

Steel Beam End Spreadsheet v2

Instruction Manual

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Updates

New to 2.5

- Incorporates AASHTO BDS 8th edition revisions for stiffened beam ends.
- Added Emergency Vehicles
- Added ability to add user to additional vehicles

New to 2.4

- [Input Review Report XML](#)
Input Review Report is now an XML report versus a plain text report.
- [Detailed and Summary Ratings](#)
The rating output has the ability to show detailed or summary ratings.
- [Workbook Activation Method](#)
The program is now a read-only xlsx workbook as-opposed to the template workbook.
- Plus additional minor improvements
 - Sorting of Beam End IDs
 - Bug Fixes
 - Undefined system and condition factors
 - Eccentricity formula

New to 2.3

- [UnDefined Beam Ends](#)
Now supports custom capacity checks for special beam ends.
- [Multiple BrR LRFRReports](#) for reactions
Now supports batched BrR runs.
- [Import Old Book](#)
Feature can be used to bring in input data store in older versions of the spreadsheet.
- [Generate Input Review](#)
The Input Review replaces printing to PDF select spreadsheet tabs to add to the load rating report.
- Localized Section Loss Analysis for Stiffened Webs
A new check was added to analyze the compressive resistance of the area with localized section loss for stiffened webs. Note that a new input variable is required: Stiffened Inputs -> H.loss.
- Plus additional minor improvements
 - Default XML path will direct to AASHTOWare BrR 6.8 Folder vs 6.7 folder
 - Auto filter, Sorting & Clearing contents before runs
 - Bug fixes
 - More behind the scenes improvements

User Input Data

This section discusses how the user will use the spreadsheet to compute ratings. At the end of this document there are PDFs of each sheet of the Beam End Spreadsheet with samples of inputted values.

Basic Spreadsheet Organization & Operation

The spreadsheet is designed to analyze multiple beam ends. Each row of each sheet corresponds to one beam end. Each beam end is identified by three criteria: Span, Member, and Support. Each sheet starts with these three columns; all the inputs in that row are specific to that beam end. The order of the beam ends does not need to be the same on each sheet. There shall be no blank rows between inputs, the program will terminate when it encounters a blank row. The preferred nomenclature for the Beam End Identification is the bridge logging convention based on the most recent bridge inspection report, this nomenclature can be observed in the [Sample](#).

The workbook will be required to be activated by inputs can be made. The activation process will save a copy of the Beam End Spreadsheet and necessary data files (BE-AppData) to the users References File for the Bridge. Click **Start** on the [Introduction](#) tab and follow the on-screen instructions.

Section Properties Input

Stiffened Inputs

The [Stiffened Inputs](#) tab is used to input the beam's original section properties and section losses for beam ends with bearing stiffeners. For the input of these variables see [Schematics](#) S-BE.1, S-BE.2 and S-BE.3.

UnStiffened Inputs

The [UnStiffened Inputs](#) tab is used for the inputs for the beam's original section properties and section losses for beams ends without bearing stiffeners. For the input of these variables see the [Schematic](#) S-BE.4 and S-BE.5.

UnDefined Inputs

The [UnDefined Inputs](#) tab is used for the inputs for beam ends/reactional forces that are not supported by Stiffened and UnStiffened modules. The UnDefined module can be used to analyze bolsters, asymmetric sections, or beam ends with severe localized corrosion where typical methods may not be applicable. Capacities and section properties must be computed outside of the spreadsheet and input into each corresponding column. Leaving R_e (eccentricity ratio) blank will omit consideration of the axial load magnification, which is used to account for eccentricities caused by end conditions and localized corrosion.

Loads

The [Loads](#) tab is used to input the reaction at each beam end. Either manual entry or BrR Automatic Import is supported. For instructions, see [BrR Automatic Import](#).

Load Factors

The Load Factors tab is used to input the Strength Load Factors for each beam end and each loading. Either manual entry or automatic generations of the load factors are supported. For automatic generation a separate spreadsheet is used, "Permit Truck Live Load Factor_v1.1.xltn". This spreadsheet can be found within the Beam End Spreadsheet Package. The Live Load Factors are dependent on Analysis Type, ADTT, and Structure Length; enter this information in the orange boxes prior to pressing the **Generate Live Load Factors** button. Please note if any of these fields are blank, live load factors will be computed as if those values were a zero.

BrR Automatic Import

The BrR Control tab is used to automatically import the reaction forces generated by BrR into the spreadsheet. The inputs for this sheet is not required if the user intends to manually input the reaction loads for on the Loads tab.

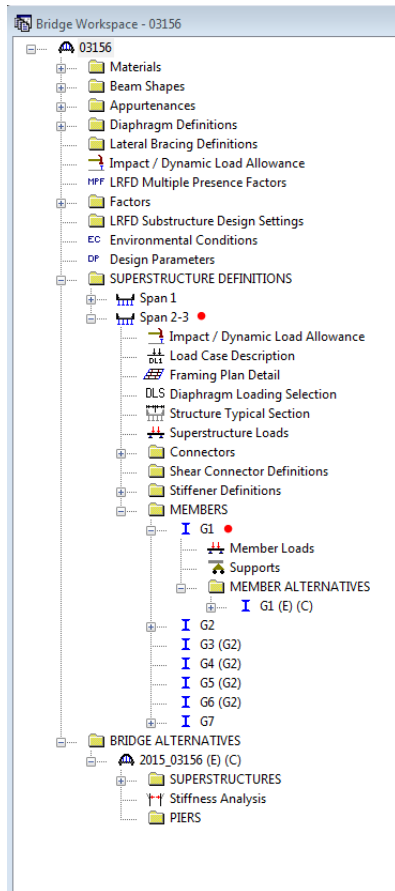
For computational intensive BrR models sometimes batch runs of the BrR model is required. Repeat steps 3 to 6 below to import multiple LRFR Reports for each BrR run. For every LRFR Report import, besides the first one, a new tab will be created.

1. In the BrR Control tab, click the **Populate IDs** button to populate the Beam End Identification columns with the data input by the user in the Stiffened Inputs tab, UnStiffened Inputs tab, and/or UnDefined Inputs tab.
2. The user will then need to link the Beam End Identification columns to the BrR Beam Identification columns, respectively. The reason for this is that the spreadsheet may use a different identification logging and naming convention then used in BrR. Below is an example on how to link IDs.

In this example, the span configuration is 3 spans, Span 1 is simple, and Span 2-3 is a two span continuous, the input would look like this:

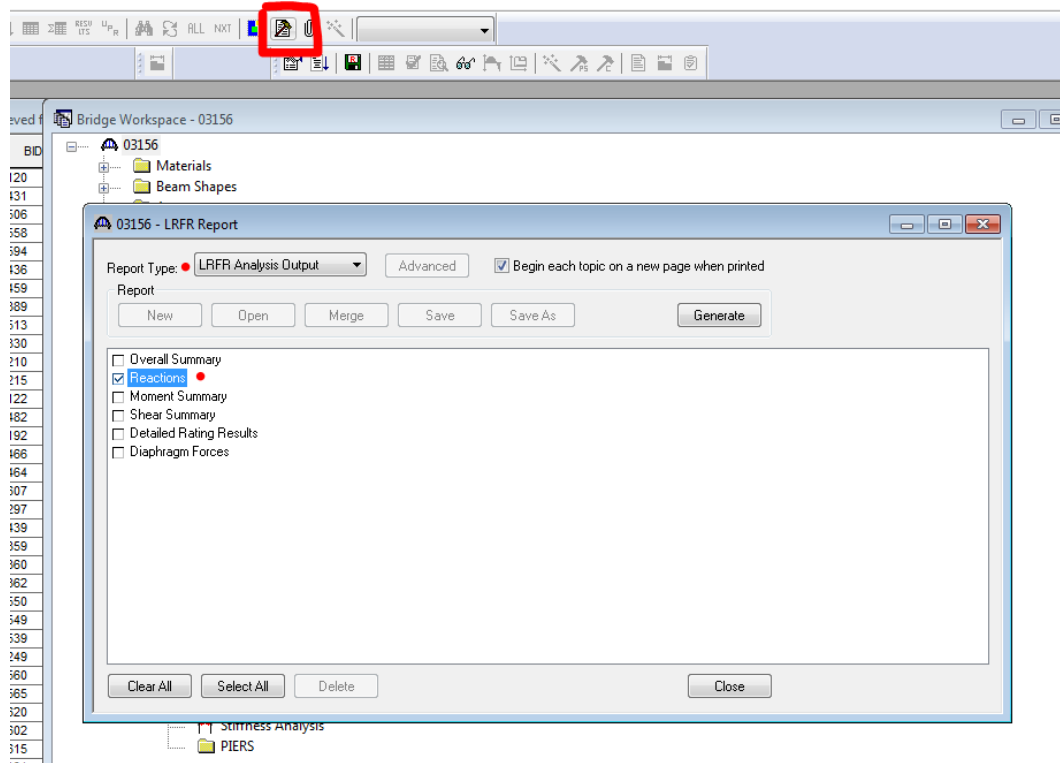
A			D			E	F
1	<-Inputs Loads->		BrR Control			Bridge	00000
2	LRFR Report Path		D:\Users\petriacm\Documents\AASHTOWARE\BrR68\Reports\LRFRReport.XML			User	Pontis
3						Rundate	Wednesday, February 01, 2017 14:53:13
4	Top	Populate IDs	Default XML Path	Custom XML Path	Import LRFR Report	Save XML Report	Version
5	Beam End Identification			AASHTOWare Beam Identification			AASHTO LRFR Engine Version 6.8.1.3001
6	Span	Member	Support	Superstructure Definition		Member	Support
7	1	G4	S Abut	Span 1		G4	1
8	1	G2	Pier 1	Span 1		G2	2
9	2	G3	Pier 1	Span 2-3		G3	1
10	3	G5	N Abut	Span 2-3		G5	3

The BrR Beam Identification (Superstructure Definition, Member, and Support) must exactly match BrR inputted values.



Note that the Member is the name by the red dot above, and not the Member Alternative name.

- The user should run the BrR model and generate all applicable LRFR Reports for Reactions, as shown in the screen image below.



- The user shall set the LRFR Report Path to the report location by either the **Default XML Path** or **Custom XML Path** buttons. The **Default XML Path** button will set the path to the default location on the user's machine, this button will only work correctly if the BrR report path is set to the users "D" drive my documents folder as on the state in-house engineer machine. If BrR is not defaulted to this location, or accessing a previously saved LRFR Report, use the **Custom XML Path** button.
- The user shall click the **Import LRFR Report** button, which will import the reactions into the LRFRReport tab. This tab will unhide itself when the **Import LRFR Report** button is pressed.
- The **Save XML Report** button is used to save the LRFRReport for future use. Include this file in the References folder upon submission.
- Select the Loads tab and click the **Populate IDs** button, then click the **Import BrR Reactions** button to import the reactions from the LRFRReport tab to the Loads tab.

Rating Factors

The final step is to select the Rating Factors tab and click **Compute Rating Factors** button.

Review Results

The ratings for each vehicle and beam end can be found on the Rating Factors tab. There are two different options to display ratings, Detailed and Summary.

Selecting the 'Detail Ratings' option will output beam end rating factors for all failure mechanisms for each vehicle for a particular beam end.

Selecting the 'Summary Ratings' option will only output the controlling beam end rating factors for each beam end per vehicle. Please note that failure mechanism between Stiffened, UnStiffened and Undefined will be enveloped and only the controlling Rating Factor for each vehicle will be displayed per Beam End ID. The 'Summary Ratings' option is selected by default.

Please note that an XML data file will be created in the BE-AppData folder with all ratings included.

To review the intermediate calculation values go to the UnStiffened Outputs tab and/or the Stiffened Outputs tab.

To review the governing rating factor for each vehicle go to the Governing Ratings tab.

To review the Legal and Permit ratings less than 1.0 for the Report, go to the Low Legal and Low Permit tabs, respectively.

Generate Input Review

After the beam end rating is complete, navigate to the Governing Ratings tab and press the **Generate Input Review** button. Print to PDF the generated Beam End Spreadsheet Input Review report from Internet Explorer. Note that the Input Review report will open in the Windows default program to view XML files; typically Internet Explorer is the default XML viewer. The XML report may not display correctly in other XML viewers. If the XML report opens in a program other than Internet Explorer and does not appear to be displaying correctly, navigate to the BE-AppData folder and open with 'BE-InputReview_v2.xml' in Internet Explorer.

Tip: Enabling 'Print Background Colors and Images' in Internet Explorer will display the table header background colors when printing to PDF. This option is within the Page Setup dialog box.

Import Old Book

The inputs of an older version of the Beam End Spreadsheet can be imported into the current version of the Beam End Spreadsheet. Open a new Beam End Spreadsheet, navigate to the Revision tab and click the **Import Input Values** button to select the file path of an older Beam End Spreadsheet. After the import is complete, the spreadsheet will automatically activate and the user will be prompted to save.

When updating it is recommended that rerunning the BrR automatic input on the Loads tab will provide the control vehicle configuration (lanes and truck pairs) in the Governing Ratings tab.

Method for Solution

Mathcad worksheets are provided within the BE-References folder within the Beam End Package, and also provided in the Sample Calculation Section in the appendixes of this document. These Mathcad worksheets serve as a verification that the spreadsheet is working correctly, by providing a "proof" or "sample" calculation. This section also serves to help the load rating engineer (LRE) understand the individual inputs and outputs of the spreadsheet related to the actual analysis. The LRE should be able to easily follow the calculations to determine if the methods used are appropriate for a specific beam end. It is the LRE's responsibility to agree with the methods used herein, and shall accept ownership of

the calculations, as with any other software the LRE uses to perform their tasks. The LRE may contact the Load Rating Section by messaging: DOT.BridgeRating@ct.gov with questions, improvements, or bugs to the analysis.

The LRE may modify the Mathcad worksheets to customize the analysis for any specific conditions the LRE believes it warrants. In this case the LRE shall document the reasons why the Mathcad worksheets were modified within the "Description" section of the worksheet, and add " – Modified" to the title of the Mathcad worksheet. The capacity information should then be inputted to the Beam End Spreadsheet, UnDefined Input tab.

Appendix

Schematics

- S-BE.1 Stiffened Web Original Section
- S-BE.2 Stiffened Web Localized Section Loss
- S-BE.3 Stiffened Web Uniform Loss
- S-BE.4 UnStiffened Web Original Section
- S-BE.5 UnStiffened Web Section Loss

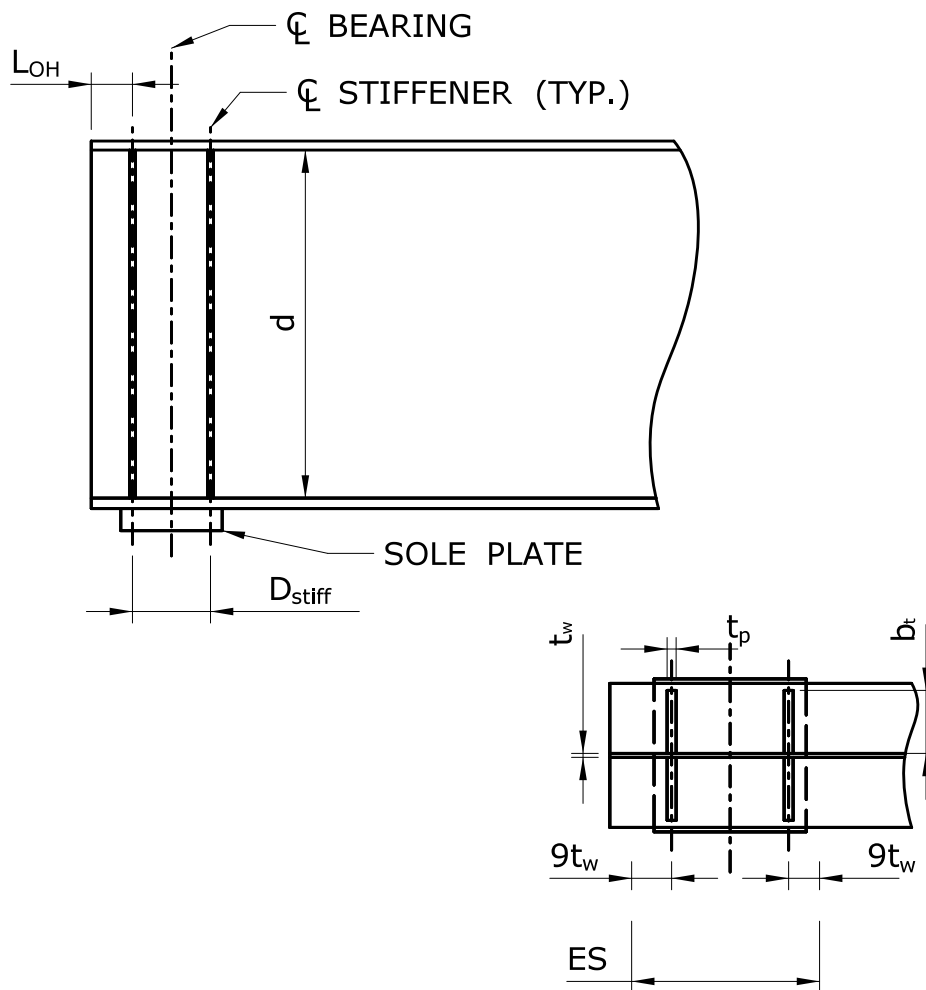
Mathcad Sample Calculations

- Stiffened Web
- Stiffened Web – Localized Loss Region
- UnStiffened Web where Web Crippling Controls
- UnStiffened Web where Web Local Yielding Controls

Beam End Spreadsheet Sample

- Introduction
- Revision
- Stiffened Web Inputs
- UnStiffened Web Inputs
- UnDefined Inputs
- BrR Control
- Loads
- Load Factors
- Rating Factors
- Governing Ratings
- Low Legal
- Low Permit
- Stiffened Web Capacity Outputs
- UnStiffened Web Capacity Outputs
- Beam End Spreadsheet Input Review Report

Input Review Report



where:

- L_{OH} Distance from the centerline of the end bearing stiffener to the girder end
 d Web depth, inside distance between flanges
 t_w Original web thickness
 t_p Original bearing stiffener thickness
 b_t Original stiffener width
 ES Effective column section
 D_{stiff} Distance between outer bearing stiffeners
 if $N_p = 1$, set $D_{stiff} = 0$
 N_p Number of stiffener pairs

NOTE:

The effective section is composed of a centrally located strip of web between the outer bearing stiffeners plus nine times the thickness of the web on each side of the outer stiffeners.

CTDOT
BLRM
 RATING AID

BLRM v2.0

STIFFENED WEB
ORIGINAL GIRDER SECTION

Issue Date:

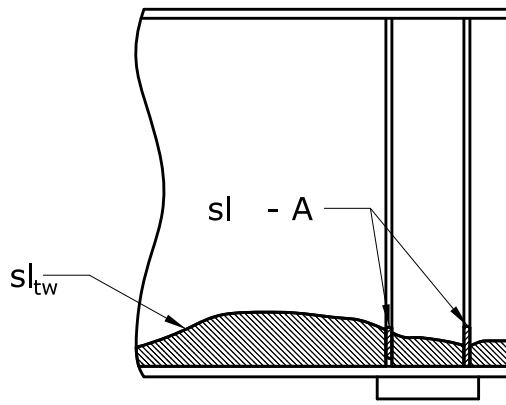
-

Revision Date:

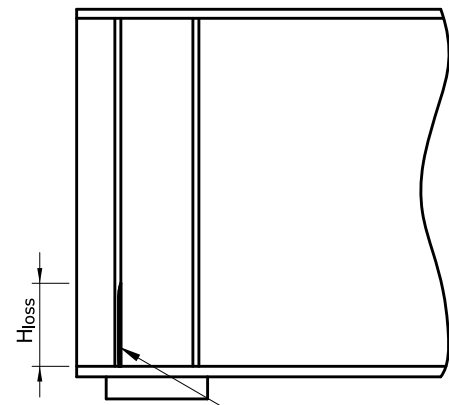
-

Plate ID:

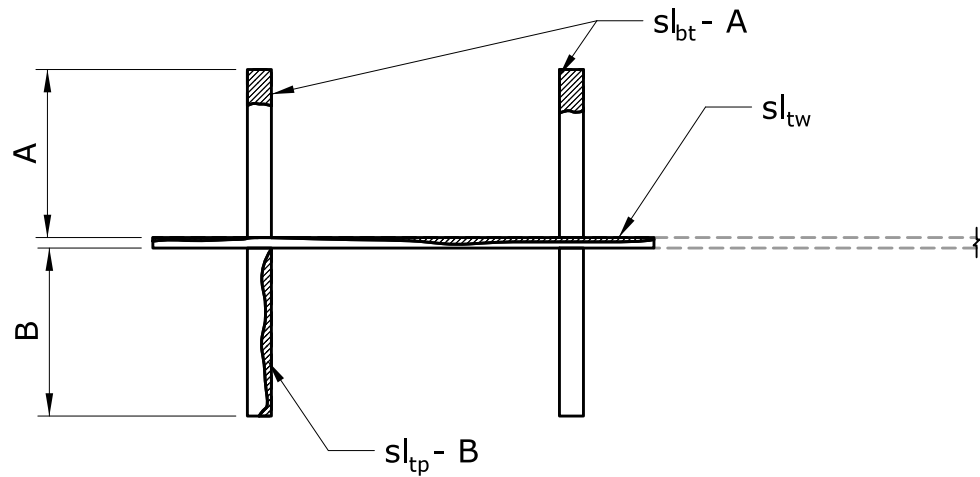
S-BE.1



ELEVATION A



ELEVATION B



where:

- A Group A, stiffeners to the left of the web
- B Group B, stiffeners to the right of the web
- $sl_{bt} - A$ Width section loss of stiffeners in Group A
- $sl_{tp} - A$ Thickness section loss of stiffeners in Group A
- $sl_{bt} - B$ Width section loss of stiffeners in Group B
- $sl_{tp} - B$ Thickness section loss of stiffeners in Group B
- sl_{tw} Thickness section loss of web
- H_{loss} Height of localized corrosion

NOTE:

Losses are computed in percentages against the original gross section for each group and each dimension.

CTDOT
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BLRM v2.0

STIFFENED WEB LOCALIZED SECTION LOSS

Issue Date:

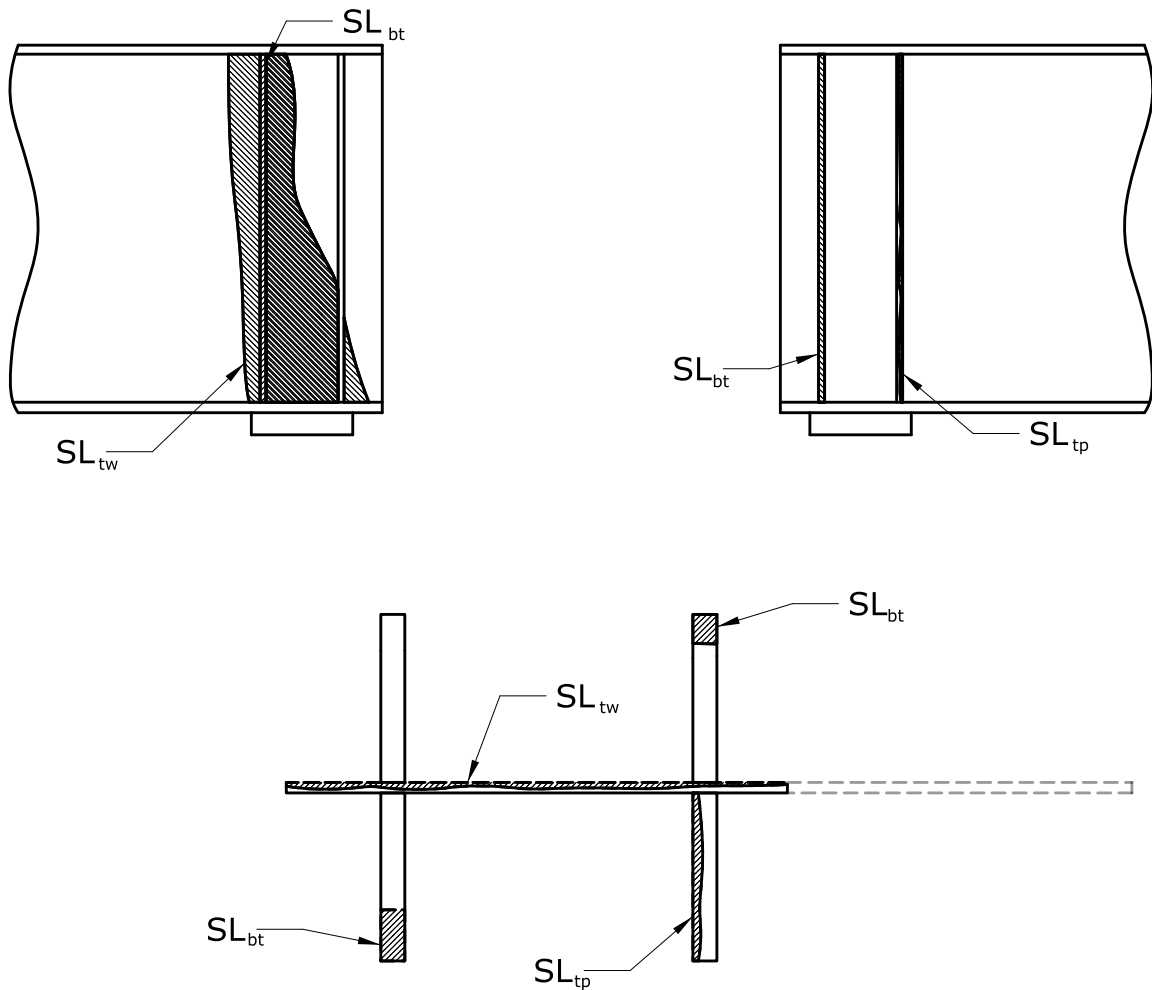
-

Revision Date:

-

Plate ID:

S-BE.2



where:

- SL_{tw} Thickness section loss to the web
 SL_{bt} Width section loss to the stiffeners
 SL_{tp} Thickness section loss of the stiffeners

NOTES:

1. Losses are computed in percentages against the gross section for each dimension. Losses applied to the stiffener are assumed to be equally distributed amongst all stiffener elements.
2. Computed losses to the web should be limited to the deterioration within the effective section.

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STIFFENED WEB
 UNIFORM LOSS

Issue Date:

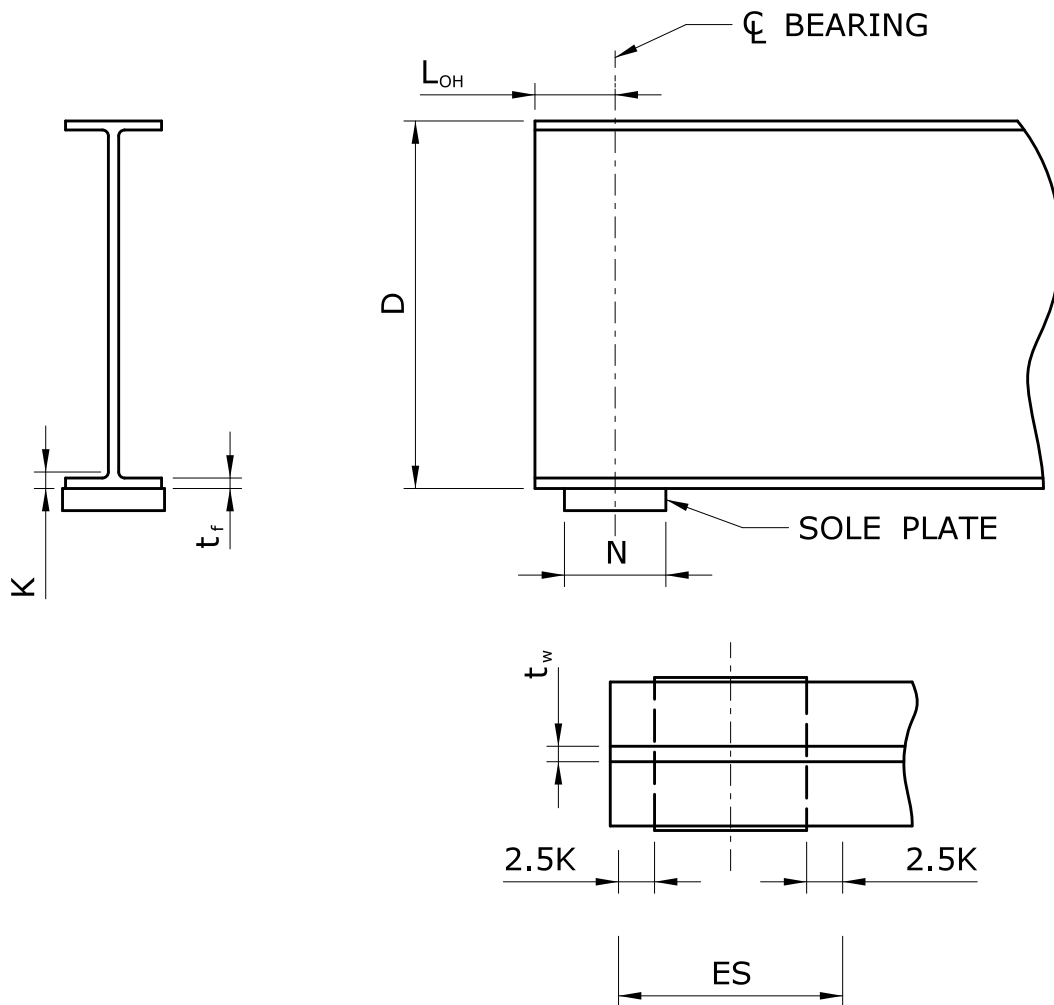
-

Revision Date:

-

Plate ID:

S-BE.3



where:

- L_{OH} Distance from the centerline of bearing to the girder end
- D Depth of the section, out-to-out of flanges
- N Bearing/Sole plate length
- t_f Original bottom flange thickness
- K Bottom flange + fillet thickness
- t_w Original web thickness
- ES Effective column section

CTDOT
BLRM

RATING AID

BLRM v2.0

UNSTIFFENED WEB
ORIGINAL SECTION

Issue Date:

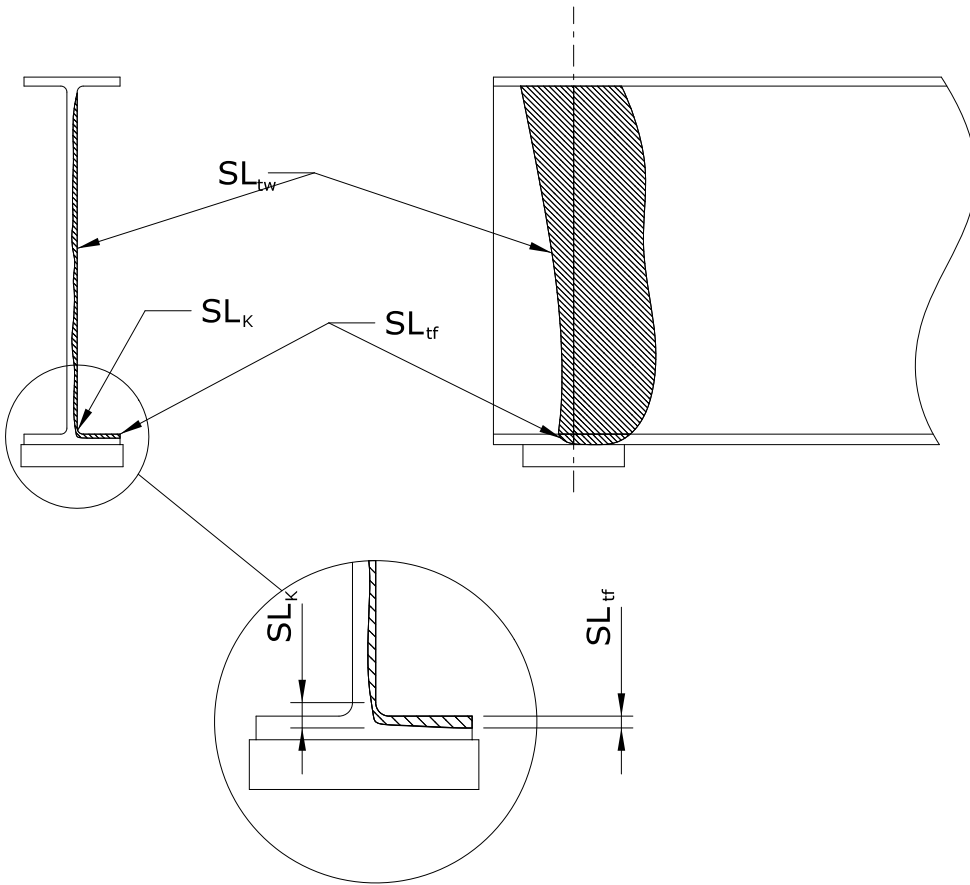
-

Revision Date:

-

Plate ID:

S-BE.4



where:

SL_{tw} Thickness section loss to the web

SL_k Thickness section loss to the bottom flange + fillet

SL_{tf} Thickness section loss to the bottom flange

CTDOT
BLRM
RATING AID

BLRM v2.0

**UNSTIFFENED WEB
SECTION LOSS**

Issue Date:

-

Revision Date:

-

Plate ID:

S-BE.5



Steel Beam Ends Load Rating-Stiffened Web

v2 12/19/2017

Description: The purpose of this worksheet is to compute rating factors for Steel Beams with bearing stiffeners, and provide a sample calculation for the approval of the CTDOT Beam End Spreadsheet v2.

References:

MBE - AASHTO The Manual for Bridge Evaluation 2nd ed. 2014 with 2016 Interim Revisions
BDS - AASHTO LRFD Bridge Design Specifications 8th ed.
BLRM - CTDOT Bridge Load Rating Manual v1.0

Orange backgrounds signifies input regions

Bridge: 00000
Span: 4
Girder: 6
Location: Pier 4

Original Girder Section Properties

Web Depth	$d := 54\text{in}$	Inside Flange to Flange distance
Web Thickness	$t_w := \frac{3}{8}\text{in}$	
Web Yield Strength	$F_{yw} := 33\text{ksi}$	
Modulus Elasticity of Steel	$E := 29000\text{ksi}$	
Minimum End Length	$L_{OH} := 8\text{in}$	Distance from end of beam to 1st bearing stiffener from beam end
Stiffener Thickness	$t_p := \frac{5}{8}\text{in}$	
Stiffener Projecting Width	$b_t := 7\text{in}$	
Number of Stiffener Pairs	$N_p := 3$	
Stiffener Yield Strength	$F_{ys} := 33\text{ksi}$	
Distance Between Outer Stiffeners	$D_{stiff} := 15\text{in}$	
Connection	$\text{Connection} := \text{"Welded"}$	[None, Welded, Bolted]

*Note Beam Ends not rated based on Stiffener Bearing Resistance.

**Section Loss***Uniform Corrosion*

Web Thickness Loss	$SL_w := 20\%$
Stiffener Thickness Loss	$SL_{tp} := 11\%$
Stiffener Width Loss	$SL_{bt} := 2\%$

Localized Corrosion

Stiffener Width Loss in group A	$sl_{b,a} := 2\%$
Stiffener Thickness Loss in group A	$sl_{t,a} := 15\%$
Stiffener Width Loss in group B	$sl_{b,b} := 15\%$
Stiffener Thickness Loss in group B	$sl_{t,b} := 18\%$
Web Thickness Loss	$sl_{t,w,l} := 10\%$
Height of Localized Corrosion	$H_{loss} := 5in$

**As-Inspected Girder Section Properties**

Web Thickness $t_w := t_w \cdot (1 - SL_w) = 0.3 \cdot \text{in}$
Stiffener Thickness $t_p := t_p \cdot (1 - SL_{tp}) = 0.556 \cdot \text{in}$
Stiffener Width $b_t := b_t \cdot (1 - SL_{bt}) = 6.86 \cdot \text{in}$

LRFD Resistance Factors, MBE 6A.6.3 & BDS 6.5.4.2

For Bearing on Milled Surfaces

$$\phi_b := 1.0$$

For Axial Compression, Steel Only - (Dependent on Built Date)

$$\phi_{\text{comp}} := 0.90$$

LRFR Factors

System Factor, MBE 6A.4.2.4 & MBE Table 6A.4.2.4-1

$$\phi_s := 1.0$$

For All Other Girder Bridges and Slab Bridges

Condition Factor, MBE 6A.4.2.3 & MBE Table 6A.4.2.3-1

$$\phi_c := 0.90$$

Poor Condition + Increased by 0.05 for field measured losses, MBE C6A.4.2.3

**Beam Ends With Bearing Stiffeners, BDS 6.10.11.2****Axial Resistance of Bearing Stiffeners, BDS 6.10.11.2.4****Effective Width of Web BDS 6.10.11.2.4b**

$$ES := \begin{cases} (D_{\text{stiff}} + 9 \cdot t_w + \min(9 \cdot t_w, L_{OH})) \cdot \min\left(1, \frac{F_{yw}}{F_{ys}}\right) & \text{if Connection = "Welded"} \\ t_p & \text{otherwise} \end{cases} = 20.4 \cdot \text{in}$$

General Requirements, BDS 6.10.11.2.4a**Determine Moment of Inertia of Projecting Plate**

$$I_s := \frac{N_p \cdot t_p \cdot \left(2 \cdot b_t + \frac{t_w}{1 - SL_w}\right)^3 + (ES - t_p \cdot N_p) \cdot t_w^3}{12} = 389.451 \cdot \text{in}^4$$

Determine Gross Remaining Area

$$A_g := 2N_p \cdot t_p \cdot b_t + ES \cdot t_w = 29.015 \cdot \text{in}^2$$

Determine Radius of Gyration

$$r_s := \sqrt{\frac{I_s}{A_g}} = 3.664 \cdot \text{in}$$

Effective Length Factor, BDS 6.10.11.2.4.a

$$K_{\text{eff}} := 0.75$$

**Axial Compression, BDS 6.9.2.1***Elastic Flexural Buckling Resistance, BDS 6.9.4.1.2-1*

$$P_e := \frac{\pi^2 \cdot E}{\left(\frac{K_{eff} \cdot d}{r_s} \right)^2} \cdot A_g = 67957.903 \cdot \text{kip}$$

Determine Equivalent Nominal Yield Resistance, BDS 6.9.4.1

$$P_o := F_{ys} \cdot A_g = 957.503 \cdot \text{kip}$$

Determine P_n , BDS 6.9.4.1.1-1 & 6.9.4.1.1-2

$$P_{cr} := \begin{cases} \left[0.658^{\left(\frac{P_o}{P_e} \right)} \right] \cdot P_o & \text{if } \frac{P_e}{P_o} \geq 0.44 \\ 0.877 \cdot P_e & \text{otherwise} \end{cases} = 951.873 \cdot \text{kip}$$

Compute the critical buckling stress, BDS eq. 6.9.4.2.2-2

$$F_{cr} := \frac{P_{cr}}{A_g} = 32.806 \cdot \text{ksi}$$

**Nonslender and Slender Element BDS 6.9.4.2**STIFFENERS

Determine Effective Width Imperfection Adjustment factors, c_1 and c_2 BDS Table 6.9.4.2.2a-1

$$c_1 := 0.22$$

$$c_2 := 1.49$$

Width to thickness ratio limit, derived from BDS 6.10.11.2.2:

$$k := 0.48$$

$$\lambda_{rs} := k \cdot \sqrt{\frac{E}{F_{ys}}} = 14.229$$

Elastic Local Buckling Stress BDS 6.9.4.2.2a-4

$$F_{el} := \left[c_2 \cdot \frac{\lambda_{rs}}{\left(\frac{b_t}{t_p} \right)} \right]^2 \cdot F_{ys} = 97.531 \cdot \text{ksi}$$

Compute Effective Width, BDS 6.9.4.2.2a-1 and 6.9.4.2.2a-2

$$b_{es} := \begin{cases} b_t & \text{if } \frac{b_t}{t_p} \leq \lambda_{rs} \\ \text{otherwise} \\ \begin{cases} b_t & \text{if } \frac{b_t}{t_p} \leq \lambda_{rs} \cdot \sqrt{\frac{F_{ys}}{F_{cr}}} \\ b_t \cdot \left(1 - c_1 \cdot \sqrt{\frac{F_{el}}{F_{cr}}} \right) \cdot \sqrt{\frac{F_{el}}{F_{cr}}} & \text{otherwise} \end{cases} \end{cases} = 6.86 \cdot \text{in}$$

**Nonslender and Slender Element Cross-Sections BDS 6.9.4.2**WEB

Determine Effective Width Imperfection Adjustment factors, c_1 and c_2 BDS Table 6.9.4.2.2a-1

$$c_1 := 0.18$$

$$c_2 := 1.31$$

Width to thickness ratio limit, BDS Table 6.9.4.2.1-1 "All other plates supported along two longitudinal edges"

$$\lambda_{rw} := 1.49 \cdot \sqrt{\frac{E}{F_{yw}}} = 44.17$$

Width of web between stiffeners

$$b_w := \begin{cases} 0 & \text{if } N_p = 1 \\ \frac{D_{stiff}}{N_p - 1} & \text{otherwise} \end{cases} = 0.191$$

Width-to-thickness ratio of web:

$$\lambda_w := \begin{cases} 1 & \text{if } N_p = 1 \\ \frac{b_w}{t_w} & \text{otherwise} \end{cases}$$

Elastic Local Buckling Stress BDS 6.9.4.2.2a-4

$$F_{el} := \left(c_2 \cdot \frac{\lambda_{rw}}{\lambda_w} \right)^2 \cdot F_{ys} = 176.78 \cdot \text{ksi}$$

Compute Effective Width, BDS 6.9.4.2.2a-1 and 6.9.4.2.2a-2

$$b_{ew} := \begin{cases} b_w & \text{if } \lambda_w \leq \lambda_{rw} \\ \text{otherwise} & \begin{cases} b_w & \text{if } \lambda_w \leq \lambda_{rw} \cdot \sqrt{\frac{F_{yw}}{F_{cr}}} \\ b_w \cdot \left(1 - c_1 \cdot \sqrt{\frac{F_{el}}{F_{cr}}} \right) \cdot \sqrt{\frac{F_{el}}{F_{cr}}} & \text{otherwise} \end{cases} \end{cases} = 7.5 \cdot \text{in}$$

**Compute Effective Area BDS 6.9.4.2.2**

$$A_{\text{eff}} := A_g - 2 \cdot N_p (b_t - b_{\text{es}}) \cdot t_p - (b_w - b_{\text{ew}}) \cdot t_w (N_p - 1) = 29.015 \cdot \text{in}^2$$

Compute Compressive Resistance BDS 6.9.4.2.2-1

$$P_n := F_{\text{cr}} \cdot A_{\text{eff}} = 951.873 \cdot \text{kip}$$

$$P_r := \phi_{\text{comp}} \cdot P_n = 856.686 \cdot \text{kip}$$

**Loading**DC Load Factor $\gamma_{DC} := 1.25$ DW Load Factor $\gamma_{DW} := 1.50$ DC Load $DC := 46\text{-kip}$ DW Load $DW := 8.71\text{kip}$

Vehicle	Class	Load Factor	Load (kip)
HL-93	Inventory	1.75	64.66
HL-93	Operating	1.35	64.66
Type 3	Legal	1.45	35.07
Type 3S2	Legal	1.45	43.05
Type 3-3	Legal	1.45	43.92
SU4	Legal	1.45	38.37
SU5	Legal	1.45	43.2
SU6	Legal	1.45	46.8
SU7	Legal	1.45	50.39
Legal H20	Legal	1.45	29.77
Legal HS20	Legal	1.45	49.23
CT-L73.0	Legal	1.45	50.88
CT-L32S	Legal	1.45	42.78
CT-P76.5	Permit	1.30	54.27
CT-P120(6)	Permit	1.35	70.84
CT-P140(7)a	Permit	1.40	69.22
CT-P140(7)b	Permit	1.40	65.72
CT-P160(8)a	Permit	1.40	73.39
CT-P160(8)b	Permit	1.40	75.93
CT-P180(9)	Permit	1.35	80.39
CT-P200(10)	Permit	1.35	91.64
CT-P380	Permit	1.10	61.72

 $i := 0..21$

**Localized Corrosion Eccentricity Ratio, MBE C6A.6.5**

Distance From The N.A. To Extreme Fiber Of Original Section

$$c := b_t + \frac{t_w}{2 \cdot (1 - SL_w)} = 7.047 \cdot \text{in}$$

Load Eccentricity In The Member From Corrosion

$$e := \frac{\frac{N_p \cdot t_p \cdot b_t}{2} \cdot \left[(1 - sl_{t,a}) \cdot (1 - sl_{b,a}) \cdot \left[b_t \cdot (1 - sl_{b,a}) + \frac{t_w}{1 - SL_w} \right] - (1 - sl_{t,b}) \cdot (1 - sl_{b,b}) \cdot \left[b_t \cdot (1 - sl_{b,b}) + \frac{t_w}{1 - SL_w} \right] \right]}{t_p \cdot b_t \cdot \left[(1 - sl_{t,a}) \cdot (1 - sl_{b,a}) + (1 - sl_{t,b}) \cdot (1 - sl_{b,b}) \right] + ES \cdot t_w \cdot (1 - sl_{t,w,l})} = 0.801 \cdot \text{in}$$

Eccentricity Ratio

$$R_e := \frac{|e| \cdot c}{r_s^2} = 0.42$$

Axial Load Magnification Due to Localized Corrosion, MBE I6A

Total Factored Axial Loading

$$P_{u_i} := \gamma_{DC} \cdot DC + \gamma_{DW} \cdot DW + \gamma_{LL_i} \cdot LL_i \cdot \text{kip}$$

Axial Load Magnification Factor, MBE I6A-1.

$$\delta_{A_i} := \left(1 + R_e \cdot \sec \left(\frac{K_{eff} \cdot d}{2} \cdot \sqrt{\frac{P_{u_i}}{E \cdot I_s}} \right) \right)$$

**Axial Load Magnification Output:**

Vehicle	Class	Axial Load, Pu	$\delta.A$
HL-93	Inventory	183.72	1.4217318
HL-93	Operating	157.86	1.42153342
Type 3	Legal	121.42	1.42125418
Type 3S2	Legal	132.99	1.42134282
Type 3-3	Legal	134.25	1.42135248
SU4	Legal	126.20	1.42129083
SU5	Legal	133.21	1.42134448
SU6	Legal	138.43	1.42138448
SU7	Legal	143.63	1.42142437
Legal H20	Legal	113.73	1.42119533
Legal HS20	Legal	141.95	1.42141148
CT-L73.0	Legal	144.34	1.42142982
CT-L32S	Legal	132.60	1.42133982
CT-P76.5	Permit	141.12	1.4214051
CT-P120(6)	Permit	166.20	1.42159739
CT-P140(7)a	Permit	167.47	1.42160716
CT-P140(7)b	Permit	162.57	1.42156958
CT-P160(8)a	Permit	173.31	1.42165194
CT-P160(8)b	Permit	176.87	1.42167922
CT-P180(9)	Permit	179.09	1.42169628
CT-P200(10)	Permit	194.28	1.42181283
CT-P380	Permit	138.46	1.42138472

**Rating**

Determine Minimum Capacity

$$R_n := P_r = 856.686 \cdot \text{kip}$$

*Note Beam Ends not rated based on Stiffener Bearing

$$C := \max(0.85, \phi_s \cdot \phi_c) \cdot R_n = 771.017 \cdot \text{kip}$$

Compute Ratings

$$RF_i := \frac{\frac{C}{\delta A_i} - \gamma_{DC} \cdot DC - \gamma_{DW} \cdot DW}{\gamma_{LL_i} \cdot LL_i \cdot \text{kip}}$$

Vehicle	Class	Rating
HL-93	Inventory	4.16
HL-93	Operating	5.40
Type 3	Legal	9.28
Type 3S2	Legal	7.55
Type 3-3	Legal	7.40
SU4	Legal	8.48
SU5	Legal	7.53
SU6	Legal	6.95
SU7	Legal	6.45
Legal H20	Legal	10.93
Legal HS20	Legal	6.61
CT-L73.0	Legal	6.39
CT-L32S	Legal	7.60
CT-P76.5	Permit	6.68
CT-P120(6)	Permit	4.93
CT-P140(7)a	Permit	4.86
CT-P140(7)b	Permit	5.12
CT-P160(8)a	Permit	4.59
CT-P160(8)b	Permit	4.43
CT-P180(9)	Permit	4.34
CT-P200(10)	Permit	3.81
CT-P380	Permit	6.95



Steel Beam Ends Load Rating-Stiffened Web - Localized Region

v2 3/10/2017

Description: The purpose of this worksheet is to compute rating factors for Steel Beams with bearing stiffeners, and provide a sample calculation for the approval of the CTDOT Beam End Spreadsheet v2. This Mathcad outlines the procedure used to analyze the localized area of the beam as a column within the column methodology. The localized analysis was added to the Beam End Spreadsheet starting in v2.3.

Assumptions: The localized corrosion is uniform about the each stiffener in the group for computing b/t ratios. The localized region will behave as an independent column with the height of the column equal to the height of the corrosion.

References:

MBE - AASHTO The Manual for Bridge Evaluation 2nd ed. 2014 with 2016 Interim Revisions
BDS - AASHTO LRFD Bridge Design Specifications 8th ed. with 2016 Interim Revisions
BLRM - CTDOT Bridge Load Rating Manual v1.0

Orange backgrounds signifies input regions

 Reference:X:\Z_V8_CTDOT_NON_PROJECTS\Struct_Bridge\A_Bridge_Load_Rating\Development\Beam End Development



Original Girder Properties

$$t_p := \frac{t_p}{(1 - SL_{tp})} = 0.625 \text{ in}$$

$$b_t := \frac{b_t}{(1 - SL_{bt})} = 7 \text{ in}$$

As-Inspected Girder Section Properties

$$t_w := t_w \cdot \frac{(1 - sl_{t.w.l})}{(1 - SL_w)} = 0.337 \text{ in}$$

Group A

Stiffener Thickness $t_{p.a} := t_p \cdot (1 - sl_{t.a}) = 0.531 \text{ in}$

Stiffener Width $b_{t.a} := b_t \cdot (1 - sl_{b.a}) = 6.86 \text{ in}$

Group B

Stiffener Thickness $t_{p.b} := t_p \cdot (1 - sl_{t.b}) = 0.513 \text{ in}$

Stiffener Width $b_{t.b} := b_t \cdot (1 - sl_{b.b}) = 5.95 \text{ in}$

Height of Local Corrosion

$$d := H_{loss} = 5 \text{ in}$$



Beam Ends With Bearing Stiffeners, BDS 6.10.11.2

Axial Resistance of Bearing Stiffeners, BDS 6.10.11.2.4

Effective Section, BDS 6.10.11.2.4b

$$ES := \begin{cases} (D_{\text{stiff}} + 9 \cdot t_w + \min(9 \cdot t_w, L_{OH})) \cdot \min\left(1, \frac{F_{yw}}{F_{ys}}\right) & \text{if Connection} = \text{"Welded"} \\ t_p & \text{otherwise} \end{cases} = 21.075 \text{ in}$$

General Requirements, BDS 6.10.11.2.4a

Determine Neutral Axis of Section of: (Y = 0 @ Centerline of Web)
Web

$$A_w := ES \cdot t_w = 7.113 \text{ in}^2$$

$$Y_w := 0 \text{ in}$$

Stiffeners on A side of Web

$$A_a := N_p \cdot t_{p,a} \cdot b_{t,a} = 10.933 \text{ in}^2$$

$$Y_a := \frac{t_w}{2 \cdot (1 - s_{l_{t,w,l}})} + \frac{b_{t,a}}{2} = 3.617 \text{ in}$$

Stiffener on B side of Web

$$A_b := N_p \cdot t_{p,b} \cdot b_{t,b} = 9.148 \text{ in}^2$$

$$Y_b := \frac{-t_w}{2 \cdot (1 - s_{l_{t,w,l}})} + \frac{-b_{t,b}}{2} = -3.163 \text{ in}$$

Determine Gross Remaining Area

$$A_g := A_w + A_a + A_b = 27.194 \text{ in}^2$$

$$Y := \frac{A_w \cdot Y_w + A_a \cdot Y_a + A_b \cdot Y_b}{A_g} = 0.391 \text{ in}$$



Determine Moment of Inertia of Elements

$$I_w := \frac{1}{12} E S \cdot t_w^3 + (Y - Y_w)^2 \cdot A_w = 1.152 \text{ in}^4$$

$$I_a := \frac{N_p}{12} \cdot t_{p.a} \cdot b_{t.a}^3 + (Y - Y_a)^2 \cdot A_a = 156.727 \text{ in}^4$$

$$I_b := \frac{N_p}{12} \cdot t_{p.b} \cdot b_{t.b}^3 + (Y - Y_b)^2 \cdot A_b = 142.474 \text{ in}^4$$

$$I_s := I_w + I_a + I_b = 300.353 \text{ in}^4$$

Determine Radius of Gyration

$$r_s := \sqrt{\frac{I_s}{A_g}} = 3.323 \text{ in}$$

Effective Length Factor, BDS 6.10.11.2.4.a

Assumed to behave similar to the full depth section due to the 2 dimensional projecting elements of the stiffeners about the Y, and the Web about the X. Corrosion generally tapers down to the bottom of the web, therefore the top of the localized region is rigidity attached to the remained of the beam end and more corrosion is located above the bottom flange.

$$K_{\text{eff}} := 0.75$$



Axial Compression, BDS 6.9.2.1

Elastic Flexural Buckling Resistance, BDS 6.9.1.2-1

$$P_e := \frac{\pi^2 \cdot E}{\left(\frac{K_{eff} \cdot d}{r_s} \right)^2} \cdot A_g = 6113186.688 \text{kip}$$

Determine Equivalent Nominal Yield Resistance, BDS 6.9.4.1

$$P_o := F_{ys} \cdot A_g = 897.404 \text{kip}$$

Determine P_n , BDS 6.9.4.1.1-1 & 6.9.4.1.1-2

$$P_{cr} := \begin{cases} \left[0.658^{\left(\frac{P_o}{P_e} \right)} \right] \cdot P_o & \text{if } \frac{P_e}{P_o} \geq 0.44 \\ 0.877 \cdot P_e & \text{otherwise} \end{cases} = 897.349 \text{kip}$$

Compute the critical buckling stress, BDS eq. 6.9.4.2.2-2

$$F_{cr} := \frac{P_{cr}}{A_g} = 32.998 \text{ksi}$$



Nonslender and Slender Element Cross-Section BDS 6.9.4.2

STIFFENERS

Determine Effective Width Imperfection Adjustment factors, c_1 and c_2 BDS Table 6.9.4.2.2a-1

$$c_1 := 0.22$$

$$c_2 := 1.49$$

Width to thickness ratio limit, modified form from BDS 6.10.11.2.2:

$$k := 0.48$$

$$\lambda_{rs} := k \cdot \sqrt{\frac{E}{F_{ys}}} = 14.229$$

Compute width to thickness ratios for each group of stiffeners

$$\lambda_{s,a} := \begin{cases} 1 & \text{if } b_{t,a} \cdot t_{p,a} = 0 \\ \frac{b_{t,a}}{t_{p,a}} & \text{otherwise} \end{cases} = 12.913$$

$$\lambda_{s,b} := \begin{cases} 1 & \text{if } b_{t,b} \cdot t_{p,b} = 0 \\ \frac{b_{t,b}}{t_{p,b}} & \text{otherwise} \end{cases} = 11.61$$

Elastic Local Buckling Stress BDS 6.9.4.2.2a-4

$$F_{el,a} := \left(c_2 \cdot \frac{\lambda_{rs}}{\lambda_{s,a}} \right)^2 \cdot F_{ys} = 88.962 \text{ ksi} \quad F_{el,b} := \left(c_2 \cdot \frac{\lambda_{rs}}{\lambda_{s,b}} \right)^2 \cdot F_{ys} = 110.054 \text{ ksi}$$

Compute Effective Width, BDS 6.9.4.2.2a-1 and 6.9.4.2.2a-2

$$b_{es}(b_t, \lambda_s, F_{el}) := \begin{cases} b_t & \text{if } \lambda_s \leq \lambda_{rs} \\ \text{otherwise} \\ \begin{cases} b_t & \text{if } \lambda_s \leq \lambda_{rs} \cdot \sqrt{\frac{F_{ys}}{F_{cr}}} \\ b_t \cdot \left(1 - c_1 \cdot \sqrt{\frac{F_{el}}{F_{cr}}} \right) \cdot \sqrt{\frac{F_{el}}{F_{cr}}} & \text{otherwise} \end{cases} \end{cases}$$

$$b_{es,a} := b_{es}(b_{t,a}, \lambda_{s,a}, F_{el,a}) = 6.86 \text{ in}$$

$$b_{es,b} := b_{es}(b_{t,b}, \lambda_{s,b}, F_{el,b}) = 5.95 \text{ in}$$



Nonslender and Slender Element Cross-Section BDS 6.9.4.2

WEB

Determine Effective Width Imperfection Adjustment factors, c_1 and c_2 BDS Table 6.9.4.2.2a-1

$$c_1 := 0.18$$

$$c_2 := 1.31$$

Width to thickness ratio limit, BDS Table 6.9.4.2.1-1 "All other plates supported along two longitudinal edges"

$$\lambda_{rw} := 1.49 \sqrt{\frac{E}{F_{yw}}} = 44.17$$

Width of web between stiffeners

$$b_w := \begin{cases} 0 & \text{if } N_p = 1 \\ \frac{D_{stiff}}{N_p - 1} & \text{otherwise} \end{cases} = 7.5\text{-in}$$

Compute width-to-thickness ratios between stiffeners

$$\lambda_w := \begin{cases} 1 & \text{if } b_w \cdot t_w = 0 \\ \frac{b_w}{t_w} & \text{otherwise} \end{cases} = 22.222$$

Elastic Local Buckling Stress BDS 6.9.4.2.2a-4

$$F_{el} := \left(c_2 \cdot \frac{\lambda_{rw}}{\lambda_w} \right)^2 \cdot F_{yw} = 223.737\text{ksi}$$

Compute Effective Width, BDS 6.9.4.2.2a-1 and 6.9.4.2.2a-2

$$b_{ew} := \begin{cases} b_w & \text{if } \lambda_w \leq \lambda_{rw} \\ \text{otherwise} & \begin{cases} b_w & \text{if } \lambda_w \leq \lambda_{rw} \cdot \sqrt{\frac{F_{yw}}{F_{cr}}} \\ b_w \cdot \left(1 - c_1 \cdot \sqrt{\frac{F_{el}}{F_{cr}}} \right) \cdot \sqrt{\frac{F_{el}}{F_{cr}}} & \text{otherwise} \end{cases} \end{cases} = 7.5\text{-in}$$



Compute Effective Area BDS 6.9.4.2.2

$$A_{\text{eff}} := A_g - N_p \cdot (b_{t.a} - b_{es.a}) \cdot t_{p.a} - N_p \cdot (b_{t.b} - b_{es.b}) \cdot t_{p.b} - (b_w - b_{ew}) \cdot t_w \cdot (N_p - 1)$$

$$A_{\text{eff}} = 27.194 \text{ in}^2$$

Compute Compressive Resistance BDS 6.9.4.2-1

$$P_n := F_{cr} \cdot A_{\text{eff}} = 897.349 \text{ kip}$$

$$P_r := \phi_{\text{comp}} \cdot P_n = 807.614 \text{ kip}$$



Localized Corrosion Eccentricity Ratio, MBE C6A.6.5

Distance From The N.A. To Extreme Fiber to Extreme Compression Fiber

$$c := \frac{t_w}{2(1 - sl_{t,w,l})} + b_t + |Y| = 7.578 \text{ in}$$

Load Eccentricity In The Member From Corrosion

$$e := Y = 0.391 \text{ in}$$

Eccentricity Ratio

$$R_e := \frac{|e| c}{r_s^2} = 0.268$$

Axial Load Magnification Due to Localized Corrosion, MBE I6A

Total Factored Axial Loading

$$P_{u_i} := \gamma_{DC} \cdot DC + \gamma_{DW} \cdot DW + \gamma_{LL_i} \cdot LL_i \cdot \text{kip}$$

Axial Load Magnification Factor, MBE I6A-1

$$\delta_{A_i} := \left(1 + R_e \cdot \sec \left(\frac{K_{eff} \cdot d}{2} \cdot \sqrt{\frac{P_{u_i}}{E \cdot I_s}} \right) \right)$$



Axial Load Magnification Output:

Vehicle	Class	Axial Load, Pu	$\delta.A$
HL-93	Inventory	183.72	1.26794679
HL-93	Operating	157.86	1.26794539
Type 3	Legal	121.42	1.26794342
Type 3S2	Legal	132.99	1.26794405
Type 3-3	Legal	134.25	1.26794412
SU4	Legal	126.20	1.26794368
SU5	Legal	133.21	1.26794406
SU6	Legal	138.43	1.26794434
SU7	Legal	143.63	1.26794462
Legal H20	Legal	113.73	1.26794301
Legal HS20	Legal	141.95	1.26794453
CT-L73.0	Legal	144.34	1.26794466
CT-L32S	Legal	132.60	1.26794403
CT-P76.5	Permit	141.12	1.26794449
CT-P120(6)	Permit	166.20	1.26794584
CT-P140(7)a	Permit	167.47	1.26794591
CT-P140(7)b	Permit	162.57	1.26794565
CT-P160(8)a	Permit	173.31	1.26794623
CT-P160(8)b	Permit	176.87	1.26794642
CT-P180(9)	Permit	179.09	1.26794654
CT-P200(10)	Permit	194.28	1.26794736
CT-P380	Permit	138.46	1.26794434



Rating

Determine Minimum Capacity

$$R_n := P_r = 807.614 \cdot \text{kip}$$

*Note Beam Ends not rated based on Stiffener Bearing

$$C := \max(0.85, \phi_s \cdot \phi_c) \cdot R_n = 726.853 \cdot \text{kip}$$

Compute Ratings

$$RF_i := \frac{\frac{C}{\delta A_i} - \gamma_{DC} \cdot DC - \gamma_{DW} \cdot DW}{\gamma_{LL_i} \cdot LL_i \cdot \text{kip}}$$

Vehicle	Class	Rating
HL-93	Inventory	4.44
HL-93	Operating	5.75
Type 3	Legal	9.88
Type 3S2	Legal	8.05
Type 3-3	Legal	7.89
SU4	Legal	9.03
SU5	Legal	8.02
SU6	Legal	7.40
SU7	Legal	6.87
Legal H20	Legal	11.64
Legal HS20	Legal	7.04
CT-L73.0	Legal	6.81
CT-L32S	Legal	8.10
CT-P76.5	Permit	7.12
CT-P120(6)	Permit	5.25
CT-P140(7)a	Permit	5.18
CT-P140(7)b	Permit	5.46
CT-P160(8)a	Permit	4.89
CT-P160(8)b	Permit	4.72
CT-P180(9)	Permit	4.63
CT-P200(10)	Permit	4.06
CT-P380	Permit	7.40



Steel Beam Ends Load Rating - UnStiffened Web

v1.1 3/10/2017

Description: The purpose of this worksheet is to compute rating factors for Steel Beams without bearing stiffeners, and provide a sample calculation for the approval of the CTDOT Beam End Spreadsheet v2.

References:

MBE - AASHTO The Manual for Bridge Evaluation 2nd ed. 2014 with 2016 Interim Revisions
LRFD - AASHTO LRFD Bridge Design Specifications 7th ed. with 2016 Interim Revisions
BLRM - CTDOT Bridge Load Rating Manual v1.0

Orange backgrounds signifies input regions

Bridge: 00000
Span: 4
Girder: 6
Location: Pier 4

Original Girder Section

Section Depth	D	24 in
Web Thickness	t.w	1 in
Web Yield Strength	F.yw	70 ksi
E of Steel	E	29000 ksi
Flange Thickness	t.f	1 in
Flange + Fillet Thickness	K	2 in
Length of Bearing	N	12 in
Minimum End Length	L.OH	24 in
Web Thickness Loss	SL.w	50 %
Flange + Fillet Loss	SL.K	50 %
Flange Loss	SL.tf	50 %

Units

D := D·in
t_w := t_w·in
F_{yw} := F_{yw}·ksi
E := E·ksi
t_f := t_f·in
K := K·in
N := N·in
L_{OH} := L_{OH}·in
SL_w := SL_w·%
SL_K := SL_K·%
SL_{tf} := SL_{tf}·%

**As-Inspected Girder Section Properties**

Web Thickness $t_w := t_w \cdot (1 - SL_w) = 0.5 \text{ in}$

Flange + Fillet $K := K \cdot (1 - SL_K) = 1 \text{ in}$

Flange $t_f := t_f \cdot (1 - SL_{tf}) = 0.5 \text{ in}$

LRFD Resistance Factors, MBE 6A.6.3 & LRFD 6.5.4.2

For Bearing On Milled Surfaces

$\phi_b := 1.0$

For Web Crippling

$\phi_w := 0.80$

LRFR Factors

System Factor, MBE 6A.4.2.4 & MBE Table 6A.4.2.4-1

$\phi_s := 1.0$

For All Other Girder Bridges and Slab Bridges

Condition Factor, MBE 6A.4.2.3 & MBE Table 6A.4.2.3-1

$\phi_c := 0.90$

Poor Condition + Increased by 0.05 for field measured losses, MBE C6A.4.2.3

**Beam Ends Without Bearing Stiffeners, LRFD D6.5.2**

The following calculations are applicable only for UnStiffened Beam Ends

Web Local Yielding, LRFD D6.5.2

Nominal Resistance to the Concentrated Loading, LRFD D6.5.2-2 or D6.2.2-3

$$R_{nb} := \begin{cases} (5 \cdot K + N) \cdot F_{yw} \cdot t_w & \text{if } L_{OH} > D \\ \left(2.5 \cdot K + N + \min \left(2.5 \cdot K, \max \left(0, L_{OH} - \frac{N}{2} \right) \right) \right) \cdot F_{yw} \cdot t_w & \text{otherwise} \end{cases}$$

$$R_{nb} = 595 \text{ kip}$$

$$R_{ub} := \phi_b \cdot R_{nb} = 595 \text{ kip}$$

Web Crippling, LRFD D6.5.3

Nominal Resistance to the Concentrated Loading, LRFD D6.5.3-2, D6.5.3-3, or D6.5.3-4

$$R_{nw} := \begin{cases} \left[0.8 t_w^2 \cdot \left[1 + 3 \cdot \left(\frac{N}{D} \right) \cdot \left(\frac{t_w}{t_f} \right)^{1.5} \right] \cdot \sqrt{\frac{E \cdot F_{yw} \cdot t_f}{t_w}} \right] & \text{if } L_{OH} \geq \frac{D}{2} \\ \left[0.4 t_w^2 \cdot \left[1 + 3 \cdot \left(\frac{N}{D} \right) \cdot \left(\frac{t_w}{t_f} \right)^{1.5} \right] \cdot \sqrt{\frac{E \cdot F_{yw} \cdot t_f}{t_w}} \right] & \text{if } \frac{N}{D} \leq 0.2 \\ \left[0.4 t_w^2 \cdot \left[1 + \left(\frac{4N}{D} - 0.2 \right) \cdot \left(\frac{t_w}{t_f} \right)^{1.5} \right] \cdot \sqrt{\frac{E \cdot F_{yw} \cdot t_f}{t_w}} \right] & \text{otherwise} \end{cases}$$

$$R_{nw} = 712.39 \text{ kip}$$

$$R_{uw} := \phi_w \cdot R_{nw} = 569.912 \text{ kip}$$

**Loading**DC Load Factor $\gamma_{DC} := 1.25$ DW Load Factor $\gamma_{DW} := 1.50$ DC Load $DC := 46\text{kip}$ DW Load $DW := 8.7\text{kip}$

Vehicle	Class	Load Factor	Load (kip)
HL-93	Inventory	1.75	64.66
HL-93	Operating	1.35	64.66
Type 3	Legal	1.45	35.07
Type 3S2	Legal	1.45	43.05
Type 3-3	Legal	1.45	43.92
SU4	Legal	1.45	38.37
SU5	Legal	1.45	43.2
SU6	Legal	1.45	46.8
SU7	Legal	1.45	50.39
Legal H20	Legal	1.45	29.77
Legal HS20	Legal	1.45	49.23
CT-L73.0	Legal	1.45	50.88
CT-L32S	Legal	1.45	42.78
CT-P76.5	Permit	1.30	54.27
CT-P120(6)	Permit	1.35	70.84
CT-P140(7)a	Permit	1.40	69.22
CT-P140(7)b	Permit	1.40	65.72
CT-P160(8)a	Permit	1.40	73.39
CT-P160(8)b	Permit	1.40	75.93
CT-P180(9)	Permit	1.35	80.39
CT-P200(10)	Permit	1.35	91.64
CT-P380	Permit	1.10	61.72

 $i := 0..21$

**Rating**

Determine Minimum Capacity

$$R_n := \min(R_{ub}, R_{uw}) = 569.912 \text{ kip}$$

$$C := \max(0.85, \phi_s \cdot \phi_c) \cdot R_n = 512.921 \text{ kip}$$

Compute Ratings

$$RF_i := \frac{C - \gamma_{DC} \cdot DC - \gamma_{DW} \cdot DW}{\gamma_{LL_i} \cdot LL_i \cdot \text{kip}}$$

Vehicle	Class	Rating
HL-93	Inventory	3.90
HL-93	Operating	5.06
Type 3	Legal	8.69
Type 3S2	Legal	7.08
Type 3-3	Legal	6.94
SU4	Legal	7.95
SU5	Legal	7.06
SU6	Legal	6.51
SU7	Legal	6.05
Legal H20	Legal	10.24
Legal HS20	Legal	6.19
CT-L73.0	Legal	5.99
CT-L32S	Legal	7.13
CT-P76.5	Permit	6.27
CT-P120(6)	Permit	4.62
CT-P140(7)a	Permit	4.56
CT-P140(7)b	Permit	4.80
CT-P160(8)a	Permit	4.30
CT-P160(8)b	Permit	4.16
CT-P180(9)	Permit	4.07
CT-P200(10)	Permit	3.57
CT-P380	Permit	6.51



Analysis Summary		
As-Inspected Web Thickness	t.w	0.5 in
As-Inspected Flange + Fillet Thickness	K	1 in
Web Local Yield Resistance	R.ub	595 kip
Web Crippling Resistance	R.uw	569.9123 kip
Factored Capacity	C	512.921 kip



STEEL BEAM ENDS - LOAD RATING

Description

The purpose of this worksheet is to compute Rating Factors for Stiffened and UnStiffened Web subject to concentrated loads at supports.

References

BLRM	CTDOT Bridge Load Rating Manual version 1.0
MBE	AASHTO Manual for Bridge Evaluation, 2nd ed. 2010, with 2016 Interim Revisions
BDS	AASHTO LRFD Bridge Design Specifications 7th ed. with 2016 Interim Revisions

Bridge Identification Data

Bridge ID 00000

Worksheet Instructions

Please see the BeamEndSpreadsheet Package for Instructions on how to use this worksheet.

Submittal

This spreadsheet shall be included in the References File. See the CTDOT Bridge Load Rating Manual for more information about the References file. This workbook shall be saved as a macro-enabled workbook. Consult with Microsoft Support and Excel Help for questions about saving the workbook as a macro-enabled workbook.

A PDF of the Input Review text file generated shall be include in the Load Rating Report PDF document. The Input Review file should also be digitaly provided in the references folder.

Mathcad or hand calculations may be needed for inputs for this spreadsheet. Those calculations shall be included within the Calculations section of the report.

Accuracy

The load rating engineer is responsible for the accuracy of the results. If the load rating engineer has reason to believe the results are not true contact the load rating section for guidance.

Resources and Contacts

email	DOT.BridgeRating@ct.gov
website	http://www.ct.gov/dot/cwp/view.asp?a=4048&Q=562040&PM=1

Click Start Below to activate the Beam End Spreadsheet

Start

Note:

Macros must be enabled before continuing. Consult with Microsoft Support and Excel Help for questions about enabling macros



Steel Beam Ends - Load Rating
Connecticut Department of Transportation



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Current Version: 2.3

Import Input Values

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#	Version	Date	By	Approved by	Description
1	2	9/15/2016	cmp	mgd	Updated Stiffened web analysis method
2	2	9/15/2016	cmp	mgd	Updated User Interface
3	2.1	10/12/2016	cmp	mgd	Fixed squaring of the b/t ratio of stiffener slenderness check (reported by Lochner)
4	2.1	10/12/2016	cmp	mgd	Removed MathCad library, Mathcad plugin no longer required to use spreadsheet (reported by CME)
5	2.1	10/12/2016	cmp	mgd	Remove reformatting of bridge number after BrR import
6	2.1	10/12/2016	cmp	mgd	fix error if there where more unstiffened web locations than stiffened webs, would crash the rating (reported by Stantec)
7	2.2	10/26/2016	cmp	sjjs	fixed issue in BrR Import routine where it would use the ID Support rather than the BrR Support Id
8	2.3	3/17/2017	cmp	sjjs	fixed sorting/filtering function
9	2.3	3/17/2017	cmp	sjjs	Added ability to add multiple BrR LRFRReports
10	2.3	3/17/2017	cmp	sjjs	Added Undefined Section Analysis for users to input user defined capacities to preform ratings
11	2.3	3/17/2017	cmp	sjjs	Added Governing Rating Factors Sheets and Permit and Legal Less than 1.0 Tables for Reporting
12	2.3	3/17/2017	cmp	sjjs	Updated buttons to stand out from the cell backgrounds
13	2.3	3/17/2017	cmp	sjjs	Added importer to import older spreadsheet input data (button on this sheet)
14	2.3	3/17/2017	cmp	sjjs	Added Input Review for reporting (button on Governing Rating Sheet)
15	2.3	3/17/2017	cmp	sjjs	Added Localized Region analysis for Stiffened Webs
16	2.3	3/17/2017	cmp	sjjs	Added Effective Section to UnStiffened Outputs sheet to assist in section loss calculations



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[UnStiffened Outputs ->>](#)

Stiffened Web Inputs

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Beam End Identification			Resistance	System	Condition	Member Properties (in, kip)					Stiffener Properties (in, kip)						Uniform Section Loss (%)			Localized Section Losses (% in)					
Span	Member	Support	φ	φ.s	φ.c	E	F.yw	L.OH	d	t.w	D.stiff	Connection	b.t	t.p	F.ys	Np	SL.w	SL.tp	SL.bt	sl.b.a	sl.t.a	sl.b.b	sl.t.b	sl.t.w.l	H.loss
1	G1	S Abut	0.9	1	0.85	29000	36	6	60	0.375	0	Welded	6	0.5	36	1	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	22.00%	5
1	G1	Pier 1	0.9	1	0.85	29000	36	6	60	0.375	0	Welded	6	0.5	36	1	0.00%	0.00%	0.00%	0.00%	55.00%	11.00%	20.00%	11.00%	5
1	G5	S Abut	0.9	1	0.85	29000	36	6	60	0.375	0	Welded	6	0.5	36	1	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	22.00%	5
1	G5	Pier 1	0.9	1	0.85	29000	36	6	60	0.375	0	Welded	6	0.5	36	1	14.82%	12.50%	0.00%	33.33%	25.00%	0.00%	40.00%	51.00%	5
2	G1	Pier 2	0.9	1	0.85	29000	36	6	60	0.375	0	Welded	7	0.875	36	1	0.00%	0.00%	0.00%	0.00%	21.00%	0.00%	0.00%	0.00%	5
2	G3	Pier 2	0.9	1	0.85	29000	36	6	60	0.375	0	Welded	7	0.875	36	1	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	42.86%	0.00%	5
2	G5	Pier 1	0.9	1	0.85	29000	36	6	60	0.375	0	Welded	7	0.875	36	1	29.63%	17.88%	0.00%	0.00%	0.00%	0.00%	0.00%	40.74%	5
2	G5	Pier 2	0.9	1	0.85	29000	36	6	60	0.375	0	Welded	7	0.875	36	1	0.00%	0.00%	0.00%	0.00%	25.00%	0.00%	14.00%	18.00%	5
3	G1	Pier 2	0.9	1	0.85	29000	36	6	60	0.375	0	Welded	6	0.5	36	1	0.00%	12.50%	0.00%	0.00%	0.00%	0.00%	21.43%	90.00%	5
3	G5	Pier 2	0.9	1	0.85	29000	36	6	60	0.375	0	Welded	6	0.5	36	1	0.00%	0.00%	0.00%	0.00%	40.00%	20.00%	23.00%	11.11%	5



Steel Beam Ends - Load Rating
Connecticut Department of Transportation



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[UnStiffened Outputs ->>](#)

UnStiffened Web Inputs

$\phi.b$	1
$\phi.w$	0.8

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Beam End Identification			System	Condition	Member Properties (kip, in)								Section Loss (%)		
Span	Member	Support	$\phi.s$	$\phi.c$	E	F.yw	D	t.w	t.f	K	L.OH	N	SL.w	SL.tf	SL.K
1	G2	S Abut	1	0.85	29000	36	35.55	0.598	0.794	0.794	6	6	2.22%	0.00%	7.11%
1	G2	Pier 1	1	0.85	29000	36	35.55	0.598	0.794	0.794	6	6	0.63%	0.00%	2.03%
1	G3	S Abut	1	0.85	29000	36	35.55	0.598	0.794	0.794	6	6	2.22%	0.00%	7.11%
1	G3	Pier 1	1	0.85	29000	36	35.55	0.598	0.794	0.794	6	6	0.63%	0.00%	2.03%
1	G4	S Abut	1	0.85	29000	36	35.55	0.598	0.794	0.794	6	6	2.22%	0.00%	7.11%
1	G4	Pier 1	1	0.85	29000	36	35.55	0.598	0.794	0.794	6	6	0.63%	0.00%	2.03%
3	G2	Pier 2	1	0.85	29000	36	35.55	0.598	0.794	0.794	6	6	3.69%	4.50%	0.00%
3	G2	N Abut	1	0.85	29000	36	35.55	0.598	0.794	0.794	6	6	3.69%	0.00%	0.00%
3	G3	Pier 2	1	0.85	29000	36	35.55	0.598	0.794	0.794	6	6	3.69%	4.50%	0.00%
3	G3	N Abut	1	0.85	29000	36	35.55	0.598	0.794	0.794	6	6	3.69%	0.00%	0.00%
3	G4	Pier 2	1	0.85	29000	36	35.55	0.598	0.794	0.794	6	6	3.69%	4.50%	0.00%
3	G4	N Abut	1	0.85	29000	36	35.55	0.598	0.794	0.794	6	6	3.69%	0.00%	0.00%



Steel Beam Ends - Load Rating
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UnDefined Section Inputs

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Beam End Identification			System	Condition	Resistance (kip)		Secant Formula (kip, in)			
Span	Member	Support	$\phi.s$	$\phi.c$	$\phi P.n$	Failure Mechanism	R.e	E	KL	I
1	G2	S Abut	1	0.85	200	Pedestal Bearing				
1	G2	Pier 1	1	0.85	204	Pedestal Bearing				
1	G3	S Abut	1	0.85	230	Pedestal Bearing				



Steel Beam Ends - Load Rating
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BrR Control

LRFR Report Path	D:\Users\patriacm\Documents\AASHTOWARE\BrDR68\Reports\LRFRReport.XML	Bridge	00000
		User	patriacm
		Rundate	Wednesday, February 01, 2017 14:53:13
		Version	AASHTO LRFR Engine Version 6.8.1.3001

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Beam End Identification			AASHTOWare Beam Identification		
Span	Member	Support	Superstructure Definition	Member	Support
1	G1	S Abut	Span 1	G1	1
1	G1	Pier 1	Span 1	G1	2
1	G5	S Abut	Span 1	G5	1
1	G5	Pier 1	Span 1	G5	2
2	G1	Pier 2	Span 2	G1	2
2	G3	Pier 2	Span 2	G3	2
2	G5	Pier 1	Span 2	G5	1
2	G5	Pier 2	Span 2	G5	2
3	G1	Pier 2	Span 3	G1	1
3	G5	Pier 2	Span 3	G5	1
1	G2	S Abut	Span 1	G2	1
1	G2	Pier 1	Span 1	G2	2
1	G3	S Abut	Span 1	G3	1
1	G3	Pier 1	Span 1	G3	2
1	G4	S Abut	Span 1	G4	1
1	G4	Pier 1	Span 1	G4	2
3	G2	Pier 2	Span 3	G2	1
3	G2	N Abut	Span 3	G2	2
3	G3	Pier 2	Span 3	G3	1
3	G3	N Abut	Span 3	G3	2
3	G4	Pier 2	Span 3	G4	1
3	G4	N Abut	Span 3	G4	2



[<-BrR Cntrl](#) [Factors ->](#)

Loads

Populate IDs

Import AASHTOWare Reactions

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Beam End Identification			Dead Load		INVENTORY	OPERATING	AASHTO LEGAL							CT LEGAL				CT PERMIT									
Span	Member	Support	DC	DW	HL-93	HL-93	Type 3	Type 3S2	Type 3-3	SU4	SU5	SU6	SU7	H-20	HS-20	CT-L73.0	CT-L3S2	CT-P76.5	CT-P120(6)	CT-P140(7)a	CT-P140(7)b	CT-P160(8)a	CT-P160(8)b	CT-P180(9)	CT-P200(10)	CT-P380	
1	G1	S Abut	23.29	3.97	57.75	57.75	36.34	34.44	32.24	40.46	44.36	45.75	46.62	33.27	49.24	52.28	37.26	57.12	56.45	59.93	59.42	61.43	64.21	63.21	70.42	48.21	
1	G1	Pier 1	23.28	3.79	52.22	52.22	32.86	31.14	29.16	36.59	40.11	41.37	42.15	30.09	44.52	47.28	33.7	51.65	51.04	54.2	53.73	55.55	58.06	57.16	63.68	43.59	
1	G5	S Abut	23.29	3.85	52.22	52.22	32.86	31.14	29.16	36.59	40.11	41.37	42.15	30.09	44.52	47.28	33.7	51.65	51.04	54.2	53.73	55.55	58.06	57.16	63.68	43.59	
1	G5	Pier 1	23.31	3.67	57.75	57.75	36.34	34.44	32.24	40.46	44.36	45.75	46.62	33.27	49.24	52.28	37.26	57.12	56.45	59.93	59.42	61.43	64.21	63.21	70.42	48.21	
2	G1	Pier 2	69.93	11.44	74.41	74.41	37.7	48.29	50.5	41.12	46.52	50.84	55.24	31.55	53.27	54.79	49.57	58.19	79.74	82.21	77.12	89.34	90.79	98.75	111.59	85.54	
2	G3	Pier 2	77.71	8.84	105.36	105.36	53.39	68.38	71.51	58.22	65.87	71.99	78.22	44.67	75.44	77.59	70.2	82.39	112.91	116.4	109.2	126.5	128.55	139.83	158.01	112.37	
2	G5	Pier 1	70.11	11.12	74.41	74.41	37.7	48.29	50.5	41.12	46.52	50.84	55.24	31.55	53.27	54.79	49.57	58.19	79.74	82.21	77.12	89.34	90.79	98.75	111.59	85.54	
2	G5	Pier 2	70.13	11.12	81.09	81.09	41.09	52.62	55.03	44.81	50.7	55.4	60.2	34.38	58.06	59.71	54.02	63.41	86.9	89.59	84.04	97.36	98.93	107.61	121.61	93.21	
3	G1	Pier 2	21.96	4.01	56.19	56.19	35.75	33.06	30.92	39.9	43.59	44.64	45.11	33.06	48.2	51.37	36.84	56.31	53.77	59.1	58.78	60.57	63.3	62.35	69.44	45.88	
3	G5	Pier 2	21.96	3.9	50.9	50.9	32.38	29.95	28.01	36.14	39.48	40.44	40.86	29.94	43.66	46.54	33.37	51.01	48.71	53.53	53.25	54.87	57.34	56.48	62.9	41.56	
1	G2	S Abut	25.47	3.79	78.22	78.22	49.22	46.65	43.68	54.81	60.09	61.97	63.14	45.07	66.69	70.82	50.48	77.37	76.46	81.18	80.49	83.21	86.97	85.63	95.39	60.58	
1	G2	Pier 1	25.48	3.79	67.85	67.85	42.69	40.46	37.89	47.54	52.12	53.76	54.77	39.1	57.85	61.43	43.78	67.12	66.32	70.42	69.82	72.18	75.45	74.27	82.74	52.55	
1	G3	S Abut	25.31	2.84	67.85	67.85	42.69	40.46	37.89	47.54	52.12	53.76	54.77	39.1	57.85	61.43	43.78	67.12	66.32	70.42	69.82	72.18	75.45	74.27	82.74	52.55	
1	G3	Pier 1	25.31	2.84	78.22	78.22	49.22	46.65	43.68	54.81	60.09	61.97	63.14	45.07	66.69	70.82	50.48	77.37	76.46	81.18	80.49	83.21	86.97	85.63	95.39	60.58	
1	G4	S Abut	25.49	3.67	67.85	67.85	42.69	40.46	37.89	47.54	52.12	53.76	54.77	39.1	57.85	61.43	43.78	67.12	66.32	70.42	69.82	72.18	75.45	74.27	82.74	52.55	
1	G4	Pier 1	25.49	3.67	78.22	78.22	49.22	46.65	43.68	54.81	60.09	61.97	63.14	45.07	66.69	70.82	50.48	77.37	76.46	81.18	80.49	83.21	86.97	85.63	95.39	60.58	
3	G2	Pier 2	24.03	4.01	76.06	76.06	48.39	44.75	41.85	54.01	59	60.43	61.06	44.75	65.24	69.54	49.87	76.22	72.79	79.99	79.57	81.99	85.68	84.4	93.99	57.62	
3	G2	N Abut	24.03	4.01	66.14	66.14	42.07	38.91	36.39	46.96	51.3	52.54	53.09	38.91	56.73	60.47	43.36	66.28	63.29	69.56	69.18	71.3	74.5	73.39	81.73	50.1	
3	G3	Pier 2	23.86	3.12	66.14	66.14	42.07	38.91	36.39	46.96	51.3	52.54	53.09	38.91	56.73	60.47	43.36	66.28	63.29	69.56	69.18	71.3	74.5	73.39	81.73	50.1	
3	G3	N Abut	23.86	3.12	76.06	76.06	48.39	44.75	41.85	54.01	59	60.43	61.06	44.75	65.24	69.54	49.87	76.22	72.79	79.99	79.57	81.99	85.68	84.4	93.99	57.62	
3	G4	Pier 2	24.04	3.9	66.14	66.14	42.07	38.91	36.39	46.96	51.3	52.54	53.09	38.91	56.73	60.47	43.36	66.28	63.29	69.56	69.18	71.3	74.5	73.39	81.73	50.1	
3	G4	N Abut	24.04	3.9	76.06	76.06	48.39	44.75	41.85	54.01	59	60.43	61.06	44.75	65.24	69.54	49.87	76.22	72.79	79.99	79.57	81.99	85.68	84.4	93.99	57.62	



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Load Factors

Analysis	Other
ADTT	5000

DC	1.25
DW	1.50

Inventory	1.75
Operating	1.35

Live Load Factor Path	X:\Z_V8_CTDOT_NON_PROJECTS\Struct_Bridge\A_Bridge_Load_Rating\Development\Beam End Development\2.
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Generate Live Load Factors

Beam End Identification			Structure	Dead Load		INVENTORY	OPERATING	AASHTO LEGAL							CT LEGAL				CT PERMIT									
Span	Member	Support	Length	DC	DW	HL-93	HL-93	Type 3	Type 3S2	Type 3-3	SU4	SU5	SU6	SU7	H-20	HS-20	CT-L73.0	CT-L3S2	CT-P76.5	CT-P120(6)	CT-P140(7)a	CT-P140(7)b	CT-P160(8)a	CT-P160(8)b	CT-P180(9)	CT-P200(10)	CT-P380	
1	G1	S Abut	39.52083	1.25	1.5	1.75	1.35	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.16	1.20977778	1.16	1.16	1.16	1.31	1.31	1.31	1.1	
1	G1	Pier 1	39.52083	1.25	1.5	1.75	1.35	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.16	1.20977778	1.16	1.16	1.16	1.31	1.31	1.31	1.1	
1	G5	S Abut	39.52083	1.25	1.5	1.75	1.35	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.16	1.20977778	1.16	1.16	1.16	1.31	1.31	1.31	1.1	
1	G5	Pier 1	39.52083	1.25	1.5	1.75	1.35	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.16	1.20977778	1.16	1.16	1.16	1.31	1.31	1.31	1.1	
2	G1	Pier 2	108.5	1.25	1.5	1.75	1.35	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.16	1.20977778	1.31	1.31	1.31	1.31	1.31	1.21	1.1	
2	G3	Pier 2	108.5	1.25	1.5	1.75	1.35	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.16	1.20977778	1.31	1.31	1.31	1.31	1.31	1.21	1.1	
2	G5	Pier 1	108.5	1.25	1.5	1.75	1.35	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.16	1.20977778	1.31	1.31	1.31	1.31	1.31	1.21	1.1	
2	G5	Pier 2	108.5	1.25	1.5	1.75	1.35	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.16	1.20977778	1.31	1.31	1.31	1.31	1.31	1.21	1.1	
3	G1	Pier 2	37.1875	1.25	1.5	1.75	1.35	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.16	1.20977778	1.16	1.16	1.16	1.31	1.31	1.31	1.1	
3	G5	Pier 2	37.1875	1.25	1.5	1.75	1.35	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.16	1.20977778	1.16	1.16	1.16	1.31	1.31	1.31	1.1	
1	G2	S Abut	39.52083	1.25	1.5	1.75	1.35	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.16	1.20977778	1.16	1.16	1.16	1.31	1.31	1.31	1.1	
1	G2	Pier 1	39.52083	1.25	1.5	1.75	1.35	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.16	1.20977778	1.16	1.16	1.16	1.31	1.31	1.31	1.1	
1	G3	S Abut	39.52083	1.25	1.5	1.75	1.35	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.16	1.20977778	1.16	1.16	1.16	1.31	1.31	1.31	1.1	
1	G3	Pier 1	39.52083	1.25	1.5	1.75	1.35	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.16	1.20977778	1.16	1.16	1.16	1.31	1.31	1.31	1.1	
1	G4	S Abut	39.52083	1.25	1.5	1.75	1.35	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.16	1.20977778	1.16	1.16	1.16	1.31	1.31	1.31	1.1	
1	G4	Pier 1	39.52083	1.25	1.5	1.75	1.35	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.16	1.20977778	1.16	1.16	1.16	1.31	1.31	1.31	1.1	
3	G2	Pier 2	37.1875	1.25	1.5	1.75	1.35	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.16	1.20977778	1.16	1.16	1.16	1.31	1.31	1.31	1.1	
3	G2	N Abut	37.1875	1.25	1.5	1.75	1.35	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.16	1.20977778	1.16	1.16	1.16	1.31	1.31	1.31	1.1	
3	G3	Pier 2	37.1875	1.25	1.5	1.75	1.35	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.16	1.20977778	1.16	1.16	1.16	1.31	1.31	1.31	1.1	
3	G3	N Abut	37.1875	1.25	1.5	1.75	1.35	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.16	1.20977778	1.16	1.16	1.16	1.31	1.31	1.31	1.1	
3	G4	Pier 2	37.1875	1.25	1.5	1.75	1.35	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.16	1.20977778	1.16	1.16	1.16	1.31	1.31	1.31	1.1	
3	G4	N Abut	37.1875	1.25	1.5	1.75	1.35	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.16	1.20977778	1.16	1.16	1.16	1.31	1.31	1.31	1.1	



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Beam End Identification				Vehicle		Rating		Loading						Capacity	Axial Magnification	
Span	Member	Support	S.M.S	Vehicle	Load Type	RF	Failure Mechanism	γ.DC	DC	γ.DW	DW	γ.LL	LL	C	P.u	δ.A
1	G1	S Abut	1.G1.S Abut	HL-93	INVENTORY	1.95	Stiffened Web - Flexural Buckling	1.25	23.29	1.5	3.97	1.75	57.75	232.259984	136.13	1
1	G1	S Abut	1.G1.S Abut	HL-93	OPERATING	2.52	Stiffened Web - Flexural Buckling	1.25	23.29	1.5	3.97	1.35	57.75	232.259984	113.03	1
1	G1	S Abut	1.G1.S Abut	Type 3	AASHTO LEGAL	4.17	Stiffened Web - Flexural Buckling	1.25	23.29	1.5	3.97	1.3	36.34	232.259984	82.3095	1
1	G1	S Abut	1.G1.S Abut	Type 3S2	AASHTO LEGAL	4.4	Stiffened Web - Flexural Buckling	1.25	23.29	1.5	3.97	1.3	34.44	232.259984	79.8395	1
1	G1	S Abut	1.G1.S Abut	Type 3-3	AASHTO LEGAL	4.7	Stiffened Web - Flexural Buckling	1.25	23.29	1.5	3.97	1.3	32.24	232.259984	76.9795	1
1	G1	S Abut	1.G1.S Abut	SU4	AASHTO LEGAL	3.74	Stiffened Web - Flexural Buckling	1.25	23.29	1.5	3.97	1.3	40.46	232.259984	87.6655	1
1	G1	S Abut	1.G1.S Abut	SU5	AASHTO LEGAL	3.41	Stiffened Web - Flexural Buckling	1.25	23.29	1.5	3.97	1.3	44.36	232.259984	92.7355	1
1	G1	S Abut	1.G1.S Abut	SU6	AASHTO LEGAL	3.31	Stiffened Web - Flexural Buckling	1.25	23.29	1.5	3.97	1.3	45.75	232.259984	94.5425	1
1	G1	S Abut	1.G1.S Abut	SU7	AASHTO LEGAL	3.25	Stiffened Web - Flexural Buckling	1.25	23.29	1.5	3.97	1.3	46.62	232.259984	95.6735	1
1	G1	S Abut	1.G1.S Abut	H-20	CT LEGAL	4.55	Stiffened Web - Flexural Buckling	1.25	23.29	1.5	3.97	1.3	33.27	232.259984	78.3185	1
1	G1	S Abut	1.G1.S Abut	HS-20	CT LEGAL	3.08	Stiffened Web - Flexural Buckling	1.25	23.29	1.5	3.97	1.3	49.24	232.259984	99.0795	1
1	G1	S Abut	1.G1.S Abut	CT-L73.0	CT LEGAL	2.9	Stiffened Web - Flexural Buckling	1.25	23.29	1.5	3.97	1.3	52.28	232.259984	103.0315	1
1	G1	S Abut	1.G1.S Abut	CT-L3S2	CT LEGAL	4.07	Stiffened Web - Flexural Buckling	1.25	23.29	1.5	3.97	1.3	37.26	232.259984	83.5055	1
1	G1	S Abut	1.G1.S Abut	CT-P76.5	CT PERMIT	2.97	Stiffened Web - Flexural Buckling	1.25	23.29	1.5	3.97	1.16	57.12	232.259984	101.3267	1
1	G1	S Abut	1.G1.S Abut	CT-P120(6)	CT PERMIT	2.88	Stiffened Web - Flexural Buckling	1.25	23.29	1.5	3.97	1.209778	56.45	232.259984	103.3595	1
1	G1	S Abut	1.G1.S Abut	CT-P140(7)a	CT PERMIT	2.83	Stiffened Web - Flexural Buckling	1.25	23.29	1.5	3.97	1.16	59.93	232.259984	104.5863	1
1	G1	S Abut	1.G1.S Abut	CT-P140(7)b	CT PERMIT	2.86	Stiffened Web - Flexural Buckling	1.25	23.29	1.5	3.97	1.16	59.42	232.259984	103.9947	1
1	G1	S Abut	1.G1.S Abut	CT-P160(8)a	CT PERMIT	2.76	Stiffened Web - Flexural Buckling	1.25	23.29	1.5	3.97	1.16	61.43	232.259984	106.3263	1
1	G1	S Abut	1.G1.S Abut	CT-P160(8)b	CT PERMIT	2.34	Stiffened Web - Flexural Buckling	1.25	23.29	1.5	3.97	1.31	64.21	232.259984	119.1826	1
1	G1	S Abut	1.G1.S Abut	CT-P180(9)	CT PERMIT	2.38	Stiffened Web - Flexural Buckling	1.25	23.29	1.5	3.97	1.31	63.21	232.259984	117.8726	1
1	G1	S Abut	1.G1.S Abut	CT-P200(10)	CT PERMIT	2.13	Stiffened Web - Flexural Buckling	1.25	23.29	1.5	3.97	1.31	70.42	232.259984	127.3177	1
1	G1	S Abut	1.G1.S Abut	CT-P380	CT PERMIT	3.71	Stiffened Web - Flexural Buckling	1.25	23.29	1.5	3.97	1.1	48.21	232.259984	88.0985	1
1	G1	Pier 1	1.G1.Pier 1	HL-93	INVENTORY	1.75	Stiffened Web - Flexural Buckling	1.25	23.28	1.5	3.79	1.75	52.22	232.259984	126.17	1.192574271
1	G1	Pier 1	1.G1.Pier 1	HL-93	OPERATING	2.26	Stiffened Web - Flexural Buckling	1.25	23.28	1.5	3.79	1.35	52.22	232.259984	105.282	1.192574226
1	G1	Pier 1	1.G1.Pier 1	Type 3	AASHTO LEGAL	3.74	Stiffened Web - Flexural Buckling	1.25	23.28	1.5	3.79	1.3	32.86	232.259984	77.503	1.192574179
1	G1	Pier 1	1.G1.Pier 1	Type 3S2	AASHTO LEGAL	3.95	Stiffened Web - Flexural Buckling	1.25	23.28	1.5	3.79	1.3	31.14	232.259984	75.267	1.192574176
1	G1	Pier 1	1.G1.Pier 1	Type 3-3	AASHTO LEGAL	4.21	Stiffened Web - Flexural Buckling	1.25	23.28	1.5	3.79	1.3	29.16	232.259984	72.693	1.192574172
1	G1	Pier 1	1.G1.Pier 1	SU4	AASHTO LEGAL	3.36	Stiffened Web - Flexural Buckling	1.25	23.28	1.5	3.79	1.3	36.59	232.259984	82.352	1.192574186
1	G1	Pier 1	1.G1.Pier 1	SU5	AASHTO LEGAL	3.06	Stiffened Web - Flexural Buckling	1.25	23.28	1.5	3.79	1.3	40.11	232.259984	86.928	1.192574193
1	G1	Pier 1	1.G1.Pier 1	SU6	AASHTO LEGAL	2.97	Stiffened Web - Flexural Buckling	1.25	23.28	1.5	3.79	1.3	41.37	232.259984	88.566	1.192574196
1	G1	Pier 1	1.G1.Pier 1	SU7	AASHTO LEGAL	2.91	Stiffened Web - Flexural Buckling	1.25	23.28	1.5	3.79	1.3	42.15	232.259984	89.58	1.192574198
1	G1	Pier 1	1.G1.Pier 1	H-20	CT LEGAL	4.08	Stiffened Web - Flexural Buckling	1.25	23.28	1.5	3.79	1.3	30.09	232.259984	73.902	1.192574174
1	G1	Pier 1	1.G1.Pier 1	HS-20	CT LEGAL	2.76	Stiffened Web - Flexural Buckling	1.25	23.28	1.5	3.79	1.3	44.52	232.259984	92.661	1.192574203
1	G1	Pier 1	1.G1.Pier 1	CT-L73.0	CT LEGAL	2.6	Stiffened Web - Flexural Buckling	1.25	23.28	1.5	3.79	1.3	47.28	232.259984	96.249	1.192574209
1	G1	Pier 1	1.G1.Pier 1	CT-L3S2	CT LEGAL	3.65	Stiffened Web - Flexural Buckling	1.25	23.28	1.5	3.79	1.3	33.7	232.259984	78.595	1.192574181
1	G1	Pier 1	1.G1.Pier 1	CT-P76.5	CT PERMIT	2.66	Stiffened Web - Flexural Buckling	1.25	23.28	1.5	3.79	1.16	51.65	232.259984	94.699	1.192574207
1	G1	Pier 1	1.G1.Pier 1	CT-P120(6)	CT PERMIT	2.59	Stiffened Web - Flexural Buckling	1.25	23.28	1.5	3.79	1.209778	51.04	232.259984	96.53206	1.19257421
1	G1	Pier 1	1.G1.Pier 1	CT-P140(7)a	CT PERMIT	2.54	Stiffened Web - Flexural Buckling	1.25	23.28	1.5	3.79	1.16	54.2	232.259984	97.657	1.192574212
1	G1	Pier 1	1.G1.Pier 1	CT-P140(7)b	CT PERMIT	2.56	Stiffened Web - Flexural Buckling	1.25	23.28	1.5	3.79	1.16	53.73	232.259984	97.1118	1.192574211
1	G1	Pier 1	1.G1.Pier 1	CT-P160(8)a	CT PERMIT	2.48	Stiffened Web - Flexural Buckling	1.25	23.28	1.5	3.79	1.16	55.55	232.259984	99.223	1.192574215
1	G1	Pier 1	1.G1.Pier 1	CT-P160(8)b	CT PERMIT	2.1	Stiffened Web - Flexural Buckling	1.25	23.28	1.5	3.79	1.31	58.06	232.259984	110.8436	1.192574237
1	G1	Pier 1	1.G1.Pier 1	CT-P180(9)	CT PERMIT	2.13	Stiffened Web - Flexural Buckling	1.25	23.28	1.5	3.79	1.31	57.16	232.259984	109.6646	1.192574235
1	G1	Pier 1	1.G1.Pier 1	CT-P200(10)	CT PERMIT	1.91	Stiffened Web - Flexural Buckling	1.25	23.28	1.5	3.79	1.31	63.68	232.259984	118.2058	1.192574253
1	G1	Pier 1	1.G1.Pier 1	CT-P380	CT PERMIT	3.33	Stiffened Web - Flexural Buckling	1.25	23.28	1.5	3.79	1.1	43.59	232.259984	82.734	1.192574187
1	G5	S Abut	1.G5.S Abut	HL-93	INVENTORY	2.15	Stiffened Web - Flexural Buckling	1.25	23.29	1.5	3.85	1.75	52.22	232.259984	126.2725	1
1	G5	S Abut	1.G5.S Abut	HL-93	OPERATING	2.79	Stiffened Web - Flexural Buckling	1.25	23.29	1.5	3.85	1.35	52.22	232.259984	105.3845	1
1	G5	S Abut	1.G5.S Abut	Type 3	AASHTO LEGAL	4.62	Stiffened Web - Flexural Buckling	1.25	23.29	1.5	3.85	1.3	32.86	232.259984	77.6055	1
1	G5	S Abut	1.G5.S Abut	Type 3S2	AASHTO LEGAL	4.87	Stiffened Web - Flexural Buckling	1.25	23.29	1.5	3.85	1.3	31.14	232.259984	75.3695	1
1	G5	S Abut	1.G5.S Abut	Type 3-3	AASHTO LEGAL	5.2	Stiffened Web - Flexural Buckling	1.25	23.29	1.5	3.85	1.3	29.16	232.259984	72.7955	1
1	G5	S Abut	1.G5.S Abut	SU4	AASHTO LEGAL	4.14	Stiffened Web - Flexural Buckling	1.25	23.29	1.5	3.85	1.3	36.59	232.259984	82.4545	1
1	G5	S Abut	1.G5.S Abut	SU5	AASHTO LEGAL	3.78	Stiffened Web - Flexural Buckling	1.25	23.29	1.5	3.85	1.3	40.11	232.259984	87.0305	1
1	G5	S Abut	1.G5.S Abut	SU6	AASHTO LEGAL	3.66	Stiffened Web - Flexural Buckling	1.25	23.29	1.5	3.85	1.3	41.37	232.259984	88.6685	1
1	G5	S Abut	1.G5.S Abut	SU7	AASHTO LEGAL	3.6	Stiffened Web - Flexural Buckling	1.25	23.29	1.5	3.85	1.3	42.15	232.259984	89.6825	1



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Beam End Identification				Vehicle		Rating		Loading						Capacity	Axial Magnification	
Span	Member	Support	S.M.S	Vehicle	Load Type	RF	Failure Mechanism	γ.DC	DC	γ.DW	DW	γ.LL	LL	C	P.u	δ.A
1	G5	S Abut	1.G5.S Abut	H-20	CT LEGAL	5.04	Stiffened Web - Flexural Buckling	1.25	23.29	1.5	3.85	1.3	30.09	232.259984	74.0045	1
1	G5	S Abut	1.G5.S Abut	HS-20	CT LEGAL	3.41	Stiffened Web - Flexural Buckling	1.25	23.29	1.5	3.85	1.3	44.52	232.259984	92.7635	1
1	G5	S Abut	1.G5.S Abut	CT-L73.0	CT LEGAL	3.21	Stiffened Web - Flexural Buckling	1.25	23.29	1.5	3.85	1.3	47.28	232.259984	96.3515	1
1	G5	S Abut	1.G5.S Abut	CT-L3S2	CT LEGAL	4.5	Stiffened Web - Flexural Buckling	1.25	23.29	1.5	3.85	1.3	33.7	232.259984	78.6975	1
1	G5	S Abut	1.G5.S Abut	CT-P76.5	CT PERMIT	3.29	Stiffened Web - Flexural Buckling	1.25	23.29	1.5	3.85	1.16	51.65	232.259984	94.8015	1
1	G5	S Abut	1.G5.S Abut	CT-P120(6)	CT PERMIT	3.19	Stiffened Web - Flexural Buckling	1.25	23.29	1.5	3.85	1.209778	51.04	232.259984	96.63456	1
1	G5	S Abut	1.G5.S Abut	CT-P140(7)a	CT PERMIT	3.13	Stiffened Web - Flexural Buckling	1.25	23.29	1.5	3.85	1.16	54.2	232.259984	97.7595	1
1	G5	S Abut	1.G5.S Abut	CT-P140(7)b	CT PERMIT	3.16	Stiffened Web - Flexural Buckling	1.25	23.29	1.5	3.85	1.16	53.73	232.259984	97.2143	1
1	G5	S Abut	1.G5.S Abut	CT-P160(8)a	CT PERMIT	3.06	Stiffened Web - Flexural Buckling	1.25	23.29	1.5	3.85	1.16	55.55	232.259984	99.3255	1
1	G5	S Abut	1.G5.S Abut	CT-P160(8)b	CT PERMIT	2.59	Stiffened Web - Flexural Buckling	1.25	23.29	1.5	3.85	1.31	58.06	232.259984	110.9461	1
1	G5	S Abut	1.G5.S Abut	CT-P180(9)	CT PERMIT	2.63	Stiffened Web - Flexural Buckling	1.25	23.29	1.5	3.85	1.31	57.16	232.259984	109.7671	1
1	G5	S Abut	1.G5.S Abut	CT-P200(10)	CT PERMIT	2.36	Stiffened Web - Flexural Buckling	1.25	23.29	1.5	3.85	1.31	63.68	232.259984	118.3083	1
1	G5	S Abut	1.G5.S Abut	CT-P380	CT PERMIT	4.11	Stiffened Web - Flexural Buckling	1.25	23.29	1.5	3.85	1.1	43.59	232.259984	82.8365	1
1	G5	Pier 1	1.G5.Pier 1	HL-93	INVENTORY	1.02	Stiffened Web - Flexural Buckling	1.25	23.31	1.5	3.67	1.75	57.75	187.8470071	135.705	1.361026626
1	G5	Pier 1	1.G5.Pier 1	HL-93	OPERATING	1.32	Stiffened Web - Flexural Buckling	1.25	23.31	1.5	3.67	1.35	57.75	187.8470071	112.605	1.361026495
1	G5	Pier 1	1.G5.Pier 1	Type 3	AASHTO LEGAL	2.18	Stiffened Web - Flexural Buckling	1.25	23.31	1.5	3.67	1.3	36.34	187.8470071	81.8845	1.361026359
1	G5	Pier 1	1.G5.Pier 1	Type 3S2	AASHTO LEGAL	2.3	Stiffened Web - Flexural Buckling	1.25	23.31	1.5	3.67	1.3	34.44	187.8470071	79.4145	1.36102635
1	G5	Pier 1	1.G5.Pier 1	Type 3-3	AASHTO LEGAL	2.46	Stiffened Web - Flexural Buckling	1.25	23.31	1.5	3.67	1.3	32.24	187.8470071	76.5545	1.36102634
1	G5	Pier 1	1.G5.Pier 1	SU4	AASHTO LEGAL	1.96	Stiffened Web - Flexural Buckling	1.25	23.31	1.5	3.67	1.3	40.46	187.8470071	87.2405	1.36102638
1	G5	Pier 1	1.G5.Pier 1	SU5	AASHTO LEGAL	1.79	Stiffened Web - Flexural Buckling	1.25	23.31	1.5	3.67	1.3	44.36	187.8470071	92.3105	1.361026401
1	G5	Pier 1	1.G5.Pier 1	SU6	AASHTO LEGAL	1.73	Stiffened Web - Flexural Buckling	1.25	23.31	1.5	3.67	1.3	45.75	187.8470071	94.1175	1.361026408
1	G5	Pier 1	1.G5.Pier 1	SU7	AASHTO LEGAL	1.7	Stiffened Web - Flexural Buckling	1.25	23.31	1.5	3.67	1.3	46.62	187.8470071	95.2485	1.361026413
1	G5	Pier 1	1.G5.Pier 1	H-20	CT LEGAL	2.39	Stiffened Web - Flexural Buckling	1.25	23.31	1.5	3.67	1.3	33.27	187.8470071	77.8935	1.361026345
1	G5	Pier 1	1.G5.Pier 1	HS-20	CT LEGAL	1.61	Stiffened Web - Flexural Buckling	1.25	23.31	1.5	3.67	1.3	49.24	187.8470071	98.6545	1.361026428
1	G5	Pier 1	1.G5.Pier 1	CT-L73.0	CT LEGAL	1.52	Stiffened Web - Flexural Buckling	1.25	23.31	1.5	3.67	1.3	52.28	187.8470071	102.6065	1.361026446
1	G5	Pier 1	1.G5.Pier 1	CT-L3S2	CT LEGAL	2.13	Stiffened Web - Flexural Buckling	1.25	23.31	1.5	3.67	1.3	37.26	187.8470071	83.0805	1.361026364
1	G5	Pier 1	1.G5.Pier 1	CT-P76.5	CT PERMIT	1.56	Stiffened Web - Flexural Buckling	1.25	23.31	1.5	3.67	1.16	57.12	187.8470071	100.9017	1.361026438
1	G5	Pier 1	1.G5.Pier 1	CT-P120(6)	CT PERMIT	1.51	Stiffened Web - Flexural Buckling	1.25	23.31	1.5	3.67	1.209778	56.45	187.8470071	102.9345	1.361026448
1	G5	Pier 1	1.G5.Pier 1	CT-P140(7)a	CT PERMIT	1.48	Stiffened Web - Flexural Buckling	1.25	23.31	1.5	3.67	1.16	59.93	187.8470071	104.1613	1.361026454
1	G5	Pier 1	1.G5.Pier 1	CT-P140(7)b	CT PERMIT	1.49	Stiffened Web - Flexural Buckling	1.25	23.31	1.5	3.67	1.16	59.42	187.8470071	103.5697	1.361026451
1	G5	Pier 1	1.G5.Pier 1	CT-P160(8)a	CT PERMIT	1.45	Stiffened Web - Flexural Buckling	1.25	23.31	1.5	3.67	1.16	61.43	187.8470071	105.9013	1.361026462
1	G5	Pier 1	1.G5.Pier 1	CT-P160(8)b	CT PERMIT	1.22	Stiffened Web - Flexural Buckling	1.25	23.31	1.5	3.67	1.31	64.21	187.8470071	118.7576	1.361026528
1	G5	Pier 1	1.G5.Pier 1	CT-P180(9)	CT PERMIT	1.24	Stiffened Web - Flexural Buckling	1.25	23.31	1.5	3.67	1.31	63.21	187.8470071	117.4476	1.361026521
1	G5	Pier 1	1.G5.Pier 1	CT-P200(10)	CT PERMIT	1.12	Stiffened Web - Flexural Buckling	1.25	23.31	1.5	3.67	1.31	70.42	187.8470071	126.8927	1.361026573
1	G5	Pier 1	1.G5.Pier 1	CT-P380	CT PERMIT	1.94	Stiffened Web - Flexural Buckling	1.25	23.31	1.5	3.67	1.1	48.21	187.8470071	87.6735	1.361026382
2	G1	Pier 2	2.G1.Pier 2	HL-93	INVENTORY	1.86	Stiffened Web - Flexural Buckling	1.25	69.93	1.5	11.44	1.75	74.41	404.1248081	234.79	1.163631556
2	G1	Pier 2	2.G1.Pier 2	HL-93	OPERATING	2.41	Stiffened Web - Flexural Buckling	1.25	69.93	1.5	11.44	1.35	74.41	404.1248081	205.026	1.163631542
2	G1	Pier 2	2.G1.Pier 2	Type 3	AASHTO LEGAL	4.95	Stiffened Web - Flexural Buckling	1.25	69.93	1.5	11.44	1.3	37.7	404.1248081	153.5825	1.163631523
2	G1	Pier 2	2.G1.Pier 2	Type 3S2	AASHTO LEGAL	3.86	Stiffened Web - Flexural Buckling	1.25	69.93	1.5	11.44	1.3	48.29	404.1248081	167.3495	1.163631527
2	G1	Pier 2	2.G1.Pier 2	Type 3-3	AASHTO LEGAL	3.69	Stiffened Web - Flexural Buckling	1.25	69.93	1.5	11.44	1.3	50.5	404.1248081	170.2225	1.163631528
2	G1	Pier 2	2.G1.Pier 2	SU4	AASHTO LEGAL	4.54	Stiffened Web - Flexural Buckling	1.25	69.93	1.5	11.44	1.3	41.12	404.1248081	158.0285	1.163631524
2	G1	Pier 2	2.G1.Pier 2	SU5	AASHTO LEGAL	4.01	Stiffened Web - Flexural Buckling	1.25	69.93	1.5	11.44	1.3	46.52	404.1248081	165.0485	1.163631527
2	G1	Pier 2	2.G1.Pier 2	SU6	AASHTO LEGAL	3.67	Stiffened Web - Flexural Buckling	1.25	69.93	1.5	11.44	1.3	50.84	404.1248081	170.6645	1.163631529
2	G1	Pier 2	2.G1.Pier 2	SU7	AASHTO LEGAL	3.37	Stiffened Web - Flexural Buckling	1.25	69.93	1.5	11.44	1.3	55.24	404.1248081	176.3845	1.163631531
2	G1	Pier 2	2.G1.Pier 2	H-20	CT LEGAL	5.91	Stiffened Web - Flexural Buckling	1.25	69.93	1.5	11.44	1.3	31.55	404.1248081	145.5875	1.16363152
2	G1	Pier 2	2.G1.Pier 2	HS-20	CT LEGAL	3.5	Stiffened Web - Flexural Buckling	1.25	69.93	1.5	11.44	1.3	53.27	404.1248081	173.8235	1.16363153
2	G1	Pier 2	2.G1.Pier 2	CT-L73.0	CT LEGAL	3.4	Stiffened Web - Flexural Buckling	1.25	69.93	1.5	11.44	1.3	54.79	404.1248081	175.7995	1.16363153
2	G1	Pier 2	2.G1.Pier 2	CT-L3S2	CT LEGAL	3.76	Stiffened Web - Flexural Buckling	1.25	69.93	1.5	11.44	1.3	49.57	404.1248081	169.0135	1.163631528
2	G1	Pier 2	2.G1.Pier 2	CT-P76.5	CT PERMIT	3.59	Stiffened Web - Flexural Buckling	1.25	69.93	1.5	11.44	1.16	58.19	404.1248081	172.0729	1.163631529
2	G1	Pier 2	2.G1.Pier 2	CT-P120(6)	CT PERMIT	2.51	Stiffened Web - Flexural Buckling	1.25	69.93	1.5	11.44	1.209778	79.74	404.1248081	201.0402	1.16363154
2	G1	Pier 2	2.G1.Pier 2	CT-P140(7)a	CT PERMIT	2.25	Stiffened Web - Flexural Buckling	1.25	69.93	1.5	11.44	1.31	82.21	404.1248081	212.2676	1.163631545
2	G1	Pier 2	2.G1.Pier 2	CT-P140(7)b	CT PERMIT	2.4	Stiffened Web - Flexural Buckling	1.25	69.93	1.5	11.44	1.31	77.12	404.1248081	205.5997	1.163631542
2	G1	Pier 2	2.G1.Pier 2	CT-P160(8)a	CT PERMIT	2.07	Stiffened Web - Flexural Buckling	1.25	69.93	1.5	11.44	1.31	89.34	404.1248081	221.6079	1.16363155



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Beam End Identification				Vehicle		Rating		Loading						Capacity	Axial Magnification	
Span	Member	Support	S.M.S	Vehicle	Load Type	RF	Failure Mechanism	γ.DC	DC	γ.DW	DW	γ.LL	LL	C	P.u	δ.A
2	G1	Pier 2	2.G1.Pier 2	CT-P160(8)b	CT PERMIT	2.04	Stiffened Web - Flexural Buckling	1.25	69.93	1.5	11.44	1.31	90.79	404.1248081	223.5074	1.16363155
2	G1	Pier 2	2.G1.Pier 2	CT-P180(9)	CT PERMIT	1.87	Stiffened Web - Flexural Buckling	1.25	69.93	1.5	11.44	1.31	98.75	404.1248081	233.935	1.163631555
2	G1	Pier 2	2.G1.Pier 2	CT-P200(10)	CT PERMIT	1.79	Stiffened Web - Flexural Buckling	1.25	69.93	1.5	11.44	1.21	111.59	404.1248081	239.5964	1.163631558
2	G1	Pier 2	2.G1.Pier 2	CT-P380	CT PERMIT	2.57	Stiffened Web - Flexural Buckling	1.25	69.93	1.5	11.44	1.1	85.54	404.1248081	198.6665	1.163631539
2	G3	Pier 2	2.G3.Pier 2	HL-93	INVENTORY	1	Stiffened Web - Flexural Buckling	1.25	77.71	1.5	8.84	1.75	105.36	404.1248081	294.7775	1.370717062
2	G3	Pier 2	2.G3.Pier 2	HL-93	OPERATING	1.29	Stiffened Web - Flexural Buckling	1.25	77.71	1.5	8.84	1.35	105.36	404.1248081	252.6335	1.370717007
2	G3	Pier 2	2.G3.Pier 2	Type 3	AASHTO LEGAL	2.65	Stiffened Web - Flexural Buckling	1.25	77.71	1.5	8.84	1.3	53.39	404.1248081	179.8045	1.370716932
2	G3	Pier 2	2.G3.Pier 2	Type 3S2	AASHTO LEGAL	2.07	Stiffened Web - Flexural Buckling	1.25	77.71	1.5	8.84	1.3	68.38	404.1248081	199.2915	1.370716949
2	G3	Pier 2	2.G3.Pier 2	Type 3-3	AASHTO LEGAL	1.98	Stiffened Web - Flexural Buckling	1.25	77.71	1.5	8.84	1.3	71.51	404.1248081	203.3605	1.370716953
2	G3	Pier 2	2.G3.Pier 2	SU4	AASHTO LEGAL	2.43	Stiffened Web - Flexural Buckling	1.25	77.71	1.5	8.84	1.3	58.22	404.1248081	186.0835	1.370716937
2	G3	Pier 2	2.G3.Pier 2	SU5	AASHTO LEGAL	2.15	Stiffened Web - Flexural Buckling	1.25	77.71	1.5	8.84	1.3	65.87	404.1248081	196.0285	1.370716946
2	G3	Pier 2	2.G3.Pier 2	SU6	AASHTO LEGAL	1.97	Stiffened Web - Flexural Buckling	1.25	77.71	1.5	8.84	1.3	71.99	404.1248081	203.9845	1.370716954
2	G3	Pier 2	2.G3.Pier 2	SU7	AASHTO LEGAL	1.81	Stiffened Web - Flexural Buckling	1.25	77.71	1.5	8.84	1.3	78.22	404.1248081	212.0835	1.370716962
2	G3	Pier 2	2.G3.Pier 2	H-20	CT LEGAL	3.17	Stiffened Web - Flexural Buckling	1.25	77.71	1.5	8.84	1.3	44.67	404.1248081	168.4685	1.370716922
2	G3	Pier 2	2.G3.Pier 2	HS-20	CT LEGAL	1.88	Stiffened Web - Flexural Buckling	1.25	77.71	1.5	8.84	1.3	75.44	404.1248081	208.4695	1.370716958
2	G3	Pier 2	2.G3.Pier 2	CT-L73.0	CT LEGAL	1.82	Stiffened Web - Flexural Buckling	1.25	77.71	1.5	8.84	1.3	77.59	404.1248081	211.2645	1.370716961
2	G3	Pier 2	2.G3.Pier 2	CT-L3S2	CT LEGAL	2.02	Stiffened Web - Flexural Buckling	1.25	77.71	1.5	8.84	1.3	70.2	404.1248081	201.6575	1.370716952
2	G3	Pier 2	2.G3.Pier 2	CT-P76.5	CT PERMIT	1.92	Stiffened Web - Flexural Buckling	1.25	77.71	1.5	8.84	1.16	82.39	404.1248081	205.9699	1.370716956
2	G3	Pier 2	2.G3.Pier 2	CT-P120(6)	CT PERMIT	1.35	Stiffened Web - Flexural Buckling	1.25	77.71	1.5	8.84	1.209778	112.91	404.1248081	246.9935	1.370717
2	G3	Pier 2	2.G3.Pier 2	CT-P140(7)a	CT PERMIT	1.2	Stiffened Web - Flexural Buckling	1.25	77.71	1.5	8.84	1.31	116.4	404.1248081	262.8815	1.370717019
2	G3	Pier 2	2.G3.Pier 2	CT-P140(7)b	CT PERMIT	1.28	Stiffened Web - Flexural Buckling	1.25	77.71	1.5	8.84	1.31	109.2	404.1248081	253.4495	1.370717008
2	G3	Pier 2	2.G3.Pier 2	CT-P160(8)a	CT PERMIT	1.11	Stiffened Web - Flexural Buckling	1.25	77.71	1.5	8.84	1.31	126.5	404.1248081	276.1125	1.370717036
2	G3	Pier 2	2.G3.Pier 2	CT-P160(8)b	CT PERMIT	1.09	Stiffened Web - Flexural Buckling	1.25	77.71	1.5	8.84	1.31	128.55	404.1248081	278.798	1.37071704
2	G3	Pier 2	2.G3.Pier 2	CT-P180(9)	CT PERMIT	1	Stiffened Web - Flexural Buckling	1.25	77.71	1.5	8.84	1.31	139.83	404.1248081	293.5748	1.37071706
2	G3	Pier 2	2.G3.Pier 2	CT-P200(10)	CT PERMIT	0.96	Stiffened Web - Flexural Buckling	1.25	77.71	1.5	8.84	1.21	158.01	404.1248081	301.5896	1.370717071
2	G3	Pier 2	2.G3.Pier 2	CT-P380	CT PERMIT	1.49	Stiffened Web - Flexural Buckling	1.25	77.71	1.5	8.84	1.1	112.37	404.1248081	234.0045	1.370716985
2	G5	Pier 1	2.G5.Pier 1	HL-93	INVENTORY	1.57	Stiffened Web - Flexural Buckling	1.25	70.11	1.5	11.12	1.75	74.41	309.4757369	234.535	1
2	G5	Pier 1	2.G5.Pier 1	HL-93	OPERATING	2.04	Stiffened Web - Flexural Buckling	1.25	70.11	1.5	11.12	1.35	74.41	309.4757369	204.771	1
2	G5	Pier 1	2.G5.Pier 1	Type 3	AASHTO LEGAL	4.18	Stiffened Web - Flexural Buckling	1.25	70.11	1.5	11.12	1.3	37.7	309.4757369	153.3275	1
2	G5	Pier 1	2.G5.Pier 1	Type 3S2	AASHTO LEGAL	3.26	Stiffened Web - Flexural Buckling	1.25	70.11	1.5	11.12	1.3	48.29	309.4757369	167.0945	1
2	G5	Pier 1	2.G5.Pier 1	Type 3-3	AASHTO LEGAL	3.12	Stiffened Web - Flexural Buckling	1.25	70.11	1.5	11.12	1.3	50.5	309.4757369	169.9675	1
2	G5	Pier 1	2.G5.Pier 1	SU4	AASHTO LEGAL	3.83	Stiffened Web - Flexural Buckling	1.25	70.11	1.5	11.12	1.3	41.12	309.4757369	157.7735	1
2	G5	Pier 1	2.G5.Pier 1	SU5	AASHTO LEGAL	3.39	Stiffened Web - Flexural Buckling	1.25	70.11	1.5	11.12	1.3	46.52	309.4757369	164.7935	1
2	G5	Pier 1	2.G5.Pier 1	SU6	AASHTO LEGAL	3.1	Stiffened Web - Flexural Buckling	1.25	70.11	1.5	11.12	1.3	50.84	309.4757369	170.4095	1
2	G5	Pier 1	2.G5.Pier 1	SU7	AASHTO LEGAL	2.85	Stiffened Web - Flexural Buckling	1.25	70.11	1.5	11.12	1.3	55.24	309.4757369	176.1295	1
2	G5	Pier 1	2.G5.Pier 1	H-20	CT LEGAL	5	Stiffened Web - Flexural Buckling	1.25	70.11	1.5	11.12	1.3	31.55	309.4757369	145.3325	1
2	G5	Pier 1	2.G5.Pier 1	HS-20	CT LEGAL	2.96	Stiffened Web - Flexural Buckling	1.25	70.11	1.5	11.12	1.3	53.27	309.4757369	173.5685	1
2	G5	Pier 1	2.G5.Pier 1	CT-L73.0	CT LEGAL	2.88	Stiffened Web - Flexural Buckling	1.25	70.11	1.5	11.12	1.3	54.79	309.4757369	175.5445	1
2	G5	Pier 1	2.G5.Pier 1	CT-L3S2	CT LEGAL	3.18	Stiffened Web - Flexural Buckling	1.25	70.11	1.5	11.12	1.3	49.57	309.4757369	168.7585	1
2	G5	Pier 1	2.G5.Pier 1	CT-P76.5	CT PERMIT	3.03	Stiffened Web - Flexural Buckling	1.25	70.11	1.5	11.12	1.16	58.19	309.4757369	171.8179	1
2	G5	Pier 1	2.G5.Pier 1	CT-P120(6)	CT PERMIT	2.12	Stiffened Web - Flexural Buckling	1.25	70.11	1.5	11.12	1.209778	79.74	309.4757369	200.7852	1
2	G5	Pier 1	2.G5.Pier 1	CT-P140(7)a	CT PERMIT	1.9	Stiffened Web - Flexural Buckling	1.25	70.11	1.5	11.12	1.31	82.21	309.4757369	212.0126	1
2	G5	Pier 1	2.G5.Pier 1	CT-P140(7)b	CT PERMIT	2.03	Stiffened Web - Flexural Buckling	1.25	70.11	1.5	11.12	1.31	77.12	309.4757369	205.3447	1
2	G5	Pier 1	2.G5.Pier 1	CT-P160(8)a	CT PERMIT	1.75	Stiffened Web - Flexural Buckling	1.25	70.11	1.5	11.12	1.31	89.34	309.4757369	221.3529	1
2	G5	Pier 1	2.G5.Pier 1	CT-P160(8)b	CT PERMIT	1.72	Stiffened Web - Flexural Buckling	1.25	70.11	1.5	11.12	1.31	90.79	309.4757369	223.2524	1
2	G5	Pier 1	2.G5.Pier 1	CT-P180(9)	CT PERMIT	1.58	Stiffened Web - Flexural Buckling	1.25	70.11	1.5	11.12	1.31	98.75	309.4757369	233.68	1
2	G5	Pier 1	2.G5.Pier 1	CT-P200(10)	CT PERMIT	1.51	Stiffened Web - Flexural Buckling	1.25	70.11	1.5	11.12	1.21	111.59	309.4757369	239.3414	1
2	G5	Pier 1	2.G5.Pier 1	CT-P380	CT PERMIT	2.18	Stiffened Web - Flexural Buckling	1.25	70.11	1.5	11.12	1.1	85.54	309.4757369	198.4115	1
2	G5	Pier 2	2.G5.Pier 2	HL-93	INVENTORY	1.86	Stiffened Web - Flexural Buckling	1.25	70.13	1.5	11.12	1.75	81.09	404.1248081	246.25	1.096899762
2	G5	Pier 2	2.G5.Pier 2	HL-93	OPERATING	2.41	Stiffened Web - Flexural Buckling	1.25	70.13	1.5	11.12	1.35	81.09	404.1248081	213.814	1.096899752
2	G5	Pier 2	2.G5.Pier 2	Type 3	AASHTO LEGAL	4.94	Stiffened Web - Flexural Buckling	1.25	70.13	1.5	11.12	1.3	41.09	404.1248081	157.7595	1.096899739
2	G5	Pier 2	2.G5.Pier 2	Type 3S2	AASHTO LEGAL	3.86	Stiffened Web - Flexural Buckling	1.25	70.13	1.5	11.12	1.3	52.62	404.1248081	172.7485	1.096899742
2	G5	Pier 2	2.G5.Pier 2	Type 3-3	AASHTO LEGAL	3.69	Stiffened Web - Flexural Buckling	1.25	70.13	1.5	11.12	1.3	55.03	404.1248081	175.8815	1.096899743



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Beam End Identification				Vehicle		Rating		Loading						Capacity	Axial Magnification	
Span	Member	Support	S.M.S	Vehicle	Load Type	RF	Failure Mechanism	γ.DC	DC	γ.DW	DW	γ.LL	LL	C	P.u	δ.A
2	G5	Pier 2	2.G5.Pier 2	SU4	AASHTO LEGAL	4.53	Stiffened Web - Flexural Buckling	1.25	70.13	1.5	11.12	1.3	44.81	404.1248081	162.5955	1.09689974
2	G5	Pier 2	2.G5.Pier 2	SU5	AASHTO LEGAL	4	Stiffened Web - Flexural Buckling	1.25	70.13	1.5	11.12	1.3	50.7	404.1248081	170.2525	1.096899742
2	G5	Pier 2	2.G5.Pier 2	SU6	AASHTO LEGAL	3.66	Stiffened Web - Flexural Buckling	1.25	70.13	1.5	11.12	1.3	55.4	404.1248081	176.3625	1.096899743
2	G5	Pier 2	2.G5.Pier 2	SU7	AASHTO LEGAL	3.37	Stiffened Web - Flexural Buckling	1.25	70.13	1.5	11.12	1.3	60.2	404.1248081	182.6025	1.096899745
2	G5	Pier 2	2.G5.Pier 2	H-20	CT LEGAL	5.9	Stiffened Web - Flexural Buckling	1.25	70.13	1.5	11.12	1.3	34.38	404.1248081	149.0365	1.096899738
2	G5	Pier 2	2.G5.Pier 2	HS-20	CT LEGAL	3.49	Stiffened Web - Flexural Buckling	1.25	70.13	1.5	11.12	1.3	58.06	404.1248081	179.8205	1.096899744
2	G5	Pier 2	2.G5.Pier 2	CT-L73.0	CT LEGAL	3.4	Stiffened Web - Flexural Buckling	1.25	70.13	1.5	11.12	1.3	59.71	404.1248081	181.9655	1.096899744
2	G5	Pier 2	2.G5.Pier 2	CT-L3S2	CT LEGAL	3.76	Stiffened Web - Flexural Buckling	1.25	70.13	1.5	11.12	1.3	54.02	404.1248081	174.5685	1.096899743
2	G5	Pier 2	2.G5.Pier 2	CT-P76.5	CT PERMIT	3.59	Stiffened Web - Flexural Buckling	1.25	70.13	1.5	11.12	1.16	63.41	404.1248081	177.8981	1.096899744
2	G5	Pier 2	2.G5.Pier 2	CT-P120(6)	CT PERMIT	2.51	Stiffened Web - Flexural Buckling	1.25	70.13	1.5	11.12	1.209778	86.9	404.1248081	209.4722	1.096899751
2	G5	Pier 2	2.G5.Pier 2	CT-P140(7)a	CT PERMIT	2.25	Stiffened Web - Flexural Buckling	1.25	70.13	1.5	11.12	1.31	89.59	404.1248081	221.7054	1.096899754
2	G5	Pier 2	2.G5.Pier 2	CT-P140(7)b	CT PERMIT	2.39	Stiffened Web - Flexural Buckling	1.25	70.13	1.5	11.12	1.31	84.04	404.1248081	214.4349	1.096899752
2	G5	Pier 2	2.G5.Pier 2	CT-P160(8)a	CT PERMIT	2.07	Stiffened Web - Flexural Buckling	1.25	70.13	1.5	11.12	1.31	97.36	404.1248081	231.8841	1.096899757
2	G5	Pier 2	2.G5.Pier 2	CT-P160(8)b	CT PERMIT	2.03	Stiffened Web - Flexural Buckling	1.25	70.13	1.5	11.12	1.31	98.93	404.1248081	233.9408	1.096899758
2	G5	Pier 2	2.G5.Pier 2	CT-P180(9)	CT PERMIT	1.87	Stiffened Web - Flexural Buckling	1.25	70.13	1.5	11.12	1.31	107.61	404.1248081	245.3116	1.096899761
2	G5	Pier 2	2.G5.Pier 2	CT-P200(10)	CT PERMIT	1.79	Stiffened Web - Flexural Buckling	1.25	70.13	1.5	11.12	1.21	121.61	404.1248081	251.4906	1.096899763
2	G5	Pier 2	2.G5.Pier 2	CT-P380	CT PERMIT	2.57	Stiffened Web - Flexural Buckling	1.25	70.13	1.5	11.12	1.1	93.21	404.1248081	206.8735	1.096899751
3	G1	Pier 2	3.G1.Pier 2	HL-93	INVENTORY	1.35	Stiffened Web - Flexural Buckling	1.25	21.96	1.5	4.01	1.75	56.19	206.0396908	131.7975	1.239555706
3	G1	Pier 2	3.G1.Pier 2	HL-93	OPERATING	1.75	Stiffened Web - Flexural Buckling	1.25	21.96	1.5	4.01	1.35	56.19	206.0396908	109.3215	1.239555624
3	G1	Pier 2	3.G1.Pier 2	Type 3	AASHTO LEGAL	2.85	Stiffened Web - Flexural Buckling	1.25	21.96	1.5	4.01	1.3	35.75	206.0396908	79.94	1.239555554
3	G1	Pier 2	3.G1.Pier 2	Type 3S2	AASHTO LEGAL	3.08	Stiffened Web - Flexural Buckling	1.25	21.96	1.5	4.01	1.3	33.06	206.0396908	76.443	1.239555532
3	G1	Pier 2	3.G1.Pier 2	Type 3-3	AASHTO LEGAL	3.3	Stiffened Web - Flexural Buckling	1.25	21.96	1.5	4.01	1.3	30.92	206.0396908	73.661	1.239555526
3	G1	Pier 2	3.G1.Pier 2	SU4	AASHTO LEGAL	2.55	Stiffened Web - Flexural Buckling	1.25	21.96	1.5	4.01	1.3	39.9	206.0396908	85.335	1.239555554
3	G1	Pier 2	3.G1.Pier 2	SU5	AASHTO LEGAL	2.34	Stiffened Web - Flexural Buckling	1.25	21.96	1.5	4.01	1.3	43.59	206.0396908	90.132	1.239555566
3	G1	Pier 2	3.G1.Pier 2	SU6	AASHTO LEGAL	2.28	Stiffened Web - Flexural Buckling	1.25	21.96	1.5	4.01	1.3	44.64	206.0396908	91.497	1.239555557
3	G1	Pier 2	3.G1.Pier 2	SU7	AASHTO LEGAL	2.26	Stiffened Web - Flexural Buckling	1.25	21.96	1.5	4.01	1.3	45.11	206.0396908	92.108	1.239555572
3	G1	Pier 2	3.G1.Pier 2	H-20	CT LEGAL	3.08	Stiffened Web - Flexural Buckling	1.25	21.96	1.5	4.01	1.3	33.06	206.0396908	76.443	1.239555532
3	G1	Pier 2	3.G1.Pier 2	HS-20	CT LEGAL	2.11	Stiffened Web - Flexural Buckling	1.25	21.96	1.5	4.01	1.3	48.2	206.0396908	96.125	1.239555583
3	G1	Pier 2	3.G1.Pier 2	CT-L73.0	CT LEGAL	1.98	Stiffened Web - Flexural Buckling	1.25	21.96	1.5	4.01	1.3	51.37	206.0396908	100.246	1.239555596
3	G1	Pier 2	3.G1.Pier 2	CT-L3S2	CT LEGAL	2.77	Stiffened Web - Flexural Buckling	1.25	21.96	1.5	4.01	1.3	36.84	206.0396908	81.357	1.239555544
3	G1	Pier 2	3.G1.Pier 2	CT-P76.5	CT PERMIT	2.03	Stiffened Web - Flexural Buckling	1.25	21.96	1.5	4.01	1.16	56.31	206.0396908	98.7846	1.239555591
3	G1	Pier 2	3.G1.Pier 2	CT-P120(6)	CT PERMIT	2.04	Stiffened Web - Flexural Buckling	1.25	21.96	1.5	4.01	1.209778	53.77	206.0396908	98.51475	1.239555559
3	G1	Pier 2	3.G1.Pier 2	CT-P140(7)a	CT PERMIT	1.93	Stiffened Web - Flexural Buckling	1.25	21.96	1.5	4.01	1.16	59.1	206.0396908	102.021	1.239555601
3	G1	Pier 2	3.G1.Pier 2	CT-P140(7)b	CT PERMIT	1.94	Stiffened Web - Flexural Buckling	1.25	21.96	1.5	4.01	1.16	58.78	206.0396908	101.6498	1.23955556
3	G1	Pier 2	3.G1.Pier 2	CT-P160(8)a	CT PERMIT	1.88	Stiffened Web - Flexural Buckling	1.25	21.96	1.5	4.01	1.16	60.57	206.0396908	103.7262	1.239555606
3	G1	Pier 2	3.G1.Pier 2	CT-P160(8)b	CT PERMIT	1.6	Stiffened Web - Flexural Buckling	1.25	21.96	1.5	4.01	1.31	63.3	206.0396908	116.388	1.239555648
3	G1	Pier 2	3.G1.Pier 2	CT-P180(9)	CT PERMIT	1.62	Stiffened Web - Flexural Buckling	1.25	21.96	1.5	4.01	1.31	62.35	206.0396908	115.1435	1.239555644
3	G1	Pier 2	3.G1.Pier 2	CT-P200(10)	CT PERMIT	1.45	Stiffened Web - Flexural Buckling	1.25	21.96	1.5	4.01	1.31	69.44	206.0396908	124.4314	1.239555678
3	G1	Pier 2	3.G1.Pier 2	CT-P380	CT PERMIT	2.63	Stiffened Web - Flexural Buckling	1.25	21.96	1.5	4.01	1.1	45.88	206.0396908	83.933	1.239555555
3	G5	Pier 2	3.G5.Pier 2	HL-93	INVENTORY	1.97	Stiffened Web - Flexural Buckling	1.25	21.96	1.5	3.9	1.75	50.9	232.259984	122.375	1.109357411
3	G5	Pier 2	3.G5.Pier 2	HL-93	OPERATING	2.56	Stiffened Web - Flexural Buckling	1.25	21.96	1.5	3.9	1.35	50.9	232.259984	102.015	1.109357386
3	G5	Pier 2	3.G5.Pier 2	Type 3	AASHTO LEGAL	4.18	Stiffened Web - Flexural Buckling	1.25	21.96	1.5	3.9	1.3	32.38	232.259984	75.394	1.109357361
3	G5	Pier 2	3.G5.Pier 2	Type 3S2	AASHTO LEGAL	4.52	Stiffened Web - Flexural Buckling	1.25	21.96	1.5	3.9	1.3	29.95	232.259984	72.235	1.109357359
3	G5	Pier 2	3.G5.Pier 2	Type 3-3	AASHTO LEGAL	4.83	Stiffened Web - Flexural Buckling	1.25	21.96	1.5	3.9	1.3	28.01	232.259984	69.713	1.109357357
3	G5	Pier 2	3.G5.Pier 2	SU4	AASHTO LEGAL	3.74	Stiffened Web - Flexural Buckling	1.25	21.96	1.5	3.9	1.3	36.14	232.259984	80.282	1.109357366
3	G5	Pier 2	3.G5.Pier 2	SU5	AASHTO LEGAL	3.43	Stiffened Web - Flexural Buckling	1.25	21.96	1.5	3.9	1.3	39.48	232.259984	84.624	1.109357369
3	G5	Pier 2	3.G5.Pier 2	SU6	AASHTO LEGAL	3.34	Stiffened Web - Flexural Buckling	1.25	21.96	1.5	3.9	1.3	40.44	232.259984	85.872	1.10935737
3	G5	Pier 2	3.G5.Pier 2	SU7	AASHTO LEGAL	3.31	Stiffened Web - Flexural Buckling	1.25	21.96	1.5	3.9	1.3	40.86	232.259984	86.418	1.109357371
3	G5	Pier 2	3.G5.Pier 2	H-20	CT LEGAL	4.52	Stiffened Web - Flexural Buckling	1.25	21.96	1.5	3.9	1.3	29.94	232.259984	72.222	1.109357359
3	G5	Pier 2	3.G5.Pier 2	HS-20	CT LEGAL	3.1	Stiffened Web - Flexural Buckling	1.25	21.96	1.5	3.9	1.3	43.66	232.259984	90.058	1.109357374
3	G5	Pier 2	3.G5.Pier 2	CT-L73.0	CT LEGAL	2.91	Stiffened Web - Flexural Buckling	1.25	21.96	1.5	3.9	1.3	46.54	232.259984	93.802	1.109357378
3	G5	Pier 2	3.G5.Pier 2	CT-L3S2	CT LEGAL	4.05	Stiffened Web - Flexural Buckling	1.25	21.96	1.5	3.9	1.3	33.37	232.259984	76.681	1.109357363
3	G5	Pier 2	3.G5.Pier 2	CT-P76.5	CT PERMIT	2.97	Stiffened Web - Flexural Buckling	1.25	21.96	1.5	3.9	1.16	51.01	232.259984	92.4716	1.109357377



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Beam End Identification				Vehicle		Rating		Loading						Capacity	Axial Magnification	
Span	Member	Support	S.M.S	Vehicle	Load Type	RF	Failure Mechanism	γ.DC	DC	γ.DW	DW	γ.LL	LL	C	P.u	δ.A
3	G5	Pier 2	3.G5.Pier 2	CT-P120(6)	CT PERMIT	2.98	Stiffened Web - Flexural Buckling	1.25	21.96	1.5	3.9	1.209778	48.71	232.259984	92.22828	1.109357376
3	G5	Pier 2	3.G5.Pier 2	CT-P140(7)a	CT PERMIT	2.83	Stiffened Web - Flexural Buckling	1.25	21.96	1.5	3.9	1.16	53.53	232.259984	95.3948	1.10935738
3	G5	Pier 2	3.G5.Pier 2	CT-P140(7)b	CT PERMIT	2.85	Stiffened Web - Flexural Buckling	1.25	21.96	1.5	3.9	1.16	53.25	232.259984	95.07	1.109357379
3	G5	Pier 2	3.G5.Pier 2	CT-P160(8)a	CT PERMIT	2.76	Stiffened Web - Flexural Buckling	1.25	21.96	1.5	3.9	1.16	54.87	232.259984	96.9492	1.109357381
3	G5	Pier 2	3.G5.Pier 2	CT-P160(8)b	CT PERMIT	2.34	Stiffened Web - Flexural Buckling	1.25	21.96	1.5	3.9	1.31	57.34	232.259984	108.4154	1.109357394
3	G5	Pier 2	3.G5.Pier 2	CT-P180(9)	CT PERMIT	2.37	Stiffened Web - Flexural Buckling	1.25	21.96	1.5	3.9	1.31	56.48	232.259984	107.2888	1.109357392
3	G5	Pier 2	3.G5.Pier 2	CT-P200(10)	CT PERMIT	2.13	Stiffened Web - Flexural Buckling	1.25	21.96	1.5	3.9	1.31	62.9	232.259984	115.699	1.109357402
3	G5	Pier 2	3.G5.Pier 2	CT-P380	CT PERMIT	3.85	Stiffened Web - Flexural Buckling	1.25	21.96	1.5	3.9	1.1	41.56	232.259984	79.016	1.109357364
1	G1	S Abut	1.G1.S Abut	HL-93	INVENTORY	1.7	Stiffened Web - Localized Flex. Buck.	1.25	23.29	1.5	3.97	1.75	57.75	207.6369701	136.13	1
1	G1	S Abut	1.G1.S Abut	HL-93	OPERATING	2.21	Stiffened Web - Localized Flex. Buck.	1.25	23.29	1.5	3.97	1.35	57.75	207.6369701	113.03	1
1	G1	S Abut	1.G1.S Abut	Type 3	AASHTO LEGAL	3.65	Stiffened Web - Localized Flex. Buck.	1.25	23.29	1.5	3.97	1.3	36.34	207.6369701	82.3095	1
1	G1	S Abut	1.G1.S Abut	Type 3S2	AASHTO LEGAL	3.85	Stiffened Web - Localized Flex. Buck.	1.25	23.29	1.5	3.97	1.3	34.44	207.6369701	79.8395	1
1	G1	S Abut	1.G1.S Abut	Type 3-3	AASHTO LEGAL	4.11	Stiffened Web - Localized Flex. Buck.	1.25	23.29	1.5	3.97	1.3	32.24	207.6369701	76.9795	1
1	G1	S Abut	1.G1.S Abut	SU4	AASHTO LEGAL	3.28	Stiffened Web - Localized Flex. Buck.	1.25	23.29	1.5	3.97	1.3	40.46	207.6369701	87.6655	1
1	G1	S Abut	1.G1.S Abut	SU5	AASHTO LEGAL	2.99	Stiffened Web - Localized Flex. Buck.	1.25	23.29	1.5	3.97	1.3	44.36	207.6369701	92.7355	1
1	G1	S Abut	1.G1.S Abut	SU6	AASHTO LEGAL	2.9	Stiffened Web - Localized Flex. Buck.	1.25	23.29	1.5	3.97	1.3	45.75	207.6369701	94.5425	1
1	G1	S Abut	1.G1.S Abut	SU7	AASHTO LEGAL	2.84	Stiffened Web - Localized Flex. Buck.	1.25	23.29	1.5	3.97	1.3	46.62	207.6369701	95.6735	1
1	G1	S Abut	1.G1.S Abut	H-20	CT LEGAL	3.98	Stiffened Web - Localized Flex. Buck.	1.25	23.29	1.5	3.97	1.3	33.27	207.6369701	78.3185	1
1	G1	S Abut	1.G1.S Abut	HS-20	CT LEGAL	2.69	Stiffened Web - Localized Flex. Buck.	1.25	23.29	1.5	3.97	1.3	49.24	207.6369701	99.0795	1
1	G1	S Abut	1.G1.S Abut	CT-L73.0	CT LEGAL	2.53	Stiffened Web - Localized Flex. Buck.	1.25	23.29	1.5	3.97	1.3	52.28	207.6369701	103.0315	1
1	G1	S Abut	1.G1.S Abut	CT-L3S2	CT LEGAL	3.56	Stiffened Web - Localized Flex. Buck.	1.25	23.29	1.5	3.97	1.3	37.26	207.6369701	83.5055	1
1	G1	S Abut	1.G1.S Abut	CT-P76.5	CT PERMIT	2.6	Stiffened Web - Localized Flex. Buck.	1.25	23.29	1.5	3.97	1.16	57.12	207.6369701	101.3267	1
1	G1	S Abut	1.G1.S Abut	CT-P120(6)	CT PERMIT	2.52	Stiffened Web - Localized Flex. Buck.	1.25	23.29	1.5	3.97	1.209778	56.45	207.6369701	103.3595	1
1	G1	S Abut	1.G1.S Abut	CT-P140(7)a	CT PERMIT	2.48	Stiffened Web - Localized Flex. Buck.	1.25	23.29	1.5	3.97	1.16	59.93	207.6369701	104.5863	1
1	G1	S Abut	1.G1.S Abut	CT-P140(7)b	CT PERMIT	2.5	Stiffened Web - Localized Flex. Buck.	1.25	23.29	1.5	3.97	1.16	59.42	207.6369701	103.9947	1
1	G1	S Abut	1.G1.S Abut	CT-P160(8)a	CT PERMIT	2.42	Stiffened Web - Localized Flex. Buck.	1.25	23.29	1.5	3.97	1.16	61.43	207.6369701	106.3263	1
1	G1	S Abut	1.G1.S Abut	CT-P160(8)b	CT PERMIT	2.05	Stiffened Web - Localized Flex. Buck.	1.25	23.29	1.5	3.97	1.31	64.21	207.6369701	119.1826	1
1	G1	S Abut	1.G1.S Abut	CT-P180(9)	CT PERMIT	2.08	Stiffened Web - Localized Flex. Buck.	1.25	23.29	1.5	3.97	1.31	63.21	207.6369701	117.8726	1
1	G1	S Abut	1.G1.S Abut	CT-P200(10)	CT PERMIT	1.87	Stiffened Web - Localized Flex. Buck.	1.25	23.29	1.5	3.97	1.31	70.42	207.6369701	127.3177	1
1	G1	S Abut	1.G1.S Abut	CT-P380	CT PERMIT	3.25	Stiffened Web - Localized Flex. Buck.	1.25	23.29	1.5	3.97	1.1	48.21	207.6369701	88.0985	1
1	G1	Pier 1	1.G1.Pier 1	HL-93	INVENTORY	0.38	Stiffened Web - Localized Flex. Buck.	1.25	23.28	1.5	3.79	1.75	52.22	90.78676773	126.17	1.294783496
1	G1	Pier 1	1.G1.Pier 1	HL-93	OPERATING	0.5	Stiffened Web - Localized Flex. Buck.	1.25	23.28	1.5	3.79	1.35	52.22	90.78676773	105.282	1.294783494
1	G1	Pier 1	1.G1.Pier 1	Type 3	AASHTO LEGAL	0.82	Stiffened Web - Localized Flex. Buck.	1.25	23.28	1.5	3.79	1.3	32.86	90.78676773	77.503	1.294783492
1	G1	Pier 1	1.G1.Pier 1	Type 3S2	AASHTO LEGAL	0.87	Stiffened Web - Localized Flex. Buck.	1.25	23.28	1.5	3.79	1.3	31.14	90.78676773	75.267	1.294783492
1	G1	Pier 1	1.G1.Pier 1	Type 3-3	AASHTO LEGAL	0.93	Stiffened Web - Localized Flex. Buck.	1.25	23.28	1.5	3.79	1.3	29.16	90.78676773	72.693	1.294783492
1	G1	Pier 1	1.G1.Pier 1	SU4	AASHTO LEGAL	0.74	Stiffened Web - Localized Flex. Buck.	1.25	23.28	1.5	3.79	1.3	36.59	90.78676773	82.352	1.294783492
1	G1	Pier 1	1.G1.Pier 1	SU5	AASHTO LEGAL	0.67	Stiffened Web - Localized Flex. Buck.	1.25	23.28	1.5	3.79	1.3	40.11	90.78676773	86.928	1.294783493
1	G1	Pier 1	1.G1.Pier 1	SU6	AASHTO LEGAL	0.65	Stiffened Web - Localized Flex. Buck.	1.25	23.28	1.5	3.79	1.3	41.37	90.78676773	88.566	1.294783493
1	G1	Pier 1	1.G1.Pier 1	SU7	AASHTO LEGAL	0.64	Stiffened Web - Localized Flex. Buck.	1.25	23.28	1.5	3.79	1.3	42.15	90.78676773	89.58	1.294783493
1	G1	Pier 1	1.G1.Pier 1	H-20	CT LEGAL	0.9	Stiffened Web - Localized Flex. Buck.	1.25	23.28	1.5	3.79	1.3	30.09	90.78676773	73.902	1.294783492
1	G1	Pier 1	1.G1.Pier 1	HS-20	CT LEGAL	0.61	Stiffened Web - Localized Flex. Buck.	1.25	23.28	1.5	3.79	1.3	44.52	90.78676773	92.661	1.294783493
1	G1	Pier 1	1.G1.Pier 1	CT-L73.0	CT LEGAL	0.57	Stiffened Web - Localized Flex. Buck.	1.25	23.28	1.5	3.79	1.3	47.28	90.78676773	96.249	1.294783493
1	G1	Pier 1	1.G1.Pier 1	CT-L3S2	CT LEGAL	0.8	Stiffened Web - Localized Flex. Buck.	1.25	23.28	1.5	3.79	1.3	33.7	90.78676773	78.595	1.294783492
1	G1	Pier 1	1.G1.Pier 1	CT-P76.5	CT PERMIT	0.58	Stiffened Web - Localized Flex. Buck.	1.25	23.28	1.5	3.79	1.16	51.65	90.78676773	94.699	1.294783493
1	G1	Pier 1	1.G1.Pier 1	CT-P120(6)	CT PERMIT	0.57	Stiffened Web - Localized Flex. Buck.	1.25	23.28	1.5	3.79	1.209778	51.04	90.78676773	96.53206	1.294783493
1	G1	Pier 1	1.G1.Pier 1	CT-P140(7)a	CT PERMIT	0.56	Stiffened Web - Localized Flex. Buck.	1.25	23.28	1.5	3.79	1.16	54.2	90.78676773	97.657	1.294783493
1	G1	Pier 1	1.G1.Pier 1	CT-P140(7)b	CT PERMIT	0.56	Stiffened Web - Localized Flex. Buck.	1.25	23.28	1.5	3.79	1.16	53.73	90.78676773	97.1118	1.294783493
1	G1	Pier 1	1.G1.Pier 1	CT-P160(8)a	CT PERMIT	0.54	Stiffened Web - Localized Flex. Buck.	1.25	23.28	1.5	3.79	1.16	55.55	90.78676773	99.223	1.294783494
1	G1	Pier 1	1.G1.Pier 1	CT-P160(8)b	CT PERMIT	0.46	Stiffened Web - Localized Flex. Buck.	1.25	23.28	1.5	3.79	1.31	58.06	90.78676773	110.8436	1.294783495
1	G1	Pier 1	1.G1.Pier 1	CT-P180(9)	CT PERMIT	0.47	Stiffened Web - Localized Flex. Buck.	1.25	23.28	1.5	3.79	1.31	57.16	90.78676773	109.6646	1.294783494
1	G1	Pier 1	1.G1.Pier 1	CT-P200(10)	CT PERMIT	0.42	Stiffened Web - Localized Flex. Buck.	1.25	23.28	1.5	3.79	1.31	63.68	90.78676773	118.2058	1.294783495
1	G1	Pier 1	1.G1.Pier 1	CT-P380	CT PERMIT	0.73	Stiffened Web - Localized Flex. Buck.	1.25	23.28	1.5	3.79	1.1	43.59	90.78676773	82.734	1.294783492
1	G5	S Abut	1.G5.S Abut	HL-93	INVENTORY	1.89	Stiffened Web - Localized Flex. Buck.	1.25	23.29	1.5	3.85	1.75	52.22	207.6369701	126.2725	1



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Beam End Identification				Vehicle		Rating		Loading						Capacity	Axial Magnification	
Span	Member	Support	S.M.S	Vehicle	Load Type	RF	Failure Mechanism	γ.DC	DC	γ.DW	DW	γ.LL	LL	C	P.u	δ.A
1	G5	S Abut	1.G5.S Abut	HL-93	OPERATING	2.45	Stiffened Web - Localized Flex. Buck.	1.25	23.29	1.5	3.85	1.35	52.22	207.6369701	105.3845	1
1	G5	S Abut	1.G5.S Abut	Type 3	AASHTO LEGAL	4.04	Stiffened Web - Localized Flex. Buck.	1.25	23.29	1.5	3.85	1.3	32.86	207.6369701	77.6055	1
1	G5	S Abut	1.G5.S Abut	Type 3S2	AASHTO LEGAL	4.26	Stiffened Web - Localized Flex. Buck.	1.25	23.29	1.5	3.85	1.3	31.14	207.6369701	75.3695	1
1	G5	S Abut	1.G5.S Abut	Type 3-3	AASHTO LEGAL	4.55	Stiffened Web - Localized Flex. Buck.	1.25	23.29	1.5	3.85	1.3	29.16	207.6369701	72.7955	1
1	G5	S Abut	1.G5.S Abut	SU4	AASHTO LEGAL	3.63	Stiffened Web - Localized Flex. Buck.	1.25	23.29	1.5	3.85	1.3	36.59	207.6369701	82.4545	1
1	G5	S Abut	1.G5.S Abut	SU5	AASHTO LEGAL	3.31	Stiffened Web - Localized Flex. Buck.	1.25	23.29	1.5	3.85	1.3	40.11	207.6369701	87.0305	1
1	G5	S Abut	1.G5.S Abut	SU6	AASHTO LEGAL	3.21	Stiffened Web - Localized Flex. Buck.	1.25	23.29	1.5	3.85	1.3	41.37	207.6369701	88.6685	1
1	G5	S Abut	1.G5.S Abut	SU7	AASHTO LEGAL	3.15	Stiffened Web - Localized Flex. Buck.	1.25	23.29	1.5	3.85	1.3	42.15	207.6369701	89.6825	1
1	G5	S Abut	1.G5.S Abut	H-20	CT LEGAL	4.41	Stiffened Web - Localized Flex. Buck.	1.25	23.29	1.5	3.85	1.3	30.09	207.6369701	74.0045	1
1	G5	S Abut	1.G5.S Abut	HS-20	CT LEGAL	2.98	Stiffened Web - Localized Flex. Buck.	1.25	23.29	1.5	3.85	1.3	44.52	207.6369701	92.7635	1
1	G5	S Abut	1.G5.S Abut	CT-L73.0	CT LEGAL	2.81	Stiffened Web - Localized Flex. Buck.	1.25	23.29	1.5	3.85	1.3	47.28	207.6369701	96.3515	1
1	G5	S Abut	1.G5.S Abut	CT-L3S2	CT LEGAL	3.94	Stiffened Web - Localized Flex. Buck.	1.25	23.29	1.5	3.85	1.3	33.7	207.6369701	78.6975	1
1	G5	S Abut	1.G5.S Abut	CT-P76.5	CT PERMIT	2.88	Stiffened Web - Localized Flex. Buck.	1.25	23.29	1.5	3.85	1.16	51.65	207.6369701	94.8015	1
1	G5	S Abut	1.G5.S Abut	CT-P120(6)	CT PERMIT	2.79	Stiffened Web - Localized Flex. Buck.	1.25	23.29	1.5	3.85	1.209778	51.04	207.6369701	96.63456	1
1	G5	S Abut	1.G5.S Abut	CT-P140(7)a	CT PERMIT	2.74	Stiffened Web - Localized Flex. Buck.	1.25	23.29	1.5	3.85	1.16	54.2	207.6369701	97.7595	1
1	G5	S Abut	1.G5.S Abut	CT-P140(7)b	CT PERMIT	2.77	Stiffened Web - Localized Flex. Buck.	1.25	23.29	1.5	3.85	1.16	53.73	207.6369701	97.2143	1
1	G5	S Abut	1.G5.S Abut	CT-P160(8)a	CT PERMIT	2.68	Stiffened Web - Localized Flex. Buck.	1.25	23.29	1.5	3.85	1.16	55.55	207.6369701	99.3255	1
1	G5	S Abut	1.G5.S Abut	CT-P160(8)b	CT PERMIT	2.27	Stiffened Web - Localized Flex. Buck.	1.25	23.29	1.5	3.85	1.31	58.06	207.6369701	110.9461	1
1	G5	S Abut	1.G5.S Abut	CT-P180(9)	CT PERMIT	2.3	Stiffened Web - Localized Flex. Buck.	1.25	23.29	1.5	3.85	1.31	57.16	207.6369701	109.7671	1
1	G5	S Abut	1.G5.S Abut	CT-P200(10)	CT PERMIT	2.07	Stiffened Web - Localized Flex. Buck.	1.25	23.29	1.5	3.85	1.31	63.68	207.6369701	118.3083	1
1	G5	S Abut	1.G5.S Abut	CT-P380	CT PERMIT	3.6	Stiffened Web - Localized Flex. Buck.	1.25	23.29	1.5	3.85	1.1	43.59	207.6369701	82.8365	1
1	G5	Pier 1	1.G5.Pier 1	HL-93	INVENTORY	0.21	Stiffened Web - Localized Flex. Buck.	1.25	23.31	1.5	3.67	1.75	57.75	86.56845354	135.705	1.549338251
1	G5	Pier 1	1.G5.Pier 1	HL-93	OPERATING	0.27	Stiffened Web - Localized Flex. Buck.	1.25	23.31	1.5	3.67	1.35	57.75	86.56845354	112.605	1.549338243
1	G5	Pier 1	1.G5.Pier 1	Type 3	AASHTO LEGAL	0.44	Stiffened Web - Localized Flex. Buck.	1.25	23.31	1.5	3.67	1.3	36.34	86.56845354	81.8845	1.549338236
1	G5	Pier 1	1.G5.Pier 1	Type 3S2	AASHTO LEGAL	0.47	Stiffened Web - Localized Flex. Buck.	1.25	23.31	1.5	3.67	1.3	34.44	86.56845354	79.4145	1.549338235
1	G5	Pier 1	1.G5.Pier 1	Type 3-3	AASHTO LEGAL	0.5	Stiffened Web - Localized Flex. Buck.	1.25	23.31	1.5	3.67	1.3	32.24	86.56845354	76.5545	1.549338234
1	G5	Pier 1	1.G5.Pier 1	SU4	AASHTO LEGAL	0.4	Stiffened Web - Localized Flex. Buck.	1.25	23.31	1.5	3.67	1.3	40.46	86.56845354	87.2405	1.549338237
1	G5	Pier 1	1.G5.Pier 1	SU5	AASHTO LEGAL	0.36	Stiffened Web - Localized Flex. Buck.	1.25	23.31	1.5	3.67	1.3	44.36	86.56845354	92.3105	1.549338238
1	G5	Pier 1	1.G5.Pier 1	SU6	AASHTO LEGAL	0.35	Stiffened Web - Localized Flex. Buck.	1.25	23.31	1.5	3.67	1.3	45.75	86.56845354	94.1175	1.549338238
1	G5	Pier 1	1.G5.Pier 1	SU7	AASHTO LEGAL	0.35	Stiffened Web - Localized Flex. Buck.	1.25	23.31	1.5	3.67	1.3	46.62	86.56845354	95.2485	1.549338239
1	G5	Pier 1	1.G5.Pier 1	H-20	CT LEGAL	0.49	Stiffened Web - Localized Flex. Buck.	1.25	23.31	1.5	3.67	1.3	33.27	86.56845354	77.8935	1.549338235
1	G5	Pier 1	1.G5.Pier 1	HS-20	CT LEGAL	0.33	Stiffened Web - Localized Flex. Buck.	1.25	23.31	1.5	3.67	1.3	49.24	86.56845354	98.6545	1.549338239
1	G5	Pier 1	1.G5.Pier 1	CT-L73.0	CT LEGAL	0.31	Stiffened Web - Localized Flex. Buck.	1.25	23.31	1.5	3.67	1.3	52.28	86.56845354	102.6065	1.549338241
1	G5	Pier 1	1.G5.Pier 1	CT-L3S2	CT LEGAL	0.43	Stiffened Web - Localized Flex. Buck.	1.25	23.31	1.5	3.67	1.3	37.26	86.56845354	83.0805	1.549338236
1	G5	Pier 1	1.G5.Pier 1	CT-P76.5	CT PERMIT	0.32	Stiffened Web - Localized Flex. Buck.	1.25	23.31	1.5	3.67	1.16	57.12	86.56845354	100.9017	1.54933824
1	G5	Pier 1	1.G5.Pier 1	CT-P120(6)	CT PERMIT	0.31	Stiffened Web - Localized Flex. Buck.	1.25	23.31	1.5	3.67	1.209778	56.45	86.56845354	102.9345	1.549338241
1	G5	Pier 1	1.G5.Pier 1	CT-P140(7)a	CT PERMIT	0.3	Stiffened Web - Localized Flex. Buck.	1.25	23.31	1.5	3.67	1.16	59.93	86.56845354	104.1613	1.549338241
1	G5	Pier 1	1.G5.Pier 1	CT-P140(7)b	CT PERMIT	0.3	Stiffened Web - Localized Flex. Buck.	1.25	23.31	1.5	3.67	1.16	59.42	86.56845354	103.5697	1.549338241
1	G5	Pier 1	1.G5.Pier 1	CT-P160(8)a	CT PERMIT	0.29	Stiffened Web - Localized Flex. Buck.	1.25	23.31	1.5	3.67	1.16	61.43	86.56845354	105.9013	1.549338241
1	G5	Pier 1	1.G5.Pier 1	CT-P160(8)b	CT PERMIT	0.25	Stiffened Web - Localized Flex. Buck.	1.25	23.31	1.5	3.67	1.31	64.21	86.56845354	118.7576	1.549338245
1	G5	Pier 1	1.G5.Pier 1	CT-P180(9)	CT PERMIT	0.25	Stiffened Web - Localized Flex. Buck.	1.25	23.31	1.5	3.67	1.31	63.21	86.56845354	117.4476	1.549338245
1	G5	Pier 1	1.G5.Pier 1	CT-P200(10)	CT PERMIT	0.23	Stiffened Web - Localized Flex. Buck.	1.25	23.31	1.5	3.67	1.31	70.42	86.56845354	126.8927	1.549338248
1	G5	Pier 1	1.G5.Pier 1	CT-P380	CT PERMIT	0.4	Stiffened Web - Localized Flex. Buck.	1.25	23.31	1.5	3.67	1.1	48.21	86.56845354	87.6735	1.549338237
2	G1	Pier 2	2.G1.Pier 2	HL-93	INVENTORY	1.6	Stiffened Web - Localized Flex. Buck.	1.25	69.93	1.5	11.44	1.75	74.41	371.6329834	234.79	1.186031905
2	G1	Pier 2	2.G1.Pier 2	HL-93	OPERATING	2.07	Stiffened Web - Localized Flex. Buck.	1.25	69.93	1.5	11.44	1.35	74.41	371.6329834	205.026	1.186031904
2	G1	Pier 2	2.G1.Pier 2	Type 3	AASHTO LEGAL	4.25	Stiffened Web - Localized Flex. Buck.	1.25	69.93	1.5	11.44	1.3	37.7	371.6329834	153.5825	1.186031904
2	G1	Pier 2	2.G1.Pier 2	Type 3S2	AASHTO LEGAL	3.32	Stiffened Web - Localized Flex. Buck.	1.25	69.93	1.5	11.44	1.3	48.29	371.6329834	167.3495	1.186031904
2	G1	Pier 2	2.G1.Pier 2	Type 3-3	AASHTO LEGAL	3.18	Stiffened Web - Localized Flex. Buck.	1.25	69.93	1.5	11.44	1.3	50.5	371.6329834	170.2225	1.186031904
2	G1	Pier 2	2.G1.Pier 2	SU4	AASHTO LEGAL	3.9	Stiffened Web - Localized Flex. Buck.	1.25	69.93	1.5	11.44	1.3	41.12	371.6329834	158.0285	1.186031904
2	G1	Pier 2	2.G1.Pier 2	SU5	AASHTO LEGAL	3.45	Stiffened Web - Localized Flex. Buck.	1.25	69.93	1.5	11.44	1.3	46.52	371.6329834	165.0485	1.186031904
2	G1	Pier 2	2.G1.Pier 2	SU6	AASHTO LEGAL	3.15	Stiffened Web - Localized Flex. Buck.	1.25	69.93	1.5	11.44	1.3	50.84	371.6329834	170.6645	1.186031904
2	G1	Pier 2	2.G1.Pier 2	SU7	AASHTO LEGAL	2.9	Stiffened Web - Localized Flex. Buck.	1.25	69.93	1.5	11.44	1.3	55.24	371.6329834	176.3845	1.186031904
2	G1	Pier 2	2.G1.Pier 2	H-20	CT LEGAL	5.09	Stiffened Web - Localized Flex. Buck.	1.25	69.93	1.5	11.44	1.3	31.55	371.6329834	145.5875	1.186031904



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Beam End Identification				Vehicle		Rating		Loading						Capacity	Axial Magnification	
Span	Member	Support	S.M.S	Vehicle	Load Type	RF	Failure Mechanism	γ.DC	DC	γ.DW	DW	γ.LL	LL	C	P.u	δ.A
2	G1	Pier 2	2.G1.Pier 2	HS-20	CT LEGAL	3.01	Stiffened Web - Localized Flex. Buck.	1.25	69.93	1.5	11.44	1.3	53.27	371.6329834	173.8235	1.186031904
2	G1	Pier 2	2.G1.Pier 2	CT-L73.0	CT LEGAL	2.93	Stiffened Web - Localized Flex. Buck.	1.25	69.93	1.5	11.44	1.3	54.79	371.6329834	175.7995	1.186031904
2	G1	Pier 2	2.G1.Pier 2	CT-L3S2	CT LEGAL	3.23	Stiffened Web - Localized Flex. Buck.	1.25	69.93	1.5	11.44	1.3	49.57	371.6329834	169.0135	1.186031904
2	G1	Pier 2	2.G1.Pier 2	CT-P76.5	CT PERMIT	3.09	Stiffened Web - Localized Flex. Buck.	1.25	69.93	1.5	11.44	1.16	58.19	371.6329834	172.0729	1.186031904
2	G1	Pier 2	2.G1.Pier 2	CT-P120(6)	CT PERMIT	2.16	Stiffened Web - Localized Flex. Buck.	1.25	69.93	1.5	11.44	1.209778	79.74	371.6329834	201.0402	1.186031904
2	G1	Pier 2	2.G1.Pier 2	CT-P140(7)a	CT PERMIT	1.93	Stiffened Web - Localized Flex. Buck.	1.25	69.93	1.5	11.44	1.31	82.21	371.6329834	212.2676	1.186031904
2	G1	Pier 2	2.G1.Pier 2	CT-P140(7)b	CT PERMIT	2.06	Stiffened Web - Localized Flex. Buck.	1.25	69.93	1.5	11.44	1.31	77.12	371.6329834	205.5997	1.186031904
2	G1	Pier 2	2.G1.Pier 2	CT-P160(8)a	CT PERMIT	1.78	Stiffened Web - Localized Flex. Buck.	1.25	69.93	1.5	11.44	1.31	89.34	371.6329834	221.6079	1.186031905
2	G1	Pier 2	2.G1.Pier 2	CT-P160(8)b	CT PERMIT	1.75	Stiffened Web - Localized Flex. Buck.	1.25	69.93	1.5	11.44	1.31	90.79	371.6329834	223.5074	1.186031905
2	G1	Pier 2	2.G1.Pier 2	CT-P180(9)	CT PERMIT	1.61	Stiffened Web - Localized Flex. Buck.	1.25	69.93	1.5	11.44	1.31	98.75	371.6329834	233.935	1.186031905
2	G1	Pier 2	2.G1.Pier 2	CT-P200(10)	CT PERMIT	1.54	Stiffened Web - Localized Flex. Buck.	1.25	69.93	1.5	11.44	1.21	111.59	371.6329834	239.5964	1.186031905
2	G1	Pier 2	2.G1.Pier 2	CT-P380	CT PERMIT	2.21	Stiffened Web - Localized Flex. Buck.	1.25	69.93	1.5	11.44	1.1	85.54	371.6329834	198.6665	1.186031904
2	G3	Pier 2	2.G3.Pier 2	HL-93	INVENTORY	0.58	Stiffened Web - Localized Flex. Buck.	1.25	77.71	1.5	8.84	1.75	105.36	323.088702	294.7775	1.475564994
2	G3	Pier 2	2.G3.Pier 2	HL-93	OPERATING	0.76	Stiffened Web - Localized Flex. Buck.	1.25	77.71	1.5	8.84	1.35	105.36	323.088702	252.6335	1.475564993
2	G3	Pier 2	2.G3.Pier 2	Type 3	AASHTO LEGAL	1.56	Stiffened Web - Localized Flex. Buck.	1.25	77.71	1.5	8.84	1.3	53.39	323.088702	179.8045	1.475564992
2	G3	Pier 2	2.G3.Pier 2	Type 3S2	AASHTO LEGAL	1.22	Stiffened Web - Localized Flex. Buck.	1.25	77.71	1.5	8.84	1.3	68.38	323.088702	199.2915	1.475564992
2	G3	Pier 2	2.G3.Pier 2	Type 3-3	AASHTO LEGAL	1.16	Stiffened Web - Localized Flex. Buck.	1.25	77.71	1.5	8.84	1.3	71.51	323.088702	203.3605	1.475564992
2	G3	Pier 2	2.G3.Pier 2	SU4	AASHTO LEGAL	1.43	Stiffened Web - Localized Flex. Buck.	1.25	77.71	1.5	8.84	1.3	58.22	323.088702	186.0835	1.475564992
2	G3	Pier 2	2.G3.Pier 2	SU5	AASHTO LEGAL	1.26	Stiffened Web - Localized Flex. Buck.	1.25	77.71	1.5	8.84	1.3	65.87	323.088702	196.0285	1.475564992
2	G3	Pier 2	2.G3.Pier 2	SU6	AASHTO LEGAL	1.16	Stiffened Web - Localized Flex. Buck.	1.25	77.71	1.5	8.84	1.3	71.99	323.088702	203.9845	1.475564992
2	G3	Pier 2	2.G3.Pier 2	SU7	AASHTO LEGAL	1.06	Stiffened Web - Localized Flex. Buck.	1.25	77.71	1.5	8.84	1.3	78.22	323.088702	212.0835	1.475564992
2	G3	Pier 2	2.G3.Pier 2	H-20	CT LEGAL	1.86	Stiffened Web - Localized Flex. Buck.	1.25	77.71	1.5	8.84	1.3	44.67	323.088702	168.4685	1.475564992
2	G3	Pier 2	2.G3.Pier 2	HS-20	CT LEGAL	1.1	Stiffened Web - Localized Flex. Buck.	1.25	77.71	1.5	8.84	1.3	75.44	323.088702	208.4695	1.475564992
2	G3	Pier 2	2.G3.Pier 2	CT-L73.0	CT LEGAL	1.07	Stiffened Web - Localized Flex. Buck.	1.25	77.71	1.5	8.84	1.3	77.59	323.088702	211.2645	1.475564992
2	G3	Pier 2	2.G3.Pier 2	CT-L3S2	CT LEGAL	1.18	Stiffened Web - Localized Flex. Buck.	1.25	77.71	1.5	8.84	1.3	70.2	323.088702	201.6575	1.475564992
2	G3	Pier 2	2.G3.Pier 2	CT-P76.5	CT PERMIT	1.13	Stiffened Web - Localized Flex. Buck.	1.25	77.71	1.5	8.84	1.16	82.39	323.088702	205.9699	1.475564992
2	G3	Pier 2	2.G3.Pier 2	CT-P120(6)	CT PERMIT	0.79	Stiffened Web - Localized Flex. Buck.	1.25	77.71	1.5	8.84	1.209778	112.91	323.088702	246.9935	1.475564993
2	G3	Pier 2	2.G3.Pier 2	CT-P140(7)a	CT PERMIT	0.71	Stiffened Web - Localized Flex. Buck.	1.25	77.71	1.5	8.84	1.31	116.4	323.088702	262.8815	1.475564993
2	G3	Pier 2	2.G3.Pier 2	CT-P140(7)b	CT PERMIT	0.75	Stiffened Web - Localized Flex. Buck.	1.25	77.71	1.5	8.84	1.31	109.2	323.088702	253.4495	1.475564993
2	G3	Pier 2	2.G3.Pier 2	CT-P160(8)a	CT PERMIT	0.65	Stiffened Web - Localized Flex. Buck.	1.25	77.71	1.5	8.84	1.31	126.5	323.088702	276.1125	1.475564993
2	G3	Pier 2	2.G3.Pier 2	CT-P160(8)b	CT PERMIT	0.64	Stiffened Web - Localized Flex. Buck.	1.25	77.71	1.5	8.84	1.31	128.55	323.088702	278.798	1.475564994
2	G3	Pier 2	2.G3.Pier 2	CT-P180(9)	CT PERMIT	0.59	Stiffened Web - Localized Flex. Buck.	1.25	77.71	1.5	8.84	1.31	139.83	323.088702	293.5748	1.475564994
2	G3	Pier 2	2.G3.Pier 2	CT-P200(10)	CT PERMIT	0.56	Stiffened Web - Localized Flex. Buck.	1.25	77.71	1.5	8.84	1.21	158.01	323.088702	301.5896	1.475564994
2	G3	Pier 2	2.G3.Pier 2	CT-P380	CT PERMIT	0.87	Stiffened Web - Localized Flex. Buck.	1.25	77.71	1.5	8.84	1.1	112.37	323.088702	234.0045	1.475564993
2	G5	Pier 1	2.G5.Pier 1	HL-93	INVENTORY	1.97	Stiffened Web - Localized Flex. Buck.	1.25	70.11	1.5	11.12	1.75	74.41	361.8280074	234.535	1
2	G5	Pier 1	2.G5.Pier 1	HL-93	OPERATING	2.56	Stiffened Web - Localized Flex. Buck.	1.25	70.11	1.5	11.12	1.35	74.41	361.8280074	204.771	1
2	G5	Pier 1	2.G5.Pier 1	Type 3	AASHTO LEGAL	5.25	Stiffened Web - Localized Flex. Buck.	1.25	70.11	1.5	11.12	1.3	37.7	361.8280074	153.3275	1
2	G5	Pier 1	2.G5.Pier 1	Type 3S2	AASHTO LEGAL	4.1	Stiffened Web - Localized Flex. Buck.	1.25	70.11	1.5	11.12	1.3	48.29	361.8280074	167.0945	1
2	G5	Pier 1	2.G5.Pier 1	Type 3-3	AASHTO LEGAL	3.92	Stiffened Web - Localized Flex. Buck.	1.25	70.11	1.5	11.12	1.3	50.5	361.8280074	169.9675	1
2	G5	Pier 1	2.G5.Pier 1	SU4	AASHTO LEGAL	4.81	Stiffened Web - Localized Flex. Buck.	1.25	70.11	1.5	11.12	1.3	41.12	361.8280074	157.7735	1
2	G5	Pier 1	2.G5.Pier 1	SU5	AASHTO LEGAL	4.25	Stiffened Web - Localized Flex. Buck.	1.25	70.11	1.5	11.12	1.3	46.52	361.8280074	164.7935	1
2	G5	Pier 1	2.G5.Pier 1	SU6	AASHTO LEGAL	3.89	Stiffened Web - Localized Flex. Buck.	1.25	70.11	1.5	11.12	1.3	50.84	361.8280074	170.4095	1
2	G5	Pier 1	2.G5.Pier 1	SU7	AASHTO LEGAL	3.58	Stiffened Web - Localized Flex. Buck.	1.25	70.11	1.5	11.12	1.3	55.24	361.8280074	176.1295	1
2	G5	Pier 1	2.G5.Pier 1	H-20	CT LEGAL	6.27	Stiffened Web - Localized Flex. Buck.	1.25	70.11	1.5	11.12	1.3	31.55	361.8280074	145.3325	1
2	G5	Pier 1	2.G5.Pier 1	HS-20	CT LEGAL	3.71	Stiffened Web - Localized Flex. Buck.	1.25	70.11	1.5	11.12	1.3	53.27	361.8280074	173.5685	1
2	G5	Pier 1	2.G5.Pier 1	CT-L73.0	CT LEGAL	3.61	Stiffened Web - Localized Flex. Buck.	1.25	70.11	1.5	11.12	1.3	54.79	361.8280074	175.5445	1
2	G5	Pier 1	2.G5.Pier 1	CT-L3S2	CT LEGAL	3.99	Stiffened Web - Localized Flex. Buck.	1.25	70.11	1.5	11.12	1.3	49.57	361.8280074	168.7585	1
2	G5	Pier 1	2.G5.Pier 1	CT-P76.5	CT PERMIT	3.81	Stiffened Web - Localized Flex. Buck.	1.25	70.11	1.5	11.12	1.16	58.19	361.8280074	171.8179	1
2	G5	Pier 1	2.G5.Pier 1	CT-P120(6)	CT PERMIT	2.66	Stiffened Web - Localized Flex. Buck.	1.25	70.11	1.5	11.12	1.209778	79.74	361.8280074	200.7852	1
2	G5	Pier 1	2.G5.Pier 1	CT-P140(7)a	CT PERMIT	2.39	Stiffened Web - Localized Flex. Buck.	1.25	70.11	1.5	11.12	1.31	82.21	361.8280074	212.0126	1
2	G5	Pier 1	2.G5.Pier 1	CT-P140(7)b	CT PERMIT	2.54	Stiffened Web - Localized Flex. Buck.	1.25	70.11	1.5	11.12	1.31	77.12	361.8280074	205.3447	1
2	G5	Pier 1	2.G5.Pier 1	CT-P160(8)a	CT PERMIT	2.2	Stiffened Web - Localized Flex. Buck.	1.25	70.11	1.5	11.12	1.31	89.34	361.8280074	221.3529	1
2	G5	Pier 1	2.G5.Pier 1	CT-P160(8)b	CT PERMIT	2.16	Stiffened Web - Localized Flex. Buck.	1.25	70.11	1.5	11.12	1.31	90.79	361.8280074	223.2524	1



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Beam End Identification				Vehicle		Rating		Loading						Capacity	Axial Magnification	
Span	Member	Support	S.M.S	Vehicle	Load Type	RF	Failure Mechanism	γ.DC	DC	γ.DW	DW	γ.LL	LL	C	P.u	δ.A
2	G5	Pier 1	2.G5.Pier 1	CT-P180(9)	CT PERMIT	1.99	Stiffened Web - Localized Flex. Buck.	1.25	70.11	1.5	11.12	1.31	98.75	361.8280074	233.68	1
2	G5	Pier 1	2.G5.Pier 1	CT-P200(10)	CT PERMIT	1.9	Stiffened Web - Localized Flex. Buck.	1.25	70.11	1.5	11.12	1.21	111.59	361.8280074	239.3414	1
2	G5	Pier 1	2.G5.Pier 1	CT-P380	CT PERMIT	2.73	Stiffened Web - Localized Flex. Buck.	1.25	70.11	1.5	11.12	1.1	85.54	361.8280074	198.4115	1
2	G5	Pier 2	2.G5.Pier 2	HL-93	INVENTORY	1.29	Stiffened Web - Localized Flex. Buck.	1.25	70.13	1.5	11.12	1.75	81.09	318.4363451	246.25	1.105800923
2	G5	Pier 2	2.G5.Pier 2	HL-93	OPERATING	1.67	Stiffened Web - Localized Flex. Buck.	1.25	70.13	1.5	11.12	1.35	81.09	318.4363451	213.814	1.105800923
2	G5	Pier 2	2.G5.Pier 2	Type 3	AASHTO LEGAL	3.43	Stiffened Web - Localized Flex. Buck.	1.25	70.13	1.5	11.12	1.3	41.09	318.4363451	157.7595	1.105800923
2	G5	Pier 2	2.G5.Pier 2	Type 3S2	AASHTO LEGAL	2.68	Stiffened Web - Localized Flex. Buck.	1.25	70.13	1.5	11.12	1.3	52.62	318.4363451	172.7485	1.105800923
2	G5	Pier 2	2.G5.Pier 2	Type 3-3	AASHTO LEGAL	2.56	Stiffened Web - Localized Flex. Buck.	1.25	70.13	1.5	11.12	1.3	55.03	318.4363451	175.8815	1.105800923
2	G5	Pier 2	2.G5.Pier 2	SU4	AASHTO LEGAL	3.15	Stiffened Web - Localized Flex. Buck.	1.25	70.13	1.5	11.12	1.3	44.81	318.4363451	162.5955	1.105800923
2	G5	Pier 2	2.G5.Pier 2	SU5	AASHTO LEGAL	2.78	Stiffened Web - Localized Flex. Buck.	1.25	70.13	1.5	11.12	1.3	50.7	318.4363451	170.2525	1.105800923
2	G5	Pier 2	2.G5.Pier 2	SU6	AASHTO LEGAL	2.54	Stiffened Web - Localized Flex. Buck.	1.25	70.13	1.5	11.12	1.3	55.4	318.4363451	176.3625	1.105800923
2	G5	Pier 2	2.G5.Pier 2	SU7	AASHTO LEGAL	2.34	Stiffened Web - Localized Flex. Buck.	1.25	70.13	1.5	11.12	1.3	60.2	318.4363451	182.6025	1.105800923
2	G5	Pier 2	2.G5.Pier 2	H-20	CT LEGAL	4.1	Stiffened Web - Localized Flex. Buck.	1.25	70.13	1.5	11.12	1.3	34.38	318.4363451	149.0365	1.105800923
2	G5	Pier 2	2.G5.Pier 2	HS-20	CT LEGAL	2.43	Stiffened Web - Localized Flex. Buck.	1.25	70.13	1.5	11.12	1.3	58.06	318.4363451	179.8205	1.105800923
2	G5	Pier 2	2.G5.Pier 2	CT-L73.0	CT LEGAL	2.36	Stiffened Web - Localized Flex. Buck.	1.25	70.13	1.5	11.12	1.3	59.71	318.4363451	181.9655	1.105800923
2	G5	Pier 2	2.G5.Pier 2	CT-L3S2	CT LEGAL	2.61	Stiffened Web - Localized Flex. Buck.	1.25	70.13	1.5	11.12	1.3	54.02	318.4363451	174.5685	1.105800923
2	G5	Pier 2	2.G5.Pier 2	CT-P76.5	CT PERMIT	2.49	Stiffened Web - Localized Flex. Buck.	1.25	70.13	1.5	11.12	1.16	63.41	318.4363451	177.8981	1.105800923
2	G5	Pier 2	2.G5.Pier 2	CT-P120(6)	CT PERMIT	1.74	Stiffened Web - Localized Flex. Buck.	1.25	70.13	1.5	11.12	1.209778	86.9	318.4363451	209.4722	1.105800923
2	G5	Pier 2	2.G5.Pier 2	CT-P140(7)a	CT PERMIT	1.56	Stiffened Web - Localized Flex. Buck.	1.25	70.13	1.5	11.12	1.31	89.59	318.4363451	221.7054	1.105800923
2	G5	Pier 2	2.G5.Pier 2	CT-P140(7)b	CT PERMIT	1.66	Stiffened Web - Localized Flex. Buck.	1.25	70.13	1.5	11.12	1.31	84.04	318.4363451	214.4349	1.105800923
2	G5	Pier 2	2.G5.Pier 2	CT-P160(8)a	CT PERMIT	1.43	Stiffened Web - Localized Flex. Buck.	1.25	70.13	1.5	11.12	1.31	97.36	318.4363451	231.8841	1.105800923
2	G5	Pier 2	2.G5.Pier 2	CT-P160(8)b	CT PERMIT	1.41	Stiffened Web - Localized Flex. Buck.	1.25	70.13	1.5	11.12	1.31	98.93	318.4363451	233.9408	1.105800923
2	G5	Pier 2	2.G5.Pier 2	CT-P180(9)	CT PERMIT	1.3	Stiffened Web - Localized Flex. Buck.	1.25	70.13	1.5	11.12	1.31	107.61	318.4363451	245.3116	1.105800923
2	G5	Pier 2	2.G5.Pier 2	CT-P200(10)	CT PERMIT	1.24	Stiffened Web - Localized Flex. Buck.	1.25	70.13	1.5	11.12	1.21	121.61	318.4363451	251.4906	1.105800923
2	G5	Pier 2	2.G5.Pier 2	CT-P380	CT PERMIT	1.79	Stiffened Web - Localized Flex. Buck.	1.25	70.13	1.5	11.12	1.1	93.21	318.4363451	206.8735	1.105800923
3	G1	Pier 2	3.G1.Pier 2	HL-93	INVENTORY	0.83	Stiffened Web - Localized Flex. Buck.	1.25	21.96	1.5	4.01	1.75	56.19	138.0018244	131.7975	1.192865037
3	G1	Pier 2	3.G1.Pier 2	HL-93	OPERATING	1.08	Stiffened Web - Localized Flex. Buck.	1.25	21.96	1.5	4.01	1.35	56.19	138.0018244	109.3215	1.192865036
3	G1	Pier 2	3.G1.Pier 2	Type 3	AASHTO LEGAL	1.76	Stiffened Web - Localized Flex. Buck.	1.25	21.96	1.5	4.01	1.3	35.75	138.0018244	79.94	1.192865036
3	G1	Pier 2	3.G1.Pier 2	Type 3S2	AASHTO LEGAL	1.91	Stiffened Web - Localized Flex. Buck.	1.25	21.96	1.5	4.01	1.3	33.06	138.0018244	76.443	1.192865036
3	G1	Pier 2	3.G1.Pier 2	Type 3-3	AASHTO LEGAL	2.04	Stiffened Web - Localized Flex. Buck.	1.25	21.96	1.5	4.01	1.3	30.92	138.0018244	73.661	1.192865036
3	G1	Pier 2	3.G1.Pier 2	SU4	AASHTO LEGAL	1.58	Stiffened Web - Localized Flex. Buck.	1.25	21.96	1.5	4.01	1.3	39.9	138.0018244	85.335	1.192865036
3	G1	Pier 2	3.G1.Pier 2	SU5	AASHTO LEGAL	1.45	Stiffened Web - Localized Flex. Buck.	1.25	21.96	1.5	4.01	1.3	43.59	138.0018244	90.132	1.192865036
3	G1	Pier 2	3.G1.Pier 2	SU6	AASHTO LEGAL	1.41	Stiffened Web - Localized Flex. Buck.	1.25	21.96	1.5	4.01	1.3	44.64	138.0018244	91.497	1.192865036
3	G1	Pier 2	3.G1.Pier 2	SU7	AASHTO LEGAL	1.4	Stiffened Web - Localized Flex. Buck.	1.25	21.96	1.5	4.01	1.3	45.11	138.0018244	92.108	1.192865036
3	G1	Pier 2	3.G1.Pier 2	H-20	CT LEGAL	1.91	Stiffened Web - Localized Flex. Buck.	1.25	21.96	1.5	4.01	1.3	33.06	138.0018244	76.443	1.192865036
3	G1	Pier 2	3.G1.Pier 2	HS-20	CT LEGAL	1.31	Stiffened Web - Localized Flex. Buck.	1.25	21.96	1.5	4.01	1.3	48.2	138.0018244	96.125	1.192865036
3	G1	Pier 2	3.G1.Pier 2	CT-L73.0	CT LEGAL	1.23	Stiffened Web - Localized Flex. Buck.	1.25	21.96	1.5	4.01	1.3	51.37	138.0018244	100.246	1.192865036
3	G1	Pier 2	3.G1.Pier 2	CT-L3S2	CT LEGAL	1.71	Stiffened Web - Localized Flex. Buck.	1.25	21.96	1.5	4.01	1.3	36.84	138.0018244	81.357	1.192865036
3	G1	Pier 2	3.G1.Pier 2	CT-P76.5	CT PERMIT	1.25	Stiffened Web - Localized Flex. Buck.	1.25	21.96	1.5	4.01	1.16	56.31	138.0018244	98.7846	1.192865036
3	G1	Pier 2	3.G1.Pier 2	CT-P120(6)	CT PERMIT	1.26	Stiffened Web - Localized Flex. Buck.	1.25	21.96	1.5	4.01	1.209778	53.77	138.0018244	98.51475	1.192865036
3	G1	Pier 2	3.G1.Pier 2	CT-P140(7)a	CT PERMIT	1.19	Stiffened Web - Localized Flex. Buck.	1.25	21.96	1.5	4.01	1.16	59.1	138.0018244	102.021	1.192865036
3	G1	Pier 2	3.G1.Pier 2	CT-P140(7)b	CT PERMIT	1.2	Stiffened Web - Localized Flex. Buck.	1.25	21.96	1.5	4.01	1.16	58.78	138.0018244	101.6498	1.192865036
3	G1	Pier 2	3.G1.Pier 2	CT-P160(8)a	CT PERMIT	1.17	Stiffened Web - Localized Flex. Buck.	1.25	21.96	1.5	4.01	1.16	60.57	138.0018244	103.7262	1.192865036
3	G1	Pier 2	3.G1.Pier 2	CT-P160(8)b	CT PERMIT	0.99	Stiffened Web - Localized Flex. Buck.	1.25	21.96	1.5	4.01	1.31	63.3	138.0018244	116.388	1.192865036
3	G1	Pier 2	3.G1.Pier 2	CT-P180(9)	CT PERMIT	1	Stiffened Web - Localized Flex. Buck.	1.25	21.96	1.5	4.01	1.31	62.35	138.0018244	115.1435	1.192865036
3	G1	Pier 2	3.G1.Pier 2	CT-P200(10)	CT PERMIT	0.9	Stiffened Web - Localized Flex. Buck.	1.25	21.96	1.5	4.01	1.31	69.44	138.0018244	124.4314	1.192865037
3	G1	Pier 2	3.G1.Pier 2	CT-P380	CT PERMIT	1.62	Stiffened Web - Localized Flex. Buck.	1.25	21.96	1.5	4.01	1.1	45.88	138.0018244	83.933	1.192865036
3	G5	Pier 2	3.G5.Pier 2	HL-93	INVENTORY	0.84	Stiffened Web - Localized Flex. Buck.	1.25	21.96	1.5	3.9	1.75	50.9	125.119045	122.375	1.15533022
3	G5	Pier 2	3.G5.Pier 2	HL-93	OPERATING	1.09	Stiffened Web - Localized Flex. Buck.	1.25	21.96	1.5	3.9	1.35	50.9	125.119045	102.015	1.155330219
3	G5	Pier 2	3.G5.Pier 2	Type 3	AASHTO LEGAL	1.78	Stiffened Web - Localized Flex. Buck.	1.25	21.96	1.5	3.9	1.3	32.38	125.119045	75.394	1.155330218
3	G5	Pier 2	3.G5.Pier 2	Type 3S2	AASHTO LEGAL	1.92	Stiffened Web - Localized Flex. Buck.	1.25	21.96	1.5	3.9	1.3	29.95	125.119045	72.235	1.155330218
3	G5	Pier 2	3.G5.Pier 2	Type 3-3	AASHTO LEGAL	2.05	Stiffened Web - Localized Flex. Buck.	1.25	21.96	1.5	3.9	1.3	28.01	125.119045	69.713	1.155330218
3	G5	Pier 2	3.G5.Pier 2	SU4	AASHTO LEGAL	1.59	Stiffened Web - Localized Flex. Buck.	1.25	21.96	1.5	3.9	1.3	36.14	125.119045	80.282	1.155330218



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Beam End Identification				Vehicle		Rating		Loading						Capacity	Axial Magnification	
Span	Member	Support	S.M.S	Vehicle	Load Type	RF	Failure Mechanism	γ.DC	DC	γ.DW	DW	γ.LL	LL	C	P.u	δ.A
3	G5	Pier 2	3.G5.Pier 2	SU5	AASHTO LEGAL	1.46	Stiffened Web - Localized Flex. Buck.	1.25	21.96	1.5	3.9	1.3	39.48	125.119045	84.624	1.155330218
3	G5	Pier 2	3.G5.Pier 2	SU6	AASHTO LEGAL	1.42	Stiffened Web - Localized Flex. Buck.	1.25	21.96	1.5	3.9	1.3	40.44	125.119045	85.872	1.155330218
3	G5	Pier 2	3.G5.Pier 2	SU7	AASHTO LEGAL	1.41	Stiffened Web - Localized Flex. Buck.	1.25	21.96	1.5	3.9	1.3	40.86	125.119045	86.418	1.155330218
3	G5	Pier 2	3.G5.Pier 2	H-20	CT LEGAL	1.92	Stiffened Web - Localized Flex. Buck.	1.25	21.96	1.5	3.9	1.3	29.94	125.119045	72.222	1.155330218
3	G5	Pier 2	3.G5.Pier 2	HS-20	CT LEGAL	1.32	Stiffened Web - Localized Flex. Buck.	1.25	21.96	1.5	3.9	1.3	43.66	125.119045	90.058	1.155330218
3	G5	Pier 2	3.G5.Pier 2	CT-L73.0	CT LEGAL	1.23	Stiffened Web - Localized Flex. Buck.	1.25	21.96	1.5	3.9	1.3	46.54	125.119045	93.802	1.155330218
3	G5	Pier 2	3.G5.Pier 2	CT-L3S2	CT LEGAL	1.72	Stiffened Web - Localized Flex. Buck.	1.25	21.96	1.5	3.9	1.3	33.37	125.119045	76.681	1.155330218
3	G5	Pier 2	3.G5.Pier 2	CT-P76.5	CT PERMIT	1.26	Stiffened Web - Localized Flex. Buck.	1.25	21.96	1.5	3.9	1.16	51.01	125.119045	92.4716	1.155330218
3	G5	Pier 2	3.G5.Pier 2	CT-P120(6)	CT PERMIT	1.27	Stiffened Web - Localized Flex. Buck.	1.25	21.96	1.5	3.9	1.209778	48.71	125.119045	92.22828	1.155330218
3	G5	Pier 2	3.G5.Pier 2	CT-P140(7)a	CT PERMIT	1.2	Stiffened Web - Localized Flex. Buck.	1.25	21.96	1.5	3.9	1.16	53.53	125.119045	95.3948	1.155330219
3	G5	Pier 2	3.G5.Pier 2	CT-P140(7)b	CT PERMIT	1.21	Stiffened Web - Localized Flex. Buck.	1.25	21.96	1.5	3.9	1.16	53.25	125.119045	95.07	1.155330219
3	G5	Pier 2	3.G5.Pier 2	CT-P160(8)a	CT PERMIT	1.17	Stiffened Web - Localized Flex. Buck.	1.25	21.96	1.5	3.9	1.16	54.87	125.119045	96.9492	1.155330219
3	G5	Pier 2	3.G5.Pier 2	CT-P160(8)b	CT PERMIT	0.99	Stiffened Web - Localized Flex. Buck.	1.25	21.96	1.5	3.9	1.31	57.34	125.119045	108.4154	1.155330219
3	G5	Pier 2	3.G5.Pier 2	CT-P180(9)	CT PERMIT	1.01	Stiffened Web - Localized Flex. Buck.	1.25	21.96	1.5	3.9	1.31	56.48	125.119045	107.2888	1.155330219
3	G5	Pier 2	3.G5.Pier 2	CT-P200(10)	CT PERMIT	0.91	Stiffened Web - Localized Flex. Buck.	1.25	21.96	1.5	3.9	1.31	62.9	125.119045	115.699	1.155330219
3	G5	Pier 2	3.G5.Pier 2	CT-P380	CT PERMIT	1.64	Stiffened Web - Localized Flex. Buck.	1.25	21.96	1.5	3.9	1.1	41.56	125.119045	79.016	1.155330218
1	G2	S Abut	1.G2.S Abut	HL-93	INVENTORY	0.79	UnStiffened Web - Web Crippling	1.25	25.47	1.5	3.79	1.75	78.22	146.1532624		1
1	G2	S Abut	1.G2.S Abut	HL-93	OPERATING	1.02	UnStiffened Web - Web Crippling	1.25	25.47	1.5	3.79	1.35	78.22	146.1532624		1
1	G2	S Abut	1.G2.S Abut	Type 3	AASHTO LEGAL	1.69	UnStiffened Web - Web Crippling	1.25	25.47	1.5	3.79	1.3	49.22	146.1532624		1
1	G2	S Abut	1.G2.S Abut	Type 3S2	AASHTO LEGAL	1.79	UnStiffened Web - Web Crippling	1.25	25.47	1.5	3.79	1.3	46.65	146.1532624		1
1	G2	S Abut	1.G2.S Abut	Type 3-3	AASHTO LEGAL	1.91	UnStiffened Web - Web Crippling	1.25	25.47	1.5	3.79	1.3	43.68	146.1532624		1
1	G2	S Abut	1.G2.S Abut	SU4	AASHTO LEGAL	1.52	UnStiffened Web - Web Crippling	1.25	25.47	1.5	3.79	1.3	54.81	146.1532624		1
1	G2	S Abut	1.G2.S Abut	SU5	AASHTO LEGAL	1.39	UnStiffened Web - Web Crippling	1.25	25.47	1.5	3.79	1.3	60.09	146.1532624		1
1	G2	S Abut	1.G2.S Abut	SU6	AASHTO LEGAL	1.34	UnStiffened Web - Web Crippling	1.25	25.47	1.5	3.79	1.3	61.97	146.1532624		1
1	G2	S Abut	1.G2.S Abut	SU7	AASHTO LEGAL	1.32	UnStiffened Web - Web Crippling	1.25	25.47	1.5	3.79	1.3	63.14	146.1532624		1
1	G2	S Abut	1.G2.S Abut	H-20	CT LEGAL	1.85	UnStiffened Web - Web Crippling	1.25	25.47	1.5	3.79	1.3	45.07	146.1532624		1
1	G2	S Abut	1.G2.S Abut	HS-20	CT LEGAL	1.25	UnStiffened Web - Web Crippling	1.25	25.47	1.5	3.79	1.3	66.69	146.1532624		1
1	G2	S Abut	1.G2.S Abut	CT-L73.0	CT LEGAL	1.17	UnStiffened Web - Web Crippling	1.25	25.47	1.5	3.79	1.3	70.82	146.1532624		1
1	G2	S Abut	1.G2.S Abut	CT-L3S2	CT LEGAL	1.65	UnStiffened Web - Web Crippling	1.25	25.47	1.5	3.79	1.3	50.48	146.1532624		1
1	G2	S Abut	1.G2.S Abut	CT-P76.5	CT PERMIT	1.21	UnStiffened Web - Web Crippling	1.25	25.47	1.5	3.79	1.16	77.37	146.1532624		1
1	G2	S Abut	1.G2.S Abut	CT-P120(6)	CT PERMIT	1.17	UnStiffened Web - Web Crippling	1.25	25.47	1.5	3.79	1.209778	76.46	146.1532624		1
1	G2	S Abut	1.G2.S Abut	CT-P140(7)a	CT PERMIT	1.15	UnStiffened Web - Web Crippling	1.25	25.47	1.5	3.79	1.16	81.18	146.1532624		1
1	G2	S Abut	1.G2.S Abut	CT-P140(7)b	CT PERMIT	1.16	UnStiffened Web - Web Crippling	1.25	25.47	1.5	3.79	1.16	80.49	146.1532624		1
1	G2	S Abut	1.G2.S Abut	CT-P160(8)a	CT PERMIT	1.12	UnStiffened Web - Web Crippling	1.25	25.47	1.5	3.79	1.16	83.21	146.1532624		1
1	G2	S Abut	1.G2.S Abut	CT-P160(8)b	CT PERMIT	0.95	UnStiffened Web - Web Crippling	1.25	25.47	1.5	3.79	1.31	86.97	146.1532624		1
1	G2	S Abut	1.G2.S Abut	CT-P180(9)	CT PERMIT	0.96	UnStiffened Web - Web Crippling	1.25	25.47	1.5	3.79	1.31	85.63	146.1532624		1
1	G2	S Abut	1.G2.S Abut	CT-P200(10)	CT PERMIT	0.86	UnStiffened Web - Web Crippling	1.25	25.47	1.5	3.79	1.31	95.39	146.1532624		1
1	G2	S Abut	1.G2.S Abut	CT-P380	CT PERMIT	1.63	UnStiffened Web - Web Crippling	1.25	25.47	1.5	3.79	1.1	60.58	146.1532624		1
1	G2	Pier 1	1.G2.Pier 1	HL-93	INVENTORY	0.95	UnStiffened Web - Web Crippling	1.25	25.48	1.5	3.79	1.75	67.85	150.6187873		1
1	G2	Pier 1	1.G2.Pier 1	HL-93	OPERATING	1.23	UnStiffened Web - Web Crippling	1.25	25.48	1.5	3.79	1.35	67.85	150.6187873		1
1	G2	Pier 1	1.G2.Pier 1	Type 3	AASHTO LEGAL	2.03	UnStiffened Web - Web Crippling	1.25	25.48	1.5	3.79	1.3	42.69	150.6187873		1
1	G2	Pier 1	1.G2.Pier 1	Type 3S2	AASHTO LEGAL	2.14	UnStiffened Web - Web Crippling	1.25	25.48	1.5	3.79	1.3	40.46	150.6187873		1
1	G2	Pier 1	1.G2.Pier 1	Type 3-3	AASHTO LEGAL	2.29	UnStiffened Web - Web Crippling	1.25	25.48	1.5	3.79	1.3	37.89	150.6187873		1
1	G2	Pier 1	1.G2.Pier 1	SU4	AASHTO LEGAL	1.82	UnStiffened Web - Web Crippling	1.25	25.48	1.5	3.79	1.3	47.54	150.6187873		1
1	G2	Pier 1	1.G2.Pier 1	SU5	AASHTO LEGAL	1.66	UnStiffened Web - Web Crippling	1.25	25.48	1.5	3.79	1.3	52.12	150.6187873		1
1	G2	Pier 1	1.G2.Pier 1	SU6	AASHTO LEGAL	1.61	UnStiffened Web - Web Crippling	1.25	25.48	1.5	3.79	1.3	53.76	150.6187873		1
1	G2	Pier 1	1.G2.Pier 1	SU7	AASHTO LEGAL	1.58	UnStiffened Web - Web Crippling	1.25	25.48	1.5	3.79	1.3	54.77	150.6187873		1
1	G2	Pier 1	1.G2.Pier 1	H-20	CT LEGAL	2.22	UnStiffened Web - Web Crippling	1.25	25.48	1.5	3.79	1.3	39.1	150.6187873		1
1	G2	Pier 1	1.G2.Pier 1	HS-20	CT LEGAL	1.5	UnStiffened Web - Web Crippling	1.25	25.48	1.5	3.79	1.3	57.85	150.6187873		1
1	G2	Pier 1	1.G2.Pier 1	CT-L73.0	CT LEGAL	1.41	UnStiffened Web - Web Crippling	1.25	25.48	1.5	3.79	1.3	61.43	150.6187873		1
1	G2	Pier 1	1.G2.Pier 1	CT-L3S2	CT LEGAL	1.98	UnStiffened Web - Web Crippling	1.25	25.48	1.5	3.79	1.3	43.78	150.6187873		1
1	G2	Pier 1	1.G2.Pier 1	CT-P76.5	CT PERMIT	1.45	UnStiffened Web - Web Crippling	1.25	25.48	1.5	3.79	1.16	67.12	150.6187873		1
1	G2	Pier 1	1.G2.Pier 1	CT-P120(6)	CT PERMIT	1.4	UnStiffened Web - Web Crippling	1.25	25.48	1.5	3.79	1.209778	66.32	150.6187873		1



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Beam End Identification				Vehicle		Rating		Loading						Capacity	Axial Magnification	
Span	Member	Support	S.M.S	Vehicle	Load Type	RF	Failure Mechanism	γ.DC	DC	γ.DW	DW	γ.LL	LL	C	P.u	δ.A
1	G2	Pier 1	1.G2.Pier 1	CT-P140(7)a	CT PERMIT	1.38	UnStiffened Web - Web Crippling	1.25	25.48	1.5	3.79	1.16	70.42	150.6187873		1
1	G2	Pier 1	1.G2.Pier 1	CT-P140(7)b	CT PERMIT	1.39	UnStiffened Web - Web Crippling	1.25	25.48	1.5	3.79	1.16	69.82	150.6187873		1
1	G2	Pier 1	1.G2.Pier 1	CT-P160(8)a	CT PERMIT	1.35	UnStiffened Web - Web Crippling	1.25	25.48	1.5	3.79	1.16	72.18	150.6187873		1
1	G2	Pier 1	1.G2.Pier 1	CT-P160(8)b	CT PERMIT	1.14	UnStiffened Web - Web Crippling	1.25	25.48	1.5	3.79	1.31	75.45	150.6187873		1
1	G2	Pier 1	1.G2.Pier 1	CT-P180(9)	CT PERMIT	1.16	UnStiffened Web - Web Crippling	1.25	25.48	1.5	3.79	1.31	74.27	150.6187873		1
1	G2	Pier 1	1.G2.Pier 1	CT-P200(10)	CT PERMIT	1.04	UnStiffened Web - Web Crippling	1.25	25.48	1.5	3.79	1.31	82.74	150.6187873		1
1	G2	Pier 1	1.G2.Pier 1	CT-P380	CT PERMIT	1.95	UnStiffened Web - Web Crippling	1.25	25.48	1.5	3.79	1.1	52.55	150.6187873		1
1	G3	S Abut	1.G3.S Abut	HL-93	INVENTORY	0.92	UnStiffened Web - Web Crippling	1.25	25.31	1.5	2.84	1.75	67.85	146.1532624		1
1	G3	S Abut	1.G3.S Abut	HL-93	OPERATING	1.2	UnStiffened Web - Web Crippling	1.25	25.31	1.5	2.84	1.35	67.85	146.1532624		1
1	G3	S Abut	1.G3.S Abut	Type 3	AASHTO LEGAL	1.98	UnStiffened Web - Web Crippling	1.25	25.31	1.5	2.84	1.3	42.69	146.1532624		1
1	G3	S Abut	1.G3.S Abut	Type 3S2	AASHTO LEGAL	2.09	UnStiffened Web - Web Crippling	1.25	25.31	1.5	2.84	1.3	40.46	146.1532624		1
1	G3	S Abut	1.G3.S Abut	Type 3-3	AASHTO LEGAL	2.23	UnStiffened Web - Web Crippling	1.25	25.31	1.5	2.84	1.3	37.89	146.1532624		1
1	G3	S Abut	1.G3.S Abut	SU4	AASHTO LEGAL	1.78	UnStiffened Web - Web Crippling	1.25	25.31	1.5	2.84	1.3	47.54	146.1532624		1
1	G3	S Abut	1.G3.S Abut	SU5	AASHTO LEGAL	1.62	UnStiffened Web - Web Crippling	1.25	25.31	1.5	2.84	1.3	52.12	146.1532624		1
1	G3	S Abut	1.G3.S Abut	SU6	AASHTO LEGAL	1.57	UnStiffened Web - Web Crippling	1.25	25.31	1.5	2.84	1.3	53.76	146.1532624		1
1	G3	S Abut	1.G3.S Abut	SU7	AASHTO LEGAL	1.54	UnStiffened Web - Web Crippling	1.25	25.31	1.5	2.84	1.3	54.77	146.1532624		1
1	G3	S Abut	1.G3.S Abut	H-20	CT LEGAL	2.16	UnStiffened Web - Web Crippling	1.25	25.31	1.5	2.84	1.3	39.1	146.1532624		1
1	G3	S Abut	1.G3.S Abut	HS-20	CT LEGAL	1.46	UnStiffened Web - Web Crippling	1.25	25.31	1.5	2.84	1.3	57.85	146.1532624		1
1	G3	S Abut	1.G3.S Abut	CT-L73.0	CT LEGAL	1.38	UnStiffened Web - Web Crippling	1.25	25.31	1.5	2.84	1.3	61.43	146.1532624		1
1	G3	S Abut	1.G3.S Abut	CT-L3S2	CT LEGAL	1.93	UnStiffened Web - Web Crippling	1.25	25.31	1.5	2.84	1.3	43.78	146.1532624		1
1	G3	S Abut	1.G3.S Abut	CT-P76.5	CT PERMIT	1.41	UnStiffened Web - Web Crippling	1.25	25.31	1.5	2.84	1.16	67.12	146.1532624		1
1	G3	S Abut	1.G3.S Abut	CT-P120(6)	CT PERMIT	1.37	UnStiffened Web - Web Crippling	1.25	25.31	1.5	2.84	1.209778	66.32	146.1532624		1
1	G3	S Abut	1.G3.S Abut	CT-P140(7)a	CT PERMIT	1.34	UnStiffened Web - Web Crippling	1.25	25.31	1.5	2.84	1.16	70.42	146.1532624		1
1	G3	S Abut	1.G3.S Abut	CT-P140(7)b	CT PERMIT	1.36	UnStiffened Web - Web Crippling	1.25	25.31	1.5	2.84	1.16	69.82	146.1532624		1
1	G3	S Abut	1.G3.S Abut	CT-P160(8)a	CT PERMIT	1.31	UnStiffened Web - Web Crippling	1.25	25.31	1.5	2.84	1.16	72.18	146.1532624		1
1	G3	S Abut	1.G3.S Abut	CT-P160(8)b	CT PERMIT	1.11	UnStiffened Web - Web Crippling	1.25	25.31	1.5	2.84	1.31	75.45	146.1532624		1
1	G3	S Abut	1.G3.S Abut	CT-P180(9)	CT PERMIT	1.13	UnStiffened Web - Web Crippling	1.25	25.31	1.5	2.84	1.31	74.27	146.1532624		1
1	G3	S Abut	1.G3.S Abut	CT-P200(10)	CT PERMIT	1.01	UnStiffened Web - Web Crippling	1.25	25.31	1.5	2.84	1.31	82.74	146.1532624		1
1	G3	S Abut	1.G3.S Abut	CT-P380	CT PERMIT	1.9	UnStiffened Web - Web Crippling	1.25	25.31	1.5	2.84	1.1	52.55	146.1532624		1
1	G3	Pier 1	1.G3.Pier 1	HL-93	INVENTORY	0.83	UnStiffened Web - Web Crippling	1.25	25.31	1.5	2.84	1.75	78.22	150.6187873		1
1	G3	Pier 1	1.G3.Pier 1	HL-93	OPERATING	1.08	UnStiffened Web - Web Crippling	1.25	25.31	1.5	2.84	1.35	78.22	150.6187873		1
1	G3	Pier 1	1.G3.Pier 1	Type 3	AASHTO LEGAL	1.79	UnStiffened Web - Web Crippling	1.25	25.31	1.5	2.84	1.3	49.22	150.6187873		1
1	G3	Pier 1	1.G3.Pier 1	Type 3S2	AASHTO LEGAL	1.89	UnStiffened Web - Web Crippling	1.25	25.31	1.5	2.84	1.3	46.65	150.6187873		1
1	G3	Pier 1	1.G3.Pier 1	Type 3-3	AASHTO LEGAL	2.02	UnStiffened Web - Web Crippling	1.25	25.31	1.5	2.84	1.3	43.68	150.6187873		1
1	G3	Pier 1	1.G3.Pier 1	SU4	AASHTO LEGAL	1.61	UnStiffened Web - Web Crippling	1.25	25.31	1.5	2.84	1.3	54.81	150.6187873		1
1	G3	Pier 1	1.G3.Pier 1	SU5	AASHTO LEGAL	1.46	UnStiffened Web - Web Crippling	1.25	25.31	1.5	2.84	1.3	60.09	150.6187873		1
1	G3	Pier 1	1.G3.Pier 1	SU6	AASHTO LEGAL	1.42	UnStiffened Web - Web Crippling	1.25	25.31	1.5	2.84	1.3	61.97	150.6187873		1
1	G3	Pier 1	1.G3.Pier 1	SU7	AASHTO LEGAL	1.39	UnStiffened Web - Web Crippling	1.25	25.31	1.5	2.84	1.3	63.14	150.6187873		1
1	G3	Pier 1	1.G3.Pier 1	H-20	CT LEGAL	1.95	UnStiffened Web - Web Crippling	1.25	25.31	1.5	2.84	1.3	45.07	150.6187873		1
1	G3	Pier 1	1.G3.Pier 1	HS-20	CT LEGAL	1.32	UnStiffened Web - Web Crippling	1.25	25.31	1.5	2.84	1.3	66.69	150.6187873		1
1	G3	Pier 1	1.G3.Pier 1	CT-L73.0	CT LEGAL	1.24	UnStiffened Web - Web Crippling	1.25	25.31	1.5	2.84	1.3	70.82	150.6187873		1
1	G3	Pier 1	1.G3.Pier 1	CT-L3S2	CT LEGAL	1.74	UnStiffened Web - Web Crippling	1.25	25.31	1.5	2.84	1.3	50.48	150.6187873		1
1	G3	Pier 1	1.G3.Pier 1	CT-P76.5	CT PERMIT	1.27	UnStiffened Web - Web Crippling	1.25	25.31	1.5	2.84	1.16	77.37	150.6187873		1
1	G3	Pier 1	1.G3.Pier 1	CT-P120(6)	CT PERMIT	1.24	UnStiffened Web - Web Crippling	1.25	25.31	1.5	2.84	1.209778	76.46	150.6187873		1
1	G3	Pier 1	1.G3.Pier 1	CT-P140(7)a	CT PERMIT	1.21	UnStiffened Web - Web Crippling	1.25	25.31	1.5	2.84	1.16	81.18	150.6187873		1
1	G3	Pier 1	1.G3.Pier 1	CT-P140(7)b	CT PERMIT	1.22	UnStiffened Web - Web Crippling	1.25	25.31	1.5	2.84	1.16	80.49	150.6187873		1
1	G3	Pier 1	1.G3.Pier 1	CT-P160(8)a	CT PERMIT	1.18	UnStiffened Web - Web Crippling	1.25	25.31	1.5	2.84	1.16	83.21	150.6187873		1
1	G3	Pier 1	1.G3.Pier 1	CT-P160(8)b	CT PERMIT	1	UnStiffened Web - Web Crippling	1.25	25.31	1.5	2.84	1.31	86.97	150.6187873		1
1	G3	Pier 1	1.G3.Pier 1	CT-P180(9)	CT PERMIT	1.02	UnStiffened Web - Web Crippling	1.25	25.31	1.5	2.84	1.31	85.63	150.6187873		1
1	G3	Pier 1	1.G3.Pier 1	CT-P200(10)	CT PERMIT	0.91	UnStiffened Web - Web Crippling	1.25	25.31	1.5	2.84	1.31	95.39	150.6187873		1
1	G3	Pier 1	1.G3.Pier 1	CT-P380	CT PERMIT	1.72	UnStiffened Web - Web Crippling	1.25	25.31	1.5	2.84	1.1	60.58	150.6187873		1
1	G4	S Abut	1.G4.S Abut	HL-93	INVENTORY	0.91	UnStiffened Web - Web Crippling	1.25	25.49	1.5	3.67	1.75	67.85	146.1532624		1
1	G4	S Abut	1.G4.S Abut	HL-93	OPERATING	1.18	UnStiffened Web - Web Crippling	1.25	25.49	1.5	3.67	1.35	67.85	146.1532624		1



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Beam End Identification				Vehicle		Rating		Loading						Capacity	Axial Magnification	
Span	Member	Support	S.M.S	Vehicle	Load Type	RF	Failure Mechanism	γ.DC	DC	γ.DW	DW	γ.LL	LL	C	P.u	δ.A
1	G4	S Abut	1.G4.S Abut	Type 3	AASHTO LEGAL	1.96	UnStiffened Web - Web Crippling	1.25	25.49	1.5	3.67	1.3	42.69	146.1532624		1
1	G4	S Abut	1.G4.S Abut	Type 3S2	AASHTO LEGAL	2.06	UnStiffened Web - Web Crippling	1.25	25.49	1.5	3.67	1.3	40.46	146.1532624		1
1	G4	S Abut	1.G4.S Abut	Type 3-3	AASHTO LEGAL	2.2	UnStiffened Web - Web Crippling	1.25	25.49	1.5	3.67	1.3	37.89	146.1532624		1
1	G4	S Abut	1.G4.S Abut	SU4	AASHTO LEGAL	1.76	UnStiffened Web - Web Crippling	1.25	25.49	1.5	3.67	1.3	47.54	146.1532624		1
1	G4	S Abut	1.G4.S Abut	SU5	AASHTO LEGAL	1.6	UnStiffened Web - Web Crippling	1.25	25.49	1.5	3.67	1.3	52.12	146.1532624		1
1	G4	S Abut	1.G4.S Abut	SU6	AASHTO LEGAL	1.55	UnStiffened Web - Web Crippling	1.25	25.49	1.5	3.67	1.3	53.76	146.1532624		1
1	G4	S Abut	1.G4.S Abut	SU7	AASHTO LEGAL	1.52	UnStiffened Web - Web Crippling	1.25	25.49	1.5	3.67	1.3	54.77	146.1532624		1
1	G4	S Abut	1.G4.S Abut	H-20	CT LEGAL	2.14	UnStiffened Web - Web Crippling	1.25	25.49	1.5	3.67	1.3	39.1	146.1532624		1
1	G4	S Abut	1.G4.S Abut	HS-20	CT LEGAL	1.44	UnStiffened Web - Web Crippling	1.25	25.49	1.5	3.67	1.3	57.85	146.1532624		1
1	G4	S Abut	1.G4.S Abut	CT-L73.0	CT LEGAL	1.36	UnStiffened Web - Web Crippling	1.25	25.49	1.5	3.67	1.3	61.43	146.1532624		1
1	G4	S Abut	1.G4.S Abut	CT-L3S2	CT LEGAL	1.91	UnStiffened Web - Web Crippling	1.25	25.49	1.5	3.67	1.3	43.78	146.1532624		1
1	G4	S Abut	1.G4.S Abut	CT-P76.5	CT PERMIT	1.39	UnStiffened Web - Web Crippling	1.25	25.49	1.5	3.67	1.16	67.12	146.1532624		1
1	G4	S Abut	1.G4.S Abut	CT-P120(6)	CT PERMIT	1.35	UnStiffened Web - Web Crippling	1.25	25.49	1.5	3.67	1.209778	66.32	146.1532624		1
1	G4	S Abut	1.G4.S Abut	CT-P140(7)a	CT PERMIT	1.33	UnStiffened Web - Web Crippling	1.25	25.49	1.5	3.67	1.16	70.42	146.1532624		1
1	G4	S Abut	1.G4.S Abut	CT-P140(7)b	CT PERMIT	1.34	UnStiffened Web - Web Crippling	1.25	25.49	1.5	3.67	1.16	69.82	146.1532624		1
1	G4	S Abut	1.G4.S Abut	CT-P160(8)a	CT PERMIT	1.29	UnStiffened Web - Web Crippling	1.25	25.49	1.5	3.67	1.16	72.18	146.1532624		1
1	G4	S Abut	1.G4.S Abut	CT-P160(8)b	CT PERMIT	1.1	UnStiffened Web - Web Crippling	1.25	25.49	1.5	3.67	1.31	75.45	146.1532624		1
1	G4	S Abut	1.G4.S Abut	CT-P180(9)	CT PERMIT	1.11	UnStiffened Web - Web Crippling	1.25	25.49	1.5	3.67	1.31	74.27	146.1532624		1
1	G4	S Abut	1.G4.S Abut	CT-P200(10)	CT PERMIT	1	UnStiffened Web - Web Crippling	1.25	25.49	1.5	3.67	1.31	82.74	146.1532624		1
1	G4	S Abut	1.G4.S Abut	CT-P380	CT PERMIT	1.88	UnStiffened Web - Web Crippling	1.25	25.49	1.5	3.67	1.1	52.55	146.1532624		1
1	G4	Pier 1	1.G4.Pier 1	HL-93	INVENTORY	0.82	UnStiffened Web - Web Crippling	1.25	25.49	1.5	3.67	1.75	78.22	150.6187873		1
1	G4	Pier 1	1.G4.Pier 1	HL-93	OPERATING	1.07	UnStiffened Web - Web Crippling	1.25	25.49	1.5	3.67	1.35	78.22	150.6187873		1
1	G4	Pier 1	1.G4.Pier 1	Type 3	AASHTO LEGAL	1.76	UnStiffened Web - Web Crippling	1.25	25.49	1.5	3.67	1.3	49.22	150.6187873		1
1	G4	Pier 1	1.G4.Pier 1	Type 3S2	AASHTO LEGAL	1.86	UnStiffened Web - Web Crippling	1.25	25.49	1.5	3.67	1.3	46.65	150.6187873		1
1	G4	Pier 1	1.G4.Pier 1	Type 3-3	AASHTO LEGAL	1.99	UnStiffened Web - Web Crippling	1.25	25.49	1.5	3.67	1.3	43.68	150.6187873		1
1	G4	Pier 1	1.G4.Pier 1	SU4	AASHTO LEGAL	1.58	UnStiffened Web - Web Crippling	1.25	25.49	1.5	3.67	1.3	54.81	150.6187873		1
1	G4	Pier 1	1.G4.Pier 1	SU5	AASHTO LEGAL	1.44	UnStiffened Web - Web Crippling	1.25	25.49	1.5	3.67	1.3	60.09	150.6187873		1
1	G4	Pier 1	1.G4.Pier 1	SU6	AASHTO LEGAL	1.4	UnStiffened Web - Web Crippling	1.25	25.49	1.5	3.67	1.3	61.97	150.6187873		1
1	G4	Pier 1	1.G4.Pier 1	SU7	AASHTO LEGAL	1.37	UnStiffened Web - Web Crippling	1.25	25.49	1.5	3.67	1.3	63.14	150.6187873		1
1	G4	Pier 1	1.G4.Pier 1	H-20	CT LEGAL	1.93	UnStiffened Web - Web Crippling	1.25	25.49	1.5	3.67	1.3	45.07	150.6187873		1
1	G4	Pier 1	1.G4.Pier 1	HS-20	CT LEGAL	1.3	UnStiffened Web - Web Crippling	1.25	25.49	1.5	3.67	1.3	66.69	150.6187873		1
1	G4	Pier 1	1.G4.Pier 1	CT-L73.0	CT LEGAL	1.23	UnStiffened Web - Web Crippling	1.25	25.49	1.5	3.67	1.3	70.82	150.6187873		1
1	G4	Pier 1	1.G4.Pier 1	CT-L3S2	CT LEGAL	1.72	UnStiffened Web - Web Crippling	1.25	25.49	1.5	3.67	1.3	50.48	150.6187873		1
1	G4	Pier 1	1.G4.Pier 1	CT-P76.5	CT PERMIT	1.26	UnStiffened Web - Web Crippling	1.25	25.49	1.5	3.67	1.16	77.37	150.6187873		1
1	G4	Pier 1	1.G4.Pier 1	CT-P120(6)	CT PERMIT	1.22	UnStiffened Web - Web Crippling	1.25	25.49	1.5	3.67	1.209778	76.46	150.6187873		1
1	G4	Pier 1	1.G4.Pier 1	CT-P140(7)a	CT PERMIT	1.2	UnStiffened Web - Web Crippling	1.25	25.49	1.5	3.67	1.16	81.18	150.6187873		1
1	G4	Pier 1	1.G4.Pier 1	CT-P140(7)b	CT PERMIT	1.21	UnStiffened Web - Web Crippling	1.25	25.49	1.5	3.67	1.16	80.49	150.6187873		1
1	G4	Pier 1	1.G4.Pier 1	CT-P160(8)a	CT PERMIT	1.17	UnStiffened Web - Web Crippling	1.25	25.49	1.5	3.67	1.16	83.21	150.6187873		1
1	G4	Pier 1	1.G4.Pier 1	CT-P160(8)b	CT PERMIT	0.99	UnStiffened Web - Web Crippling	1.25	25.49	1.5	3.67	1.31	86.97	150.6187873		1
1	G4	Pier 1	1.G4.Pier 1	CT-P180(9)	CT PERMIT	1	UnStiffened Web - Web Crippling	1.25	25.49	1.5	3.67	1.31	85.63	150.6187873		1
1	G4	Pier 1	1.G4.Pier 1	CT-P200(10)	CT PERMIT	0.9	UnStiffened Web - Web Crippling	1.25	25.49	1.5	3.67	1.31	95.39	150.6187873		1
1	G4	Pier 1	1.G4.Pier 1	CT-P380	CT PERMIT	1.69	UnStiffened Web - Web Crippling	1.25	25.49	1.5	3.67	1.1	60.58	150.6187873		1
3	G2	Pier 2	3.G2.Pier 2	HL-93	INVENTORY	0.79	UnStiffened Web - Web Crippling	1.25	24.03	1.5	4.01	1.75	76.06	141.2208466		1
3	G2	Pier 2	3.G2.Pier 2	HL-93	OPERATING	1.02	UnStiffened Web - Web Crippling	1.25	24.03	1.5	4.01	1.35	76.06	141.2208466		1
3	G2	Pier 2	3.G2.Pier 2	Type 3	AASHTO LEGAL	1.67	UnStiffened Web - Web Crippling	1.25	24.03	1.5	4.01	1.3	48.39	141.2208466		1
3	G2	Pier 2	3.G2.Pier 2	Type 3S2	AASHTO LEGAL	1.8	UnStiffened Web - Web Crippling	1.25	24.03	1.5	4.01	1.3	44.75	141.2208466		1
3	G2	Pier 2	3.G2.Pier 2	Type 3-3	AASHTO LEGAL	1.93	UnStiffened Web - Web Crippling	1.25	24.03	1.5	4.01	1.3	41.85	141.2208466		1
3	G2	Pier 2	3.G2.Pier 2	SU4	AASHTO LEGAL	1.49	UnStiffened Web - Web Crippling	1.25	24.03	1.5	4.01	1.3	54.01	141.2208466		1
3	G2	Pier 2	3.G2.Pier 2	SU5	AASHTO LEGAL	1.37	UnStiffened Web - Web Crippling	1.25	24.03	1.5	4.01	1.3	59	141.2208466		1
3	G2	Pier 2	3.G2.Pier 2	SU6	AASHTO LEGAL	1.33	UnStiffened Web - Web Crippling	1.25	24.03	1.5	4.01	1.3	60.43	141.2208466		1
3	G2	Pier 2	3.G2.Pier 2	SU7	AASHTO LEGAL	1.32	UnStiffened Web - Web Crippling	1.25	24.03	1.5	4.01	1.3	61.06	141.2208466		1
3	G2	Pier 2	3.G2.Pier 2	H-20	CT LEGAL	1.8	UnStiffened Web - Web Crippling	1.25	24.03	1.5	4.01	1.3	44.75	141.2208466		1
3	G2	Pier 2	3.G2.Pier 2	HS-20	CT LEGAL	1.24	UnStiffened Web - Web Crippling	1.25	24.03	1.5	4.01	1.3	65.24	141.2208466		1



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Beam End Identification				Vehicle		Rating		Loading						Capacity	Axial Magnification	
Span	Member	Support	S.M.S	Vehicle	Load Type	RF	Failure Mechanism	γ.DC	DC	γ.DW	DW	γ.LL	LL	C	P.u	δ.A
3	G2	Pier 2	3.G2.Pier 2	CT-L73.0	CT LEGAL	1.16	UnStiffened Web - Web Crippling	1.25	24.03	1.5	4.01	1.3	69.54	141.2208466		1
3	G2	Pier 2	3.G2.Pier 2	CT-L3S2	CT LEGAL	1.62	UnStiffened Web - Web Crippling	1.25	24.03	1.5	4.01	1.3	49.87	141.2208466		1
3	G2	Pier 2	3.G2.Pier 2	CT-P76.5	CT PERMIT	1.18	UnStiffened Web - Web Crippling	1.25	24.03	1.5	4.01	1.16	76.22	141.2208466		1
3	G2	Pier 2	3.G2.Pier 2	CT-P120(6)	CT PERMIT	1.19	UnStiffened Web - Web Crippling	1.25	24.03	1.5	4.01	1.209778	72.79	141.2208466		1
3	G2	Pier 2	3.G2.Pier 2	CT-P140(7)a	CT PERMIT	1.13	UnStiffened Web - Web Crippling	1.25	24.03	1.5	4.01	1.16	79.99	141.2208466		1
3	G2	Pier 2	3.G2.Pier 2	CT-P140(7)b	CT PERMIT	1.13	UnStiffened Web - Web Crippling	1.25	24.03	1.5	4.01	1.16	79.57	141.2208466		1
3	G2	Pier 2	3.G2.Pier 2	CT-P160(8)a	CT PERMIT	1.1	UnStiffened Web - Web Crippling	1.25	24.03	1.5	4.01	1.16	81.99	141.2208466		1
3	G2	Pier 2	3.G2.Pier 2	CT-P160(8)b	CT PERMIT	0.93	UnStiffened Web - Web Crippling	1.25	24.03	1.5	4.01	1.31	85.68	141.2208466		1
3	G2	Pier 2	3.G2.Pier 2	CT-P180(9)	CT PERMIT	0.95	UnStiffened Web - Web Crippling	1.25	24.03	1.5	4.01	1.31	84.4	141.2208466		1
3	G2	Pier 2	3.G2.Pier 2	CT-P200(10)	CT PERMIT	0.85	UnStiffened Web - Web Crippling	1.25	24.03	1.5	4.01	1.31	93.99	141.2208466		1
3	G2	Pier 2	3.G2.Pier 2	CT-P380	CT PERMIT	1.65	UnStiffened Web - Web Crippling	1.25	24.03	1.5	4.01	1.1	57.62	141.2208466		1
3	G2	N Abut	3.G2.N Abut	HL-93	INVENTORY	0.91	UnStiffened Web - Web Crippling	1.25	24.03	1.5	4.01	1.75	66.14	142.0889569		1
3	G2	N Abut	3.G2.N Abut	HL-93	OPERATING	1.18	UnStiffened Web - Web Crippling	1.25	24.03	1.5	4.01	1.35	66.14	142.0889569		1
3	G2	N Abut	3.G2.N Abut	Type 3	AASHTO LEGAL	1.93	UnStiffened Web - Web Crippling	1.25	24.03	1.5	4.01	1.3	42.07	142.0889569		1
3	G2	N Abut	3.G2.N Abut	Type 3S2	AASHTO LEGAL	2.09	UnStiffened Web - Web Crippling	1.25	24.03	1.5	4.01	1.3	38.91	142.0889569		1
3	G2	N Abut	3.G2.N Abut	Type 3-3	AASHTO LEGAL	2.24	UnStiffened Web - Web Crippling	1.25	24.03	1.5	4.01	1.3	36.39	142.0889569		1
3	G2	N Abut	3.G2.N Abut	SU4	AASHTO LEGAL	1.73	UnStiffened Web - Web Crippling	1.25	24.03	1.5	4.01	1.3	46.96	142.0889569		1
3	G2	N Abut	3.G2.N Abut	SU5	AASHTO LEGAL	1.58	UnStiffened Web - Web Crippling	1.25	24.03	1.5	4.01	1.3	51.3	142.0889569		1
3	G2	N Abut	3.G2.N Abut	SU6	AASHTO LEGAL	1.55	UnStiffened Web - Web Crippling	1.25	24.03	1.5	4.01	1.3	52.54	142.0889569		1
3	G2	N Abut	3.G2.N Abut	SU7	AASHTO LEGAL	1.53	UnStiffened Web - Web Crippling	1.25	24.03	1.5	4.01	1.3	53.09	142.0889569		1
3	G2	N Abut	3.G2.N Abut	H-20	CT LEGAL	2.09	UnStiffened Web - Web Crippling	1.25	24.03	1.5	4.01	1.3	38.91	142.0889569		1
3	G2	N Abut	3.G2.N Abut	HS-20	CT LEGAL	1.43	UnStiffened Web - Web Crippling	1.25	24.03	1.5	4.01	1.3	56.73	142.0889569		1
3	G2	N Abut	3.G2.N Abut	CT-L73.0	CT LEGAL	1.34	UnStiffened Web - Web Crippling	1.25	24.03	1.5	4.01	1.3	60.47	142.0889569		1
3	G2	N Abut	3.G2.N Abut	CT-L3S2	CT LEGAL	1.88	UnStiffened Web - Web Crippling	1.25	24.03	1.5	4.01	1.3	43.36	142.0889569		1
3	G2	N Abut	3.G2.N Abut	CT-P76.5	CT PERMIT	1.37	UnStiffened Web - Web Crippling	1.25	24.03	1.5	4.01	1.16	66.28	142.0889569		1
3	G2	N Abut	3.G2.N Abut	CT-P120(6)	CT PERMIT	1.38	UnStiffened Web - Web Crippling	1.25	24.03	1.5	4.01	1.209778	63.29	142.0889569		1
3	G2	N Abut	3.G2.N Abut	CT-P140(7)a	CT PERMIT	1.31	UnStiffened Web - Web Crippling	1.25	24.03	1.5	4.01	1.16	69.56	142.0889569		1
3	G2	N Abut	3.G2.N Abut	CT-P140(7)b	CT PERMIT	1.32	UnStiffened Web - Web Crippling	1.25	24.03	1.5	4.01	1.16	69.18	142.0889569		1
3	G2	N Abut	3.G2.N Abut	CT-P160(8)a	CT PERMIT	1.28	UnStiffened Web - Web Crippling	1.25	24.03	1.5	4.01	1.16	71.3	142.0889569		1
3	G2	N Abut	3.G2.N Abut	CT-P160(8)b	CT PERMIT	1.08	UnStiffened Web - Web Crippling	1.25	24.03	1.5	4.01	1.31	74.5	142.0889569		1
3	G2	N Abut	3.G2.N Abut	CT-P180(9)	CT PERMIT	1.1	UnStiffened Web - Web Crippling	1.25	24.03	1.5	4.01	1.31	73.39	142.0889569		1
3	G2	N Abut	3.G2.N Abut	CT-P200(10)	CT PERMIT	0.99	UnStiffened Web - Web Crippling	1.25	24.03	1.5	4.01	1.31	81.73	142.0889569		1
3	G2	N Abut	3.G2.N Abut	CT-P380	CT PERMIT	1.92	UnStiffened Web - Web Crippling	1.25	24.03	1.5	4.01	1.1	50.1	142.0889569		1
3	G3	Pier 2	3.G3.Pier 2	HL-93	INVENTORY	0.92	UnStiffened Web - Web Crippling	1.25	23.86	1.5	3.12	1.75	66.14	141.2208466		1
3	G3	Pier 2	3.G3.Pier 2	HL-93	OPERATING	1.19	UnStiffened Web - Web Crippling	1.25	23.86	1.5	3.12	1.35	66.14	141.2208466		1
3	G3	Pier 2	3.G3.Pier 2	Type 3	AASHTO LEGAL	1.95	UnStiffened Web - Web Crippling	1.25	23.86	1.5	3.12	1.3	42.07	141.2208466		1
3	G3	Pier 2	3.G3.Pier 2	Type 3S2	AASHTO LEGAL	2.1	UnStiffened Web - Web Crippling	1.25	23.86	1.5	3.12	1.3	38.91	141.2208466		1
3	G3	Pier 2	3.G3.Pier 2	Type 3-3	AASHTO LEGAL	2.25	UnStiffened Web - Web Crippling	1.25	23.86	1.5	3.12	1.3	36.39	141.2208466		1
3	G3	Pier 2	3.G3.Pier 2	SU4	AASHTO LEGAL	1.74	UnStiffened Web - Web Crippling	1.25	23.86	1.5	3.12	1.3	46.96	141.2208466		1
3	G3	Pier 2	3.G3.Pier 2	SU5	AASHTO LEGAL	1.6	UnStiffened Web - Web Crippling	1.25	23.86	1.5	3.12	1.3	51.3	141.2208466		1
3	G3	Pier 2	3.G3.Pier 2	SU6	AASHTO LEGAL	1.56	UnStiffened Web - Web Crippling	1.25	23.86	1.5	3.12	1.3	52.54	141.2208466		1
3	G3	Pier 2	3.G3.Pier 2	SU7	AASHTO LEGAL	1.54	UnStiffened Web - Web Crippling	1.25	23.86	1.5	3.12	1.3	53.09	141.2208466		1
3	G3	Pier 2	3.G3.Pier 2	H-20	CT LEGAL	2.1	UnStiffened Web - Web Crippling	1.25	23.86	1.5	3.12	1.3	38.91	141.2208466		1
3	G3	Pier 2	3.G3.Pier 2	HS-20	CT LEGAL	1.44	UnStiffened Web - Web Crippling	1.25	23.86	1.5	3.12	1.3	56.73	141.2208466		1
3	G3	Pier 2	3.G3.Pier 2	CT-L73.0	CT LEGAL	1.35	UnStiffened Web - Web Crippling	1.25	23.86	1.5	3.12	1.3	60.47	141.2208466		1
3	G3	Pier 2	3.G3.Pier 2	CT-L3S2	CT LEGAL	1.89	UnStiffened Web - Web Crippling	1.25	23.86	1.5	3.12	1.3	43.36	141.2208466		1
3	G3	Pier 2	3.G3.Pier 2	CT-P76.5	CT PERMIT	1.38	UnStiffened Web - Web Crippling	1.25	23.86	1.5	3.12	1.16	66.28	141.2208466		1
3	G3	Pier 2	3.G3.Pier 2	CT-P120(6)	CT PERMIT	1.39	UnStiffened Web - Web Crippling	1.25	23.86	1.5	3.12	1.209778	63.29	141.2208466		1
3	G3	Pier 2	3.G3.Pier 2	CT-P140(7)a	CT PERMIT	1.32	UnStiffened Web - Web Crippling	1.25	23.86	1.5	3.12	1.16	69.56	141.2208466		1
3	G3	Pier 2	3.G3.Pier 2	CT-P140(7)b	CT PERMIT	1.32	UnStiffened Web - Web Crippling	1.25	23.86	1.5	3.12	1.16	69.18	141.2208466		1
3	G3	Pier 2	3.G3.Pier 2	CT-P160(8)a	CT PERMIT	1.29	UnStiffened Web - Web Crippling	1.25	23.86	1.5	3.12	1.16	71.3	141.2208466		1
3	G3	Pier 2	3.G3.Pier 2	CT-P160(8)b	CT PERMIT	1.09	UnStiffened Web - Web Crippling	1.25	23.86	1.5	3.12	1.31	74.5	141.2208466		1
3	G3	Pier 2	3.G3.Pier 2	CT-P180(9)	CT PERMIT	1.1	UnStiffened Web - Web Crippling	1.25	23.86	1.5	3.12	1.31	73.39	141.2208466		1



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Beam End Identification				Vehicle		RF	Rating	Loading						Capacity	Axial Magnification	
Span	Member	Support	S.M.S	Vehicle	Load Type		Failure Mechanism	γ.DC	DC	γ.DW	DW	γ.LL	LL	C	P.u	δ.A
3	G3	Pier 2	3.G3.Pier 2	CT-P200(10)	CT PERMIT	0.99	UnStiffened Web - Web Crippling	1.25	23.86	1.5	3.12	1.31	81.73	141.2208466		1
3	G3	Pier 2	3.G3.Pier 2	CT-P380	CT PERMIT	1.93	UnStiffened Web - Web Crippling	1.25	23.86	1.5	3.12	1.1	50.1	141.2208466		1
3	G3	N Abut	3.G3.N Abut	HL-93	INVENTORY	0.8	UnStiffened Web - Web Crippling	1.25	23.86	1.5	3.12	1.75	76.06	142.0889569		1
3	G3	N Abut	3.G3.N Abut	HL-93	OPERATING	1.04	UnStiffened Web - Web Crippling	1.25	23.86	1.5	3.12	1.35	76.06	142.0889569		1
3	G3	N Abut	3.G3.N Abut	Type 3	AASHTO LEGAL	1.71	UnStiffened Web - Web Crippling	1.25	23.86	1.5	3.12	1.3	48.39	142.0889569		1
3	G3	N Abut	3.G3.N Abut	Type 3S2	AASHTO LEGAL	1.84	UnStiffened Web - Web Crippling	1.25	23.86	1.5	3.12	1.3	44.75	142.0889569		1
3	G3	N Abut	3.G3.N Abut	Type 3-3	AASHTO LEGAL	1.97	UnStiffened Web - Web Crippling	1.25	23.86	1.5	3.12	1.3	41.85	142.0889569		1
3	G3	N Abut	3.G3.N Abut	SU4	AASHTO LEGAL	1.53	UnStiffened Web - Web Crippling	1.25	23.86	1.5	3.12	1.3	54.01	142.0889569		1
3	G3	N Abut	3.G3.N Abut	SU5	AASHTO LEGAL	1.4	UnStiffened Web - Web Crippling	1.25	23.86	1.5	3.12	1.3	59	142.0889569		1
3	G3	N Abut	3.G3.N Abut	SU6	AASHTO LEGAL	1.36	UnStiffened Web - Web Crippling	1.25	23.86	1.5	3.12	1.3	60.43	142.0889569		1
3	G3	N Abut	3.G3.N Abut	SU7	AASHTO LEGAL	1.35	UnStiffened Web - Web Crippling	1.25	23.86	1.5	3.12	1.3	61.06	142.0889569		1
3	G3	N Abut	3.G3.N Abut	H-20	CT LEGAL	1.84	UnStiffened Web - Web Crippling	1.25	23.86	1.5	3.12	1.3	44.75	142.0889569		1
3	G3	N Abut	3.G3.N Abut	HS-20	CT LEGAL	1.26	UnStiffened Web - Web Crippling	1.25	23.86	1.5	3.12	1.3	65.24	142.0889569		1
3	G3	N Abut	3.G3.N Abut	CT-L73.0	CT LEGAL	1.19	UnStiffened Web - Web Crippling	1.25	23.86	1.5	3.12	1.3	69.54	142.0889569		1
3	G3	N Abut	3.G3.N Abut	CT-L3S2	CT LEGAL	1.65	UnStiffened Web - Web Crippling	1.25	23.86	1.5	3.12	1.3	49.87	142.0889569		1
3	G3	N Abut	3.G3.N Abut	CT-P76.5	CT PERMIT	1.21	UnStiffened Web - Web Crippling	1.25	23.86	1.5	3.12	1.16	76.22	142.0889569		1
3	G3	N Abut	3.G3.N Abut	CT-P120(6)	CT PERMIT	1.22	UnStiffened Web - Web Crippling	1.25	23.86	1.5	3.12	1.209778	72.79	142.0889569		1
3	G3	N Abut	3.G3.N Abut	CT-P140(7)a	CT PERMIT	1.15	UnStiffened Web - Web Crippling	1.25	23.86	1.5	3.12	1.16	79.99	142.0889569		1
3	G3	N Abut	3.G3.N Abut	CT-P140(7)b	CT PERMIT	1.16	UnStiffened Web - Web Crippling	1.25	23.86	1.5	3.12	1.16	79.57	142.0889569		1
3	G3	N Abut	3.G3.N Abut	CT-P160(8)a	CT PERMIT	1.13	UnStiffened Web - Web Crippling	1.25	23.86	1.5	3.12	1.16	81.99	142.0889569		1
3	G3	N Abut	3.G3.N Abut	CT-P160(8)b	CT PERMIT	0.95	UnStiffened Web - Web Crippling	1.25	23.86	1.5	3.12	1.31	85.68	142.0889569		1
3	G3	N Abut	3.G3.N Abut	CT-P180(9)	CT PERMIT	0.97	UnStiffened Web - Web Crippling	1.25	23.86	1.5	3.12	1.31	84.4	142.0889569		1
3	G3	N Abut	3.G3.N Abut	CT-P200(10)	CT PERMIT	0.87	UnStiffened Web - Web Crippling	1.25	23.86	1.5	3.12	1.31	93.99	142.0889569		1
3	G3	N Abut	3.G3.N Abut	CT-P380	CT PERMIT	1.69	UnStiffened Web - Web Crippling	1.25	23.86	1.5	3.12	1.1	57.62	142.0889569		1
3	G4	Pier 2	3.G4.Pier 2	HL-93	INVENTORY	0.9	UnStiffened Web - Web Crippling	1.25	24.04	1.5	3.9	1.75	66.14	141.2208466		1
3	G4	Pier 2	3.G4.Pier 2	HL-93	OPERATING	1.17	UnStiffened Web - Web Crippling	1.25	24.04	1.5	3.9	1.35	66.14	141.2208466		1
3	G4	Pier 2	3.G4.Pier 2	Type 3	AASHTO LEGAL	1.92	UnStiffened Web - Web Crippling	1.25	24.04	1.5	3.9	1.3	42.07	141.2208466		1
3	G4	Pier 2	3.G4.Pier 2	Type 3S2	AASHTO LEGAL	2.08	UnStiffened Web - Web Crippling	1.25	24.04	1.5	3.9	1.3	38.91	141.2208466		1
3	G4	Pier 2	3.G4.Pier 2	Type 3-3	AASHTO LEGAL	2.22	UnStiffened Web - Web Crippling	1.25	24.04	1.5	3.9	1.3	36.39	141.2208466		1
3	G4	Pier 2	3.G4.Pier 2	SU4	AASHTO LEGAL	1.72	UnStiffened Web - Web Crippling	1.25	24.04	1.5	3.9	1.3	46.96	141.2208466		1
3	G4	Pier 2	3.G4.Pier 2	SU5	AASHTO LEGAL	1.57	UnStiffened Web - Web Crippling	1.25	24.04	1.5	3.9	1.3	51.3	141.2208466		1
3	G4	Pier 2	3.G4.Pier 2	SU6	AASHTO LEGAL	1.54	UnStiffened Web - Web Crippling	1.25	24.04	1.5	3.9	1.3	52.54	141.2208466		1
3	G4	Pier 2	3.G4.Pier 2	SU7	AASHTO LEGAL	1.52	UnStiffened Web - Web Crippling	1.25	24.04	1.5	3.9	1.3	53.09	141.2208466		1
3	G4	Pier 2	3.G4.Pier 2	H-20	CT LEGAL	2.08	UnStiffened Web - Web Crippling	1.25	24.04	1.5	3.9	1.3	38.91	141.2208466		1
3	G4	Pier 2	3.G4.Pier 2	HS-20	CT LEGAL	1.42	UnStiffened Web - Web Crippling	1.25	24.04	1.5	3.9	1.3	56.73	141.2208466		1
3	G4	Pier 2	3.G4.Pier 2	CT-L73.0	CT LEGAL	1.33	UnStiffened Web - Web Crippling	1.25	24.04	1.5	3.9	1.3	60.47	141.2208466		1
3	G4	Pier 2	3.G4.Pier 2	CT-L3S2	CT LEGAL	1.86	UnStiffened Web - Web Crippling	1.25	24.04	1.5	3.9	1.3	43.36	141.2208466		1
3	G4	Pier 2	3.G4.Pier 2	CT-P76.5	CT PERMIT	1.36	UnStiffened Web - Web Crippling	1.25	24.04	1.5	3.9	1.16	66.28	141.2208466		1
3	G4	Pier 2	3.G4.Pier 2	CT-P120(6)	CT PERMIT	1.37	UnStiffened Web - Web Crippling	1.25	24.04	1.5	3.9	1.209778	63.29	141.2208466		1
3	G4	Pier 2	3.G4.Pier 2	CT-P140(7)a	CT PERMIT	1.3	UnStiffened Web - Web Crippling	1.25	24.04	1.5	3.9	1.16	69.56	141.2208466		1
3	G4	Pier 2	3.G4.Pier 2	CT-P140(7)b	CT PERMIT	1.31	UnStiffened Web - Web Crippling	1.25	24.04	1.5	3.9	1.16	69.18	141.2208466		1
3	G4	Pier 2	3.G4.Pier 2	CT-P160(8)a	CT PERMIT	1.27	UnStiffened Web - Web Crippling	1.25	24.04	1.5	3.9	1.16	71.3	141.2208466		1
3	G4	Pier 2	3.G4.Pier 2	CT-P160(8)b	CT PERMIT	1.07	UnStiffened Web - Web Crippling	1.25	24.04	1.5	3.9	1.31	74.5	141.2208466		1
3	G4	Pier 2	3.G4.Pier 2	CT-P180(9)	CT PERMIT	1.09	UnStiffened Web - Web Crippling	1.25	24.04	1.5	3.9	1.31	73.39	141.2208466		1
3	G4	Pier 2	3.G4.Pier 2	CT-P200(10)	CT PERMIT	0.98	UnStiffened Web - Web Crippling	1.25	24.04	1.5	3.9	1.31	81.73	141.2208466		1
3	G4	Pier 2	3.G4.Pier 2	CT-P380	CT PERMIT	1.91	UnStiffened Web - Web Crippling	1.25	24.04	1.5	3.9	1.1	50.1	141.2208466		1
3	G4	N Abut	3.G4.N Abut	HL-93	INVENTORY	0.79	UnStiffened Web - Web Crippling	1.25	24.04	1.5	3.9	1.75	76.06	142.0889569		1
3	G4	N Abut	3.G4.N Abut	HL-93	OPERATING	1.03	UnStiffened Web - Web Crippling	1.25	24.04	1.5	3.9	1.35	76.06	142.0889569		1
3	G4	N Abut	3.G4.N Abut	Type 3	AASHTO LEGAL	1.68	UnStiffened Web - Web Crippling	1.25	24.04	1.5	3.9	1.3	48.39	142.0889569		1
3	G4	N Abut	3.G4.N Abut	Type 3S2	AASHTO LEGAL	1.82	UnStiffened Web - Web Crippling	1.25	24.04	1.5	3.9	1.3	44.75	142.0889569		1
3	G4	N Abut	3.G4.N Abut	Type 3-3	AASHTO LEGAL	1.95	UnStiffened Web - Web Crippling	1.25	24.04	1.5	3.9	1.3	41.85	142.0889569		1
3	G4	N Abut	3.G4.N Abut	SU4	AASHTO LEGAL	1.51	UnStiffened Web - Web Crippling	1.25	24.04	1.5	3.9	1.3	54.01	142.0889569		1
3	G4	N Abut	3.G4.N Abut	SU5	AASHTO LEGAL	1.38	UnStiffened Web - Web Crippling	1.25	24.04	1.5	3.9	1.3	59	142.0889569		1



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Beam End Identification				Vehicle		RF	Rating	Loading						Capacity	Axial Magnification	
Span	Member	Support	S.M.S	Vehicle	Load Type		Failure Mechanism	γ.DC	DC	γ.DW	DW	γ.LL	LL	C	P.u	δ.A
3	G4	N Abut	3.G4.N Abut	SU6	AASHTO LEGAL	1.35	UnStiffened Web - Web Crippling	1.25	24.04	1.5	3.9	1.3	60.43	142.0889569		1
3	G4	N Abut	3.G4.N Abut	SU7	AASHTO LEGAL	1.33	UnStiffened Web - Web Crippling	1.25	24.04	1.5	3.9	1.3	61.06	142.0889569		1
3	G4	N Abut	3.G4.N Abut	H-20	CT LEGAL	1.82	UnStiffened Web - Web Crippling	1.25	24.04	1.5	3.9	1.3	44.75	142.0889569		1
3	G4	N Abut	3.G4.N Abut	HS-20	CT LEGAL	1.25	UnStiffened Web - Web Crippling	1.25	24.04	1.5	3.9	1.3	65.24	142.0889569		1
3	G4	N Abut	3.G4.N Abut	CT-L73.0	CT LEGAL	1.17	UnStiffened Web - Web Crippling	1.25	24.04	1.5	3.9	1.3	69.54	142.0889569		1
3	G4	N Abut	3.G4.N Abut	CT-L3S2	CT LEGAL	1.63	UnStiffened Web - Web Crippling	1.25	24.04	1.5	3.9	1.3	49.87	142.0889569		1
3	G4	N Abut	3.G4.N Abut	CT-P76.5	CT PERMIT	1.2	UnStiffened Web - Web Crippling	1.25	24.04	1.5	3.9	1.16	76.22	142.0889569		1
3	G4	N Abut	3.G4.N Abut	CT-P120(6)	CT PERMIT	1.2	UnStiffened Web - Web Crippling	1.25	24.04	1.5	3.9	1.209778	72.79	142.0889569		1
3	G4	N Abut	3.G4.N Abut	CT-P140(7)a	CT PERMIT	1.14	UnStiffened Web - Web Crippling	1.25	24.04	1.5	3.9	1.16	79.99	142.0889569		1
3	G4	N Abut	3.G4.N Abut	CT-P140(7)b	CT PERMIT	1.15	UnStiffened Web - Web Crippling	1.25	24.04	1.5	3.9	1.16	79.57	142.0889569		1
3	G4	N Abut	3.G4.N Abut	CT-P160(8)a	CT PERMIT	1.11	UnStiffened Web - Web Crippling	1.25	24.04	1.5	3.9	1.16	81.99	142.0889569		1
3	G4	N Abut	3.G4.N Abut	CT-P160(8)b	CT PERMIT	0.94	UnStiffened Web - Web Crippling	1.25	24.04	1.5	3.9	1.31	85.68	142.0889569		1
3	G4	N Abut	3.G4.N Abut	CT-P180(9)	CT PERMIT	0.96	UnStiffened Web - Web Crippling	1.25	24.04	1.5	3.9	1.31	84.4	142.0889569		1
3	G4	N Abut	3.G4.N Abut	CT-P200(10)	CT PERMIT	0.86	UnStiffened Web - Web Crippling	1.25	24.04	1.5	3.9	1.31	93.99	142.0889569		1
3	G4	N Abut	3.G4.N Abut	CT-P380	CT PERMIT	1.67	UnStiffened Web - Web Crippling	1.25	24.04	1.5	3.9	1.1	57.62	142.0889569		1
1	G2	S Abut	1.G2.S Abut	HL-93	INVENTORY	1.18	UnDefined - Pedestal Bearing	1.25	25.47	1.5	3.79	1.75	78.22	200	174.4075	1
1	G2	S Abut	1.G2.S Abut	HL-93	OPERATING	1.53	UnDefined - Pedestal Bearing	1.25	25.47	1.5	3.79	1.35	78.22	200	143.1195	1
1	G2	S Abut	1.G2.S Abut	Type 3	AASHTO LEGAL	2.53	UnDefined - Pedestal Bearing	1.25	25.47	1.5	3.79	1.3	49.22	200	101.5085	1
1	G2	S Abut	1.G2.S Abut	Type 3S2	AASHTO LEGAL	2.67	UnDefined - Pedestal Bearing	1.25	25.47	1.5	3.79	1.3	46.65	200	98.1675	1
1	G2	S Abut	1.G2.S Abut	Type 3-3	AASHTO LEGAL	2.86	UnDefined - Pedestal Bearing	1.25	25.47	1.5	3.79	1.3	43.68	200	94.3065	1
1	G2	S Abut	1.G2.S Abut	SU4	AASHTO LEGAL	2.28	UnDefined - Pedestal Bearing	1.25	25.47	1.5	3.79	1.3	54.81	200	108.7755	1
1	G2	S Abut	1.G2.S Abut	SU5	AASHTO LEGAL	2.07	UnDefined - Pedestal Bearing	1.25	25.47	1.5	3.79	1.3	60.09	200	115.6395	1
1	G2	S Abut	1.G2.S Abut	SU6	AASHTO LEGAL	2.01	UnDefined - Pedestal Bearing	1.25	25.47	1.5	3.79	1.3	61.97	200	118.0835	1
1	G2	S Abut	1.G2.S Abut	SU7	AASHTO LEGAL	1.97	UnDefined - Pedestal Bearing	1.25	25.47	1.5	3.79	1.3	63.14	200	119.6045	1
1	G2	S Abut	1.G2.S Abut	H-20	CT LEGAL	2.77	UnDefined - Pedestal Bearing	1.25	25.47	1.5	3.79	1.3	45.07	200	96.1135	1
1	G2	S Abut	1.G2.S Abut	HS-20	CT LEGAL	1.87	UnDefined - Pedestal Bearing	1.25	25.47	1.5	3.79	1.3	66.69	200	124.2195	1
1	G2	S Abut	1.G2.S Abut	CT-L73.0	CT LEGAL	1.76	UnDefined - Pedestal Bearing	1.25	25.47	1.5	3.79	1.3	70.82	200	129.5885	1
1	G2	S Abut	1.G2.S Abut	CT-L3S2	CT LEGAL	2.47	UnDefined - Pedestal Bearing	1.25	25.47	1.5	3.79	1.3	50.48	200	103.1465	1
1	G2	S Abut	1.G2.S Abut	CT-P76.5	CT PERMIT	1.81	UnDefined - Pedestal Bearing	1.25	25.47	1.5	3.79	1.16	77.37	200	127.2717	1
1	G2	S Abut	1.G2.S Abut	CT-P120(6)	CT PERMIT	1.75	UnDefined - Pedestal Bearing	1.25	25.47	1.5	3.79	1.209778	76.46	200	130.0221	1
1	G2	S Abut	1.G2.S Abut	CT-P140(7)a	CT PERMIT	1.72	UnDefined - Pedestal Bearing	1.25	25.47	1.5	3.79	1.16	81.18	200	131.6913	1
1	G2	S Abut	1.G2.S Abut	CT-P140(7)b	CT PERMIT	1.74	UnDefined - Pedestal Bearing	1.25	25.47	1.5	3.79	1.16	80.49	200	130.8909	1
1	G2	S Abut	1.G2.S Abut	CT-P160(8)a	CT PERMIT	1.68	UnDefined - Pedestal Bearing	1.25	25.47	1.5	3.79	1.16	83.21	200	134.0461	1
1	G2	S Abut	1.G2.S Abut	CT-P160(8)b	CT PERMIT	1.42	UnDefined - Pedestal Bearing	1.25	25.47	1.5	3.79	1.31	86.97	200	151.4532	1
1	G2	S Abut	1.G2.S Abut	CT-P180(9)	CT PERMIT	1.44	UnDefined - Pedestal Bearing	1.25	25.47	1.5	3.79	1.31	85.63	200	149.6978	1
1	G2	S Abut	1.G2.S Abut	CT-P200(10)	CT PERMIT	1.3	UnDefined - Pedestal Bearing	1.25	25.47	1.5	3.79	1.31	95.39	200	162.4834	1
1	G2	S Abut	1.G2.S Abut	CT-P380	CT PERMIT	2.43	UnDefined - Pedestal Bearing	1.25	25.47	1.5	3.79	1.1	60.58	200	104.1605	1
1	G2	Pier 1	1.G2.Pier 1	HL-93	INVENTORY	1.4	UnDefined - Pedestal Bearing	1.25	25.48	1.5	3.79	1.75	67.85	204	156.2725	1
1	G2	Pier 1	1.G2.Pier 1	HL-93	OPERATING	1.81	UnDefined - Pedestal Bearing	1.25	25.48	1.5	3.79	1.35	67.85	204	129.1325	1
1	G2	Pier 1	1.G2.Pier 1	Type 3	AASHTO LEGAL	2.99	UnDefined - Pedestal Bearing	1.25	25.48	1.5	3.79	1.3	42.69	204	93.032	1
1	G2	Pier 1	1.G2.Pier 1	Type 3S2	AASHTO LEGAL	3.16	UnDefined - Pedestal Bearing	1.25	25.48	1.5	3.79	1.3	40.46	204	90.133	1
1	G2	Pier 1	1.G2.Pier 1	Type 3-3	AASHTO LEGAL	3.37	UnDefined - Pedestal Bearing	1.25	25.48	1.5	3.79	1.3	37.89	204	86.792	1
1	G2	Pier 1	1.G2.Pier 1	SU4	AASHTO LEGAL	2.69	UnDefined - Pedestal Bearing	1.25	25.48	1.5	3.79	1.3	47.54	204	99.337	1
1	G2	Pier 1	1.G2.Pier 1	SU5	AASHTO LEGAL	2.45	UnDefined - Pedestal Bearing	1.25	25.48	1.5	3.79	1.3	52.12	204	105.291	1
1	G2	Pier 1	1.G2.Pier 1	SU6	AASHTO LEGAL	2.38	UnDefined - Pedestal Bearing	1.25	25.48	1.5	3.79	1.3	53.76	204	107.423	1
1	G2	Pier 1	1.G2.Pier 1	SU7	AASHTO LEGAL	2.33	UnDefined - Pedestal Bearing	1.25	25.48	1.5	3.79	1.3	54.77	204	108.736	1
1	G2	Pier 1	1.G2.Pier 1	H-20	CT LEGAL	3.27	UnDefined - Pedestal Bearing	1.25	25.48	1.5	3.79	1.3	39.1	204	88.365	1
1	G2	Pier 1	1.G2.Pier 1	HS-20	CT LEGAL	2.21	UnDefined - Pedestal Bearing	1.25	25.48	1.5	3.79	1.3	57.85	204	112.74	1
1	G2	Pier 1	1.G2.Pier 1	CT-L73.0	CT LEGAL	2.08	UnDefined - Pedestal Bearing	1.25	25.48	1.5	3.79	1.3	61.43	204	117.394	1
1	G2	Pier 1	1.G2.Pier 1	CT-L3S2	CT LEGAL	2.92	UnDefined - Pedestal Bearing	1.25	25.48	1.5	3.79	1.3	43.78	204	94.449	1
1	G2	Pier 1	1.G2.Pier 1	CT-P76.5	CT PERMIT	2.13	UnDefined - Pedestal Bearing	1.25	25.48	1.5	3.79	1.16	67.12	204	115.3942	1
1	G2	Pier 1	1.G2.Pier 1	CT-P120(6)	CT PERMIT	2.07	UnDefined - Pedestal Bearing	1.25	25.48	1.5	3.79	1.209778	66.32	204	117.7675	1
1	G2	Pier 1	1.G2.Pier 1	CT-P140(7)a	CT PERMIT	2.03	UnDefined - Pedestal Bearing	1.25	25.48	1.5	3.79	1.16	70.42	204	119.2222	1



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Beam End Identification				Vehicle		RF	Rating	Loading						Capacity	Axial Magnification	
Span	Member	Support	S.M.S	Vehicle	Load Type		Failure Mechanism	γ.DC	DC	γ.DW	DW	γ.LL	LL	C	P.u	δ.A
1	G2	Pier 1	1.G2.Pier 1	CT-P140(7)b	CT PERMIT	2.05	UnDefined - Pedestal Bearing	1.25	25.48	1.5	3.79	1.16	69.82	204	118.5262	1
1	G2	Pier 1	1.G2.Pier 1	CT-P160(8)a	CT PERMIT	1.98	UnDefined - Pedestal Bearing	1.25	25.48	1.5	3.79	1.16	72.18	204	121.2638	1
1	G2	Pier 1	1.G2.Pier 1	CT-P160(8)b	CT PERMIT	1.68	UnDefined - Pedestal Bearing	1.25	25.48	1.5	3.79	1.31	75.45	204	136.3745	1
1	G2	Pier 1	1.G2.Pier 1	CT-P180(9)	CT PERMIT	1.71	UnDefined - Pedestal Bearing	1.25	25.48	1.5	3.79	1.31	74.27	204	134.8287	1
1	G2	Pier 1	1.G2.Pier 1	CT-P200(10)	CT PERMIT	1.53	UnDefined - Pedestal Bearing	1.25	25.48	1.5	3.79	1.31	82.74	204	145.9244	1
1	G2	Pier 1	1.G2.Pier 1	CT-P380	CT PERMIT	2.87	UnDefined - Pedestal Bearing	1.25	25.48	1.5	3.79	1.1	52.55	204	95.34	1
1	G3	S Abut	1.G3.S Abut	HL-93	INVENTORY	1.63	UnDefined - Pedestal Bearing	1.25	25.31	1.5	2.84	1.75	67.85	230	154.635	1
1	G3	S Abut	1.G3.S Abut	HL-93	OPERATING	2.11	UnDefined - Pedestal Bearing	1.25	25.31	1.5	2.84	1.35	67.85	230	127.495	1
1	G3	S Abut	1.G3.S Abut	Type 3	AASHTO LEGAL	3.49	UnDefined - Pedestal Bearing	1.25	25.31	1.5	2.84	1.3	42.69	230	91.3945	1
1	G3	S Abut	1.G3.S Abut	Type 3S2	AASHTO LEGAL	3.69	UnDefined - Pedestal Bearing	1.25	25.31	1.5	2.84	1.3	40.46	230	88.4955	1
1	G3	S Abut	1.G3.S Abut	Type 3-3	AASHTO LEGAL	3.94	UnDefined - Pedestal Bearing	1.25	25.31	1.5	2.84	1.3	37.89	230	85.1545	1
1	G3	S Abut	1.G3.S Abut	SU4	AASHTO LEGAL	3.14	UnDefined - Pedestal Bearing	1.25	25.31	1.5	2.84	1.3	47.54	230	97.6995	1
1	G3	S Abut	1.G3.S Abut	SU5	AASHTO LEGAL	2.86	UnDefined - Pedestal Bearing	1.25	25.31	1.5	2.84	1.3	52.12	230	103.6535	1
1	G3	S Abut	1.G3.S Abut	SU6	AASHTO LEGAL	2.77	UnDefined - Pedestal Bearing	1.25	25.31	1.5	2.84	1.3	53.76	230	105.7855	1
1	G3	S Abut	1.G3.S Abut	SU7	AASHTO LEGAL	2.72	UnDefined - Pedestal Bearing	1.25	25.31	1.5	2.84	1.3	54.77	230	107.0985	1
1	G3	S Abut	1.G3.S Abut	H-20	CT LEGAL	3.81	UnDefined - Pedestal Bearing	1.25	25.31	1.5	2.84	1.3	39.1	230	86.7275	1
1	G3	S Abut	1.G3.S Abut	HS-20	CT LEGAL	2.58	UnDefined - Pedestal Bearing	1.25	25.31	1.5	2.84	1.3	57.85	230	111.1025	1
1	G3	S Abut	1.G3.S Abut	CT-L73.0	CT LEGAL	2.43	UnDefined - Pedestal Bearing	1.25	25.31	1.5	2.84	1.3	61.43	230	115.7565	1
1	G3	S Abut	1.G3.S Abut	CT-L3S2	CT LEGAL	3.41	UnDefined - Pedestal Bearing	1.25	25.31	1.5	2.84	1.3	43.78	230	92.8115	1
1	G3	S Abut	1.G3.S Abut	CT-P76.5	CT PERMIT	2.49	UnDefined - Pedestal Bearing	1.25	25.31	1.5	2.84	1.16	67.12	230	113.7567	1
1	G3	S Abut	1.G3.S Abut	CT-P120(6)	CT PERMIT	2.41	UnDefined - Pedestal Bearing	1.25	25.31	1.5	2.84	1.209778	66.32	230	116.13	1
1	G3	S Abut	1.G3.S Abut	CT-P140(7)a	CT PERMIT	2.37	UnDefined - Pedestal Bearing	1.25	25.31	1.5	2.84	1.16	70.42	230	117.5847	1
1	G3	S Abut	1.G3.S Abut	CT-P140(7)b	CT PERMIT	2.39	UnDefined - Pedestal Bearing	1.25	25.31	1.5	2.84	1.16	69.82	230	116.8887	1
1	G3	S Abut	1.G3.S Abut	CT-P160(8)a	CT PERMIT	2.31	UnDefined - Pedestal Bearing	1.25	25.31	1.5	2.84	1.16	72.18	230	119.6263	1
1	G3	S Abut	1.G3.S Abut	CT-P160(8)b	CT PERMIT	1.96	UnDefined - Pedestal Bearing	1.25	25.31	1.5	2.84	1.31	75.45	230	134.737	1
1	G3	S Abut	1.G3.S Abut	CT-P180(9)	CT PERMIT	1.99	UnDefined - Pedestal Bearing	1.25	25.31	1.5	2.84	1.31	74.27	230	133.1912	1
1	G3	S Abut	1.G3.S Abut	CT-P200(10)	CT PERMIT	1.79	UnDefined - Pedestal Bearing	1.25	25.31	1.5	2.84	1.31	82.74	230	144.2869	1
1	G3	S Abut	1.G3.S Abut	CT-P380	CT PERMIT	3.35	UnDefined - Pedestal Bearing	1.25	25.31	1.5	2.84	1.1	52.55	230	93.7025	1



Steel Beam Ends - Load Rating
Connecticut Department of Transportation



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Bridge ID:	00000
Analyze Date:	3/20/2017
Analyze Time:	3:53:34 PM

[Generate Input Review](#)

Vehicle	Vehicle Class	Vehicle Configuration	Governing Rating	Failure Mechanism	Span	Member	Support	GVW (tons)	Rating Tons	Num. Location <1
HL-93	INVENTORY	Truck + Lane	0.21	Stiffened Web - Localized Flex. Buck.	1	G5	Pier 1	#N/A	#N/A	#N/A
HL-93	OPERATING	Truck + Lane	0.27	Stiffened Web - Localized Flex. Buck.	1	G5	Pier 1	#N/A	#N/A	#N/A
Type 3	AASHTO LEGAL	Axle Load	0.44	Stiffened Web - Localized Flex. Buck.	1	G5	Pier 1	25	11	2
Type 3S2	AASHTO LEGAL	Axle Load	0.47	Stiffened Web - Localized Flex. Buck.	1	G5	Pier 1	36	16.92	2
Type 3-3	AASHTO LEGAL	Axle Load	0.5	Stiffened Web - Localized Flex. Buck.	1	G5	Pier 1	40	20	2
SU4	AASHTO LEGAL	Axle Load	0.4	Stiffened Web - Localized Flex. Buck.	1	G5	Pier 1	27	10.8	2
SU5	AASHTO LEGAL	Axle Load	0.36	Stiffened Web - Localized Flex. Buck.	1	G5	Pier 1	31	11.16	2
SU6	AASHTO LEGAL	Axle Load	0.35	Stiffened Web - Localized Flex. Buck.	1	G5	Pier 1	34.75	12.1625	2
SU7	AASHTO LEGAL	Axle Load	0.35	Stiffened Web - Localized Flex. Buck.	1	G5	Pier 1	38.75	13.5625	2
H-20	CT LEGAL	Axle Load	0.49	Stiffened Web - Localized Flex. Buck.	1	G5	Pier 1	36.5	17.885	2
HS-20	CT LEGAL	Axle Load	0.33	Stiffened Web - Localized Flex. Buck.	1	G5	Pier 1	40	13.2	2
CT-L73.0	CT LEGAL	Axle Load	0.31	Stiffened Web - Localized Flex. Buck.	1	G5	Pier 1	36	11.16	2
CT-L3S2	CT LEGAL	Axle Load	0.43	Stiffened Web - Localized Flex. Buck.	1	G5	Pier 1	20	8.6	2
CT-P76.5	CT PERMIT	Axle Load	0.32	Stiffened Web - Localized Flex. Buck.	1	G5	Pier 1	38.25	12.24	2
CT-P120(6)	CT PERMIT	Axle Load	0.31	Stiffened Web - Localized Flex. Buck.	1	G5	Pier 1	60	18.6	3
CT-P140(7)a	CT PERMIT	Axle Load	0.3	Stiffened Web - Localized Flex. Buck.	1	G5	Pier 1	70	21	3
CT-P140(7)b	CT PERMIT	Axle Load	0.3	Stiffened Web - Localized Flex. Buck.	1	G5	Pier 1	70	21	3
CT-P160(8)a	CT PERMIT	Axle Load	0.29	Stiffened Web - Localized Flex. Buck.	1	G5	Pier 1	80	23.2	3
CT-P160(8)b	CT PERMIT	Axle Load	0.25	Stiffened Web - Localized Flex. Buck.	1	G5	Pier 1	80	20	10
CT-P180(9)	CT PERMIT	Axle Load	0.25	Stiffened Web - Localized Flex. Buck.	1	G5	Pier 1	90	22.5	7
CT-P200(10)	CT PERMIT	Axle Load	0.23	Stiffened Web - Localized Flex. Buck.	1	G5	Pier 1	100	23	15
CT-P380	CT PERMIT	Axle Load	0.4	Stiffened Web - Localized Flex. Buck.	1	G5	Pier 1	190	76	3

Bridge No.
Town

Route over Feature

Prepared By:
Prepared On: 3/20/2017

Rating Factors Less Than 1.0 - AASHTO & CT Legal Vehicles

Failure Mechanism	Limit State	Span	Member	Location on Member (%)	Member Length (ft)	Rating Factor	Rating Tons	Vehicle
Beam End Bearing	Strength I	1	G1	Pier 1		0.57	20.5	CT-L73.0
Beam End Bearing	Strength I	1	G1	Pier 1		0.61	24.4	HS-20
Beam End Bearing	Strength I	1	G1	Pier 1		0.64	24.8	SU7
Beam End Bearing	Strength I	1	G1	Pier 1		0.65	22.6	SU6
Beam End Bearing	Strength I	1	G1	Pier 1		0.67	20.8	SU5
Beam End Bearing	Strength I	1	G1	Pier 1		0.74	20.0	SU4
Beam End Bearing	Strength I	1	G1	Pier 1		0.8	16.0	CT-L3S2
Beam End Bearing	Strength I	1	G1	Pier 1		0.82	20.5	Type 3
Beam End Bearing	Strength I	1	G1	Pier 1		0.87	31.3	Type 3S2
Beam End Bearing	Strength I	1	G1	Pier 1		0.9	32.9	H-20
Beam End Bearing	Strength I	1	G1	Pier 1		0.93	37.2	Type 3-3
Beam End Bearing	Strength I	1	G5	Pier 1		0.31	11.2	CT-L73.0
Beam End Bearing	Strength I	1	G5	Pier 1		0.33	13.2	HS-20
Beam End Bearing	Strength I	1	G5	Pier 1		0.35	12.2	SU6
Beam End Bearing	Strength I	1	G5	Pier 1		0.35	13.6	SU7
Beam End Bearing	Strength I	1	G5	Pier 1		0.36	11.2	SU5
Beam End Bearing	Strength I	1	G5	Pier 1		0.4	10.8	SU4
Beam End Bearing	Strength I	1	G5	Pier 1		0.43	8.6	CT-L3S2
Beam End Bearing	Strength I	1	G5	Pier 1		0.44	11.0	Type 3
Beam End Bearing	Strength I	1	G5	Pier 1		0.47	16.9	Type 3S2
Beam End Bearing	Strength I	1	G5	Pier 1		0.49	17.9	H-20
Beam End Bearing	Strength I	1	G5	Pier 1		0.5	20.0	Type 3-3

Bridge No.
Town

Route over Feature

Prepared By:
Prepared On: 3/20/2017

Rating Factors Less Than 1.0 - CT Permit Vehicles

Failure Mechanism	Limit State	Span	Member	Location on Member (%)	Member Length (ft)	Rating Factor	Rating Tons	Vehicle
Beam End Bearing	Strength II	1	G1	Pier 1		0.42	42.0	CT-P200(10)
Beam End Bearing	Strength II	1	G1	Pier 1		0.46	36.8	CT-P160(8)b
Beam End Bearing	Strength II	1	G1	Pier 1		0.47	42.3	CT-P180(9)
Beam End Bearing	Strength II	1	G1	Pier 1		0.54	43.2	CT-P160(8)a
Beam End Bearing	Strength II	1	G1	Pier 1		0.56	39.2	CT-P140(7)a
Beam End Bearing	Strength II	1	G1	Pier 1		0.56	39.2	CT-P140(7)b
Beam End Bearing	Strength II	1	G1	Pier 1		0.57	34.2	CT-P120(6)
Beam End Bearing	Strength II	1	G1	Pier 1		0.58	22.2	CT-P76.5
Beam End Bearing	Strength II	1	G1	Pier 1		0.73	138.7	CT-P380
Beam End Bearing	Strength II	1	G2	S Abut		0.86	86.0	CT-P200(10)
Beam End Bearing	Strength II	1	G2	S Abut		0.95	76.0	CT-P160(8)b
Beam End Bearing	Strength II	1	G2	S Abut		0.96	86.4	CT-P180(9)
Beam End Bearing	Strength II	1	G3	Pier 1		0.91	91.0	CT-P200(10)
Beam End Bearing	Strength II	1	G4	Pier 1		0.9	90.0	CT-P200(10)
Beam End Bearing	Strength II	1	G4	Pier 1		0.99	79.2	CT-P160(8)b
Beam End Bearing	Strength II	1	G5	Pier 1		0.23	23.0	CT-P200(10)
Beam End Bearing	Strength II	1	G5	Pier 1		0.25	20.0	CT-P160(8)b
Beam End Bearing	Strength II	1	G5	Pier 1		0.25	22.5	CT-P180(9)
Beam End Bearing	Strength II	1	G5	Pier 1		0.29	23.2	CT-P160(8)a
Beam End Bearing	Strength II	1	G5	Pier 1		0.3	21.0	CT-P140(7)a
Beam End Bearing	Strength II	1	G5	Pier 1		0.3	21.0	CT-P140(7)b
Beam End Bearing	Strength II	1	G5	Pier 1		0.31	18.6	CT-P120(6)
Beam End Bearing	Strength II	1	G5	Pier 1		0.32	12.2	CT-P76.5
Beam End Bearing	Strength II	1	G5	Pier 1		0.4	76.0	CT-P380
Beam End Bearing	Strength II	2	G3	Pier 2		0.56	56.0	CT-P200(10)
Beam End Bearing	Strength II	2	G3	Pier 2		0.59	53.1	CT-P180(9)
Beam End Bearing	Strength II	2	G3	Pier 2		0.64	51.2	CT-P160(8)b
Beam End Bearing	Strength II	2	G3	Pier 2		0.65	52.0	CT-P160(8)a
Beam End Bearing	Strength II	2	G3	Pier 2		0.71	49.7	CT-P140(7)a
Beam End Bearing	Strength II	2	G3	Pier 2		0.75	52.5	CT-P140(7)b
Beam End Bearing	Strength II	2	G3	Pier 2		0.79	47.4	CT-P120(6)
Beam End Bearing	Strength II	2	G3	Pier 2		0.87	165.3	CT-P380
Beam End Bearing	Strength II	2	G3	Pier 2		0.96	96.0	CT-P200(10)
Beam End Bearing	Strength II	3	G1	Pier 2		0.9	90.0	CT-P200(10)
Beam End Bearing	Strength II	3	G1	Pier 2		0.99	79.2	CT-P160(8)b
Beam End Bearing	Strength II	3	G2	N Abut		0.99	99.0	CT-P200(10)
Beam End Bearing	Strength II	3	G2	Pier 2		0.85	85.0	CT-P200(10)
Beam End Bearing	Strength II	3	G2	Pier 2		0.93	74.4	CT-P160(8)b
Beam End Bearing	Strength II	3	G2	Pier 2		0.95	85.5	CT-P180(9)
Beam End Bearing	Strength II	3	G3	N Abut		0.87	87.0	CT-P200(10)
Beam End Bearing	Strength II	3	G3	N Abut		0.95	76.0	CT-P160(8)b
Beam End Bearing	Strength II	3	G3	N Abut		0.97	87.3	CT-P180(9)
Beam End Bearing	Strength II	3	G3	Pier 2		0.99	99.0	CT-P200(10)
Beam End Bearing	Strength II	3	G4	N Abut		0.86	86.0	CT-P200(10)
Beam End Bearing	Strength II	3	G4	N Abut		0.94	75.2	CT-P160(8)b
Beam End Bearing	Strength II	3	G4	N Abut		0.96	86.4	CT-P180(9)
Beam End Bearing	Strength II	3	G4	Pier 2		0.98	98.0	CT-P200(10)
Beam End Bearing	Strength II	3	G5	Pier 2		0.91	91.0	CT-P200(10)
Beam End Bearing	Strength II	3	G5	Pier 2		0.99	79.2	CT-P160(8)b

Low Permit



[<-Summary Outputs->](#)
[<<- Stiffened Inputs](#)

Stiffened Web Capacity Outputs

Compute Capacities Without
Performing a Rating

Beam End Identification			Capacity	Mechanism	As-Inspected Section			As-Inspected Section Properties					Eccentricity Ratio			Slenderness				Axial Resistance			
Span	Member	Support	C	Localized or Unifrom	t.w	t.p	b.t	ES	I.s	A.g	r.s	K.eff	c	e	R.e	isSlenderStiff	isSlenderWeb	Q.s	Q.a	P.e	P.o	P.n	P.r
1	G1	S Abut	232.26	Stiffened Web - Flexural Buckling	0.375	0.5	6	6.75	78.96094	8.53125	3.042284	0.75	6.1875	0	0	FALSE	FALSE	1	1	11160.53	307.125	303.6078	273.247
1	G1	S Abut	207.637	Stiffened Web - Localized Flex. Buck.	0.2925	0.5	6	5.265	77.40431	7.540013	3.20403	0.75	6.14625	0	0	FALSE	FALSE	1	1	1575435	271.4405	271.4209	244.2788
1	G1	Pier 1	232.26	Stiffened Web - Flexural Buckling	0.375	0.5	6	6.75	78.96094	8.53125	3.042284	0.75	6.1875	-0.28806	0.192574123	FALSE	FALSE	1	1	11160.53	307.125	303.6078	273.247
1	G1	Pier 1	90.78677	Stiffened Web - Localized Flex. Buck.	0.33375	0.225	6	6.0075	39.2941	5.491003	2.675087	0.75	6.491822	-0.32495	0.29478349	TRUE	FALSE	0.600391	1	799765.3	118.6829	118.6755	106.808
1	G5	S Abut	232.26	Stiffened Web - Flexural Buckling	0.375	0.5	6	6.75	78.96094	8.53125	3.042284	0.75	6.1875	0	0	FALSE	FALSE	1	1	11160.53	307.125	303.6078	273.247
1	G5	S Abut	207.637	Stiffened Web - Localized Flex. Buck.	0.2925	0.5	6	5.265	77.40431	7.540013	3.20403	0.75	6.14625	0	0	FALSE	FALSE	1	1	1575435	271.4405	271.4209	244.2788
1	G5	Pier 1	187.847	Stiffened Web - Flexural Buckling	0.319444	0.4375	6	5.749988	69.09155	7.086798	3.122392	0.75	6.159722	-0.57142	0.361026207	TRUE	FALSE	0.972769	1	9765.572	248.1775	245.5516	220.9965
1	G5	Pier 1	86.56845	Stiffened Web - Localized Flex. Buck.	0.18375	0.3	6	3.3075	29.66519	3.907761	2.755241	0.75	6.713083	-0.62121	0.549338227	TRUE	FALSE	0.804455	1	603785	113.1703	113.1614	101.8452
2	G1	Pier 2	404.1248	Stiffened Web - Flexural Buckling	0.375	0.875	7	6.75	216.5921	14.78125	3.827946	0.75	7.1875	-0.3336	0.163631498	FALSE	FALSE	1	1	30613.67	532.125	528.2677	475.441
2	G1	Pier 2	371.633	Stiffened Web - Localized Flex. Buck.	0.375	0.69125	7	6.75	192.2126	13.495	3.774022	0.75	7.538967	-0.35147	0.186031904	FALSE	FALSE	1	1	3912164	485.82	485.7947	437.2153
2	G3	Pier 2	404.1248	Stiffened Web - Flexural Buckling	0.375	0.875	7	6.75	216.5921	14.78125	3.827946	0.75	7.1875	0.755781	0.370716855	FALSE	FALSE	1	1	30613.67	532.125	528.2677	475.441
2	G3	Pier 2	323.0887	Stiffened Web - Localized Flex. Buck.	0.375	0.500001	7	6.75	162.5017	12.15626	3.656192	0.75	7.983769	0.796269	0.475564991	TRUE	FALSE	0.96512	1	3307449	422.3607	422.3382	380.1044
2	G5	Pier 1	309.4757	Stiffened Web - Flexural Buckling	0.263888	0.718594	7	4.749975	177.8783	11.31377	3.965134	0.75	7.131944	0	0	FALSE	FALSE	1	1	25141.77	407.2958	404.5434	364.0891
2	G5	Pier 1	361.828	Stiffened Web - Localized Flex. Buck.	0.222221	0.875	7	3.999983	209.766	13.13888	3.995658	0.75	7.111111	0	0	FALSE	FALSE	1	1	4269433	472.9997	472.9778	425.68
2	G5	Pier 2	404.1248	Stiffened Web - Flexural Buckling	0.375	0.875	7	6.75	216.5921	14.78125	3.827946	0.75	7.1875	-0.19755	0.096899724	FALSE	FALSE	1	1	30613.67	532.125	528.2677	475.441
2	G5	Pier 2	318.4363	Stiffened Web - Localized Flex. Buck.	0.3075	0.65625	7	5.535	171.4027	11.56326	3.85007	0.75	7.366641	-0.21289	0.105800922	FALSE	FALSE	1	1	3488614	416.2775	416.2567	374.631
3	G1	Pier 2	206.0397	Stiffened Web - Flexural Buckling	0.375	0.4375	6	6.75	69.09082	7.78125	2.979789	0.75	6.1875	0.343765	0.239555444	TRUE	FALSE	0.972769	1	9765.468	272.497	269.3329	242.3996
3	G1	Pier 2	138.0018	Stiffened Web - Localized Flex. Buck.	0.0375	0.392855	6	0.675	64.19041	5.382443	3.453388	0.75	6.379304	0.360554	0.192865035	TRUE	FALSE	0.931036	1	1306488	180.405	180.3945	162.3551
3	G5	Pier 2	232.26	Stiffened Web - Flexural Buckling	0.375	0.5	6	6.75	78.96094	8.53125	3.042284	0.75	6.1875	0.163581	0.109357331	FALSE	FALSE	1	1	11160.53	307.125	303.6078	273.247
3	G5	Pier 2	125.119	Stiffened Web - Localized Flex. Buck.	0.333334	0.3	6	6.000008	39.02881	5.648005	2.628725	0.75	6.336072	0.169405	0.155330217	TRUE	FALSE	0.804455	1	794365.8	163.5684	163.5543	147.1989



Steel Beam Ends - Load Rating
Connecticut Department of Transportation



[<-Outputs](#)

[<<- UnStiffened Inputs](#)

UnStiffened Web Capacity Outputs

Compute Capacities Without Performing
a Rating

[Top](#)

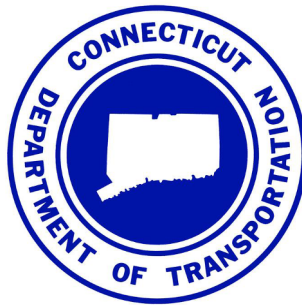
Beam End Identification			Capactiy	As-Inspected Section			Resistance	
Span	Member	Support	C	t.w	K	ES	R.ub	R.uw
1	G2	S Abut	146.1533	0.584712	0.73757836	9.6878918	203.9267	171.945
1	G2	Pier 1	150.6188	0.594215	0.7779215	9.8896075	211.5558	177.1986
1	G3	S Abut	146.1533	0.584712	0.73757836	9.6878918	203.9267	171.945
1	G3	Pier 1	150.6188	0.594215	0.7779215	9.8896075	211.5558	177.1986
1	G4	S Abut	146.1533	0.584712	0.73757836	9.6878918	203.9267	171.945
1	G4	Pier 1	150.6188	0.594215	0.7779215	9.8896075	211.5558	177.1986
3	G2	Pier 2	141.2208	0.575916	0.794	9.97	206.7077	166.1422
3	G2	N Abut	142.089	0.575916	0.794	9.97	206.7077	167.1635
3	G3	Pier 2	141.2208	0.575916	0.794	9.97	206.7077	166.1422
3	G3	N Abut	142.089	0.575916	0.794	9.97	206.7077	167.1635
3	G4	Pier 2	141.2208	0.575916	0.794	9.97	206.7077	166.1422
3	G4	N Abut	142.089	0.575916	0.794	9.97	206.7077	167.1635

BeamEnd Spreadsheet Input Review

Connecticut Department of Transportation

Bridge Design Unit - Load Rating

Bridge: 00000



Analyzed By: patriacm

Last Run on: 5/17/2017 4:08:06 PM

Report Generated on: 5/17/2017 4:08:08 PM

BeamEnd version: 2.4

Stiffened BeamEnds Inputs

Factors

Span	Member	Support	Resistance Factor	System Factor	Condition Factor
1	G1	Abut 1	0.9	1	0.9
1	G1	Pier 1	0.9	1	0.9
1	G5	Abut 1	0.9	1	0.9
1	G5	Pier 1	0.9	1	0.9
2	G1	Pier 2	0.9	1	0.9
2	G3	Pier 2	0.9	1	0.9
2	G5	Pier 1	0.9	1	0.9
2	G5	Pier 2	0.9	1	0.9
3	G1	Pier 2	0.9	1	0.9
3	G5	Pier 2	0.9	1	0.9

Member Properties

Span	Member	Support	Modulus of Elasticity (ksi)	Fy Web (ksi)	L.o.h (in)	Web Depth (in)	Web Thickness (in)
1	G1	Abut 1	29000	36	1.5	60	0.375
1	G1	Pier 1	29000	36	6	60	0.375
1	G5	Abut 1	29000	36	1.5	60	0.375
1	G5	Pier 1	29000	36	6	60	0.375
2	G1	Pier 2	29000	36	6	60	0.375
2	G3	Pier 2	29000	36	6	60	0.375
2	G5	Pier 1	29000	36	6	60	0.375
2	G5	Pier 2	29000	36	6	60	0.375
3	G1	Pier 2	29000	36	6	60	0.375
3	G5	Pier 2	29000	36	6	60	0.375

Stiffener Properties

Span	Member	Support	Out-Out Stiffener (in)	Connection Type	Projecting Width (in)	Stiffener Thickness (in)	Fy Stiffener (ksi)	Number of Pairs
1	G1	Abut 1	9	Welded	6	0.5	36	2
1	G1	Pier 1	0	Welded	6	0.5	36	1
1	G5	Abut 1	9	Welded	6	0.5	36	2
1	G5	Pier 1	0	Welded	6	0.5	36	1
2	G1	Pier 2	0	Welded	7	0.875	36	1
2	G3	Pier 2	0	Welded	7	0.875	36	1
2	G5	Pier 1	0	Welded	7	0.875	36	1
2	G5	Pier 2	0	Welded	7	0.875	36	1
3	G1	Pier 2	0	Welded	6	0.5	36	1
3	G5	Pier 2	0	Welded	6	0.5	36	1

Uniform Section Loss

Span	Member	Support	Web Thickness Loss (%)	Stiffener Thickness Loss (%)	Stiffener Width Loss (%)
1	G1	Abut 1	0	0	0
1	G1	Pier 1	0	34.375	0
1	G5	Abut 1	0	0	0
1	G5	Pier 1	8.33	12.5	0
2	G1	Pier 2	0	0	0
2	G3	Pier 2	0	0	0
2	G5	Pier 1	16.667	53.571	0
2	G5	Pier 2	0	0	0
3	G1	Pier 2	0	21.875	0
3	G5	Pier 2	0	0	0

Localized Section Loss

Span	Member	Support	Side-A Stiffener Width Loss (%)	Side-A Stiffener Thickness Loss (%)	Side-B Stiffener Width Loss (%)	Side-B Stiffener Thickness Loss (%)	Web Thickness Loss (%)	Height of Localized Loss (in)
1	G1	Abut 1	0	0	0	0	10.811	4
1	G1	Pier 1	100	0	0	0	50	5
1	G5	Abut 1	0	0	0	0	10.811	4
1	G5	Pier 1	33.333	25	0	0	66.667	4
2	G1	Pier 2	0	21.429	0	0	0	3
2	G3	Pier 2	0	42.857	0	0	0	4
2	G5	Pier 1	0	0	0	0	66.667	6
2	G5	Pier 2	0	14.286	0	25	100	6
3	G1	Pier 2	0	37.5	0	0	91.667	2
3	G5	Pier 2	0	75	66.667	0	50	2

UnStiffened BeamEnds Inputs

Factors

Span	Member	Support	System Factor	Condition Factor	Bearing Resistance Factor	Web Crippling Resistance Factor
1	G2	Abut 1	1	0.9	1	0.8
1	G2	Pier 1	1	0.9	1	0.8
1	G3	Abut 1	1	0.9	1	0.8
1	G3	Pier 1	1	0.9	1	0.8
1	G4	Abut 1	1	0.9	1	0.8
1	G4	Pier 1	1	0.9	1	0.8
3	G2	Pier 2	1	0.9	1	0.8
3	G2	Abut 2	1	0.9	1	0.8
3	G3	Pier 2	1	0.9	1	0.8
3	G3	Abut 2	1	0.9	1	0.8
3	G4	Pier 2	1	0.9	1	0.8
3	G4	Abut 2	1	0.9	1	0.8

Member Properties

Span	Member	Support	Modulus of Elasticity (ksi)	Fy Web (ksi)	Section Depth (in)	Web Thickness (in)	Bottom Flange Thickness (in)	Bottom Flange + Fillet Thickness (in)	L.OH (in)	Bearing Length (in)
1	G2	Abut 1	29000	36	35.55	0.598	0.794	0.794	6	6
1	G2	Pier 1	29000	36	35.55	0.598	0.794	0.794	6	15
1	G3	Abut 1	29000	36	35.55	0.598	0.794	0.794	6	6
1	G3	Pier 1	29000	36	35.55	0.598	0.794	0.794	6	15
1	G4	Abut 1	29000	36	35.55	0.598	0.794	0.794	6	6
1	G4	Pier 1	29000	36	35.55	0.598	0.794	0.794	6	15
3	G2	Pier 2	29000	36	35.55	0.598	0.794	0.794	6	15
3	G2	Abut 2	29000	36	35.55	0.598	0.794	0.794	6	6
3	G3	Pier 2	29000	36	35.55	0.598	0.794	0.794	6	15
3	G3	Abut 2	29000	36	35.55	0.598	0.794	0.794	6	6
3	G4	Pier 2	29000	36	35.55	0.598	0.794	0.794	6	15
3	G4	Abut 2	29000	36	35.55	0.598	0.794	0.794	6	6

Section Loss

Span	Member	Support	Web Thickness Loss (%)	Flange Thickness Loss (%)	Flange + Fillet Thickness Loss (%)
1	G2	Abut 1	20.9	0	0
1	G2	Pier 1	20.9	0	0
1	G3	Abut 1	20.9	0	0
1	G3	Pier 1	20.9	0	0
1	G4	Abut 1	20.9	0	0
1	G4	Pier 1	20.9	0	0
3	G2	Pier 2	20.9	9.269	0
3	G2	Abut 2	20.9	0	0
3	G3	Pier 2	20.9	9.269	0
3	G3	Abut 2	20.9	0	0
3	G4	Pier 2	20.9	9.269	0
3	G4	Abut 2	20.9	0	0

UnDefined BeamEnds Inputs

Factors

Span	Member	Support	System Factor	Condition Factor
1	B2	Pier 1	1	0.9
1	B3	Pier 1	1	0.9
1	B4	Pier 1	1	0.9
3	B2	Pier 2	1	0.9
3	B3	Pier 2	1	0.9
3	B4	Pier 2	1	0.9

Resistance

Span	Member	Support	Resistance (kip)	Failure Mechanism
1	B2	Pier 1	880.961	Axial Compression
1	B3	Pier 1	880.961	Axial Compression
1	B4	Pier 1	880.961	Axial Compression
3	B2	Pier 2	880.961	Axial Compression
3	B3	Pier 2	880.961	Axial Compression
3	B4	Pier 2	880.961	Axial Compression

Secant Formula

Span	Member	Support	Eccentricity Ratio (in)	Modulus of Elasticity (ksi)	Effective Length, KL (in)	Moment of Inertia (in ⁴)
1	B2	Pier 1	0.089	29000	34.5	251.815
1	B3	Pier 1	0.089	29000	34.5	251.815
1	B4	Pier 1	0.089	29000	34.5	251.815
3	B2	Pier 2	0.089	29000	34.5	251.815
3	B3	Pier 2	0.089	29000	34.5	251.815
3	B4	Pier 2	0.089	29000	34.5	251.815

BrR Association

Span	Member	Support	BrR Superstructure Definition	BrR Member	BrR Support
1	G1	Abut 1	Span 01	G1	1
1	G1	Pier 1	Span 01	G1	2
1	G5	Abut 1	Span 01	G5	1
1	G5	Pier 1	Span 01	G5	2
2	G1	Pier 2	Span 02	G1	2
2	G3	Pier 2	Span 02	G3	2
2	G5	Pier 1	Span 02	G5	1
2	G5	Pier 2	Span 02	G5	2
3	G1	Pier 2	Span 03	G1	1
3	G5	Pier 2	Span 03	G5	1
1	G2	Abut 1	Span 01	G2	1
1	G2	Pier 1	Span 01	G2	2
1	G3	Abut 1	Span 01	G3	1
1	G3	Pier 1	Span 01	G3	2
1	G4	Abut 1	Span 01	G4	1
1	G4	Pier 1	Span 01	G4	2
3	G2	Pier 2	Span 03	G2	1
3	G2	Abut 2	Span 03	G2	2
3	G3	Pier 2	Span 03	G3	1
3	G3	Abut 2	Span 03	G3	2
3	G4	Pier 2	Span 03	G4	1
3	G4	Abut 2	Span 03	G4	2
1	B2	Pier 1	Span 01	G2	2
1	B3	Pier 1	Span 01	G3	2
1	B4	Pier 1	Span 01	G4	2
3	B2	Pier 2	Span 03	G2	1
3	B3	Pier 2	Span 03	G3	1
3	B4	Pier 2	Span 03	G4	1

Load Factor Information

Live Load Factor Analysis Option: Other

ADTT: 285

Span	Member	Support	Structure Length (ft)	DC Factor	DW Factor
1	G1	Abut 1	39.52	1.25	1.5
1	G1	Pier 1	39.52	1.25	1.5
1	G5	Abut 1	39.52	1.25	1.5
1	G5	Pier 1	39.52	1.25	1.5
2	G1	Pier 2	108.5	1.25	1.5
2	G3	Pier 2	108.5	1.25	1.5
2	G5	Pier 1	108.5	1.25	1.5
2	G5	Pier 2	108.5	1.25	1.5
3	G1	Pier 2	37.19	1.25	1.5
3	G5	Pier 2	37.19	1.25	1.5
1	G2	Abut 1	39.52	1.25	1.5
1	G2	Pier 1	39.52	1.25	1.5
1	G3	Abut 1	39.52	1.25	1.5
1	G3	Pier 1	39.52	1.25	1.5
1	G4	Abut 1	39.52	1.25	1.5
1	G4	Pier 1	39.52	1.25	1.5
3	G2	Pier 2	37.19	1.25	1.5
3	G2	Abut 2	37.19	1.25	1.5
3	G3	Pier 2	37.19	1.25	1.5
3	G3	Abut 2	37.19	1.25	1.5
3	G4	Pier 2	37.19	1.25	1.5
3	G4	Abut 2	37.19	1.25	1.5
1	B2	Pier 1	39.52	1.25	1.5
1	B3	Pier 1	39.52	1.25	1.5
1	B4	Pier 1	39.52	1.25	1.5
3	B2	Pier 2	37.19	1.25	1.5
3	B3	Pier 2	37.19	1.25	1.5
3	B4	Pier 2	37.19	1.25	1.5

Governing Beam End Ratings

Governing ratings for only inputs provided in this Beam End Report.

Vehicle	Vehicle Class	Vehicle Config.	Rating	Failure Mechanism	Span	Member	Support	GVW (tons)	Rating Tons	Num. Locations below 1.00
HL-93	INVENTORY	Truck + Lane	0	Stiffened Web - Localized Flex. Buck.	1	G1	Pier 1	N/A	N/A	N/A
HL-93	OPERATING	Truck + Lane	0	Stiffened Web - Localized Flex. Buck.	1	G1	Pier 1	N/A	N/A	N/A
Type 3	AASHTO LEGAL	Axle Load	0	Stiffened Web - Localized Flex. Buck.	1	G1	Pier 1	25	0	3
Type 3S2	AASHTO LEGAL	Axle Load	0	Stiffened Web - Localized Flex. Buck.	1	G1	Pier 1	36	0	3
Type 3-3	AASHTO LEGAL	Axle Load	0	Stiffened Web - Localized Flex. Buck.	1	G1	Pier 1	40	0	3
SU4	AASHTO LEGAL	Axle Load	0	Stiffened Web - Localized Flex. Buck.	1	G1	Pier 1	27	0	6
SU5	AASHTO LEGAL	Axle Load	0	Stiffened Web - Localized Flex. Buck.	1	G1	Pier 1	31	0	7
SU6	AASHTO LEGAL	Axle Load	0	Stiffened Web - Localized Flex. Buck.	1	G1	Pier 1	34.75	0	9
SU7	AASHTO LEGAL	Axle Load	0	Stiffened Web - Localized Flex. Buck.	1	G1	Pier 1	38.75	0	9
H-20	CT LEGAL	Axle Load	0	Stiffened Web - Localized Flex. Buck.	1	G1	Pier 1	36.5	0	3
HS-20	CT LEGAL	Axle Load	0	Stiffened Web - Localized Flex. Buck.	1	G1	Pier 1	40	0	10
CT-L73.0	CT LEGAL	Axle Load	0	Stiffened Web - Localized Flex. Buck.	1	G1	Pier 1	36	0	10
CT-L3S2	CT LEGAL	Axle Load	0	Stiffened Web - Localized Flex. Buck.	1	G1	Pier 1	20	0	3
CT-P76.5	CT PERMIT	Axle Load	0	Stiffened Web - Localized Flex. Buck.	1	G1	Pier 1	38.25	0	10
CT-P120 (6)	CT PERMIT	Axle Load	0	Stiffened Web - Localized Flex. Buck.	1	G1	Pier 1	60	0	12
CT-P140 (7)a	CT PERMIT	Axle Load	0	Stiffened Web - Localized Flex. Buck.	1	G1	Pier 1	70	0	12
CT-P140 (7)b	CT PERMIT	Axle Load	0	Stiffened Web - Localized Flex. Buck.	1	G1	Pier 1	70	0	12
CT-P160 (8)a	CT PERMIT	Axle Load	0	Stiffened Web - Localized Flex. Buck.	1	G1	Pier 1	80	0	12
CT-P160 (8)b	CT PERMIT	Axle Load	0	Stiffened Web - Localized Flex. Buck.	1	G1	Pier 1	80	0	15
CT-P180 (9)	CT PERMIT	Axle Load	0	Stiffened Web - Localized Flex. Buck.	1	G1	Pier 1	90	0	15
CT-P200 (10)	CT PERMIT	Axle Load	0	Stiffened Web - Localized Flex. Buck.	1	G1	Pier 1	100	0	16
CT-P380	CT PERMIT	Axle Load	0	Stiffened Web - Localized Flex. Buck.	1	G1	Pier 1	190	0	5