OHIO DEPARTMENT of TRANSPORTATION

Project WAR-71-14.20

Bridge Number WAR-71-1514L/R
Interstate 71 over Little Miami River

JEREMIAH MORROW BRIDGES
MANUAL FOR LOAD RATING and PERMITS

HNTB

TABLE OF CONTENTS

1.0 INTRODUCTION

1.1 Objectives
1.2 Description of the Bridge
1.3 Manual Organization

2. 0 METHODOLOGY

2.1 Overview
2.2 Loads, Load Factors, and Allowable Stresses
2.3 Analysis Methods
2.4 Member Capacities
2.5 Rating Methods

3.0 DESCRIPTION OF WORKBOOKS AND SPREADSHEETS

3.1 Overview
3.2 User Input Sheets
3.3 Result Summary Sheets
3.4 Calculations
3.5 Reference or Data File Sheets

4.0 LOAD RATING PROCEDURES

4.1 Overview
4.2 Procedures for Permit Evaluations (a user-defined vehicle)
4.3 Procedures for Inventory Rating (Standard HS loading)
4.4 Procedures for Operating Rating (Standard HS loading)

5.0 INTERPRETATION OF RESULTS AND WORKED EXAMPLES

5.1 Example 1 – Permit Evaluation for a User-Define Vehicle without Adjacent Normal Traffic
5.2 Example 2 – Permit Evaluation for a User-Define Vehicle with One Lane of Adjacent Normal Traffic
5.3 Example 3 – Inventory Rating
5.4 Example 4 – Operating Rating

6.0 LOAD RATING

6.1 Load Rating Assumptions and Summary
6.2 Load Rating Observations

7.0 REFERENCES

APPENDIX A – Description of the Bridge (Figures 1-1 through 1-13)

APPENDIX B – Load Configurations of User Defined Vehicle

LIST OF FIGURES

Figure 1-1 Plan and Elevation
Figure 1-2 Cross Section
Figure 1-3 Top Slab Tendon 1
Figure 1-4 Top Slab Tendon 2
Figure 1-5 Top Slab Tendon 3
Figure 1-6 Bottom Slab Tendon 1
Figure 1-7 Bottom Slab Tendon 2
Figure 1-8 Bottom Slab Tendon 3
Figure 1-9 Bottom Slab Tendon 4
Figure 1-10 External Tendon 1
Figure 1-11 External Tendon 2
Figure 1-12 Transverse Tendon Profile
Figure 1-13 16’ Typical Segment Reinforcement

Figure 2-1 Definition of Load Configurations (User-Defined Vehicle)
Figure 2-2 T-187 Model for Longitudinal Analysis
Figure 2-3 Shallow Section T-187 Model for Transverse Analysis (Deep Section Similar)
Figure 2-4 Shallow Section LARSA Model for Transverse Analysis (Deep Section Similar)
Figure 2-5 3D Moment Surface Defined by A Point Load Acting Near the Box Center on Shallow Section (Deep Section Similar)

Figure 5-1 Permit (User Defined) Wheel Configurations for Example 1
Figure 5-2 Permit (User Defined) Wheel Configurations for Example 2

LIST OF TABLES

Table 2-1 Load Factors Used in the Analysis
Table 2-2 Allowable Stresses Used in the Analysis

Table 3-1 Summary of Workbook and Spreadsheet Content
Table 3-2 User Input Sheet for Load Rating Analysis

Table 5-1 User Input Sheet for Permit Vehicle Rating for Example 1 (w/o Adjacent Normal Traffic)
Table 5-2 Summary Results for Permit Vehicle Rating for Example 1 (w/o Adjacent Normal Traffic)
Table 5-3 Longitudinal Results for Permit Vehicle Rating for Example 1 (w/o Adjacent Normal Traffic)
Table 5-4 Transverse Results for Permit Vehicle Rating for Example 1 (w/o Adjacent

Normal Traffic)
Table 5-5 User Input Sheet for Permit Vehicle Rating for Example 2 (with Adjacent Normal Traffic)
Table 5-6 Summary Results for Permit Vehicle Rating for Example 2 (with Adjacent Normal Traffic)
Table 5-7 Longitudinal Results for Permit Vehicle Rating for Example 2 (with Adjacent Normal Traffic)
Table 5-8 Transverse Results for Permit Vehicle Rating for Example 2 (with Adjacent Normal Traffic)
Table 5-9 User Input Sheet for Inventory Rating (Standard HS) for Example 3
Table 5-10 Summary Results for Inventory Rating (Standard HS) for Example 3
Table 5-11 Longitudinal Result for Inventory Rating Standard HS) for Example 3
Table 5-12 Transverse Result for Inventory Rating (Standard HS) for Example 3
Table 5-13 User Input Sheet for Operating Rating (Standard HS) for Example 4
Table 5-14 Summary Results for Operating Rating (Standard HS) for Example 4
Table 5-15 Longitudinal Result for Operating Rating Standard HS) for Example 4
Table 5-16 Transverse Result for Operating Rating (Standard HS) for Example 4

1.0 INTRODUCTION

1.1 Objectives

The goal of this Manual is to provide ODOT with a tool to rate permit trucks for the Jeremiah Morrow Bridges. This Manual is based on Load Factor Rating (LFR) principles.

The previous rating spreadsheet tools were developed in 2009. It allowed ODOT to quickly rate this bridge for user-defined permit vehicles without any adjacent normal traffic. In March of 2018, HNTB was scoped by ODOT to enhance the previous spreadsheet tools to have the following improvements:

1) Add an option to rate the bridge for the user-defined permit vehicle with one lane of adjacent normal traffic (HS25).

2) Increase the maximum distance between the first axle and the last axle of the user-defined permit vehicle from 180 feet to 250 feet.

3) Incorporate a cross section view and a plan view showing permit vehicle wheel locations on the bridge in the input sheet of load rating tool.

4) Include a check to limit vehicles within 52 ft inside to inside of barrier walls while inputting the data in data spreadsheet.

5) Since rating the bridge for the permit vehicle with adjacent normal traffic takes much longer time, a new feature of using VBA progress bar is added in the rating tool to show Macro running progress.

1.2 Description of the Bridge

The Jeremiah Morrow project consists of twin bridges, one for northbound traffic and the other for southbound. The bridge was designed in 2006. The construction started in 2010. The southbound bridge was completed in 2013 and the northbound bridge was completed in 2016.

Each bridge has a cast-in-place concrete box girder superstructure with an overall length of 2,235 feet. The superstructures of each bridge are identical. The pier heights for each bridge are different.

Each bridge has six spans (270', 440', 440' 440', 416' and 229') supported on bearings at the abutments and Pier 5. The remaining Piers 1, 2, 3, and 4 are twin-wall piers that are integral with the superstructure.

In plan, the bridge has a constant width of 55 ft (52 ft inside to inside of barrier walls). The bridges will initially be striped for 3 lanes of traffic in each direction with 6 and 10 feet shoulders.

In the future, the bridge can be re-striped for 4 – 12 foot lanes of traffic between the traffic barriers.

In elevation, the bridge is variable depth. The section depth at the pier location is 25 feet and the section depth at the mid-span is 12 feet.

The bridge is constructed using the cast-in-place balanced cantilever method. Two small portions next to the abutments are constructed on falsework.

All Figures (1-1 through 1-13) describing the bridge are contained in Appendix A for convenience.

1.3 Manual Organization

The seven sections of this Manual are summarized as follows.

Section 1 - Introduction and Objectives

Section 2 - Provides a general description of the load rating methodologies used including descriptions of the load factors, the load combinations, and the permit vehicles considered.

Section 3 - Provides detailed information on organization of the workbooks and worksheets.

Section 4 - Describes the procedures used to obtain inventory ratings, operating ratings, and permit vehicle ratings.

Section 5 - Contains the interpretation of the results and presents four examples (inventory rating, operating rating, and rating for a permit vehicle with and without one lane of adjacent normal traffic).

Section 6 - Summarizes the primary assumptions used when assembling the inventory and operating ratings. In addition, the summary HS inventory and operating rating values are provided in this section.

Section 7 - References

2.0 METHODOLOGY

2.1 Overview

Load factor principles of the AASHTO Standard (LFD) Specifications are used for service load checks to be performed in conjunction with strength ratings. Through the use of different load factors at the strength limit state or different allowable stresses at service load limits, inventory ratings (design vehicle) differ from operating ratings (design vehicles or user-defined vehicles).

This user Manual describes a unique evaluation tool developed specifically for this structure. The spreadsheet was developed to perform the following three tasks.

- Inventory rating using standard HS load configuration
- Operating rating using standard HS load configuration
- Permit evaluation (at the operating level) for user-defined vehicles

2.1.1. Criteria and Assumptions

The load rating analysis is based on the requirement of the *AASHTO Manual for Condition Evaluation of Bridges, 1994 Second Edition*, with all Interim Revisions [1]. The capacity of each structural component was calculated according to the *AASHTO Standard Specifications for Highway Bridges, 17th Edition*, [2] and *AASHTO Guide Specifications for Segmental Bridges [3]*.

The multi-lane load reduction factor (AASHTO Standard Specification article 3.12) has been included in the spreadsheet for both the inventory rating and operating rating.

The design plans are those created by the Engineer of Record for bidding purposes. These plans are based on a number of assumptions, such as age of the concrete at erection, construction sequence, method of erection, temporary support conditions etc.

The load rating values provided in this Manual are based on the design plans. The SB Bridge was designed the same as the NB Bridge. Both bridges were constructed similarly, and closely following the original design plan; therefore, the load rating tool developed for ODOT based on the design plan can be used for both bridges.

2.1.2. Inventory and Operating Rating Levels

In general, load rating factors are developed for two conditions.

- Inventory load rating factors describe the prescribed design load on the bridge associated with standard loads and factors.

- The Operating Load Rating Factors are based on an evaluation of the bridge using reduced load factors. The Operating Load Rating factors are used to determine the maximum weight vehicles that can safely use the bridge.

The general load rating equation is the following,

RF = (C- D) / (L + I)

Where

RF represents a rating factor,
C represents the capacity of the component being evaluated,
D represents dead load effects and other built-in construction force effects including post-tensioning, and
L+ I is used to represent live load force effects.

Rating factors are dependent on the live load used to generate the L+I forces.

The inventory and operating ratings are provided as capacity in "tons" for the standard HS load configuration. For example, "25 tons" shown in the inventory rating summary sheet is corresponding to standard HS25.

Four lanes of live load are used to determine the inventory HS rating while three lanes (the number of striped lanes), are used for the operating rating live load.

2.1.3. Permit Rating

The permit vehicle is rated using the same criteria as the operating rating. The permit rating is calculated using VBA Macro with a concept called the "Margin of Safety" to obtain the rating factor.

The Margin of Safety is defined as follows.

MARGIN OF SAFETY (%) = (1 – X) * 100

Where

X= (Total Applied Load) / (The maximum load allowed for the same load configuration)

A Margin of Safety value less than zero indicates that the element is overstressed and that its capacity has been exceeded. Therefore, the rating factor will be less than 1.0. The Margin of Safety represents the available capacity beyond what is needed to support the applied load.

2.2 Loads, Load Factors, and Allowable Stresses

2.2.1 Loads other than Live Loads

Temperature effects were considered in the longitudinal analysis. Other non-gravity load effects such as wind were not considered. The transverse rating factors did not include temperature force effects.

2.2.2 Live Loads

The standard HS25 truck and lane loading were used for the bridge design. Four lanes of live load were used to design the bridge. The bridge will be striped for three lanes of traffic in its initial configuration.

This customized rating tool will allow ODOT to define any permit vehicle shown in Figure 2-1 by inputting wheel configurations, axle locations and wheel loadings. The user can define the transverse position of the permit vehicle on the bridge deck relative to the PGL. In addition, the user can specify different impact factors. Under the normal traffic condition, impact factor 0.15 is recommended for longitudinal load rating and impactor 0.3 is recommended for transverse load rating.

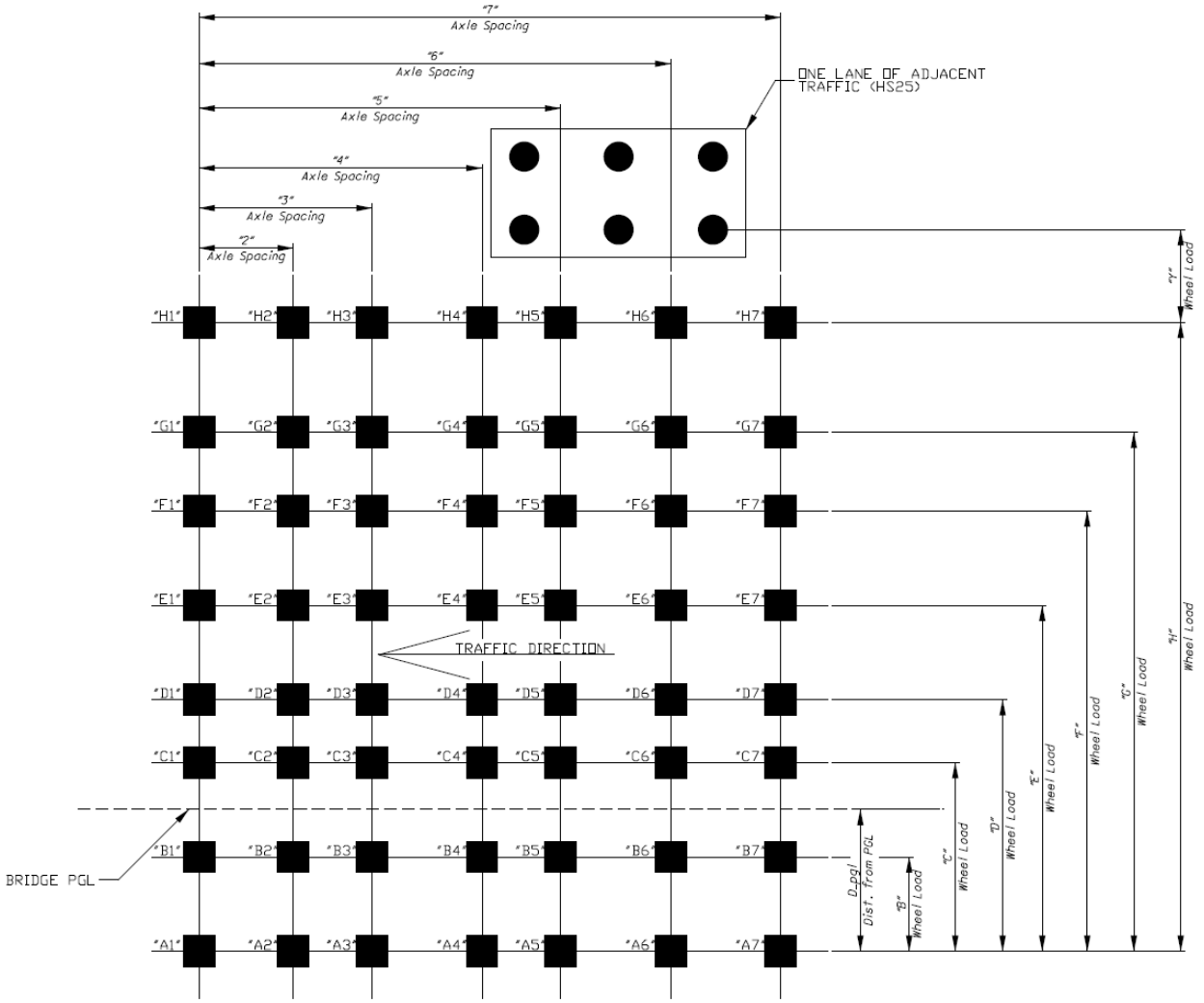


Figure 2-1 Definition of Load Configuration (User-Define Vehicle)

The user configured permit vehicle illustrated in Figure 2.1 consists of a maximum 8

wheels per axle and may utilize up to 25 axles. The maximum distance between first axle and last axle of the permit vehicle was increased from previous 180 ft to 250 ft. The user configured permit vehicle can represent a single vehicle or a group of vehicles in the most unfavorable position.

This latest enhanced rating tool allows users to rate the bridge for the permit truck concurrent with one lane of adjacent normal traffic represented by Standard HS25 and lane loading defined by AASHTO Standard Specification.

Positions between the permit truck and adjacent traffic varies transversely and longitudinally. On transverse direction, the user needs manually input the "Y" shown in Figure 2-1, which is the distance between adjacent wheels of the normal traffic and the permit truck. If the distance "Y" is expected to vary other than a constant, the user needs to input different "Y", then rerun the Macro to obtain the corresponding rating factor. In order for the permit vehicle to pass the bridge, those rating factors must be greater than 1.0. The variation of "Y" mainly just have impact on the transverse rating factor.

On longitudinal direction, VBA macro was built into the rating spreadsheets, which can automatedly account for different positions of the permit vehicle and normal traffic. For the permit truck with normal traffic, running Macro of the spreadsheet to get rating factor takes longer. More axles the permit truck has, the more time is needed.

2.2.3 Load Factors and Load Combinations

In general, conventional LFR load factors and combinations were considered in the analysis. Table 2-1summarizes the loadings used with their corresponding load factors.

Table 2-1 Load Factors Used in the Analysis

Load Combinations		Factor Used	
		Longitudinal	Transverse
Permanent Dead loads	Dc	1.3	1.3
	PT	1.0	1.0
Transient Loads	Temperature Gradient	0.5	0.0
	Uniform Temperature	1.0	0.0
	Creep and Shrinkage	1.0	0.0
Inventory Live Load	HS 25 – Lane	2.17	0.0
	HS 25 –Truck	2.17	1.3
Operating Live Load	HS 25 – Lane	2.17	0.0
	HS 25 –Truck	2.17	1.3

2.2.4 Allowable Stresses

The following table summarizes the allowable stresses. Different values of allowable stress are utilized when evaluating different components. Permit evaluations use the same allowable stress criteria as the Operating Rating.

Table 2-2 Allowable Stresses Used in the Analysis

Stress Type and Location	Allowable	
	Inventory	Operating
Tension - longitudinal, top deck	zero	zero
Tension - longitudinal, all other locations considered	230 psi	460 psi
Tension - transverse, top deck	zero	230 psi
Tension - transverse, all other locations considered	230 psi	460 psi
Compression (all loads combined)	2400 psi	2400 psi
Principal Tensile Stress	270 psi	350 psi

2.3 Analysis Methods

2.3.1 Longitudinal Analysis

The longitudinal analysis was accomplished using a proprietary HNTB structural analysis software, T-187. This software will perform construction staging and time dependent analysis. The same software was used to design the bridge. Figure 2-2 shows the T-187 model for longitudinal analysis

The built in dead load and PT forces are taken at day 10,000 which is assumed to be at the end of pre-stress losses.

The resulting structural model was then used to determine the live load force effects. The standard HS loading and user defined permit loading are generated using two different methods.

HS loading is applied to the model to generate internal force envelopes for shear and bending moment. Multi-lane effects and impacts are considered, following the AASHTO guidelines.

For user defined permit loading, moment and shear influence lines for each structure element are generated by moving a point from one end of the bridge to the other. After the permit vehicle is defined by the user, a macro is used to generate moment and shear envelopes.

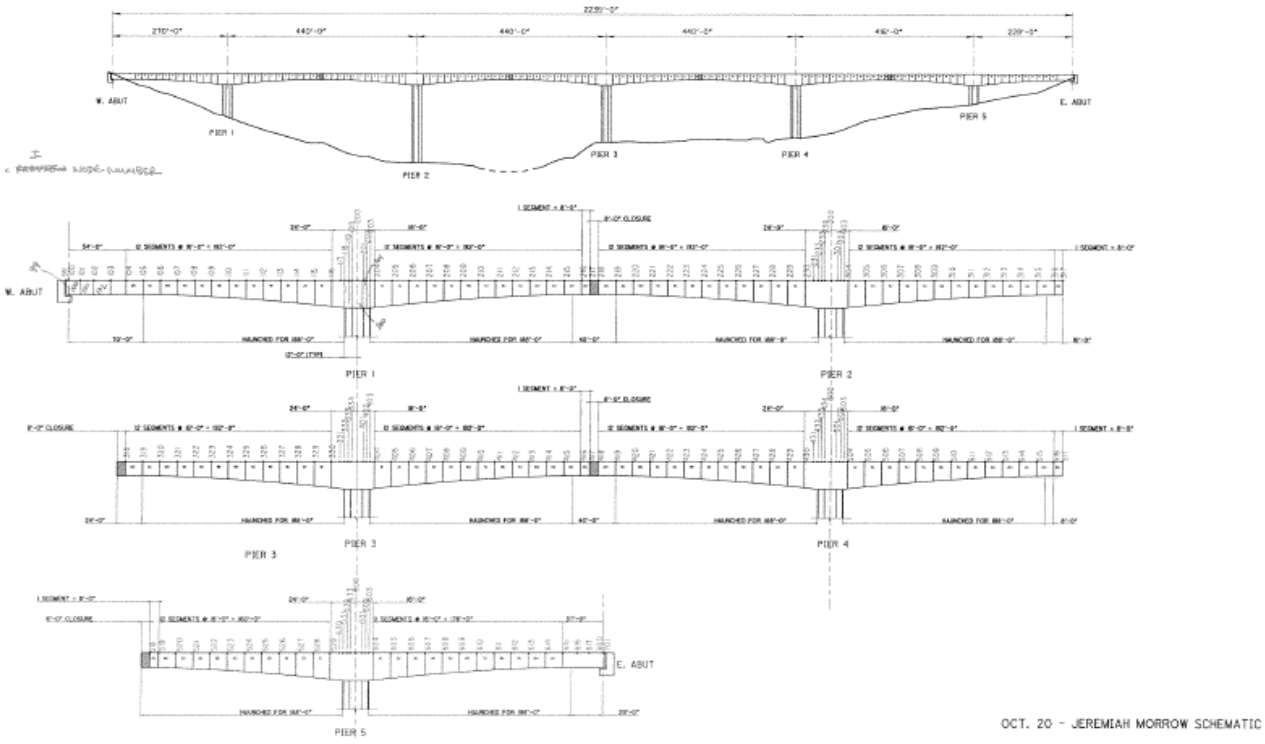


Figure 2-2 T-187 Model for Longitudinal Analysis

2.3.2 Transverse Analysis

The transverse analysis was assembled as follows. LARSA was used to generate 3D finite element models, and T-187 was used for the frame models.

Two T-187 models (2-D frame model) were used to calculate moment and stress under the effect of dead load and post-tensioning. The first model shown in Figure 2-3 used the geometry of the shallow segmental region (near midspan), and the second model used the geometry of the deep segmental region near a pier.

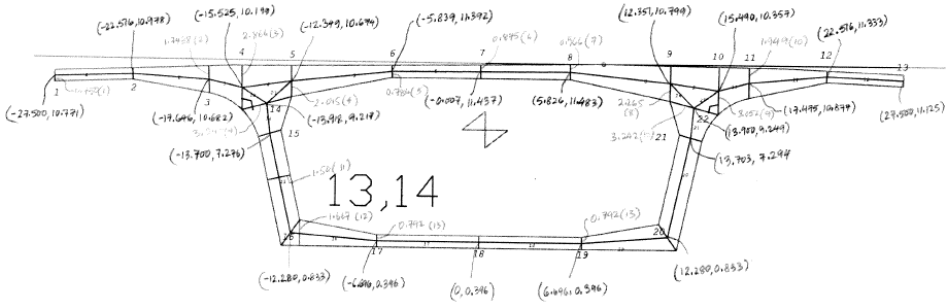


Figure 2-3 Shallow Section T-187 Model for Transverse Analysis
(Deep Section Similar)

Two LARSA models (shallow section shown in Figure 2-4 and deep section respectively) were used to generate the live load influence surfaces. The LARSA models generate the 3D influence surface under a unit point load. A spreadsheet macro was developed in the load rating spreadsheet to calculate slab moments under any truck configurations (typical HS or a user-defined).

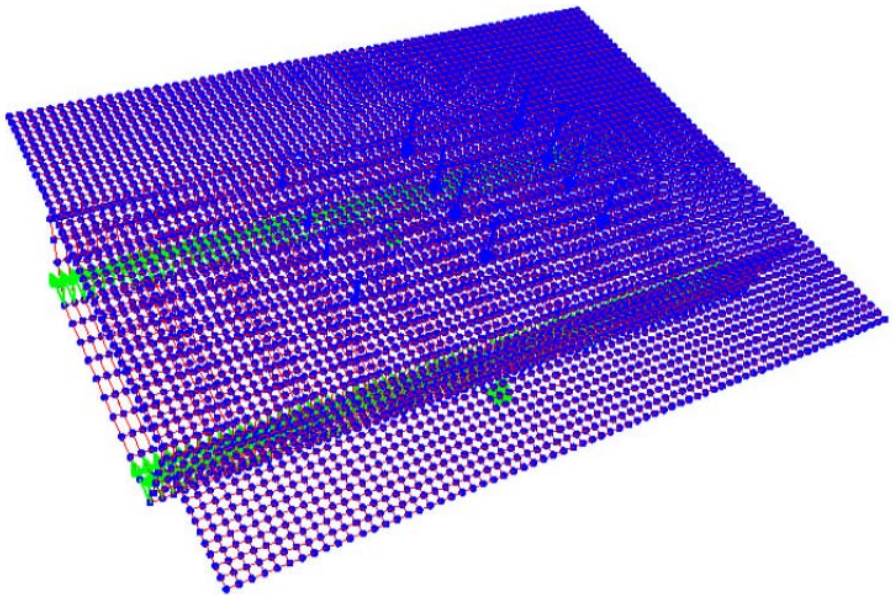


Figure 2- 4 Shallow Section LARSA Model for Transverse Analysis
(Deep Section Similar)

The transverse design is always controlled by wheel loads. Within the spreadsheet the transverse moments for ratings of permit or permit combining with one lane of adjacent normal traffic are obtained using the following procedures:

- Calculate the 3D moment surface for each wheel load using the unit loads and the 3D LARSA model. Figure 2-5 shows a 3D moment surface defined by a point load acting near the box center on shallow section.

- The total transverse influence surface is then generated by superimposing the moment surfaces from each individual wheel load.

- Obtain the maximum and minimum moment at a particular transverse position from the total transverse moment surface.

Note that the above procedures are applied to the deep and shallow sections respectively.

For the inventory and operating ratings, the transverse position of the vehicles is not defined. Therefore, the above procedures have to be repeated to consider the effect due to the most unfavorable vehicle position. A set of calculations have been conducted to generate the envelope by varying vehicle positions in the transverse direction.

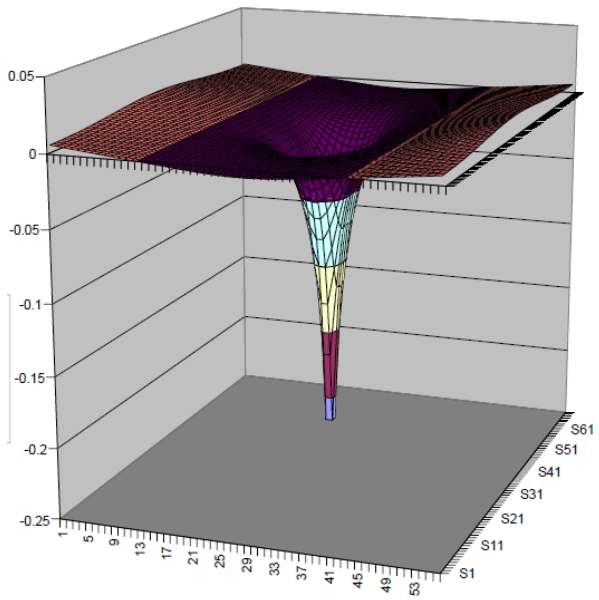


Figure 2-5 3D Moment Surface Defined by A Point Load Acting Near the Box Center on Shallow Section.
(Deep Section Similar)

2.4 Member Capacities

2.4.1 Longitudinal Checks

Longitudinal member capacities are evaluated for the following conditions.

Serviceability

- Longitudinal normal stresses (top and bottom)
- Principal tensile stress in the webs at the section CG

Strength

- Longitudinal moment capacity (positive and negative). When checking the longitudinal capacity, the external post-tensioning effect is considered as an

externally applied load, not a part of the section capacity.

- Section shear capacity including the effect of web bending. This check is performed in accordance with Podolny and Muller [5].

2.4.2 Transverse Checks

Serviceability

- Top and bottom stress checks on the top slab.

Strength

- Moment capacity at each section of the top slab.

These checks apply to both deep and shallow sections.

2.5 Rating methods

The results for member rating in the longitudinal direction are summarized in the "Long result summary" tab in the workbook. For results in the transverse direction, see the "Trans result summary" tab. The "RatingSummary" tab shows the minimum rating factor.

When performing inventory and operating rating for Standard HS loading, the rating factors are multiplied by the tonnage of the vehicle or the HS loading used to generate the L+I force to arrive at the HS rating and tonnage rating. Therefore, the rating output is provided in "tons". When performing permit vehicle rating, the rating factors that are provided correspond to the Margin of Safety.

In the "Long result summary" tab, the results are broken down for Serviceability (Column C to Column G) and Strength (column H to Column J). The minimum ratings for each individual check are provided in cell C26 for maximum top stress check, cell D26 for minimum top stress check, cell E26 for maximum bottom stress check, cell F26 for minimum bottom stress check, cell G26 for web principal stress check, cell H26 for maximum moment check, cell I26 for minimum moment check, and cell J26 for web shear check.

In the "Trans result summary" tab, the transverse results on the deep section (cell B26 to cell H84) and shallow section (cell L26 to cell R84) are provided. Further, each segment is broken down by Serviceability (Column C to Column F for deep segment and Column M to Column P for shallow segment) and Strength (column G to Column H for deep segment, and Column Q to Column R for shallow segment).

The minimum ratings for each individual check are also provided. For deep segments, cell C26 shows the minimum rating for maximum top stress check, cell D26 for minimum top stress check, cell E26 for maximum bottom stress check, cell F26 for minimum bottom

stress check, cell G26 for maximum moment check, and cell H26 for minimum moment check. For shallow segments, cell M26 shows the minimum rating for maximum top stress check, cell N26 for minimum top stress check, cell O26 for maximum bottom stress check, cell P26 for minimum bottom stress check, cell Q26 for maximum moment check, and cell R26 for minimum moment check.

Longitudinal rating and top slab rating (transverse) are provided so the user can determine which member is critical and where the critical rating is located along the bridge.

In the "RatingSummary" tab, the minimum rating of the bridge is shown in cell D7. The graphic on right side of worksheet shows transverse positions of wheels for the permit truck and adjacent traffic.

3.0 DESCRIPTION OF WORKBOOKS and SPREADSHEETS

3.1 Overview

This section provides a brief description of the organization of workbooks and the spreadsheet structure. As shown in Table 3-1, the workbooks and their spreadsheets are divided into four groups.

- USER INPUT
- CALCULATIONS
- REFERENCE OR DATA FILE, and
- RESULTS SUMMARY.

The user needs only work with the USER INPUT and RESULT SUMMARY sheets. After specifying the loading and type of rating in the USER INPUT sheet, the user can run the macro and then review the results in the RESULT SUMMARY sheets. No other worksheets should be modified. "RatingSummary" tab provides a summary in terms of controlling rating factor, design parameters and wheel & axle configuration of the permit truck. "Long result summary" tab and "Trans result summary" tab give detail summary of rating factors for longitudinal direction and transverse direction.

All cells in the spreadsheets of workbooks, except for those requiring user input and the result output sheets, are locked to protect against any accidental changes or modifications.

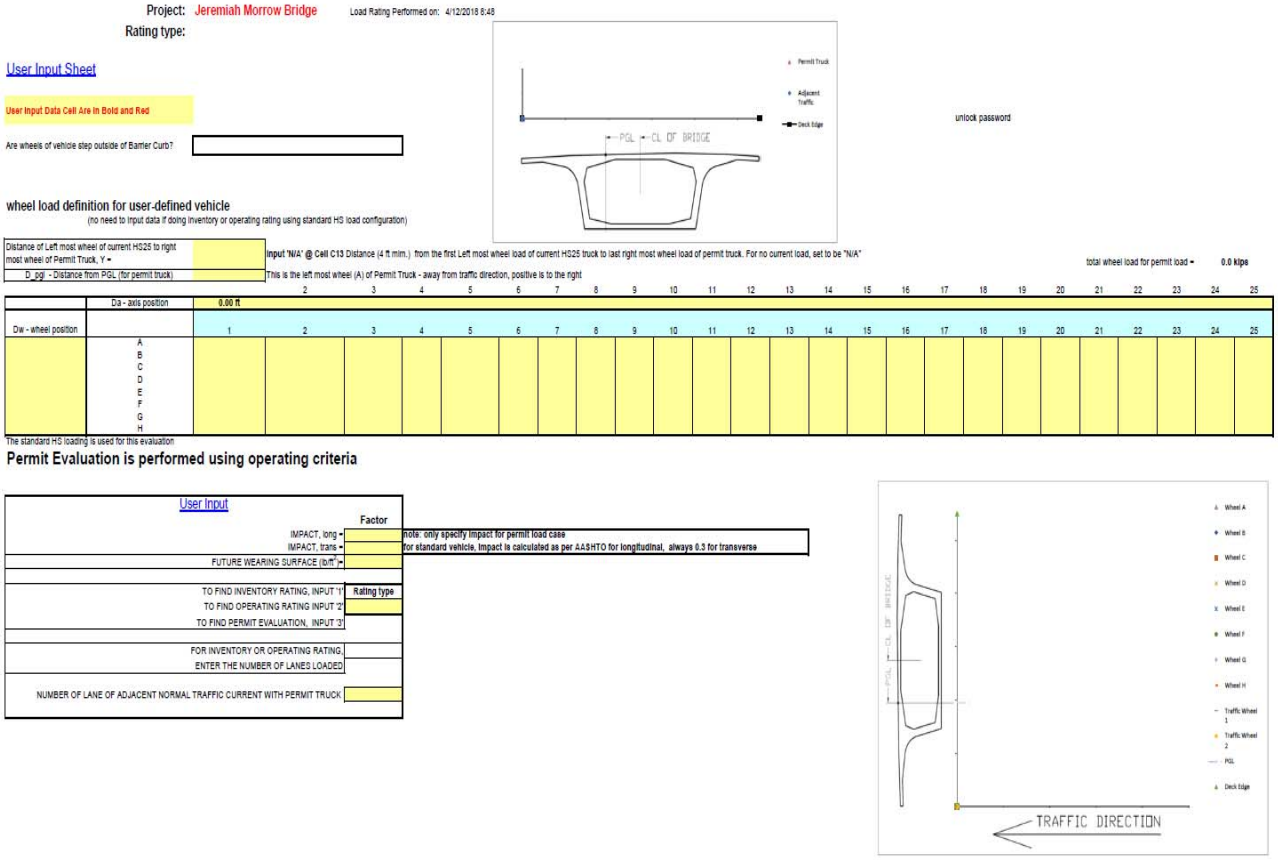
Table 3-1 Summary of Workbook and Spreadsheet Content

Group	Excel Workbook Name	Excel Worksheet Name
User Input Sheet	load_rate_control.xls	User Input
Result Summary Sheets	load_rate_control.xls	RatingSummary Trans Result Summary Long Result Summary
Calculation Sheets	load_rate_cal_original.xls	Ht&WidthDim Geometry Sect Prop LongNegMom LongPosMom Trans Sect Prop TransUltPosResist TransUltNegResist LongShear trans capacity long capacity
	load_rate_trans_current.xls	Ht&WidthDim Geometry Sect Prop LongNegMom LongPosMom Trans Sect Prop TransUltPosResist TransUltNegResist LongShear trans capacity long capacity
Reference or Data File sheets (Longitudinal Direction)	longitudinal_data.xls	Node coordinates EOSb4FWS EOS+FWS Total PT Creep Shrinkage Temp uniform Temp Gradient LL Envelope Permit LL Mom Permit LL Shear Permit LL TopStress Permit LL BotStress
Reference or Data File sheets (Transverse Direction - Deep Section)	DLtransDataDeep.xls	Axial ShearY MomentZ TopStress BotStress
	transverseDataDeep.xls	TransPoint 1 to TransPoint 57 Stdmax Stdmin
Reference or Data File sheets (Transverse Direction - Shallow Section)	DLtransDataShallow.xls	Axial ShearY MomentZ TopStress BotStress
	transverseDataShallow.xls	TransPoint 1 to TransPoint 57 Stdmax Stdmin

3.2 User Input Sheets

The USER INPUT group consists of only one sheet, “User Input.” Table 3-2 shows an example of the “User Input” sheet.

Table 3-2 User Input Sheet for Load Rating Analysis



In this sheet, the user will define loading, loading configuration, impact, any applied future wearing surface, rating tasks (whether inventory rating, operating rating or permit evaluation) and the total number of lanes to be loaded. For load configuration, the user will input the number of axles and the axle spacing. The user can define up to a maximum of 25 axles. The maximum distance of the permit vehicle (from the first axle to the last axle) is 250 ft. The user will also input the wheel location and wheel load. The maximum number of wheels is eight and the maximum vehicle width is 52 feet, which is the distance between the barriers. The distance in cell14 from PGL is the distance measured from PGL to the first leftmost wheel when facing traffic direction. Positive values mean the leftmost wheel is at the right side of the PGL while negative values mean it is at the left side. Figure 2-1 shows the definition of the load configuration data. The user can specify the load at each wheel.

If the user would like to consider rating the bridge for permit truck together with one lane of adjacent normal traffic. The user also needs to input data "Y" in cell C13, which is the distance of adjacent wheels between permit truck and adjacent traffic. The minimum "Y" shall be 4 ft per AASHTO Specification. If "Y" is expected to vary in some degree, the user shall consider rating the bridge using different "Y" to insure rating factor exceed 1.0 for all possibilities.

3.3 Result Summary Sheets

The RESULT SUMMARY group consists of three sheets, one (RatingSummary sheet) shows minimum rating factor of bridge to allow user quickly know outcome of the rating. The other two (Long_result_summary & Trans_result_summary) provide summary of the rating factor for each of the members depending on type of rating specified by the user and under the specified loading pattern. How the structure is rated (i.e. inventory, operating or permit) is also listed in summaries.

3.4. Calculations

The CALCULATIONS group are performed using two excel spreadsheets. They are "load_rate_cal_original.xls" and "load_rate_trans_current.xls". Each of these two spreadsheet consists of 11 sheets, none of which should be modified by the user. For example, the "geometry" sheet calculates section height, center of gravity, and angle on bottom flange for each segment along the entire bridge. Furthermore, the "Sect Prop" sheet finds the material and section properties for each element and then checked against the combined force of dead load, superimposed dead load, force due to post-tensioning, force due to uniform temperature change, force due to temperature gradient, load due to future wearing surface, if applies, and also live load plus impact. The "Trans Sect Prop" sheet provides the calculations of the material and section properties of the top slab which is broken into 55 members. The remainders of the sheets in the CALCULATIONS group perform similar operations where the data from this CALCULATIONS group is then incorporated into the member capacity check and used to determine the rating factor or Margin of safety at each live load step and the controlling (minimum) value for each element is summarized in the RESULT SUMMARY group. The calculation spreadsheets shall not be used or modified by any user.

3.5. Reference or Data File Sheets

The REFERENCE or DATA FILE group consists of a large database divided into two subcategories of longitudinal and transverse directions. In each subcategory, the database is further divided into two smaller groups – Permanent Loading and Live Load Loading.

3.5.1 Longitudinal Direction

The Permanent Load group for longitudinal direction consists of 7 sheets. Loadings that are considered in the permanent load group include the dead load, superimposed dead load, load due to creep and shrinkage, post-tensioning load, uniform temperature load, load due to temperature gradient, and future wearing surface if application. All of these loads are from T-187 models. The structure is defined such that the X-axis is parallel to

the longitudinal axis of the deck. For this group of loadings, each sheet provides the axial force, shear in the Y direction, moment, top stress and bottom stresses for each segment along the bridge.

The live loads are also from T-187 models. 4 lanes of traffics using standard HS are used for inventory rating while only 3 lanes of traffics using standard HS are used for operating rating. For this group of loadings, envelope (maximum and minimum values) of the axial force, shear in the Y direction, moment, top stress and bottom stresses are provided for each segment along the bridge.

The live loads for permit vehicle rating with and without current traffic are handled differently and the live load generation takes place in two steps. First, influence matrices are generated from T-187 models. Then the spreadsheet takes the user-defined load configuration and moves it across the bridge in the specified increments. Each incremental movement causes a live load case to be generated. This live load case consists of a set of concentrated point loads acting at the grid points on the live load influence surface. These loads are then multiplied by the live load influence surface coefficients to get the final live load for each structural element considered. The INFLUENCE MATRIX group for longitudinal direction consists of 4 sheets. The INFLUENCE MATRIX group sheets are the live load influence surfaces created from the 100-kip unit load. The “Permit LL Mom” sheet contains the moment influence surface for each segment along the bridge. Likewise, the “Permit LL Shear” sheet contains the shear influence surface in the Y direction for each segment along the bridge. The “Permit LL Top Stress” sheet contains the top stress influence surface for each segment along the bridge, and so forth. These sheets in the INFLUENCE MATRIX group contain the results from the T-187 model and should not to be modified.

3.5.2 Transverse Direction

Section near the pier (deep) and at the midspan (shallow) are considered when performing the transverse analysis on models using T-187 and 3D LARSA.

The results due to the permanent loading applied to each segment are separated into two workbooks where each workbook consists of 5 sheets. The “axial” sheet contains the axial force due to the permanent loading group. The “Shear Y” sheet contains the shear in the Y direction due to the permanent loading group and so forth. The loadings that are considered in the permanent load group include the dead load, superimposed dead load, post-tensioning load, and future wearing surface if applies. All of these loads are from T-187 two dimensional frame models. The X-axis is transverse to the bridge deck and Y-axis is in the vertical direction.

The live loads for inventory and operating rating using standard HS loading are from LARSA models. The transverse position of the vehicle is not defined in the excel spreadsheet for these two ratings. Instead, a set of calculations has been conducted to generate the envelope by varying vehicle positions in the transverse direction. For this group of loadings, the envelope (maximum and minimum values) of the moment is provided at each segment along the top slab. The X-axis is parallel to the longitudinal axis of the deck, Y-axis is set transverse to the bridge deck and the Z-axis is in the vertical direction.

The live loads for permit vehicle rating with or without concurrent traffic are handled differently and the live load generation takes place in two steps. First, influence matrices are generated along the top slab from 3D LARSA model. On the other hand, the spreadsheet takes the user-defined load configuration and converts into the grid points that were used in the influence matrix. This live load case consists of a set of concentrated point loads acting at the grid points on the live load influence surface. These loads are then multiplied by the live load influence surface coefficients to get the final live load for each structural element considered. The INFLUENCE MATRIX group for transverse direction consists of two workbooks (one for deep section while another for shallow section) where each workbook consists of 57 sheets. The INFLUENCE MATRIX group sheets are the live load influence surfaces created from the 1 kip unit load. Each worksheet represents the live load influence surface along a point of the top slab. These sheets in the INFLUENCE MATRIX group contain the results from the 3D LARSA model and they should not be modified by the user.

4.0 LOAD RATING PROCEDURES

4.1 Overview

The Load Rating utility is capable of performing an inventory rating on standard HS loading, an operating rating on standard HS loading, and a permit rating on user defined vehicles with or without one lane of adjacent normal traffic.

When performing a permit rating, the input is a combination of wheel loads and axle spacing associated with the vehicle to be evaluated. Furthermore, the user is able to re-evaluate the overload vehicle by limiting the speed of the vehicle and therefore reducing transverse impact of the vehicle or re-position it by relocating transversely.

4.2 Procedures for Permit Evaluation (a user-defined vehicle)

Step 1 - Open **"Load_rate_control.xls"** workbook

Step 2 - Navigate to the **"User Input"** tab

Step 3a - Enter the PGL offset value of the reference wheel line in cell C14. The distance from PGL is identified on Figure 2-1 and in the cross sections showing the traffic patterns in Section 1 of this manual. The reference wheel line is wheel line "A" in the spreadsheet which is described on row 18

Step 3b - Enter the "Y" value in cell C13 if the user would like to include one lane of adjacent normal traffic together with permit truck. "Y" is the distance between transverse position of the vehicle's wheel between normal traffic (HS25 truck) and the permit truck defined in Step 3a. Wheel load pattern and the configurations on the bridge can be seen from two graphics in "User Input" tab.

Step 4 - Enter the wheel loads in cells C18…AA25. Axles are in columns. Transverse wheel lines on each axle are in rows.

Step 5 - Put the axle distances from the reference wheel in D16…AA16. The axle distances represent the total distance to the reference wheel; not the distance to the adjacent axle.

Step 6 - Put the wheel line offsets from the reference wheel in A19…A25. Similar to the axle distances, the wheel line offsets are the total distance to the reference wheel, not the distances to the adjacent wheel line.

Step 7 - If applicable, enter the future wearing surface load or any other additional superimposed dead load in cell E36.

Step 8 - Specify a '3' in cell E39 for rating type as Permit Rating.
Specify the impact factor for longitudinal direction in cell E34 and for transverse direction in cell E35.

Step 9a - Specify a “1” in cell E42 as the number of lanes loaded for Permit Rating.

Step 9b - Specify a “0” in cell E45 if the bridge is rated only with the permit truck.

Step 9b - Specify a “1” in cell E45 if the bridge is rated with permit truck concurrently with one lane of adjacent normal traffic.

Step 10 - The macro can be executed by “**Run Load Rating Evaluation”**.

Step 11- It takes a few minutes for the macro to process the data and spit out the outputs for permit truck without adjacent normal traffic. But for permit truck with adjacent normal traffic will take much longer time than without it. The more axles the permit truck has, the more time is needed to run the Macro in the rating spreadsheet. When the macro was completed, a message box will pop out informing the program is finished processing the results. When it completes, click on the “Long result summary” tab to check on the rating factor on the longitudinal analysis. For the rating factor on the transverse analysis, click on the “Trans result summary” tab. For controlling rating factor, see “RatingSummary” tab.

Step 12 - A rating factor less than 1.0 indicates that this vehicle cannot safely pass over the bridge with the defined conditions (such as the transverse position of the vehicle’s wheels or the impact factor). The user can further try to shift the vehicle in the transverse direction of the bridge to reduce the impact if transverse rating is controlling. Also, by specifying a lower travel speed with police escort, a lower impact factor can be used.

4.3. Procedures for Inventory Rating (Standard HS Loading)

Step 1 - Open **“Load_rate_control.xls”** workbook

Step 2 - Navigate to the **“User Input”** tab

Step 3 - If applicable, input the future wearing surface load or any other additional superimposed dead load in cell E36.

Step 4 - Specify a ‘1’ in cell E39 for rating type to indicate inventory rating for standard HS loading.

Step 5 - Specify a “4” in cell E42 as the number of lanes loaded for inventory rating. On standard HS loading.

Step 6 - The macro can be executed by hitting the button that said, **“Run Load Rating Evaluation”.**

Step 7 - It takes a few minutes for the macro to process the data and spit out the outputs. When the macro was completed, a massage box will pop out informing the program is finished processing the results. When it

completes, click on the “Long result summary” tab to check on the results on longitudinal analysis and the “Trans result summary” tab to check on the results on transverse analysis. For controlling rating, see “RatingSummary” tab.

Step 8 - The rating factor are multiplied internally in the macro by the tonnage of the vehicle or the HS loading used to generate the L+I forces to arrive at the HS rating and the tonnage ratings. Noted that the impact due to HS loading for the longitudinal analysis is set as the same as original design and transverse analysis is 0.3.

4.4. Procedures for Operating Rating (Standard HS Loading)

Step 1 - Open **“Load_rate_control.xls”** workbook

Step 2 - Navigate to the **“User Input”** tab

Step 3 - If applicable, input the future wearing surface load or any other additional superimposed dead load in cell E36.

Step 4 - Specify a “2” in cell E39 for rating type to indicate operating rating for standard HS loading.

Step 5 - Specify a “3” in cell E42 as the number of lanes loaded for operating rating on standard HS loading.

Step 6 - The macro can be executed by hitting the button that said, **“Run Load Rating Evaluation”**.

Step 7 - It takes a few minutes for the macro to process the data and provide the results. When the macro was completed, a massage box will pop out informing the program is finished processing the results. When it completes, click on the “Long result summary” tab to check on the results on longitudinal analysis and the “Trans result summary” tab to check on the results on the transverse analysis. For controlling rating, see “RatingSummary” tab.

Step 8 - The rating factor are multiplied internally in the macro by the tonnage of the vehicle or the HS loading used to generate the L+I forces to arrive at the HS rating and the tonnage ratings. Noted that the impact due to HS loading for the longitudinal analysis is set as the same as original design and transverse analysis is 0.3.

Note: This spreadsheet will activate with the **“Run Load Rating Evaluation”** button.

5.0 INTERPRETATION OF RESULTS AND WORKED EXAMPLES

For permit evaluation, the Summary Tables found in the “Result Summary” sheets list all of the critical members, and the different type of rating factors for each member being checked. The lowest rating factor of bridge can be found at cell D7 in the ”RatingSummary” tab. If the rating factor is less than 1.0, which is a “Not Adequate” rating, it indicates that the structure cannot safely carry the proposed loading.

If a “Not Adequate” rating is found for the structure, measures can be taken to increase the Margin of Safety. One such measure would be to shift the vehicle transversely if the bridge is controlled by transverse rating. The second option would be to reduce the permit truck impact factor by lowering the permit vehicle speed. A third option would be to use a different vehicle to carry the load. By distributing the load with more axles, it may be possible to carry the same proposed load.

5.1 Example 1 - Permit Evaluation for a User-Defined Vehicle without Adjacent Normal Traffic

This example is for the permit evaluation of a user-defined vehicle without adjacent normal traffic. The permit vehicle weighted 550 kips consists of 8 axles with 5 wheels per axle. Refer to Figure 5-1 for the wheel load pattern and the vehicle’s transverse position on the bridge. The travel speed of the vehicle is at their normal speed, which means the impact factor on the transverse direction is 0.30. The future wearing surface has not been placed yet (0.0 kip/ft^2 for future wearing surface load). The “User Input” sheet can be found in Table 5-1. Two graphics in “User Input” sheet shows patterns and configuration of vehicle’s wheels on the bridge deck. It helps user to visualize wheel positions of the trucks on the bridge.

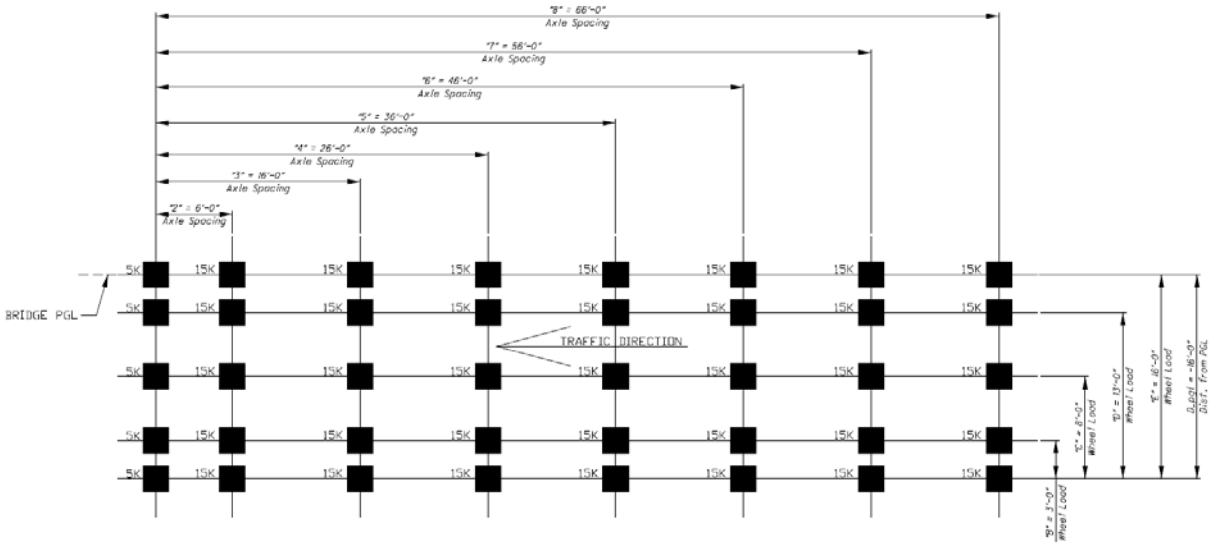
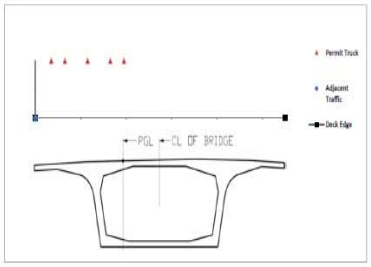


Figure 5-1 Permit (User Defined) Wheel Configurations for Example 1

Table 5-1 User Input Sheet for Permit Vehicle Rating for Example 1 (w/o adjacent normal traffic)

Project: Jeremiah Morrow Bridge Load Rating Performed on: 4/10/2018 16:10

Rating type: Permit Truck without adjacent normal traffic



User Input Sheet

User Input Data Cell Are in Bold and Red

unlock password

Are wheels of vehicle step outside of Barrier Curb? They are inside barrier curbs. So it is good !

wheel load definition for user-defined vehicle

(no need to input data if doing inventory or operating rating using standard HS load configuration)

Distance of Left most wheel of current HS25 to right most wheel of Permit Truck, Y =	N/A	Input 'N/A' @ Cell C13 Distance (4 ft min.) from the first Left most wheel load of current HS25 truck to last right most wheel load of permit truck. For no current load, set to be 'N/A'
D_pgl - Distance from PGL (for permit truck)	-16.00 ft	This is the left most wheel (A) of Permit Truck - away from traffic direction, positive is to the right

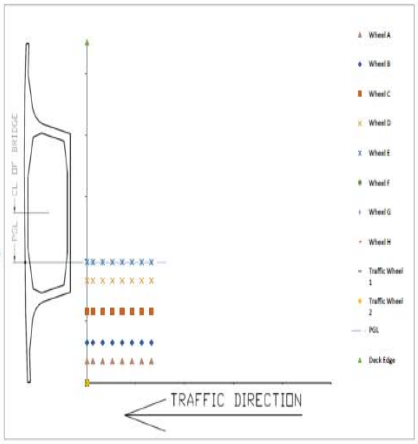
total wheel load for permit load = 550.0 kips

		2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
	Da - axis position	0.00 ft	6.00 ft	16.00 ft	26.00 ft	36.00 ft	46.00 ft	56.00 ft	66.00 ft																
Dw - wheel position		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
0.00 ft	A	5.0 kips	15.0 kips	15.0 kips	15.0 kips	15.0 kips	15.0 kips	15.0 kips	15.0 kips																
3.00 ft	B	5.0 kips	15.0 kips	15.0 kips	15.0 kips	15.0 kips	15.0 kips	15.0 kips	15.0 kips																
8.00 ft	C	5.0 kips	15.0 kips	15.0 kips	15.0 kips	15.0 kips	15.0 kips	15.0 kips	15.0 kips																
13.00 ft	D	5.0 kips	15.0 kips	15.0 kips	15.0 kips	15.0 kips	15.0 kips	15.0 kips	15.0 kips																
16.00 ft	E	5.0 kips	15.0 kips	15.0 kips	15.0 kips	15.0 kips	15.0 kips	15.0 kips	15.0 kips																
	F																								
	G																								
	H																								

Permit Evaluation is performed using operating criteria

Permit Evaluation is performed using operating criteria

User Input	Factor	
IMPACT, long =	0.15	note: only specify impact for permit load case
IMPACT, trans =	0.3	for standard vehicle, impact is calculated as per AASHTO for longitudinal, always 0.3 for transverse
FUTURE WEARING SURFACE (lb/ft²)=	0	
	Rating type	
TO FIND INVENTORY RATING, INPUT '1'		
TO FIND OPERATING RATING INPUT '2'	3	Permit Evaulation
TO FIND PERMIT EVALUATION, INPUT '3'		
FOR INVENTORY OR OPERATING RATING,	1	Number of lanes loaded must be 1 for permit
ENTER THE NUMBER OF LANES LOADED	OK	
NUMBER OF LANE OF ADJACENT NORMAL TRAFFIC CURRENT WITH PERMIT TRUCK	0	("0" for Inventory & Operating Rating as well as no current load with permit truck. "1" for one lane of current load with permit truck)
		Permit Truck without adjacent normal traffic



In this example, the controlling rating factor is 1.45 shown in Table 5-2. The longitudinal and transverse "Result Summary" sheets can be found in Tables 5-3 and 5-4, respectively. The minimum Rating Factor in the longitudinal direction is 1.75 for serviceability, based on principal tensile stress in the webs. The minimum Rating Factor in the transverse direction is 1.92 for the shallow section, and 1.45 for the deep section, both based on top slab minimum stress. The bridge is safe for the passing of this vehicle.

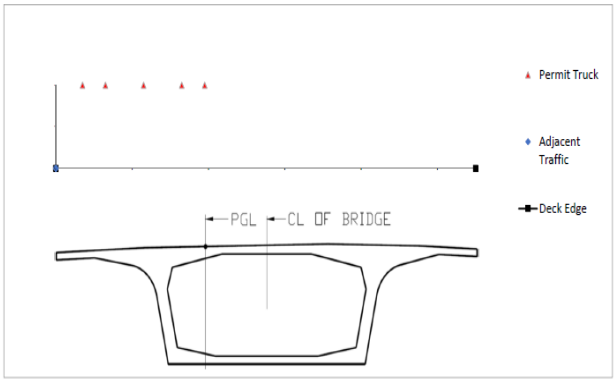
Table 5-2 Summary Results for Permit Vehicle Rating for Example 1 (w/o Adjacent Normal Traffic)

Project: Jeremiah Morrow Bridge

Rating Type: Permit Truck without adjacent normal traffic

Load Rating Performed on: 4/10/2018 16:10

No of Axles of Permit Vehicles = 8 axles
Total wheel load for permit vehicle = 550 kips
Rating Factor = 1.45 Good



Wheel load definition for user-defined vehicle

Distance of Left most wheel of current HS25 to right most wheel of Permit Truck	N/A	Distance from the first Left most wheel load of current HS25 truck to last right most wheel load of permit truck. For no current load, set to be "N/A"
D_pgl - Distance from PGL (for permit truck)	-16.00 ft	this is the left most wheel (A) of Permit Truck - away from traffic direction, positive is to the right

	Da - axis position	0.00 ft	6.00 ft	16.00 ft	26.00 ft	36.00 ft	46.00 ft	56.00 ft	66.00 ft															
Dw - wheel position		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
0.00 ft	A	5.0 kips	15.0 kips	15.0 kips	15.0 kips	15.0 kips	15.0 kips	15.0 kips	15.0 kips																	
3.00 ft	B	5.0 kips	15.0 kips	15.0 kips	15.0 kips	15.0 kips	15.0 kips	15.0 kips	15.0 kips																	
8.00 ft	C	5.0 kips	15.0 kips	15.0 kips	15.0 kips	15.0 kips	15.0 kips	15.0 kips	15.0 kips																	
13.00 ft	D	5.0 kips	15.0 kips	15.0 kips	15.0 kips	15.0 kips	15.0 kips	15.0 kips	15.0 kips																	
16.00 ft	E	5.0 kips	15.0 kips	15.0 kips	15.0 kips	15.0 kips	15.0 kips	15.0 kips	15.0 kips																	
	F																									
	G																									
	H																									

Permit Evaluation is performed using operating criteria

User Input

	Factor	
IMPACT, long =	0.15	note: only specify impact for permit load case
IMPACT, trans =	0.3	for standard vehicle, impact is calculated as per AASHTO for longitudinal, always 0.3 for transverse
FUTURE WEARING SURFACE (lb/ft²)=	0	
TO FIND INVENTORY RATING, INPUT '1'	Rating type	
TO FIND OPERATING RATING INPUT '2'	3	Permit Evaulation
TO FIND PERMIT EVALUATION, INPUT '3'		
FOR INVENTORY OR OPERATING RATING, ENTER THE NUMBER OF LANES LOADED	1	Number of lanes loaded must be 1 for permit
NUMBER OF LANE OF ADJACENT NORMAL TRAFFIC CURRENT WITH PERMIT TRUCK	0	("0" for Inventory & Operating Rating as well as no current load with permit truck. "1" for one lane of current load with permit truck)

Permit Truck without adjacent normal traffic

Table 5-3 Longitudinal Results for Permit Vehicle Rating for Example 1 (w/o Adjacent Normal Traffic)

project:	Jeremiah Morrow Bridge							
rating type:	Permit Truck without adjacent normal traffic							
summary of rating in the longitudinal direction								
Load Rating Result longitudinal								
2	3	4	5	6	7	8	9	10
Minimum Rating Factor In Longitudinal								
LOCATION OF MEMBER WITH MINIMUM								
Rating Factor								
1.75		Web Principle Stress Controls						
Rating Factor on Load Rating								
	Rating Factor							
NODE	service condition					strength check		
	top stress max	top stress min	bottom stress max	bottom stress min	web principle stress	moment max	moment min	web shear
summary	4.00	3.60	3.94	1.98	1.75	2.80	3.45	3.90
99					4.00	4.00	4.00	4.00
100					4.00	4.00	4.00	4.00
100		4.00	4.00		4.00	4.00	4.00	4.00
101		4.00	4.00		1.75	4.00	4.00	4.00
101	4.00	4.00	4.00	4.00	1.75	4.00	4.00	4.00
102	4.00	4.00	4.00	4.00	3.35	4.00	4.00	4.00
102	4.00	4.00	4.00	4.00	3.35	4.00	4.00	4.00
103	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
103	4.00	4.00	4.00	3.87	4.00	4.00	4.00	4.00
104	4.00	4.00	4.00	3.26	4.00	4.00	4.00	4.00
104	4.00	4.00	4.00	2.27	4.00	3.15	4.00	4.00
105	4.00	4.00	4.00	2.30	4.00	3.45	4.00	4.00
105	4.00	4.00	4.00	2.01	4.00	3.00	4.00	4.00
106	4.00	4.00	4.00	2.31	4.00	3.55	4.00	4.00
106	4.00	4.00	4.00	2.22	4.00	3.35	4.00	4.00
107	4.00	4.00	4.00	2.12	4.00	3.25	4.00	4.00
107	4.00	4.00	4.00	2.23	4.00	3.25	4.00	4.00
108	4.00	4.00	4.00	2.28	4.00	3.40	4.00	4.00
108	4.00	4.00	4.00	2.56	4.00	3.55	4.00	4.00
109	4.00	4.00	4.00	2.73	4.00	4.00	4.00	4.00
109	4.00	4.00	4.00	3.38	4.00	4.00	4.00	4.00
110	4.00	4.00	4.00	3.56	4.00	4.00	4.00	4.00
110	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
111	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
111	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
112	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
112	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
113	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
113	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
114	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
114	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
115	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
115	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
116	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
116	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
117	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
117	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00

Continuous Table 5-3 Longitudinal Results for Permit Vehicle Rating for Example 1 (w/o Adjacent Normal Traffic)

Rating Factor on Load Rating								
	Rating Factor							
NODE	service condition					strength check		
	top stress max	top stress min	bottom stress max	bottom stress min	web principle stress	moment max	moment min	web shear
118	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
203	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
204	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
204	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
205	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
205	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
206	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
206	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
207	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
207	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
208	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
208	4.00	4.00	4.00	4.00	3.85	4.00	4.00	4.00
209	4.00	4.00	4.00	4.00	3.65	4.00	4.00	4.00
209	4.00	4.00	4.00	4.00	3.40	4.00	4.00	4.00
210	4.00	4.00	4.00	4.00	3.50	4.00	4.00	4.00
210	4.00	4.00	4.00	4.00	3.10	4.00	4.00	3.95
211	4.00	4.00	4.00	4.00	3.30	4.00	4.00	4.00
211	4.00	4.00	4.00	4.00	2.95	4.00	4.00	4.00
212	4.00	4.00	4.00	4.00	3.25	4.00	4.00	4.00
212	4.00	4.00	4.00	4.00	3.05	4.00	4.00	4.00
213	4.00	4.00	4.00	3.64	3.60	4.00	4.00	4.00
213	4.00	4.00	4.00	2.97	3.50	4.00	4.00	4.00
214	4.00	4.00	4.00	2.81	4.00	4.00	4.00	4.00
214	4.00	4.00	4.00	2.48	4.00	4.00	4.00	4.00
215	4.00	4.00	4.00	2.63	4.00	4.00	4.00	4.00
215	4.00	4.00	4.00	2.40	4.00	4.00	4.00	4.00
216	4.00	4.00	4.00	2.84	4.00	4.00	4.00	4.00
216	4.00	4.00	4.00	2.65	4.00	3.95	4.00	4.00
217	4.00	4.00	4.00	2.28	4.00	3.65	4.00	4.00
217	4.00	4.00	4.00	2.22	4.00	3.55	4.00	4.00
218	4.00	4.00	4.00	2.12	4.00	3.50	4.00	4.00
218	4.00	4.00	4.00	2.07	4.00	3.40	4.00	4.00
219	4.00	4.00	4.00	2.47	4.00	3.80	4.00	4.00
219	4.00	4.00	4.00	2.52	4.00	3.85	4.00	4.00
220	4.00	4.00	4.00	2.45	4.00	4.00	4.00	4.00
220	4.00	4.00	4.00	2.64	4.00	4.00	4.00	4.00
221	4.00	4.00	4.00	2.81	4.00	4.00	4.00	4.00
221	4.00	4.00	4.00	3.13	4.00	4.00	4.00	4.00
222	4.00	4.00	4.00	3.39	4.00	4.00	4.00	4.00
222	4.00	4.00	4.00	3.95	4.00	4.00	4.00	4.00
223	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
223	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
224	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
224	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
225	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
225	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
226	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
226	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
227	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
227	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
228	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
228	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
229	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
229	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
230	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
230	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
231	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
231	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00

Continuous Table 5-3 Longitudinal Results for Permit Vehicle Rating for Example 1 (w/o Adjacent Normal Traffic)

Rating Factor on Load Rating								
	Rating Factor							
NODE	service condition					strength check		
	top stress max	top stress min	bottom stress max	bottom stress min	web principle stress	moment max	moment min	web shear
232	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
303	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
304	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
304	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
305	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
305	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
306	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
306	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
307	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
307	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
308	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
308	4.00	4.00	4.00	4.00	3.90	4.00	4.00	4.00
309	4.00	4.00	4.00	4.00	3.70	4.00	4.00	4.00
309	4.00	4.00	4.00	4.00	3.50	4.00	4.00	4.00
310	4.00	4.00	4.00	4.00	3.55	4.00	4.00	4.00
310	4.00	4.00	4.00	4.00	3.20	4.00	4.00	4.00
311	4.00	4.00	4.00	4.00	3.40	4.00	4.00	4.00
311	4.00	4.00	4.00	4.00	3.10	4.00	4.00	4.00
312	4.00	4.00	4.00	4.00	3.45	4.00	4.00	4.00
312	4.00	4.00	4.00	3.88	3.25	4.00	4.00	4.00
313	4.00	4.00	4.00	3.39	3.90	4.00	4.00	4.00
313	4.00	4.00	4.00	2.81	3.80	4.00	4.00	4.00
314	4.00	4.00	4.00	2.55	4.00	4.00	4.00	4.00
314	4.00	4.00	4.00	2.27	4.00	4.00	4.00	4.00
315	4.00	4.00	4.00	2.30	4.00	4.00	4.00	4.00
315	4.00	4.00	4.00	2.14	4.00	4.00	4.00	4.00
316	4.00	4.00	4.00	2.44	4.00	3.80	4.00	4.00
316	4.00	4.00	4.00	2.31	4.00	3.65	4.00	4.00
317	4.00	4.00	4.00	2.06	4.00	3.40	4.00	4.00
317	4.00	4.00	4.00	1.98	4.00	3.30	4.00	4.00
318	4.00	4.00	4.00	2.07	4.00	3.35	4.00	4.00
318	4.00	4.00	4.00	2.06	4.00	3.30	4.00	4.00
319	4.00	4.00	4.00	2.46	4.00	3.75	4.00	4.00
319	4.00	4.00	4.00	2.51	4.00	3.80	4.00	4.00
320	4.00	4.00	4.00	2.34	4.00	4.00	4.00	4.00
320	4.00	4.00	4.00	2.55	4.00	4.00	4.00	4.00
321	4.00	4.00	4.00	2.64	4.00	4.00	4.00	4.00
321	4.00	4.00	4.00	2.95	4.00	4.00	4.00	4.00
322	4.00	4.00	4.00	3.27	4.00	4.00	4.00	4.00
322	4.00	4.00	4.00	3.81	4.00	4.00	4.00	4.00
323	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
323	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
324	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
324	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
325	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
325	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
326	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
326	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
327	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
327	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
328	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
328	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
329	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
329	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
330	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
330	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
331	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
331	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00

Continuous Table 5-3 Longitudinal Results for Permit Vehicle Rating for Example 1 (w/o Adjacent Normal Traffic)

Rating Factor on Load Rating								
	Rating Factor							
NODE	service condition					strength check		
	top stress max	top stress min	bottom stress max	bottom stress min	web principle stress	moment max	moment min	web shear
332	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
403	4.00	4.00	3.94	4.00	4.00	4.00	4.00	4.00
404	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
404	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
405	4.00	3.91	3.96	4.00	4.00	4.00	4.00	4.00
405	4.00	4.00	3.98	4.00	4.00	4.00	4.00	4.00
406	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
406	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
407	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
407	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
408	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
408	4.00	4.00	4.00	4.00	3.60	4.00	4.00	4.00
409	4.00	4.00	4.00	4.00	3.40	4.00	4.00	4.00
409	4.00	4.00	4.00	4.00	3.15	4.00	4.00	4.00
410	4.00	4.00	4.00	4.00	3.20	4.00	4.00	4.00
410	4.00	4.00	4.00	4.00	2.85	4.00	4.00	3.90
411	4.00	4.00	4.00	4.00	3.00	4.00	4.00	4.00
411	4.00	4.00	4.00	4.00	2.70	4.00	4.00	3.95
412	4.00	4.00	4.00	4.00	2.95	4.00	4.00	4.00
412	4.00	4.00	4.00	4.00	2.75	4.00	4.00	4.00
413	4.00	4.00	4.00	3.96	3.30	4.00	4.00	4.00
413	4.00	4.00	4.00	3.28	3.20	4.00	4.00	4.00
414	4.00	4.00	4.00	3.07	4.00	4.00	4.00	4.00
414	4.00	4.00	4.00	2.75	4.00	4.00	4.00	4.00
415	4.00	4.00	4.00	2.70	4.00	4.00	4.00	4.00
415	4.00	4.00	4.00	2.50	4.00	4.00	4.00	4.00
416	4.00	4.00	4.00	2.73	4.00	4.00	4.00	4.00
416	4.00	4.00	4.00	2.58	4.00	3.80	4.00	4.00
417	4.00	4.00	4.00	2.17	4.00	3.50	4.00	4.00
417	4.00	4.00	4.00	2.12	4.00	3.45	4.00	4.00
418	4.00	4.00	4.00	2.06	4.00	3.40	4.00	4.00
418	4.00	4.00	4.00	2.02	4.00	3.35	4.00	4.00
419	4.00	4.00	4.00	2.36	4.00	3.75	4.00	4.00
419	4.00	4.00	4.00	2.43	4.00	3.85	4.00	4.00
420	4.00	4.00	4.00	2.16	4.00	4.00	4.00	4.00
420	4.00	4.00	4.00	2.35	4.00	4.00	4.00	4.00
421	4.00	4.00	4.00	2.35	4.00	4.00	4.00	4.00
421	4.00	4.00	4.00	2.63	4.00	4.00	4.00	4.00
422	4.00	4.00	4.00	2.86	4.00	4.00	4.00	4.00
422	4.00	4.00	4.00	3.36	4.00	4.00	4.00	4.00
423	4.00	4.00	4.00	3.71	4.00	4.00	4.00	4.00
423	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
424	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
424	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
425	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
425	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
426	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
426	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
427	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
427	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
428	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
428	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
429	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
429	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
430	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
430	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
431	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
431	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00

Continuous Table 5-3 Longitudinal Results for Permit Vehicle Rating for Example 1 (w/o Adjacent Normal Traffic)

Rating Factor on Load Rating								
	Rating Factor							
NODE	service condition					strength check		
	top stress max	top stress min	bottom stress max	bottom stress min	web principle stress	moment max	moment min	web shear
432	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
503	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
504	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
504	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
505	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
505	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
506	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
506	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
507	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
507	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
508	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
508	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
509	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
509	4.00	4.00	4.00	4.00	3.75	4.00	4.00	4.00
510	4.00	4.00	4.00	4.00	3.85	4.00	4.00	4.00
510	4.00	4.00	4.00	4.00	3.45	4.00	4.00	4.00
511	4.00	4.00	4.00	4.00	3.70	4.00	4.00	4.00
511	4.00	4.00	4.00	4.00	3.35	4.00	4.00	4.00
512	4.00	4.00	4.00	4.00	3.75	4.00	4.00	4.00
512	4.00	4.00	4.00	4.00	3.45	4.00	4.00	4.00
513	4.00	4.00	4.00	3.60	4.00	4.00	4.00	4.00
513	4.00	4.00	4.00	3.06	4.00	4.00	4.00	4.00
514	4.00	4.00	4.00	2.82	4.00	4.00	4.00	4.00
514	4.00	4.00	4.00	2.58	4.00	4.00	4.00	4.00
515	4.00	4.00	4.00	2.62	4.00	4.00	4.00	4.00
515	4.00	4.00	4.00	2.54	4.00	4.00	4.00	4.00
516	4.00	4.00	4.00	2.85	4.00	3.90	4.00	4.00
516	4.00	4.00	4.00	2.83	4.00	3.90	4.00	4.00
517	4.00	4.00	4.00	2.52	4.00	3.60	4.00	4.00
517	4.00	4.00	4.00	2.48	4.00	3.55	4.00	4.00
518	4.00	4.00	4.00	2.53	4.00	3.55	4.00	4.00
518	4.00	4.00	4.00	2.54	4.00	3.60	4.00	4.00
519	4.00	4.00	4.00	2.98	4.00	3.95	4.00	4.00
519	4.00	4.00	4.00	3.07	4.00	4.00	4.00	4.00
520	4.00	4.00	4.00	2.90	4.00	4.00	4.00	4.00
520	4.00	4.00	4.00	3.37	4.00	4.00	4.00	4.00
521	4.00	4.00	4.00	3.33	4.00	4.00	4.00	4.00
521	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
522	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
522	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
523	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
523	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
524	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
524	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
525	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
525	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
526	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
526	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
527	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
527	4.00	4.00	4.00	4.00	4.00	4.00	3.45	4.00
528	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
528	4.00	3.81	4.00	4.00	4.00	4.00	4.00	4.00
529	4.00	3.87	4.00	4.00	4.00	4.00	4.00	4.00
529	4.00	3.60	4.00	4.00	4.00	4.00	4.00	4.00
530	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
603	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
604	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
604	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00

Continuous Table 5-3 Longitudinal Results for Permit Vehicle Rating for Example 1 (w/o Adjacent Normal Traffic)

Rating Factor on Load Rating								
	Rating Factor							
NODE	service condition					strength check		
	top stress max	top stress min	bottom stress max	bottom stress min	web principle stress	moment max	moment min	web shear
605	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
605	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
606	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
606	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
607	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
607	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
608	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
608	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
609	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
609	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
610	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
610	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
611	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
611	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
612	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
612	4.00	4.00	4.00	3.39	4.00	4.00	4.00	4.00
613	4.00	4.00	4.00	2.93	4.00	3.65	4.00	4.00
613	4.00	4.00	4.00	2.71	4.00	3.65	4.00	4.00
614	4.00	4.00	4.00	2.45	4.00	2.85	4.00	4.00
614	4.00	4.00	4.00	2.55	4.00	3.15	4.00	4.00
615	4.00	4.00	4.00	2.53	4.00	2.80	4.00	4.00
615	4.00	4.00	4.00	3.01	4.00	3.50	4.00	4.00
616	4.00	4.00	4.00	3.30	4.00	3.70	4.00	4.00
616	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
617	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
617	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
700	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00

Table 5-4 Transverse Results for Permit Vehicle Rating for Example 1 (w/o Adjacent Normal Traffic)

project: Jeremiah Morrow Bridge
rating type: Permit Truck without adjacent normal traffic

Summary of rating in the transverse direction

Load Rating Result Transverse

Minimum Rating Factor In Transverse
LOCATION OF MEMBER WITH MINIMUM Rating Factor
1.45 Top Stress Controls

Minimum Rating Factor In Transverse
LOCATION OF MEMBER WITH MINIMUM Rating Factor
1.92 Top Stress Controls

Rating Factor of Individual Members						
Plate #	Rating Factor at Top Slab on Deep Section					
	service condition				strength check	
	top stress max	top stress min	bottom stress max	bottom stress min	moment max	moment min
summary	4.00	1.45	4.00	1.67	2.25	2.90
1	4.00	4.00	4.00	4.00	4.00	4.00
2	4.00	4.00	4.00	4.00	4.00	4.00
3	4.00	4.00	4.00	4.00	4.00	4.00
4	4.00	4.00	4.00	4.00	4.00	4.00
5	4.00	3.56	4.00	4.00	4.00	4.00
6	4.00	3.81	4.00	4.00	4.00	4.00
7	4.00	3.79	4.00	4.00	4.00	4.00
8	4.00	3.37	4.00	4.00	4.00	4.00
9	4.00	3.11	4.00	4.00	4.00	3.70
10	4.00	3.14	4.00	4.00	4.00	3.55
11	4.00	3.23	4.00	4.00	4.00	3.50
12	4.00	3.50	4.00	4.00	4.00	3.55
13	4.00	4.00	4.00	4.00	4.00	3.85
14	4.00	3.33	4.00	4.00	4.00	3.20
15	4.00	3.91	4.00	4.00	4.00	3.80
16	4.00	2.95	4.00	4.00	4.00	3.20
17	4.00	3.05	4.00	4.00	4.00	3.45
18	4.00	3.08	4.00	4.00	4.00	3.65
19	4.00	2.99	4.00	4.00	4.00	3.80
20	4.00	2.74	4.00	4.00	4.00	3.75
21	4.00	2.29	4.00	4.00	4.00	3.45
22	4.00	1.70	4.00	4.00	4.00	3.00
23	4.00	1.45	4.00	4.00	4.00	2.90
24	4.00	1.64	4.00	4.00	4.00	3.45
25	4.00	1.92	4.00	4.00	4.00	4.00
26	4.00	2.44	4.00	4.00	4.00	4.00
27	4.00	3.69	4.00	4.00	4.00	4.00
28	4.00	4.00	4.00	4.00	4.00	4.00
29	4.00	4.00	4.00	4.00	4.00	4.00
30	4.00	4.00	4.00	4.00	4.00	4.00
31	4.00	4.00	4.00	4.00	4.00	4.00
32	4.00	4.00	4.00	2.76	4.00	4.00
33	4.00	4.00	4.00	1.86	3.05	4.00
34	4.00	4.00	4.00	1.67	2.70	4.00
35	4.00	4.00	4.00	1.82	2.60	4.00
36	4.00	4.00	4.00	2.05	2.45	4.00
37	4.00	4.00	4.00	2.34	2.25	4.00
38	4.00	4.00	4.00	2.66	2.45	4.00
39	4.00	4.00	4.00	3.01	2.55	4.00
40	4.00	4.00	4.00	3.38	4.00	4.00
41	4.00	4.00	4.00	1.15	0.80	4.00
42	4.00	4.00	4.00	1.01	0.70	4.00
43	4.00	4.00	4.00	4.00	4.00	4.00
44	4.00	4.00	4.00	4.00	4.00	4.00
45	4.00	4.00	4.00	4.00	4.00	4.00
46	4.00	4.00	4.00	4.00	4.00	4.00
47	4.00	4.00	4.00	4.00	4.00	4.00
48	4.00	4.00	4.00	4.00	4.00	4.00
49	4.00	4.00	4.00	4.00	4.00	4.00
50	4.00	4.00	4.00	4.00	4.00	4.00
51	4.00	4.00	4.00	4.00	4.00	4.00
52	4.00	4.00	4.00	4.00	4.00	4.00
53	4.00	4.00	4.00	4.00	4.00	4.00
54	4.00	4.00	4.00	4.00	4.00	4.00
55	4.00	4.00	4.00	4.00	4.00	4.00

Rating Factor of Individual Members						
Plate #	Rating Factor at Top Slab on Shallow Section					
	service condition				strength check	
	top stress max	top stress min	bottom stress max	bottom stress min	moment max	moment min
summary	4.00	1.92	4.00	2.21	3.25	3.50
1	4.00	4.00	4.00	4.00	4.00	4.00
2	4.00	4.00	4.00	4.00	4.00	4.00
3	4.00	4.00	4.00	4.00	4.00	4.00
4	4.00	4.00	4.00	4.00	4.00	4.00
5	4.00	3.56	4.00	4.00	4.00	4.00
6	4.00	3.81	4.00	4.00	4.00	4.00
7	4.00	3.79	4.00	4.00	4.00	4.00
8	4.00	3.37	4.00	4.00	4.00	4.00
9	4.00	3.11	4.00	4.00	4.00	3.70
10	4.00	3.14	4.00	4.00	4.00	3.55
11	4.00	3.24	4.00	4.00	4.00	3.50
12	4.00	3.50	4.00	4.00	4.00	3.55
13	4.00	4.00	4.00	4.00	4.00	3.85
14	4.00	3.73	4.00	4.00	4.00	3.60
15	4.00	4.00	4.00	4.00	4.00	4.00
16	4.00	3.46	4.00	4.00	4.00	3.70
17	4.00	3.65	4.00	4.00	4.00	4.00
18	4.00	3.77	4.00	4.00	4.00	4.00
19	4.00	3.74	4.00	4.00	4.00	4.00
20	4.00	3.50	4.00	4.00	4.00	4.00
21	4.00	2.98	4.00	4.00	4.00	4.00
22	4.00	2.25	4.00	4.00	4.00	3.90
23	4.00	1.92	4.00	4.00	4.00	3.80
24	4.00	2.18	4.00	4.00	4.00	4.00
25	4.00	2.55	4.00	4.00	4.00	4.00
26	4.00	3.28	4.00	4.00	4.00	4.00
27	4.00	4.00	4.00	4.00	4.00	4.00
28	4.00	4.00	4.00	4.00	4.00	4.00
29	4.00	4.00	4.00	4.00	4.00	4.00
30	4.00	4.00	4.00	4.00	4.00	4.00
31	4.00	4.00	4.00	4.00	4.00	4.00
32	4.00	4.00	4.00	3.50	4.00	4.00
33	4.00	4.00	4.00	2.43	3.85	4.00
34	4.00	4.00	4.00	2.21	3.40	4.00
35	4.00	4.00	4.00	2.37	3.25	4.00
36	4.00	4.00	4.00	2.64	4.00	4.00
37	4.00	4.00	4.00	2.98	4.00	4.00
38	4.00	4.00	4.00	3.37	4.00	4.00
39	4.00	4.00	4.00	3.80	4.00	4.00
40	4.00	4.00	4.00	4.00	4.00	4.00
41	4.00	4.00	4.00	1.42	0.95	4.00
42	4.00	4.00	4.00	1.26	0.85	4.00
43	4.00	4.00	4.00	4.00	4.00	4.00
44	4.00	4.00	4.00	4.00	4.00	4.00
45	4.00	4.00	4.00	4.00	4.00	4.00
46	4.00	4.00	4.00	4.00	4.00	4.00
47	4.00	4.00	4.00	4.00	4.00	4.00
48	4.00	4.00	4.00	4.00	4.00	4.00
49	4.00	4.00	4.00	4.00	4.00	4.00
50	4.00	4.00	4.00	4.00	4.00	4.00
51	4.00	4.00	4.00	4.00	4.00	4.00
52	4.00	4.00	4.00	4.00	4.00	4.00
53	4.00	4.00	4.00	4.00	4.00	4.00
54	4.00	4.00	4.00	4.00	4.00	4.00
55	4.00	4.00	4.00	4.00	4.00	4.00

5.2 Example 2 - Permit Evaluation for a User-Defined Vehicle with One Lane of Adjacent Normal Traffic

This example is the same as Example except including current normal traffic with permit truck as shown in Figure 5-2. Therefore, all input data are the same except the following two cells in "user Input" Tab.

- Cell C13 = "6.00 ft".
  It is the distance from the first Left most wheel load of current traffic to last right most wheel load of permit truck.

- Cell E45 = "1"
  It indicates one lane of current traffic is considered together with permit truck. This load rating tool can only accommodate one lane of current traffic.

The "User Input" sheet can be found in Table 5-5. Two graphics in "User Input" sheet shows configurations and position of vehicle's wheels on the bridge deck. It helps user to visualize wheel positions of the trucks on the bridge.

In this example, the controlling rating factor is 1.20 shown in Table 5-6. The longitudinal and transverse "Result Summary" sheets can be found in Tables 5-7 and 5-8, respectively. The minimum Rating Factor in the longitudinal direction is 1.20 for serviceability, based on principal tensile stress in the webs. The minimum Rating Factor in the transverse direction is 1.50 for the shallow section, and 1.28 for the deep section, both based on top slab minimum stress. The bridge is safe for the passing of this vehicle.

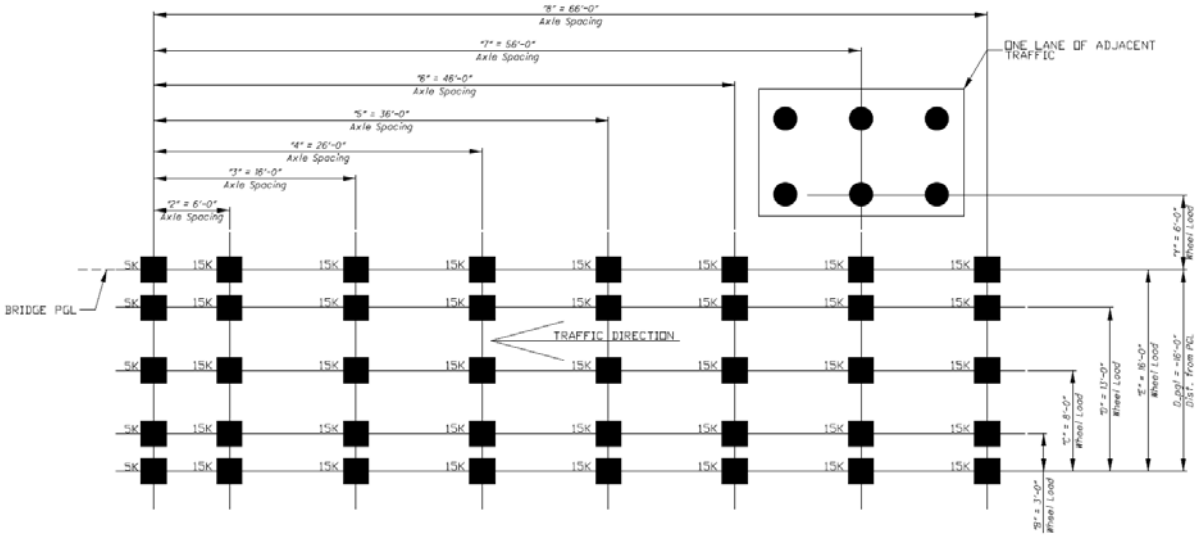
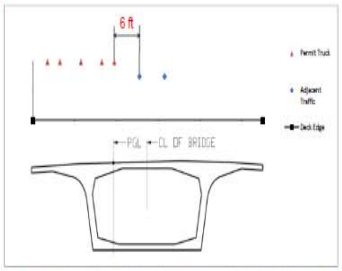


Figure 5-2 Permit (User Defined) Wheel Configurations for Example 2

Table 5-5 User Input Sheet for Permit Vehicle Rating for Example 2 (with Adjacent Normal Traffic)

Project: Jeremiah Morrow Bridge Load Rating Performed on: 4/10/2018 16:21

Rating type: Permit Truck with one lane of adjacent normal traffic



User Input Sheet

unlock password

User input Data Cell Are In Bold and Red

Are wheels of vehicle step outside of Barrier Curb? They are inside barrier curbs. So it is good !

wheel load definition for user-defined vehicle
(no need to input data if doing inventory or operating rating using standard HS load configuration)

Distance of Left most wheel of current HS25 to right most wheel of Permit Truck, Y =	6.00 ft	OK Distance (4 ft min.) from the first Left most wheel load of current HS25 truck to last right most wheel load of permit truck. For no current load, set to be "N/A"
D_pgl - Distance from PGL (for permit truck)	-16.00 ft	This is the left most wheel (A) of Permit Truck - away from traffic direction, positive is to the right

total wheel load for permit load = 550.0 kips

	Da - axis positon	0.00 ft	6.00 ft	16.00 ft	26.00 ft	36.00 ft	46.00 ft	56.00 ft	66.00 ft															
Dw - wheel position		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
0.00 ft	A	5.0 kips	15.0 kips	15.0 kips	15.0 kips	15.0 kips	15.0 kips	15.0 kips	15.0 kips																	
3.00 ft	B	5.0 kips	15.0 kips	15.0 kips	15.0 kips	15.0 kips	15.0 kips	15.0 kips	15.0 kips																	
8.00 ft	C	5.0 kips	15.0 kips	15.0 kips	15.0 kips	15.0 kips	15.0 kips	15.0 kips	15.0 kips																	
13.00 ft	D	5.0 kips	15.0 kips	15.0 kips	15.0 kips	15.0 kips	15.0 kips	15.0 kips	15.0 kips																	
16.00 ft	E	5.0 kips	15.0 kips	15.0 kips	15.0 kips	15.0 kips	15.0 kips	15.0 kips	15.0 kips																	
	F																									
	G																									
	H																									

Permit Evaluation is performed using operating criteria

Permit Evaluation is performed using operating criteria

User Input

	Factor	
IMPACT, long =	0.15	note: only specify impact for permit load case
IMPACT, trans =	0.3	for standard vehicle, Impact is calculated as per AASHTO for longitudinal, always 0.3 for transverse
FUTURE WEARING SURFACE (lb/ft²) =	0	
TO FIND INVENTORY RATING, INPUT '1'	Rating type	
TO FIND OPERATING RATING INPUT '2'	3	Permit Evaulation
TO FIND PERMIT EVALUATION, INPUT '3'		
FOR INVENTORY OR OPERATING RATING,	1	Number of lanes loaded must be 1 for permit
ENTER THE NUMBER OF LANES LOADED	OK	
NUMBER OF LANE OF ADJACENT NORMAL TRAFFIC CURRENT WITH PERMIT TRUCK	1	("0" for Inventory & Operating Rating as well as no current load with permit truck. "1" for one lane of current load with permit truck)
		Permit Truck with one lane of adjacent normal traffic

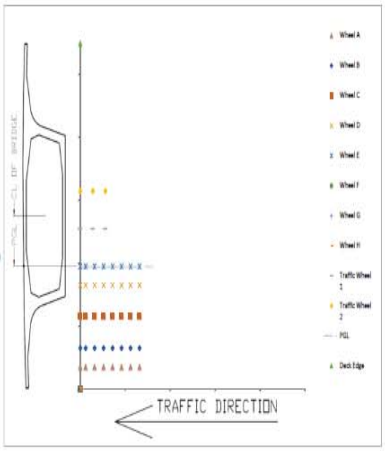


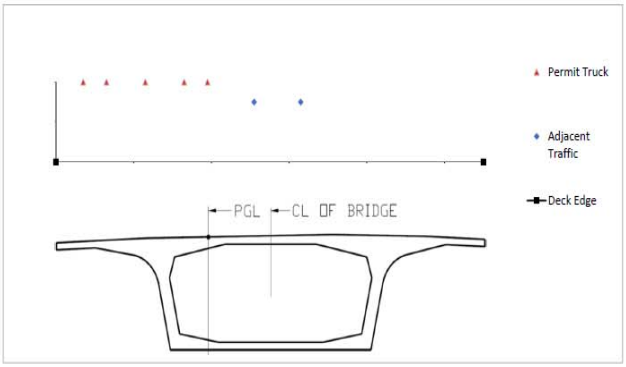
Table 5-6 Summary Results for Permit Vehicle Rating for Example 2 (with Adjacent Normal Traffic)

Project: Jeremiah Morrow Bridge

Rating Type: Permit Truck with one lane of adjacent normal traffic

Load Rating Performed on: 4/10/2018 16:21

No of Axles of Permit Vehicles = 8 axles
Total wheel load for permit vehicle = 550 kips
Rating Factor = 1.20 Good



Wheel load definition for user-defined vehicle

Distance of Left most wheel of current HS25 to right most wheel of Permit Truck	6.00 ft	Distance from the first Left most wheel load of current HS25 truck to last right most wheel load of permit truck. For no current load, set to be "N/A"
D_pgl - Distance from PGL (for permit truck)	-16.00 ft	this is the left most wheel (A) of Permit Truck - away from traffic direction, positive is to the right

	Da - axis position	0.00 ft	6.00 ft	16.00 ft	26.00 ft	36.00 ft	46.00 ft	56.00 ft	66.00 ft																
Dw - wheel position		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
0.00 ft	A	5.0 kips	15.0 kips	15.0 kips	15.0 kips	15.0 kips	15.0 kips	15.0 kips	15.0 kips																
3.00 ft	B	5.0 kips	15.0 kips	15.0 kips	15.0 kips	15.0 kips	15.0 kips	15.0 kips	15.0 kips																
8.00 ft	C	5.0 kips	15.0 kips	15.0 kips	15.0 kips	15.0 kips	15.0 kips	15.0 kips	15.0 kips																
13.00 ft	D	5.0 kips	15.0 kips	15.0 kips	15.0 kips	15.0 kips	15.0 kips	15.0 kips	15.0 kips																
16.00 ft	E	5.0 kips	15.0 kips	15.0 kips	15.0 kips	15.0 kips	15.0 kips	15.0 kips	15.0 kips																
	F																								
	G																								
	H																								

Permit Evaluation is performed using operating criteria

User Input

	Factor	
IMPACT, long =	0.15	note: only specify impact for permit load case
IMPACT, trans =	0.3	for standard vehicle, impact is calculated as per AASHTO for longitudinal, always 0.3 for transverse
FUTURE WEARING SURFACE (lb/ft^2)=	0	
TO FIND INVENTORY RATING, INPUT '1'	Rating type	
TO FIND OPERATING RATING INPUT '2'	3	Permit Evaulation
TO FIND PERMIT EVALUATION, INPUT '3'		
FOR INVENTORY OR OPERATING RATING, ENTER THE NUMBER OF LANES LOADED	1	Number of lanes loaded must be 1 for permit
NUMBER OF LANE OF ADJACENT NORMAL TRAFFIC CURRENT WITH PERMIT TRUCK	1	("0" for Inventory & Operating Rating as well as no current load with permit truck. "1" for one lane of current load with permit truck) Permit Truck with one lane of adjacent normal traffic

Table 5-7 Longitudinal Results for Permit Vehicle Rating for Example 2 (with Adjacent Normal Traffic)

project:	Jeremiah Morrow Bridge							
rating type:	Permit Truck with one lane of adjacent normal traffic							
summary of rating in the longitudinal direction								
Load Rating Result longitudinal								
Minimum Rating Factor In Longitudinal								
LOCATION OF MEMBER WITH MINIMUM								
Rating Factor								
1.20		Web Principle Stress Controls						

Rating Factor on Load Rating								
	Rating Factor							
NODE	service condition					strength check		
	top stress max	top stress min	bottom stress max	bottom stress min	web principle stress	moment max	moment min	web shear
summary	3.27	2.17	2.20	1.31	1.20	2.00	2.10	2.95
99					4.00	4.00	4.00	4.00
100		4.00	4.00		4.00	4.00	4.00	4.00
100		4.00	4.00		4.00	4.00	4.00	4.00
101	4.00	4.00	4.00	4.00	1.20	4.00	4.00	3.15
101	4.00	4.00	4.00	4.00	1.20	4.00	4.00	3.15
102	4.00	4.00	4.00	4.00	2.25	4.00	4.00	4.00
102	4.00	4.00	4.00	4.00	2.35	4.00	4.00	4.00
103	4.00	4.00	4.00	3.91	2.85	4.00	4.00	4.00
103	4.00	4.00	4.00	2.66	2.95	3.40	4.00	4.00
104	4.00	4.00	4.00	2.04	4.00	2.85	4.00	4.00
104	4.00	4.00	4.00	1.56	4.00	2.15	4.00	4.00
105	4.00	4.00	4.00	1.53	4.00	2.30	4.00	4.00
105	4.00	4.00	4.00	1.36	4.00	2.05	4.00	4.00
106	4.00	4.00	4.00	1.55	4.00	2.35	4.00	4.00
106	4.00	4.00	4.00	1.51	4.00	2.25	4.00	4.00
107	4.00	4.00	4.00	1.45	4.00	2.20	4.00	4.00
107	4.00	4.00	4.00	1.49	4.00	2.15	4.00	4.00
108	4.00	4.00	4.00	1.56	4.00	2.25	4.00	4.00
108	4.00	3.89	4.00	1.70	4.00	2.35	4.00	4.00
109	4.00	4.00	4.00	1.89	4.00	4.00	4.00	4.00
109	4.00	4.00	4.00	2.23	4.00	4.00	4.00	4.00
110	4.00	4.00	4.00	2.50	4.00	4.00	4.00	3.60
110	4.00	4.00	4.00	3.11	4.00	4.00	4.00	3.80
111	4.00	3.95	4.00	4.00	4.00	4.00	4.00	3.50
111	4.00	4.00	4.00	4.00	4.00	4.00	4.00	3.65
112	4.00	3.82	4.00	4.00	4.00	4.00	4.00	3.50
112	4.00	3.89	4.00	4.00	4.00	4.00	4.00	3.70
113	4.00	3.88	4.00	4.00	4.00	4.00	4.00	3.65
113	4.00	3.96	4.00	4.00	4.00	4.00	4.00	3.85
114	4.00	4.00	4.00	4.00	4.00	4.00	4.00	3.85
114	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
115	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
115	4.00	3.48	3.65	4.00	4.00	4.00	4.00	4.00
116	4.00	3.74	3.63	4.00	4.00	4.00	4.00	4.00
116	4.00	3.35	3.40	4.00	4.00	4.00	4.00	4.00
117	4.00	3.96	3.49	4.00	4.00	4.00	4.00	4.00
117	4.00	3.78	3.42	4.00	4.00	4.00	4.00	4.00
118	4.00	3.31	3.22	4.00	4.00	4.00	4.00	3.70
203	4.00	2.81	2.31	4.00	3.05	4.00	4.00	3.65
204	4.00	2.76	2.37	4.00	3.05	4.00	4.00	3.75
204	4.00	2.82	2.38	4.00	3.90	4.00	4.00	4.00

Continuous Table 5-7 Longitudinal Results for Permit Vehicle Rating for Example 2 (with Adjacent Normal Traffic)

Rating Factor on Load Rating								
	Rating Factor							
NODE	service condition					strength check		
	top stress max	top stress min	bottom stress max	bottom stress min	web principle stress	moment max	moment min	web shear
205	4.00	2.62	2.32	4.00	3.70	4.00	4.00	4.00
205	4.00	2.74	2.32	4.00	3.45	4.00	4.00	3.80
206	4.00	2.76	2.43	4.00	3.25	4.00	4.00	3.95
206	4.00	2.91	2.46	4.00	3.20	4.00	4.00	3.65
207	4.00	2.92	2.64	4.00	3.00	4.00	4.00	3.60
207	4.00	3.15	2.70	4.00	2.90	4.00	4.00	3.45
208	4.00	3.18	3.01	4.00	2.70	4.00	4.00	3.40
208	4.00	3.52	3.15	4.00	2.50	4.00	4.00	3.20
209	4.00	3.83	3.79	4.00	2.35	4.00	4.00	3.20
209	4.00	4.00	4.00	4.00	2.25	4.00	4.00	3.10
210	4.00	4.00	4.00	4.00	2.25	4.00	4.00	3.20
210	4.00	4.00	4.00	4.00	2.05	4.00	4.00	3.00
211	4.00	4.00	4.00	4.00	2.15	4.00	4.00	3.25
211	4.00	4.00	4.00	3.86	1.95	4.00	4.00	3.05
212	4.00	4.00	4.00	3.30	2.15	4.00	4.00	3.45
212	4.00	4.00	4.00	2.70	2.05	4.00	4.00	3.30
213	4.00	4.00	4.00	2.33	2.40	3.75	4.00	4.00
213	4.00	4.00	4.00	2.00	2.35	3.45	4.00	4.00
214	4.00	4.00	4.00	1.83	2.95	3.15	4.00	4.00
214	3.94	4.00	4.00	1.65	3.05	2.95	4.00	4.00
215	3.92	4.00	4.00	1.68	3.90	2.95	4.00	4.00
215	3.74	4.00	4.00	1.60	4.00	2.90	4.00	4.00
216	3.84	4.00	4.00	1.86	4.00	2.75	4.00	4.00
216	3.64	4.00	4.00	1.76	4.00	2.60	4.00	4.00
217	3.70	4.00	4.00	1.51	4.00	2.40	4.00	4.00
217	3.59	4.00	4.00	1.47	4.00	2.35	4.00	4.00
218	3.54	4.00	4.00	1.40	4.00	2.30	4.00	4.00
218	3.52	4.00	4.00	1.39	4.00	2.25	4.00	4.00
219	3.32	4.00	4.00	1.66	4.00	2.50	4.00	4.00
219	3.37	4.00	4.00	1.69	4.00	2.55	4.00	4.00
220	3.39	4.00	4.00	1.66	4.00	2.80	4.00	4.00
220	3.59	4.00	4.00	1.76	4.00	2.90	4.00	4.00
221	3.70	4.00	4.00	1.92	4.00	3.40	4.00	4.00
221	4.00	4.00	4.00	2.09	4.00	3.60	4.00	4.00
222	4.00	4.00	4.00	2.34	4.00	4.00	4.00	3.60
222	4.00	4.00	4.00	2.63	4.00	4.00	4.00	4.00
223	4.00	4.00	4.00	3.00	4.00	4.00	4.00	3.40
223	4.00	4.00	4.00	3.60	4.00	4.00	4.00	3.50
224	4.00	4.00	4.00	4.00	4.00	4.00	4.00	3.20
224	4.00	4.00	4.00	4.00	4.00	4.00	4.00	3.35
225	4.00	4.00	4.00	4.00	4.00	4.00	4.00	3.15
225	4.00	4.00	4.00	4.00	4.00	4.00	4.00	3.30
226	4.00	3.85	4.00	4.00	4.00	4.00	4.00	3.15
226	4.00	3.45	3.75	4.00	4.00	4.00	3.90	3.40
227	4.00	3.27	3.20	4.00	4.00	4.00	4.00	3.40
227	4.00	2.89	3.00	4.00	4.00	4.00	4.00	3.60
228	4.00	2.91	2.76	4.00	4.00	4.00	4.00	3.65
228	4.00	2.65	2.67	4.00	4.00	4.00	4.00	3.75
229	4.00	2.64	2.50	4.00	4.00	4.00	4.00	3.80
229	4.00	2.46	2.44	4.00	4.00	4.00	4.00	4.00
230	4.00	2.59	2.41	4.00	4.00	4.00	4.00	4.00
230	4.00	2.45	2.40	4.00	4.00	4.00	4.00	4.00
231	4.00	2.85	2.45	4.00	4.00	4.00	4.00	4.00
231	4.00	2.79	2.46	4.00	4.00	4.00	4.00	3.85
232	4.00	2.44	2.33	4.00	4.00	4.00	4.00	3.80
303	4.00	2.64	2.58	4.00	2.95	4.00	4.00	3.60
304	4.00	2.67	2.66	4.00	3.05	4.00	4.00	3.70
304	4.00	2.73	2.67	4.00	3.85	4.00	4.00	4.00
305	4.00	2.57	2.64	4.00	3.65	4.00	4.00	4.00
305	4.00	2.71	2.65	4.00	3.40	4.00	4.00	3.85
306	4.00	2.73	2.79	4.00	3.25	4.00	4.00	3.80

Continuous Table 5-7 Longitudinal Results for Permit Vehicle Rating for Example 2 (with Adjacent Normal Traffic)

Rating Factor on Load Rating								
	Rating Factor							
NODE	service condition					strength check		
	top stress max	top stress min	bottom stress max	bottom stress min	web principle stress	moment max	moment min	web shear
306	4.00	2.90	2.83	4.00	3.15	4.00	4.00	3.65
307	4.00	2.93	3.05	4.00	2.95	4.00	4.00	3.60
307	4.00	3.16	3.13	4.00	2.90	4.00	4.00	3.50
308	4.00	3.21	3.48	4.00	2.70	4.00	4.00	3.40
308	4.00	3.56	3.64	4.00	2.50	4.00	4.00	3.20
309	4.00	3.93	4.00	4.00	2.35	4.00	4.00	3.25
309	4.00	4.00	4.00	4.00	2.25	4.00	4.00	3.10
310	4.00	4.00	4.00	4.00	2.25	4.00	4.00	3.25
310	4.00	4.00	4.00	4.00	2.10	4.00	4.00	3.05
311	4.00	4.00	4.00	4.00	2.20	4.00	4.00	3.35
311	4.00	4.00	4.00	3.78	2.05	4.00	4.00	3.15
312	4.00	4.00	4.00	3.16	2.20	4.00	4.00	3.50
312	4.00	4.00	4.00	2.60	2.15	4.00	4.00	3.40
313	4.00	4.00	4.00	2.17	2.50	3.35	4.00	4.00
313	4.00	4.00	4.00	1.88	2.50	3.10	4.00	4.00
314	4.00	4.00	4.00	1.65	3.15	2.80	4.00	4.00
314	3.76	4.00	4.00	1.51	3.30	2.70	4.00	4.00
315	3.71	4.00	4.00	1.48	4.00	2.65	4.00	4.00
315	3.52	4.00	4.00	1.40	4.00	2.60	4.00	4.00
316	3.58	4.00	4.00	1.57	4.00	2.45	4.00	4.00
316	3.43	4.00	4.00	1.50	4.00	2.35	4.00	4.00
317	3.52	4.00	4.00	1.34	4.00	2.20	4.00	4.00
317	3.46	4.00	4.00	1.31	4.00	2.20	4.00	4.00
318	3.47	4.00	4.00	1.37	4.00	2.20	4.00	4.00
318	3.42	4.00	4.00	1.36	4.00	2.20	4.00	4.00
319	3.28	4.00	4.00	1.63	4.00	2.45	4.00	4.00
319	3.33	4.00	4.00	1.65	4.00	2.50	4.00	4.00
320	3.39	4.00	4.00	1.57	4.00	2.70	4.00	4.00
320	3.61	4.00	4.00	1.68	4.00	2.85	4.00	4.00
321	3.76	4.00	4.00	1.79	4.00	3.35	4.00	4.00
321	4.00	4.00	4.00	1.97	4.00	3.55	4.00	4.00
322	4.00	4.00	4.00	2.26	4.00	4.00	4.00	3.65
322	4.00	4.00	4.00	2.57	4.00	4.00	4.00	4.00
323	4.00	4.00	4.00	2.98	4.00	4.00	4.00	3.40
323	4.00	4.00	4.00	3.60	4.00	4.00	4.00	3.50
324	4.00	4.00	4.00	4.00	4.00	4.00	4.00	3.20
324	4.00	4.00	4.00	4.00	4.00	4.00	4.00	3.40
325	4.00	4.00	4.00	4.00	4.00	4.00	4.00	3.20
325	4.00	4.00	4.00	4.00	4.00	4.00	4.00	3.35
326	4.00	4.00	4.00	4.00	4.00	4.00	4.00	3.20
326	4.00	3.89	3.89	4.00	4.00	4.00	4.00	3.40
327	4.00	3.68	3.36	4.00	4.00	4.00	4.00	3.45
327	4.00	3.26	3.15	4.00	4.00	4.00	4.00	3.60
328	4.00	3.24	2.93	4.00	4.00	4.00	4.00	3.65
328	4.00	2.96	2.83	4.00	4.00	4.00	4.00	3.80
329	4.00	2.92	2.66	4.00	4.00	4.00	4.00	3.85
329	4.00	2.74	2.62	4.00	4.00	4.00	4.00	4.00
330	4.00	2.89	2.59	4.00	4.00	4.00	4.00	4.00
330	4.00	2.75	2.58	4.00	4.00	4.00	4.00	4.00
331	4.00	3.18	2.64	4.00	4.00	4.00	4.00	4.00
331	4.00	3.11	2.65	4.00	4.00	4.00	4.00	3.95
332	4.00	2.75	2.51	4.00	4.00	4.00	4.00	3.80
403	4.00	2.41	2.20	4.00	2.90	4.00	4.00	3.60
404	4.00	2.40	2.26	4.00	2.90	4.00	4.00	3.70
404	4.00	2.45	2.27	4.00	3.75	4.00	4.00	4.00
405	4.00	2.23	2.21	4.00	3.55	4.00	4.00	4.00
405	4.00	2.35	2.22	4.00	3.25	4.00	4.00	3.80
406	4.00	2.35	2.33	4.00	3.10	4.00	4.00	3.75
406	4.00	2.49	2.36	4.00	3.00	4.00	4.00	3.60
407	4.00	2.48	2.55	4.00	2.85	4.00	4.00	3.55
407	4.00	2.69	2.62	4.00	2.75	4.00	4.00	3.45

Continuous Table 5-7 Longitudinal Results for Permit Vehicle Rating for Example 2 (with Adjacent Normal Traffic)

Rating Factor on Load Rating								
	Rating Factor							
NODE	service condition					strength check		
	top stress max	top stress min	bottom stress max	bottom stress min	web principle stress	moment max	moment min	web shear
408	4.00	2.70	2.94	4.00	2.50	4.00	4.00	3.35
408	4.00	3.00	3.08	4.00	2.30	4.00	4.00	3.15
409	4.00	3.32	3.74	4.00	2.15	4.00	4.00	3.15
409	4.00	3.82	4.00	4.00	2.05	4.00	4.00	3.05
410	4.00	4.00	4.00	4.00	2.05	4.00	4.00	3.15
410	4.00	4.00	4.00	4.00	1.85	4.00	4.00	2.95
411	4.00	4.00	4.00	4.00	1.95	4.00	4.00	3.20
411	4.00	4.00	4.00	3.97	1.75	4.00	4.00	3.00
412	4.00	4.00	4.00	3.44	1.90	4.00	4.00	3.35
412	4.00	4.00	4.00	2.86	1.80	4.00	4.00	3.25
413	4.00	4.00	4.00	2.50	2.15	3.50	4.00	4.00
413	4.00	4.00	4.00	2.18	2.15	3.25	4.00	4.00
414	4.00	4.00	4.00	1.99	2.70	2.95	4.00	4.00
414	3.74	4.00	4.00	1.81	2.85	2.80	4.00	4.00
415	3.73	4.00	4.00	1.72	3.65	2.80	4.00	4.00
415	3.57	4.00	4.00	1.65	3.90	2.75	4.00	4.00
416	3.67	4.00	4.00	1.78	4.00	2.60	4.00	4.00
416	3.51	4.00	4.00	1.71	4.00	2.50	4.00	4.00
417	3.60	4.00	4.00	1.43	4.00	2.30	4.00	4.00
417	3.51	4.00	4.00	1.40	4.00	2.25	4.00	4.00
418	3.48	4.00	4.00	1.36	4.00	2.25	4.00	4.00
418	3.47	4.00	4.00	1.35	4.00	2.25	4.00	4.00
419	3.27	4.00	4.00	1.59	4.00	2.50	4.00	4.00
419	3.34	4.00	4.00	1.63	4.00	2.55	4.00	4.00
420	3.34	4.00	4.00	1.48	4.00	2.75	4.00	4.00
420	3.55	4.00	4.00	1.57	4.00	2.90	4.00	4.00
421	3.64	4.00	4.00	1.62	4.00	3.45	4.00	4.00
421	3.98	4.00	4.00	1.78	4.00	3.60	4.00	4.00
422	4.00	4.00	4.00	2.00	4.00	4.00	4.00	3.85
422	4.00	4.00	4.00	2.26	4.00	4.00	4.00	4.00
423	4.00	4.00	4.00	2.61	4.00	4.00	4.00	3.45
423	4.00	4.00	4.00	3.16	4.00	4.00	4.00	3.55
424	4.00	4.00	4.00	3.60	4.00	4.00	4.00	3.25
424	4.00	4.00	4.00	4.00	4.00	4.00	4.00	3.45
425	4.00	4.00	4.00	4.00	4.00	4.00	4.00	3.20
425	4.00	4.00	4.00	4.00	4.00	4.00	4.00	3.35
426	4.00	4.00	4.00	4.00	4.00	4.00	4.00	3.20
426	4.00	3.95	3.67	4.00	4.00	4.00	4.00	3.45
427	4.00	3.76	3.16	4.00	4.00	4.00	4.00	3.45
427	4.00	3.35	2.97	4.00	4.00	4.00	4.00	3.65
428	4.00	3.34	2.76	4.00	4.00	4.00	4.00	3.70
428	4.00	3.07	2.68	4.00	4.00	4.00	4.00	4.00
429	4.00	3.04	2.52	4.00	4.00	4.00	4.00	3.90
429	4.00	2.84	2.47	4.00	4.00	4.00	4.00	4.00
430	4.00	3.00	2.46	4.00	4.00	4.00	4.00	4.00
430	4.00	2.86	2.45	4.00	4.00	4.00	4.00	4.00
431	4.00	3.28	2.51	4.00	4.00	4.00	4.00	4.00
431	4.00	3.21	2.53	4.00	4.00	4.00	4.00	3.95
432	4.00	2.86	2.39	4.00	4.00	4.00	4.00	3.90
503	4.00	2.81	2.45	4.00	3.10	4.00	4.00	3.80
504	4.00	2.80	2.52	4.00	3.15	4.00	4.00	3.90
504	4.00	2.87	2.54	4.00	4.00	4.00	4.00	4.00
505	4.00	2.61	2.44	4.00	3.85	4.00	4.00	4.00
505	4.00	2.78	2.49	4.00	3.55	4.00	4.00	4.00
506	4.00	2.76	2.57	4.00	3.45	4.00	4.00	4.00
506	4.00	2.99	2.68	4.00	3.35	4.00	4.00	3.95
507	4.00	2.95	2.84	4.00	3.20	4.00	4.00	4.00
507	4.00	3.26	3.00	4.00	3.10	4.00	4.00	3.70
508	4.00	3.21	3.29	4.00	2.90	4.00	4.00	3.65
508	4.00	3.66	3.58	4.00	2.70	4.00	4.00	3.45
509	4.00	3.94	4.00	4.00	2.55	4.00	4.00	3.50

Continuous Table 5-7 Longitudinal Results for Permit Vehicle Rating for Example 2 (with Adjacent Normal Traffic)

Rating Factor on Load Rating								
	Rating Factor							
NODE	service condition					strength check		
	top stress max	top stress min	bottom stress max	bottom stress min	web principle stress	moment max	moment min	web shear
509	4.00	4.00	4.00	4.00	2.45	4.00	4.00	3.40
510	4.00	4.00	4.00	4.00	2.50	4.00	4.00	3.55
510	4.00	4.00	4.00	4.00	2.25	4.00	4.00	3.35
511	4.00	4.00	4.00	4.00	2.40	4.00	4.00	3.65
511	4.00	4.00	4.00	3.85	2.20	4.00	4.00	3.45
512	4.00	4.00	4.00	3.25	2.40	4.00	4.00	3.95
512	4.00	4.00	4.00	2.72	2.30	4.00	4.00	3.75
513	4.00	4.00	4.00	2.30	2.70	3.25	4.00	4.00
513	4.00	4.00	4.00	2.03	2.70	3.10	4.00	4.00
514	4.00	4.00	4.00	1.81	3.45	2.75	4.00	4.00
514	4.00	4.00	4.00	1.70	3.60	2.70	4.00	4.00
515	4.00	4.00	4.00	1.70	4.00	2.65	4.00	4.00
515	4.00	4.00	4.00	1.66	4.00	2.65	4.00	4.00
516	4.00	4.00	4.00	1.88	4.00	2.55	4.00	4.00
516	4.00	4.00	4.00	1.86	4.00	2.55	4.00	4.00
517	4.00	4.00	4.00	1.67	4.00	2.40	4.00	4.00
517	4.00	4.00	4.00	1.66	4.00	2.35	4.00	4.00
518	4.00	4.00	4.00	1.71	4.00	2.40	4.00	4.00
518	4.00	4.00	4.00	1.70	4.00	2.40	4.00	4.00
519	4.00	4.00	4.00	2.03	4.00	2.65	4.00	4.00
519	4.00	4.00	4.00	2.10	4.00	2.70	4.00	4.00
520	4.00	4.00	4.00	2.07	4.00	3.00	4.00	4.00
520	4.00	4.00	4.00	2.32	4.00	3.25	4.00	4.00
521	4.00	4.00	4.00	2.38	4.00	3.50	4.00	4.00
521	4.00	4.00	4.00	2.79	4.00	3.90	4.00	4.00
522	4.00	4.00	4.00	2.96	4.00	4.00	4.00	4.00
522	4.00	4.00	4.00	3.68	4.00	4.00	4.00	4.00
523	4.00	4.00	4.00	3.96	4.00	4.00	4.00	4.00
523	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
524	4.00	4.00	4.00	4.00	4.00	4.00	4.00	3.60
524	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
525	4.00	4.00	4.00	4.00	4.00	4.00	4.00	3.40
525	4.00	3.76	4.00	4.00	4.00	4.00	3.55	3.85
526	4.00	3.59	4.00	4.00	4.00	4.00	3.40	3.45
526	4.00	3.14	4.00	4.00	4.00	4.00	2.75	3.65
527	4.00	2.94	4.00	4.00	4.00	4.00	2.50	3.55
527	4.00	2.67	4.00	4.00	4.00	4.00	2.10	3.65
528	4.00	2.49	3.72	4.00	4.00	4.00	4.00	3.65
528	4.00	2.32	3.61	4.00	4.00	4.00	4.00	3.75
529	4.00	2.29	3.44	4.00	4.00	4.00	4.00	3.85
529	4.00	2.17	3.42	4.00	4.00	4.00	3.95	3.95
530	4.00	2.43	3.40	4.00	4.00	4.00	4.00	4.00
603	4.00	3.37	4.00	4.00	2.75	4.00	4.00	3.40
604	4.00	3.44	4.00	4.00	2.95	4.00	4.00	3.65
604	4.00	3.61	4.00	4.00	3.65	4.00	4.00	4.00
605	4.00	3.59	4.00	4.00	3.60	4.00	4.00	4.00
605	4.00	4.00	4.00	4.00	3.40	4.00	4.00	3.90
606	4.00	4.00	4.00	4.00	3.35	4.00	4.00	4.00
606	4.00	4.00	4.00	4.00	3.30	4.00	4.00	3.90
607	4.00	4.00	4.00	4.00	3.30	4.00	4.00	4.00
607	4.00	4.00	4.00	4.00	3.25	4.00	4.00	3.95
608	4.00	4.00	4.00	4.00	3.25	4.00	4.00	4.00
608	4.00	4.00	4.00	4.00	3.10	4.00	4.00	3.95
609	4.00	4.00	4.00	4.00	3.15	4.00	4.00	4.00
609	4.00	4.00	4.00	4.00	3.10	4.00	4.00	4.00
610	4.00	4.00	4.00	4.00	3.40	4.00	4.00	4.00
610	4.00	4.00	4.00	3.63	3.30	4.00	4.00	4.00
611	4.00	4.00	4.00	3.32	3.90	4.00	4.00	4.00
611	4.00	4.00	4.00	2.69	3.85	4.00	4.00	4.00
612	4.00	4.00	4.00	2.64	4.00	3.10	4.00	4.00
612	4.00	4.00	4.00	2.29	4.00	2.95	4.00	4.00

Continuous Table 5-7 Longitudinal Results for Permit Vehicle Rating for Example 2 (with Adjacent Normal Traffic)

Rating Factor on Load Rating								
	Rating Factor							
NODE	service condition					strength check		
	top stress max	top stress min	bottom stress max	bottom stress min	web principle stress	moment max	moment min	web shear
613	4.00	4.00	4.00	1.96	4.00	2.45	4.00	4.00
613	4.00	4.00	4.00	1.85	4.00	2.50	4.00	4.00
614	4.00	4.00	4.00	1.69	4.00	2.00	4.00	4.00
614	4.00	4.00	4.00	1.75	4.00	2.15	4.00	4.00
615	4.00	4.00	4.00	1.80	4.00	2.00	4.00	4.00
615	4.00	4.00	4.00	2.02	4.00	2.35	4.00	4.00
616	4.00	4.00	4.00	2.40	4.00	2.70	4.00	4.00
616	4.00	4.00	4.00	3.53	4.00	4.00	4.00	4.00
617	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
617	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
700	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00

Table 5-8 Transverse Results for Permit Vehicle Rating for Example 2 (with Adjacent Normal Traffic)

project: Jeremiah Morrow Bridge
rating type: Permit Truck with one lane of adjacent normal traffic

Summary of rating in the transverse direction

Load Rating Result Transverse

Minimum Rating Factor in Transverse
LOCATION OF MEMBER WITH MINIMUM
Rating Factor
1.28 Top Stress Controls

Minimum Rating Factor in Transverse
LOCATION OF MEMBER WITH MINIMUM
Rating Factor
1.50 Top Stress Controls

Rating Factor of Individual Members						
Plate #	Rating Factor at Top Slab on Deep Section					
	service condition				strength check	
	top stress max	top stress min	bottom stress max	bottom stress min	moment max	moment min
summary	2.95	1.28	3.67	1.36	2.05	2.25
1	4.00	4.00	4.00	4.00	4.00	4.00
2	4.00	4.00	4.00	4.00	4.00	4.00
3	4.00	4.00	4.00	4.00	4.00	4.00
4	4.00	4.00	4.00	4.00	4.00	4.00
5	4.00	3.44	4.00	4.00	4.00	4.00
6	4.00	3.71	4.00	4.00	4.00	4.00
7	4.00	3.70	4.00	4.00	4.00	4.00
8	4.00	3.29	4.00	4.00	4.00	4.00
9	4.00	3.03	4.00	4.00	4.00	3.60
10	4.00	3.03	4.00	4.00	4.00	3.45
11	4.00	3.09	4.00	4.00	4.00	3.35
12	4.00	3.30	4.00	4.00	4.00	3.35
13	4.00	3.76	4.00	4.00	4.00	3.55
14	4.00	2.47	4.00	4.00	4.00	2.40
15	4.00	2.85	4.00	4.00	4.00	2.75
16	4.00	2.10	4.00	4.00	4.00	2.25
17	4.00	2.11	4.00	4.00	4.00	2.40
18	4.00	2.07	4.00	4.00	4.00	2.45
19	4.00	1.97	4.00	4.00	4.00	2.50
20	4.00	1.81	4.00	4.00	4.00	2.45
21	4.00	1.57	4.00	4.00	4.00	2.35
22	4.00	1.28	3.67	4.00	4.00	2.25
23	4.00	1.30	3.71	4.00	4.00	2.60
24	4.00	1.64	4.00	4.00	4.00	3.45
25	4.00	1.92	4.00	4.00	4.00	4.00
26	4.00	2.44	4.00	3.51	4.00	4.00
27	4.00	3.69	4.00	3.80	4.00	4.00
28	4.00	4.00	4.00	4.00	4.00	4.00
29	4.00	4.00	4.00	3.74	4.00	4.00
30	4.00	4.00	4.00	2.74	3.70	4.00
31	3.65	4.00	4.00	1.81	2.60	4.00
32	2.95	4.00	4.00	1.36	2.05	4.00
33	3.42	4.00	4.00	1.45	2.40	4.00
34	4.00	4.00	4.00	1.52	2.45	4.00
35	4.00	4.00	4.00	1.70	2.40	4.00
36	4.00	4.00	4.00	1.97	2.35	4.00
37	4.00	4.00	4.00	2.29	2.20	4.00
38	4.00	4.00	4.00	2.63	2.40	4.00
39	4.00	4.00	4.00	3.00	2.55	4.00
40	4.00	4.00	4.00	3.38	4.00	4.00
41	4.00	4.00	4.00	1.15	0.80	4.00
42	4.00	4.00	4.00	1.01	0.70	4.00
43	4.00	4.00	4.00	4.00	4.00	4.00
44	4.00	4.00	4.00	4.00	4.00	4.00
45	4.00	4.00	4.00	4.00	4.00	4.00
46	4.00	4.00	4.00	4.00	4.00	4.00
47	4.00	4.00	4.00	4.00	4.00	4.00
48	4.00	4.00	4.00	4.00	4.00	4.00
49	4.00	4.00	4.00	4.00	4.00	4.00
50	4.00	4.00	4.00	4.00	4.00	4.00
51	4.00	4.00	4.00	4.00	4.00	4.00
52	4.00	4.00	4.00	4.00	4.00	4.00
53	4.00	4.00	4.00	4.00	4.00	4.00
54	4.00	4.00	4.00	4.00	4.00	4.00
55	4.00	4.00	4.00	4.00	4.00	4.00

Rating Factor of Individual Members						
Plate #	Rating Factor at Top Slab on Shallow Section					
	service condition				strength check	
	top stress max	top stress min	bottom stress max	bottom stress min	moment max	moment min
summary	3.44	1.50	4.00	1.65	2.45	2.50
1	4.00	4.00	4.00	4.00	4.00	4.00
2	4.00	4.00	4.00	4.00	4.00	4.00
3	4.00	4.00	4.00	4.00	4.00	4.00
4	4.00	4.00	4.00	4.00	4.00	4.00
5	4.00	3.46	4.00	4.00	4.00	4.00
6	4.00	3.72	4.00	4.00	4.00	4.00
7	4.00	3.72	4.00	4.00	4.00	4.00
8	4.00	3.30	4.00	4.00	4.00	4.00
9	4.00	3.04	4.00	4.00	4.00	3.60
10	4.00	3.05	4.00	4.00	4.00	3.45
11	4.00	3.11	4.00	4.00	4.00	3.35
12	4.00	3.33	4.00	4.00	4.00	3.35
13	4.00	3.79	4.00	4.00	4.00	3.60
14	4.00	2.64	4.00	4.00	4.00	2.55
15	4.00	3.08	4.00	4.00	4.00	2.95
16	4.00	2.32	4.00	4.00	4.00	2.50
17	4.00	2.34	4.00	4.00	4.00	2.65
18	4.00	2.32	4.00	4.00	4.00	2.75
19	4.00	2.24	4.00	4.00	4.00	2.80
20	4.00	2.08	4.00	4.00	4.00	2.80
21	4.00	1.82	4.00	4.00	4.00	2.70
22	4.00	1.50	4.00	4.00	4.00	2.60
23	4.00	1.57	4.00	4.00	4.00	3.10
24	4.00	2.18	4.00	4.00	4.00	4.00
25	4.00	2.55	4.00	4.00	4.00	4.00
26	4.00	3.28	4.00	3.59	4.00	4.00
27	4.00	4.00	4.00	3.99	4.00	4.00
28	4.00	4.00	4.00	4.00	4.00	4.00
29	4.00	4.00	4.00	4.00	4.00	4.00
30	4.00	4.00	4.00	3.16	4.00	4.00
31	4.00	4.00	4.00	2.13	3.00	4.00
32	3.44	4.00	4.00	1.65	2.45	4.00
33	4.00	4.00	4.00	1.92	3.05	4.00
34	4.00	4.00	4.00	2.06	3.20	4.00
35	4.00	4.00	4.00	2.27	3.15	4.00
36	4.00	4.00	4.00	2.58	3.05	4.00
37	4.00	4.00	4.00	2.94	4.00	4.00
38	4.00	4.00	4.00	3.35	4.00	4.00
39	4.00	4.00	4.00	3.80	4.00	4.00
40	4.00	4.00	4.00	4.00	4.00	4.00
41	4.00	4.00	4.00	1.42	0.95	3.80
42	4.00	4.00	4.00	1.26	0.85	3.50
43	4.00	4.00	4.00	4.00	4.00	4.00
44	4.00	4.00	4.00	4.00	4.00	4.00
45	4.00	4.00	4.00	4.00	4.00	4.00
46	4.00	4.00	4.00	4.00	4.00	4.00
47	4.00	4.00	4.00	4.00	4.00	4.00
48	4.00	4.00	4.00	4.00	4.00	4.00
49	4.00	4.00	4.00	4.00	4.00	4.00
50	4.00	4.00	4.00	4.00	4.00	4.00
51	4.00	4.00	4.00	4.00	4.00	4.00
52	4.00	4.00	4.00	4.00	4.00	4.00
53	4.00	4.00	4.00	4.00	4.00	4.00
54	4.00	4.00	4.00	4.00	4.00	4.00
55	4.00	4.00	4.00	4.00	4.00	4.00

5.3 Example 3 - Inventory Rating

In this is example, an inventory rating is conducted using standard HS loading with a 0.0 kip/ft^2 future wearing surface load. The "User Input" sheet can be found in Tables 5-9. The longitudinal and transverse "Result Summary" sheets can be found in Tables 5-11 and 5-12, respectively.

In this example, the controlling Inventory load rating is 30 tons shown in Table 5-10.

In Table 5-11, the minimum load rating in the longitudinal direction is 30 tons based on principal tensile stress in the webs.

The minimum load rating for the shallow section is 33 tons in Table 5-12, controlled by bottom of slab stresses, and 30 tons for the deep section, based on bottom of slab stresses.

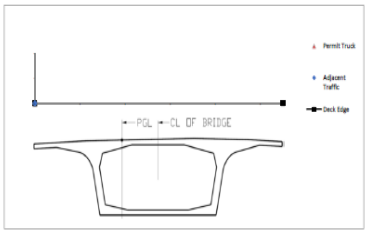
Table 5-9 User Input Sheet for Inventory Rating (Standard HS) for Example 3

Project: Jeremiah Morrow Bridge Load Rating Performed on: 4/10/2018 16:00
Rating type: Inventory Load Rating

User Input Sheet

User Input Data Cell Are In Bold and Red

Are wheels of vehicle step outside of Barrier Curb? They are inside barrier curbs. So it is good !



unlock password

wheel load definition for user-defined vehicle
(no need to input data if doing inventory or operating rating using standard HS load configuration)

Distance of Left most wheel of current HS25 to right most wheel of Permit Truck, Y =	N/A	Input 'N/A' @ Cell C13 Distance (4 ft min.) from the first Left most wheel load of current HS25 truck to last right most wheel load of permit truck. For no current load, set to be "N/A"
D_pgl - Distance from PGL (for permit truck)		This is the left most wheel (A) of Permit Truck - away from traffic direction, positive is to the right

total wheel load for permit load = 0.0 kips

Dw - wheel position	Da - axis position	0.00 ft	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
0.00 ft	A																										
	B																										
	C																										
	D																										
	E																										
	F																										
	G																										
	H																										

The standard HS loading is used for this evaluation

Permit Evaluation is performed using operating criteria

User Input

	Factor	
IMPACT, long =	0.15	note: only specify impact for permit load case
IMPACT, trans =	0.3	for standard vehicle, impact is calculated as per AASHTO for longitudinal, always 0.3 for transverse
FUTURE WEARING SURFACE (lb/ft^2) =	0	
TO FIND INVENTORY RATING, INPUT '1'	Rating type	
TO FIND OPERATING RATING INPUT '2'	1	Inventory Rating
TO FIND PERMIT EVALUATION, INPUT '3'		
FOR INVENTORY OR OPERATING RATING, ENTER THE NUMBER OF LANES LOADED	4	Number of lanes is acceptable
NUMBER OF LANE OF ADJACENT NORMAL TRAFFIC CURRENT WITH PERMIT TRUCK	0	("0" for Inventory & Operating Rating as well as no current load with permit truck. "1" for one lane of current load with permit truck) Inventory

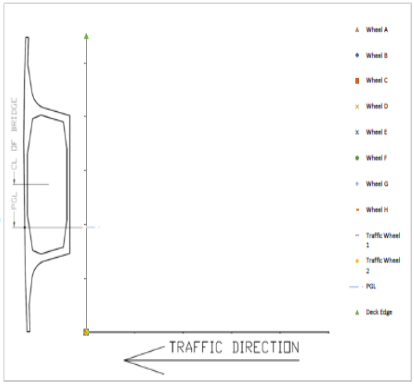


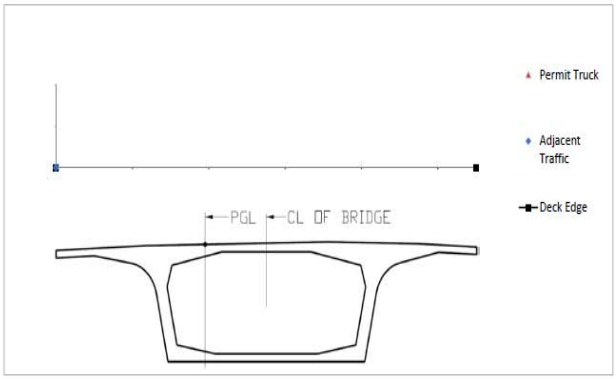
Table 5-10 Summary Results for Inventory Rating (Standard HS) for Example 3

Project: Jeremiah Morrow Bridge

Rating Type: Inventory Load Rating

Load Rating Performed on: 4/10/2018 16:00

No of Axles of Permit Vehicles =	N/A	axles
Total wheel load for permit vehicle =	N/A	kips
Rating Factor =	30.00	Tons



Wheel load definition for user-defined vehicle

Distance of Left most wheel of current HS25 to right most wheel of Permit Truck	N/A	Distance from the first Left most wheel load of current HS25 truck to last right most wheel load of permit truck. For no current load, set to be "N/A"
D_pgl - Distance from PGL (for permit truck)	0.00 ft	this is the left most wheel (A) of Permit Truck - away from traffic direction, positive is to the right

	Da - axis position	0.00 ft																						
Dw - wheel position		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
0.00 ft	A																									
	B																									
	C																									
	D																									
	E																									
	F																									
	G																									
	H																									

Permit Evaluation is performed using operating criteria

User Input	Factor	
IMPACT, long =	0.15	note: only specify impact for permit load case
IMPACT, trans =	0.3	for standard vehicle, impact is calculated as per AASHTO for longitudinal, always 0.3 for transverse
FUTURE WEARING SURFACE (lb/ft^2)=	0	
TO FIND INVENTORY RATING, INPUT '1'	Rating type	
TO FIND OPERATING RATING INPUT '2'	1	Inventory Rating
TO FIND PERMIT EVALUATION, INPUT '3'		
FOR INVENTORY OR OPERATING RATING, ENTER THE NUMBER OF LANES LOADED	4	Number of lanes is acceptable
NUMBER OF LANE OF ADJACENT NORMAL TRAFFIC CURRENT WITH PERMIT TRUCK	0	("0" for Inventory & Operating Rating as well as no current load with permit truck. "1" for one lane of current load with permit truck)

Inventory

Table 5-11 Longitudinal Results for Inventory Rating (Standard HS) for Example 3

project:		Jeremiah Morrow Bridge						
rating type:		Inventory Load Rating						
summary of rating in the longitudinal direction								
Load Rating Result longitudinal								
Minimum Rating Factor In Longitudinal								
LOCATION OF MEMBER WITH MINIMUM								
Rating Factor								
30 tons		Web Principle Stress Controls						
Capacity on Loading Rating								
	Capacity in tons							
NODE	service condition					strength check		
	top stress max	top stress min	bottom stress max	bottom stress min	web principle stress	moment max	moment min	web shear
summary	100 tons	43 tons	65 tons	43 tons	30 tons	58 tons	45 tons	31 tons
99					100 tons	100 tons	100 tons	100 tons
100		100 tons	100 tons		100 tons	100 tons	100 tons	100 tons
100		100 tons	100 tons		30 tons	100 tons	100 tons	100 tons
101	100 tons	100 tons	100 tons	100 tons	35 tons	100 tons	100 tons	35 tons
101	100 tons	100 tons	100 tons	100 tons	39 tons	100 tons	100 tons	35 tons
102	100 tons	100 tons	100 tons	100 tons	79 tons	100 tons	100 tons	46 tons
102	100 tons	100 tons	100 tons	100 tons	91 tons	100 tons	100 tons	46 tons
103	100 tons	100 tons	100 tons	93 tons	97 tons	96 tons	100 tons	46 tons
103	100 tons	100 tons	100 tons	98 tons	100 tons	96 tons	100 tons	34 tons
104	100 tons	100 tons	100 tons	53 tons	100 tons	61 tons	100 tons	34 tons
104	100 tons	100 tons	100 tons	53 tons	100 tons	61 tons	100 tons	34 tons
105	100 tons	100 tons	100 tons	47 tons	100 tons	58 tons	100 tons	34 tons
105	100 tons	100 tons	100 tons	47 tons	100 tons	58 tons	100 tons	34 tons
106	100 tons	85 tons	100 tons	54 tons	100 tons	63 tons	100 tons	34 tons
106	100 tons	85 tons	100 tons	54 tons	100 tons	63 tons	100 tons	34 tons
107	100 tons	83 tons	100 tons	52 tons	100 tons	60 tons	100 tons	33 tons
107	100 tons	83 tons	100 tons	52 tons	100 tons	60 tons	100 tons	43 tons
108	100 tons	71 tons	100 tons	59 tons	80 tons	64 tons	100 tons	38 tons
108	100 tons	71 tons	100 tons	59 tons	79 tons	64 tons	100 tons	38 tons
109	100 tons	78 tons	100 tons	79 tons	71 tons	100 tons	100 tons	36 tons
109	100 tons	78 tons	100 tons	79 tons	69 tons	100 tons	100 tons	36 tons
110	100 tons	83 tons	100 tons	100 tons	64 tons	100 tons	100 tons	35 tons
110	100 tons	83 tons	100 tons	100 tons	66 tons	100 tons	100 tons	35 tons
111	100 tons	76 tons	100 tons	100 tons	74 tons	100 tons	100 tons	35 tons
111	100 tons	76 tons	100 tons	100 tons	74 tons	100 tons	100 tons	35 tons
112	100 tons	68 tons	100 tons	100 tons	81 tons	100 tons	100 tons	35 tons
112	100 tons	68 tons	100 tons	100 tons	85 tons	100 tons	100 tons	35 tons
113	100 tons	64 tons	100 tons	100 tons	95 tons	100 tons	100 tons	35 tons
113	100 tons	64 tons	100 tons	100 tons	95 tons	100 tons	100 tons	35 tons
114	100 tons	65 tons	100 tons	100 tons	100 tons	100 tons	100 tons	36 tons
114	100 tons	65 tons	100 tons	100 tons	100 tons	100 tons	100 tons	36 tons
115	100 tons	62 tons	100 tons	100 tons	100 tons	100 tons	100 tons	36 tons
115	100 tons	62 tons	100 tons	100 tons	100 tons	100 tons	100 tons	36 tons
116	100 tons	67 tons	100 tons	100 tons	100 tons	100 tons	100 tons	38 tons
116	100 tons	67 tons	100 tons	100 tons	100 tons	100 tons	100 tons	38 tons
117	100 tons	83 tons	100 tons	100 tons	100 tons	100 tons	100 tons	39 tons
117	100 tons	83 tons	100 tons	100 tons	100 tons	100 tons	100 tons	35 tons
118	100 tons	67 tons	97 tons	100 tons	99 tons	100 tons	100 tons	34 tons
203	100 tons	64 tons	73 tons	100 tons	77 tons	100 tons	87 tons	33 tons
204	100 tons	63 tons	75 tons	100 tons	76 tons	100 tons	89 tons	33 tons
204	100 tons	63 tons	75 tons	100 tons	100 tons	100 tons	87 tons	36 tons

Continuous Table 5-11 Longitudinal Results for Inventory Rating (Standard HS) for Example 3

Capacity on Loading Rating								
	Capacity in tons							
NODE	service condition					strength check		
	top stress max	top stress min	bottom stress max	bottom stress min	web principle stress	moment max	moment min	web shear
205	100 tons	59 tons	74 tons	100 tons	100 tons	100 tons	89 tons	36 tons
205	100 tons	59 tons	74 tons	100 tons	96 tons	100 tons	89 tons	35 tons
206	100 tons	62 tons	79 tons	100 tons	90 tons	100 tons	94 tons	34 tons
206	100 tons	62 tons	79 tons	100 tons	91 tons	100 tons	94 tons	34 tons
207	100 tons	66 tons	87 tons	100 tons	84 tons	100 tons	100 tons	34 tons
207	100 tons	66 tons	87 tons	100 tons	84 tons	100 tons	100 tons	34 tons
208	100 tons	72 tons	100 tons	100 tons	75 tons	100 tons	100 tons	34 tons
208	100 tons	72 tons	100 tons	100 tons	71 tons	100 tons	100 tons	33 tons
209	100 tons	89 tons	100 tons	100 tons	64 tons	100 tons	100 tons	33 tons
209	100 tons	89 tons	100 tons	100 tons	63 tons	100 tons	100 tons	33 tons
210	100 tons	100 tons	100 tons	100 tons	63 tons	100 tons	100 tons	33 tons
210	100 tons	100 tons	100 tons	100 tons	58 tons	100 tons	100 tons	33 tons
211	100 tons	100 tons	100 tons	100 tons	60 tons	100 tons	100 tons	34 tons
211	100 tons	100 tons	100 tons	100 tons	56 tons	100 tons	100 tons	34 tons
212	100 tons	100 tons	100 tons	100 tons	60 tons	100 tons	100 tons	35 tons
212	100 tons	100 tons	100 tons	100 tons	59 tons	100 tons	100 tons	35 tons
213	100 tons	100 tons	100 tons	74 tons	70 tons	100 tons	100 tons	38 tons
213	100 tons	100 tons	100 tons	74 tons	74 tons	100 tons	100 tons	38 tons
214	100 tons	100 tons	100 tons	59 tons	92 tons	84 tons	100 tons	44 tons
214	100 tons	100 tons	100 tons	59 tons	100 tons	84 tons	100 tons	33 tons
215	100 tons	100 tons	100 tons	54 tons	100 tons	76 tons	100 tons	34 tons
215	100 tons	100 tons	100 tons	54 tons	100 tons	76 tons	100 tons	34 tons
216	100 tons	100 tons	100 tons	62 tons	100 tons	69 tons	100 tons	34 tons
216	100 tons	100 tons	100 tons	62 tons	100 tons	69 tons	100 tons	34 tons
217	100 tons	100 tons	100 tons	51 tons	100 tons	63 tons	100 tons	34 tons
217	100 tons	100 tons	100 tons	51 tons	100 tons	63 tons	100 tons	34 tons
218	100 tons	100 tons	100 tons	47 tons	100 tons	60 tons	100 tons	34 tons
218	100 tons	100 tons	100 tons	47 tons	100 tons	60 tons	100 tons	34 tons
219	100 tons	100 tons	100 tons	60 tons	100 tons	68 tons	100 tons	34 tons
219	100 tons	100 tons	100 tons	60 tons	100 tons	68 tons	100 tons	34 tons
220	100 tons	100 tons	100 tons	63 tons	100 tons	77 tons	100 tons	34 tons
220	100 tons	100 tons	100 tons	63 tons	100 tons	76 tons	100 tons	46 tons
221	100 tons	100 tons	100 tons	77 tons	81 tons	97 tons	100 tons	40 tons
221	100 tons	100 tons	100 tons	77 tons	71 tons	97 tons	100 tons	39 tons
222	100 tons	100 tons	100 tons	98 tons	56 tons	100 tons	100 tons	35 tons
222	100 tons	100 tons	100 tons	98 tons	58 tons	100 tons	100 tons	35 tons
223	100 tons	96 tons	100 tons	100 tons	53 tons	100 tons	100 tons	34 tons
223	100 tons	97 tons	100 tons	100 tons	53 tons	100 tons	100 tons	34 tons
224	100 tons	78 tons	100 tons	100 tons	50 tons	100 tons	100 tons	33 tons
224	100 tons	79 tons	100 tons	100 tons	54 tons	100 tons	100 tons	33 tons
225	100 tons	63 tons	100 tons	100 tons	54 tons	100 tons	80 tons	33 tons
225	100 tons	63 tons	100 tons	100 tons	56 tons	100 tons	80 tons	33 tons
226	100 tons	54 tons	100 tons	100 tons	58 tons	100 tons	63 tons	33 tons
226	100 tons	55 tons	100 tons	100 tons	63 tons	100 tons	63 tons	33 tons
227	100 tons	48 tons	86 tons	100 tons	71 tons	100 tons	99 tons	33 tons
227	100 tons	48 tons	86 tons	100 tons	74 tons	100 tons	99 tons	34 tons
228	100 tons	47 tons	78 tons	100 tons	81 tons	100 tons	89 tons	34 tons
228	100 tons	47 tons	78 tons	100 tons	81 tons	100 tons	89 tons	34 tons
229	100 tons	45 tons	72 tons	100 tons	87 tons	100 tons	85 tons	34 tons
229	100 tons	45 tons	72 tons	100 tons	90 tons	100 tons	85 tons	35 tons
230	100 tons	47 tons	71 tons	100 tons	96 tons	100 tons	84 tons	35 tons
230	100 tons	47 tons	71 tons	100 tons	100 tons	100 tons	84 tons	35 tons
231	100 tons	58 tons	73 tons	100 tons	100 tons	100 tons	90 tons	36 tons
231	100 tons	58 tons	73 tons	100 tons	74 tons	100 tons	90 tons	34 tons
232	100 tons	47 tons	68 tons	100 tons	73 tons	100 tons	84 tons	33 tons
303	100 tons	55 tons	77 tons	100 tons	73 tons	100 tons	84 tons	33 tons
304	100 tons	57 tons	81 tons	100 tons	74 tons	100 tons	85 tons	33 tons
304	100 tons	57 tons	80 tons	100 tons	100 tons	100 tons	85 tons	36 tons
305	100 tons	54 tons	80 tons	100 tons	99 tons	100 tons	86 tons	35 tons
305	100 tons	54 tons	80 tons	100 tons	92 tons	100 tons	86 tons	34 tons
306	100 tons	57 tons	85 tons	100 tons	86 tons	100 tons	90 tons	34 tons

Continuous Table 5-11 Longitudinal Results for Inventory Rating (Standard HS) for Example 3

Capacity on Loading Rating								
	Capacity in tons							
NODE	service condition					strength check		
	top stress max	top stress min	bottom stress max	bottom stress min	web principle stress	moment max	moment min	web shear
306	100 tons	57 tons	85 tons	100 tons	87 tons	100 tons	90 tons	34 tons
307	100 tons	60 tons	93 tons	100 tons	80 tons	100 tons	100 tons	34 tons
307	100 tons	60 tons	93 tons	100 tons	80 tons	100 tons	100 tons	34 tons
308	100 tons	65 tons	100 tons	100 tons	71 tons	100 tons	100 tons	33 tons
308	100 tons	65 tons	100 tons	100 tons	68 tons	100 tons	100 tons	33 tons
309	100 tons	81 tons	100 tons	100 tons	61 tons	100 tons	100 tons	33 tons
309	100 tons	81 tons	100 tons	100 tons	60 tons	100 tons	100 tons	33 tons
310	100 tons	94 tons	100 tons	100 tons	59 tons	100 tons	100 tons	33 tons
310	100 tons	93 tons	100 tons	100 tons	55 tons	100 tons	100 tons	33 tons
311	100 tons	100 tons	100 tons	100 tons	58 tons	100 tons	100 tons	33 tons
311	100 tons	100 tons	100 tons	100 tons	54 tons	100 tons	100 tons	33 tons
312	100 tons	100 tons	100 tons	97 tons	58 tons	100 tons	100 tons	34 tons
312	100 tons	100 tons	100 tons	97 tons	59 tons	100 tons	100 tons	34 tons
313	100 tons	100 tons	100 tons	68 tons	69 tons	89 tons	100 tons	36 tons
313	100 tons	100 tons	100 tons	68 tons	75 tons	89 tons	100 tons	38 tons
314	100 tons	100 tons	100 tons	51 tons	92 tons	72 tons	100 tons	43 tons
314	100 tons	100 tons	100 tons	51 tons	100 tons	72 tons	100 tons	33 tons
315	100 tons	100 tons	100 tons	45 tons	100 tons	68 tons	100 tons	34 tons
315	100 tons	100 tons	100 tons	45 tons	100 tons	68 tons	100 tons	34 tons
316	100 tons	100 tons	100 tons	50 tons	100 tons	61 tons	100 tons	34 tons
316	100 tons	100 tons	100 tons	50 tons	100 tons	61 tons	100 tons	34 tons
317	100 tons	100 tons	100 tons	43 tons	100 tons	58 tons	100 tons	34 tons
317	100 tons	100 tons	100 tons	43 tons	100 tons	58 tons	100 tons	34 tons
318	100 tons	100 tons	100 tons	46 tons	100 tons	58 tons	100 tons	34 tons
318	100 tons	100 tons	100 tons	46 tons	100 tons	58 tons	100 tons	34 tons
319	100 tons	100 tons	100 tons	59 tons	100 tons	66 tons	100 tons	34 tons
319	100 tons	100 tons	100 tons	59 tons	100 tons	66 tons	100 tons	34 tons
320	100 tons	100 tons	100 tons	59 tons	100 tons	76 tons	100 tons	34 tons
320	100 tons	100 tons	100 tons	59 tons	100 tons	76 tons	100 tons	46 tons
321	100 tons	100 tons	100 tons	72 tons	90 tons	100 tons	100 tons	40 tons
321	100 tons	100 tons	100 tons	72 tons	79 tons	99 tons	100 tons	39 tons
322	100 tons	100 tons	100 tons	96 tons	64 tons	100 tons	100 tons	35 tons
322	100 tons	100 tons	100 tons	96 tons	65 tons	100 tons	100 tons	35 tons
323	100 tons	100 tons	100 tons	100 tons	59 tons	100 tons	100 tons	34 tons
323	100 tons	100 tons	100 tons	100 tons	59 tons	100 tons	100 tons	34 tons
324	100 tons	100 tons	100 tons	100 tons	56 tons	100 tons	100 tons	33 tons
324	100 tons	100 tons	100 tons	100 tons	59 tons	100 tons	100 tons	33 tons
325	100 tons	82 tons	100 tons	100 tons	59 tons	100 tons	85 tons	33 tons
325	100 tons	82 tons	100 tons	100 tons	61 tons	100 tons	85 tons	33 tons
326	100 tons	69 tons	100 tons	100 tons	63 tons	100 tons	66 tons	33 tons
326	100 tons	70 tons	100 tons	100 tons	66 tons	100 tons	100 tons	33 tons
327	100 tons	61 tons	93 tons	100 tons	75 tons	100 tons	100 tons	33 tons
327	100 tons	61 tons	93 tons	100 tons	77 tons	100 tons	100 tons	34 tons
328	100 tons	58 tons	85 tons	100 tons	85 tons	100 tons	91 tons	34 tons
328	100 tons	58 tons	85 tons	100 tons	85 tons	100 tons	91 tons	34 tons
329	100 tons	54 tons	79 tons	100 tons	91 tons	100 tons	87 tons	34 tons
329	100 tons	54 tons	79 tons	100 tons	92 tons	100 tons	87 tons	35 tons
330	100 tons	57 tons	78 tons	100 tons	100 tons	100 tons	85 tons	35 tons
330	100 tons	57 tons	78 tons	100 tons	94 tons	100 tons	85 tons	36 tons
331	100 tons	68 tons	80 tons	100 tons	100 tons	100 tons	91 tons	38 tons
331	100 tons	68 tons	80 tons	100 tons	91 tons	100 tons	91 tons	34 tons
332	100 tons	57 tons	75 tons	100 tons	92 tons	100 tons	86 tons	33 tons
403	100 tons	48 tons	65 tons	100 tons	70 tons	100 tons	81 tons	33 tons
404	100 tons	48 tons	67 tons	100 tons	70 tons	100 tons	82 tons	33 tons
404	100 tons	48 tons	67 tons	100 tons	100 tons	100 tons	82 tons	36 tons
405	100 tons	43 tons	65 tons	100 tons	96 tons	100 tons	82 tons	35 tons
405	100 tons	43 tons	66 tons	100 tons	89 tons	100 tons	82 tons	34 tons
406	100 tons	44 tons	70 tons	100 tons	82 tons	100 tons	86 tons	34 tons
406	100 tons	44 tons	70 tons	100 tons	84 tons	100 tons	86 tons	34 tons
407	100 tons	46 tons	76 tons	100 tons	76 tons	100 tons	96 tons	34 tons
407	100 tons	46 tons	76 tons	100 tons	75 tons	100 tons	96 tons	34 tons

Continuous Table 5-11 Longitudinal Results for Inventory Rating (Standard HS) for Example 3

Capacity on Loading Rating								
	Capacity in tons							
NODE	service condition					strength check		
	top stress max	top stress min	bottom stress max	bottom stress min	web principle stress	moment max	moment min	web shear
408	100 tons	49 tons	87 tons	100 tons	68 tons	100 tons	100 tons	33 tons
408	100 tons	48 tons	87 tons	100 tons	63 tons	100 tons	100 tons	33 tons
409	100 tons	60 tons	100 tons	100 tons	55 tons	100 tons	100 tons	33 tons
409	100 tons	60 tons	100 tons	100 tons	54 tons	100 tons	100 tons	33 tons
410	100 tons	69 tons	100 tons	100 tons	53 tons	100 tons	100 tons	33 tons
410	100 tons	69 tons	100 tons	100 tons	48 tons	100 tons	100 tons	33 tons
411	100 tons	89 tons	100 tons	100 tons	49 tons	100 tons	100 tons	33 tons
411	100 tons	89 tons	100 tons	100 tons	45 tons	100 tons	100 tons	33 tons
412	100 tons	100 tons	100 tons	100 tons	49 tons	100 tons	100 tons	34 tons
412	100 tons	100 tons	100 tons	100 tons	48 tons	100 tons	100 tons	34 tons
413	100 tons	100 tons	100 tons	79 tons	58 tons	89 tons	100 tons	36 tons
413	100 tons	100 tons	100 tons	79 tons	60 tons	89 tons	100 tons	36 tons
414	100 tons	100 tons	100 tons	65 tons	79 tons	76 tons	100 tons	41 tons
414	100 tons	100 tons	100 tons	65 tons	90 tons	76 tons	100 tons	31 tons
415	100 tons	100 tons	100 tons	56 tons	100 tons	70 tons	100 tons	34 tons
415	100 tons	100 tons	100 tons	56 tons	100 tons	70 tons	100 tons	34 tons
416	100 tons	100 tons	100 tons	60 tons	100 tons	65 tons	100 tons	34 tons
416	100 tons	100 tons	100 tons	60 tons	100 tons	65 tons	100 tons	34 tons
417	100 tons	100 tons	100 tons	47 tons	100 tons	60 tons	100 tons	34 tons
417	100 tons	100 tons	100 tons	47 tons	100 tons	60 tons	100 tons	34 tons
418	100 tons	100 tons	100 tons	46 tons	100 tons	59 tons	100 tons	34 tons
418	100 tons	100 tons	100 tons	46 tons	100 tons	59 tons	100 tons	34 tons
419	100 tons	100 tons	100 tons	58 tons	100 tons	69 tons	100 tons	34 tons
419	100 tons	100 tons	100 tons	58 tons	100 tons	69 tons	100 tons	34 tons
420	100 tons	100 tons	100 tons	55 tons	100 tons	79 tons	100 tons	34 tons
420	100 tons	100 tons	100 tons	55 tons	100 tons	79 tons	100 tons	46 tons
421	100 tons	100 tons	100 tons	64 tons	86 tons	100 tons	100 tons	41 tons
421	100 tons	100 tons	100 tons	64 tons	77 tons	100 tons	100 tons	40 tons
422	100 tons	100 tons	100 tons	83 tons	61 tons	100 tons	100 tons	35 tons
422	100 tons	100 tons	100 tons	83 tons	64 tons	100 tons	100 tons	36 tons
423	100 tons	100 tons	100 tons	100 tons	59 tons	100 tons	100 tons	34 tons
423	100 tons	100 tons	100 tons	100 tons	59 tons	100 tons	100 tons	34 tons
424	100 tons	100 tons	100 tons	100 tons	55 tons	100 tons	100 tons	33 tons
424	100 tons	100 tons	100 tons	100 tons	59 tons	100 tons	100 tons	34 tons
425	100 tons	83 tons	100 tons	100 tons	59 tons	100 tons	86 tons	33 tons
425	100 tons	83 tons	100 tons	100 tons	61 tons	100 tons	86 tons	33 tons
426	100 tons	72 tons	100 tons	100 tons	61 tons	100 tons	68 tons	33 tons
426	100 tons	72 tons	100 tons	100 tons	66 tons	100 tons	68 tons	33 tons
427	100 tons	63 tons	89 tons	100 tons	75 tons	100 tons	100 tons	34 tons
427	100 tons	63 tons	88 tons	100 tons	77 tons	100 tons	100 tons	34 tons
428	100 tons	60 tons	81 tons	100 tons	85 tons	100 tons	91 tons	34 tons
428	100 tons	60 tons	81 tons	100 tons	84 tons	100 tons	91 tons	34 tons
429	100 tons	57 tons	75 tons	100 tons	91 tons	100 tons	87 tons	34 tons
429	100 tons	57 tons	75 tons	100 tons	92 tons	100 tons	87 tons	35 tons
430	100 tons	59 tons	74 tons	100 tons	100 tons	100 tons	85 tons	35 tons
430	100 tons	59 tons	74 tons	100 tons	94 tons	100 tons	85 tons	36 tons
431	100 tons	71 tons	76 tons	100 tons	100 tons	100 tons	91 tons	38 tons
431	100 tons	71 tons	76 tons	100 tons	90 tons	100 tons	91 tons	34 tons
432	100 tons	59 tons	71 tons	100 tons	90 tons	100 tons	85 tons	33 tons
503	100 tons	57 tons	72 tons	100 tons	80 tons	100 tons	91 tons	34 tons
504	100 tons	58 tons	75 tons	100 tons	79 tons	100 tons	92 tons	34 tons
504	100 tons	58 tons	74 tons	100 tons	100 tons	100 tons	92 tons	38 tons
505	100 tons	52 tons	72 tons	100 tons	100 tons	100 tons	94 tons	38 tons
505	100 tons	52 tons	72 tons	100 tons	100 tons	100 tons	94 tons	35 tons
506	100 tons	53 tons	76 tons	100 tons	95 tons	100 tons	97 tons	35 tons
506	100 tons	53 tons	76 tons	100 tons	96 tons	100 tons	97 tons	35 tons
507	100 tons	54 tons	82 tons	100 tons	89 tons	100 tons	100 tons	35 tons
507	100 tons	54 tons	82 tons	100 tons	89 tons	100 tons	100 tons	35 tons
508	100 tons	55 tons	92 tons	100 tons	81 tons	100 tons	100 tons	34 tons
508	100 tons	55 tons	92 tons	100 tons	76 tons	100 tons	100 tons	34 tons
509	100 tons	65 tons	100 tons	100 tons	70 tons	100 tons	100 tons	34 tons

Continuous Table 5-11 Longitudinal Results for Inventory Rating (Standard HS) for Example 3

Capacity on Loading Rating								
	Capacity in tons							
NODE	service condition					strength check		
	top stress max	top stress min	bottom stress max	bottom stress min	web principle stress	moment max	moment min	web shear
509	100 tons	65 tons	100 tons	100 tons	69 tons	100 tons	100 tons	34 tons
510	100 tons	71 tons	100 tons	100 tons	66 tons	100 tons	100 tons	34 tons
510	100 tons	71 tons	100 tons	100 tons	61 tons	100 tons	100 tons	34 tons
511	100 tons	86 tons	100 tons	100 tons	64 tons	100 tons	100 tons	35 tons
511	100 tons	86 tons	100 tons	100 tons	59 tons	100 tons	100 tons	34 tons
512	100 tons	97 tons	100 tons	100 tons	63 tons	100 tons	100 tons	35 tons
512	100 tons	97 tons	100 tons	100 tons	61 tons	100 tons	100 tons	35 tons
513	100 tons	100 tons	100 tons	74 tons	73 tons	84 tons	100 tons	39 tons
513	100 tons	100 tons	100 tons	74 tons	76 tons	84 tons	100 tons	39 tons
514	100 tons	100 tons	100 tons	58 tons	96 tons	71 tons	100 tons	44 tons
514	100 tons	100 tons	100 tons	58 tons	100 tons	71 tons	100 tons	34 tons
515	100 tons	100 tons	100 tons	56 tons	100 tons	69 tons	100 tons	34 tons
515	100 tons	100 tons	100 tons	56 tons	100 tons	69 tons	100 tons	34 tons
516	100 tons	100 tons	100 tons	66 tons	100 tons	66 tons	100 tons	34 tons
516	100 tons	100 tons	100 tons	66 tons	100 tons	66 tons	100 tons	34 tons
517	100 tons	100 tons	100 tons	58 tons	100 tons	64 tons	100 tons	34 tons
517	100 tons	100 tons	100 tons	58 tons	100 tons	64 tons	100 tons	34 tons
518	100 tons	100 tons	100 tons	62 tons	100 tons	66 tons	100 tons	34 tons
518	100 tons	100 tons	100 tons	62 tons	100 tons	66 tons	100 tons	34 tons
519	100 tons	100 tons	100 tons	82 tons	100 tons	77 tons	100 tons	34 tons
519	100 tons	100 tons	100 tons	82 tons	100 tons	77 tons	100 tons	46 tons
520	100 tons	100 tons	100 tons	93 tons	100 tons	97 tons	100 tons	46 tons
520	100 tons	100 tons	100 tons	93 tons	100 tons	97 tons	100 tons	46 tons
521	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	45 tons
521	100 tons	100 tons	100 tons	100 tons	96 tons	100 tons	100 tons	45 tons
522	100 tons	100 tons	100 tons	100 tons	85 tons	100 tons	100 tons	40 tons
522	100 tons	100 tons	100 tons	100 tons	80 tons	100 tons	100 tons	40 tons
523	100 tons	100 tons	100 tons	100 tons	73 tons	100 tons	100 tons	36 tons
523	100 tons	100 tons	100 tons	100 tons	73 tons	100 tons	100 tons	38 tons
524	100 tons	100 tons	100 tons	100 tons	70 tons	100 tons	100 tons	35 tons
524	100 tons	100 tons	100 tons	100 tons	69 tons	100 tons	100 tons	35 tons
525	100 tons	86 tons	100 tons	100 tons	68 tons	100 tons	76 tons	35 tons
525	100 tons	86 tons	100 tons	100 tons	70 tons	100 tons	76 tons	35 tons
526	100 tons	73 tons	100 tons	100 tons	70 tons	100 tons	59 tons	34 tons
526	100 tons	73 tons	100 tons	100 tons	71 tons	100 tons	59 tons	34 tons
527	100 tons	61 tons	100 tons	100 tons	76 tons	100 tons	45 tons	34 tons
527	100 tons	61 tons	100 tons	100 tons	75 tons	100 tons	45 tons	34 tons
528	100 tons	51 tons	100 tons	100 tons	80 tons	100 tons	86 tons	34 tons
528	100 tons	51 tons	100 tons	100 tons	80 tons	100 tons	86 tons	34 tons
529	100 tons	47 tons	100 tons	100 tons	85 tons	100 tons	82 tons	34 tons
529	100 tons	47 tons	100 tons	100 tons	80 tons	100 tons	82 tons	34 tons
530	100 tons	55 tons	100 tons	100 tons	85 tons	100 tons	87 tons	35 tons
603	100 tons	67 tons	100 tons	100 tons	77 tons	100 tons	100 tons	34 tons
604	100 tons	70 tons	100 tons	100 tons	81 tons	100 tons	100 tons	34 tons
604	100 tons	70 tons	100 tons	100 tons	100 tons	100 tons	100 tons	36 tons
605	100 tons	74 tons	100 tons	100 tons	100 tons	100 tons	100 tons	36 tons
605	100 tons	74 tons	100 tons	100 tons	100 tons	100 tons	100 tons	36 tons
606	100 tons	86 tons	100 tons	100 tons	100 tons	100 tons	100 tons	36 tons
606	100 tons	86 tons	100 tons	100 tons	100 tons	100 tons	100 tons	36 tons
607	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	38 tons
607	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	38 tons
608	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	38 tons
608	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	38 tons
609	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	39 tons
609	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	39 tons
610	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	40 tons
610	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	40 tons
611	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	44 tons
611	100 tons	100 tons	100 tons	99 tons	100 tons	100 tons	100 tons	44 tons
612	100 tons	98 tons	100 tons	87 tons	100 tons	86 tons	100 tons	46 tons
612	100 tons	98 tons	100 tons	87 tons	100 tons	86 tons	100 tons	46 tons

Continuous Table 5-11 Longitudinal Results for Inventory Rating (Standard HS) for Example 3

Capacity on Loading Rating								
	Capacity in tons							
NODE	service condition					strength check		
	top stress max	top stress min	bottom stress max	bottom stress min	web principle stress	moment max	moment min	web shear
613	100 tons	98 tons	100 tons	68 tons	100 tons	74 tons	100 tons	46 tons
613	100 tons	98 tons	100 tons	68 tons	100 tons	74 tons	100 tons	46 tons
614	100 tons	100 tons	100 tons	63 tons	100 tons	65 tons	100 tons	46 tons
614	100 tons	100 tons	100 tons	63 tons	100 tons	65 tons	100 tons	34 tons
615	100 tons	100 tons	100 tons	75 tons	100 tons	72 tons	100 tons	34 tons
615	100 tons	100 tons	100 tons	73 tons	100 tons	72 tons	100 tons	34 tons
616	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	34 tons
616	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	46 tons
617	100 tons	100 tons	100 tons	100 tons	73 tons	100 tons	100 tons	44 tons
617	100 tons	100 tons	100 tons	100 tons	64 tons	100 tons	100 tons	43 tons
700		100 tons	100 tons		58 tons	100 tons	100 tons	40 tons

Table 5-12 Transverse Results for Inventory Rating (Standard HS) for Example 3

project: Jeremiah Morrow Bridge
rating type: Inventory Load Rating

Summary of rating in the transverse direction

Load Rating Result Transverse

Minimum Capacity in Transverse
LOCATION OF MEMBER WITH MINIMUM
Minimum Capacity
30 tons Bottom Stress Controls

Minimum Capacity in Transverse
LOCATION OF MEMBER WITH MINIMUM
Minimum Capacity
33 tons Top Stress Controls

Capacity in Tons of Individual Members							
Plate #	Capacity in Tons at Top Slab on Deep Section						
	service condition				strength check		
	top stress max	top stress min	bottom stress max	bottom stress min	moment max	moment min	
y	75 tons	33 tons	100 tons	30 tons	31 tons	39 tons	
1	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	
2	100 tons	50 tons	100 tons	100 tons	100 tons	100 tons	
3	100 tons	34 tons	100 tons	100 tons	100 tons	100 tons	
4	100 tons	42 tons	100 tons	95 tons	100 tons	100 tons	
5	100 tons	51 tons	100 tons	96 tons	100 tons	100 tons	
6	100 tons	47 tons	100 tons	100 tons	100 tons	63 tons	
7	100 tons	51 tons	100 tons	100 tons	100 tons	59 tons	
8	100 tons	57 tons	100 tons	100 tons	100 tons	61 tons	
9	100 tons	65 tons	100 tons	100 tons	100 tons	68 tons	
10	100 tons	66 tons	100 tons	100 tons	100 tons	66 tons	
11	100 tons	60 tons	100 tons	100 tons	100 tons	60 tons	
12	100 tons	60 tons	100 tons	100 tons	100 tons	55 tons	
13	100 tons	76 tons	100 tons		69 tons	61 tons	
14	100 tons	50 tons	100 tons		20 tons	39 tons	
15	100 tons	62 tons	100 tons		21 tons	49 tons	
16	100 tons	38 tons	100 tons	80 tons	100 tons	39 tons	
17	100 tons	37 tons	100 tons	75 tons	100 tons	39 tons	
18	100 tons	36 tons	100 tons	72 tons	100 tons	39 tons	
19	100 tons	35 tons	100 tons	70 tons	100 tons	40 tons	
20	100 tons	36 tons	100 tons	72 tons	100 tons	44 tons	
21	100 tons	49 tons	100 tons	77 tons	100 tons	66 tons	
22	100 tons	44 tons	100 tons	86 tons	99 tons	69 tons	
23	100 tons	35 tons	100 tons	99 tons	100 tons	64 tons	
24	100 tons	36 tons	100 tons	42 tons	44 tons	74 tons	
25	91 tons	38 tons	100 tons	39 tons	39 tons	89 tons	
26	97 tons	40 tons	100 tons	43 tons	41 tons	100 tons	
27	84 tons	46 tons	100 tons	39 tons	35 tons	100 tons	
28	75 tons	78 tons	100 tons	35 tons	31 tons	100 tons	
29	90 tons	60 tons	100 tons	40 tons	38 tons	100 tons	
30	100 tons	60 tons	100 tons	49 tons	50 tons	100 tons	
31	83 tons	60 tons	100 tons	31 tons	35 tons	100 tons	
32	91 tons	60 tons	100 tons	30 tons	39 tons	85 tons	
33	100 tons	59 tons	100 tons	64 tons	94 tons	75 tons	
34	100 tons	66 tons	100 tons	52 tons	81 tons	79 tons	
35	100 tons	66 tons	100 tons	47 tons	76 tons	72 tons	
36	100 tons	50 tons	100 tons	48 tons	72 tons	53 tons	
37	100 tons	41 tons	100 tons	50 tons	66 tons	43 tons	
38	100 tons	39 tons	100 tons	55 tons	100 tons	40 tons	
39	100 tons	39 tons	100 tons	61 tons	100 tons	39 tons	
40	100 tons	40 tons	100 tons	68 tons	100 tons	39 tons	
41	100 tons	61 tons	100 tons		23 tons	48 tons	
42	100 tons	51 tons	100 tons		20 tons	39 tons	
43	100 tons	74 tons	100 tons		80 tons	60 tons	
44	100 tons	65 tons	100 tons	97 tons	100 tons	58 tons	
45	100 tons	65 tons	100 tons	100 tons	100 tons	63 tons	
46	100 tons	64 tons	100 tons	100 tons	100 tons	66 tons	
47	100 tons	64 tons	100 tons	100 tons	100 tons	68 tons	
48	100 tons	56 tons	100 tons	100 tons	100 tons	61 tons	
49	100 tons	50 tons	100 tons	100 tons	100 tons	58 tons	
50	100 tons	47 tons	100 tons	100 tons	100 tons	63 tons	
51	100 tons	50 tons	100 tons	100 tons	100 tons	100 tons	
52	100 tons	41 tons	100 tons	95 tons	100 tons	100 tons	
53	100 tons	33 tons	100 tons	100 tons	100 tons	100 tons	
54	100 tons	49 tons	100 tons	100 tons	100 tons	100 tons	
55	100 tons	62 tons	100 tons	100 tons	100 tons	100 tons	

Capacity in Tons of Individual Members							
Plate #	Capacity in Tons at Top Slab on Shallow Section						
	service condition				strength check		
	top stress max	top stress min	bottom stress max	bottom stress min	moment max	moment min	
y	82 tons	33 tons	100 tons	37 tons	35 tons	39 tons	
1	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	
2	100 tons	50 tons	100 tons	100 tons	100 tons	100 tons	
3	100 tons	34 tons	100 tons	100 tons	100 tons	100 tons	
4	100 tons	42 tons	100 tons	95 tons	100 tons	100 tons	
5	100 tons	51 tons	100 tons	95 tons	100 tons	100 tons	
6	100 tons	47 tons	100 tons	100 tons	100 tons	63 tons	
7	100 tons	50 tons	100 tons	100 tons	100 tons	58 tons	
8	100 tons	57 tons	100 tons	100 tons	100 tons	61 tons	
9	100 tons	65 tons	100 tons	100 tons	100 tons	68 tons	
10	100 tons	65 tons	100 tons	100 tons	100 tons	66 tons	
11	100 tons	59 tons	100 tons	100 tons	100 tons	59 tons	
12	100 tons	60 tons	100 tons	100 tons	100 tons	55 tons	
13	100 tons	76 tons	100 tons		76 tons	61 tons	
14	100 tons	51 tons	100 tons		21 tons	39 tons	
15	100 tons	64 tons	100 tons		23 tons	49 tons	
16	100 tons	40 tons	100 tons	82 tons	100 tons	40 tons	
17	100 tons	39 tons	100 tons	76 tons	100 tons	40 tons	
18	100 tons	37 tons	100 tons	73 tons	100 tons	40 tons	
19	100 tons	37 tons	100 tons	71 tons	100 tons	40 tons	
20	100 tons	38 tons	100 tons	73 tons	100 tons	45 tons	
21	100 tons	52 tons	100 tons	79 tons	100 tons	68 tons	
22	100 tons	53 tons	100 tons	87 tons	100 tons	81 tons	
23	100 tons	42 tons	100 tons	100 tons	100 tons	76 tons	
24	100 tons	44 tons	100 tons	47 tons	49 tons	90 tons	
25	100 tons	46 tons	100 tons	43 tons	43 tons	100 tons	
26	100 tons	49 tons	100 tons	45 tons	43 tons	100 tons	
27	93 tons	55 tons	100 tons	43 tons	39 tons	100 tons	
28	82 tons	100 tons	100 tons	38 tons	35 tons	100 tons	
29	100 tons	69 tons	100 tons	46 tons	43 tons	100 tons	
30	100 tons	67 tons	100 tons	53 tons	54 tons	100 tons	
31	94 tons	66 tons	100 tons	37 tons	40 tons	100 tons	
32	100 tons	65 tons	100 tons	38 tons	45 tons	99 tons	
33	100 tons	64 tons	100 tons	78 tons	100 tons	86 tons	
34	100 tons	72 tons	100 tons	62 tons	90 tons	90 tons	
35	100 tons	64 tons	100 tons	57 tons	85 tons	72 tons	
36	100 tons	49 tons	100 tons	57 tons	100 tons	54 tons	
37	100 tons	41 tons	100 tons	59 tons	100 tons	43 tons	
38	100 tons	39 tons	100 tons	64 tons	100 tons	40 tons	
39	100 tons	39 tons	100 tons	70 tons	100 tons	39 tons	
40	100 tons	40 tons	100 tons	78 tons	100 tons	40 tons	
41	100 tons	62 tons	100 tons		24 tons	48 tons	
42	100 tons	52 tons	100 tons		23 tons	40 tons	
43	100 tons	75 tons	100 tons		91 tons	60 tons	
44	100 tons	64 tons	100 tons	100 tons	100 tons	56 tons	
45	100 tons	64 tons	100 tons	100 tons	100 tons	61 tons	
46	100 tons	64 tons	100 tons	100 tons	100 tons	66 tons	
47	100 tons	64 tons	100 tons	100 tons	100 tons	68 tons	
48	100 tons	56 tons	100 tons	100 tons	100 tons	61 tons	
49	100 tons	50 tons	100 tons	100 tons	100 tons	58 tons	
50	100 tons	47 tons	100 tons	100 tons	100 tons	63 tons	
51	100 tons	50 tons	100 tons	100 tons	100 tons	100 tons	
52	100 tons	41 tons	100 tons	95 tons	100 tons	100 tons	
53	100 tons	33 tons	100 tons	100 tons	100 tons	100 tons	
54	100 tons	48 tons	100 tons	100 tons	100 tons	100 tons	
55	100 tons	61 tons	100 tons	100 tons	100 tons	100 tons	

5.4. Example 4 - Operating Rating

In this is example, an operating rating is conducted using standard HS loading with a 0.0 kip/ft^2 future wearing surface load. The “User Input” sheet can be found in Tables 5-13. The longitudinal and transverse “Result Summary” sheets can be found in Tables 5-15 and 5-16, respectively.

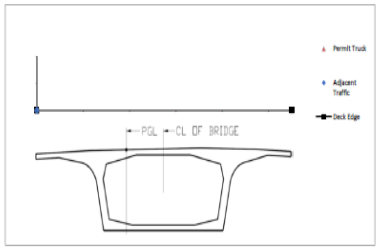
In this example, the controlling operating load rating is 41 tons shown in Table 5-14.

In Table 5-15, the minimum load rating in the longitudinal direction is 45 tons based on the web shear.

The minimum load rating for the shallow section is 47 tons in Table 5-17, controlled by bottom of slab stresses, and 41 tons for the deep section, based on bottom of slab stresses.

Table 5-13 User Input Sheet for Operating Rating (Standard HS) for Example 4

Project: Jeremiah Morrow Bridge Load Rating Performed on: 4/10/2018 14:55
Rating type: Operating Load Rating



User Input Sheet

User Input Data Cell Are In Bold and Red

unlock password

Are wheels of vehicle step outside of Barrier Curb? They are inside barrier curbs. So it is good !

wheel load definition for user-defined vehicle
(no need to input data if doing inventory or operating rating using standard HS load configuration)

Distance of Left most wheel of current HS25 to right most wheel of Permit Truck, Y =	N/A	Input 'N/A' @ Cell C13 Distance (4 ft min.) from the first Left most wheel load of current HS25 truck to last right most wheel load of permit truck. For no current load, set to be "N/A"
D_pgl - Distance from PGL (for permit truck)		This is the left most wheel (A) of Permit Truck - away from traffic direction, positive is to the right

total wheel load for permit load = 0.0 kips

	Da - axis position	0.00 ft																							
Dw - wheel position		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
0.00 ft	A																								
	B																								
	C																								
	D																								
	E																								
	F																								
	G																								
	H																								

The standard HS loading is used for this evaluation

Permit Evaluation is performed using operating criteria

User Input

	Factor	
IMPACT, long =	0.15	note: only specify impact for permit load case
IMPACT, trans =	0.3	for standard vehicle, impact is calculated as per AASHTO for longitudinal, always 0.3 for transverse
FUTURE WEARING SURFACE (lb/ft²) =	0	
TO FIND INVENTORY RATING, INPUT '1'	Rating type	
TO FIND OPERATING RATING INPUT '2'	2	Operating Rating
TO FIND PERMIT EVALUATION, INPUT '3'		
FOR INVENTORY OR OPERATING RATING, ENTER THE NUMBER OF LANES LOADED	3	Number of lanes is acceptable
NUMBER OF LANE OF ADJACENT NORMAL TRAFFIC CURRENT WITH PERMIT TRUCK	0	("0" for Inventory & Operating Rating as well as no current load with permit truck. "1" for one lane of current load with permit truck) Operating

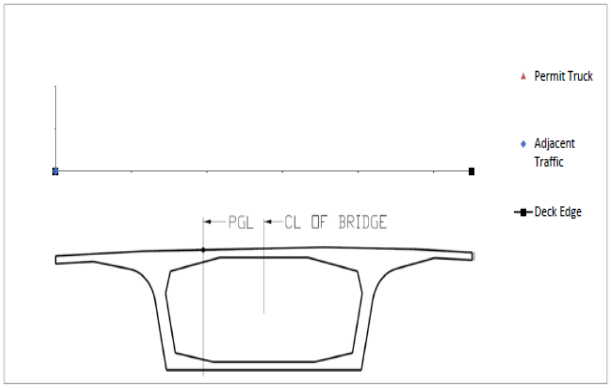
Table 5-14 Summary Results for Operating Rating (Standard HS) for Example 4

Project: Jeremiah Morrow Bridge

Rating Type: Operating Load Rating

Load Rating Performed on: 4/10/2018 14:55

No of Axles of Permit Vehicles =	N/A	axles
Total wheel load for permit vehicle =	N/A	kips
Rating Factor =	41.08	Tons



Wheel load definition for user-defined vehicle

Distance of Left most wheel of current HS25 to right most wheel of Permit Truck	N/A	Distance from the first Left most wheel load of current HS25 truck to last right most wheel load of permit truck. For no current load, set to be "N/A"
D_pgl - Distance from PGL (for permit truck)	0.00 ft	this is the left most wheel (A) of Permit Truck - away from traffic direction, positive is to the right

	Da - axis position	0.00 ft																							
Dw - wheel position		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
0.00 ft	A																									
	B																									
	C																									
	D																									
	E																									
	F																									
	G																									
	H																									

Permit Evaluation is performed using operating criteria

User Input	Factor	
IMPACT, long =	0.15	note: only specify impact for permit load case
IMPACT, trans =	0.3	for standard vehicle, impact is calculated as per AASHTO for longitudinal, always 0.3 for transverse
FUTURE WEARING SURFACE (lb/ft^2)=	0	
TO FIND INVENTORY RATING, INPUT '1'	Rating type	
TO FIND OPERATING RATING INPUT '2'	2	Operating Rating
TO FIND PERMIT EVALUATION, INPUT '3'		
FOR INVENTORY OR OPERATING RATING, ENTER THE NUMBER OF LANES LOADED	3	Number of lanes is acceptable
NUMBER OF LANE OF ADJACENT NORMAL TRAFFIC CURRENT WITH PERMIT TRUCK	0	("0" for Inventory & Operating Rating as well as no current load with permit truck. "1" for one lane of current load with permit truck) Operating

Table 5-15 Longitudinal Results for Operating Rating (Standard HS) for Example 4

project:	Jeremiah Morrow Bridge							
rating type:	Operating Load Rating							
summary of rating in the longitudinal direction								
Load Rating Result longitudinal								
Minimum Rating Factor In Longitudinal								
LOCATION OF MEMBER WITH MINIMUM								
Rating Factor								
45 tons		Web Shear Controls						
Capacity on Loading Rating								
	Capacity in tons							
NODE	service condition					strength check		
	top stress max	top stress min	bottom stress max	bottom stress min	web principle stress	moment max	moment min	web shear
summary	100 tons	76 tons	72 tons	63 tons	60 tons	100 tons	84 tons	45 tons
99					100 tons	100 tons	100 tons	100 tons
100		100 tons	100 tons		100 tons	100 tons	100 tons	100 tons
100		100 tons	100 tons		60 tons	100 tons	100 tons	100 tons
101	100 tons	100 tons	100 tons	100 tons	65 tons	100 tons	100 tons	51 tons
101	100 tons	100 tons	100 tons	100 tons	71 tons	100 tons	100 tons	53 tons
102	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	63 tons
102	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	63 tons
103	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	63 tons
103	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	45 tons
104	100 tons	100 tons	100 tons	81 tons	100 tons	100 tons	100 tons	45 tons
104	100 tons	100 tons	100 tons	81 tons	100 tons	100 tons	100 tons	45 tons
105	100 tons	100 tons	100 tons	71 tons	100 tons	100 tons	100 tons	45 tons
105	100 tons	100 tons	100 tons	71 tons	100 tons	100 tons	100 tons	45 tons
106	100 tons	100 tons	100 tons	78 tons	100 tons	100 tons	100 tons	45 tons
106	100 tons	100 tons	100 tons	78 tons	100 tons	100 tons	100 tons	45 tons
107	100 tons	100 tons	100 tons	76 tons	100 tons	100 tons	100 tons	45 tons
107	100 tons	100 tons	100 tons	76 tons	100 tons	100 tons	100 tons	63 tons
108	100 tons	100 tons	100 tons	86 tons	100 tons	100 tons	100 tons	54 tons
108	100 tons	100 tons	100 tons	86 tons	100 tons	100 tons	100 tons	54 tons
109	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	51 tons
109	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	51 tons
110	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	50 tons
110	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	50 tons
111	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	49 tons
111	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	50 tons
112	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	49 tons
112	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	50 tons
113	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	50 tons
113	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	51 tons
114	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	51 tons
114	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	51 tons
115	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	51 tons
115	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	54 tons
116	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	54 tons
116	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	55 tons
117	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	59 tons
117	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	50 tons
118	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	49 tons
203	100 tons	97 tons	81 tons	100 tons	100 tons	100 tons	100 tons	48 tons
204	100 tons	98 tons	84 tons	100 tons	100 tons	100 tons	100 tons	48 tons
204	100 tons	98 tons	83 tons	100 tons	100 tons	100 tons	100 tons	55 tons

Continuous Table 5-15 Longitudinal Results for Operating Rating (Standard HS) for Example 4

Capacity on Loading Rating								
	Capacity in tons							
NODE	service condition					strength check		
	top stress max	top stress min	bottom stress max	bottom stress min	web principle stress	moment max	moment min	web shear
205	100 tons	96 tons	82 tons	100 tons	100 tons	100 tons	100 tons	54 tons
205	100 tons	96 tons	82 tons	100 tons	100 tons	100 tons	100 tons	50 tons
206	100 tons	100 tons	88 tons	100 tons	100 tons	100 tons	100 tons	50 tons
206	100 tons	100 tons	88 tons	100 tons	100 tons	100 tons	100 tons	50 tons
207	100 tons	100 tons	97 tons	100 tons	100 tons	100 tons	100 tons	49 tons
207	100 tons	100 tons	97 tons	100 tons	100 tons	100 tons	100 tons	49 tons
208	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	49 tons
208	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	48 tons
209	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	48 tons
209	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	48 tons
210	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	48 tons
210	100 tons	100 tons	100 tons	100 tons	99 tons	100 tons	100 tons	48 tons
211	100 tons	100 tons	100 tons	100 tons	99 tons	100 tons	100 tons	49 tons
211	100 tons	100 tons	100 tons	100 tons	97 tons	100 tons	100 tons	48 tons
212	100 tons	100 tons	100 tons	100 tons	99 tons	100 tons	100 tons	50 tons
212	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	50 tons
213	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	55 tons
213	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	55 tons
214	100 tons	100 tons	100 tons	86 tons	100 tons	100 tons	100 tons	63 tons
214	100 tons	100 tons	100 tons	86 tons	100 tons	100 tons	100 tons	45 tons
215	100 tons	100 tons	100 tons	78 tons	100 tons	100 tons	100 tons	45 tons
215	100 tons	100 tons	100 tons	78 tons	100 tons	100 tons	100 tons	45 tons
216	100 tons	100 tons	100 tons	86 tons	100 tons	100 tons	100 tons	45 tons
216	100 tons	100 tons	100 tons	86 tons	100 tons	100 tons	100 tons	45 tons
217	100 tons	100 tons	100 tons	73 tons	100 tons	100 tons	100 tons	45 tons
217	100 tons	100 tons	100 tons	73 tons	100 tons	100 tons	100 tons	45 tons
218	100 tons	100 tons	100 tons	69 tons	100 tons	100 tons	100 tons	45 tons
218	100 tons	100 tons	100 tons	69 tons	100 tons	100 tons	100 tons	45 tons
219	100 tons	100 tons	100 tons	84 tons	100 tons	100 tons	100 tons	45 tons
219	100 tons	100 tons	100 tons	84 tons	100 tons	100 tons	100 tons	45 tons
220	100 tons	100 tons	100 tons	88 tons	100 tons	100 tons	100 tons	45 tons
220	100 tons	100 tons	100 tons	88 tons	100 tons	100 tons	100 tons	63 tons
221	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	60 tons
221	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	59 tons
222	100 tons	100 tons	100 tons	100 tons	99 tons	100 tons	100 tons	50 tons
222	100 tons	100 tons	100 tons	100 tons	97 tons	100 tons	100 tons	51 tons
223	100 tons	100 tons	100 tons	100 tons	95 tons	100 tons	100 tons	49 tons
223	100 tons	100 tons	100 tons	100 tons	91 tons	100 tons	100 tons	49 tons
224	100 tons	100 tons	100 tons	100 tons	91 tons	100 tons	100 tons	48 tons
224	100 tons	100 tons	100 tons	100 tons	92 tons	100 tons	100 tons	48 tons
225	100 tons	100 tons	100 tons	100 tons	95 tons	100 tons	100 tons	46 tons
225	100 tons	100 tons	100 tons	100 tons	95 tons	100 tons	100 tons	48 tons
226	100 tons	100 tons	100 tons	100 tons	99 tons	100 tons	100 tons	46 tons
226	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	48 tons
227	100 tons	89 tons	95 tons	100 tons	100 tons	100 tons	100 tons	48 tons
227	100 tons	89 tons	95 tons	100 tons	100 tons	100 tons	100 tons	49 tons
228	100 tons	84 tons	87 tons	100 tons	100 tons	100 tons	100 tons	49 tons
228	100 tons	84 tons	87 tons	100 tons	100 tons	100 tons	100 tons	49 tons
229	100 tons	79 tons	80 tons	100 tons	100 tons	100 tons	100 tons	49 tons
229	100 tons	79 tons	80 tons	100 tons	100 tons	100 tons	100 tons	50 tons
230	100 tons	80 tons	79 tons	100 tons	100 tons	100 tons	100 tons	51 tons
230	100 tons	80 tons	79 tons	100 tons	100 tons	100 tons	100 tons	53 tons
231	100 tons	91 tons	81 tons	100 tons	100 tons	100 tons	100 tons	55 tons
231	100 tons	91 tons	81 tons	100 tons	100 tons	100 tons	100 tons	48 tons
232	100 tons	78 tons	76 tons	100 tons	100 tons	100 tons	100 tons	48 tons
303	100 tons	87 tons	86 tons	100 tons	100 tons	100 tons	100 tons	48 tons
304	100 tons	90 tons	90 tons	100 tons	100 tons	100 tons	100 tons	48 tons
304	100 tons	90 tons	89 tons	100 tons	100 tons	100 tons	100 tons	54 tons
305	100 tons	89 tons	89 tons	100 tons	100 tons	100 tons	100 tons	53 tons
305	100 tons	89 tons	89 tons	100 tons	100 tons	100 tons	100 tons	49 tons
306	100 tons	94 tons	94 tons	100 tons	100 tons	100 tons	100 tons	49 tons

Continuous Table 5-15 Longitudinal Results for Operating Rating (Standard HS) for Example 4

Capacity on Loading Rating								
	Capacity in tons							
NODE	service condition					strength check		
	top stress max	top stress min	bottom stress max	bottom stress min	web principle stress	moment max	moment min	web shear
306	100 tons	94 tons	95 tons	100 tons	100 tons	100 tons	100 tons	49 tons
307	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	49 tons
307	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	49 tons
308	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	48 tons
308	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	48 tons
309	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	46 tons
309	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	46 tons
310	100 tons	100 tons	100 tons	100 tons	97 tons	100 tons	100 tons	48 tons
310	100 tons	100 tons	100 tons	100 tons	96 tons	100 tons	100 tons	46 tons
311	100 tons	100 tons	100 tons	100 tons	96 tons	100 tons	100 tons	48 tons
311	100 tons	100 tons	100 tons	100 tons	95 tons	100 tons	100 tons	48 tons
312	100 tons	100 tons	100 tons	100 tons	97 tons	100 tons	100 tons	49 tons
312	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	49 tons
313	100 tons	100 tons	100 tons	98 tons	100 tons	100 tons	100 tons	54 tons
313	100 tons	100 tons	100 tons	98 tons	100 tons	100 tons	100 tons	54 tons
314	100 tons	100 tons	100 tons	76 tons	100 tons	100 tons	100 tons	63 tons
314	100 tons	100 tons	100 tons	76 tons	100 tons	100 tons	100 tons	45 tons
315	100 tons	100 tons	100 tons	67 tons	100 tons	100 tons	100 tons	45 tons
315	100 tons	100 tons	100 tons	67 tons	100 tons	100 tons	100 tons	45 tons
316	100 tons	100 tons	100 tons	72 tons	100 tons	100 tons	100 tons	45 tons
316	100 tons	100 tons	100 tons	72 tons	100 tons	100 tons	100 tons	45 tons
317	100 tons	100 tons	100 tons	63 tons	100 tons	100 tons	100 tons	45 tons
317	100 tons	100 tons	100 tons	63 tons	100 tons	100 tons	100 tons	45 tons
318	100 tons	100 tons	100 tons	66 tons	100 tons	100 tons	100 tons	45 tons
318	100 tons	100 tons	100 tons	66 tons	100 tons	100 tons	100 tons	45 tons
319	100 tons	100 tons	100 tons	81 tons	100 tons	100 tons	100 tons	45 tons
319	100 tons	100 tons	100 tons	81 tons	100 tons	100 tons	100 tons	45 tons
320	100 tons	100 tons	100 tons	83 tons	100 tons	100 tons	100 tons	45 tons
320	100 tons	100 tons	100 tons	83 tons	100 tons	100 tons	100 tons	63 tons
321	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	61 tons
321	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	59 tons
322	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	50 tons
322	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	51 tons
323	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	49 tons
323	100 tons	100 tons	100 tons	100 tons	97 tons	100 tons	100 tons	49 tons
324	100 tons	100 tons	100 tons	100 tons	97 tons	100 tons	100 tons	48 tons
324	100 tons	100 tons	100 tons	100 tons	99 tons	100 tons	100 tons	48 tons
325	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	46 tons
325	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	48 tons
326	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	46 tons
326	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	48 tons
327	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	48 tons
327	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	49 tons
328	100 tons	97 tons	95 tons	100 tons	100 tons	100 tons	100 tons	49 tons
328	100 tons	97 tons	95 tons	100 tons	100 tons	100 tons	100 tons	49 tons
329	100 tons	91 tons	88 tons	100 tons	100 tons	100 tons	100 tons	50 tons
329	100 tons	91 tons	88 tons	100 tons	100 tons	100 tons	100 tons	51 tons
330	100 tons	91 tons	87 tons	100 tons	100 tons	100 tons	100 tons	51 tons
330	100 tons	91 tons	86 tons	100 tons	100 tons	100 tons	100 tons	53 tons
331	100 tons	100 tons	88 tons	100 tons	100 tons	100 tons	100 tons	56 tons
331	100 tons	100 tons	89 tons	100 tons	100 tons	100 tons	100 tons	49 tons
332	100 tons	89 tons	83 tons	100 tons	100 tons	100 tons	100 tons	48 tons
403	100 tons	79 tons	72 tons	100 tons	100 tons	100 tons	100 tons	48 tons
404	100 tons	80 tons	75 tons	100 tons	100 tons	100 tons	100 tons	48 tons
404	100 tons	80 tons	74 tons	100 tons	100 tons	100 tons	100 tons	54 tons
405	100 tons	76 tons	73 tons	100 tons	100 tons	100 tons	100 tons	53 tons
405	100 tons	76 tons	73 tons	100 tons	100 tons	100 tons	100 tons	50 tons
406	100 tons	80 tons	77 tons	100 tons	100 tons	100 tons	100 tons	49 tons
406	100 tons	80 tons	77 tons	100 tons	100 tons	100 tons	100 tons	49 tons
407	100 tons	85 tons	85 tons	100 tons	100 tons	100 tons	100 tons	49 tons
407	100 tons	85 tons	85 tons	100 tons	100 tons	100 tons	100 tons	49 tons

Continuous Table 5-15 Longitudinal Results for Operating Rating (Standard HS) for Example 4

Capacity on Loading Rating								
	Capacity in tons							
NODE	service condition					strength check		
	top stress max	top stress min	bottom stress max	bottom stress min	web principle stress	moment max	moment min	web shear
408	100 tons	92 tons	97 tons	100 tons	100 tons	100 tons	100 tons	48 tons
408	100 tons	92 tons	97 tons	100 tons	100 tons	100 tons	100 tons	48 tons
409	100 tons	100 tons	100 tons	100 tons	94 tons	100 tons	100 tons	46 tons
409	100 tons	100 tons	100 tons	100 tons	95 tons	100 tons	100 tons	46 tons
410	100 tons	100 tons	100 tons	100 tons	90 tons	100 tons	100 tons	48 tons
410	100 tons	100 tons	100 tons	100 tons	87 tons	100 tons	100 tons	46 tons
411	100 tons	100 tons	100 tons	100 tons	86 tons	100 tons	100 tons	48 tons
411	100 tons	100 tons	100 tons	100 tons	85 tons	100 tons	100 tons	48 tons
412	100 tons	100 tons	100 tons	100 tons	86 tons	100 tons	100 tons	49 tons
412	100 tons	100 tons	100 tons	100 tons	89 tons	100 tons	100 tons	49 tons
413	100 tons	100 tons	100 tons	100 tons	97 tons	100 tons	100 tons	53 tons
413	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	53 tons
414	100 tons	100 tons	100 tons	92 tons	100 tons	100 tons	100 tons	63 tons
414	100 tons	100 tons	100 tons	92 tons	100 tons	100 tons	100 tons	45 tons
415	100 tons	100 tons	100 tons	79 tons	100 tons	100 tons	100 tons	45 tons
415	100 tons	100 tons	100 tons	79 tons	100 tons	100 tons	100 tons	45 tons
416	100 tons	100 tons	100 tons	83 tons	100 tons	100 tons	100 tons	45 tons
416	100 tons	100 tons	100 tons	83 tons	100 tons	100 tons	100 tons	45 tons
417	100 tons	100 tons	100 tons	69 tons	100 tons	100 tons	100 tons	45 tons
417	100 tons	100 tons	100 tons	69 tons	100 tons	100 tons	100 tons	45 tons
418	100 tons	100 tons	100 tons	67 tons	100 tons	100 tons	100 tons	45 tons
418	100 tons	100 tons	100 tons	67 tons	100 tons	100 tons	100 tons	45 tons
419	100 tons	100 tons	100 tons	81 tons	100 tons	100 tons	100 tons	45 tons
419	100 tons	100 tons	100 tons	81 tons	100 tons	100 tons	100 tons	45 tons
420	100 tons	100 tons	100 tons	80 tons	100 tons	100 tons	100 tons	45 tons
420	100 tons	100 tons	100 tons	80 tons	100 tons	100 tons	100 tons	63 tons
421	100 tons	100 tons	100 tons	93 tons	100 tons	100 tons	100 tons	63 tons
421	100 tons	100 tons	100 tons	93 tons	100 tons	100 tons	100 tons	61 tons
422	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	51 tons
422	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	53 tons
423	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	49 tons
423	100 tons	100 tons	100 tons	100 tons	96 tons	100 tons	100 tons	49 tons
424	100 tons	100 tons	100 tons	100 tons	96 tons	100 tons	100 tons	48 tons
424	100 tons	100 tons	100 tons	100 tons	97 tons	100 tons	100 tons	49 tons
425	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	48 tons
425	100 tons	100 tons	100 tons	100 tons	99 tons	100 tons	100 tons	48 tons
426	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	46 tons
426	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	48 tons
427	100 tons	100 tons	98 tons	100 tons	100 tons	100 tons	100 tons	48 tons
427	100 tons	100 tons	98 tons	100 tons	100 tons	100 tons	100 tons	49 tons
428	100 tons	99 tons	90 tons	100 tons	100 tons	100 tons	100 tons	49 tons
428	100 tons	99 tons	90 tons	100 tons	100 tons	100 tons	100 tons	50 tons
429	100 tons	93 tons	83 tons	100 tons	100 tons	100 tons	100 tons	50 tons
429	100 tons	93 tons	83 tons	100 tons	100 tons	100 tons	100 tons	51 tons
430	100 tons	93 tons	82 tons	100 tons	100 tons	100 tons	100 tons	53 tons
430	100 tons	93 tons	82 tons	100 tons	100 tons	100 tons	100 tons	54 tons
431	100 tons	100 tons	84 tons	100 tons	100 tons	100 tons	100 tons	56 tons
431	100 tons	100 tons	84 tons	100 tons	100 tons	100 tons	100 tons	49 tons
432	100 tons	91 tons	79 tons	100 tons	100 tons	100 tons	100 tons	48 tons
503	100 tons	92 tons	80 tons	100 tons	100 tons	100 tons	100 tons	49 tons
504	100 tons	93 tons	83 tons	100 tons	100 tons	100 tons	100 tons	49 tons
504	100 tons	93 tons	83 tons	100 tons	100 tons	100 tons	100 tons	56 tons
505	100 tons	89 tons	80 tons	100 tons	100 tons	100 tons	100 tons	55 tons
505	100 tons	89 tons	80 tons	100 tons	100 tons	100 tons	100 tons	51 tons
506	100 tons	94 tons	84 tons	100 tons	100 tons	100 tons	100 tons	51 tons
506	100 tons	94 tons	84 tons	100 tons	100 tons	100 tons	100 tons	51 tons
507	100 tons	99 tons	91 tons	100 tons	100 tons	100 tons	100 tons	50 tons
507	100 tons	99 tons	91 tons	100 tons	100 tons	100 tons	100 tons	50 tons
508	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	50 tons
508	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	49 tons
509	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	49 tons

Continuous Table 5-15 Longitudinal Results for Operating Rating (Standard HS) for Example 4

Capacity on Loading Rating								
	Capacity in tons							
NODE	service condition					strength check		
	top stress max	top stress min	bottom stress max	bottom stress min	web principle stress	moment max	moment min	web shear
509	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	49 tons
510	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	49 tons
510	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	49 tons
511	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	50 tons
511	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	49 tons
512	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	51 tons
512	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	51 tons
513	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	56 tons
513	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	56 tons
514	100 tons	100 tons	100 tons	83 tons	100 tons	100 tons	100 tons	63 tons
514	100 tons	100 tons	100 tons	83 tons	100 tons	100 tons	100 tons	45 tons
515	100 tons	100 tons	100 tons	80 tons	100 tons	100 tons	100 tons	45 tons
515	100 tons	100 tons	100 tons	80 tons	100 tons	100 tons	100 tons	45 tons
516	100 tons	100 tons	100 tons	90 tons	100 tons	100 tons	100 tons	45 tons
516	100 tons	100 tons	100 tons	90 tons	100 tons	100 tons	100 tons	45 tons
517	100 tons	100 tons	100 tons	83 tons	100 tons	100 tons	100 tons	45 tons
517	100 tons	100 tons	100 tons	83 tons	100 tons	100 tons	100 tons	45 tons
518	100 tons	100 tons	100 tons	88 tons	100 tons	100 tons	100 tons	45 tons
518	100 tons	100 tons	100 tons	88 tons	100 tons	100 tons	100 tons	45 tons
519	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	45 tons
519	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	63 tons
520	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	63 tons
520	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	63 tons
521	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	63 tons
521	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	63 tons
522	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	61 tons
522	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	61 tons
523	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	54 tons
523	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	55 tons
524	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	51 tons
524	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	51 tons
525	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	50 tons
525	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	50 tons
526	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	49 tons
526	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	50 tons
527	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	84 tons	49 tons
527	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	84 tons	49 tons
528	100 tons	91 tons	100 tons	100 tons	100 tons	100 tons	100 tons	49 tons
528	100 tons	91 tons	100 tons	100 tons	100 tons	100 tons	100 tons	49 tons
529	100 tons	84 tons	100 tons	100 tons	100 tons	100 tons	100 tons	49 tons
529	100 tons	84 tons	100 tons	100 tons	100 tons	100 tons	100 tons	50 tons
530	100 tons	91 tons	100 tons	100 tons	100 tons	100 tons	100 tons	50 tons
603	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	48 tons
604	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	49 tons
604	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	53 tons
605	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	53 tons
605	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	51 tons
606	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	51 tons
606	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	53 tons
607	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	53 tons
607	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	53 tons
608	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	55 tons
608	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	53 tons
609	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	55 tons
609	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	55 tons
610	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	59 tons
610	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	58 tons
611	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	63 tons
611	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	63 tons
612	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	63 tons
612	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	63 tons

Continuous Table 5-15 Longitudinal Results for Operating Rating (Standard HS) for Example 4

Capacity on Loading Rating								
	Capacity in tons							
NODE	service condition					strength check		
	top stress max	top stress min	bottom stress max	bottom stress min	web principle stress	moment max	moment min	web shear
613	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	63 tons
613	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	63 tons
614	100 tons	100 tons	100 tons	97 tons	100 tons	100 tons	100 tons	63 tons
614	100 tons	100 tons	100 tons	97 tons	100 tons	100 tons	100 tons	45 tons
615	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	45 tons
615	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	45 tons
616	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	45 tons
616	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	63 tons
617	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons	63 tons
617	100 tons	100 tons	100 tons	100 tons	99 tons	100 tons	100 tons	63 tons
700		100 tons	100 tons		92 tons	100 tons	100 tons	63 tons

Table 5-16 Transverse Results for Operating Rating (Standard HS) for Example 4

project: Jeremiah Morrow Bridge
rating type: Operating Load Rating

Summary of rating in the transverse direction

Load Rating Result Transverse

Minimum Capacity in Transverse
LOCATION OF MEMBER WITH MINIMUM
Minimum Capacity
41 tons Bottom Stress Controls

Minimum Capacity in Transverse
LOCATION OF MEMBER WITH MINIMUM
Minimum Capacity
47 tons Bottom Stress Controls

Capacity in Tons of Individual Members						
Plate #	Capacity in Tons at Top Slab on Deep Section					
	service condition				strength check	
	top stress max	top stress min	bottom stress max	bottom stress min	moment max	moment min
y	75 tons	52 tons	100 tons	41 tons	53 tons	65 tons
1	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons
2	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons
3	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons
4	100 tons	90 tons	100 tons	100 tons	100 tons	100 tons
5	100 tons	81 tons	100 tons	100 tons	100 tons	100 tons
6	100 tons	66 tons	100 tons	100 tons	100 tons	100 tons
7	100 tons	70 tons	100 tons	100 tons	100 tons	97 tons
8	100 tons	81 tons	100 tons	100 tons	100 tons	100 tons
9	100 tons	95 tons	100 tons	100 tons	100 tons	100 tons
10	100 tons	98 tons	100 tons	100 tons	100 tons	100 tons
11	100 tons	92 tons	100 tons	100 tons	100 tons	100 tons
12	100 tons	91 tons	100 tons	100 tons	100 tons	92 tons
13	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons
14	100 tons	67 tons	100 tons	50 tons	34 tons	65 tons
15	100 tons	84 tons	100 tons	54 tons	36 tons	81 tons
16	100 tons	61 tons	100 tons	100 tons	100 tons	66 tons
17	100 tons	58 tons	100 tons	100 tons	100 tons	65 tons
18	100 tons	55 tons	100 tons	100 tons	100 tons	65 tons
19	100 tons	52 tons	100 tons	100 tons	100 tons	66 tons
20	100 tons	54 tons	100 tons	100 tons	100 tons	74 tons
21	100 tons	73 tons	100 tons	100 tons	100 tons	100 tons
22	100 tons	65 tons	100 tons	100 tons	100 tons	100 tons
23	100 tons	54 tons	100 tons	100 tons	100 tons	100 tons
24	100 tons	59 tons	100 tons	54 tons	72 tons	100 tons
25	91 tons	66 tons	100 tons	49 tons	65 tons	100 tons
26	97 tons	78 tons	100 tons	54 tons	69 tons	100 tons
27	84 tons	100 tons	100 tons	48 tons	60 tons	100 tons
28	75 tons	100 tons	100 tons	42 tons	53 tons	100 tons
29	90 tons	100 tons	100 tons	50 tons	64 tons	100 tons
30	100 tons	97 tons	100 tons	62 tons	84 tons	100 tons
31	83 tons	88 tons	100 tons	41 tons	59 tons	100 tons
32	91 tons	83 tons	100 tons	42 tons	64 tons	100 tons
33	100 tons	78 tons	100 tons	95 tons	100 tons	100 tons
34	100 tons	88 tons	100 tons	85 tons	100 tons	100 tons
35	100 tons	89 tons	100 tons	90 tons	100 tons	100 tons
36	100 tons	69 tons	100 tons	100 tons	100 tons	89 tons
37	100 tons	59 tons	100 tons	100 tons	100 tons	71 tons
38	100 tons	58 tons	100 tons	100 tons	100 tons	66 tons
39	100 tons	59 tons	100 tons	100 tons	100 tons	65 tons
40	100 tons	62 tons	100 tons	100 tons	100 tons	66 tons
41	100 tons	82 tons	100 tons	55 tons	38 tons	79 tons
42	100 tons	68 tons	100 tons	49 tons	34 tons	66 tons
43	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons
44	100 tons	96 tons	100 tons	100 tons	100 tons	96 tons
45	100 tons	97 tons	100 tons	100 tons	100 tons	100 tons
46	100 tons	97 tons	100 tons	100 tons	100 tons	100 tons
47	100 tons	94 tons	100 tons	100 tons	100 tons	100 tons
48	100 tons	80 tons	100 tons	100 tons	100 tons	100 tons
49	100 tons	70 tons	100 tons	100 tons	100 tons	97 tons
50	100 tons	65 tons	100 tons	100 tons	100 tons	100 tons
51	100 tons	80 tons	100 tons	100 tons	100 tons	100 tons
52	100 tons	89 tons	100 tons	100 tons	100 tons	100 tons
53	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons
54	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons
55	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons

Capacity in Tons of Individual Members						
Plate #	Capacity in Tons at Top Slab on Shallow Section					
	service condition				strength check	
	top stress max	top stress min	bottom stress max	bottom stress min	moment max	moment min
y	82 tons	54 tons	100 tons	47 tons	59 tons	66 tons
1	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons
2	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons
3	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons
4	100 tons	89 tons	100 tons	100 tons	100 tons	100 tons
5	100 tons	81 tons	100 tons	100 tons	100 tons	100 tons
6	100 tons	66 tons	100 tons	100 tons	100 tons	100 tons
7	100 tons	70 tons	100 tons	100 tons	100 tons	97 tons
8	100 tons	81 tons	100 tons	100 tons	100 tons	100 tons
9	100 tons	95 tons	100 tons	100 tons	100 tons	100 tons
10	100 tons	98 tons	100 tons	100 tons	100 tons	100 tons
11	100 tons	92 tons	100 tons	100 tons	100 tons	99 tons
12	100 tons	91 tons	100 tons	100 tons	100 tons	91 tons
13	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons
14	100 tons	68 tons	100 tons	52 tons	35 tons	66 tons
15	100 tons	86 tons	100 tons	56 tons	38 tons	82 tons
16	100 tons	63 tons	100 tons	100 tons	100 tons	68 tons
17	100 tons	60 tons	100 tons	100 tons	100 tons	68 tons
18	100 tons	57 tons	100 tons	100 tons	100 tons	66 tons
19	100 tons	54 tons	100 tons	100 tons	100 tons	69 tons
20	100 tons	56 tons	100 tons	100 tons	100 tons	75 tons
21	100 tons	76 tons	100 tons	100 tons	100 tons	100 tons
22	100 tons	78 tons	100 tons	100 tons	100 tons	100 tons
23	100 tons	65 tons	100 tons	100 tons	100 tons	100 tons
24	100 tons	71 tons	100 tons	60 tons	81 tons	100 tons
25	100 tons	80 tons	100 tons	54 tons	71 tons	100 tons
26	100 tons	96 tons	100 tons	56 tons	72 tons	100 tons
27	93 tons	100 tons	100 tons	53 tons	66 tons	100 tons
28	82 tons	100 tons	100 tons	47 tons	59 tons	100 tons
29	100 tons	100 tons	100 tons	57 tons	72 tons	100 tons
30	100 tons	100 tons	100 tons	68 tons	90 tons	100 tons
31	94 tons	100 tons	100 tons	48 tons	66 tons	100 tons
32	100 tons	92 tons	100 tons	52 tons	76 tons	100 tons
33	100 tons	87 tons	100 tons	100 tons	100 tons	100 tons
34	100 tons	97 tons	100 tons	97 tons	100 tons	100 tons
35	100 tons	88 tons	100 tons	100 tons	100 tons	100 tons
36	100 tons	69 tons	100 tons	100 tons	100 tons	89 tons
37	100 tons	59 tons	100 tons	100 tons	100 tons	71 tons
38	100 tons	58 tons	100 tons	100 tons	100 tons	68 tons
39	100 tons	60 tons	100 tons	100 tons	100 tons	66 tons
40	100 tons	63 tons	100 tons	100 tons	100 tons	66 tons
41	100 tons	83 tons	100 tons	60 tons	41 tons	80 tons
42	100 tons	69 tons	100 tons	54 tons	38 tons	66 tons
43	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons
44	100 tons	95 tons	100 tons	100 tons	100 tons	95 tons
45	100 tons	97 tons	100 tons	100 tons	100 tons	100 tons
46	100 tons	97 tons	100 tons	100 tons	100 tons	100 tons
47	100 tons	94 tons	100 tons	100 tons	100 tons	100 tons
48	100 tons	80 tons	100 tons	100 tons	100 tons	100 tons
49	100 tons	70 tons	100 tons	100 tons	100 tons	97 tons
50	100 tons	65 tons	100 tons	100 tons	100 tons	100 tons
51	100 tons	80 tons	100 tons	100 tons	100 tons	100 tons
52	100 tons	89 tons	100 tons	100 tons	100 tons	100 tons
53	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons
54	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons
55	100 tons	100 tons	100 tons	100 tons	100 tons	100 tons

6.0 LOAD RATING

6.1 Load Rating Assumptions and Summary

The following load rating results for this bridge is based on the contract design drawings. Other assumptions in the ratings are as follows.

- AASHTO HS load (both truck load and lane load have been checked) are placed, four lanes for inventory rating and three lanes for operating rating.
- The maximum impact factor, 0.30, was used for transverse design. The impact factor for longitudinal design follows the guideline in AASHTO chapter 3.
- The bridge is rated assuming 30 years in service (long term effect) and in conjunction with a 0.0 kip/ft^2 future wearing surface load.
- The AASHTO multi-lane load reduction factor (AASHTO 3.12) has been used.

A re-evaluation of the inventory rating is required when the loading or the structure changes. A possible loading change would be the addition of an overlay. A structural change could result with damage, repair, or deterioration of a structural member.

INVENTORY RATING	
LOAD CASE	RATING OF THE STRUCTURE
Longitudinal	30
Transverse	30
Controlling	**30**

OPERATING RATING	
LOAD CASE	RATING OF THE STRUCTURE
Longitudinal	45
Transverse	41
Controlling	**41**

6.2 Load Rating Observations

The load rating results on permit vehicle (user defined) indicate that the bridge has plenty of capacity in the longitudinal direction if permit truck passes the bridge without adjacent normal traffic. The controlling for load rating is in transverse direction. This matches with experience that for a long span concrete bridge, such as Jeremiah Morrow Bridge. Since the majority of the load in longitudinal direction are from dead load, therefore, live load rating of permit truck in the longitudinal direction may not control. On the other hand, live load contributes to the majority of loads in transverse direction and will be the controlling case. However, transverse rating is not necessary controlling if the permit truck is with adjacent normal traffic because of increasing live loads.

In the transverse direction, the controlling load case typically happens at local level, meaning controlled by a wheel load or a set of closely placed wheel loads. Also, the deck bending is very sensitive to the load location.

The above observations are important for load permitting process. Attention shall be paid to avoid (or carefully check) large concentrated loads. Also, modifying the vehicle path (offset from the PGL) and distance "Y" between permit truck and adjacent traffic can significantly reduce the deck moment.

It is recommended that user shall use the load rating spreadsheets to run the actual rating if the vehicle is different from HS25 with a wheel heavier than 19 kips. The reason is because deck bending is very sensitive to the load location and its concentrated loading. After the user has determined the wheel position, one shall use the load rating spreadsheet to run the actual rating.

7.0 REFERENCES

[1] *AASHTO Manual for Condition Evaluation of Bridges*, 1994 Second Edition, with 1995, 1996, 1998 and 2000 Interim Revisions.

[2] *AASHTO Standard Specifications for Highway Bridges*, 17th Edition

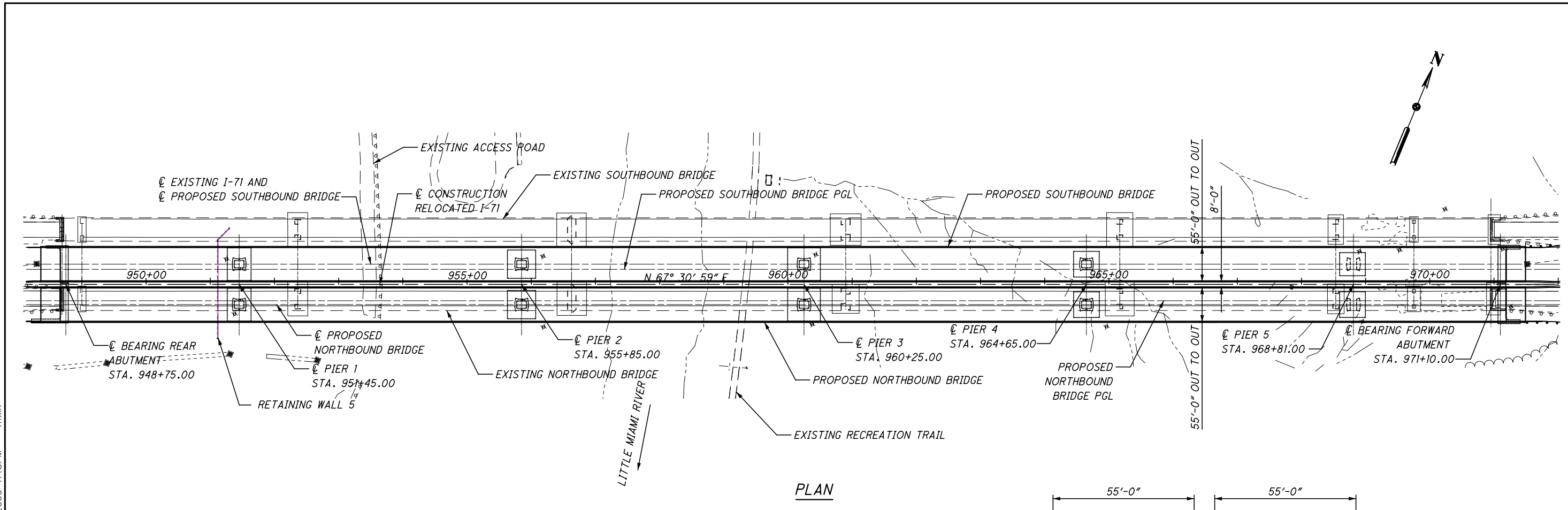
[3] *AASHTO LRFD Bridge Design Specifications, 4th Edition 200, with 2008 Interim Provisions*

[4] *AASHTO Guide Specifications for Segmental Bridges, 3.*

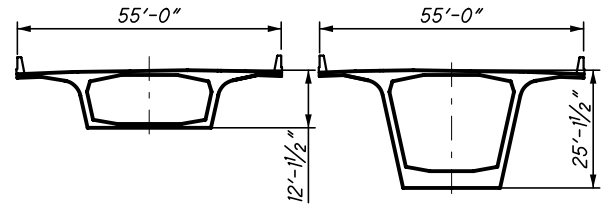
[5] *Construction and Design of Prestressed Concrete Segmental Bridges, Walter Podolny Jr., Ph.D., P.E., and Jean M. Muller, 1982, John Wiley & Sons*

APPENDIX A – DESCRIPTION of the BRIDGE (Figures 1-1 through 1-13) AND LOAD CONFIGURATION OF USER DEFINED VEHICLE

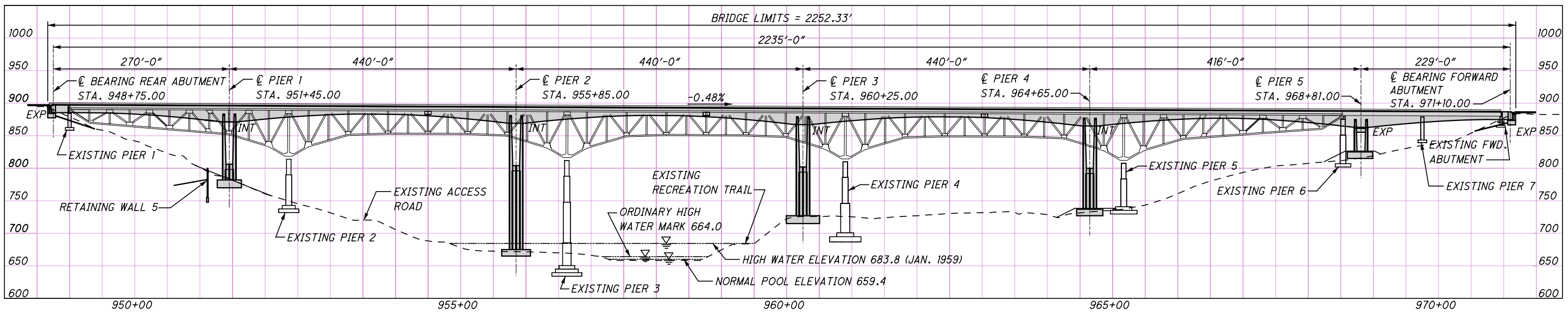
Figure 1-1 Plan and Elevation
Figure 1-2 Cross Section2
Figure 1-3 Top Slab Tendon 1
Figure 1-4 Top Slab Tendon 2
Figure 1-5 Top Slab Tendon 3
Figure 1-6 Bottom Slab Tendon 1
Figure 1-7 Bottom Slab Tendon 2
Figure 1-8 Bottom Slab Tendon 3
Figure 1-9 Bottom Slab Tendon 4
Figure 1-10 External Tendon 1
Figure 1-11 External Tendon 2
Figure 1-12 Transverse Tendon Profile
Figure 1-13 16’ Typical Segment Reinforcement



PLAN



SECTION AT MIDSPAN SECTION AT PIER



PROFILE

(SOUTHBOUND BRIDGE SHOWN)
(PILES AND DRILLED SHAFTS NOT SHOWN FOR CLARITY)

FIGURE 1-1: PLAN AND ELEVATION

NOTE:

1. FOR ADDITIONAL INFORMATION, SEE BRIDGE SITE PLANS AND BRIDGE PROFILES ON SHEETS 3 THRU 8 OF 204.

DESIGN AGENCY
HNTB
1100 Superior Avenue, Suite 1330
Cleveland, OH 44114-2531

DESIGNED	DRAWN	REVIEWED	DATE
YEH	JJB	RHW	3/21/08
CHECKED	REVISED	STRUCTURE FILE NUMBER	
BTA		8302278L/8302294R	

WARREN COUNTY
STA. 948+66.33
STA. 971+18.67

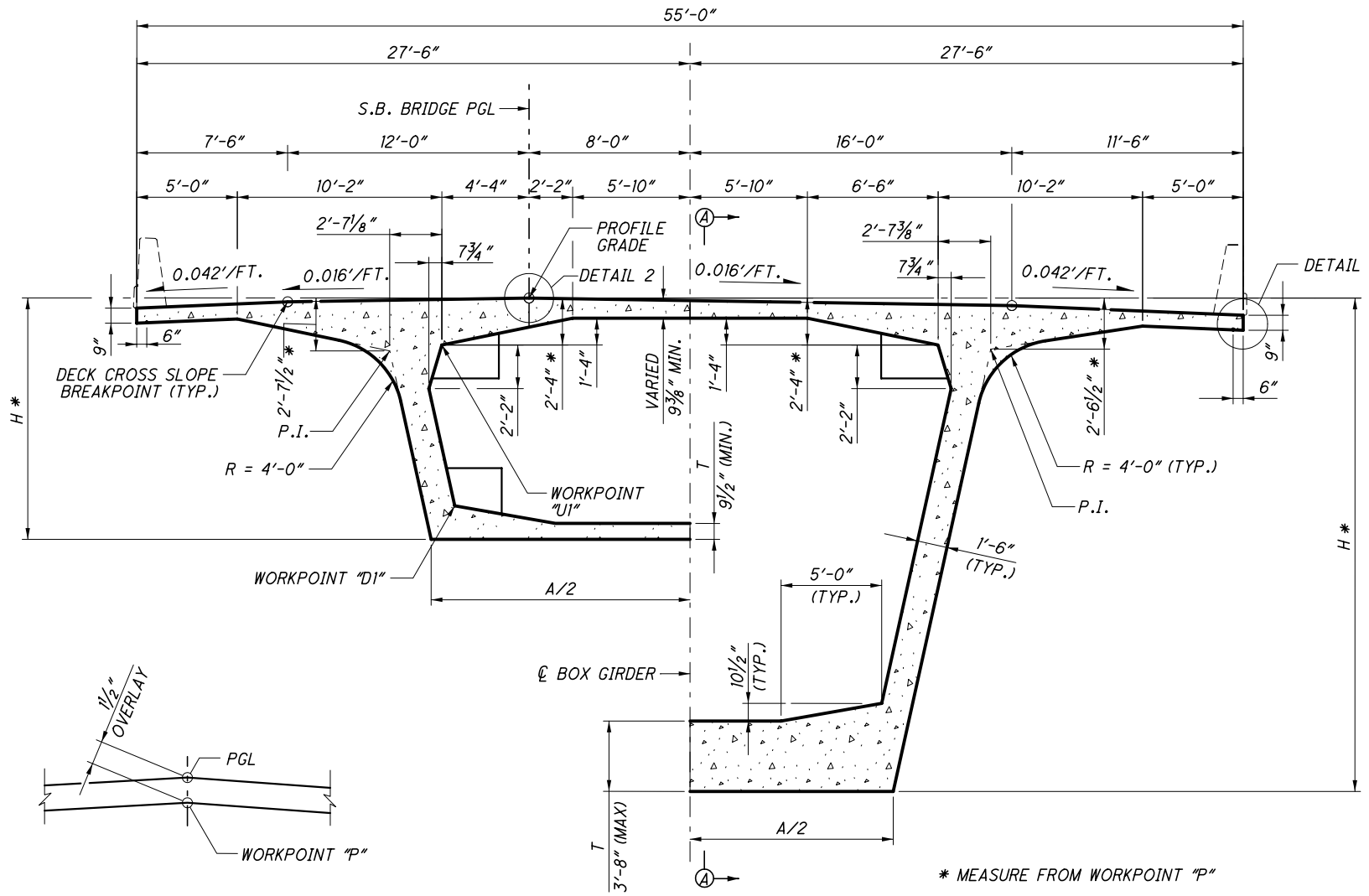
GENERAL PLAN
BRIDGE NO. WAR-71-1514L/R
INTERSTATE 71 OVER LITTLE MIAMI RIVER

WAR-71-14.20
PID No. 22950

2 / 204

268
470

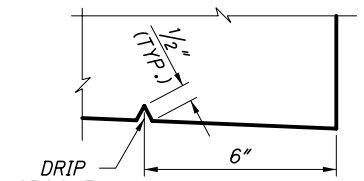
J:\34878\techprod\Br_Design\Chicago\load rating\Manual Final\Figures\Cad file\Figure 1-1.dgn 09-APR-2009 1:13PM mxin



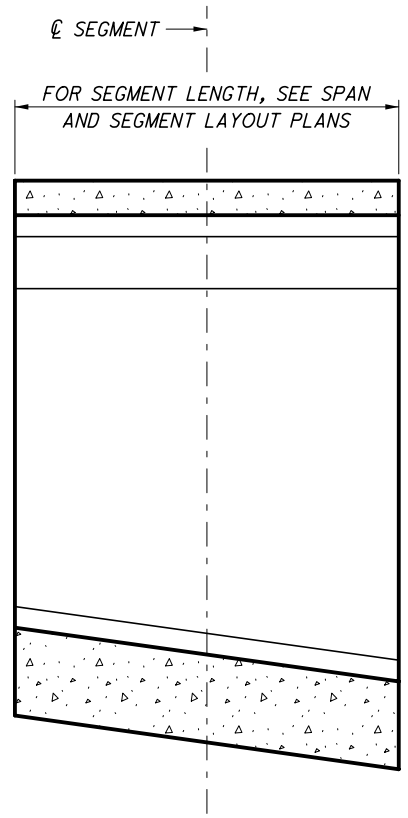
* MEASURE FROM WORKPOINT "P"

CROSS SECTION

(LOOKING DOWNSTATION, SOUTH BOUND BRIDGE SHOWN NORTH BOUND BRIDGE OPPOSITE HAND)



DETAIL 1



SECTION A-A

DETAIL 2

HALF PLAN TOP SLAB

(SOUTH BOUND BRIDGE SHOWN NORTH BOUND BRIDGE OPPOSITE HAND)

HALF PLAN BOTTOM SLAB

(SOUTH BOUND BRIDGE SHOWN NORTH BOUND BRIDGE OPPOSITE HAND)

VARIABLE DIMENSION			
JOINT NO.	A	H	T
0A **	20'-0"	25'-0"	3'-8"
1A	20'-7 3/4"	23'-6 1/4"	3'-2 3/8"
2A	21'-4 7/8"	21'-9 1/2"	2'-8"
3A	22'-1 3/8"	20'-2 1/4"	2'-2 1/2"
4A	22'-9 1/4"	18'-8 3/8"	1'-9 1/2"
5A	23'-4 1/2"	17'-4 1/8"	1'-5 1/2"
6A	23'-11"	16'-1 3/8"	1'-2 1/2"
7A	24'-4 3/4"	15'-0 1/8"	1'-0"
8A	24'-9 3/4"	14'-0 3/4"	10 1/2"
9A	25'-2"	13'-3 1/8"	9 1/2"
10A	25'-5 3/8"	12'-7 5/8"	9 1/2"
11A	25'-7 5/8"	12'-2 3/8"	9 1/2"
12A	25'-8 3/4"	12'-0"	9 1/2"
13A	25'-8 3/4"	12'-0"	9 1/2"
12C	25'-8 3/8"	12'-0 3/4"	9 1/2"

VARIABLE DIMENSION			
JOINT NO.	A	H	T
0B **	20'-0"	25'-0"	3'-8"
1B	20'-3"	24'-5"	3'-6"
2B	21'-0 1/2"	22'-7 3/4"	2'-11"
3B	21'-9 1/4"	20'-11 3/4"	2'-5"
4B	22'-5 1/2"	19'-5 1/8"	2'-0"
5B	23'-1"	18'-0 1/8"	1'-7 1/2"
6B	23'-7 7/8"	16'-8 1/2"	1'-4"
7B	24'-2"	15'-6 1/2"	1'-1"
8B	24'-7 3/8"	14'-6 1/4"	11"
9B	25'-0"	13'-7 3/4"	9 7/8"
10B	25'-3 7/8"	12'-11 1/8"	9 1/2"
11B	25'-6 5/8"	12'-4 5/8"	9 1/2"
12B	25'-8 3/8"	12'-0 3/4"	9 1/2"
13B	25'-8 3/4"	12'-0"	9 1/2"
14B	25'-8 3/4"	12'-0"	9 1/2"

** FOR DIMENSION ONLY, NOT A SEGMENT JOINT

NOTES:

1. SEE SHEETS 96 AND 97 OF 204 FOR JOINT DEFINITION.
2. ALL CONCRETE CHAMFERS ARE 3/4".
3. S.B. DENOTES SOUTH BOUND.
4. 1 1/2" INITIAL WEARING SURFACE IN CROSS SECTION NOT SHOWN FOR CLARITY. ALL DIMENSIONS SHOWN ARE MEASURED FROM WORKPOINT "P" IN DETAIL 2 AND DO NOT INCLUDE THE INITIAL WEARING SURFACE.

FIGURE 1-2: CROSS SECTION

DESIGN AGENCY
1100 Superior Avenue, Suite 1330
Cleveland, OH 44114-2531

DESIGNED	DRAWN	REVIEWED	DATE
YEH	YEH	JB	10/30/07
CHECKED	REVISED	STRUCTURE FILE NUMBER	
MX		8302278L/8302294R	

TYPICAL SEGMENT DIMENSIONS
BRIDGE NO. WAR-71-1514L/R
INTERSTATE 71 OVER LITTLE MIAMI RIVER

WAR-71-14.20
PID No. 22950

99/204
365/470

J:\34878\techprod\Br_Design\Chicago\load rating\Manual Final\Figures\Cad file\Figure 1-2.DGN 09-APR-2009 1:31PM mxin

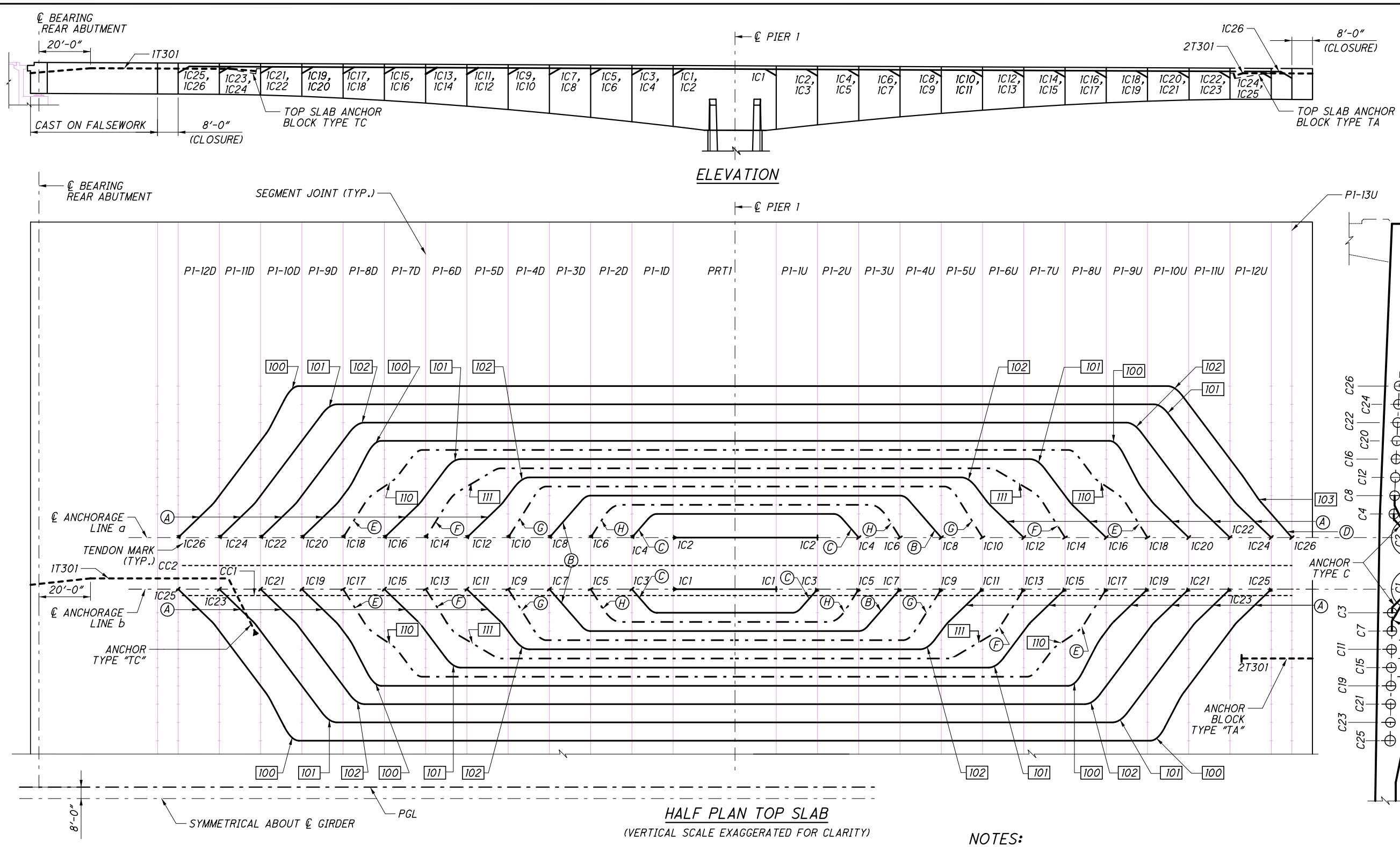


FIGURE 1-3: TOP SLAB TENDON - 1

LEGEND

- NON-STRESSING END
- STRESS END
- UPPER LEVEL CANTILEVER TENDON
- LOWER LEVEL CANTILEVER TENDON
- CONSTRUCTION CONTINGENCY TENDON
- TOP CONTINUITY TENDON
- TOP SLAB TENDON DEVIATION
- CANTILEVER TENDON ANCHOR TYPE

CANTILEVER NO OR SPAN NO. — IC2

- C - CANTILEVER TENDON
- T - TOP CONTINUITY TENDON
- CC - CONSTRUCTION CONTINGENCY TENDON

NOTES:

1. TENDON LAYOUTS OF SOUTH BOUND BRIDGE SHOWN, NORTH BOUND BRIDGE IS SIMILAR.
2. FOR TOP SLAB TENDON DEVIATION DETAILS, SEE SHEET 110 OF 204.
3. FOR CANTILEVER TENDON ANCHORAGE DETAILS, SEE SHEET 111 OF 204.
4. FOR TOP SLAB ANCHOR BLOCK DETAILS, SEE SHEETS 116 TO 120 OF 204.
5. FOR TENDON SIZE & STRESSING FORCES, SEE POST-TENSIONING TENDON SCHEDULE ON SHEETS 112 AND 113 OF 204.
6. HALF SECTION SHOWN ALL POSSIBLE TOP SLAB TENDON LOCATIONS. FOR ACTUAL NUMBER OF TENDONS AND TENDON PATHS, SEE HALF PLANS.
7. TWO CONSTRUCTION CONTINGENCY TENDON DUCTS ARE PROVIDED ON JUNCTION OF EACH WEB AND TOP SLAB IF IT IS REQUIRED. IF NOT USED, DUCTS HAVE TO BE GROUTED.
8. ALL TENDON ARRANGEMENTS SHOWN ARE SYMMETRICAL ABOUT THE CENTERLINE OF THE BOX GIRDER.

DESIGN AGENCY
1100 Superior Avenue, Suite 1330
Cleveland, OH 44114-2531

DESIGNED	DRAWN	REVIEWED	DATE
YEH	YEH	JB	10/30/07
CHECKED	REVISED	STRUCTURE FILE NUMBER	
MX		8302278L/8302294R	

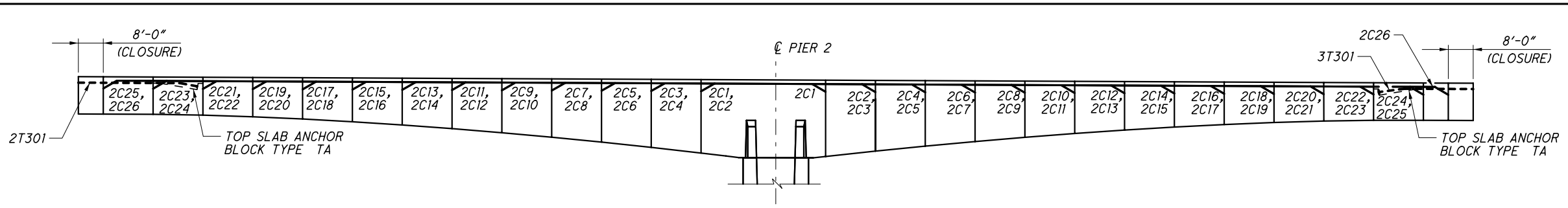
TOP SLAB TENDON LAYOUT 1
BRIDGE NO. WAR-71-1514L/R
INTERSTATE 71 OVER LITTLE MIAMI RIVER

WAR-71-14.20
PID No. 22950

100 / 204

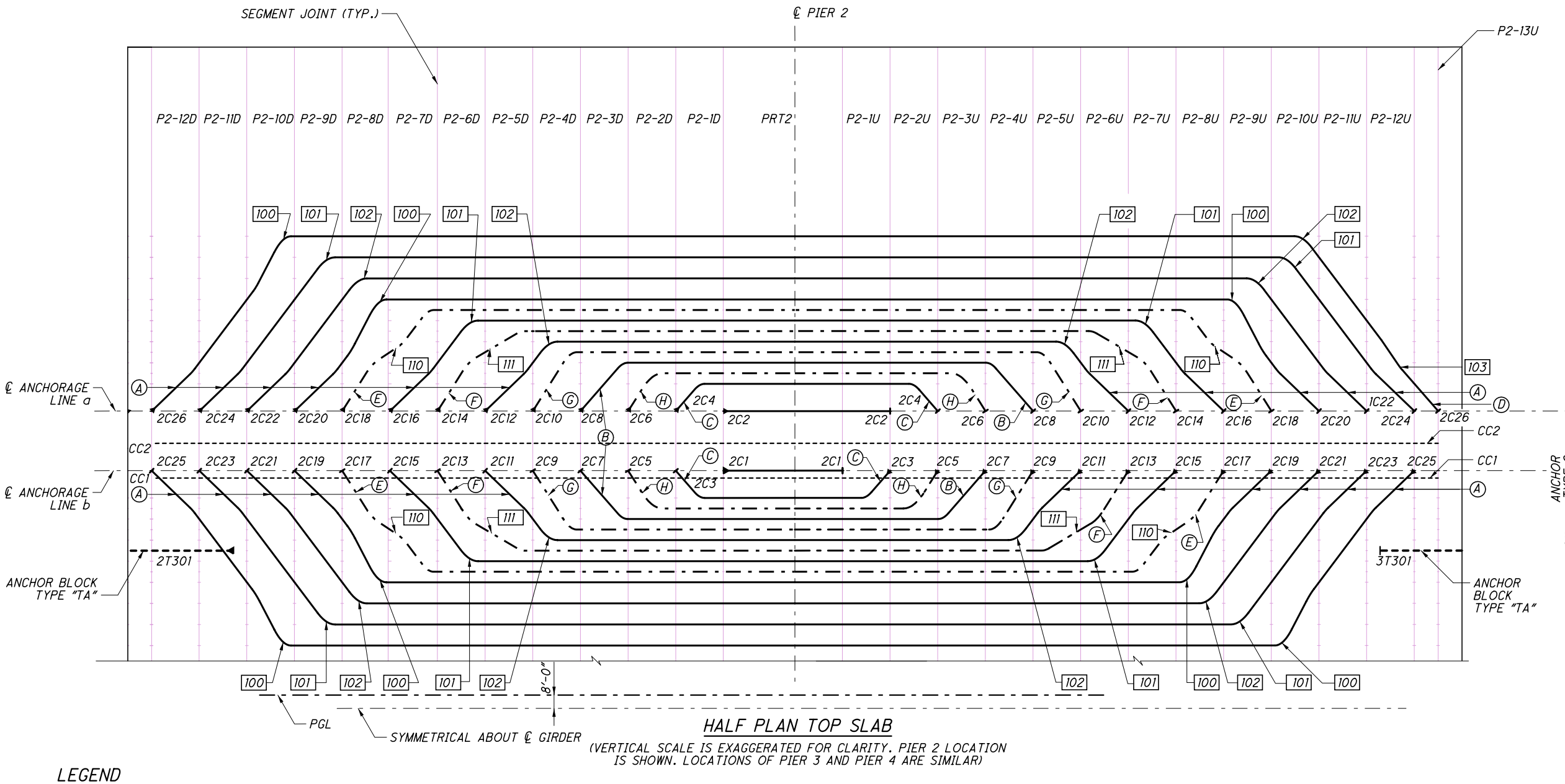
366 / 470

J:\34878\techprod\Br_Design\Chicago\load rating\Manual Final\Figures\Cad file\Figure 1-3.DGN 09-APR-2009 2:47PM mxin



ELEVATION

(PIER 2 LOCATION SHOWN, PIER 3 & PIER 4 ARE SIMILAR)



HALF PLAN TOP SLAB

(VERTICAL SCALE IS EXAGGERATED FOR CLARITY. PIER 2 LOCATION IS SHOWN. LOCATIONS OF PIER 3 AND PIER 4 ARE SIMILAR)

LEGEND

- NON-STRESSING END
- STRESS END
- UPPER LEVEL CANTILEVER TENDON
- LOWER LEVEL CANTILEVER TENDON
- CONSTRUCTION CONTINGENCY TENDON
- TOP CONTINUITY TENDON
- TOP SLAB TENDON DEVIATION
- CANTILEVER TENDON ANCHOR TYPE

CANTILEVER NO OR SPAN NO. — IC2

- C - CANTILEVER TENDON
- T - TOP CONTINUITY TENDON
- CC - CONSTRUCTION CONTINGENCY TENDON

FIGURE 1-4: TOP SLAB TENDON - 2

NOTES:

1. FOR NOTES, SEE SHEET 100 OF 204.

DESIGN AGENCY
1100 Superior Avenue, Suite 1330
Cleveland, OH 44114-2531

DESIGNED	DRAWN	REVIEWED	DATE
YEH	YEH	JB	10/30/07
CHECKED	REVISED	STRUCTURE FILE NUMBER	
MX		8302278L/8302294R	

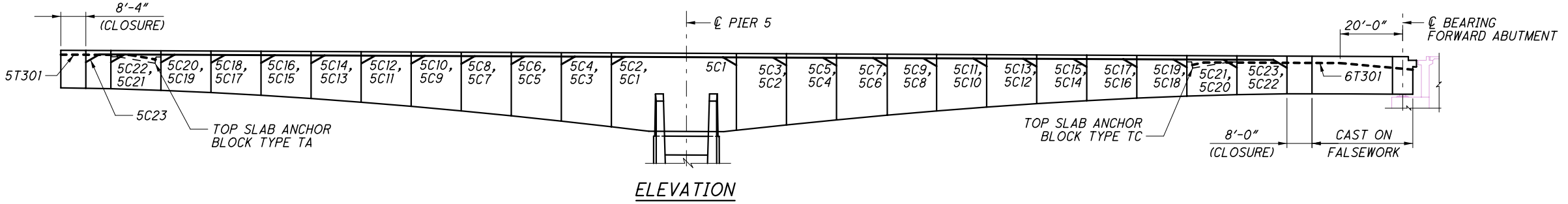
TOP SLAB TENDON LAYOUT 2
BRIDGE NO. WAR-71-1514L/R
INTERSTATE 71 OVER LITTLE MIAMI RIVER

WAR-71-14.20
PID No. 22950

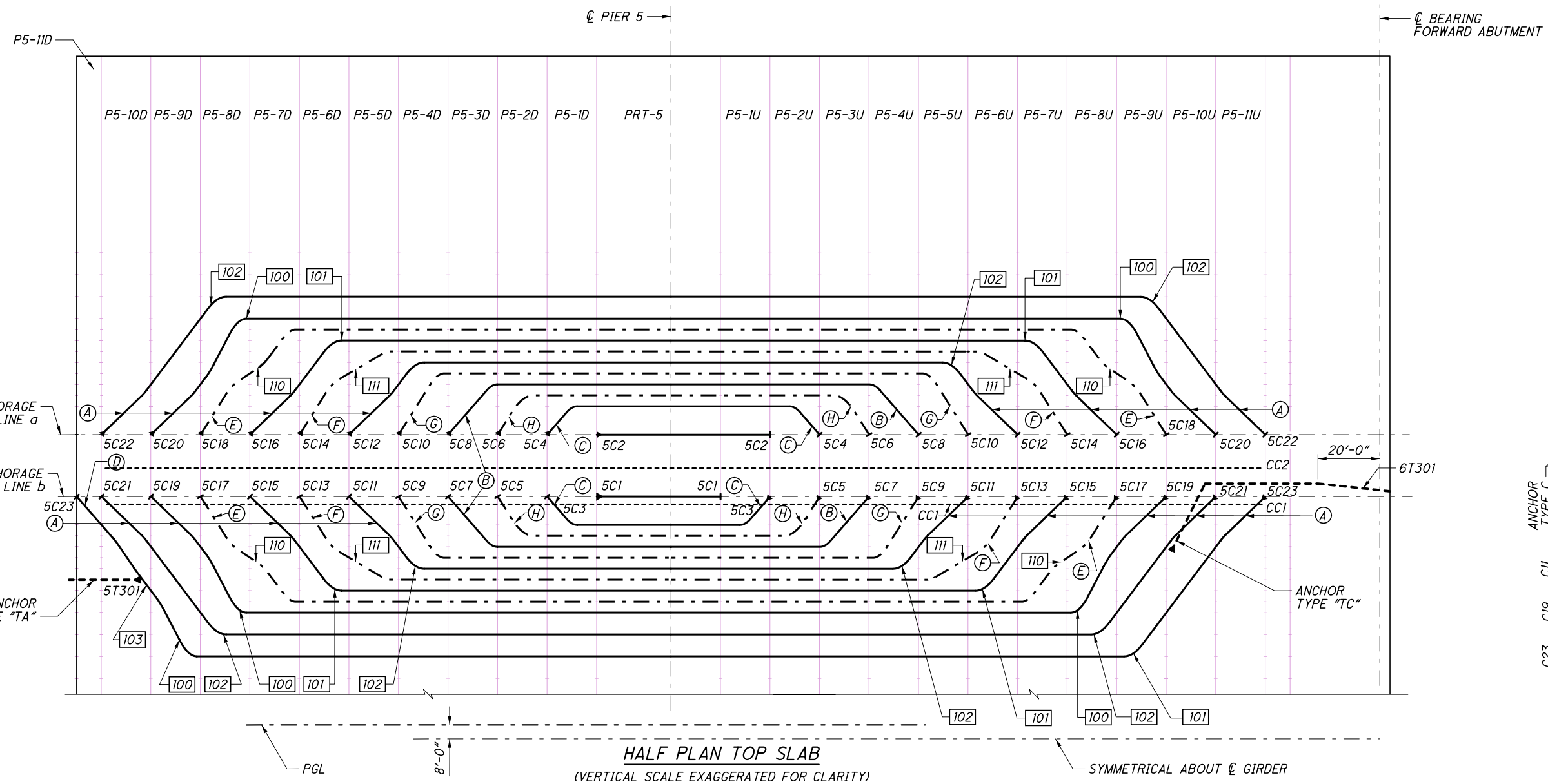
101 / 204

367 / 470

J:\34878\techprod\Br_Design\Chicago\load rating\Manual Final\Figures\Cad file\Figure 1-4.DGN 09-APR-2009 3:22PM mxin

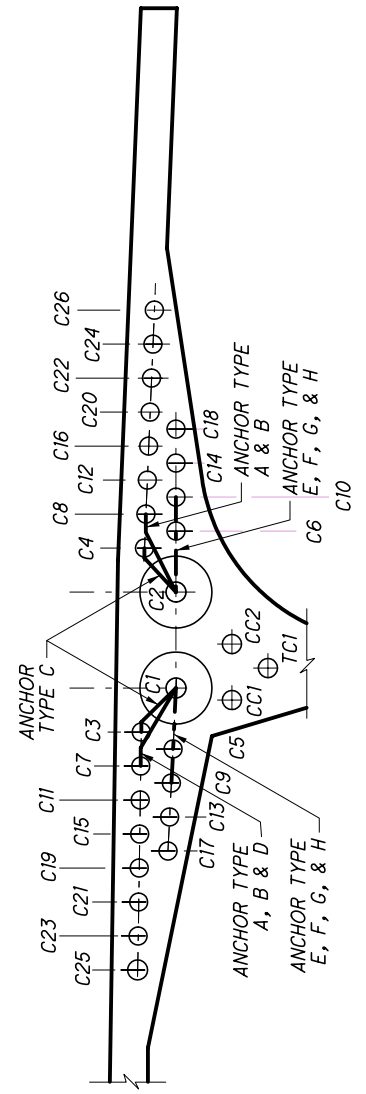


ELEVATION



HALF PLAN TOP SLAB

(VERTICAL SCALE EXAGGERATED FOR CLARITY)



HALF SECTION TOP SLAB

LEGEND

- NON-STRESSING END
- STRESS END
- UPPER LEVEL CANTILEVER TENDON
- LOWER LEVEL CANTILEVER TENDON
- CONSTRUCTION CONTINGENCY TENDON
- TOP CONTINUITY TENDON
- TOP SLAB TENDON DEVIATION
- CANTILEVER TENDON ANCHOR TYPE

CANTILEVER NO OR SPAN NO. — 1C2

- C - CANTILEVER TENDON
- T - TOP CONTINUITY TENDON
- CC - CONSTRUCTION CONTINGENCY TENDON

FIGURE 1-5: TOP SLAB TENDON - 3

NOTES:

1. FOR NOTES, SEE SHEET 100 OF 204.

DESIGN AGENCY
1100 Superior Avenue, Suite 1330
Cleveland, OH 44114-2531

DESIGNED	DRAWN	REVIEWED	DATE
YEH	YEH	JB	10/30/07
CHECKED	REVISED	STRUCTURE FILE NUMBER	
MX		8302278L/8302294R	

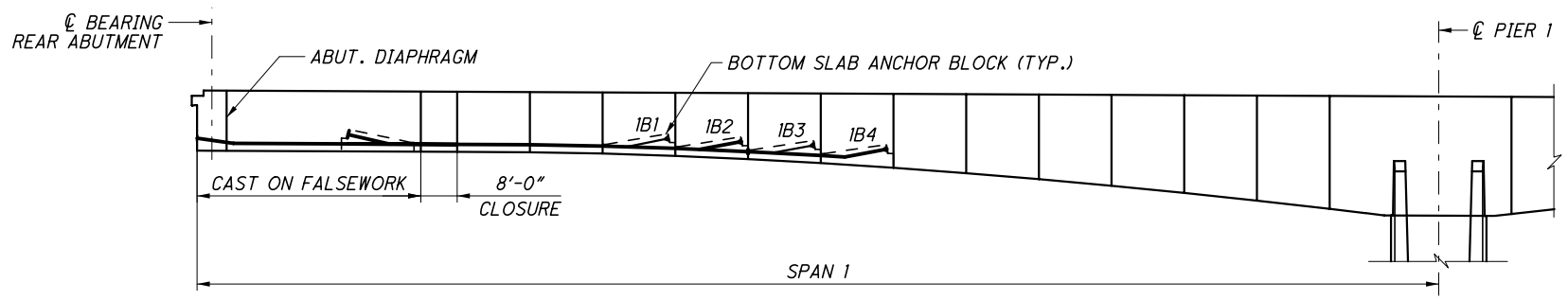
TOP SLAB TENDON LAYOUT 3
BRIDGE NO. WAR-71-1514L/R
INTERSTATE 71 OVER LITTLE MIAMI RIVER

WAR-71-14.20
PID No. 22950

102 / 204

368 / 470

J:\34878\techprod\Br_Design\Chicago\load rating\Manual Final\Figures\Cad file\Figure 1-5.DGN 09-APR-2009 4:19PM mxin

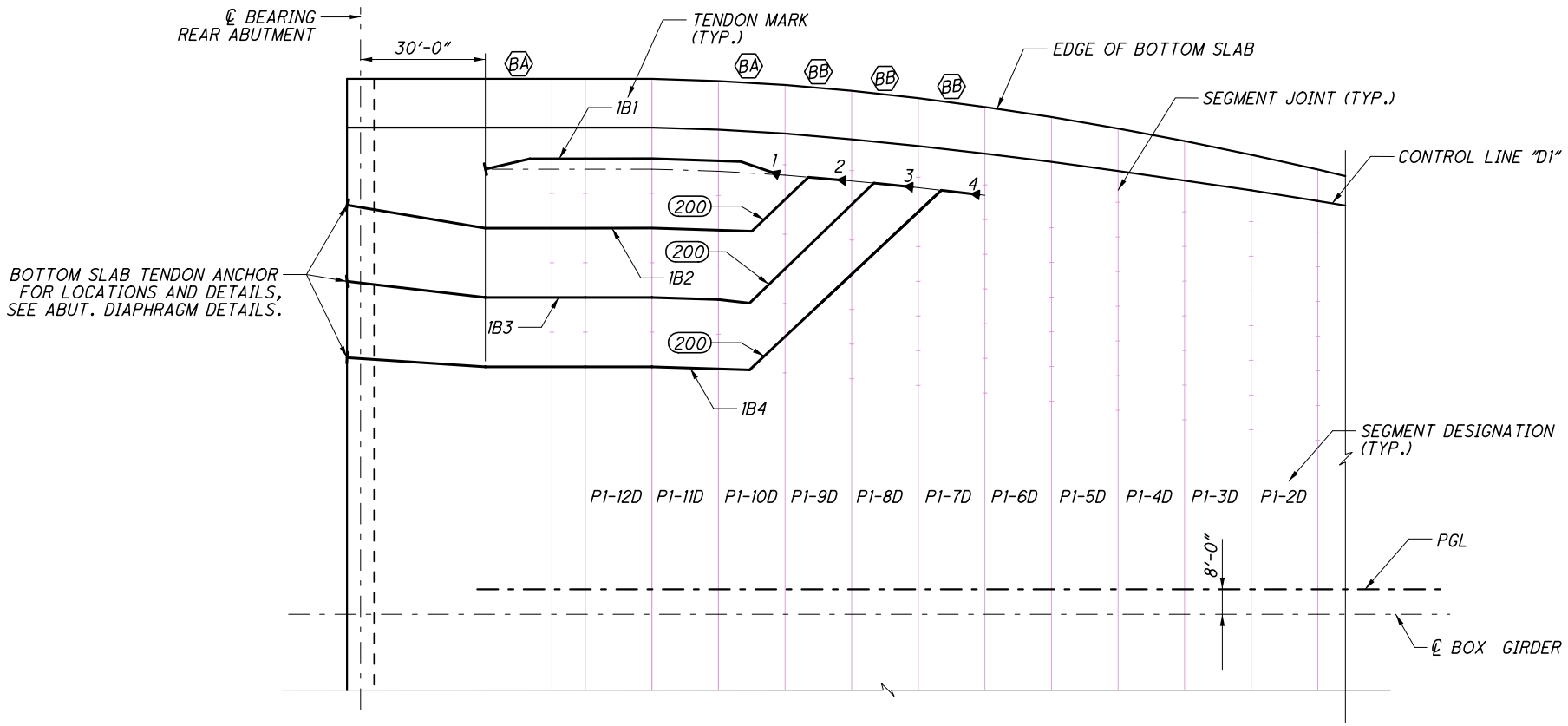


ELEVATION

(TOP PT & EXTERNAL PT NOT SHOWN FOR CLARITY)

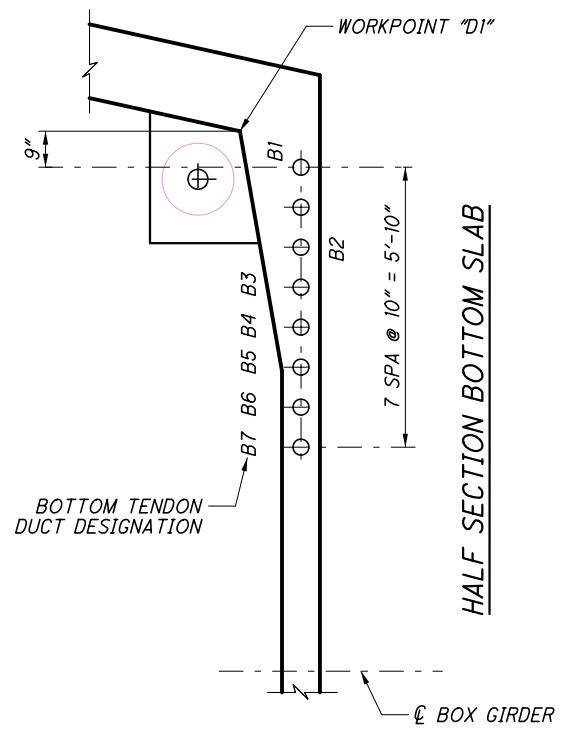
NOTES:

1. TENDON LAYOUTS OF SOUTH BOUND BRIDGE SHOWN, NORTH BOUND BRIDGE IS SIMILAR.
2. FOR BOTTOM SLAB TENDON DEVIATION DETAILS, SEE SHEET 110 OF 204.
3. FOR BOTTOM SLAB ANCHOR BLOCK DETAILS, SEE SHEETS 122 TO 127 OF 204.
4. FOR TENDON SIZE & STRESSING FORCES, SEE POST-TENSIONING TENDON SCHEDULE ON SHEETS 112 AND 113 OF 204.
5. HALF SECTION SHOWN ALL POSSIBLE BOTTOM SLAB TENDON LOCATIONS. FOR ACTUAL NUMBER OF TENDONS AND TENDON PATHS, SEE HALF PLANS.
6. ALL TENDON ARRANGEMENTS SHOWN ARE SYMMETRICAL ABOUT THE CENTERLINE OF THE BOX GIRDER.



HALF PLAN BOTTOM SLAB

(VERTICAL SCALE EXAGGERATED FOR CLARITY)



HALF SECTION BOTTOM SLAB

TENDON MARK	DUCT DESIGNATION FOR STRAIGHT PORTION
1B1	B1
1B2	B2
1B3	B4
1B4	B6

FIGURE 1-6: BOTTOM SLAB TENDON -1

LEGEND

- NON-STRESSING END
- STRESS END
- BOTTOM SLAB TENDON DEVIATION
- BOTTOM SLAB ANCHOR BLOCK TYPE

CANTILEVER NO. OR SPAN NO. — 1B2 — B - BOTTOM SLAB TENDON

DESIGN AGENCY
1100 Superior Avenue, Suite 1330
Cleveland, OH 44114-2531

DESIGNED	DRAWN	REVIEWED	DATE
YEA	YEH	JB	10/30/07
CHECKED	REVISED	STRUCTURE FILE NUMBER	
MX		8302278L/8302294R	

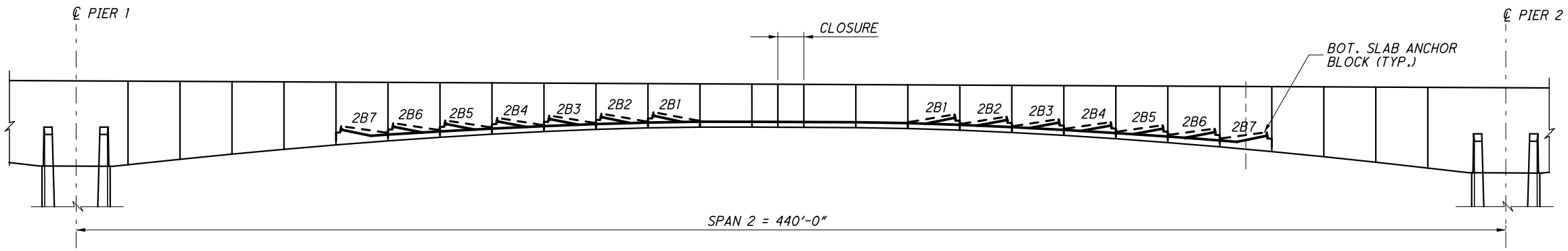
BOTTOM SLAB TENDON LAYOUT 1
BRIDGE NO. WAR-71-1514L/R
INTERSTATE 71 OVER LITTLE MIAMI RIVER

WAR-71-14.20
PID No. 22950

104 / 204

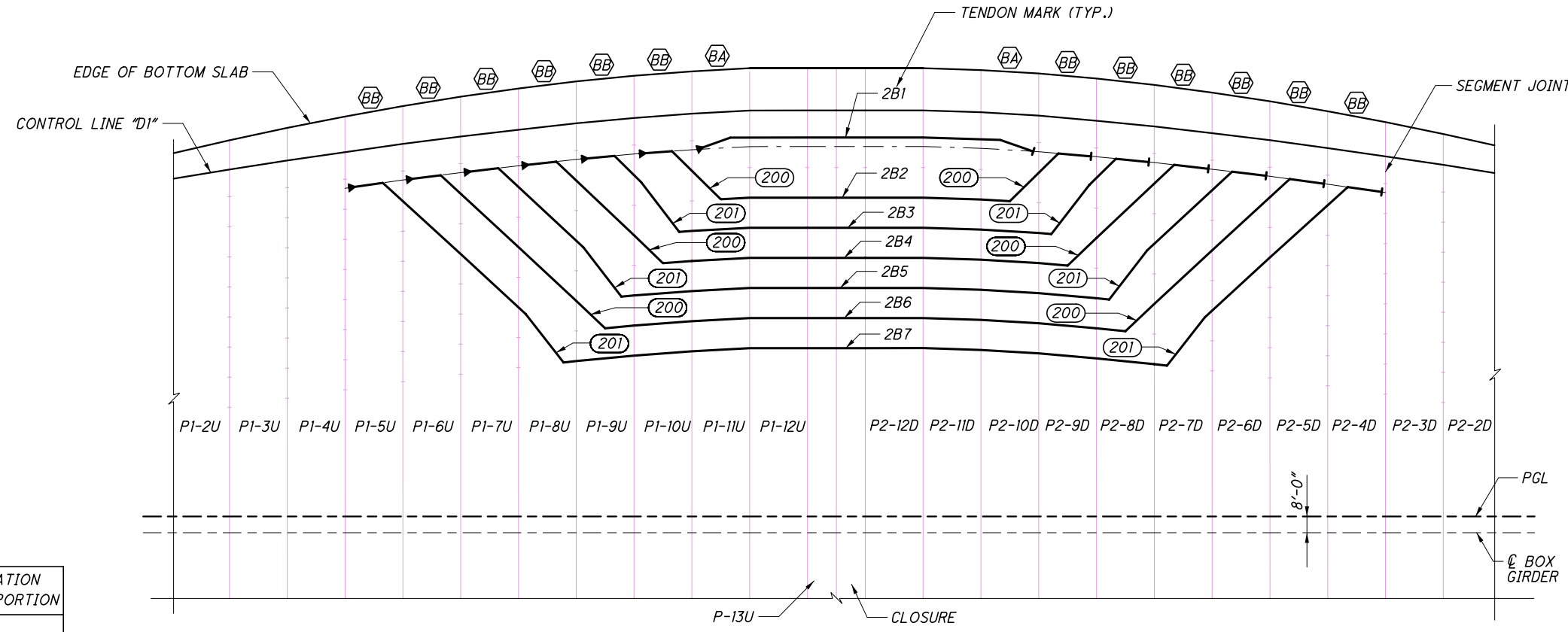
370
470

J:\34878\techprod\Br_Design\Chicago\load rating\Manual Final\Figures\Cad file\Figure 1-6.DGN 09-APR-2009 4:52PM mixin



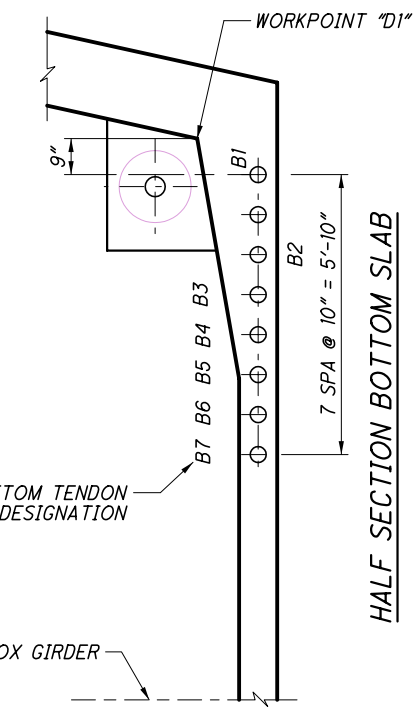
ELEVATION

(SPAN 2 SHOWN, SPAN 3, AND SPAN 4 ARE SIMILAR)



HALF PLAN BOTTOM SLAB

(VERTICAL SCALE EXAGGERATED FOR CLARITY)
(SPAN 2 SHOWN, SPAN 3 AND SPAN 4 ARE SIMILAR)



HALF SECTION BOTTOM SLAB

TENDON MARK	DUCT DESIGNATION FOR STRAIGHT PORTION
2B1	B1
2B2	B2
2B3	B3
2B4	B4
2B5	B5
2B6	B6
2B7	B7

NOTES:

1. FOR NOTES, SEE NOTES ON SHEET 104 OF 204.

LEGEND

- NON-STRESSING END
- STRESS END
- BOTTOM SLAB TENDON DEVIATION
- BOTTOM SLAB ANCHOR BLOCK TYPE

B - BOTTOM SLAB TENDON
CANTILEVER NO. OR SPAN NO. — 2B2

FIGURE 1-7: BOTTOM SLAB TENDON - 2

DESIGN AGENCY
1100 Superior Avenue, Suite 1330
Cleveland, OH 44114-2531

DESIGNED	DRAWN	REVIEWED	DATE
YEH	YEH	JB	10/30/07
CHECKED	REVISED	STRUCTURE FILE NUMBER	
MX		8302278L/8302294R	

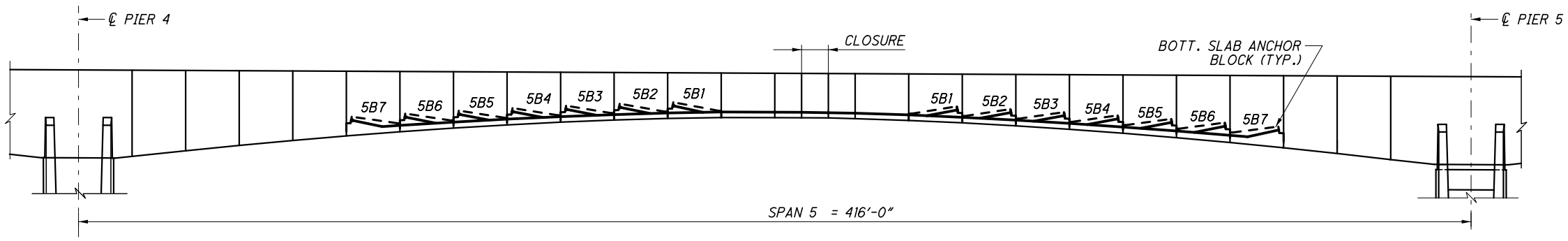
BOTTOM SLAB TENDON LAYOUT 2
BRIDGE NO. WAR-71-1514L/R
INTERSTATE 71 OVER LITTLE MIAMI RIVER

WAR-71-14.20
PID No. 22950

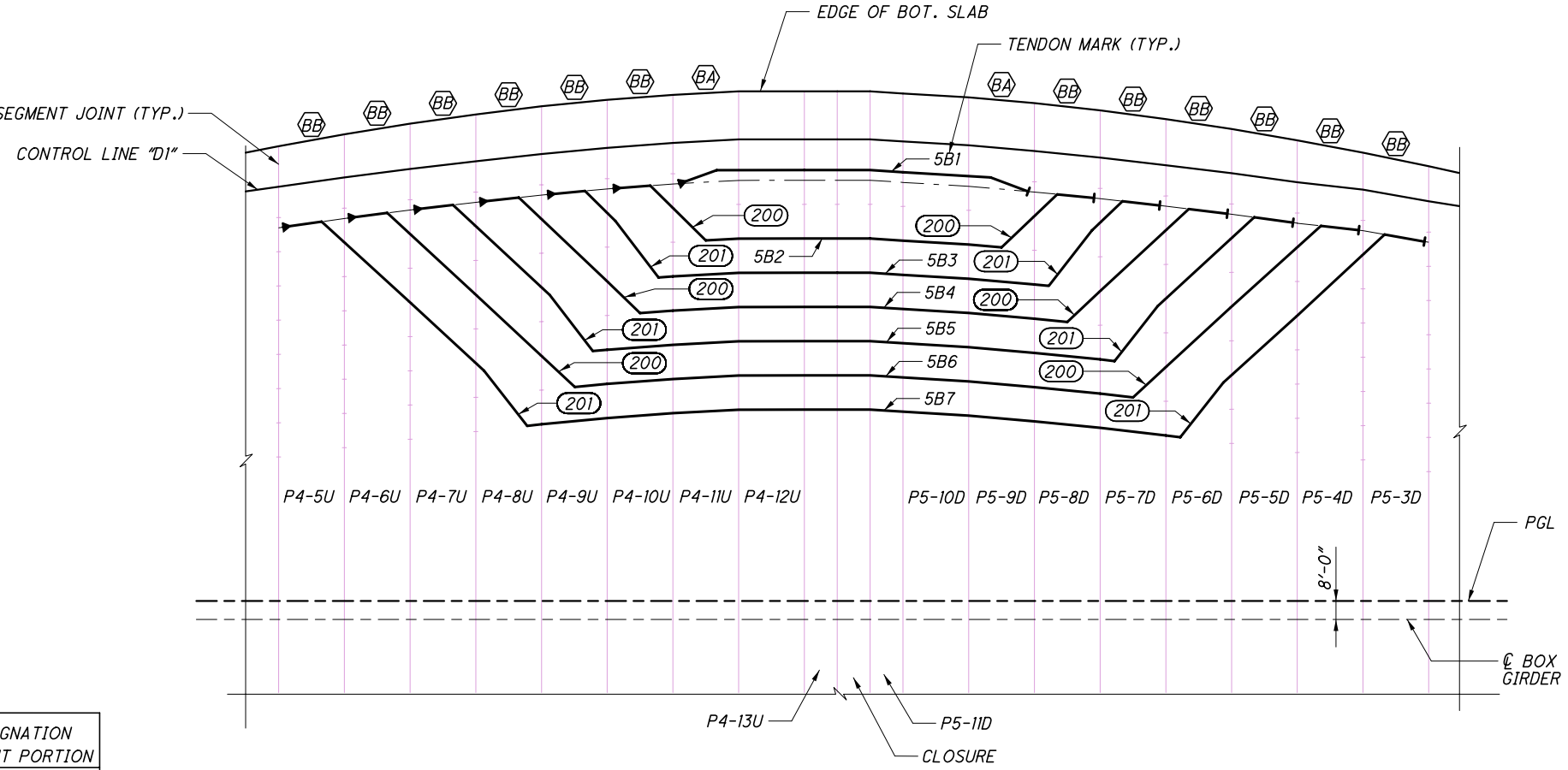
105/204

371/470

J:\34878\techprod\Br_Design\Chicago\load rating\Manual Final\Figures\Cad file\Figure 1-7.DGN 09-APR-2009 5:04PM mixin

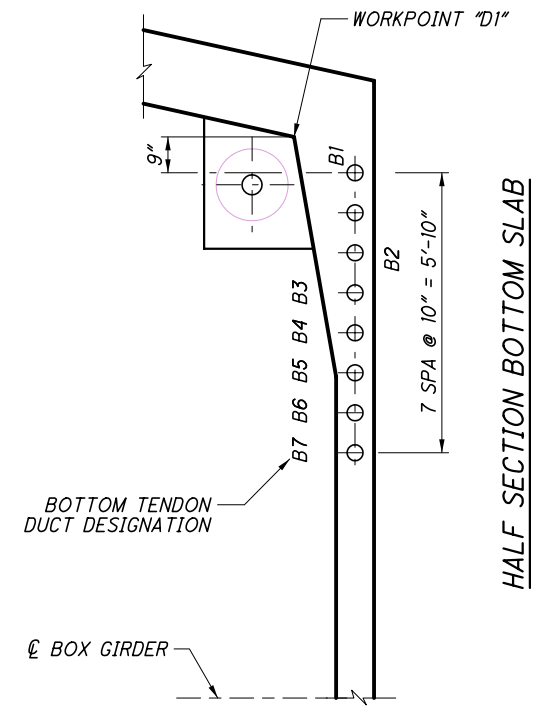


ELEVATION



HALF PLAN BOTTOM SLAB

(VERTICAL SCALE EXAGGERATED FOR CLARITY)



HALF SECTION BOTTOM SLAB

TENDON MARK	DUCT DESIGNATION FOR STRAIGHT PORTION
5B1	B1
5B2	B2
5B3	B3
5B4	B4
5B5	B5
5B6	B6
5B7	B7

LEGEND

- NON-STRESSING END
- STRESS END
- BOTTOM SLAB TENDON DEVIATION
- BOTTOM SLAB ANCHOR BLOCK TYPE

B - BOTTOM SLAB TENDON

CANTILEVER NO. OR SPAN NO. — 5B2

NOTES:

1. FOR NOTES, SEE NOTES ON SHEET 104 OF 204.

FIGURE 1-8: BOTTOM SLAB TENDON - 3

DESIGN AGENCY
1100 Superior Avenue, Suite 1330
Cleveland, OH 44114-2531

DESIGNED	DRAWN	REVIEWED	DATE
YEH	YEH	JB	10/30/07
CHECKED	REVISED	STRUCTURE FILE NUMBER	
MX		8302278L/8302294R	

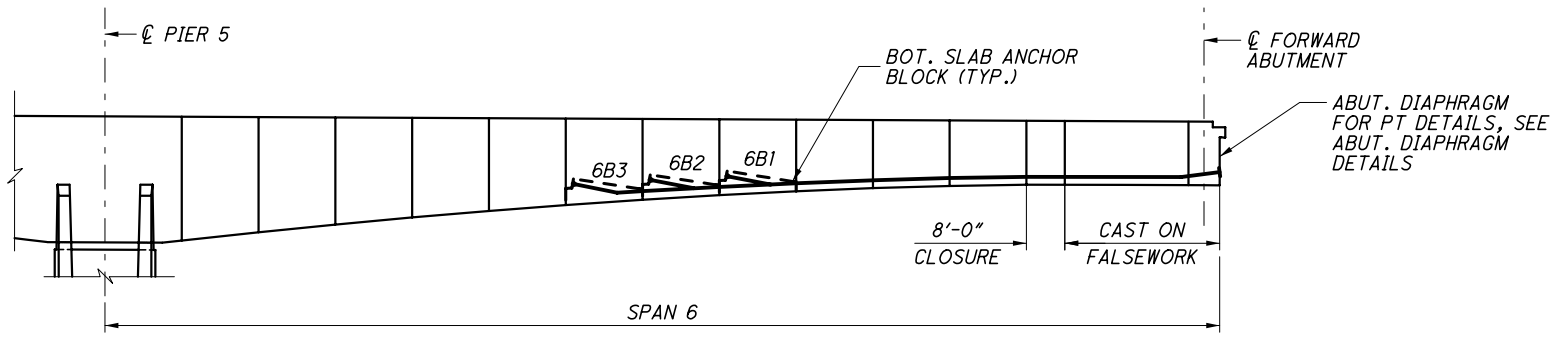
BOTTOM SLAB TENDON LAYOUT 3
BRIDGE NO. WAR-71-1514L/R
INTERSTATE 71 OVER LITTLE MIAMI RIVER

WAR-71-14.20
PID No. 22950

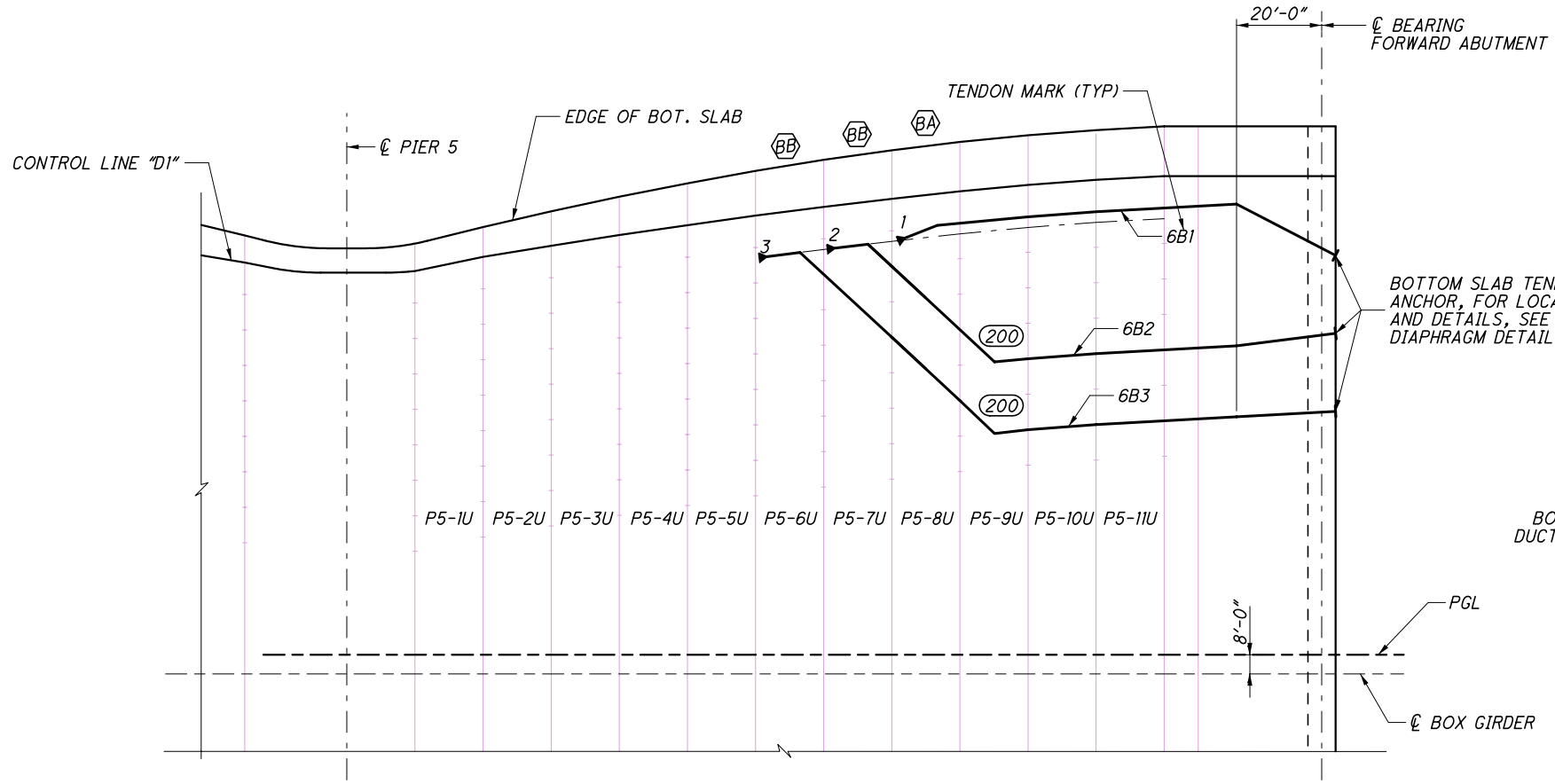
106 / 204

372 / 470

J:\34878\techprod\Br_Design\Chicago\load rating\Manual Final\Figures\Cad file\Figure 1-8.DGN 09-APR-2009 5:18PM mxin

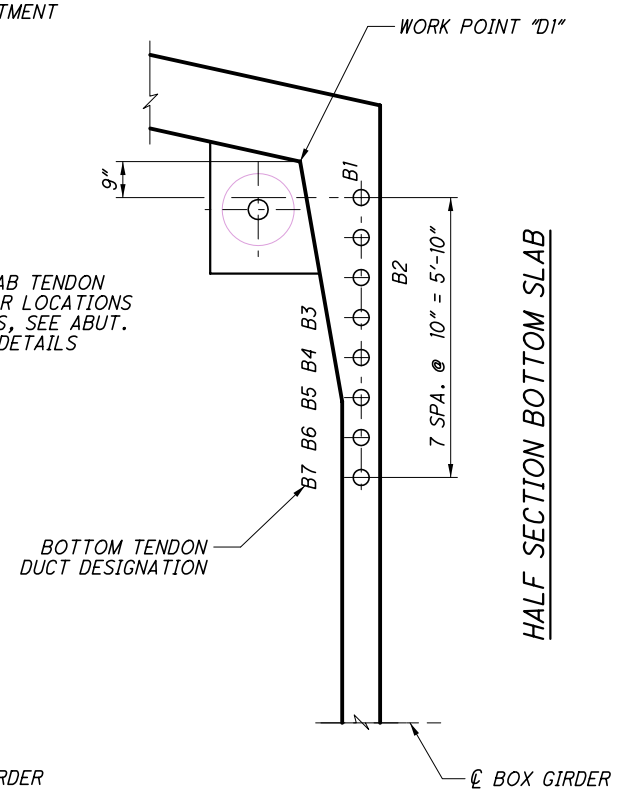


ELEVATION



HALF PLAN BOTTOM SLAB

(VERTICAL SCALE EXAGGERATED FOR CLARITY)



HALF SECTION BOTTOM SLAB

TENDON MARK	DUCT DESIGNATION FOR STRAIGHT PORTION
6B1	B1
6B2	B4
6B3	B6

FIGURE 1-9: BOTTOM SLAB TENDON - 4

NOTES:

1. FOR NOTES, SEE NOTES ON SHEET 104 OF 204.

LEGEND

- ⊢ NON-STRESSING END
- ►– STRESS END
- ⬭ BOTTOM SLAB TENDON DEVIATION
- ⬡ BOTTOM SLAB ANCHOR BLOCK TYPE

CANTILEVER NO. OR SPAN NO. — 6B2 — B - BOTTOM SLAB TENDON

DESIGN AGENCY
1100 Superior Avenue, Suite 1330
Cleveland, OH 44114-2531

DESIGNED	DRAWN	REVIEWED	DATE
YEH	YEH	JB	10/30/07
CHECKED	REVISED	STRUCTURE FILE NUMBER	
MX		8302278L/8302294R	

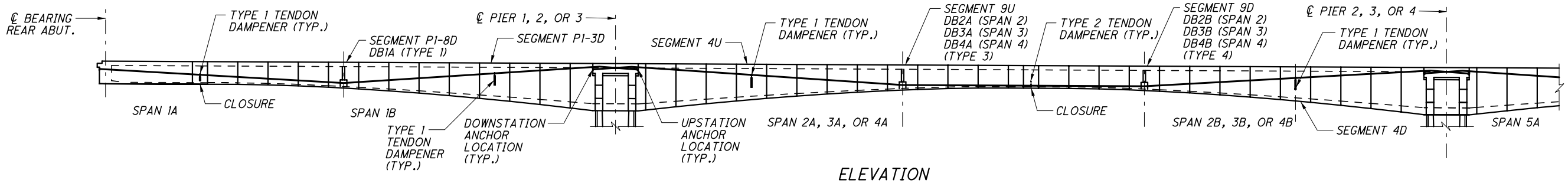
BOTTOM SLAB TENDON LAYOUT 4
BRIDGE NO. WAR-71-1514L/R
INTERSTATE 71 OVER LITTLE MIAMI RIVER

WAR-71-14.20
PID No. 22950

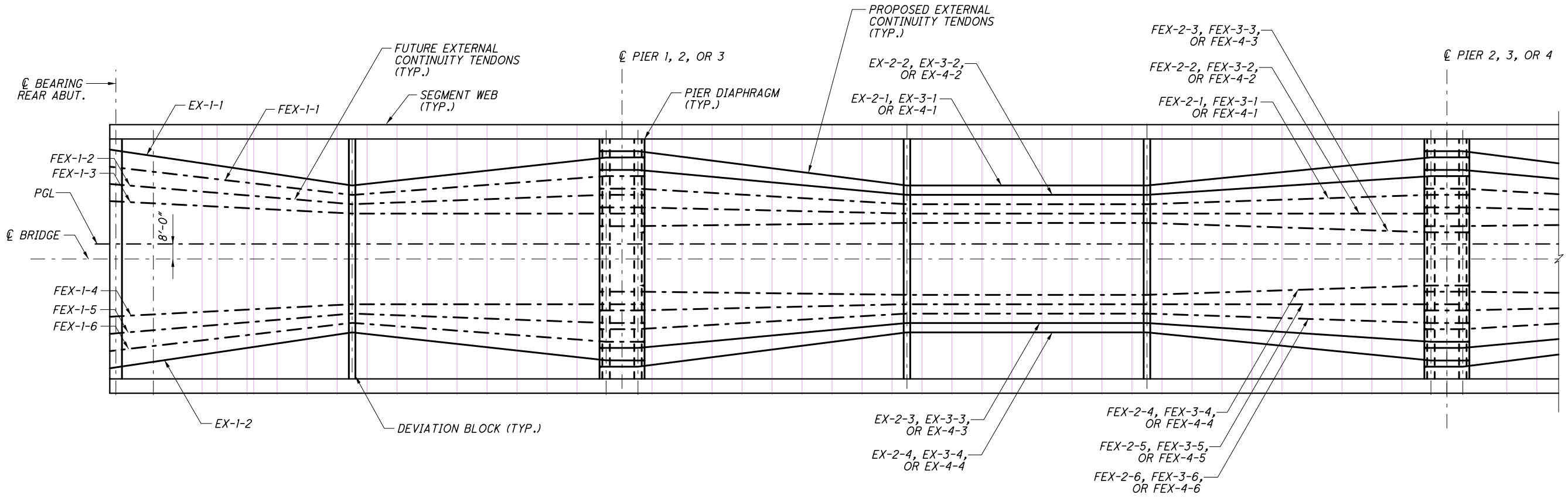
107/204

373/470

J:\34878\techprod\Br_Design\Chicago\load rating\Manual Final\Figures\Cad file\Figure 1-9.DGN 10-APR-2009 9:57AM mxin



ELEVATION



PLAN

(VERTICAL SCALE EXAGGERATED FOR CLARITY)

TABLE 1 - EXTERNAL PT

TENDON MARK	STRESSING END
EX-1-1	PIER 1 UPSTATION
EX-1-2	PIER 1 UPSTATION
EX-2-1	PIER 1 DOWNSTATION
EX-2-2	PIER 1 DOWNSTATION
EX-2-3	PIER 1 DOWNSTATION
EX-2-4	PIER 1 DOWNSTATION
EX-3-1	PIER 2 DOWNSTATION
EX-3-2	PIER 2 DOWNSTATION
EX-3-3	PIER 2 DOWNSTATION
EX-3-4	PIER 2 DOWNSTATION
EX-4-1	PIER 4 UPSTATION
EX-4-2	PIER 4 UPSTATION
EX-4-3	PIER 4 UPSTATION
EX-4-4	PIER 4 UPSTATION

FIGURE 1-10: EXTERNAL TENDON - 1

LEGEND

——— EXTERNAL CONTINUITY TENDON

– – – FUTURE EXTERNAL CONTINUITY TENDON

EX - EXTERNAL
FEX - FUTURE EXTERNAL
SPAN NO.
EX-2-3

NOTES:

1. FOR CONSTRUCTION SEQUENCE REQUIREMENT, SEE SHEETS 15 TO 17 OF 204.
2. FOR POST-TENSIONING SCHEDULE, SEE SHEETS 112 AND 113 OF 204.
3. WORK THIS SHEET WITH ABUTMENT DIAPHRAGM, PIER SEGMENT, DEVIATION BLOCK, AND BOTTOM SLAB ANCHOR BLOCK SHEETS.
4. DETAILS OF SOUTH BOUND BRIDGE SHOWN, NORTH BOUND BRIDGE IS SIMILAR.
5. TENDON DAMPENERS WILL BE PLACED AT THE CENTER OF THE SEGMENT SPECIFIED, FOR DETAILS, SEE SHEET 189 OF 204.
6. THE CONTRACTOR IS REQUIRED TO SUBMIT THE FUTURE EXTERNAL PT DETAILED INSTALLATIONS AND STRESS PROCEDURES FOR APPROVAL. ALL EMBEDDED ITEMS FOR THE FUTURE EXTERNAL PT SYSTEM, SUCH AS DEVIATION PIPES AND ANCHOR TRUMPETS, HAS TO BE INCLUDED IN THE INITIAL CONSTRUCTION. COST OF THE ABOVE ITEMS ARE INCLUDED TO PAY ITEM, ITEM 530 "SPECIAL - STRUCTURE, MISC.: POST-TENSIONING TENDONS (STRANDS)".

DESIGN AGENCY
1100 Superior Avenue, Suite 1330
Cleveland, OH 44114-2531

DESIGNED	DRAWN	REVIEWED	DATE
YEH	JFA	JB	10/30/07
CHECKED	REVISED	STRUCTURE FILE NUMBER	
MX		8302278L/8302294R	

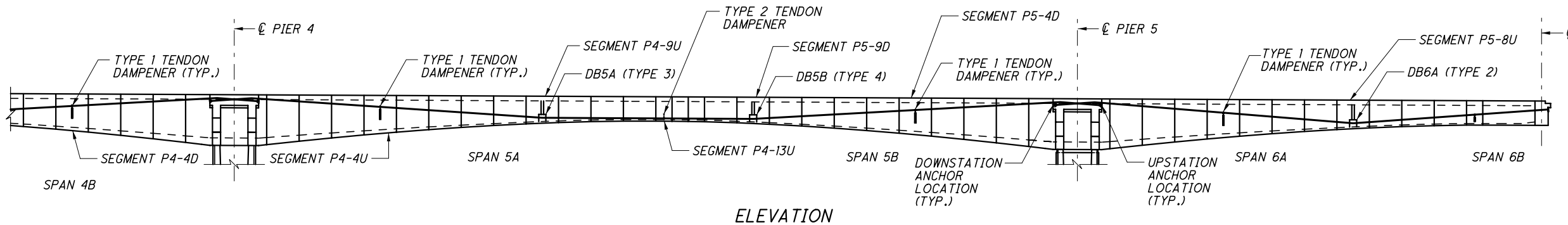
EXTERNAL CONTINUITY TENDON LAYOUT 1
BRIDGE NO. WAR-71-1514L/R
INTERSTATE 71 OVER LITTLE MIAMI RIVER

WAR-71-14.20
PID No. 22950

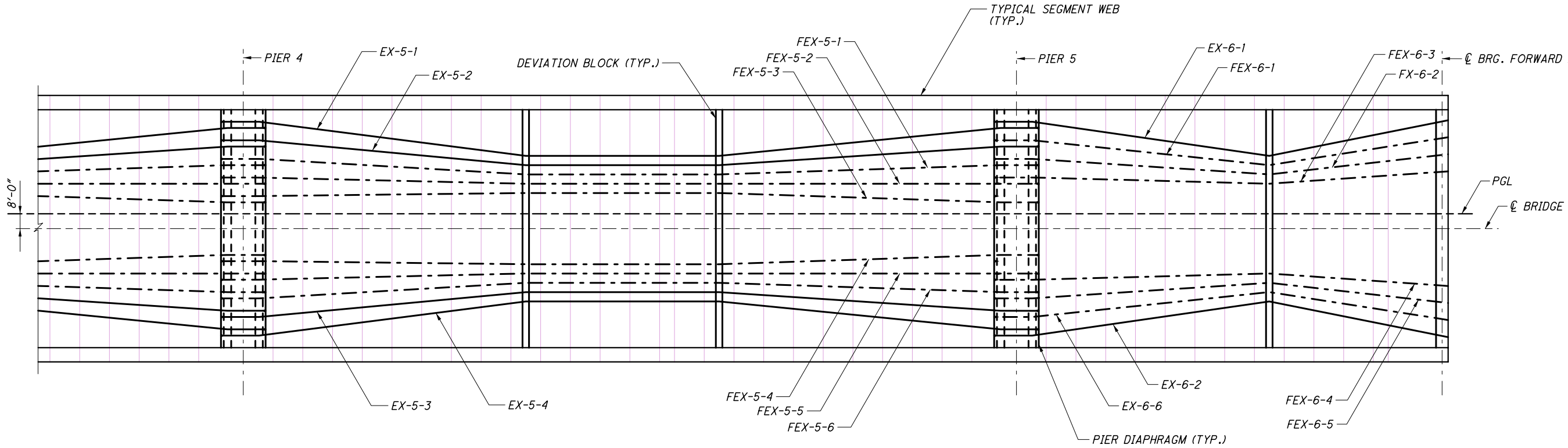
108/204

374/470

J:\34878\techprod\Br_Design\Chicago\load rating\Manual Final\Figures\Cad file\Figure 1-10.DGN 10-APR-2009 10:12AM mxin



ELEVATION



PLAN

(VERTICAL SCALE EXAGGERATED FOR CLARITY)

TABLE 1 - EXTERNAL PT

TENDON MARK	STRESSING END
EX-5-1	PIER 5 UPSTATION
EX-5-2	PIER 5 UPSTATION
EX-5-3	PIER 5 UPSTATION
EX-5-4	PIER 5 UPSTATION
EX-6-1	PIER 5 DOWNSTATION
EX-6-2	PIER 5 DOWNSTATION

FIGURE 1-11: EXTERNAL TENDON -2

LEGEND

——— EXTERNAL CONTINUITY TENDON

— - — FUTURE EXTERNAL CONTINUITY TENDON

NOTES:

1. SEE NOTES ON SHEET 108 OF 204.

DESIGN AGENCY
1100 Superior Avenue, Suite 1330
Cleveland, OH 44114-2531

DESIGNED	DRAWN	REVIEWED	DATE
YEH	JFA	JB	10/30/07
CHECKED	REVISED	STRUCTURE FILE NUMBER	
MX		8302278L/8302294R	

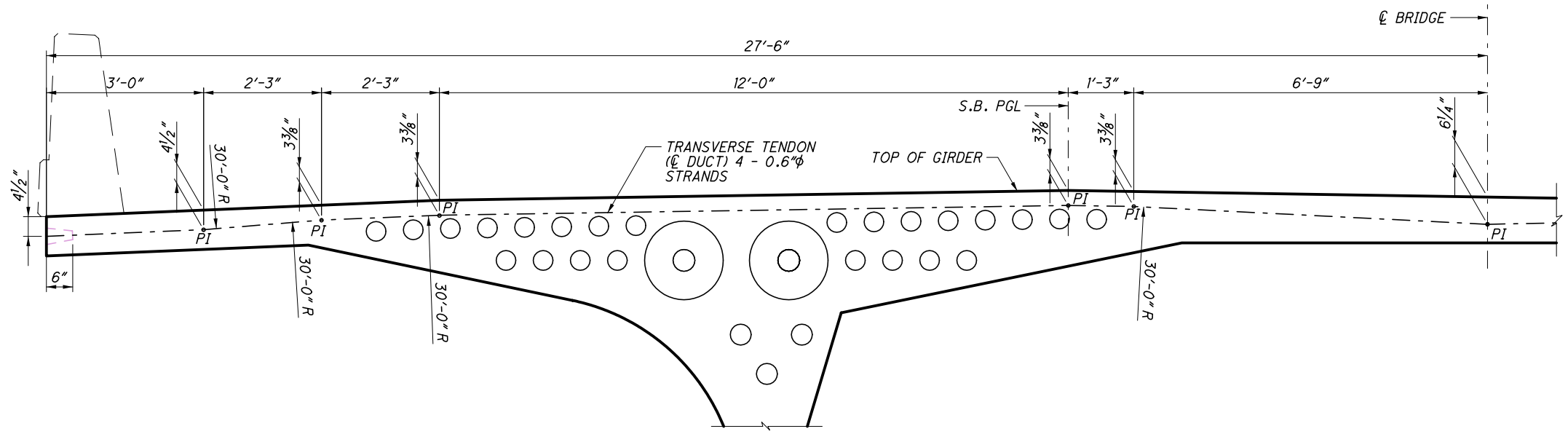
EXTERNAL CONTINUITY TENDON LAYOUT 2
BRIDGE NO. WAR-71-1514L/R
INTERSTATE 71 OVER LITTLE MIAMI RIVER

WAR-71-14.20
PID No. 22950

109/204

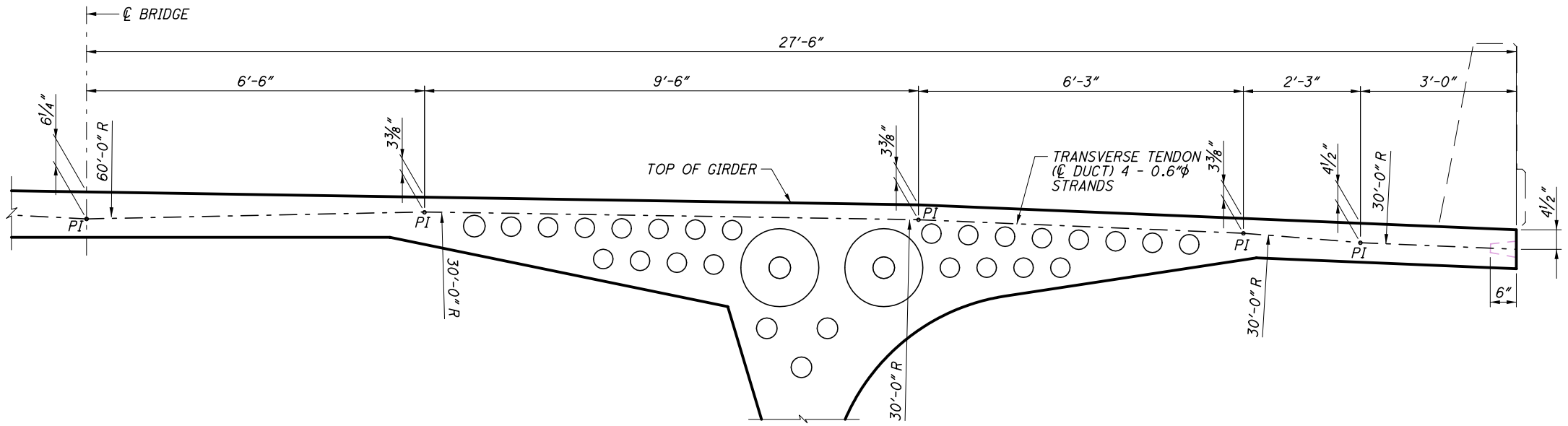
375/470

J:\34878\techprod\Br_Design\Chicago\load rating\Manual Final\Figures\Cad file\Figure 1-11.DGN 10-APR-2009 10:29AM mxin



HALF ELEVATION - PT PROFILE

(LOOKING DOWNSTATION)



HALF ELEVATION - PT PROFILE

(LOOKING DOWNSTATION)

FIGURE 1-12: TRANSVERSE TENDON PROFILE

NOTES:

1. REINFORCEMENT NOT SHOWN FOR CLARITY.
2. ALL TENDONS ARE 4x0.6" STRANDS.
3. ALL TENDONS SHALL BE SINGLE END STRESSED.
4. THE STRESSING ENDS SHALL BE ALTERNATED.
5. STRESSING FORCES SHALL BE 47 kips/STRAND.
6. TENDONS TO BE PLACED PERPENDICULAR TO ℄ BOX GIRDER.
7. TRANSVERSE TENDON PROFILE OF SOUTH BOUND BRIDGE SHOWN. NORTH BOUND BRIDGE IS SIMILAR.

DESIGN AGENCY
1100 Superior Avenue, Suite 1330
Cleveland, OH 44114-2531

DESIGNED	DRAWN	REVIEWED	DATE
SA	SA	JB	10/30/07
CHECKED	REVISED	STRUCTURE FILE NUMBER	
MX		8302278L/8302294R	

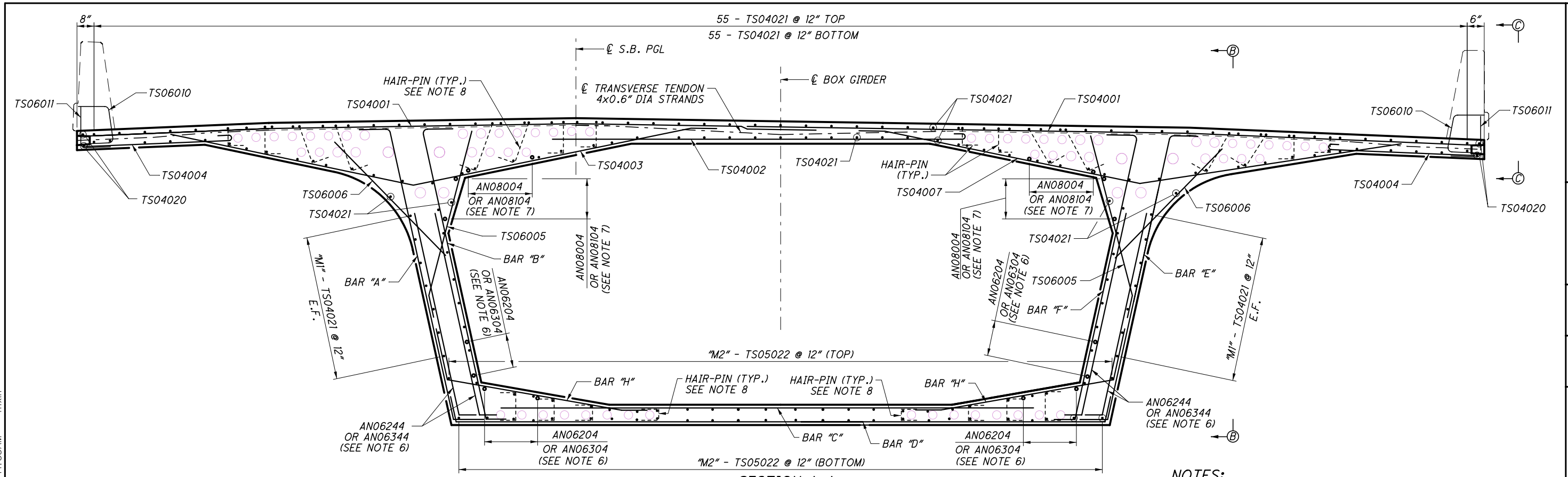
TRANSVERSE TENDON PROFILES
BRIDGE NO. WAR-71-1514L/R
INTERSTATE 71 OVER LITTLE MIAMI RIVER

WAR-71-14.20
PID No. 22950

114 / 204

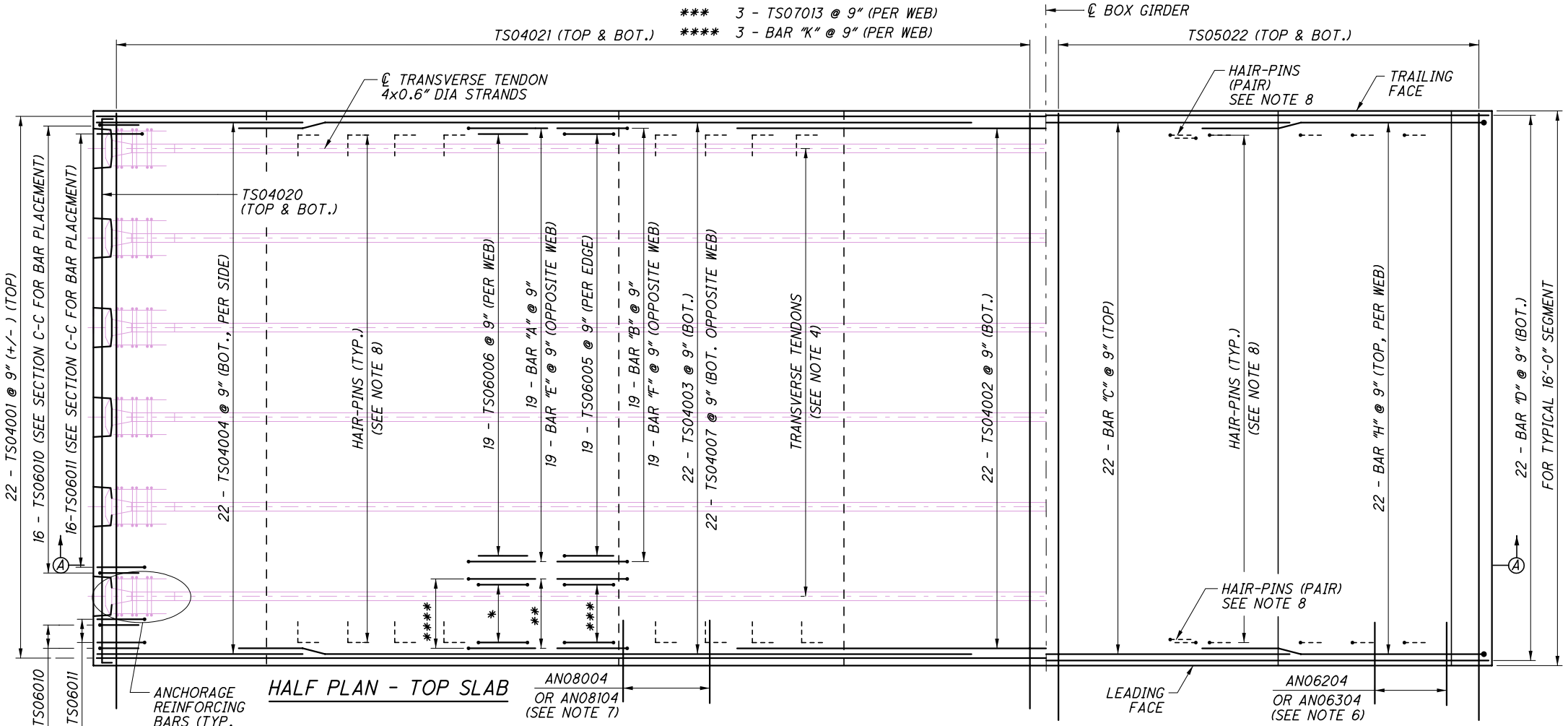
380
470

J:\34878\techprod\Br_Design\Chicago\load rating\Manual Final\Figures\Cad file\Figure 1-12.DGN 10-APR-2009 11:18AM mxin



SECTION A-A
(LOOKING DOWNSTATION)

* 3 - BAR "G" @ 9" (PER WEB)
** 3 - TS07012 @ 9" (PER WEB)
*** 3 - TS07013 @ 9" (PER WEB)
**** 3 - BAR "K" @ 9" (PER WEB)



HALF PLAN - TOP SLAB

HALF PLAN - BOTTOM SLAB

FIGURE 1-13: TYPICAL SEGMENT REINFORCEMENT

NOTES:

1. ALL CONCRETE CHAMFERS ARE ¾".
2. 1½" INITIAL WEARING SURFACE NOT SHOWN FOR CLARITY.
3. SPACE ALL REINFORCING BAR IN TOP SLAB TO CLEAR POST TENSIONING TENDONS.
4. FOR TRANSVERSE TENDON PROFILES, LAYOUT AND DETAILS, SEE SHEETS 114 AND 115 OF 204.
5. FOR REINFORCING BARS AT TRANSVERSE TENDON ANCHORAGES, SEE TRANSVERSE TENDON DETAILS, SHEET 115 OF 204.
6. ANCHOR BLOCK BARS AN06204, AN06244, AN06304 & AN06344 ARE USED ONLY WHEN THE NEXT CASTING SEGMENT CONTAINS A BOTTOM SLAB ANCHORAGE BLOCK TYPE "BA" OR "BB". THEY SHALL BE PLACED IN ADDITION TO TYPICAL SEGMENTS BARS. FOR PLACEMENT AND QUANTITY OF BAR AN06204 AND AN06244 ON TYPE "BA", SEE SHEETS 122 AND 123 OF 204; AND BAR AN06304 AND AN06344 ON TYPE "BB", SEE SHEETS 124 TO 127 OF 204.
7. ANCHOR BLOCK BARS AN08004 & AN08104 ARE USED ONLY WHEN THE NEXT CASTING SEGMENT CONTAINS A TOP SLAB ANCHORAGE BLOCK TYPE "TA" OR "TC". THEY SHALL BE PLACED IN ADDITION TO TYPICAL SEGMENT BARS. FOR PLACEMENT AND QUANTITY OF BAR AN08004 ON TYPE "TA", SEE SHEETS 116 AND 117 OF 204; AND BAR AN08104 ON TYPE "TC", SEE SHEET 120 AND 121 OF 204.
8. PAIRS OF #4 HAIR-PIN BARS SHALL BE PROVIDED FOR THE BOTTOM SLAB AROUND EACH DUCT AT EACH SEGMENT FACE. IN ADDITION, #4 HAIR-PIN BARS SHALL ALSO BE PROVIDED WITH MAXIMUM SPACINGS OF 18 INCHES TO TIE TOP AND BOTTOM NON-PRESTRESSED REINFORCEMENTS WHEN SPACING BETWEEN THE TRANSVERSE OR LONGITUDINAL DUCTS IS LESS THAN 12 INCHES. THE CONTRACTOR SHALL BE RESPONSIBLE FOR DETAILING AND PROVIDING NECESSARY HAIR-PIN BARS, BASED ON THE ACTUAL PT LAYOUT USED, AS PER AASHTO SEGMENTAL GUIDE SPECIFICATION, ARTICLES 16.6, SEE SPECIAL PROVISION - "POST-TENSIONING."
9. FOR VARIABLE NUMBER OF BARS, "M1" AND "M2", OF EACH SEGMENT, SEE TABLE ON SHEET 141 OF 204.
10. FOR SECTION B-B AND C-C, SEE SHEET 141 OF 204.
11. REBARS AND CONCRETE FOR TOP AND BOTTOM ANCHORAGE BLOCKS ARE NOT INCLUDED IN THE BILL OF MATERIAL FOR TYPICAL SEGMENT. WORK THIS SHEET WITH APPLICABLE TYPE OF TOP AND/OR BOTTOM SLAB ANCHOR BLOCK.

DESIGN AGENCY
1100 Superior Avenue, Suite 1330
Cleveland, OH 44114-2531

DESIGNED	DRAWN	REVIEWED	DATE
PY	PY	JB	10/30/07
CHECKED	REVISED	STRUCTURE FILE NUMBER	
MX		8302278L/8302294R	

16 FT TYPICAL SEGMENT REINFORCEMENT
BRIDGE NO. WAR-71-1514L/R
INTERSTATE 71 OVER LITTLE MIAMI RIVER

WAR-71-14.20
PID No. 22950

140 / 204

406
470

J:\34878\techprod\Br_Design\Chicago\load rating\Manual Final\Figures\Cad file\Figure 1-13.DGN 10-APR-2009 11:33AM mxin

APPENDIX B – LOAD CONFIGURATION OF USER DEFINED VEHICLE

Figure 2-1 Definition of Load Configurations (User-Defined Vehicle)
Figure 5-1 Permit (User Defined) Wheel Configurations for Example 1
Figure 5-2 Permit (User Defined) Wheel Configurations for Example 2

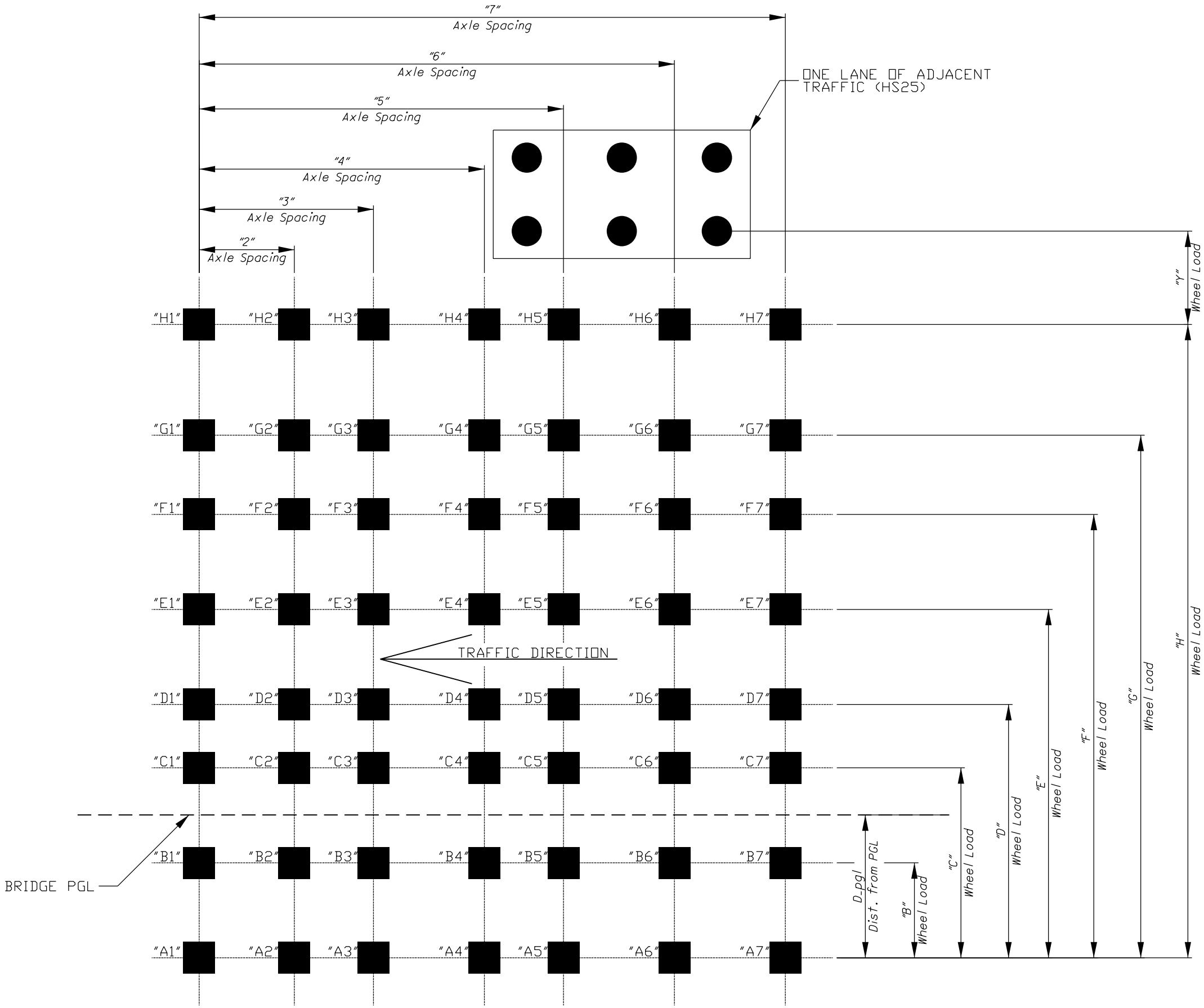


FIGURE 2-1: PERMIT VEHICLE WHEEL CONFIGURATIONS

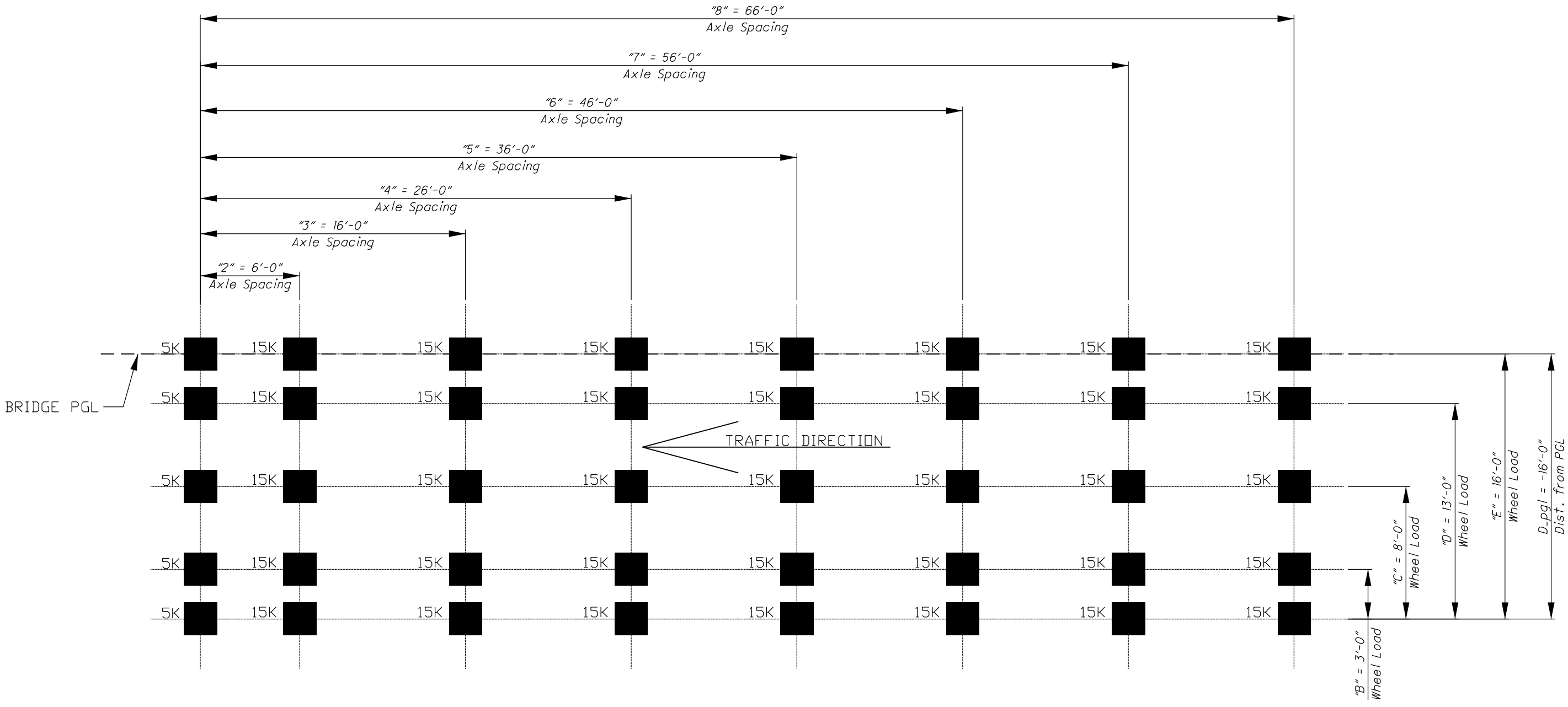


FIGURE 5-1: PERMIT (USER DEFINED) WHEEL CONFIGURATION FOR EXAMPLE 1

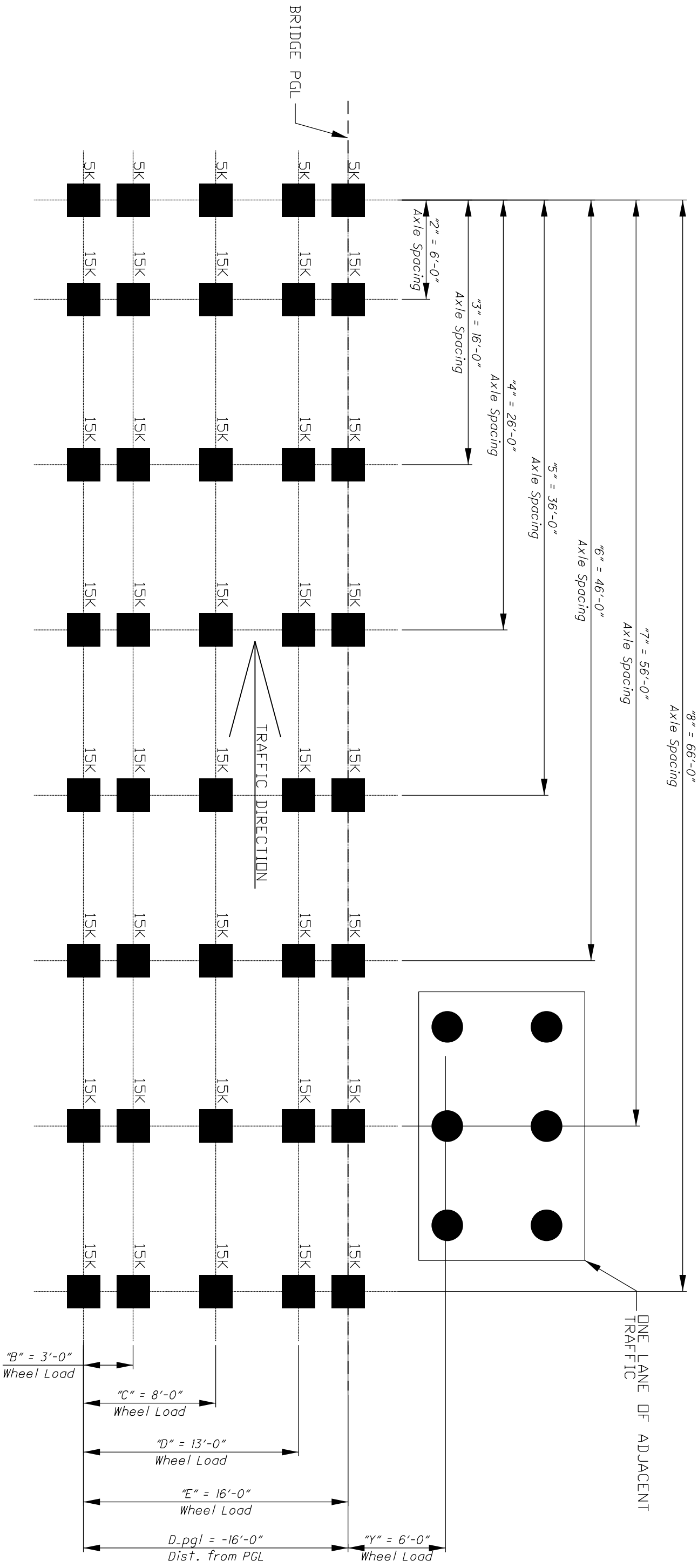


FIGURE 5-2: PERMIT (USER DEFINED) WHEEL CONFIGURATION FOR EXAMPLE 1