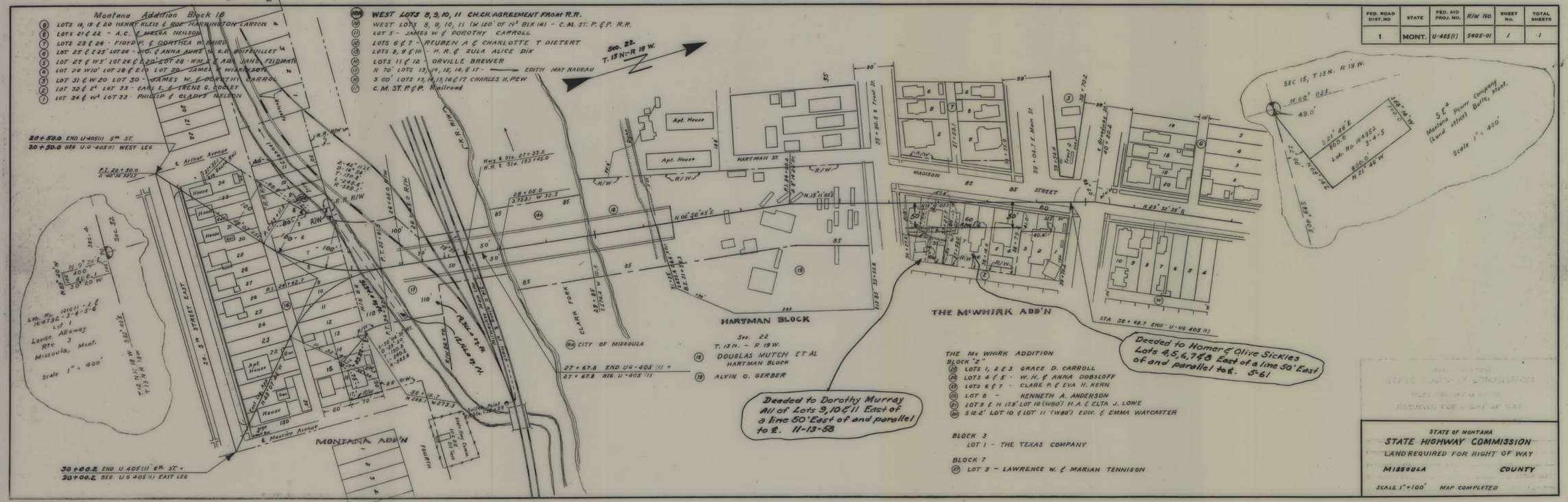
BPR-APPR-6/2/61

CONSTRUCTION LIMITS
TOP OF CUT _____
TOE OF FILL - - - - - - - - - -
MAP TRANS. TO R/W _____

STATE OF MONTANA
STATE HIGHWAY COMMISSION
LAND REQUIRED FOR RIGHT OF WAY

PLANS
NOT
TO
SCALE

FED. ROAD DIST. NO	STATE	FED. AID PROJ. NO.	R/W NO.	SHEET No.	TOTAL SHEETS
1	MONT.	U-405(1)	5405-01	1	1



U 405(1) SHT 1 OF 1

4

Appendix 6

Operational
Analysis Worksheets

MULTILANE HIGHWAYS WORKSHEET(Direction 1)

General Information

Analyst	David Stoner
Agency or Company	DOWL HKM
Date Performed	4/19/2013
Analysis Time Period	AM Peak Hour

Site Information

Highway/Direction to Travel	Higgins Avenue
From/To	Higgins Avenue Bridge
Jurisdiction	Missoula
Analysis Year	2013

Project Description Missoula Bridges Planning Study

☐ Oper.(LOS) ☐ Des. (N) ☐ Plan. (vp)

Flow Inputs

Volume, V (veh/h)	640	Peak-Hour Factor, PHF	0.79
AADT(veh/h)		%Trucks and Buses, P_T	5
Peak-Hour Prop of AADT (veh/d)		%RVs, P_R	0
Peak-Hour Direction Prop, D		General Terrain:	Level
DDHV (veh/h)		Grade Length (mi)	0.00
Driver Type Adjustment	1.00	Up/Down %	0.00
		Number of Lanes	2

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	f_{HV}	0.976

Speed Inputs

Lane Width, LW (ft)	12.0
Total Lateral Clearance, LC (ft)	12.0
Access Points, A (A/mi)	0
Median Type, M	
FFS (measured)	45.0
Base Free-Flow Speed, BFFS	

Calc Speed Adj and FFS

f_{LW} (mi/h)	
f_{LC} (mi/h)	
f_A (mi/h)	
f_M (mi/h)	
FFS (mi/h)	45.0

Operations

Operational (LOS)

Flow Rate, v_p (pc/h/ln)	415
Speed, S (mi/h)	45.0
D (pc/mi/ln)	9.2
LOS	A

Design

Design (N)

Required Number of Lanes, N	
Flow Rate, v_p (pc/h)	
Max Service Flow Rate (pc/h/ln)	
Design LOS	

Bicycle Level of Service

Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*405.1*
Effective width, W_v (Eq. 15-29) ft	*24.00*
Effective speed factor, S_t (Eq. 15-30)	*2.61*
Bicycle level of service score, BLOS (Eq. 15-31)	*2.21*
Bicycle level of service (Exhibit 15-4)	*B*

Copyright © 2012 University of Florida, All Rights Reserved *HCS 2010*™ Version 6.41 Generated: 4/30/2013 10:45 AM

MULTILANE HIGHWAYS WORKSHEET(Direction 1)

General Information

Analyst	David Stoner
Agency or Company	DOWL HKM
Date Performed	4/19/2013
Analysis Time Period	PM Peak Hour

Site Information

Highway/Direction to Travel	Higgins Avenue
From/To	Higgins Avenue Bridge
Jurisdiction	Missoula
Analysis Year	2013

Project Description Missoula Bridges Planning Study

☐ Oper.(LOS) ☐ Des. (N) ☐ Plan. (vp)

Flow Inputs

Volume, V (veh/h)	712	Peak-Hour Factor, PHF	0.84
AADT(veh/h)		%Trucks and Buses, P_T	5
Peak-Hour Prop of AADT (veh/d)		%RVs, P_R	0
Peak-Hour Direction Prop, D		General Terrain:	Level
DDHV (veh/h)		Grade Length (mi)	0.00
Driver Type Adjustment	1.00	Up/Down %	0.00
		Number of Lanes	2

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	f_{HV}	0.976

Speed Inputs

Lane Width, LW (ft)	12.0
Total Lateral Clearance, LC (ft)	12.0
Access Points, A (A/mi)	0
Median Type, M	
FFS (measured)	45.0
Base Free-Flow Speed, BFFS	

Calc Speed Adj and FFS

f_{LW} (mi/h)	
f_{LC} (mi/h)	
f_A (mi/h)	
f_M (mi/h)	
FFS (mi/h)	45.0

Operations

Operational (LOS)

Flow Rate, v_p (pc/h/ln)	434
Speed, S (mi/h)	45.0
D (pc/mi/ln)	9.6
LOS	A

Design

Design (N)

Required Number of Lanes, N	
Flow Rate, v_p (pc/h)	
Max Service Flow Rate (pc/h/ln)	
Design LOS	

Bicycle Level of Service

Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*423.8*
Effective width, W_v (Eq. 15-29) ft	*24.00*
Effective speed factor, S_t (Eq. 15-30)	*2.61*
Bicycle level of service score, BLOS (Eq. 15-31)	*2.23*
Bicycle level of service (Exhibit 15-4)	*B*

Copyright © 2012 University of Florida, All Rights Reserved *HCS 2010*™ Version 6.41 Generated: 4/30/2013 10:49 AM

MULTILANE HIGHWAYS WORKSHEET(Direction 2)

General Information

Analyst	David Stoner
Agency or Company	DOWL HKM
Date Performed	4/19/2013
Analysis Time Period	AM Peak Hour

Site Information

Highway/Direction to Travel	Higgins Avenue
From/To	Higgins Avenue Bridge
Jurisdiction	Missoula
Analysis Year	2013

Project Description Missoula Bridges Planning Study

☐ Oper.(LOS) ☐ Des. (N) ☐ Plan. (vp)

Flow Inputs

Volume, V (veh/h)	335	Peak-Hour Factor, PHF	0.80
AADT(veh/h)		%Trucks and Buses, P_T	5
Peak-Hour Prop of AADT (veh/d)		%RVs, P_R	0
Peak-Hour Direction Prop, D		General Terrain:	Level
DDHV (veh/h)		Grade Length (mi)	0.00
Driver Type Adjustment	1.00	Up/Down %	0.00
		Number of Lanes	2

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	f_{HV}	0.976

Speed Inputs

Lane Width, LW (ft)	12.0
Total Lateral Clearance, LC (ft)	12.0
Access Points, A (A/mi)	0
Median Type, M	
FFS (measured)	45.0
Base Free-Flow Speed, BFFS	

Calc Speed Adj and FFS

f_{LW} (mi/h)	
f_{LC} (mi/h)	
f_A (mi/h)	
f_M (mi/h)	
FFS (mi/h)	45.0

Operations

Operational (LOS)

Flow Rate, v_p (pc/h/ln)	214
Speed, S (mi/h)	45.0
D (pc/mi/ln)	4.8
LOS	A

Design

Design (N)

Required Number of Lanes, N	
Flow Rate, v_p (pc/h)	
Max Service Flow Rate (pc/h/ln)	
Design LOS	

Bicycle Level of Service

Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*209.4*
Effective width, W_v (Eq. 15-29) ft	*24.00*
Effective speed factor, S_t (Eq. 15-30)	*2.61*
Bicycle level of service score, BLOS (Eq. 15-31)	*1.88*
Bicycle level of service (Exhibit 15-4)	*B*

Copyright © 2012 University of Florida, All Rights Reserved *HCS 2010*™ Version 6.41 Generated: 4/30/2013 10:46 AM

MULTILANE HIGHWAYS WORKSHEET(Direction 2)

General Information

Analyst	David Stoner
Agency or Company	DOWL HKM
Date Performed	4/19/2013
Analysis Time Period	PM Peak Hour

Site Information

Highway/Direction to Travel	Higgins Avenue
From/To	Higgins Avenue Bridge
Jurisdiction	Missoula
Analysis Year	2013

Project Description Missoula Bridges Planning Study

☐ Oper.(LOS) ☐ Des. (N) ☐ Plan. (vp)

Flow Inputs

Volume, V (veh/h)	955	Peak-Hour Factor, PHF	0.83
AADT(veh/h)		%Trucks and Buses, P_T	5
Peak-Hour Prop of AADT (veh/d)		%RVs, P_R	0
Peak-Hour Direction Prop, D		General Terrain:	Level
DDHV (veh/h)		Grade Length (mi)	0.00
Driver Type Adjustment	1.00	Up/Down %	0.00
		Number of Lanes	2

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	f_{HV}	0.976

Speed Inputs

Lane Width, LW (ft)	12.0
Total Lateral Clearance, LC (ft)	12.0
Access Points, A (A/mi)	0
Median Type, M	
FFS (measured)	45.0
Base Free-Flow Speed, BFFS	

Calc Speed Adj and FFS

f_{LW} (mi/h)	
f_{LC} (mi/h)	
f_A (mi/h)	
f_M (mi/h)	
FFS (mi/h)	45.0

Operations

Operational (LOS)

Flow Rate, v_p (pc/h/ln)	589
Speed, S (mi/h)	45.0
D (pc/mi/ln)	13.1
LOS	B

Design

Design (N)

Required Number of Lanes, N	
Flow Rate, v_p (pc/h)	
Max Service Flow Rate (pc/h/ln)	
Design LOS	

Bicycle Level of Service

Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*575.3*
Effective width, W_v (Eq. 15-29) ft	*24.00*
Effective speed factor, S_t (Eq. 15-30)	*2.61*
Bicycle level of service score, BLOS (Eq. 15-31)	*2.39*
Bicycle level of service (Exhibit 15-4)	*B*

Copyright © 2012 University of Florida, All Rights Reserved *HCS 2010*™ Version 6.41 Generated: 4/30/2013 10:50 AM

MULTILANE HIGHWAYS WORKSHEET(Direction 1)

General Information

Analyst	David Stoner
Agency or Company	DOWL HKM
Date Performed	4/19/2013
Analysis Time Period	AM Peak Hour

Site Information

Highway/Direction to Travel	Madison Avenue
From/To	Madison Avenue Bridge
Jurisdiction	Missoula
Analysis Year	2013

Project Description Missoula Bridges Planning Study

☐ Oper.(LOS) ☐ Des. (N) ☐ Plan. (vp)

Flow Inputs

Volume, V (veh/h)	496	Peak-Hour Factor, PHF	0.92
AADT(veh/h)		%Trucks and Buses, P_T	5
Peak-Hour Prop of AADT (veh/d)		%RVs, P_R	0
Peak-Hour Direction Prop, D		General Terrain:	Level
DDHV (veh/h)		Grade Length (mi)	0.00
Driver Type Adjustment	1.00	Up/Down %	0.00
		Number of Lanes	2

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	f_{HV}	0.976

Speed Inputs

Lane Width, LW (ft)	12.0
Total Lateral Clearance, LC (ft)	12.0
Access Points, A (A/mi)	0
Median Type, M	
FFS (measured)	45.0
Base Free-Flow Speed, BFFS	

Calc Speed Adj and FFS

f_{LW} (mi/h)	
f_{LC} (mi/h)	
f_A (mi/h)	
f_M (mi/h)	
FFS (mi/h)	45.0

Operations

Operational (LOS)

Flow Rate, v_p (pc/h/ln)	276
Speed, S (mi/h)	45.0
D (pc/mi/ln)	6.1
LOS	A

Design

Design (N)

Required Number of Lanes, N	
Flow Rate, v_p (pc/h)	
Max Service Flow Rate (pc/h/ln)	
Design LOS	

Bicycle Level of Service

Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*269.6*
Effective width, W_v (Eq. 15-29) ft	*24.00*
Effective speed factor, S_t (Eq. 15-30)	*2.61*
Bicycle level of service score, BLOS (Eq. 15-31)	*2.01*
Bicycle level of service (Exhibit 15-4)	*B*

Copyright © 2012 University of Florida, All Rights Reserved *HCS 2010*™ Version 6.41 Generated: 4/30/2013 10:51 AM

MULTILANE HIGHWAYS WORKSHEET(Direction 1)

General Information

Analyst	David Stoner
Agency or Company	DOWL HKM
Date Performed	4/19/2013
Analysis Time Period	PM Peak Hour

Site Information

Highway/Direction to Travel	Madison Avenue
From/To	Madison Avenue Bridge
Jurisdiction	Missoula
Analysis Year	2013

Project Description Missoula Bridges Planning Study

☐ Oper.(LOS) ☐ Des. (N) ☐ Plan. (vp)

Flow Inputs

Volume, V (veh/h)	1220	Peak-Hour Factor, PHF	0.92
AADT(veh/h)		%Trucks and Buses, P_T	5
Peak-Hour Prop of AADT (veh/d)		%RVs, P_R	0
Peak-Hour Direction Prop, D		General Terrain:	Level
DDHV (veh/h)		Grade Length (mi)	0.00
Driver Type Adjustment	1.00	Up/Down %	0.00
		Number of Lanes	2

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	f_{HV}	0.976

Speed Inputs

Lane Width, LW (ft)	12.0
Total Lateral Clearance, LC (ft)	12.0
Access Points, A (A/mi)	0
Median Type, M	
FFS (measured)	45.0
Base Free-Flow Speed, BFFS	

Calc Speed Adj and FFS

f_{LW} (mi/h)	
f_{LC} (mi/h)	
f_A (mi/h)	
f_M (mi/h)	
FFS (mi/h)	45.0

Operations

Operational (LOS)

Flow Rate, v_p (pc/h/ln)	679
Speed, S (mi/h)	45.0
D (pc/mi/ln)	15.1
LOS	B

Design

Design (N)

Required Number of Lanes, N	
Flow Rate, v_p (pc/h)	
Max Service Flow Rate (pc/h/ln)	
Design LOS	

Bicycle Level of Service

Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*663.0*
Effective width, W_v (Eq. 15-29) ft	*24.00*
Effective speed factor, S_t (Eq. 15-30)	*2.61*
Bicycle level of service score, BLOS (Eq. 15-31)	*2.46*
Bicycle level of service (Exhibit 15-4)	*B*

Copyright © 2012 University of Florida, All Rights Reserved *HCS 2010*™ Version 6.41 Generated: 4/30/2013 10:52 AM

MULTILANE HIGHWAYS WORKSHEET(Direction 2)

General Information

Analyst	David Stoner
Agency or Company	DOWL HKM
Date Performed	4/19/2013
Analysis Time Period	AM Peak Hour

Site Information

Highway/Direction to Travel	Madison Avenue
From/To	Madison Avenue Bridge
Jurisdiction	Missoula
Analysis Year	2013

Project Description Missoula Bridges Planning Study

☐ Oper.(LOS) ☐ Des. (N) ☐ Plan. (vp)

Flow Inputs

Volume, V (veh/h)	1176	Peak-Hour Factor, PHF	0.92
AADT(veh/h)		%Trucks and Buses, P_T	5
Peak-Hour Prop of AADT (veh/d)		%RVs, P_R	0
Peak-Hour Direction Prop, D		General Terrain:	Level
DDHV (veh/h)		Grade Length (mi)	0.00
Driver Type Adjustment	1.00	Up/Down %	0.00
		Number of Lanes	2

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	f_{HV}	0.976

Speed Inputs

Lane Width, LW (ft)	12.0
Total Lateral Clearance, LC (ft)	12.0
Access Points, A (A/mi)	0
Median Type, M	
FFS (measured)	45.0
Base Free-Flow Speed, BFFS	

Calc Speed Adj and FFS

f_{LW} (mi/h)	
f_{LC} (mi/h)	
f_A (mi/h)	
f_M (mi/h)	
FFS (mi/h)	45.0

Operations

Operational (LOS)

Flow Rate, v_p (pc/h/ln)	655
Speed, S (mi/h)	45.0
D (pc/mi/ln)	14.6
LOS	B

Design

Design (N)

Required Number of Lanes, N	
Flow Rate, v_p (pc/h)	
Max Service Flow Rate (pc/h/ln)	
Design LOS	

Bicycle Level of Service

Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*639.1*
Effective width, W_v (Eq. 15-29) ft	*24.00*
Effective speed factor, S_t (Eq. 15-30)	*2.61*
Bicycle level of service score, BLOS (Eq. 15-31)	*2.44*
Bicycle level of service (Exhibit 15-4)	*B*

Copyright © 2012 University of Florida, All Rights Reserved *HCS 2010*™ Version 6.41 Generated: 4/30/2013 10:51 AM

MULTILANE HIGHWAYS WORKSHEET(Direction 2)

General Information

Analyst	David Stoner
Agency or Company	DOWL HKM
Date Performed	4/19/2013
Analysis Time Period	PM Peak Hour

Site Information

Highway/Direction to Travel	Madison Avenue
From/To	Madison Avenue Bridge
Jurisdiction	Missoula
Analysis Year	2013

Project Description Missoula Bridges Planning Study

☐ Oper.(LOS) ☐ Des. (N) ☐ Plan. (vp)

Flow Inputs

Volume, V (veh/h)	994	Peak-Hour Factor, PHF	0.92
AADT(veh/h)		%Trucks and Buses, P_T	5
Peak-Hour Prop of AADT (veh/d)		%RVs, P_R	0
Peak-Hour Direction Prop, D		General Terrain:	Level
DDHV (veh/h)		Grade Length (mi)	0.00
Driver Type Adjustment	1.00	Up/Down %	0.00
		Number of Lanes	2

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	f_{HV}	0.976

Speed Inputs

Lane Width, LW (ft)	12.0
Total Lateral Clearance, LC (ft)	12.0
Access Points, A (A/mi)	0
Median Type, M	
FFS (measured)	45.0
Base Free-Flow Speed, BFFS	

Calc Speed Adj and FFS

f_{LW} (mi/h)	
f_{LC} (mi/h)	
f_A (mi/h)	
f_M (mi/h)	
FFS (mi/h)	45.0

Operations

Operational (LOS)

Flow Rate, v_p (pc/h/ln)	553
Speed, S (mi/h)	45.0
D (pc/mi/ln)	12.3
LOS	B

Design

Design (N)

Required Number of Lanes, N	
Flow Rate, v_p (pc/h)	
Max Service Flow Rate (pc/h/ln)	
Design LOS	

Bicycle Level of Service

Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*540.2*
Effective width, W_v (Eq. 15-29) ft	*24.00*
Effective speed factor, S_t (Eq. 15-30)	*2.61*
Bicycle level of service score, BLOS (Eq. 15-31)	*2.36*
Bicycle level of service (Exhibit 15-4)	*B*

Copyright © 2012 University of Florida, All Rights Reserved *HCS 2010*™ Version 6.41 Generated: 4/30/2013 10:52 AM

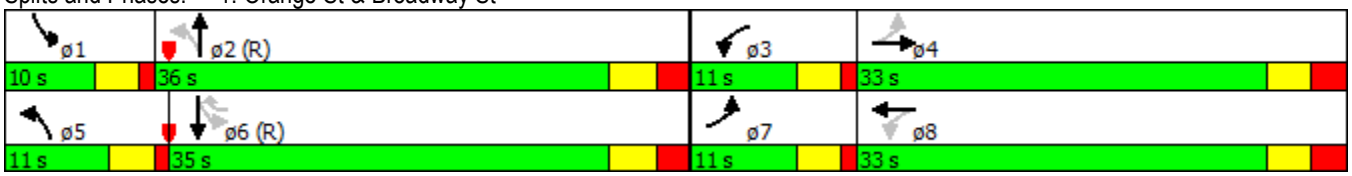
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	42	203	5	57	251	63	200	576	120	89	592	59
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Storage Length (ft)	100		175	75		0	100		0	125		0
Storage Lanes	1		1	1		1	1		0	1		0
Taper Length (ft)	75			100			100			75		
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Ped Bike Factor	1.00	1.00		1.00		0.98	0.99	1.00		1.00	1.00	
Frt		0.996				0.850		0.974			0.986	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1341	2670	0	1341	1412	1200	1341	2602	0	1341	2634	0
Flt Permitted	0.408			0.561			0.169			0.309		
Satd. Flow (perm)	575	2670	0	790	1412	1172	237	2602	0	435	2634	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		3				127		30			12	
Link Speed (mph)		25			25			30			30	
Link Distance (ft)		2490			751			388			780	
Travel Time (s)		67.9			20.5			8.8			17.7	
Confl. Peds. (#/hr)	4		17	4		12	13		12	8		17
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Parking (#/hr)			0									
Adj. Flow (vph)	51	245	6	69	302	76	241	694	145	107	713	71
Shared Lane Traffic (%)												
Lane Group Flow (vph)	51	251	0	69	302	76	241	839	0	107	784	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane		Yes									Yes	
Headway Factor	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2	1	1	2		1	2	
Detector Template	Left	Thru		Left	Thru	Right	Left	Thru		Left	Thru	
Leading Detector (ft)	20	100		20	100	20	20	100		20	100	
Trailing Detector (ft)	0	0		0	0	0	0	0		0	0	
Detector 1 Position(ft)	0	0		0	0	0	0	0		0	0	
Detector 1 Size(ft)	20	6		20	6	20	20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA		pm+pt	NA	custom	pm+pt	NA		pm+pt	NA	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8		6	2			6		
Detector Phase	7	4		3	8	6	5	2		1	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0	6.0	6.0	6.0		6.0	6.0	
Minimum Split (s)	10.0	32.5		10.0	32.5	34.5	10.0	34.5		10.0	34.5	
Total Split (s)	11.0	33.0		11.0	33.0	35.0	11.0	36.0		10.0	35.0	
Total Split (%)	12.2%	36.7%		12.2%	36.7%	38.9%	12.2%	40.0%		11.1%	38.9%	
Maximum Green (s)	7.0	27.5		7.0	27.5	29.5	7.0	30.5		6.0	29.5	
Yellow Time (s)	3.0	3.0		3.0	3.0	3.2	3.0	3.2		3.0	3.2	
All-Red Time (s)	1.0	2.5		1.0	2.5	2.3	1.0	2.3		1.0	2.3	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.0	5.5		4.0	5.5	5.5	4.0	5.5		4.0	5.5	
Lead/Lag	Lead	Lag		Lead	Lag	Lag	Lead	Lag		Lead	Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	None	Min		None	Min	C-Max	None	C-Max		None	C-Max	
Walk Time (s)		7.0			7.0	7.0		7.0			7.0	
Flash Dont Walk (s)		20.0			20.0	22.0		22.0			22.0	
Pedestrian Calls (#/hr)		5			5	5		5			5	
Act Effct Green (s)	28.5	21.4		29.3	23.6	29.8	48.5	39.9		38.2	29.8	
Actuated g/C Ratio	0.32	0.24		0.33	0.26	0.33	0.54	0.44		0.42	0.33	
v/c Ratio	0.21	0.39		0.23	0.82	0.16	0.77	0.72		0.42	0.89	
Control Delay	18.3	29.2		18.5	48.3	2.7	47.6	20.9		15.7	37.2	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	18.3	29.2		18.5	48.3	2.7	47.6	20.9		15.7	37.2	
LOS	B	C		B	D	A	D	C		B	D	
Approach Delay		27.3			35.9			26.9			34.6	
Approach LOS		C			D			C			C	

Intersection Summary

Area Type: CBD
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 84 (93%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.89
Intersection Signal Delay: 30.9 Intersection LOS: C
Intersection Capacity Utilization 78.8% ICU Level of Service D
Analysis Period (min) 15

Splits and Phases: 1: Orange St & Broadway St

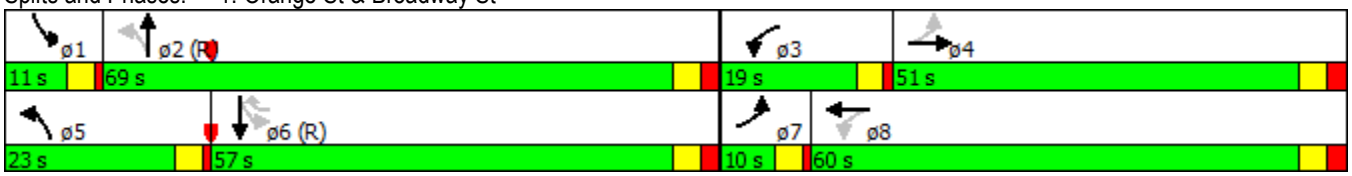


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	71	249	16	171	466	126	212	678	115	73	756	69
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Storage Length (ft)	100		175	75		0	100		0	125		0
Storage Lanes	1		1	1		1	1		0	1		0
Taper Length (ft)	75			100			100			75		
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Ped Bike Factor	1.00	1.00		0.99		0.96		0.99		1.00	0.99	
Frt		0.991				0.850		0.978			0.987	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1341	2648	0	1341	1412	1200	1341	2606	0	1341	2628	0
Flt Permitted	0.228			0.479			0.121			0.249		
Satd. Flow (perm)	321	2648	0	669	1412	1151	171	2606	0	350	2628	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		5				135		16			7	
Link Speed (mph)		25			25			30			30	
Link Distance (ft)		2490			751			388			780	
Travel Time (s)		67.9			20.5			8.8			17.7	
Confl. Peds. (#/hr)	7		30	11		19	19		23	12		26
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Parking (#/hr)			0									
Adj. Flow (vph)	78	274	18	188	512	138	233	745	126	80	831	76
Shared Lane Traffic (%)												
Lane Group Flow (vph)	78	292	0	188	512	138	233	871	0	80	907	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane		Yes									Yes	
Headway Factor	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2	1	1	2		1	2	
Detector Template	Left	Thru		Left	Thru	Right	Left	Thru		Left	Thru	
Leading Detector (ft)	20	100		20	100	20	20	100		20	100	
Trailing Detector (ft)	0	0		0	0	0	0	0		0	0	
Detector 1 Position(ft)	0	0		0	0	0	0	0		0	0	
Detector 1 Size(ft)	20	6		20	6	20	20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA		pm+pt	NA	custom	pm+pt	NA		pm+pt	NA	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8		6	2			6		
Detector Phase	7	4		3	8	6	5	2		1	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0	6.0	6.0	6.0		6.0	6.0	
Minimum Split (s)	10.0	32.5		10.0	34.5	34.5	10.0	34.5		10.0	34.5	
Total Split (s)	10.0	51.0		19.0	60.0	57.0	23.0	69.0		11.0	57.0	
Total Split (%)	6.7%	34.0%		12.7%	40.0%	38.0%	15.3%	46.0%		7.3%	38.0%	
Maximum Green (s)	6.0	45.5		15.0	54.5	51.5	19.0	63.5		7.0	51.5	
Yellow Time (s)	3.0	3.0		3.0	3.0	3.2	3.0	3.2		3.0	3.2	
All-Red Time (s)	1.0	2.5		1.0	2.5	2.3	1.0	2.3		1.0	2.3	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.0	5.5		4.0	5.5	5.5	4.0	5.5		4.0	5.5	
Lead/Lag	Lead	Lag		Lead	Lag	Lag	Lead	Lag		Lead	Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	None	Min		None	Min	C-Max	None	C-Max		None	C-Max	
Walk Time (s)		7.0			7.0	7.0		7.0			7.0	
Flash Dont Walk (s)		20.0			20.0	22.0		22.0			22.0	
Pedestrian Calls (#/hr)		10			10	10		10			10	
Act Effct Green (s)	53.5	46.0		66.0	54.5	51.5	76.0	63.5		60.0	51.5	
Actuated g/C Ratio	0.36	0.31		0.44	0.36	0.34	0.51	0.42		0.40	0.34	
v/c Ratio	0.50	0.36		0.52	1.00	0.29	1.00	0.78		0.43	1.00	
Control Delay	39.8	41.5		33.5	86.5	7.1	109.2	21.7		23.4	70.2	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	2.2		0.0	0.0	
Total Delay	39.8	41.5		33.5	86.5	7.1	109.2	24.0		23.4	70.2	
LOS	D	D		C	F	A	F	C		C	E	
Approach Delay		41.1			61.5			41.9			66.4	
Approach LOS		D			E			D			E	

Intersection Summary	
Area Type: CBD	
Cycle Length: 150	
Actuated Cycle Length: 150	
Offset: 8 (5%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green	
Natural Cycle: 150	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.00	
Intersection Signal Delay: 54.1	Intersection LOS: D
Intersection Capacity Utilization 99.6%	ICU Level of Service F
Analysis Period (min) 15	

Splits and Phases: 1: Orange St & Broadway St



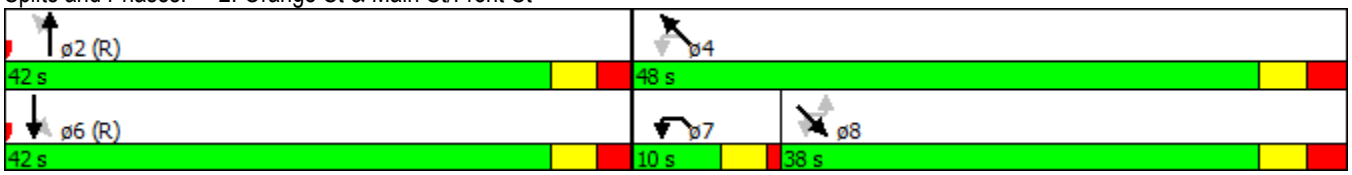
Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Volume (vph)	97	857	165	76	618	25	5	187	125	54	30	43
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Storage Length (ft)	90		0	70		0	50		50	0		0
Storage Lanes	1		0	1		0	1		1	1		0
Taper Length (ft)	100			100			75			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	1.00	1.00			1.00		0.99		0.98	1.00	0.98	
Frt		0.976			0.994				0.850		0.912	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1490	2896	0	1490	2957	0	1490	1569	1333	1490	1403	0
Flt Permitted	0.309			0.145			0.699			0.406		
Satd. Flow (perm)	484	2896	0	227	2957	0	1085	1569	1313	637	1403	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		30			5				124		31	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		542			388			507			119	
Travel Time (s)		12.3			8.8			11.5			2.7	
Confl. Peds. (#/hr)	3		11			15	12		4	1		22
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Adj. Flow (vph)	118	1045	201	93	754	30	6	228	152	66	37	52
Shared Lane Traffic (%)												
Lane Group Flow (vph)	118	1246	0	93	784	0	6	228	152	66	89	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2	1	1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru	Right	Left	Thru	
Leading Detector (ft)	20	100		20	100		20	100	20	20	100	
Trailing Detector (ft)	0	0		0	0		0	0	0	0	0	
Detector 1 Position(ft)	0	0		0	0		0	0	0	0	0	
Detector 1 Size(ft)	20	6		20	6		20	6	20	20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	pm+pt	NA	
Protected Phases		2			6			8		7	4	

Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Permitted Phases	2			6			8		8	4	4	
Detector Phase	2	2		6	6		8	8	8	7	4	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0		6.0	6.0	6.0	6.0	6.0	
Minimum Split (s)	25.5	25.5		32.5	32.5		38.0	38.0	38.0	10.0	33.0	
Total Split (s)	42.0	42.0		42.0	42.0		38.0	38.0	38.0	10.0	48.0	
Total Split (%)	46.7%	46.7%		46.7%	46.7%		42.2%	42.2%	42.2%	11.1%	53.3%	
Maximum Green (s)	36.5	36.5		36.5	36.5		32.0	32.0	32.0	6.0	42.0	
Yellow Time (s)	3.2	3.2		3.2	3.2		3.2	3.2	3.2	3.0	3.2	
All-Red Time (s)	2.3	2.3		2.3	2.3		2.8	2.8	2.8	1.0	2.8	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.5	5.5		5.5	5.5		6.0	6.0	6.0	4.0	6.0	
Lead/Lag							Lag	Lag	Lag	Lead		
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Recall Mode	C-Max	C-Max		C-Max	C-Max		None	None	None	None	None	
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0	7.0		7.0	
Flash Dont Walk (s)	13.0	13.0		20.0	20.0		25.0	25.0	25.0		20.0	
Pedestrian Calls (#/hr)	5	5		5	5		5	5	5		10	
Act Effct Green (s)	50.6	50.6		50.6	50.6		19.9	19.9	19.9	29.9	27.9	
Actuated g/C Ratio	0.56	0.56		0.56	0.56		0.22	0.22	0.22	0.33	0.31	
v/c Ratio	0.44	0.76		0.73	0.47		0.03	0.66	0.39	0.25	0.20	
Control Delay	22.7	21.7		40.6	4.3		22.6	39.8	10.0	18.8	13.4	
Queue Delay	0.0	0.2		0.0	0.1		0.0	0.0	0.0	0.0	0.0	
Total Delay	22.7	21.9		40.6	4.4		22.6	39.8	10.0	18.8	13.4	
LOS	C	C		D	A		C	D	B	B	B	
Approach Delay		22.0			8.2			27.8			15.7	
Approach LOS		C			A			C			B	

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 86 (96%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 105
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.76
Intersection Signal Delay: 18.1 Intersection LOS: B
Intersection Capacity Utilization 78.4% ICU Level of Service D
Analysis Period (min) 15

Splits and Phases: 2: Orange St & Main St/Front St

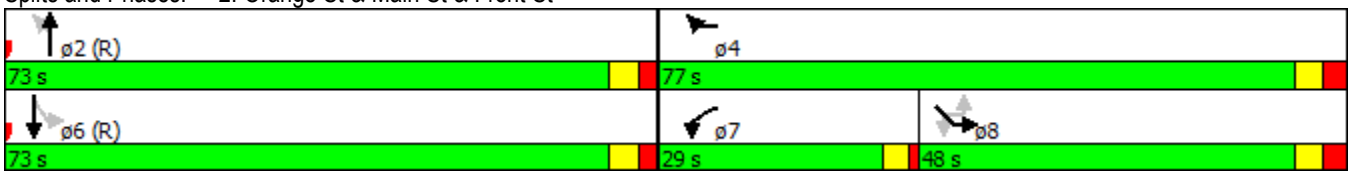


Lane Group	WBL	WBR	WBR2	NBL	NBT	NBR	SBL	SBT	SBR	SEL2	SEL	SER
Lane Configurations												
Volume (vph)	230	46	125	26	932	116	64	857	10	8	212	378
Ideal Flow (vphpl)	1800	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Storage Length (ft)	0	0		90		0	70		0		50	50
Storage Lanes	1	1		1		0	1		0		1	1
Taper Length (ft)	25			100			100				75	
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00
Ped Bike Factor	0.99	0.96		1.00	0.99			1.00		0.99		0.98
Frt		0.850			0.983			0.998				0.850
Flt Protected	0.950			0.950			0.950			0.950	0.950	
Satd. Flow (prot)	1676	1333	0	1490	2912	0	1490	2973	0	1490	1490	1333
Flt Permitted	0.950			0.186			0.118			0.639	0.950	
Satd. Flow (perm)	1668	1274	0	291	2912	0	185	2973	0	995	1490	1301
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		46			12			1				86
Link Speed (mph)	30				30			30			30	
Link Distance (ft)	96				542			388			507	
Travel Time (s)	2.2				12.3			8.8			11.5	
Confl. Peds. (#/hr)	5		20	4		19	15		10	6		9
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	253	51	137	29	1024	127	70	942	11	9	233	415
Shared Lane Traffic (%)												
Lane Group Flow (vph)	253	188	0	29	1151	0	70	953	0	9	233	415
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Right	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)	12				12			12			24	
Link Offset(ft)	0				0			0			0	
Crosswalk Width(ft)	16				16			16			16	
Two way Left Turn Lane												
Headway Factor	1.07	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24
Turning Speed (mph)	15	25	9	15		9	15		9	25	25	9
Number of Detectors	1	1		1	2		1	2		1	1	1
Detector Template	Left	Right		Left	Thru		Left	Thru		Left	Left	Right
Leading Detector (ft)	20	20		20	100		20	100		20	20	20
Trailing Detector (ft)	0	0		0	0		0	0		0	0	0
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	0
Detector 1 Size(ft)	20	20		20	6		20	6		20	20	20
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 2 Position(ft)					94			94				
Detector 2 Size(ft)					6			6				
Detector 2 Type					Cl+Ex			Cl+Ex				
Detector 2 Channel												
Detector 2 Extend (s)					0.0			0.0				
Turn Type	NA	custom		Perm	NA		Perm	NA		Perm	NA	Perm
Protected Phases	7	4			2			6			8	

Lane Group	WBL	WBR	WBR2	NBL	NBT	NBR	SBL	SBT	SBR	SEL2	SEL	SER
Permitted Phases		4		2			6			8		8
Detector Phase	7	4		2	2		6	6		8	8	8
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	6.0
Minimum Split (s)	10.0	33.0		25.5	25.5		32.5	32.5		38.0	38.0	38.0
Total Split (s)	29.0	77.0		73.0	73.0		73.0	73.0		48.0	48.0	48.0
Total Split (%)	19.3%	51.3%		48.7%	48.7%		48.7%	48.7%		32.0%	32.0%	32.0%
Maximum Green (s)	25.0	71.0		67.5	67.5		67.5	67.5		42.0	42.0	42.0
Yellow Time (s)	3.0	3.2		3.2	3.2		3.2	3.2		3.2	3.2	3.2
All-Red Time (s)	1.0	2.8		2.3	2.3		2.3	2.3		2.8	2.8	2.8
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	4.0	6.0		5.5	5.5		5.5	5.5		6.0	6.0	6.0
Lead/Lag	Lead									Lag	Lag	Lag
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Recall Mode	None	None		C-Max	C-Max		C-Max	C-Max		None	None	None
Walk Time (s)		7.0		7.0	7.0		7.0	7.0		7.0	7.0	7.0
Flash Dont Walk (s)		20.0		13.0	13.0		20.0	20.0		25.0	25.0	25.0
Pedestrian Calls (#/hr)		5		5	5		5	5		5	5	5
Act Effct Green (s)	24.3	70.0		68.5	68.5		68.5	68.5		41.6	41.6	41.6
Actuated g/C Ratio	0.16	0.47		0.46	0.46		0.46	0.46		0.28	0.28	0.28
v/c Ratio	0.93	0.29		0.22	0.86		0.83	0.70		0.03	0.56	0.98
Control Delay	100.8	19.4		30.8	44.3		52.8	14.3		39.9	52.5	81.4
Queue Delay	0.0	0.0		0.0	0.4		0.0	1.1		0.0	0.0	0.0
Total Delay	100.8	19.4		30.8	44.7		52.8	15.4		39.9	52.5	81.4
LOS	F	B		C	D		D	B		D	D	F
Approach Delay	66.1				44.3			18.0			70.6	
Approach LOS	E				D			B			E	

Intersection Summary	
Area Type:	Other
Cycle Length: 150	
Actuated Cycle Length: 150	
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green	
Natural Cycle: 105	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.98	
Intersection Signal Delay: 44.3	Intersection LOS: D
Intersection Capacity Utilization 88.4%	ICU Level of Service E
Analysis Period (min) 15	

Splits and Phases: 2: Orange St & Main St & Front St

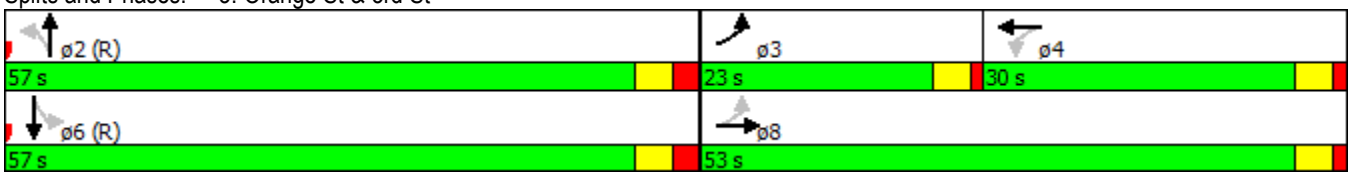


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	235	66	65	6	39	17	33	886	9	12	668	83
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Storage Length (ft)	155		0	0		0	35		0	35		0
Storage Lanes	1		1	0		0	1		0	1		0
Taper Length (ft)	100			25			75			75		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Ped Bike Factor	0.98	0.99			0.99		1.00	1.00		1.00	0.99	
Frt		0.925			0.963			0.999			0.983	
Flt Protected	0.950				0.995		0.950			0.950		
Satd. Flow (prot)	1490	1432	0	0	1484	0	1490	2976	0	1490	2907	0
Flt Permitted	0.488				0.962		0.258			0.198		
Satd. Flow (perm)	752	1432	0	0	1434	0	404	2976	0	310	2907	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		58			16			1			16	
Link Speed (mph)		30			25			30			30	
Link Distance (ft)		369			372			727			741	
Travel Time (s)		8.4			10.1			16.5			16.8	
Confl. Peds. (#/hr)	17		11	6		26	5		15	9		22
Peak Hour Factor	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81
Parking (#/hr)						0						
Adj. Flow (vph)	290	81	80	7	48	21	41	1094	11	15	825	102
Shared Lane Traffic (%)												
Lane Group Flow (vph)	290	161	0	0	76	0	41	1105	0	15	927	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane								Yes			Yes	
Headway Factor	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (ft)	20	100		20	100		20	100		20	100	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA		Perm	NA		Perm	NA		Perm	NA	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Protected Phases	3	8			4			2			6	
Permitted Phases	8			4			2			6		
Detector Phase	3	8		4	4		2	2		6	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0		20.0	20.0		20.0	20.0	
Minimum Split (s)	10.0	29.5		29.5	29.5		28.5	28.5		28.5	28.5	
Total Split (s)	23.0	53.0		30.0	30.0		57.0	57.0		57.0	57.0	
Total Split (%)	20.9%	48.2%		27.3%	27.3%		51.8%	51.8%		51.8%	51.8%	
Maximum Green (s)	19.0	48.5		25.5	25.5		51.5	51.5		51.5	51.5	
Yellow Time (s)	3.0	3.2		3.2	3.2		3.2	3.2		3.2	3.2	
All-Red Time (s)	1.0	1.3		1.3	1.3		2.3	2.3		2.3	2.3	
Lost Time Adjust (s)	0.0	0.0			0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.0	4.5			4.5		5.5	5.5		5.5	5.5	
Lead/Lag	Lead			Lag	Lag							
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		C-Max	C-Max		C-Max	C-Max	
Walk Time (s)		7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)		18.0		18.0	18.0		16.0	16.0		16.0	16.0	
Pedestrian Calls (#/hr)		5		10	10		5	5		10	10	
Act Effct Green (s)	33.3	32.8			12.2		67.2	67.2		67.2	67.2	
Actuated g/C Ratio	0.30	0.30			0.11		0.61	0.61		0.61	0.61	
v/c Ratio	0.82	0.34			0.44		0.17	0.61		0.08	0.52	
Control Delay	50.9	18.6			42.0		17.3	16.7		14.3	15.2	
Queue Delay	0.0	0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay	50.9	18.6			42.0		17.3	16.7		14.3	15.2	
LOS	D	B			D		B	B		B	B	
Approach Delay		39.4			42.0			16.7			15.2	
Approach LOS		D			D			B			B	

Intersection Summary	
Area Type: Other	
Cycle Length: 110	
Actuated Cycle Length: 110	
Offset: 13 (12%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green	
Natural Cycle: 75	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.82	
Intersection Signal Delay: 20.8	Intersection LOS: C
Intersection Capacity Utilization 63.0%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 3: Orange St & 3rd St

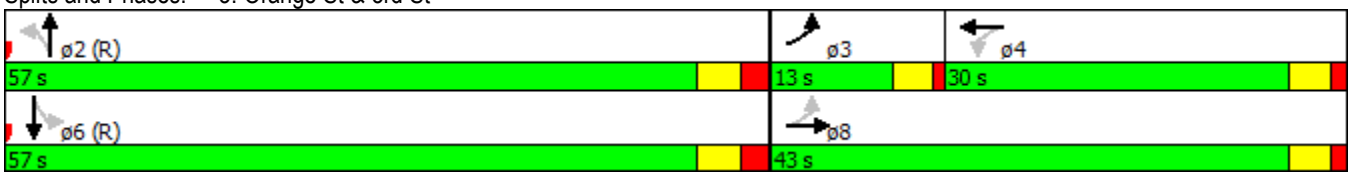


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	241	122	66	24	96	33	27	792	17	26	1113	156
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Storage Length (ft)	155		0	0		0	35		0	35		0
Storage Lanes	1		1	0		0	1		0	1		0
Taper Length (ft)	100			25			75			75		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Ped Bike Factor	0.99	0.98			0.99			1.00		1.00	0.99	
Frt		0.947			0.971			0.997			0.982	
Flt Protected	0.950				0.992		0.950			0.950		
Satd. Flow (prot)	1490	1459	0	0	1503	0	1490	2968	0	1490	2903	0
Flt Permitted	0.400				0.923		0.127			0.279		
Satd. Flow (perm)	624	1459	0	0	1395	0	199	2968	0	437	2903	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		32			13			3			23	
Link Speed (mph)		30			25			30			30	
Link Distance (ft)		369			372			727			741	
Travel Time (s)		8.4			10.1			16.5			16.8	
Confl. Peds. (#/hr)	7		33	18		10	15		21	3		22
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Parking (#/hr)						0						
Adj. Flow (vph)	262	133	72	26	104	36	29	861	18	28	1210	170
Shared Lane Traffic (%)												
Lane Group Flow (vph)	262	205	0	0	166	0	29	879	0	28	1380	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane								Yes			Yes	
Headway Factor	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (ft)	20	100		20	100		20	100		20	100	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA		Perm	NA		Perm	NA		Perm	NA	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Protected Phases	3	8			4			2			6	
Permitted Phases	8			4			2			6		
Detector Phase	3	8		4	4		2	2		6	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0		20.0	20.0		20.0	20.0	
Minimum Split (s)	10.0	29.5		29.5	29.5		28.5	28.5		28.5	28.5	
Total Split (s)	13.0	43.0		30.0	30.0		57.0	57.0		57.0	57.0	
Total Split (%)	13.0%	43.0%		30.0%	30.0%		57.0%	57.0%		57.0%	57.0%	
Maximum Green (s)	9.0	38.5		25.5	25.5		51.5	51.5		51.5	51.5	
Yellow Time (s)	3.0	3.2		3.2	3.2		3.2	3.2		3.2	3.2	
All-Red Time (s)	1.0	1.3		1.3	1.3		2.3	2.3		2.3	2.3	
Lost Time Adjust (s)	0.0	0.0			0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.0	4.5			4.5		5.5	5.5		5.5	5.5	
Lead/Lag	Lead			Lag	Lag							
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		C-Max	C-Max		C-Max	C-Max	
Walk Time (s)		7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)		18.0		18.0	18.0		16.0	16.0		16.0	16.0	
Pedestrian Calls (#/hr)		10		5	5		5	5		5	5	
Act Effct Green (s)	30.1	29.6			16.6		60.4	60.4		60.4	60.4	
Actuated g/C Ratio	0.30	0.30			0.17		0.60	0.60		0.60	0.60	
v/c Ratio	0.99	0.45			0.69		0.24	0.49		0.11	0.78	
Control Delay	85.0	26.1			49.8		13.6	9.2		11.8	20.1	
Queue Delay	0.0	0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay	85.0	26.1			49.8		13.6	9.2		11.8	20.1	
LOS	F	C			D		B	A		B	C	
Approach Delay		59.1			49.8			9.4			19.9	
Approach LOS		E			D			A			B	

Intersection Summary	
Area Type: Other	
Cycle Length: 100	
Actuated Cycle Length: 100	
Offset: 14 (14%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green	
Natural Cycle: 90	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.99	
Intersection Signal Delay: 24.6	Intersection LOS: C
Intersection Capacity Utilization 87.2%	ICU Level of Service E
Analysis Period (min) 15	

Splits and Phases: 3: Orange St & 3rd St



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	36	136	53	10	875	0	0	686	59
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Storage Length (ft)	0		0	0		0	40		0	0		0
Storage Lanes	0		0	0		0	1		0	0		0
Taper Length (ft)	25			25			75			25		
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	0.95	1.00	0.95	1.00	1.00	0.95	0.95
Ped Bike Factor					0.99		1.00				1.00	
Frt					0.965						0.988	
Flt Protected					0.992		0.950					
Satd. Flow (prot)	0	0	0	0	2837	0	1490	2980	0	0	2939	0
Flt Permitted					0.992		0.288					
Satd. Flow (perm)	0	0	0	0	2835	0	451	2980	0	0	2939	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					35						17	
Link Speed (mph)		25			25			30			30	
Link Distance (ft)		379			1500			340			727	
Travel Time (s)		10.3			40.9			7.7			16.5	
Confl. Peds. (#/hr)				3		9	7		10	7		9
Peak Hour Factor	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79
Parking (#/hr)				0		0						
Adj. Flow (vph)	0	0	0	46	172	67	13	1108	0	0	868	75
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	285	0	13	1108	0	0	943	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane								Yes			Yes	
Headway Factor	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors				1	2		1	2			2	
Detector Template				Left	Thru		Left	Thru			Thru	
Leading Detector (ft)				20	100		20	100			100	
Trailing Detector (ft)				0	0		0	0			0	
Detector 1 Position(ft)				0	0		0	0			0	
Detector 1 Size(ft)				20	6		20	6			6	
Detector 1 Type				Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex			Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)				0.0	0.0		0.0	0.0			0.0	
Detector 1 Queue (s)				0.0	0.0		0.0	0.0			0.0	
Detector 1 Delay (s)				0.0	0.0		0.0	0.0			0.0	
Detector 2 Position(ft)					94			94			94	
Detector 2 Size(ft)					6			6			6	
Detector 2 Type					Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)					0.0			0.0			0.0	
Turn Type				Perm	NA		Perm	NA			NA	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Protected Phases					4			2			2	
Permitted Phases				4			2					
Detector Phase				4	4		2	2			2	
Switch Phase												
Minimum Initial (s)				6.0	6.0		16.0	16.0			16.0	
Minimum Split (s)				30.0	30.0		29.5	29.5			29.5	
Total Split (s)				33.0	33.0		77.0	77.0			77.0	
Total Split (%)				30.0%	30.0%		70.0%	70.0%			70.0%	
Maximum Green (s)				28.0	28.0		71.5	71.5			71.5	
Yellow Time (s)				3.0	3.0		3.2	3.2			3.2	
All-Red Time (s)				2.0	2.0		2.3	2.3			2.3	
Lost Time Adjust (s)					0.0		0.0	0.0			0.0	
Total Lost Time (s)					5.0		5.5	5.5			5.5	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)				3.0	3.0		3.0	3.0			3.0	
Recall Mode				None	None		C-Max	C-Max			C-Max	
Walk Time (s)				7.0	7.0		7.0	7.0			7.0	
Flash Dont Walk (s)				18.0	18.0		17.0	17.0			17.0	
Pedestrian Calls (#/hr)				0	0		0	0			0	
Act Effct Green (s)					15.1		84.4	84.4			84.4	
Actuated g/C Ratio					0.14		0.77	0.77			0.77	
v/c Ratio					0.68		0.04	0.48			0.42	
Control Delay					47.5		1.1	1.6			3.3	
Queue Delay					0.0		0.0	0.1			0.0	
Total Delay					47.5		1.1	1.7			3.3	
LOS					D		A	A			A	
Approach Delay					47.5			1.7			3.3	
Approach LOS					D			A			A	

Intersection Summary	
Area Type:	Other
Cycle Length: 110	
Actuated Cycle Length: 110	
Offset: 32 (29%), Referenced to phase 2:NBSB, Start of Green	
Natural Cycle: 60	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.68	
Intersection Signal Delay: 7.9	Intersection LOS: A
Intersection Capacity Utilization 72.0%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 4: Orange St & 5th St

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	85	343	57	17	783	0	0	1081	137
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Storage Length (ft)	0		0	0		0	40		0	0		0
Storage Lanes	0		0	0		0	1		0	0		0
Taper Length (ft)	25			25			75			25		
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	0.95	1.00	0.95	1.00	1.00	0.95	0.95
Ped Bike Factor					0.99		1.00				1.00	
Frt					0.982						0.983	
Flt Protected					0.991		0.950					
Satd. Flow (prot)	0	0	0	0	2886	0	1490	2980	0	0	2920	0
Flt Permitted					0.991		0.135					
Satd. Flow (perm)	0	0	0	0	2883	0	212	2980	0	0	2920	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					14						26	
Link Speed (mph)		25			25			30			30	
Link Distance (ft)		379			1500			340			727	
Travel Time (s)		10.3			40.9			7.7			16.5	
Confl. Peds. (#/hr)				6		25	12		28	22		15
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Parking (#/hr)				0		0						
Adj. Flow (vph)	0	0	0	99	399	66	20	910	0	0	1257	159
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	564	0	20	910	0	0	1416	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane								Yes			Yes	
Headway Factor	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors				1	2		1	2			2	
Detector Template				Left	Thru		Left	Thru			Thru	
Leading Detector (ft)				20	100		20	100			100	
Trailing Detector (ft)				0	0		0	0			0	
Detector 1 Position(ft)				0	0		0	0			0	
Detector 1 Size(ft)				20	6		20	6			6	
Detector 1 Type				Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex			Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)				0.0	0.0		0.0	0.0			0.0	
Detector 1 Queue (s)				0.0	0.0		0.0	0.0			0.0	
Detector 1 Delay (s)				0.0	0.0		0.0	0.0			0.0	
Detector 2 Position(ft)					94			94			94	
Detector 2 Size(ft)					6			6			6	
Detector 2 Type					Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)					0.0			0.0			0.0	
Turn Type				Perm	NA		Perm	NA			NA	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Protected Phases					4			2			2	
Permitted Phases				4			2					
Detector Phase				4	4		2	2			2	
Switch Phase												
Minimum Initial (s)				6.0	6.0		16.0	16.0			16.0	
Minimum Split (s)				30.0	30.0		29.5	29.5			29.5	
Total Split (s)				32.0	32.0		68.0	68.0			68.0	
Total Split (%)				32.0%	32.0%		68.0%	68.0%			68.0%	
Maximum Green (s)				27.0	27.0		62.5	62.5			62.5	
Yellow Time (s)				3.0	3.0		3.2	3.2			3.2	
All-Red Time (s)				2.0	2.0		2.3	2.3			2.3	
Lost Time Adjust (s)					0.0		0.0	0.0			0.0	
Total Lost Time (s)					5.0		5.5	5.5			5.5	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)				3.0	3.0		3.0	3.0			3.0	
Recall Mode				None	None		C-Max	C-Max			C-Max	
Walk Time (s)				7.0	7.0		7.0	7.0			7.0	
Flash Dont Walk (s)				18.0	18.0		17.0	17.0			17.0	
Pedestrian Calls (#/hr)				10	10		10	10			10	
Act Effct Green (s)					23.9		65.6	65.6			65.6	
Actuated g/C Ratio					0.24		0.66	0.66			0.66	
v/c Ratio					0.81		0.14	0.47			0.74	
Control Delay					44.3		6.5	7.2			3.8	
Queue Delay					0.0		0.0	0.2			0.0	
Total Delay					44.3		6.5	7.4			3.8	
LOS					D		A	A			A	
Approach Delay					44.3			7.3			3.8	
Approach LOS					D			A			A	

Intersection Summary	
Area Type: Other	
Cycle Length: 100	
Actuated Cycle Length: 100	
Offset: 19 (19%), Referenced to phase 2:NBSB, Start of Green	
Natural Cycle: 75	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.81	
Intersection Signal Delay: 12.8	Intersection LOS: B
Intersection Capacity Utilization 86.5%	ICU Level of Service E
Analysis Period (min) 15	

Splits and Phases: 4: Orange St & 5th St

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	62	300	12	0	0	0	0	819	75	132	601	0
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Storage Length (ft)	0		0	0		0	0		0	40		0
Storage Lanes	0		0	0		0	0		0	1		0
Taper Length (ft)	25			25			25			75		
Lane Util. Factor	0.95	0.95	0.95	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	1.00
Ped Bike Factor		1.00						0.99		0.99		
Frt		0.995						0.987				
Flt Protected		0.992								0.950		
Satd. Flow (prot)	0	2939	0	0	0	0	0	2925	0	1490	2980	0
Flt Permitted		0.992								0.202		
Satd. Flow (perm)	0	2936	0	0	0	0	0	2925	0	315	2980	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		3						19				
Link Speed (mph)		25			25			30			30	
Link Distance (ft)		359			1502			177			340	
Travel Time (s)		9.8			41.0			4.0			7.7	
Confl. Peds. (#/hr)	5		13				5		31	23		6
Peak Hour Factor	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76
Parking (#/hr)	0											
Adj. Flow (vph)	82	395	16	0	0	0	0	1078	99	174	791	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	493	0	0	0	0	0	1177	0	174	791	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane											Yes	
Headway Factor	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2						2		1	2	
Detector Template	Left	Thru						Thru		Left	Thru	
Leading Detector (ft)	20	100						100		20	100	
Trailing Detector (ft)	0	0						0		0	0	
Detector 1 Position(ft)	0	0						0		0	0	
Detector 1 Size(ft)	20	6						6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex						Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0						0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0						0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0						0.0		0.0	0.0	
Detector 2 Position(ft)		94						94			94	
Detector 2 Size(ft)		6						6			6	
Detector 2 Type		Cl+Ex						Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0						0.0			0.0	
Turn Type	Perm	NA						NA		Perm	NA	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Protected Phases		4						2			2	
Permitted Phases	4									2		
Detector Phase	4	4						2		2	2	
Switch Phase												
Minimum Initial (s)	6.0	6.0						16.0		16.0	16.0	
Minimum Split (s)	30.0	30.0						23.5		23.5	23.5	
Total Split (s)	30.0	30.0						80.0		80.0	80.0	
Total Split (%)	27.3%	27.3%						72.7%		72.7%	72.7%	
Maximum Green (s)	25.0	25.0						74.5		74.5	74.5	
Yellow Time (s)	3.0	3.0						3.2		3.2	3.2	
All-Red Time (s)	2.0	2.0						2.3		2.3	2.3	
Lost Time Adjust (s)		0.0						0.0		0.0	0.0	
Total Lost Time (s)		5.0						5.5		5.5	5.5	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	4.0	4.0						0.2		0.2	0.2	
Recall Mode	None	None						C-Max		C-Max	C-Max	
Walk Time (s)	7.0	7.0						7.0		7.0	7.0	
Flash Dont Walk (s)	18.0	18.0						11.0		11.0	11.0	
Pedestrian Calls (#/hr)	10	10						10		10	10	
Act Effct Green (s)		23.2						76.3		76.3	76.3	
Actuated g/C Ratio		0.21						0.69		0.69	0.69	
v/c Ratio		0.79						0.58		0.80	0.38	
Control Delay		50.8						10.2		36.5	2.7	
Queue Delay		0.0						0.0		0.0	0.2	
Total Delay		50.8						10.2		36.5	2.8	
LOS		D						B		D	A	
Approach Delay		50.8						10.2			8.9	
Approach LOS		D						B			A	

Intersection Summary	
Area Type:	Other
Cycle Length: 110	
Actuated Cycle Length: 110	
Offset: 20 (18%), Referenced to phase 2:NBSB, Start of Green	
Natural Cycle: 90	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.80	
Intersection Signal Delay: 17.3	Intersection LOS: B
Intersection Capacity Utilization 72.0%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 5: Orange St & 6th St

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	59	170	20	0	0	0	0	726	83	140	1004	0
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Storage Length (ft)	0		0	0		0	0		0	40		0
Storage Lanes	0		0	0		0	0		0	1		0
Taper Length (ft)	25			25			25			75		
Lane Util. Factor	0.95	0.95	0.95	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	1.00
Ped Bike Factor		1.00						0.99		0.99		
Frt		0.988						0.985				
Flt Protected		0.988								0.950		
Satd. Flow (prot)	0	2902	0	0	0	0	0	2919	0	1490	2980	0
Flt Permitted		0.988								0.324		
Satd. Flow (perm)	0	2897	0	0	0	0	0	2919	0	504	2980	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		9						24				
Link Speed (mph)		25			25			30			30	
Link Distance (ft)		359			1502			177			340	
Travel Time (s)		9.8			41.0			4.0			7.7	
Confl. Peds. (#/hr)	6		17				8		27	18		14
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Parking (#/hr)	0											
Adj. Flow (vph)	61	175	21	0	0	0	0	748	86	144	1035	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	257	0	0	0	0	0	834	0	144	1035	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane											Yes	
Headway Factor	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2						2		1	2	
Detector Template	Left	Thru						Thru		Left	Thru	
Leading Detector (ft)	20	100						100		20	100	
Trailing Detector (ft)	0	0						0		0	0	
Detector 1 Position(ft)	0	0						0		0	0	
Detector 1 Size(ft)	20	6						6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex						Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0						0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0						0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0						0.0		0.0	0.0	
Detector 2 Position(ft)		94						94			94	
Detector 2 Size(ft)		6						6			6	
Detector 2 Type		Cl+Ex						Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0						0.0			0.0	
Turn Type	Perm	NA						NA		Perm	NA	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Protected Phases		4						2			2	
Permitted Phases	4									2		
Detector Phase	4	4						2		2	2	
Switch Phase												
Minimum Initial (s)	6.0	6.0						16.0		16.0	16.0	
Minimum Split (s)	30.0	30.0						23.5		23.5	23.5	
Total Split (s)	31.0	31.0						69.0		69.0	69.0	
Total Split (%)	31.0%	31.0%						69.0%		69.0%	69.0%	
Maximum Green (s)	26.0	26.0						63.5		63.5	63.5	
Yellow Time (s)	3.0	3.0						3.2		3.2	3.2	
All-Red Time (s)	2.0	2.0						2.3		2.3	2.3	
Lost Time Adjust (s)		0.0						0.0		0.0	0.0	
Total Lost Time (s)		5.0						5.5		5.5	5.5	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	4.0	4.0						0.2		0.2	0.2	
Recall Mode	None	None						C-Max		C-Max	C-Max	
Walk Time (s)	7.0	7.0						7.0		7.0	7.0	
Flash Dont Walk (s)	18.0	18.0						11.0		11.0	11.0	
Pedestrian Calls (#/hr)	5	5						10		10	10	
Act Effct Green (s)		16.0						73.5		73.5	73.5	
Actuated g/C Ratio		0.16						0.74		0.74	0.74	
v/c Ratio		0.55						0.39		0.39	0.47	
Control Delay		40.8						6.0		6.6	4.5	
Queue Delay		0.0						0.0		0.0	0.2	
Total Delay		40.8						6.0		6.6	4.8	
LOS		D						A		A	A	
Approach Delay		40.8						6.0			5.0	
Approach LOS		D						A			A	

Intersection Summary	
Area Type:	Other
Cycle Length: 100	
Actuated Cycle Length: 100	
Offset: 12 (12%), Referenced to phase 2:NBSB, Start of Green	
Natural Cycle: 65	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.55	
Intersection Signal Delay: 9.4	Intersection LOS: A
Intersection Capacity Utilization 86.5%	ICU Level of Service E
Analysis Period (min) 15	

Splits and Phases: 5: Orange St & 6th St

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	5	366	34	12	378	5	21	5	24	11	16	37
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Lane Util. Factor	0.95	0.95	0.95	0.95	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor		0.99			1.00			0.96			0.97	
Frt		0.987			0.998			0.935			0.922	
Flt Protected		0.999			0.998			0.979			0.991	
Satd. Flow (prot)	0	2621	0	0	2668	0	0	1249	0	0	1255	0
Flt Permitted		0.951			0.939			0.890			0.961	
Satd. Flow (perm)	0	2494	0	0	2508	0	0	1127	0	0	1211	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		19			2			26			40	
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		751			421			230			319	
Travel Time (s)		20.5			11.5			6.3			8.7	
Confl. Peds. (#/hr)	15		46	27		45	19		57	30		34
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Parking (#/hr)			0			0			0			0
Adj. Flow (vph)	5	394	37	13	406	5	23	5	26	12	17	40
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	436	0	0	424	0	0	54	0	0	69	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		0			0			0			0	
Two way Left Turn Lane												
Headway Factor	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			2			4			4	
Permitted Phases	2			2			4			4		
Minimum Split (s)	28.0	28.0		28.0	28.0		31.0	31.0		31.0	31.0	
Total Split (s)	59.0	59.0		59.0	59.0		31.0	31.0		31.0	31.0	
Total Split (%)	65.6%	65.6%		65.6%	65.6%		34.4%	34.4%		34.4%	34.4%	
Maximum Green (s)	54.0	54.0		54.0	54.0		26.0	26.0		26.0	26.0	
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0			0.0			0.0			0.0	
Total Lost Time (s)		5.0			5.0			5.0			5.0	
Lead/Lag												
Lead-Lag Optimize?												
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	16.0	16.0		16.0	16.0		19.0	19.0		19.0	19.0	
Pedestrian Calls (#/hr)	20	20		20	20		20	20		20	20	
Act Effct Green (s)		54.0			54.0			26.0			26.0	
Actuated g/C Ratio		0.60			0.60			0.29			0.29	
v/c Ratio		0.29			0.28			0.16			0.18	
Control Delay		8.8			7.9			16.0			13.9	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		8.8			7.9			16.0			13.9	
LOS		A			A			B			B	
Approach Delay		8.8			7.9			16.0			13.9	
Approach LOS		A			A			B			B	

Intersection Summary	
Area Type:	CBD
Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 66 (73%), Referenced to phase 2:EBWB, Start of Green	
Natural Cycle: 60	
Control Type: Pretimed	
Maximum v/c Ratio: 0.29	
Intersection Signal Delay: 9.2	Intersection LOS: A
Intersection Capacity Utilization 55.5%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 6: Ryman St & Broadway St

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	5	391	24	27	656	5	50	5	33	20	32	93
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Lane Util. Factor	0.95	0.95	0.95	0.95	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor		0.99			1.00			0.94			0.95	
Frt		0.992			0.999			0.949			0.913	
Flt Protected		0.999			0.998			0.972			0.993	
Satd. Flow (prot)	0	2628	0	0	2672	0	0	1241	0	0	1227	0
Flt Permitted		0.949			0.926			0.788			0.960	
Satd. Flow (perm)	0	2496	0	0	2472	0	0	992	0	0	1179	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		12			1			34			95	
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		751			421			230			319	
Travel Time (s)		20.5			11.5			6.3			8.7	
Confl. Peds. (#/hr)	19		96	63		66	33		110	47		52
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Parking (#/hr)			0			0			0			0
Adj. Flow (vph)	5	399	24	28	669	5	51	5	34	20	33	95
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	428	0	0	702	0	0	90	0	0	148	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		0			0			0			0	
Two way Left Turn Lane												
Headway Factor	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			2			4			4	
Permitted Phases	2			2			4			4		
Minimum Split (s)	28.0	28.0		28.0	28.0		31.0	31.0		31.0	31.0	
Total Split (s)	59.0	59.0		59.0	59.0		31.0	31.0		31.0	31.0	
Total Split (%)	65.6%	65.6%		65.6%	65.6%		34.4%	34.4%		34.4%	34.4%	
Maximum Green (s)	54.0	54.0		54.0	54.0		26.0	26.0		26.0	26.0	
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0			0.0			0.0			0.0	
Total Lost Time (s)		5.0			5.0			5.0			5.0	
Lead/Lag												
Lead-Lag Optimize?												
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	16.0	16.0		16.0	16.0		19.0	19.0		19.0	19.0	
Pedestrian Calls (#/hr)	100	100		100	100		100	100		100	100	
Act Effct Green (s)		54.0			54.0			26.0			26.0	
Actuated g/C Ratio		0.60			0.60			0.29			0.29	
v/c Ratio		0.28			0.47			0.29			0.36	
Control Delay		9.0			7.6			19.3			13.2	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		9.0			7.6			19.3			13.2	
LOS		A			A			B			B	
Approach Delay		9.0			7.6			19.3			13.2	
Approach LOS		A			A			B			B	

Intersection Summary	
Area Type:	CBD
Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 66 (73%), Referenced to phase 2:EBWB, Start of Green	
Natural Cycle: 60	
Control Type: Pretimed	
Maximum v/c Ratio: 0.47	
Intersection Signal Delay: 9.4	Intersection LOS: A
Intersection Capacity Utilization 79.2%	ICU Level of Service D
Analysis Period (min) 15	

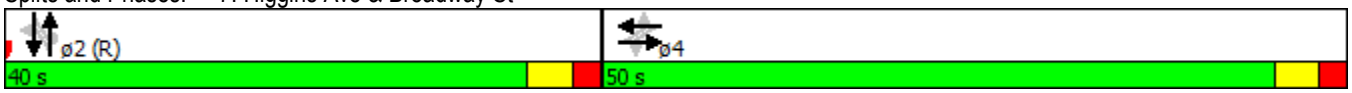
Splits and Phases: 6: Ryman St & Broadway St

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	26	278	79	61	254	25	141	171	119	9	121	19
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Storage Length (ft)	0		0	0		0	0		0	50		0
Storage Lanes	0		0	0		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	0.95	0.95	0.95	0.95	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor		0.98			0.99		0.97	0.97		0.98	0.99	
Frt		0.969			0.989			0.939			0.979	
Flt Protected		0.997			0.991		0.950			0.950		
Satd. Flow (prot)	0	2546	0	0	2601	0	1341	1283	0	1341	1363	0
Flt Permitted		0.913			0.812		0.658			0.461		
Satd. Flow (perm)	0	2324	0	0	2124	0	897	1283	0	639	1363	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		52			13			45			10	
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		421			386			388			390	
Travel Time (s)		11.5			10.5			10.6			10.6	
Confl. Peds. (#/hr)	44		72	33		74	39		63	30		83
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Parking (#/hr)			0			0			0			0
Adj. Flow (vph)	28	302	86	66	276	27	153	186	129	10	132	21
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	416	0	0	369	0	153	315	0	10	153	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane											Yes	
Headway Factor	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			4			2			2	
Permitted Phases	4			4			2			2		
Minimum Split (s)	31.0	31.0		31.0	31.0		30.0	30.0		30.0	30.0	
Total Split (s)	50.0	50.0		50.0	50.0		40.0	40.0		40.0	40.0	
Total Split (%)	55.6%	55.6%		55.6%	55.6%		44.4%	44.4%		44.4%	44.4%	
Maximum Green (s)	45.0	45.0		45.0	45.0		35.0	35.0		35.0	35.0	
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0			0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)		5.0			5.0		5.0	5.0		5.0	5.0	
Lead/Lag												
Lead-Lag Optimize?												
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	19.0	19.0		19.0	19.0		18.0	18.0		18.0	18.0	
Pedestrian Calls (#/hr)	20	20		20	20		20	20		20	20	
Act Effct Green (s)		45.0			45.0		35.0	35.0		35.0	35.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Actuated g/C Ratio		0.50			0.50		0.39	0.39		0.39	0.39	
v/c Ratio		0.35			0.35		0.44	0.60		0.04	0.29	
Control Delay		8.1			10.4		12.5	10.8		14.9	15.2	
Queue Delay		0.0			0.0		0.0	0.1		0.0	0.0	
Total Delay		8.1			10.4		12.5	10.9		14.9	15.2	
LOS		A			B		B	B		B	B	
Approach Delay		8.1			10.4			11.4			15.2	
Approach LOS		A			B			B			B	

Intersection Summary	
Area Type: CBD	
Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 31 (34%), Referenced to phase 2:NBSB, Start of Green	
Natural Cycle: 65	
Control Type: Pretimed	
Maximum v/c Ratio: 0.60	
Intersection Signal Delay: 10.6	Intersection LOS: B
Intersection Capacity Utilization 91.1%	ICU Level of Service F
Analysis Period (min) 15	

Splits and Phases: 7: Higgins Ave & Broadway St

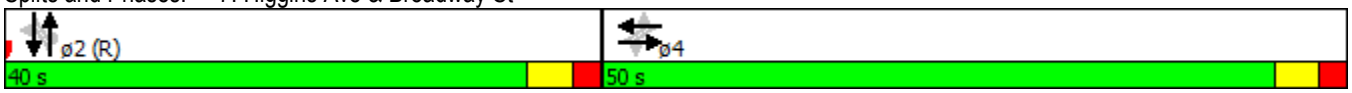


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	25	381	91	84	368	31	162	222	156	25	317	38
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Storage Length (ft)	0		0	0		0	0		0	50		0
Storage Lanes	0		0	0		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	0.95	0.95	0.95	0.95	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor		0.98			0.98		0.94	0.94		0.97	0.99	
Frt		0.972			0.990			0.938			0.984	
Flt Protected		0.997			0.991		0.950			0.950		
Satd. Flow (prot)	0	2542	0	0	2593	0	1341	1248	0	1341	1370	0
Flt Permitted		0.908			0.750		0.357			0.328		
Satd. Flow (perm)	0	2309	0	0	1953	0	475	1248	0	451	1370	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		43			11			46			8	
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		421			386			388			390	
Travel Time (s)		11.5			10.5			10.6			10.6	
Confl. Peds. (#/hr)	63		107	63		121	120		121	58		107
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Parking (#/hr)			0			0			0			0
Adj. Flow (vph)	29	438	105	97	423	36	186	255	179	29	364	44
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	572	0	0	556	0	186	434	0	29	408	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane											Yes	
Headway Factor	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			4			2			2	
Permitted Phases	4			4			2			2		
Minimum Split (s)	31.0	31.0		31.0	31.0		30.0	30.0		30.0	30.0	
Total Split (s)	50.0	50.0		50.0	50.0		40.0	40.0		40.0	40.0	
Total Split (%)	55.6%	55.6%		55.6%	55.6%		44.4%	44.4%		44.4%	44.4%	
Maximum Green (s)	45.0	45.0		45.0	45.0		35.0	35.0		35.0	35.0	
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0			0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)		5.0			5.0		5.0	5.0		5.0	5.0	
Lead/Lag												
Lead-Lag Optimize?												
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	19.0	19.0		19.0	19.0		18.0	18.0		18.0	18.0	
Pedestrian Calls (#/hr)	100	100		100	100		100	100		100	100	
Act Effct Green (s)		45.0			45.0		35.0	35.0		35.0	35.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Actuated g/C Ratio		0.50			0.50		0.39	0.39		0.39	0.39	
v/c Ratio		0.49			0.57		1.01	0.85		0.17	0.76	
Control Delay		10.3			12.7		78.1	22.8		14.8	25.6	
Queue Delay		0.0			0.0		0.0	0.4		0.0	0.6	
Total Delay		10.3			12.7		78.1	23.2		14.8	26.2	
LOS		B			B		E	C		B	C	
Approach Delay		10.3			12.7			39.7			25.4	
Approach LOS		B			B			D			C	

Intersection Summary	
Area Type: CBD	
Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 31 (34%), Referenced to phase 2:NBSB, Start of Green	
Natural Cycle: 65	
Control Type: Pretimed	
Maximum v/c Ratio: 1.01	
Intersection Signal Delay: 22.3	Intersection LOS: C
Intersection Capacity Utilization 97.6%	ICU Level of Service F
Analysis Period (min) 15	

Splits and Phases: 7: Higgins Ave & Broadway St



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	57	109	24	89	396	0	0	220	49
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	0.95	0.95	0.95	1.00	1.00	0.95	0.95
Ped Bike Factor					0.98			1.00			0.99	
Frt					0.981						0.973	
Flt Protected					0.985			0.991				
Satd. Flow (prot)	0	0	0	0	2446	0	0	2525	0	0	2448	0
Flt Permitted					0.985			0.817				
Satd. Flow (perm)	0	0	0	0	2403	0	0	2074	0	0	2448	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					19						46	
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		1063			359			401			388	
Travel Time (s)		29.0			9.8			10.9			10.6	
Confl. Peds. (#/hr)				56		40	31		71	15		56
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Parking (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Adj. Flow (vph)	0	0	0	64	122	27	100	445	0	0	247	55
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	213	0	0	545	0	0	302	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.42	1.42	1.42	1.42	1.51	1.42	1.42	1.51	1.42	1.42	1.51	1.42
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type				Perm	NA		Perm	NA			NA	
Protected Phases					4			2			2	
Permitted Phases				4			2					
Minimum Split (s)				31.0	31.0		31.0	31.0			31.0	
Total Split (s)				36.0	36.0		54.0	54.0			54.0	
Total Split (%)				40.0%	40.0%		60.0%	60.0%			60.0%	
Maximum Green (s)				31.0	31.0		49.0	49.0			49.0	
Yellow Time (s)				3.0	3.0		3.0	3.0			3.0	
All-Red Time (s)				2.0	2.0		2.0	2.0			2.0	
Lost Time Adjust (s)					0.0			0.0			0.0	
Total Lost Time (s)					5.0			5.0			5.0	
Lead/Lag												
Lead-Lag Optimize?												
Walk Time (s)				7.0	7.0		7.0	7.0			7.0	
Flash Dont Walk (s)				19.0	19.0		19.0	19.0			19.0	
Pedestrian Calls (#/hr)				20	20		20	20			20	
Act Effct Green (s)					31.0			49.0			49.0	
Actuated g/C Ratio					0.34			0.54			0.54	
v/c Ratio					0.25			0.48			0.22	
Control Delay					20.2			5.7			8.6	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Delay					0.0			0.0			0.0	
Total Delay					20.2			5.7			8.6	
LOS					C			A			A	
Approach Delay					20.2			5.7			8.6	
Approach LOS					C			A			A	

Intersection Summary	
Area Type:	CBD
Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 19 (21%), Referenced to phase 2:NBSB, Start of Green	
Natural Cycle: 65	
Control Type: Pretimed	
Maximum v/c Ratio: 0.48	
Intersection Signal Delay: 9.4	Intersection LOS: A
Intersection Capacity Utilization 77.5%	ICU Level of Service D
Analysis Period (min) 15	

Splits and Phases: 8: Higgins Ave & Main St

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	222	188	43	103	491	0	0	459	58
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	0.95	0.95	0.95	1.00	1.00	0.95	0.95
Ped Bike Factor					0.94			1.00			0.98	
Frt					0.986						0.983	
Flt Protected					0.976			0.991				
Satd. Flow (prot)	0	0	0	0	2417	0	0	2525	0	0	2466	0
Flt Permitted					0.976			0.711				
Satd. Flow (perm)	0	0	0	0	2301	0	0	1807	0	0	2466	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					14						24	
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		1085			359			401			388	
Travel Time (s)		29.6			9.8			10.9			10.6	
Confl. Peds. (#/hr)				95		135	41		148	53		123
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Parking (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Adj. Flow (vph)	0	0	0	267	227	52	124	592	0	0	553	70
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	546	0	0	716	0	0	623	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.42	1.42	1.42	1.42	1.51	1.42	1.42	1.51	1.42	1.42	1.51	1.42
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type				Perm	NA		Perm	NA			NA	
Protected Phases					4			2			2	
Permitted Phases				4			2					
Minimum Split (s)				31.0	31.0		31.0	31.0			31.0	
Total Split (s)				36.0	36.0		54.0	54.0			54.0	
Total Split (%)				40.0%	40.0%		60.0%	60.0%			60.0%	
Maximum Green (s)				31.0	31.0		49.0	49.0			49.0	
Yellow Time (s)				3.0	3.0		3.0	3.0			3.0	
All-Red Time (s)				2.0	2.0		2.0	2.0			2.0	
Lost Time Adjust (s)					0.0			0.0			0.0	
Total Lost Time (s)					5.0			5.0			5.0	
Lead/Lag												
Lead-Lag Optimize?												
Walk Time (s)				7.0	7.0		7.0	7.0			7.0	
Flash Dont Walk (s)				19.0	19.0		19.0	19.0			19.0	
Pedestrian Calls (#/hr)				100	100		100	100			100	
Act Effct Green (s)					31.0			49.0			49.0	
Actuated g/C Ratio					0.34			0.54			0.54	
v/c Ratio					0.68			0.73			0.46	
Control Delay					29.8			8.5			10.3	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Delay					0.0			0.0			0.0	
Total Delay					29.8			8.6			10.3	
LOS					C			A			B	
Approach Delay					29.8			8.6			10.3	
Approach LOS					C			A			B	

Intersection Summary	
Area Type:	CBD
Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 19 (21%), Referenced to phase 2:NBSB, Start of Green	
Natural Cycle: 65	
Control Type: Pretimed	
Maximum v/c Ratio: 0.73	
Intersection Signal Delay: 15.3	Intersection LOS: B
Intersection Capacity Utilization 77.7%	ICU Level of Service D
Analysis Period (min) 15	

Splits and Phases: 8: Higgins Ave & Main St

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	14	151	124	0	0	0	0	454	186	15	197	0
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	0.95	0.95	0.95
Ped Bike Factor		1.00	0.91					0.97			1.00	
Frt			0.850					0.956				
Flt Protected		0.996									0.996	
Satd. Flow (prot)	0	1266	1080	0	0	0	0	2369	0	0	2538	0
Flt Permitted		0.996									0.886	
Satd. Flow (perm)	0	1263	983	0	0	0	0	2369	0	0	2257	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			157					108				
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		459			449			987			401	
Travel Time (s)		12.5			12.2			26.9			10.9	
Confl. Peds. (#/hr)	20		82				33		72	23		53
Peak Hour Factor	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79
Parking (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Adj. Flow (vph)	18	191	157	0	0	0	0	575	235	19	249	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	209	157	0	0	0	0	810	0	0	268	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.42	1.61	1.61	1.42	1.42	1.42	1.42	1.51	1.42	1.42	1.51	1.42
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Perm	NA	Perm				Perm	NA		Perm	NA	
Protected Phases		4						2			2	
Permitted Phases	4		4				2			2		
Minimum Split (s)	33.0	33.0	33.0				28.0	28.0		28.0	28.0	
Total Split (s)	36.0	36.0	36.0				54.0	54.0		54.0	54.0	
Total Split (%)	40.0%	40.0%	40.0%				60.0%	60.0%		60.0%	60.0%	
Maximum Green (s)	31.0	31.0	31.0				49.0	49.0		49.0	49.0	
Yellow Time (s)	3.0	3.0	3.0				3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0	2.0				2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0	0.0					0.0			0.0	
Total Lost Time (s)		5.0	5.0					5.0			5.0	
Lead/Lag												
Lead-Lag Optimize?												
Walk Time (s)	7.0	7.0	7.0				7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	21.0	21.0	21.0				16.0	16.0		16.0	16.0	
Pedestrian Calls (#/hr)	25	25	25				20	20		20	20	
Act Effct Green (s)		31.0	31.0					49.0			49.0	
Actuated g/C Ratio		0.34	0.34					0.54			0.54	
v/c Ratio		0.48	0.36					0.61			0.22	
Control Delay		25.1	5.4					14.2			6.4	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Delay		0.0	0.0					0.0			0.0	
Total Delay		25.1	5.4					14.2			6.4	
LOS		C	A					B			A	
Approach Delay		16.6						14.2			6.4	
Approach LOS		B						B			A	

Intersection Summary	
Area Type: CBD	
Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 15 (17%), Referenced to phase 2:NBSB, Start of Green	
Natural Cycle: 65	
Control Type: Pretimed	
Maximum v/c Ratio: 0.61	
Intersection Signal Delay: 13.3	Intersection LOS: B
Intersection Capacity Utilization 57.5%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 9: Higgins Ave & Front St

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	34	174	254	0	0	0	0	571	141	5	611	0
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	0.95	0.95	0.95
Ped Bike Factor		0.99	0.81					0.95			1.00	
Frt			0.850					0.970				
Flt Protected		0.992										
Satd. Flow (prot)	0	1260	1080	0	0	0	0	2347	0	0	2548	0
Flt Permitted		0.992									0.949	
Satd. Flow (perm)	0	1249	877	0	0	0	0	2347	0	0	2418	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			110					53				
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		459			449			987			401	
Travel Time (s)		12.5			12.2			26.9			10.9	
Confl. Peds. (#/hr)	57		186				52		211	77		109
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Parking (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Adj. Flow (vph)	40	207	302	0	0	0	0	680	168	6	727	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	247	302	0	0	0	0	848	0	0	733	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.42	1.61	1.61	1.42	1.42	1.42	1.42	1.51	1.42	1.42	1.51	1.42
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Perm	NA	Perm				Perm	NA		Perm	NA	
Protected Phases		4						2			2	
Permitted Phases	4		4				2			2		
Minimum Split (s)	33.0	33.0	33.0				28.0	28.0		28.0	28.0	
Total Split (s)	36.0	36.0	36.0				54.0	54.0		54.0	54.0	
Total Split (%)	40.0%	40.0%	40.0%				60.0%	60.0%		60.0%	60.0%	
Maximum Green (s)	31.0	31.0	31.0				49.0	49.0		49.0	49.0	
Yellow Time (s)	3.0	3.0	3.0				3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0	2.0				2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0	0.0					0.0			0.0	
Total Lost Time (s)		5.0	5.0					5.0			5.0	
Lead/Lag												
Lead-Lag Optimize?												
Walk Time (s)	7.0	7.0	7.0				7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	21.0	21.0	21.0				16.0	16.0		16.0	16.0	
Pedestrian Calls (#/hr)	100	100	100				100	100		100	100	
Act Effct Green (s)		31.0	31.0					49.0			49.0	
Actuated g/C Ratio		0.34	0.34					0.54			0.54	
v/c Ratio		0.57	0.81					0.65			0.56	
Control Delay		30.5	35.6					16.4			14.8	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Delay		0.0	0.0					0.0			0.1	
Total Delay		30.5	35.6					16.4			14.9	
LOS		C	D					B			B	
Approach Delay		33.3						16.4			14.9	
Approach LOS		C						B			B	

Intersection Summary	
Area Type: CBD	
Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 15 (17%), Referenced to phase 2:NBSB, Start of Green	
Natural Cycle: 65	
Control Type: Pretimed	
Maximum v/c Ratio: 0.81	
Intersection Signal Delay: 20.3	Intersection LOS: C
Intersection Capacity Utilization 60.0%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 9: Higgins Ave & Front St

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	21	40	20	5	7	11	29	587	25	8	311	16
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	0.95	0.95	0.95
Ped Bike Factor		0.98			0.98			1.00			1.00	
Frt		0.967			0.935			0.994			0.993	
Flt Protected		0.987			0.990			0.998			0.999	
Satd. Flow (prot)	0	1474	0	0	1429	0	0	2946	0	0	2944	0
Flt Permitted		0.925			0.948			0.922			0.938	
Satd. Flow (perm)	0	1379	0	0	1363	0	0	2718	0	0	2764	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		22			14			8			11	
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		338			394			361			635	
Travel Time (s)		9.2			10.7			9.8			17.3	
Confl. Peds. (#/hr)	8		49	24		20	25		36	12		33
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Adj. Flow (vph)	26	50	25	6	9	14	36	734	31	10	389	20
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	101	0	0	29	0	0	801	0	0	419	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (ft)	20	100		20	100		20	100		20	100	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			4			2			2	
Permitted Phases	4			4			2			2		
Detector Phase	4	4		4	4		2	2		2	2	
Switch Phase												

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Minimum Split (s)	27.0	27.0		27.0	27.0		23.0	23.0		23.0	23.0	
Total Split (s)	30.0	30.0		30.0	30.0		50.0	50.0		50.0	50.0	
Total Split (%)	37.5%	37.5%		37.5%	37.5%		62.5%	62.5%		62.5%	62.5%	
Maximum Green (s)	26.0	26.0		26.0	26.0		46.0	46.0		46.0	46.0	
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)		0.0			0.0			0.0			0.0	
Total Lost Time (s)		4.0			4.0			4.0			4.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		0.2	0.2		0.2	0.2	
Recall Mode	None	None		None	None		C-Max	C-Max		C-Max	C-Max	
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	16.0	16.0		16.0	16.0		12.0	12.0		12.0	12.0	
Pedestrian Calls (#/hr)	20	20		20	20		10	10		10	10	
Act Effct Green (s)		14.0			14.0			60.8			60.8	
Actuated g/C Ratio		0.18			0.18			0.76			0.76	
v/c Ratio		0.39			0.12			0.39			0.20	
Control Delay		25.0			16.2			0.9			4.7	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		25.0			16.2			1.0			4.7	
LOS		C			B			A			A	
Approach Delay		25.0			16.2			1.0			4.7	
Approach LOS		C			B			A			A	

Intersection Summary

Area Type: Other
Cycle Length: 80
Actuated Cycle Length: 80
Offset: 21 (26%), Referenced to phase 2:NBSB, Start of Green
Natural Cycle: 50
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.39
Intersection Signal Delay: 4.3 Intersection LOS: A
Intersection Capacity Utilization 64.3% ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 10: Higgins Ave & 4th St

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	55	33	33	32	42	29	6	622	32	25	872	58
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	0.95	0.95	0.95
Ped Bike Factor		0.97			0.97			0.99			0.99	
Frt		0.963			0.962			0.993			0.991	
Flt Protected		0.978			0.985						0.999	
Satd. Flow (prot)	0	1448	0	0	1455	0	0	2934	0	0	2929	0
Flt Permitted		0.813			0.888			0.946			0.921	
Satd. Flow (perm)	0	1192	0	0	1299	0	0	2776	0	0	2699	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		24			25			12			15	
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		338			394			361			635	
Travel Time (s)		9.2			10.7			9.8			17.3	
Confl. Peds. (#/hr)	27		59	38		63	21		74	36		48
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Adj. Flow (vph)	66	40	40	39	51	35	7	749	39	30	1051	70
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	146	0	0	125	0	0	795	0	0	1151	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (ft)	20	100		20	100		20	100		20	100	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			4			2			2	
Permitted Phases	4			4			2			2		
Detector Phase	4	4		4	4		2	2		2	2	
Switch Phase												

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Minimum Split (s)	27.0	27.0		27.0	27.0		23.0	23.0		23.0	23.0	
Total Split (s)	27.0	27.0		27.0	27.0		53.0	53.0		53.0	53.0	
Total Split (%)	33.8%	33.8%		33.8%	33.8%		66.3%	66.3%		66.3%	66.3%	
Maximum Green (s)	23.0	23.0		23.0	23.0		49.0	49.0		49.0	49.0	
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)		0.0			0.0			0.0			0.0	
Total Lost Time (s)		4.0			4.0			4.0			4.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		0.2	0.2		0.2	0.2	
Recall Mode	None	None		None	None		C-Max	C-Max		C-Max	C-Max	
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	16.0	16.0		16.0	16.0		12.0	12.0		12.0	12.0	
Pedestrian Calls (#/hr)	20	20		20	20		20	20		20	20	
Act Effct Green (s)		15.3			15.3			56.7			56.7	
Actuated g/C Ratio		0.19			0.19			0.71			0.71	
v/c Ratio		0.59			0.46			0.40			0.60	
Control Delay		32.6			26.4			1.9			8.9	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		32.6			26.4			1.9			9.0	
LOS		C			C			A			A	
Approach Delay		32.6			26.4			1.9			9.0	
Approach LOS		C			C			A			A	

Intersection Summary	
Area Type:	Other
Cycle Length: 80	
Actuated Cycle Length: 80	
Offset: 79 (99%), Referenced to phase 2:NBSB, Start of Green	
Natural Cycle: 60	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.60	
Intersection Signal Delay: 9.0	Intersection LOS: A
Intersection Capacity Utilization 77.7%	ICU Level of Service D
Analysis Period (min) 15	

Splits and Phases: 10: Higgins Ave & 4th St

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	323	184	34	57	609	0	0	327	14
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	0.95	0.95	0.95	1.00	1.00	0.95	0.95
Ped Bike Factor					0.99			1.00			1.00	
Frt					0.991						0.994	
Flt Protected					0.971			0.996				
Satd. Flow (prot)	0	0	0	0	2863	0	0	2968	0	0	2959	0
Flt Permitted					0.971			0.871				
Satd. Flow (perm)	0	0	0	0	2840	0	0	2595	0	0	2959	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					10						8	
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		1500			386			343			361	
Travel Time (s)		40.9			10.5			9.4			9.8	
Confl. Peds. (#/hr)				13		15	6		17	4		17
Peak Hour Factor	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77
Adj. Flow (vph)	0	0	0	419	239	44	74	791	0	0	425	18
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	702	0	0	865	0	0	443	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors				1	2		1	2			2	
Detector Template				Left	Thru		Left	Thru			Thru	
Leading Detector (ft)				20	100		20	100			100	
Trailing Detector (ft)				0	0		0	0			0	
Detector 1 Position(ft)				0	0		0	0			0	
Detector 1 Size(ft)				20	6		20	6			6	
Detector 1 Type				Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex			Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)				0.0	0.0		0.0	0.0			0.0	
Detector 1 Queue (s)				0.0	0.0		0.0	0.0			0.0	
Detector 1 Delay (s)				0.0	0.0		0.0	0.0			0.0	
Detector 2 Position(ft)					94			94			94	
Detector 2 Size(ft)					6			6			6	
Detector 2 Type					Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)					0.0			0.0			0.0	
Turn Type				Perm	NA		Perm	NA			NA	
Protected Phases					4			2			2	
Permitted Phases				4			2					
Detector Phase				4	4		2	2			2	
Switch Phase												

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)				6.0	6.0		6.0	6.0			6.0	
Minimum Split (s)				27.0	27.0		24.0	24.0			24.0	
Total Split (s)				33.0	33.0		47.0	47.0			47.0	
Total Split (%)				41.3%	41.3%		58.8%	58.8%			58.8%	
Maximum Green (s)				29.0	29.0		43.0	43.0			43.0	
Yellow Time (s)				3.0	3.0		3.0	3.0			3.0	
All-Red Time (s)				1.0	1.0		1.0	1.0			1.0	
Lost Time Adjust (s)					0.0			0.0			0.0	
Total Lost Time (s)					4.0			4.0			4.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)				3.0	3.0		0.2	0.2			0.2	
Recall Mode				None	None		C-Max	C-Max			C-Max	
Walk Time (s)				7.0	7.0		7.0	7.0			7.0	
Flash Dont Walk (s)				16.0	16.0		13.0	13.0			13.0	
Pedestrian Calls (#/hr)				5	5		5	5			5	
Act Effct Green (s)					25.4			46.6			46.6	
Actuated g/C Ratio					0.32			0.58			0.58	
v/c Ratio					0.88dl			0.57			0.26	
Control Delay					30.3			4.2			7.1	
Queue Delay					0.0			0.2			0.0	
Total Delay					30.3			4.4			7.1	
LOS					C			A			A	
Approach Delay					30.3			4.4			7.1	
Approach LOS					C			A			A	

Intersection Summary	
Area Type:	Other
Cycle Length: 80	
Actuated Cycle Length: 80	
Offset: 14 (18%), Referenced to phase 2:NBSB, Start of Green	
Natural Cycle: 55	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.77	
Intersection Signal Delay: 14.0	Intersection LOS: B
Intersection Capacity Utilization 69.9%	ICU Level of Service C
Analysis Period (min) 15	
dl Defacto Left Lane. Recode with 1 though lane as a left lane.	

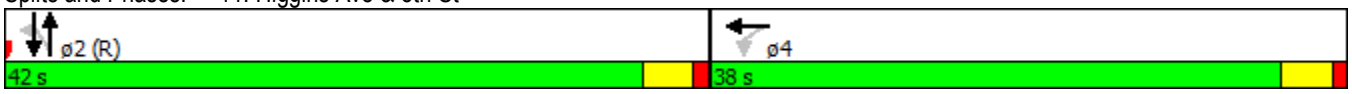
Splits and Phases: 11: Higgins Ave & 5th St

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	344	382	62	10	642	0	0	832	78
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	0.95	0.95	0.95	1.00	1.00	0.95	0.95
Ped Bike Factor					0.97			1.00			1.00	
Frt					0.988						0.987	
Flt Protected					0.979			0.999				
Satd. Flow (prot)	0	0	0	0	2871	0	0	2977	0	0	2928	0
Flt Permitted					0.979			0.935				
Satd. Flow (perm)	0	0	0	0	2805	0	0	2787	0	0	2928	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					14						17	
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		1500			386			343			361	
Travel Time (s)		40.9			10.5			9.4			9.8	
Confl. Peds. (#/hr)				51		38	17		69	18		37
Peak Hour Factor	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81
Adj. Flow (vph)	0	0	0	425	472	77	12	793	0	0	1027	96
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	974	0	0	805	0	0	1123	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors				1	2		1	2			2	
Detector Template				Left	Thru		Left	Thru			Thru	
Leading Detector (ft)				20	100		20	100			100	
Trailing Detector (ft)				0	0		0	0			0	
Detector 1 Position(ft)				0	0		0	0			0	
Detector 1 Size(ft)				20	6		20	6			6	
Detector 1 Type				Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex			Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)				0.0	0.0		0.0	0.0			0.0	
Detector 1 Queue (s)				0.0	0.0		0.0	0.0			0.0	
Detector 1 Delay (s)				0.0	0.0		0.0	0.0			0.0	
Detector 2 Position(ft)					94			94			94	
Detector 2 Size(ft)					6			6			6	
Detector 2 Type					Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)					0.0			0.0			0.0	
Turn Type				Perm	NA		Perm	NA			NA	
Protected Phases					4			2			2	
Permitted Phases				4			2					
Detector Phase				4	4		2	2			2	
Switch Phase												

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)				6.0	6.0		6.0	6.0			6.0	
Minimum Split (s)				27.0	27.0		24.0	24.0			24.0	
Total Split (s)				38.0	38.0		42.0	42.0			42.0	
Total Split (%)				47.5%	47.5%		52.5%	52.5%			52.5%	
Maximum Green (s)				34.0	34.0		38.0	38.0			38.0	
Yellow Time (s)				3.0	3.0		3.0	3.0			3.0	
All-Red Time (s)				1.0	1.0		1.0	1.0			1.0	
Lost Time Adjust (s)					0.0			0.0			0.0	
Total Lost Time (s)					4.0			4.0			4.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)				3.0	3.0		0.2	0.2			0.2	
Recall Mode				None	None		C-Max	C-Max			C-Max	
Walk Time (s)				7.0	7.0		7.0	7.0			7.0	
Flash Dont Walk (s)				16.0	16.0		13.0	13.0			13.0	
Pedestrian Calls (#/hr)				20	20		20	20			20	
Act Effct Green (s)					32.3			39.7			39.7	
Actuated g/C Ratio					0.40			0.50			0.50	
v/c Ratio					0.85			0.58			0.77	
Control Delay					29.8			8.5			14.6	
Queue Delay					0.0			0.3			0.3	
Total Delay					29.8			8.8			15.0	
LOS					C			A			B	
Approach Delay					29.8			8.8			15.0	
Approach LOS					C			A			B	

Intersection Summary	
Area Type:	Other
Cycle Length: 80	
Actuated Cycle Length: 80	
Offset: 4 (5%), Referenced to phase 2:NBSB, Start of Green	
Natural Cycle: 60	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.85	
Intersection Signal Delay: 18.3	Intersection LOS: B
Intersection Capacity Utilization 64.2%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 11: Higgins Ave & 5th St



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	30	405	50	0	0	0	0	619	267	5	642	0
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Lane Util. Factor	0.95	0.95	0.95	1.00	1.00	1.00	1.00	0.95	0.95	0.95	0.95	1.00
Ped Bike Factor		1.00						0.97			1.00	
Frt		0.984						0.955				
Flt Protected		0.997										
Satd. Flow (prot)	0	2916	0	0	0	0	0	2770	0	0	2980	0
Flt Permitted		0.997									0.946	
Satd. Flow (perm)	0	2914	0	0	0	0	0	2770	0	0	2819	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		16						84				
Link Speed (mph)		25			25			30			25	
Link Distance (ft)		1502			1027			348			343	
Travel Time (s)		41.0			28.0			7.9			9.4	
Confl. Peds. (#/hr)	9		15						69	54		9
Peak Hour Factor	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74
Adj. Flow (vph)	41	547	68	0	0	0	0	836	361	7	868	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	656	0	0	0	0	0	1197	0	0	875	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2						2		1	2	
Detector Template	Left	Thru						Thru		Left	Thru	
Leading Detector (ft)	20	100						100		20	100	
Trailing Detector (ft)	0	0						0		0	0	
Detector 1 Position(ft)	0	0						0		0	0	
Detector 1 Size(ft)	20	6						6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex						Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0						0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0						0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0						0.0		0.0	0.0	
Detector 2 Position(ft)		94						94			94	
Detector 2 Size(ft)		6						6			6	
Detector 2 Type		Cl+Ex						Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0						0.0			0.0	
Turn Type	Perm	NA						NA		Perm	NA	
Protected Phases		4						2			2	
Permitted Phases	4									2		
Detector Phase	4	4						2		2	2	
Switch Phase												

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)	6.0	6.0						6.0		6.0	6.0	
Minimum Split (s)	28.0	28.0						25.0		25.0	25.0	
Total Split (s)	28.0	28.0						52.0		52.0	52.0	
Total Split (%)	35.0%	35.0%						65.0%		65.0%	65.0%	
Maximum Green (s)	24.0	24.0						48.0		48.0	48.0	
Yellow Time (s)	3.0	3.0						3.0		3.0	3.0	
All-Red Time (s)	1.0	1.0						1.0		1.0	1.0	
Lost Time Adjust (s)		0.0						0.0			0.0	
Total Lost Time (s)		4.0						4.0			4.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0						0.2		0.2	0.2	
Recall Mode	None	None						C-Max		C-Max	C-Max	
Walk Time (s)	7.0	7.0						7.0		7.0	7.0	
Flash Dont Walk (s)	17.0	17.0						14.0		14.0	14.0	
Pedestrian Calls (#/hr)	5	5						20		20	20	
Act Effct Green (s)		22.1						49.9			49.9	
Actuated g/C Ratio		0.28						0.62			0.62	
v/c Ratio		0.80						0.68			0.50	
Control Delay		34.4						11.6			7.1	
Queue Delay		0.5						0.5			0.4	
Total Delay		34.8						12.0			7.4	
LOS		C						B			A	
Approach Delay		34.8						12.0			7.4	
Approach LOS		C						B			A	

Intersection Summary

Area Type: Other
Cycle Length: 80
Actuated Cycle Length: 80
Offset: 0 (0%), Referenced to phase 2:NBSB, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.80
Intersection Signal Delay: 16.1 Intersection LOS: B
Intersection Capacity Utilization 56.4% ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 12: Higgins Ave & 6th Ave

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	44	276	68	0	0	0	0	594	386	12	1164	0
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Lane Util. Factor	0.95	0.95	0.95	1.00	1.00	1.00	1.00	0.95	0.95	0.95	0.95	1.00
Ped Bike Factor		0.99						0.97			1.00	
Frt		0.974						0.941				
Flt Protected		0.994									0.999	
Satd. Flow (prot)	0	2861	0	0	0	0	0	2734	0	0	2977	0
Flt Permitted		0.994									0.940	
Satd. Flow (perm)	0	2856	0	0	0	0	0	2734	0	0	2801	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		32						191				
Link Speed (mph)		25			25			30			25	
Link Distance (ft)		1502			1027			348			343	
Travel Time (s)		41.0			28.0			7.9			9.4	
Confl. Peds. (#/hr)	15		37				13		46	22		28
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	52	325	80	0	0	0	0	699	454	14	1369	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	457	0	0	0	0	0	1153	0	0	1383	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2						2		1	2	
Detector Template	Left	Thru						Thru		Left	Thru	
Leading Detector (ft)	20	100						100		20	100	
Trailing Detector (ft)	0	0						0		0	0	
Detector 1 Position(ft)	0	0						0		0	0	
Detector 1 Size(ft)	20	6						6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex						Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0						0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0						0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0						0.0		0.0	0.0	
Detector 2 Position(ft)		94						94			94	
Detector 2 Size(ft)		6						6			6	
Detector 2 Type		Cl+Ex						Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0						0.0			0.0	
Turn Type	Perm	NA						NA		Perm	NA	
Protected Phases		4						2			2	
Permitted Phases	4									2		
Detector Phase	4	4						2		2	2	
Switch Phase												

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)	6.0	6.0						6.0		6.0	6.0	
Minimum Split (s)	28.0	28.0						25.0		25.0	25.0	
Total Split (s)	28.0	28.0						52.0		52.0	52.0	
Total Split (%)	35.0%	35.0%						65.0%		65.0%	65.0%	
Maximum Green (s)	24.0	24.0						48.0		48.0	48.0	
Yellow Time (s)	3.0	3.0						3.0		3.0	3.0	
All-Red Time (s)	1.0	1.0						1.0		1.0	1.0	
Lost Time Adjust (s)		0.0						0.0			0.0	
Total Lost Time (s)		4.0						4.0			4.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0						0.2		0.2	0.2	
Recall Mode	None	None						C-Max		C-Max	C-Max	
Walk Time (s)	7.0	7.0						7.0		7.0	7.0	
Flash Dont Walk (s)	17.0	17.0						14.0		14.0	14.0	
Pedestrian Calls (#/hr)	10	10						10		10	10	
Act Effct Green (s)		17.9						54.1			54.1	
Actuated g/C Ratio		0.22						0.68			0.68	
v/c Ratio		0.69						0.60			0.73	
Control Delay		31.5						7.3			6.7	
Queue Delay		0.0						0.5			0.2	
Total Delay		31.5						7.8			6.9	
LOS		C						A			A	
Approach Delay		31.5						7.8			6.9	
Approach LOS		C						A			A	

Intersection Summary	
Area Type:	Other
Cycle Length: 80	
Actuated Cycle Length: 80	
Offset: 0 (0%), Referenced to phase 2:NBSB, Start of Green	
Natural Cycle: 65	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.73	
Intersection Signal Delay: 11.0	Intersection LOS: B
Intersection Capacity Utilization 73.1%	ICU Level of Service D
Analysis Period (min) 15	

Splits and Phases: 12: Higgins Ave & 6th Ave

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	37	313	44	9	294	18	21	20	23	19	26	23
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Lane Util. Factor	0.95	0.95	0.95	0.95	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor		0.98			0.99			0.97			0.97	
Frt		0.983			0.992			0.951			0.954	
Flt Protected		0.995			0.999			0.984			0.986	
Satd. Flow (prot)	0	2587	0	0	2641	0	0	1294	0	0	1299	0
Flt Permitted		0.891			0.942			0.912			0.927	
Satd. Flow (perm)	0	2311	0	0	2489	0	0	1188	0	0	1213	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		26			12			26			26	
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		386			1549			261			294	
Travel Time (s)		10.5			42.2			7.1			8.0	
Confl. Peds. (#/hr)	19		50	17		46	33		44	27		52
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Parking (#/hr)			0			0			0			0
Adj. Flow (vph)	41	348	49	10	327	20	23	22	26	21	29	26
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	438	0	0	357	0	0	71	0	0	76	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			2			4			4	
Permitted Phases	2			2			4			4		
Minimum Split (s)	26.0	26.0		26.0	26.0		32.0	32.0		32.0	32.0	
Total Split (s)	58.0	58.0		58.0	58.0		32.0	32.0		32.0	32.0	
Total Split (%)	64.4%	64.4%		64.4%	64.4%		35.6%	35.6%		35.6%	35.6%	
Maximum Green (s)	53.0	53.0		53.0	53.0		27.0	27.0		27.0	27.0	
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0			0.0			0.0			0.0	
Total Lost Time (s)		5.0			5.0			5.0			5.0	
Lead/Lag												
Lead-Lag Optimize?												
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	14.0	14.0		14.0	14.0		20.0	20.0		20.0	20.0	
Pedestrian Calls (#/hr)	20	20		20	20		20	20		20	20	
Act Effct Green (s)		53.0			53.0			27.0			27.0	
Actuated g/C Ratio		0.59			0.59			0.30			0.30	
v/c Ratio		0.32			0.24			0.19			0.20	
Control Delay		7.3			9.1			17.7			18.1	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		7.3			9.1			17.7			18.1	
LOS		A			A			B			B	
Approach Delay		7.3			9.1			17.7			18.1	
Approach LOS		A			A			B			B	

Intersection Summary	
Area Type:	CBD
Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 75 (83%), Referenced to phase 2:EBWB, Start of Green	
Natural Cycle: 60	
Control Type: Pretimed	
Maximum v/c Ratio: 0.32	
Intersection Signal Delay: 9.7	Intersection LOS: A
Intersection Capacity Utilization 70.0%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 13: Pattee St & Broadway St

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	36	485	40	22	429	36	56	46	51	31	29	22
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Lane Util. Factor	0.95	0.95	0.95	0.95	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor		0.99			0.99			0.98			0.98	
Frt		0.989			0.989			0.955			0.964	
Flt Protected		0.997			0.998			0.982			0.981	
Satd. Flow (prot)	0	2626	0	0	2620	0	0	1299	0	0	1314	0
Flt Permitted		0.891			0.914			0.863			0.858	
Satd. Flow (perm)	0	2343	0	0	2398	0	0	1135	0	0	1141	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		15			16			28			21	
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		386			1549			261			294	
Travel Time (s)		10.5			42.2			7.1			8.0	
Confl. Peds. (#/hr)	30		37	18		57	19		45	27		49
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Parking (#/hr)			0			0			0			0
Adj. Flow (vph)	40	533	44	24	471	40	62	51	56	34	32	24
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	617	0	0	535	0	0	169	0	0	90	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			2			4			4	
Permitted Phases	2			2			4			4		
Minimum Split (s)	26.0	26.0		26.0	26.0		32.0	32.0		32.0	32.0	
Total Split (s)	58.0	58.0		58.0	58.0		32.0	32.0		32.0	32.0	
Total Split (%)	64.4%	64.4%		64.4%	64.4%		35.6%	35.6%		35.6%	35.6%	
Maximum Green (s)	53.0	53.0		53.0	53.0		27.0	27.0		27.0	27.0	
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0			0.0			0.0			0.0	
Total Lost Time (s)		5.0			5.0			5.0			5.0	
Lead/Lag												
Lead-Lag Optimize?												
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	14.0	14.0		14.0	14.0		20.0	20.0		20.0	20.0	
Pedestrian Calls (#/hr)	20	20		20	20		20	20		20	20	
Act Effct Green (s)		53.0			53.0			27.0			27.0	
Actuated g/C Ratio		0.59			0.59			0.30			0.30	
v/c Ratio		0.45			0.38			0.47			0.25	
Control Delay		8.2			10.4			26.3			20.8	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		8.2			10.4			26.3			20.8	
LOS		A			B			C			C	
Approach Delay		8.2			10.4			26.3			20.8	
Approach LOS		A			B			C			C	

Intersection Summary	
Area Type:	CBD
Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 75 (83%), Referenced to phase 2:EBWB, Start of Green	
Natural Cycle: 60	
Control Type: Pretimed	
Maximum v/c Ratio: 0.47	
Intersection Signal Delay: 12.0	Intersection LOS: B
Intersection Capacity Utilization 74.3%	ICU Level of Service D
Analysis Period (min) 15	

Splits and Phases: 13: Pattee St & Broadway St

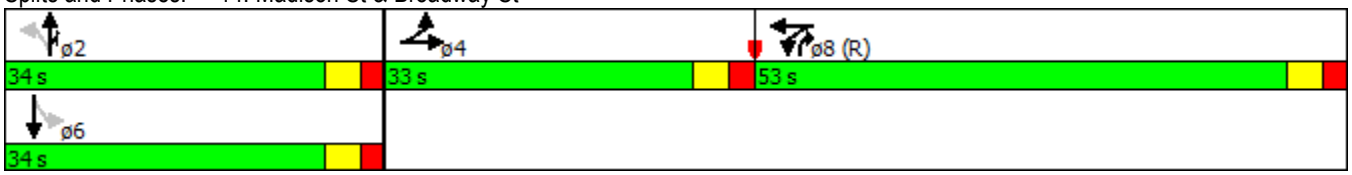
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	17	168	91	933	224	38	43	52	287	39	247	19
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Storage Length (ft)	125		0	100		0	200		0	0		100
Storage Lanes	1		0	1		0	1		1	0		1
Taper Length (ft)	100			75			100			25		
Lane Util. Factor	1.00	0.95	0.95	0.91	0.91	0.95	1.00	1.00	1.00	0.95	0.95	0.95
Ped Bike Factor	0.99	0.99		1.00	1.00		1.00				1.00	
Frt		0.947			0.992				0.850		0.991	
Flt Protected	0.950			0.950	0.969		0.950				0.994	
Satd. Flow (prot)	1490	2800	0	1356	2735	0	1490	1569	1333	0	2929	0
Flt Permitted	0.950			0.950	0.969		0.371				0.900	
Satd. Flow (perm)	1474	2800	0	1354	2732	0	580	1569	1333	0	2651	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		74			5				308		5	
Link Speed (mph)		30			30			30			25	
Link Distance (ft)		1549			1136			397			399	
Travel Time (s)		35.2			25.8			9.0			10.9	
Confl. Peds. (#/hr)	13		8	2		16	6		5	3		19
Peak Hour Factor	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81
Adj. Flow (vph)	21	207	112	1152	277	47	53	64	354	48	305	23
Shared Lane Traffic (%)				50%								
Lane Group Flow (vph)	21	319	0	576	900	0	53	64	354	0	376	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane					Yes							
Headway Factor	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2	1	1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru	Right	Left	Thru	
Leading Detector (ft)	20	100		20	100		20	100	20	20	100	
Trailing Detector (ft)	0	0		0	0		0	0	0	0	0	
Detector 1 Position(ft)	0	0		0	0		0	0	0	0	0	
Detector 1 Size(ft)	20	6		20	6		20	6	20	20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Split	NA		Split	NA		Perm	NA	pt+ov	Perm	NA	
Protected Phases	4	4		8	8			2	8 2		6	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Permitted Phases							2			6		
Detector Phase	4	4		8	8		2	2	8 2	6	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Minimum Split (s)	32.5	32.5		25.5	25.5		33.5	33.5		33.5	33.5	
Total Split (s)	33.0	33.0		53.0	53.0		34.0	34.0		34.0	34.0	
Total Split (%)	27.5%	27.5%		44.2%	44.2%		28.3%	28.3%		28.3%	28.3%	
Maximum Green (s)	27.5	27.5		47.5	47.5		28.5	28.5		28.5	28.5	
Yellow Time (s)	3.2	3.2		3.2	3.2		3.2	3.2		3.2	3.2	
All-Red Time (s)	2.3	2.3		2.3	2.3		2.3	2.3		2.3	2.3	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0			0.0	
Total Lost Time (s)	5.5	5.5		5.5	5.5		5.5	5.5			5.5	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.5	3.5		3.5	3.5		3.0	3.0		3.0	3.0	
Recall Mode	None	None		C-Max	C-Max		None	None		None	None	
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	20.0	20.0		13.0	13.0		21.0	21.0		21.0	21.0	
Pedestrian Calls (#/hr)	5	5		5	5		5	5		5	5	
Act Effct Green (s)	17.5	17.5		63.9	63.9		22.1	22.1	91.5		22.1	
Actuated g/C Ratio	0.15	0.15		0.53	0.53		0.18	0.18	0.76		0.18	
v/c Ratio	0.10	0.68		0.80	0.62		0.50	0.22	0.33		0.77	
Control Delay	42.2	43.7		33.1	24.4		59.2	41.9	1.8		56.2	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0		0.0	
Total Delay	42.2	43.7		33.1	24.4		59.2	41.9	1.8		56.2	
LOS	D	D		C	C		E	D	A		E	
Approach Delay		43.6			27.8			13.7			56.2	
Approach LOS		D			C			B			E	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 90 (75%), Referenced to phase 8:WBTL, Start of Green
Natural Cycle: 125
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.80
Intersection Signal Delay: 31.3 Intersection LOS: C
Intersection Capacity Utilization 85.6% ICU Level of Service E
Analysis Period (min) 15

Splits and Phases: 14: Madison St & Broadway St



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	48	479	73	630	271	55	136	223	625	109	216	14
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Storage Length (ft)	125		0	100		0	200		0	0		100
Storage Lanes	1		0	1		0	1		1	0		1
Taper Length (ft)	100			75			100			25		
Lane Util. Factor	1.00	0.95	0.95	0.91	0.91	0.95	1.00	1.00	1.00	0.95	0.95	0.95
Ped Bike Factor	1.00	0.99		0.99	0.99		1.00				0.99	
Frt		0.980			0.987				0.850		0.994	
Flt Protected	0.950			0.950	0.976		0.950				0.984	
Satd. Flow (prot)	1490	2906	0	1356	2729	0	1490	1569	1333	0	2912	0
Flt Permitted	0.950			0.950	0.976		0.451				0.675	
Satd. Flow (perm)	1485	2906	0	1344	2717	0	704	1569	1333	0	1987	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		15			9				54		4	
Link Speed (mph)		30			30			30			25	
Link Distance (ft)		1549			1136			397			399	
Travel Time (s)		35.2			25.8			9.0			10.9	
Confl. Peds. (#/hr)	3		23	16		26	7		39	23		10
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	52	515	78	677	291	59	146	240	672	117	232	15
Shared Lane Traffic (%)				50%								
Lane Group Flow (vph)	52	593	0	338	689	0	146	240	672	0	364	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane					Yes							
Headway Factor	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2	1	1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru	Right	Left	Thru	
Leading Detector (ft)	20	100		20	100		20	100	20	20	100	
Trailing Detector (ft)	0	0		0	0		0	0	0	0	0	
Detector 1 Position(ft)	0	0		0	0		0	0	0	0	0	
Detector 1 Size(ft)	20	6		20	6		20	6	20	20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Split	NA		Split	NA		Perm	NA	pt+ov	Perm	NA	
Protected Phases	4	4		8	8			2	8 2		6	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Permitted Phases							2			6		
Detector Phase	4	4		8	8		2	2	8 2	6	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Minimum Split (s)	32.5	32.5		25.5	25.5		33.5	33.5		33.5	33.5	
Total Split (s)	33.0	33.0		40.0	40.0		37.0	37.0		37.0	37.0	
Total Split (%)	30.0%	30.0%		36.4%	36.4%		33.6%	33.6%		33.6%	33.6%	
Maximum Green (s)	27.5	27.5		34.5	34.5		31.5	31.5		31.5	31.5	
Yellow Time (s)	3.2	3.2		3.2	3.2		3.2	3.2		3.2	3.2	
All-Red Time (s)	2.3	2.3		2.3	2.3		2.3	2.3		2.3	2.3	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0			0.0	
Total Lost Time (s)	5.5	5.5		5.5	5.5		5.5	5.5			5.5	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.5	3.5		3.5	3.5		3.0	3.0		3.0	3.0	
Recall Mode	None	None		C-Max	C-Max		None	None		None	None	
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	20.0	20.0		13.0	13.0		21.0	21.0		21.0	21.0	
Pedestrian Calls (#/hr)	10	10		10	10		10	10		10	10	
Act Effct Green (s)	25.9	25.9		40.0	40.0		27.6	27.6	73.1		27.6	
Actuated g/C Ratio	0.24	0.24		0.36	0.36		0.25	0.25	0.66		0.25	
v/c Ratio	0.15	0.85		0.69	0.69		0.83	0.61	0.74		0.73	
Control Delay	33.7	51.9		39.8	35.3		73.5	42.7	18.0		45.7	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0		0.0	
Total Delay	33.7	51.9		39.8	35.3		73.5	42.7	18.0		45.7	
LOS	C	D		D	D		E	D	B		D	
Approach Delay		50.4			36.8			31.2			45.7	
Approach LOS		D			D			C			D	

Intersection Summary

Area Type: Other
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 108 (98%), Referenced to phase 8:WBTL, Start of Green
Natural Cycle: 95
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.85
Intersection Signal Delay: 38.8 Intersection LOS: D
Intersection Capacity Utilization 98.6% ICU Level of Service F
Analysis Period (min) 15

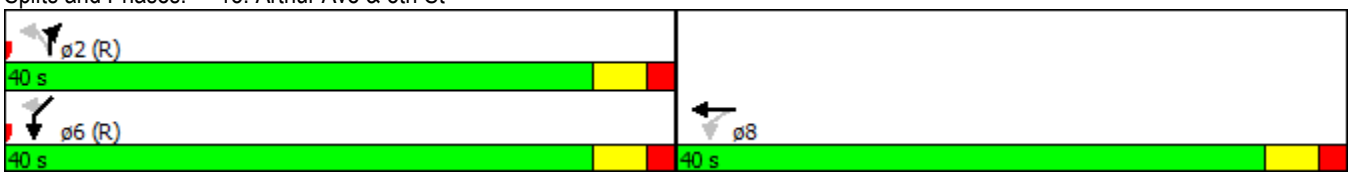
Splits and Phases: 14: Madison St & Broadway St

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBR	SWL	SWR
Lane Configurations										
Volume (vph)	0	0	0	19	43	0	8	357	646	524
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00
Frt								0.850		0.850
Flt Protected					0.985		0.950		0.950	
Satd. Flow (prot)	0	0	0	0	2936	0	1490	1333	1490	1333
Flt Permitted					0.985		0.365		0.950	
Satd. Flow (perm)	0	0	0	0	2936	0	573	1333	1490	1333
Right Turn on Red			Yes			Yes				Yes
Satd. Flow (RTOR)										570
Link Speed (mph)		30			30		30		30	
Link Distance (ft)		435			603		367		507	
Travel Time (s)		9.9			13.7		8.3		11.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	21	47	0	9	388	702	570
Shared Lane Traffic (%)										
Lane Group Flow (vph)	0	0	0	0	68	0	9	388	702	570
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Right	Left	Right
Median Width(ft)		0			0		12		12	
Link Offset(ft)		0			0		0		0	
Crosswalk Width(ft)		16			16		16		16	
Two way Left Turn Lane										
Headway Factor	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24
Turning Speed (mph)	15		9	15		9	15	9	15	9
Number of Detectors				1	2		1	1	1	1
Detector Template				Left	Thru		Left	Right	Left	Right
Leading Detector (ft)				20	100		20	20	20	20
Trailing Detector (ft)				0	0		0	0	0	0
Detector 1 Position(ft)				0	0		0	0	0	0
Detector 1 Size(ft)				20	6		20	20	20	20
Detector 1 Type				Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel										
Detector 1 Extend (s)				0.0	0.0		0.0	0.0	0.0	0.0
Detector 1 Queue (s)				0.0	0.0		0.0	0.0	0.0	0.0
Detector 1 Delay (s)				0.0	0.0		0.0	0.0	0.0	0.0
Detector 2 Position(ft)					94					
Detector 2 Size(ft)					6					
Detector 2 Type					Cl+Ex					
Detector 2 Channel										
Detector 2 Extend (s)					0.0					
Turn Type				Perm	NA		NA	custom	NA	Perm
Protected Phases					8			2	6	
Permitted Phases				8			2			6
Detector Phase				8	8		2	2	6	6
Switch Phase										
Minimum Initial (s)				6.0	6.0		6.0	6.0	6.0	6.0
Minimum Split (s)				24.0	24.0		24.0	24.0	24.0	24.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBR	SWL	SWR
Total Split (s)				40.0	40.0		40.0	40.0	40.0	40.0
Total Split (%)				50.0%	50.0%		50.0%	50.0%	50.0%	50.0%
Maximum Green (s)				35.0	35.0		35.0	35.0	35.0	35.0
Yellow Time (s)				3.2	3.2		3.2	3.2	3.2	3.2
All-Red Time (s)				1.8	1.8		1.8	1.8	1.8	1.8
Lost Time Adjust (s)					0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)					5.0		5.0	5.0	5.0	5.0
Lead/Lag										
Lead-Lag Optimize?										
Vehicle Extension (s)				3.0	3.0		3.0	3.0	3.0	3.0
Recall Mode				None	None		C-Max	C-Max	C-Max	C-Max
Walk Time (s)				7.0	7.0		7.0	7.0	7.0	7.0
Flash Dont Walk (s)				12.0	12.0		12.0	12.0	12.0	12.0
Pedestrian Calls (#/hr)				0	0		0	0	0	0
Act Effct Green (s)					7.4		65.8	65.8	65.8	65.8
Actuated g/C Ratio					0.09		0.82	0.82	0.82	0.82
v/c Ratio					0.25		0.02	0.35	0.57	0.48
Control Delay					35.6		2.4	3.6	5.8	1.7
Queue Delay					0.0		0.0	0.5	0.0	0.0
Total Delay					35.6		2.4	4.2	5.8	1.7
LOS					D		A	A	A	A
Approach Delay					35.6		4.1		3.9	
Approach LOS					D		A		A	

Intersection Summary	
Area Type:	Other
Cycle Length: 80	
Actuated Cycle Length: 80	
Offset: 65 (81%), Referenced to phase 2:NBL and 6:SWL, Start of Green	
Natural Cycle: 60	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.57	
Intersection Signal Delay: 5.2	Intersection LOS: A
Intersection Capacity Utilization 65.0%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 15: Arthur Ave & 5th St

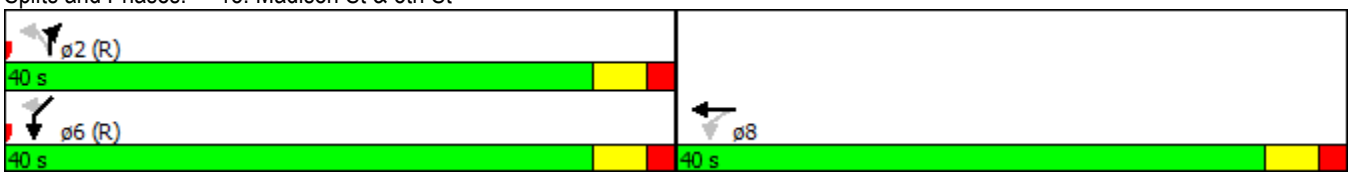


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBR	SWL	SWR
Lane Configurations										
Volume (vph)	0	0	0	60	199	0	16	701	510	484
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00
Frt								0.850		0.850
Flt Protected					0.989		0.950		0.950	
Satd. Flow (prot)	0	0	0	0	2948	0	1490	1333	1490	1333
Flt Permitted					0.989		0.414		0.950	
Satd. Flow (perm)	0	0	0	0	2948	0	649	1333	1490	1333
Right Turn on Red			Yes			Yes				Yes
Satd. Flow (RTOR)										526
Link Speed (mph)		30			30		30		30	
Link Distance (ft)		435			603		367		507	
Travel Time (s)		9.9			13.7		8.3		11.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	65	216	0	17	762	554	526
Shared Lane Traffic (%)										
Lane Group Flow (vph)	0	0	0	0	281	0	17	762	554	526
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Right	Left	Right
Median Width(ft)		0			0		12		12	
Link Offset(ft)		0			0		0		0	
Crosswalk Width(ft)		16			16		16		16	
Two way Left Turn Lane										
Headway Factor	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24
Turning Speed (mph)	15		9	15		9	15	9	15	9
Number of Detectors				1	2		1	1	1	1
Detector Template				Left	Thru		Left	Right	Left	Right
Leading Detector (ft)				20	100		20	20	20	20
Trailing Detector (ft)				0	0		0	0	0	0
Detector 1 Position(ft)				0	0		0	0	0	0
Detector 1 Size(ft)				20	6		20	20	20	20
Detector 1 Type				Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel										
Detector 1 Extend (s)				0.0	0.0		0.0	0.0	0.0	0.0
Detector 1 Queue (s)				0.0	0.0		0.0	0.0	0.0	0.0
Detector 1 Delay (s)				0.0	0.0		0.0	0.0	0.0	0.0
Detector 2 Position(ft)					94					
Detector 2 Size(ft)					6					
Detector 2 Type					Cl+Ex					
Detector 2 Channel										
Detector 2 Extend (s)					0.0					
Turn Type				Perm	NA		NA	custom	NA	Perm
Protected Phases					8			2	6	
Permitted Phases				8			2			6
Detector Phase				8	8		2	2	6	6
Switch Phase										
Minimum Initial (s)				6.0	6.0		6.0	6.0	6.0	6.0
Minimum Split (s)				24.0	24.0		24.0	24.0	24.0	24.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBR	SWL	SWR
Total Split (s)				40.0	40.0		40.0	40.0	40.0	40.0
Total Split (%)				50.0%	50.0%		50.0%	50.0%	50.0%	50.0%
Maximum Green (s)				35.0	35.0		35.0	35.0	35.0	35.0
Yellow Time (s)				3.2	3.2		3.2	3.2	3.2	3.2
All-Red Time (s)				1.8	1.8		1.8	1.8	1.8	1.8
Lost Time Adjust (s)					0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)					5.0		5.0	5.0	5.0	5.0
Lead/Lag										
Lead-Lag Optimize?										
Vehicle Extension (s)				3.0	3.0		3.0	3.0	3.0	3.0
Recall Mode				None	None		C-Max	C-Max	C-Max	C-Max
Walk Time (s)				7.0	7.0		7.0	7.0	7.0	7.0
Flash Dont Walk (s)				12.0	12.0		12.0	12.0	12.0	12.0
Pedestrian Calls (#/hr)				0	0		0	0	0	0
Act Effct Green (s)					13.1		56.9	56.9	56.9	56.9
Actuated g/C Ratio					0.16		0.71	0.71	0.71	0.71
v/c Ratio					0.58		0.04	0.80	0.52	0.48
Control Delay					35.6		4.5	17.6	8.1	2.1
Queue Delay					0.0		0.0	9.3	0.0	0.0
Total Delay					35.6		4.5	26.9	8.1	2.1
LOS					D		A	C	A	A
Approach Delay					35.6		26.4		5.1	
Approach LOS					D		C		A	

Intersection Summary	
Area Type:	Other
Cycle Length: 80	
Actuated Cycle Length: 80	
Offset: 65 (81%), Referenced to phase 2:NBL and 6:SWL, Start of Green	
Natural Cycle: 80	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.80	
Intersection Signal Delay: 16.9	Intersection LOS: B
Intersection Capacity Utilization 68.5%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 15: Madison St & 5th St

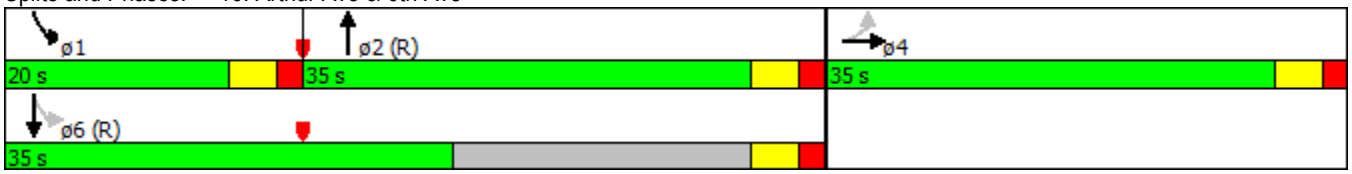


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	252	247	70	0	0	0	0	112	93	342	333	0
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.967						0.939				
Flt Protected	0.950									0.950		
Satd. Flow (prot)	1490	1517	0	0	0	0	0	1473	0	1490	1569	0
Flt Permitted	0.950									0.504		
Satd. Flow (perm)	1490	1517	0	0	0	0	0	1473	0	791	1569	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		17						50				
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		432			609			266			367	
Travel Time (s)		9.8			13.8			6.0			8.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	274	268	76	0	0	0	0	122	101	372	362	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	274	344	0	0	0	0	0	223	0	372	362	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2						2		1	2	
Detector Template	Left	Thru						Thru		Left	Thru	
Leading Detector (ft)	20	100						100		20	100	
Trailing Detector (ft)	0	0						0		0	0	
Detector 1 Position(ft)	0	0						0		0	0	
Detector 1 Size(ft)	20	6						6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex						Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0						0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0						0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0						0.0		0.0	0.0	
Detector 2 Position(ft)		94						94			94	
Detector 2 Size(ft)		6						6			6	
Detector 2 Type		Cl+Ex						Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0						0.0			0.0	
Turn Type	Perm	NA						NA		pm+pt	NA	
Protected Phases		4						2		1	6	
Permitted Phases	4									6		
Detector Phase	4	4						2		1	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0						6.0		6.0	6.0	
Minimum Split (s)	24.0	24.0						24.0		11.0	24.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)	35.0	35.0						35.0		20.0	35.0	
Total Split (%)	38.9%	38.9%						38.9%		22.2%	38.9%	
Maximum Green (s)	30.0	30.0						30.0		15.0	30.0	
Yellow Time (s)	3.2	3.2						3.2		3.2	3.2	
All-Red Time (s)	1.8	1.8						1.8		1.8	1.8	
Lost Time Adjust (s)	0.0	0.0						0.0		0.0	0.0	
Total Lost Time (s)	5.0	5.0						5.0		5.0	5.0	
Lead/Lag								Lag		Lead		
Lead-Lag Optimize?								Yes		Yes		
Vehicle Extension (s)	3.0	3.0						3.0		3.0	3.0	
Recall Mode	None	None						C-Max		None	C-Max	
Walk Time (s)	7.0	7.0						7.0			7.0	
Flash Dont Walk (s)	12.0	12.0						12.0			12.0	
Pedestrian Calls (#/hr)	0	0						0			0	
Act Effct Green (s)	24.6	24.6						36.1		55.4	55.4	
Actuated g/C Ratio	0.27	0.27						0.40		0.62	0.62	
v/c Ratio	0.67	0.81						0.36		0.62	0.38	
Control Delay	36.9	43.2						18.5		15.6	11.2	
Queue Delay	0.0	0.0						0.0		1.7	1.0	
Total Delay	36.9	43.2						18.5		17.3	12.2	
LOS	D	D						B		B	B	
Approach Delay		40.4						18.5			14.8	
Approach LOS		D						B			B	

Intersection Summary	
Area Type:	Other
Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBTL, Start of Green	
Natural Cycle: 60	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.81	
Intersection Signal Delay: 25.3	Intersection LOS: C
Intersection Capacity Utilization 69.2%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 16: Arthur Ave & 6th Ave

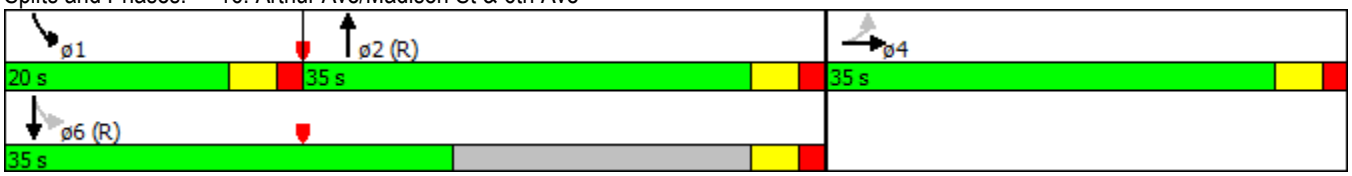


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	371	294	59	0	0	0	0	340	65	145	425	0
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.975						0.978				
Flt Protected	0.950									0.950		
Satd. Flow (prot)	1490	1529	0	0	0	0	0	1534	0	1490	1569	0
Flt Permitted	0.950									0.299		
Satd. Flow (perm)	1490	1529	0	0	0	0	0	1534	0	469	1569	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		12						12				
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		432			609			266			367	
Travel Time (s)		9.8			13.8			6.0			8.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	403	320	64	0	0	0	0	370	71	158	462	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	403	384	0	0	0	0	0	441	0	158	462	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2						2		1	2	
Detector Template	Left	Thru						Thru		Left	Thru	
Leading Detector (ft)	20	100						100		20	100	
Trailing Detector (ft)	0	0						0		0	0	
Detector 1 Position(ft)	0	0						0		0	0	
Detector 1 Size(ft)	20	6						6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex						Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0						0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0						0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0						0.0		0.0	0.0	
Detector 2 Position(ft)		94						94			94	
Detector 2 Size(ft)		6						6			6	
Detector 2 Type		Cl+Ex						Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0						0.0			0.0	
Turn Type	Perm	NA						NA		pm+pt	NA	
Protected Phases		4						2		1	6	
Permitted Phases	4									6		
Detector Phase	4	4						2		1	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0						6.0		6.0	6.0	
Minimum Split (s)	24.0	24.0						24.0		11.0	24.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)	35.0	35.0						35.0		20.0	35.0	
Total Split (%)	38.9%	38.9%						38.9%		22.2%	38.9%	
Maximum Green (s)	30.0	30.0						30.0		15.0	30.0	
Yellow Time (s)	3.2	3.2						3.2		3.2	3.2	
All-Red Time (s)	1.8	1.8						1.8		1.8	1.8	
Lost Time Adjust (s)	0.0	0.0						0.0		0.0	0.0	
Total Lost Time (s)	5.0	5.0						5.0		5.0	5.0	
Lead/Lag								Lag		Lead		
Lead-Lag Optimize?								Yes		Yes		
Vehicle Extension (s)	3.0	3.0						3.0		3.0	3.0	
Recall Mode	None	None						C-Max		None	C-Max	
Walk Time (s)	7.0	7.0						7.0			7.0	
Flash Dont Walk (s)	12.0	12.0						12.0			12.0	
Pedestrian Calls (#/hr)	0	0						0			0	
Act Effct Green (s)	27.8	27.8						37.0		52.2	52.2	
Actuated g/C Ratio	0.31	0.31						0.41		0.58	0.58	
v/c Ratio	0.88	0.80						0.69		0.41	0.51	
Control Delay	50.7	41.1						30.2		12.9	14.4	
Queue Delay	0.0	0.0						0.0		0.0	1.9	
Total Delay	50.7	41.1						30.2		12.9	16.2	
LOS	D	D						C		B	B	
Approach Delay		46.0						30.2			15.4	
Approach LOS		D						C			B	

Intersection Summary	
Area Type:	Other
Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBTL, Start of Green	
Natural Cycle: 60	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.88	
Intersection Signal Delay: 32.0	Intersection LOS: C
Intersection Capacity Utilization 72.4%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 16: Arthur Ave/Madison St & 6th Ave



17: Maurice Avenue & 5th Street Performance by movement

Movement	WBT	WBR	NBL2	NBL	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.1	0.2	0.0	0.0	0.1
Total Delay (hr)	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	5.0	3.0	3.9	5.2	4.3
Stop Delay (hr)	0.0	0.0	0.0	0.0	0.0
Stop Del/Veh (s)	2.4	2.7	2.8	3.2	2.9

17: Maurice Avenue & 5th Street Performance by movement

Movement	WBL	WBT	WBR	NBL2	NBL	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.1	0.2	0.3	0.0	0.0	0.1
Total Delay (hr)	0.0	0.1	0.0	0.0	0.1	0.2
Total Del/Veh (s)	5.1	6.5	4.3	6.2	7.1	6.0
Stop Delay (hr)	0.0	0.0	0.0	0.0	0.1	0.1
Stop Del/Veh (s)	3.2	3.3	3.7	3.3	4.4	3.8

Intersection	
Intersection Delay, s/veh	1.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	24	610	31	0	0	0	0	38	30	0	5	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	None	None	None	None	None	None	None	None	None	None	None	None
Storage Length	0		0	0		0	0		0	0		0
Median Width		0			0			0			0	
Grade, %		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	26	663	34	0	0	0	0	41	33	0	5	0
Number of Lanes	0	1	0	0	0	0	0	1	0	0	1	0

Major/Minor	Major 1					Minor 1			Minor 2		
Conflicting Flow All	0	0	0			735	732	680	769	749	0
Stage 1	-	-	-			732	732	-	0	0	-
Stage 2	-	-	-			3	0	-	769	749	-
Follow-up Headway	-	-	-			3.518	4.018	3.318	3.518	4.018	Error
Pot Capacity-1 Maneuver	-	-	-			387	348	451	369	341	-
Stage 1	-	-	-			476	427	-	-	-	-
Stage 2	-	-	-			-	-	-	457	419	-
Time blocked-Platoon, %	0	-	-			0	0	0	0	0	0
Mov Capacity-1 Maneuver	-	-	-			387	# 0	451	369	# 0	-
Mov Capacity-2 Maneuver	-	-	-			387	# 0	-	369	# 0	-
Stage 1	-	-	-			476	# 0	-	-	# 0	-
Stage 2	-	-	-			-	# 0	-	457	# 0	-

Approach	EB	NB	SB
HCM Control Delay, s	0	14.5	-
HCM LOS	-	B	-

Minor Lane / Major Mvmt	NBLn1	EBL	EBT	EBR	SBLn1
Cap, veh/h	451	-	-	-	-
HCM Control Delay, s	14.5	-	-	-	-
HCM Lane V/C Ratio	0.16	-	-	-	-
HCM Lane LOS	B	-	-	-	-
HCM 95th-tile Q, veh	0.6	-	-	-	-

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	2.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	196	303	7	0	0	0	0	111	32	0	10	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	None	None	None	None	None	None	None	None	None	None	None	None
Storage Length	0		0	0		0	0		0	0		0
Median Width		0			0			0			0	
Grade, %		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	213	329	8	0	0	0	0	121	35	0	11	0
Number of Lanes	0	1	0	0	0	0	0	1	0	0	1	0

Major/Minor	Major 1			Minor 1			Minor 2		
Conflicting Flow All	0	0	0	764	759	333	837	763	0
Stage 1	-	-	-	759	759	-	0	0	-
Stage 2	-	-	-	5	0	-	837	763	-
Follow-up Headway	-	-	-	3.518	4.018	3.318	3.518	4.018	Error
Pot Capacity-1 Maneuver	-	-	-	372	336	709	337	334	-
Stage 1	-	-	-	462	415	-	-	-	-
Stage 2	-	-	-	-	-	-	425	413	-
Time blocked-Platoon, %	0	-	-	0	0	0	0	0	0
Mov Capacity-1 Maneuver	-	-	-	372	# 0	709	337	# 0	-
Mov Capacity-2 Maneuver	-	-	-	372	# 0	-	337	# 0	-
Stage 1	-	-	-	462	# 0	-	-	# 0	-
Stage 2	-	-	-	-	# 0	-	425	# 0	-

Approach	EB	NB	SB
HCM Control Delay, s	0	11.5	-
HCM LOS	-	B	-

Minor Lane / Major Mvmt	NBLn1	EBL	EBT	EBR	SBLn1
Cap, veh/h	709	-	-	-	-
HCM Control Delay, s	11.5	-	-	-	-
HCM Lane V/C Ratio	0.22	-	-	-	-
HCM Lane LOS	B	-	-	-	-
HCM 95th-tile Q, veh	0.8	-	-	-	-

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Arterial Level of Service: NB Higgins Ave

Cross Street	Arterial Class	Flow Speed	Running Time	Signal Delay	Travel Time (s)	Dist (mi)	Arterial Speed	Arterial LOS
Brooks St	IV	30	118.2	8.4	126.6	0.99	28.0	A
6th Ave	IV	30	15.0	11.6	26.6	0.07	8.9	E
5th St	IV	25	17.2	4.2	21.4	0.06	10.9	D
4th St	IV	25	18.1	0.9	19.0	0.07	13.0	D
Front St	IV	25	47.0	14.2	61.2	0.31	18.1	C
Main St	IV	25	16.7	5.7	22.4	0.08	12.2	D
Broadway St	IV	25	19.5	10.8	30.3	0.07	8.7	E
Pine St	IV	25	19.6	5.5	25.1	0.07	10.6	D
Spruce St	IV	25	19.0	7.5	26.5	0.07	9.7	D
Total	IV		290.3	68.8	359.1	1.79	17.9	C

Arterial Level of Service: SB Higgins Ave

Cross Street	Arterial Class	Flow Speed	Running Time	Signal Delay	Travel Time (s)	Dist (mi)	Arterial Speed	Arterial LOS
Spruce St	IV	25	16.4	17.8	34.2	0.06	6.5	F
Pine St	IV	25	19.0	4.8	23.8	0.07	10.8	D
Broadway St	IV	25	19.6	15.2	34.8	0.07	7.6	E
Main St	IV	25	19.5	8.6	28.1	0.07	9.4	D
Front St	IV	25	16.7	6.4	23.1	0.08	11.8	D
4th St	IV	25	47.0	4.7	51.7	0.31	21.4	B
5th St	IV	25	18.1	7.1	25.2	0.07	9.8	D
6th Ave	IV	25	17.2	7.1	24.3	0.06	9.6	D
Brooks St	IV	30	15.0	3.7	18.7	0.07	12.7	D
Total	IV		188.5	75.4	263.9	0.86	11.8	D

Arterial Level of Service: NB Higgins Ave

Cross Street	Arterial Class	Flow Speed	Running Time	Signal Delay	Travel Time (s)	Dist (mi)	Arterial Speed	Arterial LOS
Brooks St	IV	30	118.2	9.0	127.2	0.99	27.9	A
6th Ave	IV	30	15.0	7.3	22.3	0.07	10.6	D
5th St	IV	25	17.2	8.5	25.7	0.06	9.1	D
4th St	IV	25	18.1	1.9	20.0	0.07	12.3	D
Front St	IV	25	47.0	16.4	63.4	0.31	17.4	C
Main St	IV	25	16.7	8.5	25.2	0.08	10.8	D
Broadway St	IV	25	19.5	22.8	42.3	0.07	6.3	F
Pine St	IV	25	19.6	5.7	25.3	0.07	10.5	D
Spruce St	IV	25	19.0	25.2	44.2	0.07	5.8	F
Total	IV		290.3	105.3	395.6	1.79	16.3	C

Arterial Level of Service: SB Higgins Ave

Cross Street	Arterial Class	Flow Speed	Running Time	Signal Delay	Travel Time (s)	Dist (mi)	Arterial Speed	Arterial LOS
Spruce St	IV	25	16.4	26.2	42.6	0.06	5.2	F
Pine St	IV	25	19.0	8.6	27.6	0.07	9.3	D
Broadway St	IV	25	19.6	25.6	45.2	0.07	5.9	F
Main St	IV	25	19.5	10.3	29.8	0.07	8.9	E
Front St	IV	25	16.7	14.8	31.5	0.08	8.7	E
4th St	IV	25	47.0	8.9	55.9	0.31	19.8	B
5th St	IV	25	18.1	14.6	32.7	0.07	7.5	E
6th Ave	IV	25	17.2	6.7	23.9	0.06	9.8	D
Brooks St	IV	30	15.0	12.2	27.2	0.07	8.7	E
Total	IV		188.5	127.9	316.4	0.86	9.8	D

Arterial Level of Service: NB Madison St

Cross Street	Arterial Class	Flow Speed	Running Time	Signal Delay	Travel Time (s)	Dist (mi)	Arterial Speed	Arterial LOS
5th St	IV	30	15.8	3.6	19.4	0.07	12.9	D
Broadway St	IV	26	54.4	41.9	96.3	0.36	13.3	C
Total	IV		70.2	45.5	115.7	0.43	13.2	C

Arterial Level of Service: SB Madison St

Cross Street	Arterial Class	Flow Speed	Running Time	Signal Delay	Travel Time (s)	Dist (mi)	Arterial Speed	Arterial LOS
Broadway St	IV	30	13.6	56.2	69.8	0.08	3.9	F
5th St	IV	30	17.3	5.8	23.1	0.10	15.0	C
6th Ave	IV	30	15.8	11.2	27.0	0.07	9.3	D
Total	IV		46.7	73.2	119.9	0.24	7.2	E

Arterial Level of Service: NB Madison St

Cross Street	Arterial Class	Flow Speed	Running Time	Signal Delay	Travel Time (s)	Dist (mi)	Arterial Speed	Arterial LOS
5th St	IV	30	15.8	17.6	33.4	0.07	7.5	E
Broadway St	IV	26	54.4	42.7	97.1	0.36	13.2	C
Total	IV		70.2	60.3	130.5	0.43	11.7	D

Arterial Level of Service: SB Madison St

Cross Street	Arterial Class	Flow Speed	Running Time	Signal Delay	Travel Time (s)	Dist (mi)	Arterial Speed	Arterial LOS
Broadway St	IV	30	13.6	45.5	59.1	0.08	4.6	F
5th St	IV	30	17.3	8.1	25.4	0.10	13.6	C
6th Ave	IV	30	15.8	14.4	30.2	0.07	8.3	E
Total	IV		46.7	68.0	114.7	0.24	7.6	E

Appendix 7

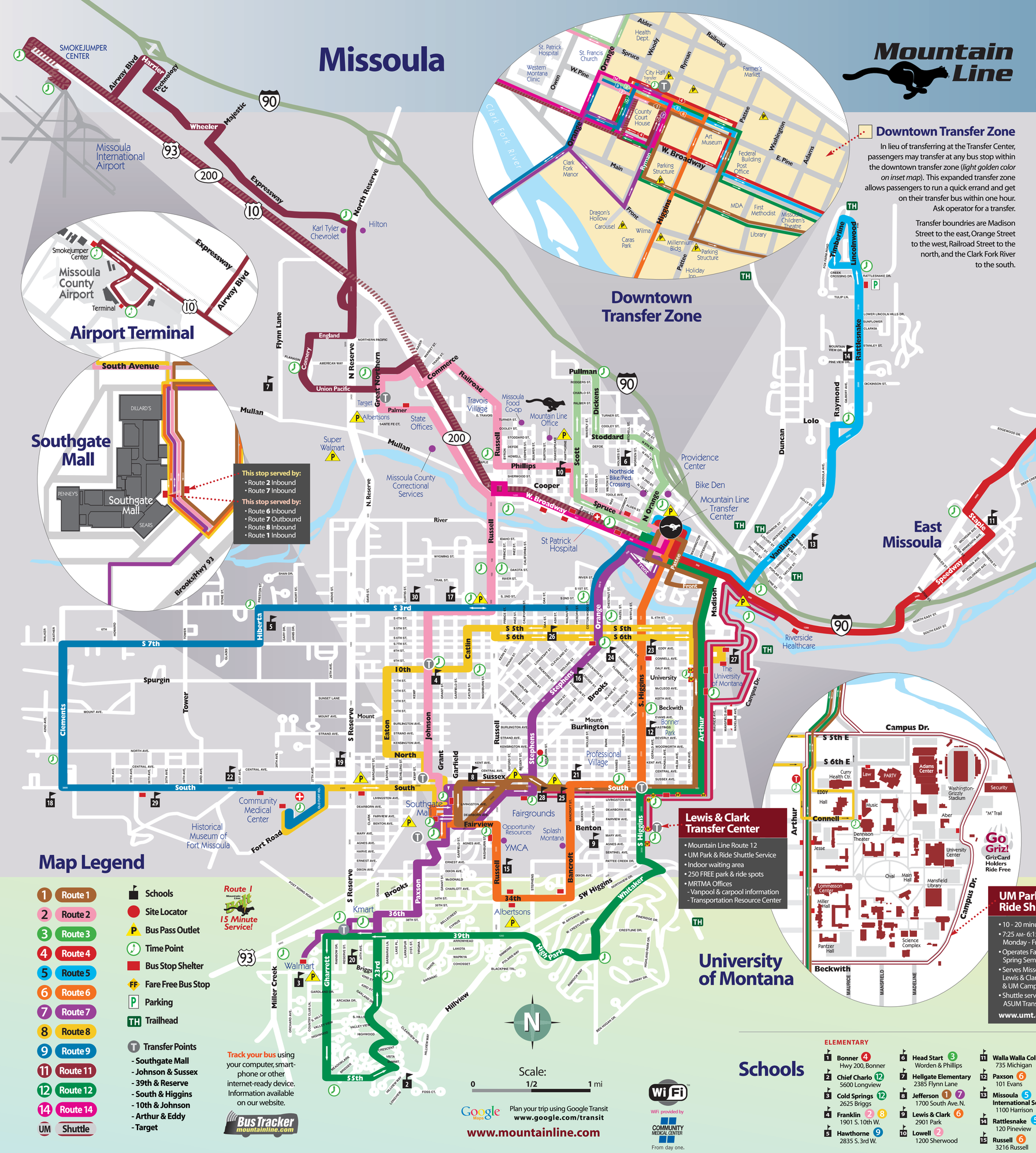
Mountain Line Routes

Missoula

Mountain Line

Route Map

Revised April, 2013



Downtown Transfer Zone

In lieu of transferring at the Transfer Center, passengers may transfer at any bus stop within the downtown transfer zone (*light golden color on inset map*). This expanded transfer zone allows passengers to run a quick errand and get on their transfer bus within one hour. Ask operator for a transfer.

Transfer boundries are Madison Street to the west, Orange Street to the west, Railroad Street to the north, and the Clark Fork River to the south.

Passes & Tickets

One Way Fares - *exact change only please*

- **Adult** cash fare $1.00
- **Youth** cash fare (18 & under) $0.35
- **Senior & adult with disability** cash fare (with proof of eligibility) $0.50
- **Unlimited day pass** $2.00

Passes & Tickets - available at all ticket outlets. *See reverse for locations.*

- **11-ride ticket - senior & adult with disability** (with proof of eligibility) $4.00
- **11-ride ticket - general** $10.00
- **31-day pass*- youth** (18 & under) $8.00
- **31-day pass*- senior & adult with disability** (with proof of eligibility) $12.50
- **31-day pass*- general** $25.00

* 31-day passes valid 31 calendar days from first day of use.

Passes and tickets are available at the following locations:

- Mountain Line Office - 1221 Shakespeare 2
- Mountain Line Transfer Center - 200 W. Pine 1 2 3 4 5 6 7 9 11 12 14
- Albertsons - 39th & Russell 6 12
- Albertsons Eastgate Cust. Service - 1003 E. Broadway 4 5
- Albertsons Northgate Cust. Service - 2230 N. Reserve 2 11
- Albertsons Trempers Cust. Service - 2205 Oxford 1 7
- Good Food Store - 1610 S. 3rd W. 2 8 9
- Missoula in Motion - 127 W. Spruce 1 2 3 4 5 6 7 9 11 12 14
- Missoula Parking Commission - 128 W. Main 1 2 3 4 5 6 7 9 11 12 14
- Missoula Manor - 909 W. Central 7
- Southgate Mall Guest Relations 1 2 6 7 8
- Walmart - 4000 S. U.S. Hwy. 93 7
- Super Walmart - 3555 Mullan Rd. 2 11
- Rosauers - 2350 S. Reserve 8

Go Griz! GrizCard Holders Ride Free

For your convenience, passes and tickets are also available through the mail. Bus pass order forms are available on all buses or by calling 721-3333. If you do not have an order form, mail your request to: Mountain Line, 1221 Shakespeare, Missoula, MT 59802. Be sure to include the following information with your request: name, mailing address, telephone number, type and number of tickets you want and a check or money order for the appropriate amount *plus* a 50 cent processing fee.

NO CASH PLEASE! Please allow approximately one week for delivery.

Passengers age sixty and over may ride for a ***reduced fare*** *with proof of eligibility*. Up to three children age five and under may ride free when accompanied by a fare paying passenger twelve years of age or older.*

***Reduced Fare Identification:**

Mountain Line offers *Reduced Fare Identification Cards* for all eligible riders at no charge. Applications can be obtained on all buses or by calling 721-3333 or TDD 721-2848 (Telecommunications Device for the Deaf). Identification cards are not required to obtain a reduced fare. All forms of identification listed below will also be honored.

- ***Valid driver's license or non-driver identification card issued by the Department of Motor Vehicles.***
- ***Medicare cards*** • ***Eligibility cards from other bus systems which verify disability or age*** • ***Paratransit eligibility card***

Points of Interest

COMMUNITY

- **A Carousel for Missoula**, Caras Park 1 2 3 4 5 6 7 9 11 12 14
- **Historical Museum at Fort Missoula** 1 9
- **Missoula Museum of the Arts**, 335 N. Pattee 1 4 5
- **Missoula Children's Theatre**, Adams & E. Broadway 1 4 5
- **Missoula Public Library**, 310 E. Main 1 12
- **YMCA**, 3000 N. Russell 6

SHOPPING

- **Goodwill Industries**, 2300 Brooks 1 7
- **Northgate Plaza**, N. Reserve Street 2 11
- **Shopko**, 2510 S. Reserve 8
- **Southgate Mall**, Brooks/Highway 93 1 2 6 7 8
- **Target**, 2420 N. Reserve 2 11
- **Wal-Mart**, 4000 S. Highway 93 7 12
- **Super Wal-Mart**, 3555 Mullan Rd. 2 11

GROCERIES

- **Albertsons**
  - 2205 Oxford - 1 7
  - 1003 E Broadway - 4 5
  - 2230 N Reserve - 2 11
  - 39th & Russell - 6 12
- **Costco**, 3220 Northern Pacific 2 11
- **Good Food Store**, 1610 S. 3rd W. 2 8 9
- **Missoula Food Co-op**, 1500 Burns 2
- **Orange Street Food Farm**, 701 S. Orange 7 8
- **Pattee Creek Market**, 704 S.W. Higgins 6 12
- **Rosauers**, 2350 S. Reserve 8
- **Safeway**
  - 800 W. Broadway - 2 3 11 14
  - 3630 Brooks - 7 12

PARKS

- **Bonner Park**, Ronald & Beverly 6 12
- **Caras Park**, West of Higgins Bridge 1 2 3 4 5 6 7 9 11 12 14
- **Fort Missoula Park**, South Avenue 8 9
- **Greenough Park**, W. Greenough 5
- **Franklin Park**, Kemp & 10th 2 8
- **Lions Park**, Bancroft & Kent 7
- **McCormick Park/Currents**, Cregg Lane 7
- **Playfair Park/ Splash Montana**, 3001 Bancroft 6

PUBLIC SERVICES

- **Missoula City County Health Dept**, 301 W. Alder 1 2 3 4 5 6 7 9 11 12 14
- **Missoula International Airport** Highway 10 West 11
- **Missoula Food Bank**, 219 S. 3rd W. 6 7
- **Poverello Center**, 535 Ryman 1 2 3 4 5 6 7 9 11 12 14
- **Senior Citizens Center**, 705 S. Higgins 6 8
- **Social Security Office**, 3701 American Way 11
- **Social Services/Palmer St. Offices** 2 11
- **YWCA**, 1130 West Broadway 11 14

Map Legend

- 1 Route 1
- 2 Route 2
- 3 Route 3
- 4 Route 4
- 5 Route 5
- 6 Route 6
- 7 Route 7
- 8 Route 8
- 9 Route 9
- 11 Route 11
- 12 Route 12
- 14 Route 14
- UM Shuttle

- Schools
- Site Locator
- Bus Pass Outlet
- Time Point
- Bus Stop Shelter
- Fare Free Bus Stop
- Parking
- TH Trailhead

Transfer Points
- Southgate Mall
- Johnson & Sussex
- 39th & Reserve
- South & Higgins
- 10th & Johnson
- Arthur & Eddy
- Target

Route 1 Bat 15 Minute Service!

Schools

ELEMENTARY

1. **Bonner** 4 — Hwy 200, Bonner
2. **Chief Charlo** 12 — 5600 Longview
3. **Cold Springs** 12 — 2625 Briggs
4. **Franklin** 2 8 — 1901 S. 10th W.
5. **Hawthorne** 9 — 2835 S. 3rd W.
6. **Head Start** 3 — Worden & Phillips
7. **Hellgate Elementary** — 2385 Flynn Lane
8. **Jefferson** 1 7 — 1700 South Ave. N.
9. **Lewis & Clark** 6 — 2901 Park
10. **Lowell** 2 — 1200 Sherwood

MIDDLE SCHOOLS

16. **St. Joseph** 7 8 — 503 Edith
17. **Sussex** 9 2 — 137 Garfield
18. **Target Range** 9 — 4095 South Ave. W.
19. **C.S. Porter** 8 — 2510 Reserve
20. **Meadow Hill** 7 12 — 4210 Reserve
21. **Washington** 1 6 7 — 645 W. Central

HIGH SCHOOLS

11. **Walla Walla College** 4 — 735 Michigan
12. **Paxson** 6 — 101 Evans
13. **Missoula International School** — 1100 Harrison
14. **Rattlesnake** 5 — 120 Pineview
15. **Russell** 6 — 3216 Russell
22. **Big Sky** 9 — 3100 South Ave.
23. **Hellgate** 6 8 — 900 S. Higgins
24. **Loyola/Sacred Heart** 7 8 — 320 Edith
25. **Sentinel** 1 6 7 — 901 South Ave.
26. **Willard Alternative** 8 — 901 S. 6th West

HIGHER EDUCATION

27. **The University of Montana** 1 8 12
28. **Missoula College** 1 7 — Main Campus/909 South Ave.
29. **Missoula College** 9 — West Campus/3639 South Ave.
30. **Dickinson Lifelong Learning Center** 9 — 310 N. Curtis

Mountain Line Route Map

Revised April 2013

ROUTE 1 Monday - Friday *15 Minute Service!*

Outbound from Downtown

Depart Transfer Center	Arthur & University	South & Higgins * (T)	Missoula College	Southgate Mall (T)
6:45 AM	6:51 AM	6:57 AM	6:59 AM	7:02 AM
7:15	7:21	7:27	7:29	7:32
7:30	7:36	7:42	7:44	7:47
7:45	7:51	7:57	7:59	8:02
8:00	8:06	8:12	8:14	8:17
8:15	8:21	8:27	8:29	8:32
8:30	8:36	8:42	8:44	8:47
8:45	8:51	8:57	8:59	9:02
9:00	9:06	9:12	9:14	9:17
9:15	9:21	9:27	9:29	9:32
9:30	9:36	9:42	9:44	9:47
9:45	9:51	9:57	9:59	10:02
10:00	10:06	10:12	10:14	10:17
10:15	10:21	10:27	10:29	10:32
10:30	10:36	10:42	10:44	10:47
10:45	10:51	10:57	10:59	11:02
11:00	11:06	11:12	11:14	11:17
11:15	11:21	11:27	11:29	11:32
11:30	11:36	11:42	11:44	11:47
11:45	11:51	11:57	11:59	12:02 PM
12:00 PM	12:06 PM	12:12 PM	12:14 PM	12:17
12:15	12:21	12:27	12:29	12:32
12:30	12:36	12:42	12:44	12:47
12:45	12:51	12:57	12:59	1:02
1:00	1:06	1:12	1:14	1:17
1:15	1:21	1:27	1:29	1:32
1:30	1:36	1:42	1:44	1:47
1:45	1:51	1:57	1:59	2:02
2:00	2:06	2:12	2:14	2:17
2:15	2:21	2:27	2:29	2:32
2:30	2:36	2:42	2:44	2:47
2:45	2:51	2:57	2:59	3:02
3:00	3:06	3:12	3:14	3:17
3:15	3:21	3:27	3:29	3:32
3:30	3:36	3:42	3:44	3:47
3:45	3:51	3:57	3:59	4:02
4:00	4:06	4:12	4:14	4:17
4:15	4:21	4:27	4:29	4:32
4:30	4:36	4:42	4:44	4:47
4:45	4:51	4:57	4:59	5:02
5:00	5:06	5:12	5:14	5:17
5:15	5:21	5:27	5:29	5:32
5:30	5:36	5:42	5:44	5:47
5:45	5:51	5:57	5:59	6:02
6:30	6:36	6:42	6:44	6:47
7:15	7:21	7:27	7:29	7:32
8:00	8:06	8:12	8:14	**8:17**

*Serves Dornblaser Park and Ride

Inbound to Downtown

Southgate Mall (T)	Missoula College	South & Higgins * (T)	Arthur & Keith	Arrive Transfer Center
7:05 AM	7:09 AM	7:13 AM	7:19 AM	7:30 AM
7:35	7:39	7:43	7:49	8:00
7:50	7:54	7:58	8:04	8:15
8:05	8:09	8:13	8:19	8:30
8:20	8:24	8:28	8:34	8:45
8:35	8:39	8:43	8:49	9:00
8:50	8:54	8:58	9:04	9:15
9:05	9:09	9:13	9:19	9:30
9:20	9:24	9:28	9:34	9:45
9:35	9:38	9:43	9:49	10:00
9:50	9:54	9:58	10:04	10:15
10:05	10:09	10:13	10:19	10:30
10:20	10:24	10:28	10:34	10:45
10:35	10:39	10:43	10:49	11:00
10:50	10:54	10:58	11:04	11:15
11:05	11:09	11:13	11:19	11:30
11:20	11:24	11:28	11:34	11:45
11:35	11:39	11:43	11:49	12:00
11:50	11:54	11:58	12:04	12:15
12:05 PM	12:09 PM	12:13 PM	12:19 PM	12:30 PM
12:20	12:24	12:28	12:34	12:45
12:35	12:39	12:43	12:49	1:00
12:50	12:54	12:58	1:04	1:15
1:05	1:09	1:13	1:19	1:30
1:20	1:24	1:28	1:34	1:45
1:35	1:39	1:43	1:49	2:00
1:50	1:54	1:58	2:04	2:15
2:05	2:09	2:13	2:19	2:30
2:20	2:24	2:28	2:34	2:45
2:35	2:39	2:43	2:49	3:00
2:50	2:54	2:58	3:04	3:15
3:05	3:09	3:13	3:19	3:30
3:20	3:24	3:28	3:34	3:45
3:35	3:39	3:43	3:49	4:00
3:50	3:54	3:58	4:04	4:15
4:05	4:09	4:13	4:19	4:30
4:20	4:24	4:28	4:34	4:45
4:35	4:39	4:43	4:49	5:00
4:50	4:54	4:58	5:04	5:15
5:05	5:09	5:13	5:19	5:30
5:20	5:24	5:28	5:34	5:45
5:35	5:39	5:43	5:49	6:00
5:50	5:54	5:58	6:04	6:15
6:05	6:09	6:13	6:19	6:30
6:50	6:54	6:58	7:04	7:15
7:35	7:39	7:43	7:49	8:00
8:17	Bus Returns to Garage via Johnson, 3rd & Russell			

*Serves Dornblaser Park and Ride

ROUTE 1 Saturday

Outbound from Downtown

Depart Transfer Center	Arthur & University	South & Higgins * (T)	Missoula College	Southgate Mall (T)
9:45 AM	9:51 AM	9:57 AM	9:59 AM	10:02 AM
10:30	10:36	10:42	10:44	10:47
11:15	11:21	11:27	11:29	11:32
12:00 PM	12:06 PM	12:12 PM	12:14 PM	12:17 PM
12:45	12:51	12:57	12:59	1:02
2:15	2:21	2:27	2:29	2:32
3:00	3:06	3:12	3:14	3:17
3:45	3:51	3:57	3:59	4:02
4:30	4:36	4:42	4:44	4:47
5:15	5:21	5:27	5:29	5:32

*Serves Dornblaser Park and Ride

Inbound to Downtown

Southgate Mall (T)	Missoula College	South & Higgins * (T)	Arthur & Keith	Arrive Transfer Center
10:05 AM	10:09 AM	10:13 AM	10:19 AM	10:30 AM
10:50	10:54	10:58	11:04	11:15
11:35	11:39	11:43	11:49	12:00 PM
12:20 PM	12:24 PM	12:28 PM	12:34 PM	12:45
1:05	1:09	1:13	1:19	1:30
2:35	2:39	2:43	2:49	3:00
3:20	3:24	3:28	3:34	3:45
4:05	4:09	4:13	4:19	4:30
4:50	4:54	4:58	5:04	5:15
5:35	5:39	5:43	5:49	6:00

*Serves Dornblaser Park and Ride

ROUTE 2 Monday - Friday

Outbound from Downtown

Depart Transfer Center	St. Patrick Hospital	Howell & Russell	Target (T)	Russell & Dakota	10th & Johnson	Southgate Mall (T)
-----	-----	-----	-----	-----	-----	-----
6:45 AM	6:47 AM	6:52 AM	6:58 AM	7:05 AM	7:08 AM	7:18 AM
7:15	7:17	7:22	7:28	7:35	7:38	7:48
7:45	7:47	7:52	7:58	8:05	8:08	8:18
8:15	8:17	8:22	8:28	8:35	8:38	8:48
8:45	8:47	8:52	8:58	9:05	9:08	9:18
9:45	9:47	9:52	9:58	10:05	10:08	10:18
10:45	10:47	10:52	10:58	11:05	11:08	11:18
11:45	11:47	11:52	11:58	12:05 PM	12:08 PM	12:18 PM
12:45 PM	12:47 PM	12:52 PM	12:58 PM	1:05	1:08	1:18
1:45	1:47	1:52	1:58	2:05	2:08	2:18
2:45	2:47	2:52	2:58	3:05	3:08	3:18
3:15	3:17	3:22	3:28	3:35	3:38	3:48
3:45	3:47	3:52	3:58	4:05	4:08	4:18
4:15	4:17	4:22	4:28	4:35	4:38	4:48
4:45	4:47	4:52	4:58	5:05	5:08	5:18
5:15	5:17	5:22	5:28	5:35	5:38	5:48
6:45	6:47	6:52	6:58	7:05	7:08	7:18

Inbound to Downtown

Southgate Mall (T)	10th & Johnson	Russell & Dakota	Target (T)	Maple & Russell	St. Patrick Hospital	Arrive Transfer Center
6:34 AM	6:38 AM	6:43 AM	6:55 AM	7:02 AM	7:05 AM	7:15 AM
7:04	7:08	7:13	7:25	7:32	7:35	7:45
7:34	7:38	7:43	7:55	8:02	8:05	8:15
8:04	8:08	8:13	8:25	8:32	8:35	8:45
8:34	8:38	8:43	8:55	9:02	9:05	9:15
9:04	9:08	9:13	9:25	9:32	9:35	9:45
9:34	9:38	9:43	9:55	10:02	10:05	10:15
10:04	10:08	10:13	10:25	10:32	10:35	10:45
10:34	10:38	10:43	10:55	11:02	11:05	11:15
11:04	11:08	11:13	11:25	11:32	11:35	11:45
11:34	11:38	11:43	11:55	12:02 PM	12:05 PM	12:15 PM
12:04 PM	12:08 PM	12:13 PM	12:25 PM	12:32	12:35	12:45
12:34	12:38	12:43	12:55	1:02	1:05	1:15
1:04	1:08	1:13	1:25	1:32	1:35	1:45
2:04	2:08	2:13	2:25	2:32	2:35	2:45
3:04	3:08	3:13	3:25	3:32	3:35	3:45
3:34	3:38	3:43	3:55	4:02	4:05	4:15
4:04	4:08	4:13	4:25	4:32	4:35	4:45
4:34	4:38	4:43	4:55	5:02	5:05	5:15
5:04	5:08	5:13	5:25	5:32	5:35	5:45
5:34	5:38	5:43	5:55	6:02	6:05	6:08
6:04	6:08	6:13	6:25	6:32	6:35	6:45
7:04	7:08	7:13	7:25	**7:32**	Bus returns to Garage via Phillips	

All Route 2 arrivals at Southgate Mall continue as Route 6

ROUTE 2 Saturday

Outbound from Downtown

Depart Transfer Center	St. Patrick Hospital	Howell & Russell	Target (T)	Russell & Dakota	10th & Johnson	Southgate Mall (T)
9:45 AM	9:47 AM	9:52 AM	9:58 AM	10:05 AM	10:08 AM	10:18 AM
10:45	10:47	10:52	10:58	11:05	11:08	11:18
11:45	11:47	11:52	11:58	12:05 PM	12:08 PM	12:18 PM
12:45 PM	12:47 PM	12:52 PM	12:58 PM	1:05	1:08	1:18
2:15	2:17	2:22	2:28	2:35	2:38	2:48
3:15	3:17	3:22	3:28	3:35	3:38	3:48
4:15	4:17	4:22	4:28	4:35	4:38	4:48
5:15	5:17	5:22	5:28	5:35	5:38	5:48

All Route 2 arrivals at Southgate Mall continue as Route 6

Inbound to Downtown

Southgate Mall (T)	10th & Johnson	Russell & Dakota	Target (T)	Maple & Russell	St. Patrick Hospital	Arrive Transfer Center
10:04 AM	10:08 AM	10:13 AM	10:25 AM	10:32 AM	10:37 AM	10:45 AM
11:04	11:08	11:13	11:25	11:32	11:37	11:45
12:04 PM	12:08 PM	12:13 PM	12:25 PM	12:32 PM	12:37 PM	12:45 PM
1:04	1:08	1:13	1:25	1:32	1:37	1:45
2:34	2:38	2:43	2:55	3:02	3:07	3:15
3:34	3:38	3:43	3:55	4:02	4:07	4:15
4:34	4:38	4:43	4:55	5:02	5:07	5:15
5:34	5:38	5:43	5:55	**6:02**	Bus returns to Garage via Phillips	

ROUTE 3 Monday - Friday

Outbound from Downtown

Depart Transfer Center	St. Patrick Hospital	Dickens & Pullman
6:30 AM	6:32 AM	6:36 AM
-----	-----	-----
7:30	7:32	7:36
7:45	7:47	7:51
8:45	8:47	8:51
9:15	9:17	9:21
9:45	9:47	9:51
10:45	10:47	10:51
11:45	11:47	11:51
12:45 PM	12:47 PM	12:51 PM
1:45	1:47	1:51
2:45	2:47	2:51
3:15	3:17	3:21
3:45	3:47	3:51
4:45	4:47	4:51
5:00	5:02	5:06
5:45	5:47	5:51
6:15*	6:17	**6:20**
6:45	6:47	6:51

Inbound to Downtown

Dickens & Pullman	Providence Center	Arrive Transfer Center
6:36 AM	6:39 AM	6:45 AM
7:06	7:09	7:15
7:36	7:39	7:45
7:51	7:54	8:00
8:51	8:54	9:00
9:21	9:24	9:30
9:51	9:54	10:00
10:51	10:54	11:00
11:51	11:54	12:00 PM
12:51 PM	12:54 PM	1:00
1:51	1:54	2:00
2:51	2:54	3:00
3:21	3:24	3:30
3:51	3:54	4:00
4:51	4:54	5:00
5:06	5:09	5:15
5:51	5:54	6:00
Bus returns to Garage via Scott & Phillips		
6:51	6:54	7:00

ROUTE 3 Saturday

Outbound from Downtown

Depart Transfer Center	St. Patrick Hospital	Dickens & Pullman
-----	-----	-----
10:30 AM	10:32 AM	10:36 AM
11:30	11:32	11:36
12:30 PM	12:32 PM	12:36 PM
1:30	1:32	1:36
3:00	3:02	3:06
4:00	4:02	4:06
5:00	5:02	5:06
6:00	6:02	**6:06**

Inbound to Downtown

Dickens & Pullman	Providence Center	Arrive Transfer Center
9:36 AM	9:39 AM	9:45 AM
10:36	10:39	10:45
11:36	11:39	11:45
12:36 PM	12:39 PM	12:45 PM
1:36	1:39	1:45
3:06	3:09	3:15
4:06	4:09	4:15
5:06	5:09	5:15
Bus returns to Garage via Scott & Phillips		

ROUTE 4 Monday - Friday

Outbound from Downtown

Depart Transfer Center	Broadway & Van Buren	Staple & US 200	1st & West Riverside	Bonner
-----	-----	-----	-----	-----
6:45 AM	6:48 AM	6:55 AM	7:00 AM	7:15 AM
7:45	7:48	7:55	8:00	8:15
8:45	8:48	8:55	9:00	9:15
9:45	9:48	9:55	10:00	10:15
12:45 PM	12:48 PM	12:55 PM	1:00 PM	1:15 PM
2:15	2:18	2:25	2:30	2:45
3:15	3:18	3:25	3:30	3:45
4:15	4:18	4:25	4:30	4:45
5:15	5:18	5:25	5:30	5:45
6:15	6:18	6:25	6:30	6:45
7:15	7:18	7:23	7:27	**7:37**

Inbound to Downtown

Bonner	1st & West Riverside	Staple & US 200	Broadway & Van Buren	Arrive Transfer Center
6:15 AM	6:18 AM	6:30 AM	6:37 AM	6:45 AM
7:15	7:18	7:30	7:37	7:45
8:15	8:18	8:30	8:37	8:45
9:15	9:18	9:30	9:37	9:45
10:15	10:18	10:30	10:37	10:45
1:15 PM	1:18 PM	1:28 PM	1:35 PM	1:45 PM
2:45	2:48	2:58	3:05	3:15
3:45	3:48	3:58	4:05	4:15
4:45	4:48	4:58	5:05	5:15
5:45	5:48	5:58	6:05	6:15
6:45	6:48	6:58	7:05	7:15
Bus returns to Garage via I-90				

ROUTE 4 Saturday

Outbound from Downtown

Depart Transfer Center	Broadway & Van Buren	Staple & US 200	1st & West Riverside	Bonner
9:45 AM	9:48 AM	9:55 AM	10:00 AM	10:15 AM
10:45	10:48	10:55	11:00	11:15
11:45	11:48	11:55	12:00 PM	12:15 PM
12:45 PM	12:48 PM	12:55 PM	1:00	1:15
2:15	2:18	2:25	2:30	2:45
3:15	3:18	3:25	3:30	3:45
4:15	4:18	4:25	4:30	4:45
5:15	5:18	5:25	5:30	**5:45**

Inbound to Downtown

Bonner	1st & West Riverside	Staple & US 200	Broadway & Van Buren	Arrive Transfer Center
10:15 AM	10:18 AM	10:30 AM	10:37 AM	10:45 AM
11:15	11:18	11:30	11:37	11:45
12:15 PM	12:18 PM	12:30 PM	12:37 PM	12:45 PM
1:15	1:18	1:30	1:37	1:45
2:45	2:48	2:58	3:05	3:15
3:45	3:48	3:58	4:05	4:15
4:45	4:48	4:58	5:05	5:15
Bus returns to Garage via I-90				

ROUTE 5 Monday - Friday

Outbound from Downtown

Depart Transfer Center	Broadway & Van Buren	Lincoln Road & Lincolnwood
7:15 AM	7:18 AM	7:25 AM
8:15	8:18	8:25
9:15	9:18	9:25
10:15	10:18	10:25
11:15	11:18	11:25
12:15 PM	12:18 PM	12:25 PM
1:15	1:18	1:25
2:15	2:18	2:25
2:45	2:48	2:55
3:15	3:18	3:25
4:15	4:18	4:25
5:15	5:18	5:25
6:15	6:18	6:25

Inbound to Downtown

Lincoln Road & Lincolnwood	Lolo & Raymond	Broadway & Van Buren	Arrive Transfer Center
7:25 AM	7:31 AM	7:37 AM	7:45 AM
8:25	8:31	8:37	8:45
9:25	9:31	9:37	9:45
10:25	10:31	10:37	10:45
11:25	11:31	11:37	11:45
12:25 PM	12:31 PM	12:37 PM	12:45 PM
1:25	1:31	1:37	1:45
2:25	2:31	2:37	2:45
2:55	3:01	3:07	3:15
3:25	3:31	3:37	3:45
4:25	4:31	4:37	4:45
5:25	5:31	5:37	5:45
6:25	6:31	6:37	6:45

ROUTE 5 Saturday

Outbound from Downtown

Depart Transfer Center	Broadway & Van Buren	Lincoln Road & Lincolnwood
9:45 AM	9:48 AM	9:55 AM
10:45	10:48	10:55
11:45	11:48	11:55
12:45 PM	12:48 PM	12:55 PM
2:15	2:18	2:25
3:15	3:18	3:25
4:15	4:18	4:25
5:15	5:18	5:25

Inbound to Downtown

Lincoln Road & Lincolnwood	Lolo & Raymond	Broadway & Van Buren	Arrive Transfer Center
9:55 AM	10:01 AM	10:07 AM	10:15 AM
10:55	11:01	11:07	11:15
11:55	12:01 PM	12:07 PM	12:15 PM
12:55 PM	1:01	1:07	1:15
2:25	2:31	2:37	2:45
3:25	3:31	3:37	3:45
4:25	4:31	4:37	4:45
5:25	5:31	5:37	5:45

ROUTE 6 Monday - Friday

Outbound from Downtown

Depart Transfer Center	Higgins & Beckwith	South & Higgins (T)	Opportunity Resources	Southgate Mall (T)
-----	-----	-----	-----	-----
6:45 AM	6:50 AM	6:53 AM	7:00 AM	7:04 AM
7:15	7:20	7:23	7:30	7:34
7:45	7:50	7:53	8:00	8:04
8:15	8:20	8:23	8:30	8:34
8:45	8:50	8:53	9:00	9:04
9:15	9:20	9:23	9:30	9:34
9:45	9:50	9:53	10:00	10:04
10:15	10:20	10:23	10:30	10:34
10:45	10:50	10:53	11:00	11:04
11:15	11:20	11:23	11:30	11:34
11:45	11:50	11:53	12:00 PM	12:04 PM
12:15 PM	12:20 PM	12:23 PM	12:30	12:34
12:45	12:50	12:53	1:00	1:04
1:45	1:50	1:53	2:00	2:04
2:45	2:50	2:53	3:00	3:04
3:15	3:20	3:23	3:30	3:34
3:45	3:50	3:53	4:00	4:04
4:15	4:20	4:23	4:30	4:34
4:45	4:50	4:53	5:00	5:04
5:15	5:20	5:23	5:30	5:34
5:45	5:50	5:53	6:00	6:04
6:45	6:50	6:53	7:00	7:04

All Route 6 trips continue as Route 2 at Southgate Mall

Inbound to Downtown

Southgate Mall (T)	Opportunity Resources	South & Higgins (T)	Higgins & Beckwith	Arrive Transfer Center
6:48 AM	6:52 AM	7:00 AM	7:03 AM	7:15 AM
7:18	7:22	7:30	7:33	7:45
7:48	7:52	8:00	8:03	8:15
8:18	8:22	8:30	8:33	8:45
8:48	8:52	9:00	9:03	9:15
9:18	9:22	9:30	9:33	9:45
10:18	10:22	10:30	10:33	10:45
11:18	11:22	11:30	11:33	11:45
12:18 PM	12:22 PM	12:30 PM	12:33 PM	12:45 PM
1:18	1:22	1:30	1:33	1:45
2:18	2:22	2:30	2:33	2:45
-----	-----	-----	**3:05***	3:15
3:18	3:22	3:30	3:33	3:45
3:48	3:52	4:00	4:03	4:15
4:18	4:22	4:30	4:33	4:45
4:48	4:52	5:00	5:03	5:15
5:18	5:22	5:30	5:33	5:45
5:48	5:52	6:00	6:03	6:08
6:18	6:22	6:30	6:33	6:45
7:18	7:22	7:27	7:30	7:38

*This trip begins at Higgins & Connell (Hellgate High School) at 3:05 pm when school is in session

ROUTE 6 Saturday

Outbound from Downtown

Depart Transfer Center	Higgins & Beckwith	South & Higgins (T)	Opportunity Resources	Southgate Mall (T)
9:45 AM	9:50 AM	9:53 AM	10:00 AM	10:04 AM
10:45	10:50	10:53	11:00	11:04
11:45	11:50	11:53	12:00 PM	12:04 PM
12:45 PM	12:50 PM	12:53 PM	1:00	1:04
2:15	2:20	2:23	2:30	2:34
3:15	3:20	3:23	3:30	3:34
4:15	4:20	4:23	4:30	4:34
5:15	5:20	5:23	5:30	5:34

Inbound to Downtown

Southgate Mall (T)	Opportunity Resources	South & Higgins (T)	Higgins & Beckwith	Arrive Transfer Center
10:18 AM	10:22 AM	10:30 AM	10:33 AM	10:45 AM
11:18	11:22	11:30	11:33	11:45
12:18 PM	12:22 PM	12:30 PM	12:33 PM	12:45 PM
1:18	1:22	1:30	1:33	1:45
2:48	2:52	3:00	3:03	3:15
3:48	3:52	4:00	4:03	4:15
4:48	4:52	5:00	5:03	5:15
5:48	5:52	6:00	6:03	6:10

ROUTE 7 Monday - Friday

Outbound from Downtown

Depart Transfer Center	5th & Orange	Stephens & Central	Southgate Mall (T)	Walmart	K-Mart
6:45 AM	6:48 AM	6:52 AM	7:00 AM	7:15 AM	7:18 AM
7:15	7:18	7:22	7:30	7:45	7:48
7:45	7:48	7:52	8:00	8:15	8:18
8:15	8:18	8:22	8:30	8:45	8:48
8:45	8:48	8:52	9:00	9:15	9:18
9:45	9:48	9:52	10:00	10:15	10:18
10:45	10:48	10:52	11:00	11:15	11:18
11:45	11:48	11:52	12:00 PM	12:15 PM	12:18 PM
12:45 PM	12:48 PM	12:52 PM	1:00	1:15	1:18
1:45	1:48	1:52	2:00	2:15	2:18
2:45	2:48	2:52	3:00	3:15	3:18
3:15	3:18	3:22	3:30	3:45	3:48
3:45	3:48	3:52	4:00	4:15	4:18
4:15	4:18	4:22	4:30	4:45	4:48
4:45	4:48	4:52	5:00	5:15	5:18
5:15	5:18	5:22	5:30	5:45	5:48
5:45	5:48	5:52	6:00	6:15	6:18
6:45	6:48	6:52	7:00	7:15	7:18

Inbound to Downtown

K-Mart	Southgate Mall (T)	Stephens & Central	5th & Orange	Arrive Transfer Center
7:18 AM	7:25 AM	7:28 AM	7:33 AM	7:45 AM
7:48	7:55	7:58	8:03	8:15
8:18	8:25	8:28	8:33	8:45
8:48	8:55	8:58	9:03	9:15
9:18	9:25	9:28	9:33	9:45
10:18	10:25	10:28	10:33	10:45
11:18	11:25	11:28	11:33	11:45
12:18 PM	12:25 PM	12:28 PM	12:33 PM	12:45 PM
1:18	1:25	1:28	1:33	1:45
2:18	2:25	2:28	2:33	2:45
3:18	3:25	3:28	3:33	3:45
3:48	3:55	3:58	4:03	4:15
4:18	4:25	4:28	4:33	4:45
4:48	4:55	4:58	5:03	5:15
5:18	5:25	5:28	5:33	5:45
5:48	5:55	5:58	6:03	6:15
6:18	6:25	6:28	6:33	6:45
7:18	7:25	7:28	7:33	7:45

ROUTE 7 Saturday

Outbound from Downtown

Depart Transfer Center	5th & Orange	Stephens & Central	Southgate Mall (T)	Walmart	K-Mart
9:45 AM	9:48 AM	9:52 AM	10:00 AM	10:15 AM	10:18 AM
10:45	10:48	10:52	11:00	11:15	11:18
11:45	11:48	11:52	12:00 PM	12:15 PM	12:18 PM
12:45 PM	12:48 PM	12:52 PM	1:00	1:15	1:18
2:15	2:18	2:22	2:30	2:45	2:48
3:15	3:18	3:22	3:30	3:45	3:48
4:15	4:18	4:22	4:30	4:45	4:48
5:15	5:18	5:22	5:30	5:45	5:48
5:45	5:48	5:52	6:00	6:15	6:18
6:45	6:48	6:52	7:00	7:15	7:18

Inbound to Downtown

K-Mart	Southgate Mall (T)	Stephens & Central	5th & Orange	Arrive Transfer Center
10:18 AM	10:25 AM	10:28 AM	10:33