2014 Load Rating Calculations

Pittsburgh, PA

HWY22MH003

(49 pages)

CDM Smith

CLIENT 118096 | JOB NO. 86795 | COMPUTED BY PLM
PROJECT Fern Hollow K-frame | DATE CHECKED 1/7/14 | DATE 11/20/13
DETAIL Dead Loads | CHECKED BY DJW | PAGE NO. 1

Point Loads

Diaphragm Loads due to 12 [25 (D1 on existing plans)

Loads to be placed on girders & stringers at "even" points in b/w Floor Beams (but NOT @ Pt's "14", "26", "38", or "50")

Load @ Girder => $\frac{1}{2} \times (6'-9") \times (25\ \#/ft) = 84$ lbs [D1-Girder]

Load @ Stringer => $(6'-9") \times (25\ \#/ft) = 169$ lbs [D1-stringer]

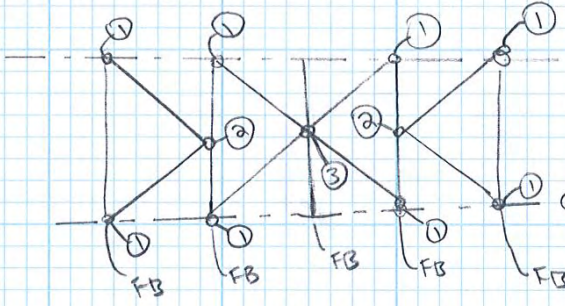
Diaphragm Loads due to 12WF40 (D2 on existing plans)

Loads to be placed on girders & stringers @ pt "14", "26", "38", & "50"

Load @ Girder => $\frac{1}{2} \times (6'-9") \times (40\ \#/ft) = 135\ \#$

Load @ stringer => $(6'-9") \times (40\ \#/ft) = 270\ \#$

Lateral Bracing Dead Load



Length of each lateral brace
$= \sqrt{(27'-8")^2 + (27'-0")^2} = 38.658'$

Weight of each lateral brace
$= (38.658') \times (40.3\ \#/ft) = 1558\ \#$

Location ① (End of each floor Beam) $= \frac{1}{2} \times (1558) = 779\ \#$

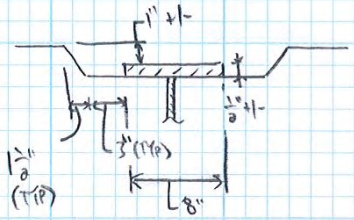
Location ② (Center of each floor Beam) $= 2 \times \frac{1}{2} \times (1558) = 1558\ \#$

Location ③ (Center of Bridge) $= 4 \times \frac{1}{2} \times (1558) = 3116\ \#$

Distributed Loads

On Stringers

Haunch:



$\text{Area} = 2 \times \frac{1}{2} \times (1\frac{1}{2}") \times (1\frac{1}{2}") + (14") \times (1\frac{1}{2}") - (8") \times (\frac{1}{2}") = 19\frac{1}{4}\ in^2$

Haunch DL = $(19\frac{1}{4}\ in^2) \times (150\ lb/ft^3)$

Haunch DL = 20 lb/ft

Also consider 3" of wearing surface, w/ density approx. equal to 150 #/ft³ (see calcs by HDR from 5/30/00).

Wearing surface DL = (6'-9" Tributary Width) × (37.5 psf) [for 3" of wearing] = 253.1 lb/ft

Total DL on Stringer => 273.1 lb/ft = 22.76 lb/in

On Floor Beams

See Existing Plans sheet 16 of 30

Each floor beam has 20 stiffeners that are 4" × 3/8"

$$\frac{(20\ \text{stiffeners}) \times (4") \times (\frac{3}{8}") \times (\text{say } 4'\text{-}3" \text{ deep}) \times 490\ pcf}{54'} = \text{say } 9\ \#/ft = 0.75\ \#/in$$

On Columns

See Existing Plans sheet 14 of 30

Each column has 13 stiffeners, most are 7" × 7/16"

$$\frac{(13\ \text{stiffeners}) \times (7") \times (\frac{7}{16}") \times \frac{1}{2} \times [(3'\text{-}0") + (7'\text{-}0")] \times 490\ pcf}{52'} = 13\ \#/ft \text{ for transverse stiffeners}$$

Each column has 2 longitudinal stiffeners that are $5\frac{1}{2}" \times \frac{1}{2}"$

Long. stiffener = $2 \times (5\frac{1}{2}") \times (\frac{1}{2}") \times 490\ pcf = 19\ \#/ft$

32 #/ft total on columns

= 2.67 #/in

Distributed Loads (cont.)

On Girders

Trans. Stiffeners => Assume $7\frac{1}{2}" \times \frac{1}{2}"$ @ 4' SPA, 8'-6" Dep Avg

$$\Rightarrow \frac{(7\frac{1}{2}") \times (\frac{1}{2}") \times (8'-6") \times 490\ pcf}{4'} = 27\ lb/ft$$

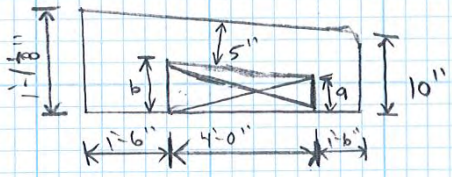
Long. Stiffeners => 3 Top Long Stiffnrs, 4" x 3/8", Total Length Approx 343'
2 Bot Long. Stiffners, Total Length Approx 268'

$$\frac{(4") \times (3/8") \times (343' + 268') \times 490\ pcf}{442'-8"} = 7\ lb/ft$$

Sidewalk Weight

[Note: BMS 2 indicated no reconstruction work has been performed on bridge, so use existing plans for sidewalk]

See sheet 22 of 30



$$Area \cong \frac{1}{2}\left(1'-1\frac{1}{8}" + 10"\right) \times (7'-0") - \left[(4'-0") \times \frac{1}{2}(a+b)\right]$$

$$a = \left(\frac{(1'-1\frac{1}{8}")-10"}{7'-0"}\right) \times (1'-6") + (10") - (5") = 5.67"$$

$$b = \left(\frac{(1'-1\frac{1}{8}")-10"}{7'-0"}\right) \times (5'-6") + (10") - (5") = 7.46"$$

$$Area \cong 4.56\ ft^2$$

$$Sidewalk\ Load = (4.56\ ft^2) \times (150\ pcf) = 684\ lb/ft$$

Railing Weight

[See Sheet 19 of 30]

Tubes => $2 \times (10.5\ \#/ft\ for\ 3 \times 3 \times \frac{5}{16}) + 2 \times (17.2\ \#/ft\ for\ 5 \times 3 \times 3/8) = 55\ lb/ft$

Posts => $\left[(10\frac{1}{2}") \times (11") \times (1\frac{1}{8}") \times 490\ pcf + (22.5\ \#/ft) \times (3'-6")\right] / (7'-3"\ SPA) = 16\ lb/ft$

Curb Guard Weight

Tube => (27.5 #/ft HSS 8x6x5/16) = 27.5 lb/ft

Posts => $\left[(1'-2") \times (7") \times (1") \times 490\ pcf + (23.3\ \#/ft\ HSS\ 8 \times 4 \times \frac{5}{16}) \times 5"\right] / 7'-3"\ SPA = 5\ lb/ft$

Wearing Surface

Wearing Surface DL = $\left[\frac{1}{2}(6'-9"\ trib\ width) - 2'-0"\ to\ curb\right] \times (37.5\ psf) = 51.56\ lb/ft$

Total Dead Load => 873.06 lb/ft = 72.75 lb/in

	The FHWA Asphalt Mixture Expert Task Group developed recommendations that are being considered by the Association of State Highway and Transportation Officials (AASHTO) to provide guidance in asphalt binder grade selection when using RAP. These recommendations are summarized below. • When 15% or less RAP is used: "The binder grade for the mixture is selected for the environment and traffic conditions the same as for a virgin mix. No grade adjustment is made to compensate for the stiffness of the asphalt in the RAP". • When 16 to 25% RAP is used: "The selected binder grade for the new asphalt is one grade lower for both the high and low temperature stiffness than the binder grade required for a virgin asphalt. For example, if the specified binder grade for the virgin mix is a PG 64-22, the required grade for the recycled mix would be a PG 58-28". • When more than 25% RAP is used: "The binder grade for the new asphalt binder is selected using an appropriate blending chart for high and low temperature. The low temperature grade is one grade lower than the binder grade required for a virgin asphalt". Normally, the above guidelines would be applied to both new and existing pavements. If a warranty was applied to a project, a more conservative approach - such as the use of blending charts - might be taken. It is suggested that you contact the local state highway agency and/or asphalt binder supplier for the prevailing local practices.

Top Contents

PLACEMENT	
Q.	Should construction crews be allowed to pave in the rain?
A.	This common question can mean different things to different people because of the wide range of precipitation encompassed by the word "rain." On one end, occasional light sprinkles should not be cause to shut down operations. However, a steady downpour, either light or heavy, should result in cessation of paving activities. To avoid waste, some states have verbiage in their specifications stating that trucks in route to the project when rain begins can be laid at the contractor's risk. Also keep in mind that the surface on which you are paving may influence your decision. Paving on a firm, stable, well-draining crushed aggregate base might be given more leeway than a thin asphalt overlay. Raining or not, new pavement must be placed on a firm, unyielding base. Critical ideas to keep in mind when dealing with rain: • rain will cool the asphalt mix and could make obtaining proper compaction more difficult • the asphalt lifts must be able to properly bond together and moisture can be a hindrance to that bond • puddles overlaid with HMA turn to steam, which may cause stripping (separation of the asphalt binder from the aggregate) - never pave over puddles whether it is raining or not If you temporarily suspend paving operations due to rain, don't forget to: • keep all trucks tarped • construct a vertical-faced construction joint • properly dispose of all material left in the hopper • be careful not to track mud and dirt onto the project Asphalt pavements are designed to last for many years, so don't let a sense of urgency to get the job done quickly allow you to make decisions which could strip years away from the pavement life.
Q.	Does AI have any recommendations of an asphaltic concrete sealer?
A.	Information on fuel-resistant asphalt sealers can be found at www.aaptp.us with Report 05-02.
Q.	How do I determine how much asphalt is required for a project?
A.	Here's the process: 1. Calculate the number of **cubic feet** to be paved. (Remember to convert the thickness to feet - by dividing by 12 inches per 1 foot). 10' x 25' x (4/12)' = 83.3 cubic feet of HMA 2. Asphalt Mixture typically weighs from 142 to 148 pounds per cubic foot (PCF) in-place. Use 148 PCF. 3. Calculate the tonnage needed. (remember to convert from pounds to tons; 2000 pounds per ton). 83.3 cubic feet x 148 PCF = 12328 pounds of mix = 12328 / 2000 tons = 6.1 tons

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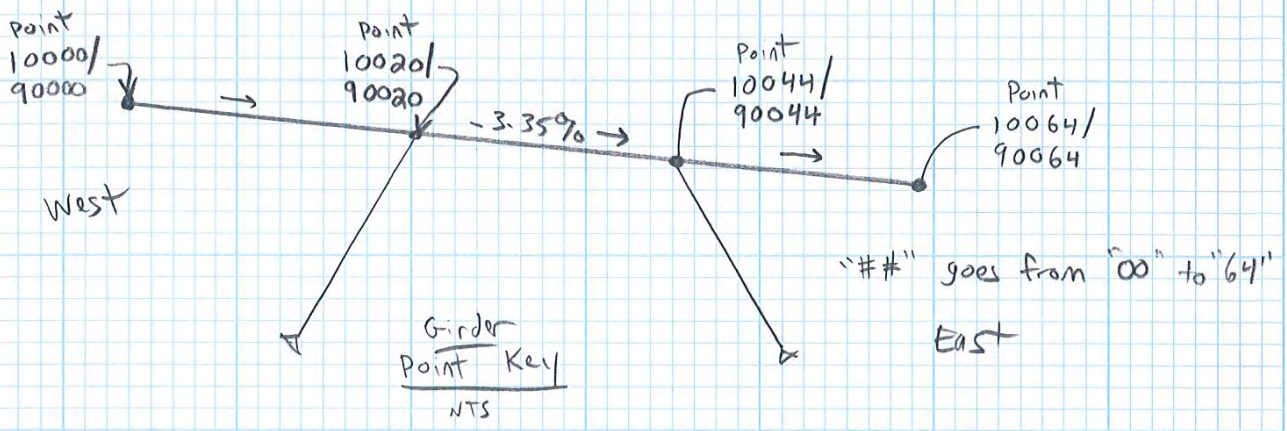
PROJECT Forbes Ave over Fern Hollow | DATE CHECKED 1/7/14 | DATE 12/16/13
DETAIL Geometry Key | CHECKED BY OJW | PAGE NO. 1

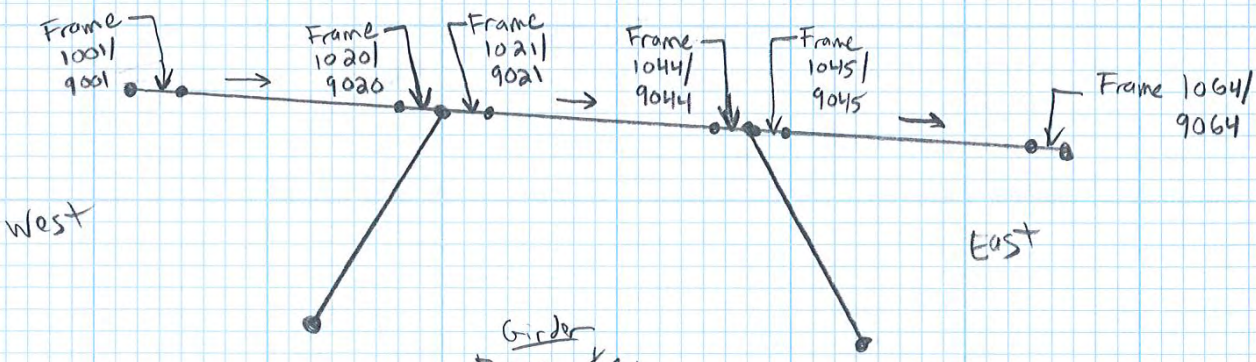
Girders/Stringers

Each Girder/stringer is made up of 65 equally spaced points.
The convention for the points is "X00##", where X is "1" or "9" for the main Girders, & X is "2-8" for the stringers. See sketch below.



Girder Point Key
NTS

Each Girder/stringer is made up of 64 Frame Elements.
The convention for the elements is "X0##", where X is "1" or "9" for the main girders, & X is "2-8" for the stringers.
"##" varies from "01" to "64". See sketch Below

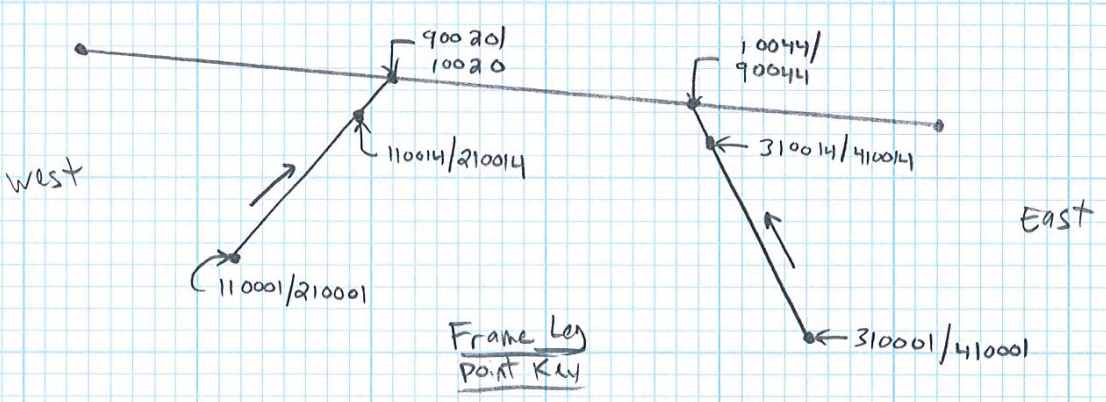


Girder Frame Key
NTS

Frame Legs

Each frame leg is made up of 15 points, as follows: (See sketch below)

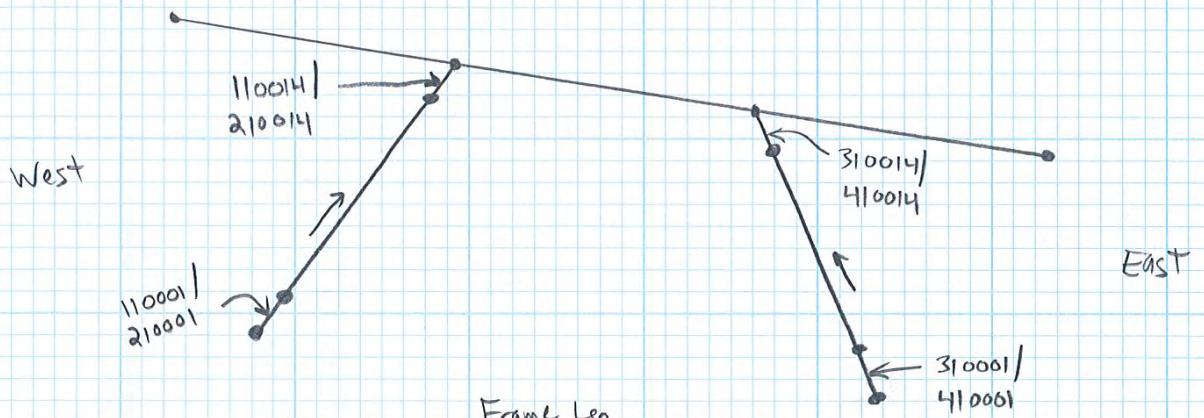
110001 - 110014, 90020
210001 - 210014, 10020
310001 - 310014, 10044
410001 - 410014, 90044



Frame Leg
Point Key

Each Frame Leg is made up of 14 Frame Elements, as follows: (See sketch Below)

110001 - 110014
210001 - 210014
310001 - 310014
410001 - 410014



Frame Leg
Frame Key
NTS

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Cross Bracing

Joint numbers are random.

Frame Element Labels are in the following form: 88XY##

"X" is "1" for Cross-Bracing B/W Legs on west side
"X" is "2" for Cross-Bracing B/W Legs on east side
"Y" is "1" for Lower "X"
"Y" is "2" for Upper "X"
"Y" is "3" for Top Chord
"##" varies from "01" to "20"

Floor Beams

Joint Numbers are random

Frame Element Labels are in the following form: 99NN##

"NN" indicates the corresponding Girder/Stringer Joint Label Location.
"##" varies from "01" to "08"

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DETAIL Section Losses | CHECKED BY DJW | PAGE NO. 1

Section Loss Summary

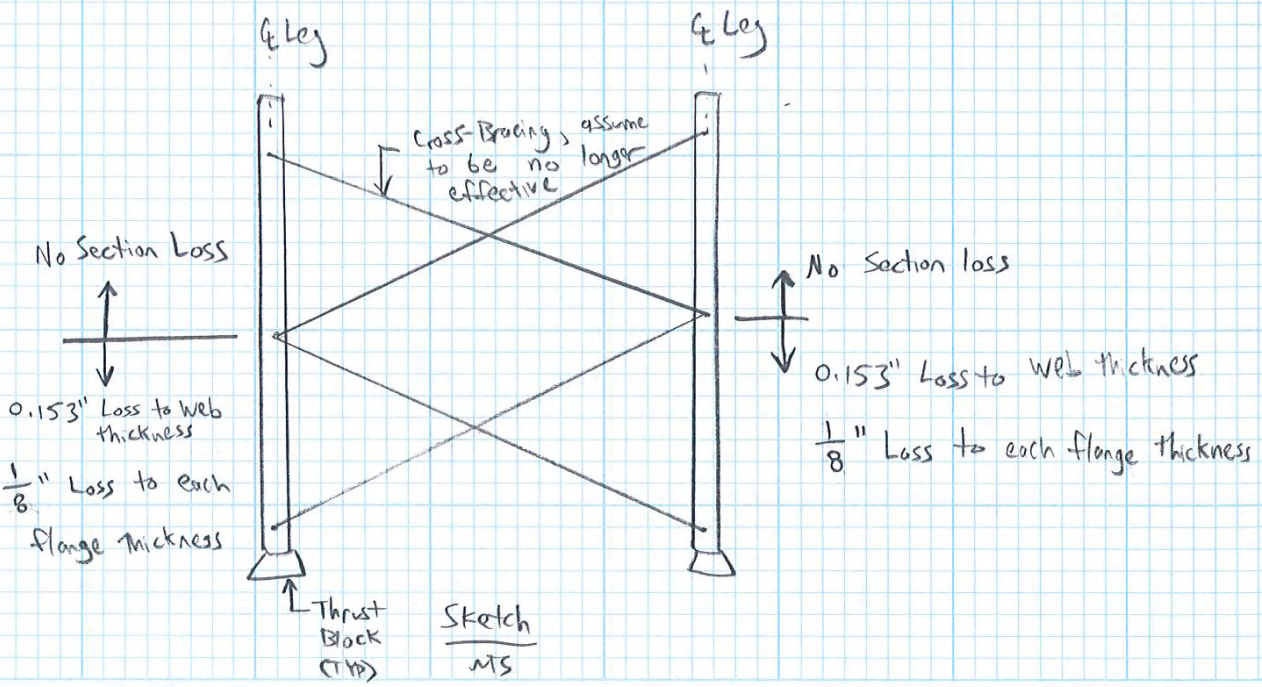
Girders => Moderate corrosion, mostly localized and not global.
Assume no section loss for model.

Cross-Bracing => severe section loss, assume cross bracing is gone.

Frame Legs => Web loss in lower half of legs.

Worst case web loss is a 11"x3" hole
Original thickness = $\frac{1}{2}$"
Web depth ≈ 3'-0"
Find equivalent thickness for web
$(3'\text{-}0")\times(t) = (3'\text{-}0" - 11")\times(\frac{1}{2}")$
$t = 0.347"$, say section loss of 0.153" for lower half of leg

Flange loss - lower half of legs
$\frac{1}{4}$" Losses found on outside face of half-flange width.
Therefore, reduce flange thicknesses by $\frac{1}{8}$" for lower half of leg.



Sketch
MTS

Check if Girder is Compact (10.48.1) (check @ Abut 1)

$$\frac{b'}{t} \le \frac{2055}{\sqrt{F_y}} \quad \text{(AASHTO 10-92)}$$

$$\frac{12"}{1.25"} \le \frac{2055}{\sqrt{50,000}}$$

$9.6 \le 9.19$, No Good, Not Compact!

Check if Girder is Braced Non-Compact (10.48.2)

$$\frac{b'}{t} \le \frac{2200}{\sqrt{F_y}} \quad \text{(AASHTO 10-98)}$$

$$9.6 \le \frac{2200}{\sqrt{50000}}$$

$9.6 \le 9.8$, ok

$$\frac{D_c}{t_w} \le \frac{15,400}{\sqrt{F_y}}$$

$$\frac{36"}{0.375"} \le \frac{15,400}{\sqrt{50000}}$$

$96 \le 68.8$, No Good, Not Braced Non-Compact!

Girder to be designed as Unbraced Section as per 10.48.4

D_c = ½ web Depth (symmetric)

$\lambda = 15,400$ (Equal flanges)

$L_b = 2x(13'-10") = 27'-8" = 332"$ for Girders

C_b = Conservatively say 1. By inspection this is OK, as M_y controls

$M_y = F_y \times S$

M_R is as per Eqn 10-102c

R_b is as per 10-102b, to be cons.

$L_b = 25'-8" = 308"$ for columns (before cons. dering section loss)

$M_o = 0.8 F_y S$ as per Bar 7 Manual

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DETAIL Shear Capacity | CHECKED BY DJW | PAGE NO.

Shear is as per Section 10.48.8

$d_o \cong 48"$ as per existing plans for both girders & columns

$$K = 5 + \frac{5}{\left(\frac{d_o}{D}\right)^2}$$

C is as per 10-115 thru 10-116, depending on limits

use Eqn 10-113 for V_u, $V_u = V_p \left[C + \frac{0.87(1-C)}{\sqrt{1+\left(\frac{d_o}{D}\right)^2}} \right]$

where $V_p = 0.58 F_y D t_w$

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DETAIL Axial Capacity | CHECKED BY DJW | PAGE NO.

See Section 10.54

As per 10.54.1.2, K = 0.75

L_c in strong direction $\cong$ 52'-0" = 624"

L_c in weak direction = 25'-8" = 308", However use 624" for case considering section losses

F_{cr} is as per 10-151 & 10-153

$$F_e = \frac{E\pi^2}{\left(\frac{KL_c}{r}\right)^2}$$

$P_o = F_e A_s$

$P_y = 0.95 A_s F_y$

Rating Factors

OR_1 => Moment

$$OR_1 = \frac{M_u - 1.3\,M_{PL}}{1.3\,M_{LL+I}}$$

OR_2 => Shear

$$OR_2 = \frac{V_u - 1.3\,V_{DL}}{1.3\,V_{LL+I}}$$

OR_3 => overload

$$OR_3 => \frac{M_o - M_{DL}}{M_{LL+I}}$$

OR_4 => Shear Moment Interaction

$$OR_4 => \frac{1.375\,M_u V_u - 1.3\left[M_{DL} V_u + 0.625\,V_{DL} M_u\right]}{1.3\left[M_{LL+I} V_u + 0.625\,V_{LL+I} M_u\right]}$$

OR_5 => Axial

$$OR_5 => \frac{P_u - 1.3\,P_{DL}}{1.3\,P_{LL+I}}$$

OR_6 => Moment - Axial Interaction (10-155)

$$\frac{1.3\,(P_{DL} + OR_6\,P_{LL+I})}{P_u} + \frac{1.3\,(M_{DL} + OR_6\,M_{LL+I})}{M_u\left[1 - \frac{1.3\,(P_{DL} + OR_6\,P_{LL+I})}{P_o}\right]} = 1$$

OR_7 => Moment - Axial Interaction (10-156)

$$OR_7 => \frac{M_p P_y - 1.3\,P_{DL} M_p - 1.3\,M_{DL} P_y}{1.3\,(P_{LL+I} M_p + M_{LL+I} P_y)}$$

Shear-Moment Interaction Proof

As per AASHTO 10.48.8.2

$$\frac{V}{Vu} = 2.2 - 1.6\,\frac{M}{Mu}$$

Let $V = 1.3\left[V_{DL} + OR_4 V_{LL+I}\right]$ & $M = 1.3\left[M_{DL} + OR_4 M_{LL+I}\right]$

$$\frac{1.3\left[V_{DL} + OR_4 V_{LL+I}\right]}{Vu} = 2.2 - 1.6 \times \frac{1.3\left[M_{DL} + OR_4 M_{LL+I}\right]}{Mu}$$

$$1.3\,Mu\left[V_{DL} + OR_4 V_{LL+I}\right] = 2.2\,Vu\,Mu - 1.6\,Vu \times (1.3) \times \left[M_{DL} + OR_4 M_{LL+I}\right]$$

$$1.3 V_{DL} M_u + 1.3 OR_4 V_{LL+I} M_u = 2.2 V_u M_u - 2.08 M_{DL} V_u - 2.08 OR_4 M_{LL+I} V_u$$

$$2.08 OR_4 M_{LL+I} V_u + 1.3 OR_4 V_{LL+I} M_u = 2.2 V_u M_u - 2.08 M_{DL} V_u - 1.3 V_{DL} M_u$$

$$OR_4 \times 2.08 \times \left[M_{LL+I} V_u + 0.625\, V_{LL+I} M_u\right] = 2.2 V_u M_u - 2.08\left(M_{DL} V_u + 0.625 V_{DL} M_u\right)$$

$$OR_4 = \frac{2.2 V_u M_u - 2.08\left(M_{DL} V_u + 0.625 V_{DL} M_u\right)}{2.08\left(M_{LL+I} V_u + 0.625 V_{LL+I} M_u\right)}$$

$$OR_4 = \frac{1.6 \times \left\{1.375 V_u M_u - 1.3\left(M_{DL} V_u + 0.625 V_{DL} M_u\right)\right\}}{1.6 \times 1.3 \times \left(M_{LL+I} V_u + 0.625 V_{LL+I} M_u\right)}$$

$$OR_4 = \frac{1.375 V_u M_u - 1.3\left(M_{DL} V_u + 0.625 V_{DL} M_u\right)}{1.3\left(M_{LL+I} V_u + 0.625 V_{LL+I} M_u\right)}$$

Moment Axial Interaction Proof (10-155)

As per AASHTO 10.54.2.1

$$\frac{P}{P_u} + \frac{MC}{M_u\left(1-\frac{P}{A_s F_e}\right)} \leq 1.0$$

Let $C=1$ (conservative)

$P = 1.3[P_{DL} + OR_6 P_{LL+I}]$

$M = 1.3[M_{DL} + OR_6 M_{LL+I}]$

$P_o = A_s F_e$

$$\frac{1.3(P_{DL}+OR_6 P_{LL+I})}{P_u} + \frac{1.3(M_{DL}+OR_6 M_{LL+I})}{M_u\left(1-\frac{1.3(P_{DL}+OR_6 P_{LL+I})}{P_o}\right)} =$$

$$1.3(P_{DL}+OR_6 P_{LL+I}) \times M_u \times \left(1-\frac{1.3(P_{DL}+OR_6 P_{LL+I})}{P_o}\right) + 1.3(M_{DL}+OR_6 M_{LL+I})P_u = P_u M_u(\sim)$$

$$1.3(P_{DL}+OR_6 P_{LL+I})M_u - \frac{1.69(P_{DL}+OR_6 P_{LL+I})^2 M_u}{P_o} + 1.3(M_{DL}+OR_6 M_{LL+I})P_u = P_u M_u(\sim) \quad [\text{EQN A}]$$

$$1.3 P_{DL} M_u P_o + 1.3 OR_6 P_{LL+I} M_u P_o - 1.69 P_{DL}^2 M_u - 3.38 OR_6 P_{DL} P_{LL+I} M_u - 1.69 OR_6^2 P_{LL+I}^2 M_u + 1.3 M_{DL} P_o P_u + 1.3 OR_6 M_{LL+I} P_u P_o = 1$$

when P_o is very large, $\therefore$ EQN A reduces to:

$$1.3(P_{DL}+OR_6 P_{LL+I})M_u + 1.3(M_{DL}+OR_6 M_{LL+I})P_u = P_u M_u$$

$$1.3 P_{DL} M_u + OR_6 \times 1.3 P_{LL+I} M_u + 1.3 M_{DL} P_u + OR_6 \times 1.3 M_{LL+I} P_u = P_u M_u$$

$$OR_6 \times (1.3) \times (P_{LL+I} M_u + M_{LL+I} P_u) = P_u M_u - 1.3 P_{DL} M_u - 1.3 M_{DL} P_u$$

$$OR_6 = \frac{P_u M_u - 1.3 P_{DL} M_u - 1.3 M_{DL} P_u}{1.3 \times (P_{LL+I} M_u + M_{LL+I} P_u)}$$

Moment Axial Interaction Proof (10-156)

$$\frac{P}{P_y} + \frac{M}{M_p} \leq 1.0$$

Let $P = 1.3[P_{DL} + OR_7 P_{LLI}]$ & $M = 1.3[M_{DL} + OR_7 M_{LLI}]$

$$\frac{1.3P_{DL} + 1.3OR_7 P_{LLI}}{P_y} + \frac{1.3M_{DL} + 1.3OR_7 M_{LLI}}{M_p} = 1$$

$$1.3P_{DL}M_p + 1.3OR_7 P_{LLI}M_p + 1.3M_{DL}P_y + 1.3OR_7 M_{LLI}P_y = M_pP_y$$

$$OR_7 \times [1.3(P_{LLI}M_p + M_{LLI}P_y)] = M_pP_y - 1.3P_{DL}M_p - 1.3M_{DL}P_y$$

$$OR_7 = \frac{M_pP_y - 1.3P_{DL}M_p - 1.3M_{DL}P_y}{1.3(P_{LLI}M_p + M_{LLI}P_y)}$$

3.7.3 Overload Moment Strength of Steel Members

The Overload Moment Strength, M_O, is calculated by the following equation.

$$M_O = 0.8\, F_y\, S \qquad \text{(non-composite)}$$

or

$$M_O = 0.95\, F_y\, S \qquad \text{(composite)}$$

The program calculates the Overload Moment Strength based on the section moduli for tension flange, compression flange, concrete deck and tension reinforcement and uses the appropriate strength to determine the critical rating factor. Refer to AASHTO Manual C.2.5.

3.7.4 Flexural Strength of Concrete Members

The Flexural Strength, M_U, is calculated by the following equations.

$$\Phi = 0.90$$

$$\beta_1 = 0.85 \qquad \text{for } f_c' \le 4000 \text{ psi}$$

$$= 0.85 - 0.05\frac{f_c' - 4000}{1000} \qquad \text{for } f_c' > 4000 \text{ psi}$$

but not less than 0.65

$$aa = \frac{(A_s - A_s')\, f_y}{0.85 f_c'(Es)}$$

if aa $\le$ t $A_{sf} = 0$

$> t \quad A_{sf} = \dfrac{0.85 f_c'(Es - b)(t)}{f_y}$

and

$$aa = \frac{(A_s - A_s' - A_{sf})\, f_y}{0.85 f_c'(Es)}$$

if $\dfrac{A_s - A_s'}{bd} < 0.85\,\beta_1 \left(\dfrac{f_c' d'}{f_y d}\right)\left(\dfrac{87000}{87000 - f_y}\right)$

$A_s' = 0$, recalculate the value of aa based on $A_s' = 0$

$$M_U = \Phi\left[(A_s - A_s' - A_{sf}) f_y \left(d - \frac{aa}{2}\right) + A_{sf} f_y \left(d - \frac{t}{2}\right) + A_s' f_y (d - d')\right]$$

$$SLC = \text{smaller of } SLC_1 \text{ and } SLC_2$$

3.8.1.2 Load Factor Method

The load factor ratings are computed based on the moment strength, shear strength, overload moment strength and moment-shear interaction and by applying appropriate load factors to the dead load and live load effects. The following factors are computed.

Operating Rating

$$OR_1 = \frac{M_U - 1.3S_{LL+I}\left(\frac{M_{DL1}}{S_{DL1}} + \frac{M_{DL2}}{S_{DL2}}\right)}{1.3M_{LL+I}} \quad \text{(non-compact)}$$

$$OR_1 = \frac{M_U - 1.3(M_{DL1} + M_{DL2})}{1.3M_{LL+I}} \quad \text{(compact)}$$

$$OR_2 = \frac{V_U - 1.3(V_{DL1} + V_{DL2})}{1.3V_{LL+I}} \quad \text{(shear)}$$

$$OR_3 = \frac{M_O - S_{LL+I}\left(\frac{M_{DL1}}{S_{DL1}} + \frac{M_{DL2}}{S_{DL2}}\right)}{M_{LL+I}} \quad \text{(overload)}$$

$$OR_4 = \frac{1.375M_UV_U - 1.3\left[S_{LL+I}\left(\frac{M_{DL1}}{S_{DL1}} + \frac{M_{DL2}}{S_{DL2}}\right)V_U + 0.625(V_{DL1} + V_{DL2})(M_U)\right]}{1.3[M_{LL+I}V_U + 0.625V_{LL+I}M_U]} \quad \text{(interaction)}$$

Note: The equation for OR_4 is derived from Eqn. (10-118) given in AASHTO Specifications Article 10.48.8.2 or AASHTO Manual C.2.3, by substituting

$$V = 1.3[V_{DL1} + V_{DL2} + OR_4(V_{LL+I})]$$

$$M = 1.3\left[S_{LL+I}\left(\frac{M_{DL1}}{S_{DL1}} + \frac{M_{DL2}}{S_{DL2}}\right) + OR_4(M_{LL+I})\right]$$

and factoring the OR_4 term out.

$$OR = \text{smaller of } OR_1, OR_2, OR_3 \text{ and } OR_4$$

Inventory Rating

$$IR = \frac{3}{5}(OR)$$

Please note that internally the program first calculates IR and then obtains OR by multiplying IR by 1.67.

The above OR_4 equation was derived from AASHTO Equation (10-117).

Safe Load Capacity as IR Level

When SLC LEVEL is expressed as a percentage of the Inventory Strength.

$$SL = 1 + \frac{SLC\ LEVEL}{100}$$

$$SLC = \frac{IR}{(1 - SL)}$$

Safe Load Capacity as OR Level

When SLC LEVEL is expressed as a percentage of the Operating Strength.

$$SL = \frac{SLC\ LEVEL}{100}$$

$$SLC_1 = \frac{(SL)\,M_U - 1.3\,S_{LL+I}\left(\frac{M_{DL1}}{S_{DL1}} + \frac{M_{DL2}}{S_{DL2}}\right)}{1.3\,M_{LL+I}}$$

$$SLC_2 = \frac{(SL)\,V_U - 1.3(V_{DL1} - V_{DL2})}{1.3\,V_{LL+I}}$$

$$SLC_3 = \frac{(SL)\,M_O - S_{LL+I}\left(\frac{M_{DL1}}{S_{DL1}} + \frac{M_{DL2}}{S_{DL2}}\right)}{M_{LL+I}}$$

$$SLC_4 = \frac{1.375\,(SL)M_U V_U - 1.3\left[S_{LL+I}\left(\frac{M_{DL1}}{S_{DL1}} + \frac{M_{DL2}}{S_{DL2}}\right)V_U + 0.625(V_{DL1} + V_{DL2})(M_U)\right]}{1.3\left(M_{LL+I}V_U + 0.625\,V_{LL+I}M_U\right)}$$

$$SLC = \text{smaller of } SLC_1, SLC_2, SLC_3 \text{ and } SLC_4$$

PENNSYLVANIA DEPARTMENT OF TRANSPORTATION

BAR7
BRIDGE ANALYSIS AND RATING

Form 9 of 10

PA LEGAL LOAD

SPECIAL LIVE LOADING

LANE LOADING

SP LL NO	NUMBER OF AXLES	3% INCR	UNIFORM LANE LOAD	CONC LOAD MOMENT	CONC LOAD SHEAR	GAGE DISTANCE	PASSING DISTANCE	VARY LAST	MAX AXLE DIST
1	2	4	5	9	14	19	22	25	26
1	3								

DISTANCE FROM AXLE TO AXLE (FEET)

TRUCK LOAD

AXLE LOAD (Kips)	DIST	AXLE LOAD	DIST	AXLE LOAD	DIST	AXLE LOAD	DIST	AXLE LOAD	DIST	AXLE LOAD	DIST	AXLE LOAD	DIST	AXLE LOAD	DIST
1	5	8	12	15	19	22	26	29	33	36	40	43	47	50	54
16	14	21.4	4	21.4											

Note: Both the Lane Load and the Truck Load must be described as a set for each of the special live loads.

Figure 5.1.9 Input Form 9

PENNSYLVANIA DEPARTMENT OF TRANSPORTATION

BAR7
BRIDGE ANALYSIS AND RATING

Form 9 of 10

AASHTO TYPE 3

SPECIAL LIVE LOADING

LANE LOADING

SP LL NO	NUMBER OF AXLES	3% INCR	UNIFORM LANE LOAD	CONC LOAD MOMENT	CONC LOAD SHEAR	GAGE DISTANCE	PASSING DISTANCE	VARY LAST	MAX AXLE DIST
1	2	4	5	9	14	19	22	25	26
1	3								

DISTANCE FROM AXLE TO AXLE (FEET)

TRUCK LOAD

AXLE LOAD (kips)	DIST	AXLE LOAD	DIST	AXLE LOAD	DIST	AXLE LOAD	DIST	AXLE LOAD	DIST	AXLE LOAD	DIST	AXLE LOAD	DIST	AXLE LOAD	DIST	AXLE LOAD	DIST
1	5	8	12	15	19	22	26	29	33	36	40	43	47	50	54		
16.	15.	17.	4.	17.													

Note: Both the Lane Load and the Truck Load must be described as a set for each of the special live loads.

Figure 5.1.9 Input Form 9

*Dimensions for 21 WF 55 below are essentially the same as W21x55 in AISC 13th Edition

Table 2.2.1 Dimensions and Primary Properties -- Steel Sections 1953-1970

Desig-nation	Wt. per ft lb	Area A in.2	Depth d in.	Depth d in.	Web Thickness tw in.	Web Thickness tw in.	Web Thickness tw/2 in.	Flange Width bf in.	Flange Width bf in.	Flange Thickness tf in.	Flange Thickness tf in.	Distance T in.	Distance k in.	Distance k1 in.
W33x240	240	70.60	33.50	33 1/2	0.830	13/16	7/16	15.865	15 7/8	1.400	1 3/8	28 5/8	2 7/16	1 3/8
W33x220	220	64.80	33.25	33 1/4	0.775	3/4	3/8	15.810	15 3/4	1.275	1 1/4	28 5/8	2 5/16	1 3/8
W33x200	200	58.90	33.00	33	0.715	11/16	3/8	15.750	15 3/4	1.150	1 1/8	28 5/8	2 3/16	1 3/8
W30x210	210	61.90	30.38	30 3/8	0.775	3/4	3/8	15.105	15 1/8	1.315	1 5/16	25 3/4	2 5/16	1 5/16
W30x190	190	56.00	30.12	30 1/8	0.710	11/16	3/8	15.040	15	1.185	1 3/16	25 3/4	2 3/16	1 5/16
W30x172	172	50.70	29.88	29 7/8	0.655	5/8	5/16	14.985	15	1.065	1 1/16	25 3/4	2 1/16	1 1/4
W27x177	177	52.20	27.31	27 1/4	0.725	3/4	3/8	14.090	14 1/8	1.190	1 3/16	23	2 1/8	1 1/4
W27x160	160	47.10	27.08	27 1/8	0.658	11/16	5/16	14.023	14	1.075	1 1/16	23	2 1/16	1 1/4
W27x145	145	42.70	26.88	26 7/8	0.600	5/8	5/16	13.965	14	0.975	1	23	1 15/16	1 3/16
W24x160	160	47.10	24.72	24 3/4	0.656	5/8	5/16	14.091	14 1/8	1.135	1 1/8	20 7/8	1 15/16	1 1/16
W24x145	145	42.70	24.49	24 1/2	0.608	5/8	5/16	14.043	14	1.020	1	20 7/8	1 13/16	1 1/16
W24x130	130	38.30	24.25	24 1/4	0.565	9/16	5/16	14.000	14	0.900	7/8	20 7/8	1 11/16	1
W24x120	120	35.40	24.31	24 1/4	0.556	9/16	1/4	12.088	12 1/8	0.930	15/16	20 7/8	1 11/16	1
W24x110	110	32.50	24.16	24 1/8	0.510	1/2	1/4	12.042	12	0.855	7/8	20 7/8	1 5/8	1
W24x100	100	29.50	24.00	24	0.468	7/16	1/4	12.000	12	0.775	3/4	20 7/8	1 9/16	15/16
W24x61	61	18.00	23.72	23 3/4	0.419	7/16	3/16	7.023	7	0.591	9/16	21	1 3/8	15/16
21WF55	55	16.18	20.80	20 3/4	0.375	3/8	3/16	8.215	8 1/4	0.522	1/2	18 5/8	1 3/16	3/4
W18x114	114	33.50	18.48	18 1/2	0.595	5/8	5/16	11.833	11 7/8	0.991	1	15 1/8	1 11/16	15/16
W18x105	105	30.90	18.32	18 3/8	0.554	9/16	1/4	11.792	11 3/4	0.911	15/16	15 1/8	1 5/8	15/16
W18x96	96	28.20	18.16	18 1/8	0.512	1/2	1/4	11.750	11 3/4	0.831	13/16	15 1/8	1 1/2	7/8
W18x85	85	25.00	18.32	18 3/8	0.526	1/2	1/4	8.838	8 7/8	0.911	15/16	15 1/8	1 5/8	7/8
W18x77	77	22.70	18.16	18 1/8	0.475	1/2	1/4	8.787	8 3/4	0.831	13/16	15 1/8	1 1/2	7/8
W18x70	70	20.60	18.00	18	0.438	7/16	1/4	8.750	8 3/4	0.751	3/4	15 1/8	1 7/16	7/8
W18x64	64	18.90	17.87	17 7/8	0.403	3/8	3/16	8.715	8 3/4	0.686	11/16	15 1/8	1 3/8	13/16
W18x45	45	13.20	17.86	17 7/8	0.335	5/16	3/16	7.477	7 1/2	0.499	1/2	15 7/8	1	5/8
W16x96	96	28.20	16.32	16 3/8	0.535	9/16	1/4	11.533	11 1/2	0.875	7/8	13 1/8	1 5/8	7/8
W16x88	88	25.90	16.16	16 1/8	0.504	1/2	1/4	11.502	11 1/2	0.795	13/16	13 1/8	1 1/2	7/8
W16x78	78	23.00	16.32	16 3/8	0.529	1/2	1/4	8.586	8 5/8	0.875	7/8	13 1/8	1 5/8	7/8
W16x71	71	20.90	16.16	16 1/8	0.486	1/2	1/4	8.543	8 1/2	0.795	13/16	13 1/8	1 1/2	7/8
W16x64	64	18.80	16.00	16	0.443	7/16	1/4	8.500	8 1/2	0.715	11/16	13 1/8	1 7/16	7/8
W16x58	58	17.10	15.86	15 7/8	0.407	7/16	3/16	8.464	8 1/2	0.645	5/8	13 1/8	1 3/8	13/16
W14x314	314	92.30	17.19	17 1/4	1.415	1 7/16	11/16	16.235	16 1/4	2.283	2 5/16	11 1/4	3	1 5/16
W14x287	287	84.40	16.81	16 3/4	1.310	1 5/16	5/8	16.130	16 1/8	2.093	2 1/16	11 1/4	2 3/4	1 5/16
W14x264	264	77.60	16.50	16 1/2	1.205	1 3/16	5/8	16.025	16	1.938	1 15/16	11 1/4	2 5/8	1 1/4
W14x246	246	72.30	16.25	16 1/4	1.125	1 1/8	9/16	15.945	16	1.813	1 13/16	11 1/4	2 1/2	1 3/16
W14x237	237	69.70	16.12	16 1/8	1.090	1 1/16	9/16	15.910	15 7/8	1.748	1 3/4	11 1/4	2 7/16	1 3/16
W14x228	228	67.10	16.00	16	1.045	1 1/16	1/2	15.865	15 7/8	1.688	1 11/16	11 1/4	2 3/8	1 1/8
W14x219	219	64.40	15.87	15 7/8	1.005	1	1/2	15.825	15 7/8	1.623	1 5/8	11 1/4	2 5/16	1 1/8
W14x202	202	59.40	15.63	15 3/4	0.930	15/16	7/16	15.750	15 3/4	1.503	1 1/2	11 1/4	2 3/16	1 1/8
W14x184	184	54.10	15.38	15 3/8	0.840	13/16	7/16	15.660	15 5/8	1.378	1 3/8	11 1/4	2 1/16	1 1/16
W14x167	167	49.10	15.12	15 1/8	0.780	3/4	3/8	15.600	15 5/8	1.248	1 1/4	11 1/4	1 15/16	1
W14x158	158	46.50	15.00	15	0.730	3/4	3/8	15.550	15 1/2	1.188	1 3/16	11 1/4	1 7/8	1
W14x150	150	44.10	14.88	14 7/8	0.695	11/16	3/8	15.515	15 1/2	1.128	1 1/8	11 1/4	1 13/16	1
W14x142	142	41.80	14.75	14 3/4	0.680	11/16	5/16	15.500	15 1/2	1.063	1 1/16	11 1/4	1 3/4	1
W14x320	320	94.10	16.81	16 3/4	1.890	1 7/8	15/16	16.710	16 3/4	2.093	2 1/16	11 1/4	2 3/4	1 9/16
W14x136	136	40.00	14.75	14 3/4	0.660	11/16	5/16	14.740	14 3/4	1.063	1 1/16	11 1/4	1 3/4	15/16
W14x127	127	37.30	14.62	14 5/8	0.610	5/8	5/16	14.690	14 3/4	0.998	1	11 1/4	1 11/16	15/16
W14x119	119	35.00	14.50	14 1/2	0.570	9/16	5/16	14.650	14 5/8	0.938	15/16	11 1/4	1 5/8	15/16
W14x111	111	32.70	14.37	14 3/8	0.540	9/16	1/4	14.620	14 5/8	0.873	7/8	11 1/4	1 9/16	7/8
W14x103	103	30.30	14.25	14 1/4	0.495	1/2	1/4	14.575	14 5/8	0.813	13/16	11 1/4	1 1/2	7/8
W14x95	95	27.90	14.12	14 1/8	0.465	7/16	1/4	14.545	14 1/2	0.748	3/4	11 1/4	1 7/16	7/8
W14x87	87	25.60	14.00	14	0.420	7/16	3/16	14.500	14 1/2	0.688	11/16	11 1/4	1 3/8	13/16
W14x84	84	24.70	14.18	14 1/8	0.451	7/16	1/4	12.023	12	0.778	3/4	11 1/4	1 7/16	7/8
W14x78	78	22.90	14.06	14	0.428	7/16	3/16	12.000	12	0.718	11/16	11 1/4	1 3/8	7/8
W12x161	161	47.40	13.88	13 7/8	0.905	7/8	7/16	12.515	12 1/2	1.486	1 1/2	9 1/2	2 3/16	1 1/16
W12x133	133	39.10	13.38	13 3/8	0.755	3/4	3/8	12.365	12 3/8	1.236	1 1/4	9 1/2	1 15/16	1
W12x99	99	29.10	12.75	12 3/4	0.582	9/16	5/16	12.192	12 1/4	0.921	15/16	9 1/2	1 5/8	15/16
W12x92	92	27.10	12.62	12 5/8	0.545	9/16	1/4	12.155	12 1/8	0.856	7/8	9 1/2	1 9/16	7/8
W12x85	85	25.00	12.50	12 1/2	0.495	1/2	1/4	12.105	12 1/8	0.796	13/16	9 1/2	1 1/2	7/8
W12x36	36	10.60	12.24	12 1/4	0.305	5/16	1/8	6.565	6 5/8	0.540	9/16	10 1/8	1 1/16	5/8
W12x31	31	9.13	12.09	12 1/8	0.265	1/4	1/8	6.525	6 1/2	0.465	7/16	10 1/8	1	5/8
W12x27	27	7.95	11.96	12	0.237	1/4	1/8	6.497	6 1/2	0.400	3/8	10 1/8	15/16	9/16
W12x16.5	16.5	4.87	12.00	12	0.230	1/4	1/8	4.000	4	0.269	1/4	10 3/8	13/16	9/16
W10x89	89	26.20	10.88	10 7/8	0.615	5/8	5/16	10.275	10 1/4	0.998	1	7 3/4	1 9/16	13/16

CDM Smith

CLIENT 118096 JOB NO. _____ COMPUTED BY RM
PROJECT Forbes Ave over Fern Hollow DATE CHECKED 1/10/14 DATE 1/10/14
DETAIL Ratings Summary CHECKED BY DSW PAGE NO. _____

Rating Summary

Girder

Truck	OR	Controlling Case	Inv. (tons)	Operating (tons)	SLC (tons)
H20 Truck	4.50	↑	54	90	72
H20 Lane	2.56	OR_6, Moment-Axial,	30	51	40
HS 20	2.56	Mid Span 2	55	92	73
ML-80	2.41	↓	52	88	70
TK-527	2.32		55	92	73

Columns

Truck	OR	Controlling Case	Inv. (tons)	Operating (tons)	SLC (tons)
H20 Truck	1.79	↑	21	35	28
H20 Lane	0.92	OR_2, Shear,	10	18	14
HS 20	0.92	$\frac{1}{3}$ Height,	19	33	26
ML-80	0.95	18' from BOT	20	34	27
TK-527	0.88	↓	21	35	28

CDM Smith

CLIENT ____ JOB NO. — COMPUTED BY OJW

PROJECT Forbes Ave. over Fern Hollow DATE CHECKED — DATE 1/10/14

DETAIL Ratings for posting. CHECKED BY — PAGE NO. ____

Phone conversation with Will Lynes on 1/10/2014

with the H 20 truck Loading having an OR of 1.79, The AAshto Load rating over a 1 and the PA Legal Load over 1 The H20 will not controle the posting.

Post The Bridge off of the Lane Load for The HS20 at 26 tons.

CDM Smith

Client: City of Pittsburgh
Project: Forbes Ave over Fern Hollow
Detail: Girder Section Properties
By: PLM 1/9/14
Chk: DJW 1/9/14

Web Depth at Abut = 72 in
Web Depth at Leg = 132 in
Web Depth at CL Bridge = 72 in

Abut 1 Location = 0 in
Leg 1 Location = 1660 in
CL Bridge Location = 2656 in
Leg 2 Location = 3652 in
Abut 2 Location = 5312 in

Point #	Frame Sec	Location	Frame #	Actual Web Depth (in)	Actual Web Thickness (in)	Actual Top Flange Width (in)	Actual Top Flange Thickness (in)	Actual Bot Flange Width (in)	Actual Bot Flange Thickness (in)	Actual Total Depth (in)	Fy (psi)
10000	g1	0	Begin 1001	72.00	0.375	24	1.25	24	1.25	74.50	50000
10001	g2	83	End 1001	75.00	0.375	24	1.25	24	1.25	77.50	50000
10002	g3	166	End 1002	78.00	0.375	24	1.25	24	1.25	80.50	50000
	g4a	216	Mid 1003	79.81	0.375	24	1.25	24	1.25	82.31	50000
	g5a	216	Mid 1003	79.81	0.375	24	1.875	24	1.875	83.56	50000
10003	g5	249	End 1003	81.00	0.375	24	1.875	24	1.875	84.75	50000
10004	g6	332	End 1004	84.00	0.375	24	1.875	24	1.875	87.75	50000
10005	g7	415	End 1005	87.00	0.375	24	1.875	24	1.875	90.75	50000
10006	g8	498	End 1006	90.00	0.375	24	1.875	24	1.875	93.75	50000
10007	g9	581	End 1007	93.00	0.375	24	1.875	24	1.875	96.75	50000
10008	g10	664	End 1008	96.00	0.375	24	1.875	24	1.875	99.75	50000
10009	g11	747	End 1009	99.00	0.375	24	1.875	24	1.875	102.75	50000
10010	g12	830	End 1010	102.00	0.375	24	1.875	24	1.875	105.75	50000
	g12a	844	Mid 1011	102.51	0.375	24	1.875	24	1.875	106.26	50000
	g13a	844	Mid 1011	102.51	0.375	24	1.25	24	1.25	105.01	50000
10011	g14	913	End 1011	105.00	0.375	24	1.25	24	1.25	107.50	50000
10012	g15	996	End 1012	108.00	0.375	24	1.25	24	1.25	110.50	50000
10013	g16	1079	End 1013	111.00	0.375	24	1.25	24	1.25	113.50	50000
	g16a	1144	Mid 1014	113.35	0.375	24	1.25	24	1.25	115.85	50000
	g17a	1144	Mid 1014	113.35	0.4375	24	1.25	24	1.25	115.85	50000
10014	g18	1162	End 1014	114.00	0.4375	24	1.25	24	1.25	116.50	50000
10015	g19	1245	End 1015	117.00	0.4375	24	1.25	24	1.25	119.50	50000
10016	g20	1328	End 1016	120.00	0.4375	24	1.25	24	1.25	122.50	50000
	g20a	1336	Mid 1017	120.29	0.4375	24	1.25	24	1.25	122.79	50000
	g21a	1336	Mid 1017	120.29	0.4375	24	2.25	24	2.25	124.79	50000
10017	g22	1411	End 1017	123.00	0.4375	24	2.25	24	2.25	127.50	50000
	g22a	1480	Mid 1018	125.49	0.4375	24	2.25	24	2.25	129.99	50000
	g23a	1480	Mid 1018	125.49	0.8125	24	3.125	24	3.125	131.74	50000
10018	g24	1494	End 1018	126.00	0.8125	24	3.125	24	3.125	132.25	50000
10019	g25	1577	End 1019	129.00	0.8125	24	3.125	24	3.125	135.25	50000
10020	g26	1660	End 1020	132.00	0.8125	24	3.125	24	3.125	138.25	50000
10021	g27	1743	End 1021	127.00	0.8125	24	3.125	24	3.125	133.25	50000
10022	g28	1826	End 1022	122.00	0.8125	24	3.125	24	3.125	128.25	50000
	g28a	1888	Mid 1023	118.27	0.8125	24	3.125	24	3.125	124.52	50000
	g29a	1888	Mid 1023	118.27	0.5	24	2.5	24	2.5	123.27	50000
10023	g30	1909	End 1023	117.00	0.5	24	2.5	24	2.5	122.00	50000
10024	g31	1992	End 1024	112.00	0.5	24	2.5	24	2.5	117.00	50000
10025	g32	2075	End 1025	107.00	0.5	24	2.5	24	2.5	112.00	50000
	g32a	2104	Mid 1026	105.25	0.5	24	2.5	24	2.5	110.25	50000
	g33a	2104	Mid 1026	105.25	0.5	24	1.25	24	1.25	107.75	50000
10026	g34	2158	End 1026	102.00	0.5	24	1.25	24	1.25	104.50	50000
10027	g35	2241	End 1027	97.00	0.5	24	1.25	24	1.25	99.50	50000
	g35a	2320	Mid 1028	92.24	0.5	24	1.25	24	1.25	94.74	50000
	g36a	2320	Mid 1028	92.24	0.5	24	2.125	24	2.125	96.49	50000
10028	g37	2324	End 1028	92.00	0.5	24	2.125	24	2.125	96.25	50000
	g37a	2356	Mid 1029	90.07	0.5	24	2.125	24	2.125	94.32	50000
	g38a	2356	Mid 1029	90.07	0.375	24	2.125	24	2.125	94.32	50000
10029	g38	2407	End 1029	87.00	0.375	24	2.125	24	2.125	91.25	50000
10030	g39	2490	End 1030	82.00	0.375	24	2.125	24	2.125	86.25	50000
10031	g40	2573	End 1031	77.00	0.375	24	2.125	24	2.125	81.25	50000
10032	g41	2656	End 1032	72.00	0.375	24	2.125	24	2.125	76.25	50000
10033	g40	2739	End 1033	77.00	0.375	24	2.125	24	2.125	81.25	50000
10034	g39	2822	End 1034	82.00	0.375	24	2.125	24	2.125	86.25	50000
10035	g38	2905	End 1035	87.00	0.375	24	2.125	24	2.125	91.25	50000
	g38a	2956	Mid 1036	90.07	0.375	24	2.125	24	2.125	94.32	50000
	g37a	2956	Mid 1036	90.07	0.5	24	2.125	24	2.125	94.32	50000
10036	g37	2988	End 1036	92.00	0.5	24	2.125	24	2.125	96.25	50000
	g36a	2992	Mid 1037	92.24	1.5	24	2.125	24	2.125	96.49	50000
	g35a	2992	Mid 1037	92.24	2.5	24	1.25	24	1.25	94.74	50000
10037	g35	3071	End 1037	97.00	0.5	24	1.25	24	1.25	99.50	50000
10038	g34	3154	End 1038	102.00	0.5	24	1.25	24	1.25	104.50	50000
	g33a	3208	Mid 1039	105.25	0.5	24	1.25	24	1.25	107.75	50000
	g32a	3208	Mid 1039	105.25	0.5	24	2.5	24	2.5	110.25	50000
10039	g32	3237	End 1039	107.00	0.5	24	2.5	24	2.5	112.00	50000
10040	g31	3320	End 1040	112.00	0.5	24	2.5	24	2.5	117.00	50000
10041	g30	3403	End 1041	117.00	0.5	24	2.5	24	2.5	122.00	50000
	g29a	3424	Mid 1042	118.27	0.5	24	2.5	24	2.5	123.27	50000
	g28a	3424	Mid 1042	118.27	0.8125	24	3.125	24	3.125	124.52	50000
10042	g28	3486	End 1042	122.00	0.8125	24	3.125	24	3.125	128.25	50000
10043	g27	3569	End 1043	127.00	0.8125	24	3.125	24	3.125	133.25	50000
10044	g26	3652	End 1044	132.00	0.8125	24	3.125	24	3.125	138.25	50000
10045	g25	3735	End 1045	129.00	0.8125	24	3.125	24	3.125	135.25	50000
10046	g24	3818	End 1046	126.00	0.8125	24	3.125	24	3.125	132.25	50000
	g23a	3832	Mid 1047	125.49	0.8125	24	3.125	24	3.125	131.74	50000

CDM Smith

Client: City of Pittsburgh
Project: Forbes Ave over Fern Hollow
Detail: Girder Section Properties

By: PLM 1/9/14
Chk: DJW 1/9/14

Web Depth at Abut =	72	in	
Web Depth at Leg =	132	in	
Web Depth at CL Bridge =	72	in	
Abut 1 Location =	0	in	
Leg 1 Location =	1660	in	
CL Bridge Location =	2656	in	
Leg 2 Location =	3652	in	
Abut 2 Location =	5312	in	

Point #	Frame Sec	Location	Frame #	Actual Web Depth (in)	Actual Web Thickness (in)	Actual Top Flange Width (in)	Actual Top Flange Thickness (in)	Actual Bot Flange Width (in)	Actual Bot Flange Thickness (in)	Actual Total Depth (in)	Fy (psi)
	g22a	3832	Mid 1047	125.49	0.4375	24	2.25	24	2.25	129.99	50000
10047	g22	3901	End 1047	123.00	0.4375	24	2.25	24	2.25	127.50	50000
	g21a	3976	Mid 1048	120.29	0.4375	24	2.25	24	2.25	124.79	50000
	g20a	3976	Mid 1048	120.29	0.4375	24	1.25	24	1.25	122.79	50000
10048	g20	3984	End 1048	120.00	0.4375	24	1.25	24	1.25	122.50	50000
10049	g19	4067	End 1049	117.00	0.4375	24	1.25	24	1.25	119.50	50000
10050	g18	4150	End 1050	114.00	0.4375	24	1.25	24	1.25	116.50	50000
	g17a	4168	Mid 1051	113.35	0.4375	24	1.25	24	1.25	115.85	50000
	g16a	4168	Mid 1051	113.35	0.375	24	1.25	24	1.25	115.85	50000
10051	g16	4233	End 1051	111.00	0.375	24	1.25	24	1.25	113.50	50000
10052	g15	4316	End 1052	108.00	0.375	24	1.25	24	1.25	110.50	50000
10053	g14	4399	End 1053	105.00	0.375	24	1.25	24	1.25	107.50	50000
	g13a	4468	Mid 1054	102.51	0.375	24	1.25	24	1.25	105.01	50000
	g12a	4468	Mid 1054	102.51	0.375	24	1.875	24	1.875	106.26	50000
10054	g12	4482	End 1054	102.00	0.375	24	1.875	24	1.875	105.75	50000
10055	g11	4565	End 1055	99.00	0.375	24	1.875	24	1.875	102.75	50000
10056	g10	4648	End 1056	96.00	0.375	24	1.875	24	1.875	99.75	50000
10057	g9	4731	End 1057	93.00	0.375	24	1.875	24	1.875	96.75	50000
10058	g8	4814	End 1058	90.00	0.375	24	1.875	24	1.875	93.75	50000
10059	g7	4897	End 1059	87.00	0.375	24	1.875	24	1.875	90.75	50000
10060	g6	4980	End 1060	84.00	0.375	24	1.875	24	1.875	87.75	50000
10061	g5	5063	End 1061	81.00	0.375	24	1.875	24	1.875	84.75	50000
	g5a	5096	Mid 1062	79.81	0.375	24	1.875	24	1.875	83.56	50000
	g4a	5096	Mid 1062	79.81	0.375	24	1.25	24	1.25	82.31	50000
10062	g3	5146	End 1062	78.00	0.375	24	1.25	24	1.25	80.50	50000
10063	g2	5229	End 1063	75.00	0.375	24	1.25	24	1.25	77.50	50000
10064	g1	5312	End 1064	72.00	0.375	24	1.25	24	1.25	74.50	50000

CDM Smith

Client: City of Pittsburgh
Project: Forbes Ave over Fern Hollow
Detail: Girder Section Properties
By: PLM 1/9/14
Chk:

																Moment Capacity								
Point #	Frame Sec	Location	Frame #	Dc (in)	λ	Total Area (in^2)	Flange Area (in^2)	I_{33} (in^4)	S_{33} (in^3)	I_{22} (in^4)	S_{22} (in^3)	I (in^4)	Z (in^3)	L_b (in)	C_b	I_{yc} (in^4)	M_D (k-ft)	M_P (k-ft)	M_y (k-ft)	M_{r1} (k-ft)	M_r (k-ft)	R_{b1}	R_b	M_n (k-ft)
10000	g1	0	Begin 1001	36.00	15400	87.000	30	92155.25	2473.97	2880.32	240.03	32.52	2583.50	332	1	1440	8246.6	11181.3	10308.2	23591.0	10308.2	0.976	0.976	10056.5
10001	g2	83	End 1001	37.50	15400	88.125	30	100402.34	2591.02	2880.33	240.03	32.57	2814.84	332	1	1440	8636.8	11728.5	10796.0	24510.1	10796.0	0.971	0.971	10480.9
10002	g3	166	End 1002	39.00	15400	89.250	30	109046.00	2709.22	2880.34	240.03	32.62	2947.88	332	1	1440	9030.7	12282.8	11288.4	25430.1	11288.4	0.966	0.966	10901.8
	g4a	216	Mid 1003	39.90	15400	89.928	30	114446.54	2780.96	2880.35	240.03	32.65	3028.83	332	1	1440	9269.9	12620.1	11587.3	25984.9	11587.3	0.963	0.963	11153.4
	g5a	216	Mid 1003	39.90	15400	119.928	45	166030.68	3974.06	4320.35	360.03	106.87	4272.81	332	1	2160	13246.9	17803.4	16558.6	40184.4	16558.6	0.975	0.975	16145.2
10003	g5	249	End 1003	40.50	15400	120.375	45	171169.88	4039.41	4320.36	360.03	106.89	4344.47	332	1	2160	13464.7	18102.0	16830.9	40725.5	16830.9	0.974	0.974	16386.3
10004	g6	332	End 1004	42.00	15400	121.500	45	184474.97	4204.56	4320.37	360.03	106.95	4525.88	332	1	2160	14015.2	18857.8	17519.0	42088.1	17519.0	0.970	0.970	16990.1
10005	g7	415	End 1005	43.50	15400	122.625	45	198326.81	4370.84	4320.38	360.03	107.00	4708.97	332	1	2160	14569.5	19620.7	18211.8	43453.1	18211.8	0.966	0.966	17589.6
10006	g8	498	End 1006	45.00	15400	123.750	45	212730.47	4538.25	4320.40	360.03	107.05	4893.75	332	1	2160	15127.5	20390.6	18909.4	44820.4	18909.4	0.962	0.962	18184.3
10007	g9	581	End 1007	46.50	15400	124.875	45	227691.00	4706.79	4320.41	360.03	107.10	5080.22	332	1	2160	15689.3	21167.6	19611.6	46189.6	19611.6	0.957	0.957	18773.7
10008	g10	664	End 1008	48.00	15400	126.000	45	243213.47	4876.46	4320.42	360.04	107.16	5268.38	332	1	2160	16254.9	21951.6	20318.6	47560.7	20318.6	0.953	0.953	19357.4
10009	g11	747	End 1009	49.50	15400	127.125	45	259302.94	5047.26	4320.44	360.04	107.21	5458.22	332	1	2160	16824.2	22742.6	21030.2	48933.4	21030.2	0.948	0.948	19935.0
10010	g12	830	End 1010	51.00	15400	128.250	45	275964.47	5219.19	4320.45	360.04	107.26	5649.75	332	1	2160	17397.3	23540.6	21746.6	50307.7	21746.6	0.943	0.943	20505.8
	g12a	844	Mid 1011	51.25	15400	128.440	45	278831.59	5248.30	4320.45	360.04	107.27	5682.22	332	1	2160	17494.3	23675.9	21867.9	50539.7	21867.9	0.942	0.942	20601.3
	g13a	844	Mid 1011	51.25	15400	98.440	30	195146.27	3716.86	2880.45	240.04	33.05	4097.76	332	1	1440	12389.5	17074.0	15486.9	32974.8	15486.9	0.913	0.913	14141.4
10011	g14	913	End 1011	52.50	15400	99.375	30	205519.53	3823.62	2880.46	240.04	33.10	4221.09	332	1	1440	12745.4	17587.9	15931.7	33744.7	15931.7	0.907	0.907	14444.4
10012	g15	996	End 1012	54.00	15400	100.500	30	218407.25	3953.07	2880.47	240.04	33.15	4371.00	332	1	1440	13176.9	18212.5	16471.1	34671.2	16471.1	0.899	0.899	14800.6
10013	g16	1079	End 1013	55.50	15400	101.625	30	231747.22	4083.65	2880.49	240.04	33.20	4522.59	332	1	1440	13612.2	18844.1	17015.2	35598.0	17015.2	0.890	0.890	15147.1
	g16a	1144	Mid 1014	56.67	15400	102.506	30	242513.23	4186.70	2880.50	240.04	33.24	4642.49	332	1	1440	13955.7	19343.7	17444.6	36324.1	17444.6	0.883	0.883	15411.3
	g17a	1144	Mid 1014	56.67	15400	109.590	30	250098.24	4317.64	2880.79	240.07	34.41	4843.24	332	1	1440	14392.1	20180.2	17990.2	36333.5	17990.2	0.900	0.900	16185.9
10014	g18	1162	End 1014	57.00	15400	109.875	30	253260.88	4347.82	2880.80	240.07	34.43	4878.94	332	1	1440	14492.8	20328.9	18115.9	36534.6	18115.9	0.898	0.898	16266.3
10015	g19	1245	End 1015	58.50	15400	111.188	30	268145.89	4487.80	2880.82	240.07	34.52	5044.73	332	1	1440	14959.3	21019.7	18699.2	37462.2	18695.2	0.889	0.889	16630.3
10016	g20	1328	End 1016	60.00	15400	112.500	30	283531.25	4629.08	2880.84	240.07	34.60	5212.50	332	1	1440	15430.3	21718.8	19287.8	38390.0	19287.8	0.881	0.881	16983.4
	g20a	1336	Mid 1017	60.14	15400	112.627	30	285040.83	4642.77	2880.84	240.07	34.61	5228.77	332	1	1440	15475.9	21786.6	19344.9	38479.5	19344.9	0.880	0.880	17016.8
	g21a	1336	Mid 1017	60.14	15400	160.627	54	468929.89	7515.56	5184.84	432.07	185.61	8199.71	332	1	2592	25051.9	34165.5	31314.8	71284.8	31314.8	0.933	0.933	29221.2
10017	g22	1411	End 1017	61.50	15400	161.813	54	491453.86	7709.08	5184.86	432.07	185.68	8418.23	332	1	2592	25696.9	35076.0	32121.2	72775.4	32121.2	0.929	0.929	29826.1
	g22a	1480	Mid 1018	62.75	15400	162.904	54	512700.91	7888.07	5184.88	432.07	185.75	8620.69	332	1	2592	26293.6	35919.6	32867.0	74147.8	32867.0	0.924	0.924	30375.7
	g23a	1480	Mid 1018	62.75	15400	251.964	75	754295.44	11450.93	7205.61	600.47	510.72	12845.39	332	1	3600	38169.8	53522.4	47712.2	106062.7	47712.2	0.989	0.989	47170.2
10018	g24	1494	End 1018	63.00	15400	252.375	75	760811.66	11505.66	7205.63	600.47	510.81	12909.19	332	1	3600	38352.2	53788.3	47940.2	106443.9	47940.2	0.988	0.988	47373.1
10019	g25	1577	End 1019	64.50	15400	254.813	75	800108.89	11831.55	7205.77	600.48	511.35	13289.58	332	1	3600	39438.5	55373.2	49298.1	108705.9	49298.1	0.985	0.985	48573.8
10020	g26	1660	End 1020	66.00	15400	257.250	75	840552.78	12159.90	7205.90	600.49	511.88	13673.63	332	1	3600	40533.0	56973.4	50666.2	110970.9	50666.2	0.982	0.982	49770.7
10021	g27	1743	End 1021	63.50	15400	253.188	75	773784.01	11614.02	7205.68	600.47	510.99	13035.58	332	1	3600	38713.4	54314.9	48391.7	107197.6	48391.7	0.987	0.987	47773.7
10022	g28	1826	End 1022	61.00	15400	249.125	75	710180.07	11074.93	7205.45	600.45	510.09	12407.69	332	1	3600	36916.4	51698.7	46145.6	103433.0	46145.6	0.992	0.992	45767.1
	g28a	1888	Mid 1023	59.13	15400	246.090	75	664703.39	10676.67	7205.29	600.44	509.43	11945.29	332	1	3600	35588.9	49772.0	44486.1	100627.1	44486.1	0.995	0.995	44263.4
	g29a	1888	Mid 1023	59.13	15400	179.133	60	506510.53	8218.23	5761.23	480.10	254.93	8994.23	332	1	2880	27394.1	37476.0	34242.6	78635.1	34242.6	0.951	0.951	32575.7
10023	g30	1909	End 1023	58.50	15400	178.500	60	495203.88	8118.10	5761.22	480.10	254.88	8881.13	332	1	2880	27060.3	37004.7	33825.4	77866.4	33825.4	0.953	0.953	32238.1
10024	g31	1992	End 1024	56.00	15400	176.000	60	451908.67	7724.93	5761.17	480.10	254.67	8438.00	332	1	2880	25749.8	35158.3	32187.2	74832.3	32187.2	0.960	0.960	30891.6
10025	g32	2075	End 1025	53.50	15400	173.500	60	410813.46	7335.95	5761.11	480.09	254.46	8001.13	332	1	2880	24453.2	33338.0	30566.5	71804.9	30566.5	0.966	0.966	29527.3
	g32a	2104	Mid 1026	52.63	15400	172.627	60	396967.75	7201.03	5761.10	480.09	254.39	7849.96	332	1	2880	24003.4	32708.1	30004.3	70748.9	30004.3	0.968	0.968	29046.8
	g33a	2104	Mid 1026	52.63	15400	112.627	30	218735.08	4059.93	2881.10	240.09	35.64	4579.86	332	1	1440	13533.1	19082.8	16916.4	33844.5	16916.4	0.936	0.936	15836.8
10026	g34	2158	End 1026	51.00	15400	111.000	30	204133.25	3906.86	2881.06	240.09	35.50	4398.00	332	1	1440	13022.9	18325.0	16278.6	32840.3	16278.6	0.944	0.944	15361.8
10027	g35	2241	End 1027	48.50	15400	108.500	30	182831.79	3675.01	2881.01	240.08	35.29	4123.63	332	1	1440	12250.0	17181.8	15312.5	31297.8	15312.5	0.955	0.955	14616.2
	g35a	2320	Mid 1028	46.12	15400	106.120	30	163817.16	3458.21	2880.96	240.08	35.09	3868.28	332	1	1440	11527.4	16117.8	14409.2	29831.0	14409.2	0.964	0.964	13891.5
	g36a	2320	Mid 1028	46.12	15400	148.120	51	259815.17	5385.27	4896.96	408.08	157.37	5876.21	332	1	2448	17950.9	24484.2	22438.6	52552.9	22438.6	0.979	0.979	21964.4
10028	g37	2324	End 1028	46.00	15400	148.000	51	258401.36	5369.38	4896.96	408.08	157.36	5858.38	332	1	2448	17897.9	24409.9	22372.4	52429.0	22372.4	0.979	0.979	21905.7
	g37a	2356	Mid 1029	45.04	15400	147.036	51	247245.31	5242.56	4896.94	408.08	157.28	5716.19	332	1	2448	17475.2	23817.5	21844.0	51438.0	21844.0	0.981	0.981	21435.0
	g38a	2356	Mid 1029	45.04	15400	135.777	51	239633.24	5081.16	4896.40	408.03	155.11	5462.66	332	1	2448	16937.2	22761.1	21171.5	51417.2	21171.5	0.966	0.966	20453.2
10029	g38	2407	End 1029	43.50	15400	134.625	51	223169.88	4891.39	4896.38	408.03	155.06	5254.97	332	1	2448	16304.6	21895.7	20380.8	49840.3	20380.8	0.970	0.970	19766.4
10030	g39	2490	End 1030	41.00	15400	132.750	51	197732.53	4585.10	4896.36	408.03	154.97	4920.75	332	1	2448	15283.7	20503.1	19104.6	47281.1	19104.6	0.976	0.976	18638.5
10031	g40	2573	End 1031	38.50	15400	130.875	51	173954.56	4281.96	4896.34	408.03	154.88	4591.22	332	1	2448	14273.2	19130.1	17841.5	44731.9	17841.5	0.981	0.981	17500.1
10032	g41	2656	End 1032	36.00	15400	129.000	51	151812.53	3981.97	4896.32	408.03	154.80	4266.38	332	1	2448	13273.2	17776.6	16591.5	42194.5	16591.5	0.986	0.986	16353.2
10033	g40	2739	End 1033	38.50	15400	130.875	51	173954.56	4281.96	4896.34	408.03	154.88	4591.22	332	1	2448	14273.2	19130.1	17841.5	44731.9	17841.5	0.981	0.981	17500.1
10034	g39	2822	End 1034	41.00	15400	132.750	51	197732.53	4585.10	4896.36	408.03	154.97	4920.75	332	1	2448	15283.7	20503.1	19104.6	47281.1	19104.6	0.976	0.976	18638.5
10035	g38	2905	End 1035	43.50	15400	134.625	51	223169.88	4891.39	4896.38	408.03	155.06	5254.97	332	1	2448	16304.6	21895.7	20380.8	49840.3	20380.8	0.970	0.970	19766.4
	g38a	2956	Mid 1036	45.04	15400	135.777	51	239633.24	5081.16	4896.40	408.03	155.11	5462.66	332	1	2448	16937.2	22761.1	21171.5	51417.2	21171.5	0.966	0.966	20453.2
	g37a	2956	Mid 1036	45.04	15400	147.036	51	247245.31	5242.56	4896.94	408.08	157.28	5716.19	332	1	2448	17475.2	23817.5	21844.0	51438.0	21844.0	0.981	0.981	21435.0
10036	g37	2988	End 1036	46.00	15400	148.000	51	258401.36	5369.38	4896.96	408.08	157.36	5858.38	332	1	2448	17897.9	24409.9	22372.4	52429.0	22372.4	0.979	0.979	21905.7
	g36a	2992	Mid 1037	46.12	15400	240.361	51	325217.05	6740.88	4921.94	410.16	257.30	8003.31	332	1	2448	22469.6	33347.1	28087.0	53482.1	28087.0	1.103	1.000	28087.0
	g35a	2992	Mid 1037	46.12	15400	290.602	30	294620.92	6219.50	3000.11	250.01	511.67	8122.48	332	1	1440	20731.7	33843.7	25914.6	34151.1	25914.6	1.388	1.000	25914.6
10037	g35	3071	End 1037	48.50	15400	108.500	30	182831.79	3675.01	2881.01	240.08	35.29	4123.63	332	1	1440	12250.0	17181.8	15312.5	31297.8	15312.5	0.955	0.955	14616.2
10038	g34	3154	End 1038	51.00	15400	111.000	30	204133.25	3906.86	2881.06	240.09	35.50	4398.00	332	1	1440	13022.9	18325.0	16278.6	32840.3	16278.6	0.944	0.944	15361.8
	g33a	3208	Mid 1039	52.63	15400	112.627	30	218735.08	4059.93	2881.10	240.09	35.64	4579.86	332	1	1440	13533.1	19082.8	16916.4	33844.5	16916.4	0.936	0.936	15836.8
	g32a	3208	Mid 1039	52.63	15400	172.627	60	396967.75	7201.03	5761.10	480.09	254.39	7849.96	332	1	2880	24003.4	32708.1	30004.3	70748.9	30004.3	0.968	0.968	29046.8
10039	g32	3237	End 1039	53.50	15400	173.500	60	410813.46	7335.95	5761.11	480.09	254.46	8001.13	332	1	2880	24453.2	33338.0	30566.5	71804.9	30566.5	0.966	0.966	29527.3
10040	g31	3320	End 1040	56.00	15400	176.000	60	451908.67	7724.93	5761.17	480.10	254.67	8438.00	332	1	2880	25749.8	35158.3	32187.2	74832.3	32187.2	0.960	0.960	30891.6
10041	g30	3403	End 1041	58.50	15400	178.500	60	495203.88	8118.10	5761.22	480.10	254.88	8881.13	332	1	2880	27060.3	37004.7	33825.4	77866.4	33825.4	0.953	0.953	32238.1
	g29a	3424	Mid 1042	59.13	15400	179.133	60	506510.53	8218.23	5761.23	480.10	254.93	8994.23	332	1	2880	27394.1	37476.0	34242.6	78635.1	34242.6	0.951	0.951	32575.7
	g28a	3424	Mid 1042	59.13	15400	246.090	75	664703.39	10676.67	7205.29	600.44	509.43	11945.29	332	1	3600	35588.9	49772.0	44486.1	100627.1	44486.1	0.995	0.995	44263.4
10042	g28	3486	End 1042	61.00	15400	249.125	75	710180.07	11074.93	7205.45	600.45	510.09	12407.69	332	1	3600	36916.4	51698.7	46145.6	103433.0	46145.6	0.992	0.992	45767.1
10043	g27	3569	End 1043	63.50	15400	253.188	75	773784.01	11614.02	7205.68	600.47	510.99	13035.58	332	1	3600	38713.4	54314.9	48391.7	107197.6	48391.7	0.987	0.987	47773.7
10044	g26	3652	End 1044	66.00	15400	257.250	75	840552.78	12159.90	7205.90	600.49	511.88	13673.63	332	1	3600	40533.0	56973.4	50666.2	110970.9	50666.2	0.982	0.982	49770.7
10045	g25	3735	End 1045	64.50	15400	254.813	75	800108.89	11831.55	7205.77	600.48	511.35	13289.58	332	1	3600	39438.5	55373.2	49298.1	108705.9	49298.1	0.985	0.985	48573.8
10046	g24	3818	End 1046	63.00	15400	252.375	75	760811.66	11505.66	7205.63	600.47	510.81	12909.19	332	1	3600	38352.2	53788.3	47940.2	106443.9	47940.2	0.988	0.988	47373.1
	g23a	3832	Mid 1047	62.75	15400	251.964	75	754295.44	11450.93	7205.61	600.47	510.72	12845.39	332	1	3600	38169.8	53522.4	47712.2	106062.7	47712.2	0.989	0.989	47170.2

CDM Smith

Client: City of Pittsburgh
Project: Forbes Ave over Fern Hollow
Detail: Girder Section Properties
By: PLM 1/9/14
Chk:

																Moment Capacity							
Point #	Frame Sec	Location	Frame #	Dc (in)	λ	Total Area (in^2)	Flange Area (in^2)	I_{33} (in^4)	S_{33} (in^3)	I_{22} (in^4)	S_{22} (in^3)	J (in^4)	Z (in^3)	L_b (in)	C_b	I_{yc} (in^4)	M_0 (k-ft)	M_p (k-ft)	M_y (k-ft)	M_{cr} (k-ft)	M_n (k-ft)	R_{b1}	R_b	M_u (k-ft)
	g22a	3832	Mid 1047	62.75	15400	162.904	54	512700.91	7888.07	5184.88	432.07	185.75	8620.69	332	1	2592	26293.6	35919.6	32867.0	74147.8	32867.0	0.924	0.924	30375.7
10047	g22	3901	End 1047	61.50	15400	161.813	54	491453.86	7709.08	5184.86	432.07	185.68	8418.23	332	1	2592	25696.9	35076.0	32121.2	72775.4	32121.2	0.929	0.929	29826.1
	g21a	3976	Mid 1048	60.14	15400	160.627	54	468929.89	7515.56	5184.84	432.07	185.61	8199.71	332	1	2592	25051.9	34165.5	31314.8	71284.8	31314.8	0.933	0.933	29221.2
	g20a	3976	Mid 1048	60.14	15400	112.627	30	285040.83	4642.77	2880.84	240.07	34.61	5228.77	332	1	1440	15475.9	21786.6	19344.9	38479.5	19344.9	0.880	0.880	17016.8
10048	g20	3984	End 1048	60.00	15400	112.500	30	283531.25	4629.08	2880.84	240.07	34.60	5212.50	332	1	1440	15430.3	21718.8	19287.8	38390.0	19287.8	0.881	0.881	16983.4
10049	g19	4067	End 1049	58.50	15400	111.188	30	268145.89	4487.80	2880.82	240.07	34.52	5044.73	332	1	1440	14959.3	21019.7	18699.2	37462.2	18699.2	0.889	0.889	16630.3
10050	g18	4150	End 1050	57.00	15400	109.875	30	253260.88	4347.83	2880.80	240.07	34.43	4878.94	332	1	1440	14492.8	20328.9	18115.9	36534.6	18115.9	0.898	0.898	16266.3
	g17a	4168	Mid 1051	56.67	15400	109.590	30	250098.24	4317.64	2880.79	240.07	34.41	4843.24	332	1	1440	14392.1	20180.2	17990.2	36333.5	17990.2	0.900	0.900	16185.9
	g16a	4168	Mid 1051	56.67	15400	102.506	30	242513.23	4186.70	2880.50	240.04	33.24	4642.49	332	1	1440	13955.7	19343.7	17444.6	36324.1	17444.6	0.883	0.883	15411.3
10051	g16	4233	End 1051	55.50	15400	101.625	30	231747.22	4083.65	2880.49	240.04	33.20	4522.59	332	1	1440	13617.2	18844.1	17015.2	35598.0	17015.2	0.890	0.890	15147.1
10052	g15	4316	End 1052	54.00	15400	100.500	30	218407.25	3953.07	2880.47	240.04	33.15	4371.00	332	1	1440	13176.9	18212.5	16471.1	34671.2	16471.1	0.899	0.899	14800.6
10053	g14	4399	End 1053	52.50	15400	99.375	30	205519.53	3823.62	2880.46	240.04	33.10	4221.09	332	1	1440	12745.4	17587.9	15931.7	33744.7	15931.7	0.907	0.907	14444.4
	g13a	4468	Mid 1054	51.25	15400	98.440	30	195146.27	3716.86	2880.45	240.04	33.05	4097.76	332	1	1440	12389.5	17074.0	15486.9	32974.8	15486.9	0.913	0.913	14141.4
	g12a	4468	Mid 1054	51.25	15400	128.440	45	278831.59	5248.30	4320.45	360.04	107.27	5682.22	332	1	2160	17494.3	23675.9	21867.9	50539.7	21867.9	0.942	0.942	20601.3
10054	g12	4482	End 1054	51.00	15400	128.250	45	275964.47	5219.19	4320.45	360.04	107.26	5649.75	332	1	2160	17397.3	23540.6	21746.6	50307.7	21746.6	0.943	0.943	20505.8
10055	g11	4565	End 1055	49.50	15400	127.125	45	259302.94	5047.26	4320.44	360.04	107.21	5458.22	332	1	2160	16824.2	22742.6	21030.2	48933.4	21030.2	0.948	0.948	19935.0
10056	g10	4648	End 1056	48.00	15400	126.000	45	243213.47	4876.46	4320.42	360.04	107.16	5268.38	332	1	2160	16254.9	21951.6	20318.6	47560.7	20318.6	0.953	0.953	19357.4
10057	g9	4731	End 1057	46.50	15400	124.875	45	227691.00	4706.79	4320.41	360.03	107.10	5080.22	332	1	2160	15689.3	21167.6	19611.6	46189.6	19611.6	0.957	0.957	18773.7
10058	g8	4814	End 1058	45.00	15400	123.750	45	212730.47	4538.25	4320.40	360.03	107.05	4893.75	332	1	2160	15127.5	20390.6	18909.4	44820.4	18909.4	0.962	0.962	18184.3
10059	g7	4897	End 1059	43.50	15400	122.625	45	198326.81	4370.84	4320.38	360.03	107.00	4708.97	332	1	2160	14569.5	19620.7	18211.8	43453.1	18211.8	0.966	0.966	17589.6
10060	g6	4980	End 1060	42.00	15400	121.500	45	184474.97	4204.56	4320.37	360.03	106.95	4525.88	332	1	2160	14015.2	18857.8	17519.0	42088.1	17519.0	0.970	0.970	16990.1
10061	g5	5063	End 1061	40.50	15400	120.375	45	171169.88	4039.41	4320.36	360.03	106.89	4344.47	332	1	2160	13464.7	18102.0	16830.9	40725.5	16830.9	0.974	0.974	16386.3
	g5a	5096	Mid 1062	39.90	15400	119.928	45	166030.68	3974.06	4320.35	360.03	106.87	4272.81	332	1	2160	13246.9	17803.4	16558.6	40184.4	16558.6	0.975	0.975	16145.2
	g4a	5096	Mid 1062	39.90	15400	89.928	30	114446.54	2780.96	2880.35	240.03	32.65	3028.83	332	1	1440	9269.9	12620.1	11587.3	25984.9	11587.3	0.963	0.963	11153.4
10062	g3	5146	End 1062	39.00	15400	89.250	30	109046.00	2709.27	2880.34	240.03	32.62	2947.88	332	1	1440	9030.7	12282.8	11288.4	25430.1	11288.4	0.966	0.966	10901.8
10063	g2	5229	End 1063	37.50	15400	88.125	30	100402.34	2591.03	2880.33	240.03	32.57	2814.84	332	1	1440	8636.8	11728.5	10796.0	24510.1	10796.0	0.971	0.971	10480.9
10064	g1	5312	End 1064	36.00	15400	87.000	30	92155.25	2473.97	2880.32	240.03	32.52	2683.50	332	1	1440	8246.6	11181.3	10308.2	23591.0	10308.2	0.976	0.976	10056.5

CDM Smith

Client: City of Pittsburgh
Project: Forbes Ave over Fern Hollow
Detail: Girder Section Properties
By: PLM 1/9/14
Chk: DOW 1/9/14

				Shear Capacity										Axial Capacity														
Point #	Frame Sec	Location	Frame #	D/t_w	d_o (in)	d_o/D	k	6000*sqrt(k)/sqrt(Fy)	7500*sqrt(k)/sqrt(Fy)	C	V_p (kips)	V_n (kips)	E (psi)	K	L_c strong (in)	L_c weak (in)	r strong (in)	r weak (in)	KL_c/r strong	KL_c/r weak	sqrt($2\pi^2$E/F_y)	F_{cr} strong (psi)	F_{cr} weak (psi)	F_{cr} (psi)	$En^2/((KL_c/r)^2)$ (psi)	P_n (k)	P_y (k)	P_n (k)
10000	g1	0	Begin 1001	192	48	0.667	16.250	108.167	135.208	0.397	783.00	652.57	29000000	0.75	0	332	32.55	5.75	0.00	43.28	107.00	50000.00	45910.60	45910.60	##########	########	3697.50	3395.09
10001	g2	83	End 1001	200	48	0.640	17.207	111.306	139.133	0.387	815.63	682.05	29000000	0.75	0	332	33.75	5.72	0.00	43.55	107.00	50000.00	45857.73	45857.73	##########	########	3745.31	3435.03
10002	g3	166	End 1002	208	48	0.615	18.203	114.483	143.103	0.379	848.25	711.72	29000000	0.75	0	332	34.95	5.68	0.00	43.83	107.00	50000.00	45804.87	45804.87	##########	########	3793.13	3474.87
	g4a	216	Mid 1003	212.8193	48	0.601	18.822	116.412	145.516	0.374	867.90	729.66	29000000	0.75	0	332	35.67	5.66	0.00	44.00	107.00	50000.00	45773.03	45773.03	##########	########	3821.93	3498.82
	g5a	216	Mid 1003	212.8193	48	0.601	18.822	116.412	145.516	0.374	867.90	729.66	29000000	0.75	0	332	37.21	6.00	0.00	41.49	107.00	50000.00	46241.79	46241.79	##########	########	5096.93	4713.82
10003	g5	249	End 1003	216	48	0.593	19.238	117.693	147.116	0.371	880.88	741.52	29000000	0.75	0	332	37.71	5.99	0.00	41.56	107.00	50000.00	46227.77	46227.77	##########	########	5115.94	4729.97
10004	g6	332	End 1004	224	48	0.571	20.313	120.934	151.167	0.364	913.50	771.45	29000000	0.75	0	332	38.97	5.96	0.00	41.76	107.00	50000.00	46192.53	46192.53	##########	########	5163.75	4770.53
10005	g7	415	End 1005	232	48	0.552	21.426	124.204	155.255	0.358	916.13	801.47	29000000	0.75	0	332	40.22	5.94	0.00	41.95	107.00	50000.00	46157.29	46157.29	##########	########	5211.56	4811.03
10006	g8	498	End 1006	240	48	0.533	22.578	127.500	159.375	0.353	978.75	831.56	29000000	0.75	0	332	41.46	5.91	0.00	42.14	107.00	50000.00	46122.05	46122.05	##########	########	5259.38	4851.46
10007	g9	581	End 1007	248	48	0.516	23.770	130.821	163.526	0.348	1011.38	861.71	29000000	0.75	0	332	42.70	5.88	0.00	42.33	107.00	50000.00	46086.80	46086.80	##########	########	5307.19	4891.83
10008	g10	664	End 1008	256	48	0.500	25.000	134.164	167.705	0.343	1044.00	891.91	29000000	0.75	0	332	43.93	5.86	0.00	42.52	107.00	50000.00	46051.56	46051.56	##########	########	5355.00	4932.12
10009	g11	747	End 1009	264	48	0.485	26.270	137.528	171.911	0.339	1076.63	922.13	29000000	0.75	0	332	45.16	5.83	0.00	42.71	107.00	50000.00	46016.32	46016.32	##########	########	5402.81	4972.35
10010	g12	830	End 1010	272	48	0.471	27.578	140.912	176.140	0.335	1109.25	952.39	29000000	0.75	0	332	46.39	5.80	0.00	42.90	107.00	50000.00	45981.08	45981.08	##########	########	5450.63	5012.51
	g12a	844	Mid 1011	273.3494	48	0.468	27.803	141.485	176.856	0.335	1114.75	957.49	29000000	0.75	0	332	46.59	5.80	0.00	42.93	107.00	50000.00	45975.13	45975.13	##########	########	5458.69	5019.28
	g13a	844	Mid 1011	273.3494	48	0.468	27.803	141.485	176.856	0.335	1114.75	957.49	29000000	0.75	0	332	44.52	5.41	0.00	46.03	107.00	50000.00	45373.09	45373.09	##########	########	4183.69	3796.54
10011	g14	913	End 1011	280	48	0.457	28.926	144.314	180.393	0.332	1141.88	982.65	29000000	0.75	0	332	45.48	5.38	0.00	46.25	107.00	50000.00	45329.15	45329.15	##########	########	4223.44	3828.90
10012	g15	996	End 1012	288	48	0.444	30.313	147.733	184.666	0.329	1174.50	1012.93	29000000	0.75	0	332	46.62	5.35	0.00	46.51	107.00	50000.00	45276.29	45276.29	##########	########	4271.25	3867.73
10013	g16	1079	End 1013	296	48	0.432	31.738	151.167	188.959	0.326	1207.13	1043.22	29000000	0.75	0	332	47.75	5.32	0.00	46.77	107.00	50000.00	45223.44	45223.44	##########	########	4319.06	3906.46
	g16a	1144	Mid 1014	302.2651	48	0.423	32.882	153.867	192.334	0.324	1232.67	1066.94	29000000	0.75	0	332	48.64	5.30	0.00	46.97	107.00	50000.00	45182.04	45182.04	##########	########	4356.51	3936.72
	g17a	1144	Mid 1014	259.0843	48	0.423	32.882	153.867	192.334	0.441	1438.12	1278.21	29000000	0.75	0	332	47.77	5.13	0.00	48.57	107.00	50000.00	44849.59	44849.59	##########	########	4657.59	4177.82
10014	g18	1162	End 1014	260.5714	48	0.421	33.203	154.616	193.271	0.440	1446.38	1285.89	29000000	0.75	0	332	48.01	5.12	0.00	48.63	107.00	50000.00	44836.22	44836.22	##########	########	4669.69	4187.42
10015	g19	1245	End 1015	267.4286	48	0.410	34.707	158.079	197.599	0.437	1484.44	1321.31	29000000	0.75	0	332	49.11	5.09	0.00	48.92	107.00	50000.00	44774.58	44774.58	##########	########	4725.47	4231.62
10016	g20	1328	End 1016	274.2857	48	0.400	36.250	161.555	201.944	0.434	1522.50	1356.75	29000000	0.75	0	332	50.20	5.06	0.00	49.21	107.00	50000.00	44712.93	44712.93	##########	########	4781.25	4275.67
	g20a	1336	Mid 1017	274.9466	48	0.399	36.401	161.891	202.363	0.433	1526.17	1360.17	29000000	0.75	0	332	50.31	5.06	0.00	49.23	107.00	50000.00	44706.99	44706.99	##########	########	4786.63	4279.91
	g21a	1336	Mid 1017	274.9466	48	0.399	36.401	161.891	202.363	0.433	1526.17	1360.17	29000000	0.75	0	332	54.03	5.68	0.00	43.83	107.00	50000.00	45805.67	45805.67	##########	########	6826.63	6253.96
10017	g22	1411	End 1017	281.1429	48	0.390	37.832	165.043	206.303	0.431	1560.56	1392.20	29000000	0.75	0	332	55.11	5.66	0.00	43.99	107.00	50000.00	45774.71	45774.71	##########	########	6877.03	6295.88
	g22a	1480	Mid 1018	286.8434	48	0.382	39.177	167.951	209.938	0.429	1592.20	1421.68	29000000	0.75	0	332	56.10	5.64	0.00	44.14	107.00	50000.00	45746.24	45746.24	##########	########	6923.40	6334.39
	g23a	1480	Mid 1018	154.4541	48	0.382	39.177	167.951	209.938	1.000	2956.95	2956.95	29000000	0.75	0	332	54.71	5.35	0.00	46.56	107.00	50000.00	45265.78	45265.78	##########	########	10708.46	9694.54
10018	g24	1494	End 1018	155.0769	48	0.381	39.453	168.542	210.677	1.000	2968.88	2968.88	29000000	0.75	0	332	54.91	5.34	0.00	46.60	107.00	50000.00	45258.07	45258.07	##########	########	10725.94	9708.70
10019	g25	1577	End 1019	158.7692	48	0.372	41.113	172.051	215.064	1.000	3039.56	3039.56	29000000	0.75	0	332	56.04	5.32	0.00	46.82	107.00	50000.00	45212.36	45212.36	##########	########	10829.53	9792.57
10020	g26	1660	End 1020	162.4615	48	0.364	42.813	175.570	219.463	1.000	3110.25	3110.25	29000000	0.75	0	332	57.16	5.29	0.00	47.05	107.00	50000.00	45166.65	45166.65	##########	########	10933.13	9876.25
10021	g27	1743	End 1021	156.3077	48	0.378	40.002	169.710	212.138	1.000	2992.44	2992.44	29000000	0.75	0	332	55.28	5.33	0.00	46.67	107.00	50000.00	45242.83	45242.83	##########	########	10760.47	9736.68
10022	g28	1826	End 1022	150.1538	48	0.393	37.300	163.879	204.848	1.000	2874.63	2874.63	29000000	0.75	0	332	53.39	5.38	0.00	46.30	107.00	50000.00	45319.02	45319.02	##########	########	10587.81	9596.59
	g28a	1888	Mid 1023	145.557	48	0.406	35.353	159.543	199.429	1.000	2786.62	2786.62	29000000	0.75	0	332	51.97	5.41	0.00	46.02	107.00	50000.00	45375.93	45375.93	##########	########	10458.84	9491.59
	g29a	1888	Mid 1023	236.5301	48	0.406	35.353	159.543	199.429	0.569	1714.84	1571.46	29000000	0.75	0	332	53.17	5.67	0.00	43.91	107.00	50000.00	45790.41	45790.41	##########	########	7613.13	6972.17
10023	g30	1909	End 1023	234	48	0.410	34.707	158.079	197.599	0.570	1696.50	1554.33	29000000	0.75	0	332	52.67	5.68	0.00	43.83	107.00	50000.00	45805.26	45805.26	##########	########	7586.25	6949.80
10024	g31	1992	End 1024	224	48	0.429	32.222	152.315	190.394	0.578	1624.00	1486.69	29000000	0.75	0	332	50.67	5.72	0.00	43.52	107.00	50000.00	45863.97	45863.97	##########	########	7480.00	6861.25
10025	g32	2075	End 1025	214	48	0.449	29.846	146.591	183.239	0.587	1551.50	1419.22	29000000	0.75	0	332	48.66	5.76	0.00	43.21	107.00	50000.00	45922.69	45922.69	##########	########	7373.75	6772.45
	g32a	2104	Mid 1026	210.506	48	0.456	29.041	144.602	180.752	0.590	1526.17	1395.70	29000000	0.75	0	332	47.95	5.78	0.00	43.10	107.00	50000.00	45943.20	45943.20	##########	########	7336.63	6741.36
	g33a	2104	Mid 1026	210.506	48	0.456	29.041	144.602	180.752	0.590	1526.17	1395.70	29000000	0.75	0	332	44.07	5.06	0.00	49.23	107.00	50000.00	44707.46	44707.46	##########	########	4786.63	4279.96
10026	g34	2158	End 1026	204	48	0.471	27.578	140.912	176.140	0.596	1479.00	1351.97	29000000	0.75	0	332	42.88	5.09	0.00	48.87	107.00	50000.00	44783.84	44783.84	##########	########	4717.50	4225.35
10027	g35	2241	End 1027	194	48	0.495	25.419	135.283	169.104	0.608	1406.50	1285.02	29000000	0.75	0	332	41.05	5.15	0.00	48.32	107.00	50000.00	44901.22	44901.22	##########	########	4611.25	4141.02
	g35a	2320	Mid 1028	184.4819	48	0.520	23.464	129.978	162.473	0.621	1337.49	1221.65	29000000	0.75	0	332	39.29	5.21	0.00	47.79	107.00	50000.00	45012.96	45012.96	##########	########	4510.12	4060.28
	g36a	2320	Mid 1028	184.4819	48	0.520	23.464	129.978	162.473	0.621	1337.49	1221.65	29000000	0.75	0	332	41.88	5.75	0.00	43.31	107.00	50000.00	45904.85	45904.85	##########	########	6295.12	5779.53
10028	g37	2324	End 1028	184	48	0.522	23.368	129.711	162.139	0.621	1334.00	1218.45	29000000	0.75	0	332	41.78	5.75	0.00	43.29	107.00	50000.00	45908.18	45908.18	##########	########	6290.00	5775.25
	g37a	2356	Mid 1029	180.1446	48	0.533	22.606	127.580	159.475	0.627	1706.05	1192.91	29000000	0.75	0	332	41.01	5.77	0.00	43.15	107.00	50000.00	45934.81	45934.81	##########	########	6249.04	5740.97
	g38a	2356	Mid 1029	240.1928	48	0.533	22.606	127.580	159.475	0.353	979.54	832.29	29000000	0.75	0	332	42.01	6.01	0.00	41.46	107.00	50000.00	46245.68	46245.68	##########	########	5770.53	5337.24
10029	g38	2407	End 1029	232	48	0.552	21.426	124.204	155.255	0.358	946.13	801.47	29000000	0.75	0	332	40.72	6.03	0.00	41.29	107.00	50000.00	46277.53	46277.53	##########	########	5721.56	5295.60
10030	g39	2490	End 1030	218.6667	48	0.585	19.592	118.770	148.462	0.369	891.75	751.49	29000000	0.75	0	332	38.59	6.07	0.00	41.00	107.00	50000.00	46329.36	46329.36	##########	########	5641.88	5227.69
10031	g40	2573	End 1031	205.3333	48	0.623	17.867	113.420	141.775	0.381	837.38	701.81	29000000	0.75	0	332	36.46	6.12	0.00	40.71	107.00	50000.00	46381.19	46381.19	##########	########	5562.19	5159.62
10032	g41	2656	End 1032	192	48	0.667	16.250	108.167	135.208	0.397	783.00	652.57	29000000	0.75	0	332	34.31	6.16	0.00	40.42	107.00	50000.00	46433.02	46433.02	##########	########	5482.50	5091.38
10033	g40	2739	End 1033	205.3333	48	0.623	17.867	113.420	141.775	0.381	837.38	701.81	29000000	0.75	0	332	36.46	6.12	0.00	40.71	107.00	50000.00	46381.19	46381.19	##########	########	5562.19	5159.62
10034	g39	2822	End 1034	218.6667	48	0.585	19.592	118.770	148.462	0.369	891.75	751.49	29000000	0.75	0	332	38.59	6.07	0.00	41.00	107.00	50000.00	46329.36	46329.36	##########	########	5641.88	5227.69
10035	g38	2905	End 1035	232	48	0.552	21.426	124.204	155.255	0.358	946.13	801.47	29000000	0.75	0	332	40.72	6.03	0.00	41.29	107.00	50000.00	46277.53	46277.53	##########	########	5721.56	5295.60
	g38a	2956	Mid 1036	240.1928	48	0.533	22.606	127.580	159.475	0.353	979.54	832.29	29000000	0.75	0	332	42.01	6.01	0.00	41.46	107.00	50000.00	46245.68	46245.68	##########	########	5770.53	5337.24
	g37a	2956	Mid 1036	180.1446	48	0.533	22.606	127.580	159.475	0.627	1706.05	1192.91	29000000	0.75	0	332	41.01	5.77	0.00	43.15	107.00	50000.00	45934.81	45934.81	##########	########	6249.04	5740.97
10036	g37	2988	End 1036	184	48	0.522	23.368	129.711	162.139	0.621	1334.00	1218.45	29000000	0.75	0	332	41.78	5.75	0.00	43.29	107.00	50000.00	45908.18	45908.18	##########	########	6290.00	5775.25
	g36a	2992	Mid 1037	61.49398	48	0.520	23.464	129.978	162.473	1.000	4012.48	4012.48	29000000	0.75	0	332	36.78	4.53	0.00	55.03	107.00	50000.00	43388.36	43388.36	##########	########	10215.36	8864.56
	g35a	2992	Mid 1037	36.89639	48	0.520	23.464	129.978	162.473	1.000	6687.47	6687.47	29000000	0.75	0	332	31.84	3.21	0.00	77.50	107.00	50000.00	36885.74	36885.74	##########	########	12350.60	9111.22
10037	g35	3071	End 1037	194	48	0.495	25.419	135.283	169.104	0.608	1406.50	1285.02	29000000	0.75	0	332	41.05	5.15	0.00	48.32	107.00	50000.00	44901.22	44901.22	##########	########	4611.25	4141.02
10038	g34	3154	End 1038	204	48	0.471	27.578	140.912	176.140	0.596	1479.00	1351.97	29000000	0.75	0	332	42.88	5.09	0.00	48.87	107.00	50000.00	44783.84	44783.84	##########	########	4717.50	4225.35
	g33a	3208	Mid 1039	210.506	48	0.456	29.041	144.602	180.752	0.590	1526.17	1395.70	29000000	0.75	0	332	44.07	5.06	0.00	49.23	107.00	50000.00	44707.46	44707.46	##########	########	4786.63	4279.96
	g32a	3208	Mid 1039	210.506	48	0.456	29.041	144.602	180.752	0.590	1526.17	1395.70	29000000	0.75	0	332	47.95	5.78	0.00	43.10	107.00	50000.00	45943.20	45943.20	##########	########	7336.63	6741.36
10039	g32	3237	End 1039	214	48	0.449	29.846	146.591	183.239	0.587	1551.50	1419.22	29000000	0.75	0	332	48.66	5.76	0.00	43.21	107.00	50000.00	45922.69	45922.69	##########	########	7373.75	6772.45
10040	g31	3320	End 1040	224	48	0.429	32.222	152.315	190.394	0.578	1624.00	1486.69	29000000	0.75	0	332	50.67	5.72	0.00	43.52	107.00	50000.00	45863.97	45863.97	##########	########	7480.00	6861.25
10041	g30	3403	End 1041	234	48	0.410	34.707	158.079	197.599	0.570	1696.50	1554.33	29000000	0.75	0	332	52.67	5.68	0.00	43.83	107.00	50000.00	45805.26	45805.26	##########	########	7586.25	6949.80
	g29a	3424	Mid 1042	236.5301	48	0.406	35.353	159.543	199.429	0.569	1714.84	1571.46	29000000	0.75	0	332	53.17	5.67	0.00	43.91	107.00	50000.00	45790.41	45790.41	##########	########	7613.13	6972.17
	g28a	3424	Mid 1042	145.557	48	0.406	35.353	159.543	199.429	1.000	2786.62	2786.62	29000000	0.75	0	332	51.97	5.41	0.00	46.02	107.00	50000.00	45375.93	45375.93	##########	########	10458.84	9491.59
10042	g28	3486	End 1042	150.1538	48	0.393	37.300	163.879	204.848	1.000	2874.63	2874.63	29000000	0.75	0	332	53.39	5.38	0.00	46.30	107.00	50000.00	45319.02	45319.02	##########	########	10587.81	9596.59
10043	g27	3569	End 1043	156.3077	48	0.378	40.002	169.710	212.138	1.000	2992.44	2992.44	29000000	0.75	0	332	55.28	5.33	0.00	46.67	107.00	50000.00	45242.83	45242.83	##########	########	10760.47	9736.68
10044	g26	3652	End 1044	162.4615	48	0.364	42.813	175.570	219.463	1.000	3110.25	3110.25	29000000	0.75	0	332	57.16	5.29	0.00	47.05	107.00	50000.00	45166.65	45166.65	##########	########	10933.13	9876.25
10045	g25	3735	End 1045	158.7692	48	0.372	41.113	172.051	215.064	1.000	3039.56	3039.56	29000000	0.75	0	332	56.04	5.32	0.00	46.82	107.00	50000.00	45212.36	45212.36	##########	########	10829.53	9792.57
10046	g24	3818	End 1046	155.0769	48	0.381	39.453	168.542	210.677	1.000	2968.88	2968.88	29000000	0.75	0	332	54.91	5.34	0.00	46.60	107.00	50000.00	45258.07	45258.07	##########	########	10725.94	9708.70
	g23a	3832	Mid 1047	154.4541	48	0.382	39.177	167.951	209.938	1.000	2956.95	2956.95	29000000	0.75	0	332	54.71	5.35	0.00	46.56	107.00	50000.00	45265.78	45265.78	##########	########	10708.46	9694.54

CDM Smith

Client: City of Pittsburgh
Project: Forbes Ave over Fern Hollow
Detail: Girder Section Properties
By: PLM 1/9/14
Chk: DJW 1/9/14

				Shear Capacity										Axial Capacity															
Point #	Frame Sec	Location	Frame #	D/t_w	d_o (in)	d_o/D	k	6000*sqrt(k)/sqrt(Fy)	7500*sqrt(k)/sqrt(Fy)	C	V_p (kips)	V_n (kips)	E (psi)	K	L_x strong (in)	L_x weak (in)	r strong (in)	r weak (in)	KL_x/r strong	KL_x/r weak	sqrt($2\pi^2E/F_y$)	F_n strong (psi)	F_n weak (psi)	F_{cr} (psi)	$En^2/((KL_x/r)^2)$ (psi)	P_n (k)	P_y (k)	P_a (k)
	g22a	3832	Mid 1047	286.8434	48	0.382	39.177	167.951	209.938	0.429	1592.20	1421.68	29000000	0.75	0	332	56.10	5.64	0.00	44.14	107.00	50000.00	45746.24	45746.24	##########	########	6923.40	6334.39
10047	g22	3901	End 1047	281.1429	48	0.390	37.832	165.043	206.303	0.431	1560.56	1392.20	29000000	0.75	0	332	55.11	5.66	0.00	43.99	107.00	50000.00	45774.71	45774.71	##########	########	6877.03	6295.88
	g21a	3976	Mid 1048	274.9466	48	0.399	36.401	161.891	202.363	0.433	1526.17	1360.17	29000000	0.75	0	332	54.03	5.68	0.00	43.83	107.00	50000.00	45805.67	45805.67	##########	########	6826.63	6253.96
	g20a	3976	Mid 1048	274.9466	48	0.399	36.401	161.891	202.363	0.433	1526.17	1360.17	29000000	0.75	0	332	50.31	5.06	0.00	49.23	107.00	50000.00	44706.99	44706.99	##########	########	4786.63	4279.91
10048	g20	3984	End 1048	274.2857	48	0.400	36.250	161.555	201.944	0.434	1522.50	1356.75	29000000	0.75	0	332	50.20	5.06	0.00	49.21	107.00	50000.00	44712.93	44712.93	##########	########	4781.25	4275.67
10049	g19	4067	End 1049	267.4286	48	0.410	34.707	158.079	197.599	0.437	1484.44	1321.31	29000000	0.75	0	332	49.11	5.09	0.00	48.92	107.00	50000.00	44774.58	44774.58	##########	########	4725.47	4231.62
10050	g18	4150	End 1050	260.5714	48	0.421	33.203	154.616	193.271	0.440	1446.38	1285.89	29000000	0.75	0	332	48.01	5.12	0.00	48.63	107.00	50000.00	44836.22	44836.22	##########	########	4669.69	4187.42
	g17a	4168	Mid 1051	259.0843	48	0.423	32.882	153.867	192.334	0.441	1438.12	1278.21	29000000	0.75	0	332	47.77	5.13	0.00	48.57	107.00	50000.00	44849.59	44849.59	##########	########	4657.59	4177.82
	g16a	4168	Mid 1051	302.2651	48	0.423	32.882	153.867	192.334	0.324	1232.67	1066.94	29000000	0.75	0	332	48.64	5.30	0.00	46.97	107.00	50000.00	45182.04	45182.04	##########	########	4356.51	3936.72
10051	g16	4233	End 1051	296	48	0.432	31.738	151.167	188.959	0.326	1207.13	1043.22	29000000	0.75	0	332	47.75	5.32	0.00	46.77	107.00	50000.00	45223.44	45223.44	##########	########	4319.06	3906.46
10052	g15	4316	End 1052	288	48	0.444	30.313	147.733	184.666	0.329	1174.50	1012.93	29000000	0.75	0	332	46.62	5.35	0.00	46.51	107.00	50000.00	45276.29	45276.29	##########	########	4271.25	3867.73
10053	g14	4399	End 1053	280	48	0.457	28.926	144.314	180.393	0.332	1141.88	982.65	29000000	0.75	0	332	45.48	5.38	0.00	46.25	107.00	50000.00	45329.15	45329.15	##########	########	4223.44	3828.90
	g13a	4468	Mid 1054	273.3494	48	0.468	27.803	141.485	176.856	0.335	1114.75	957.49	29000000	0.75	0	332	44.52	5.41	0.00	46.03	107.00	50000.00	45373.09	45373.09	##########	########	4183.69	3796.54
	g12a	4468	Mid 1054	273.3494	48	0.468	27.803	141.485	176.856	0.335	1114.75	957.49	29000000	0.75	0	332	46.59	5.80	0.00	42.93	107.00	50000.00	45975.13	45975.13	##########	########	5458.69	5019.28
10054	g12	4482	End 1054	272	48	0.471	27.578	140.912	176.140	0.335	1109.25	952.39	29000000	0.75	0	332	46.39	5.80	0.00	42.90	107.00	50000.00	45981.08	45981.08	##########	########	5450.63	5012.51
10055	g11	4565	End 1055	264	48	0.485	26.270	137.528	171.911	0.339	1076.63	922.13	29000000	0.75	0	332	45.16	5.83	0.00	42.71	107.00	50000.00	46016.32	46016.32	##########	########	5402.81	4972.35
10056	g10	4648	End 1056	256	48	0.500	25.000	134.164	167.705	0.343	1044.00	891.91	29000000	0.75	0	332	43.93	5.86	0.00	42.52	107.00	50000.00	46051.56	46051.56	##########	########	5355.00	4932.12
10057	g9	4731	End 1057	248	48	0.516	23.770	130.821	163.526	0.348	1011.38	861.71	29000000	0.75	0	332	42.70	5.88	0.00	42.33	107.00	50000.00	46086.80	46086.80	##########	########	5307.19	4891.83
10058	g8	4814	End 1058	240	48	0.533	22.578	127.500	159.375	0.353	978.75	831.56	29000000	0.75	0	332	41.46	5.91	0.00	42.14	107.00	50000.00	46122.05	46122.05	##########	########	5259.38	4851.46
10059	g7	4897	End 1059	232	48	0.552	21.426	124.204	155.255	0.358	946.13	801.47	29000000	0.75	0	332	40.22	5.94	0.00	41.95	107.00	50000.00	46157.29	46157.29	##########	########	5211.56	4811.03
10060	g6	4980	End 1060	224	48	0.571	20.313	120.934	151.167	0.364	913.50	771.45	29000000	0.75	0	332	38.97	5.96	0.00	41.76	107.00	50000.00	46192.53	46192.53	##########	########	5163.75	4770.53
10061	g5	5063	End 1061	216	48	0.593	19.238	117.693	147.116	0.371	880.88	741.52	29000000	0.75	0	332	37.71	5.99	0.00	41.56	107.00	50000.00	46227.77	46227.77	##########	########	5115.94	4729.97
	g5a	5096	Mid 1062	212.8193	48	0.601	18.822	116.412	145.516	0.374	867.90	729.66	29000000	0.75	0	332	37.21	6.00	0.00	41.49	107.00	50000.00	46241.79	46241.79	##########	########	5096.93	4713.82
	g4a	5096	Mid 1062	212.8193	48	0.601	18.822	116.412	145.516	0.374	867.90	729.66	29000000	0.75	0	332	35.67	5.66	0.00	44.00	107.00	50000.00	45773.03	45773.03	##########	########	3821.93	3498.82
10062	g3	5146	End 1062	208	48	0.615	18.203	114.483	143.103	0.379	848.25	711.72	29000000	0.75	0	332	34.95	5.68	0.00	43.83	107.00	50000.00	45804.87	45804.87	##########	########	3793.13	3474.87
10063	g2	5229	End 1063	200	48	0.640	17.207	111.306	139.133	0.387	815.63	682.05	29000000	0.75	0	332	33.75	5.72	0.00	43.55	107.00	50000.00	45857.73	45857.73	##########	########	3745.31	3435.03
10064	g1	5312	End 1064	192	48	0.667	16.250	108.167	135.208	0.397	783.00	652.57	29000000	0.75	0	332	32.55	5.75	0.00	43.28	107.00	50000.00	45910.60	45910.60	##########	########	3697.50	3395.09

CDM Smith

Client: City of Pittsburgh
Project: Forbes Ave over Fern Hollow
Detail: Column Section Properties

By: PLM 1/9/14
Chk: DJW 1/9/14

θ = 60 degrees
Web Depth at Girder = 84 in
Web Depth at Base = 36 in

Location Point #	Location Frame Section	Section #	Actual Web Depth (in)	Actual Web thickness (in)	Actual Top Flange width (in)	Actual Top Flange thickness (in)	Actual Bot Flange width (in)	Actual Bot Flange thickness (in)	Actual Total Depth (in)	Fy (psi)
90020	End COL14	Colr	84.000	0.8125	24	2.5	24	2.5	89.000	50000
110014	End COL13	Colq	77.600	0.8125	24	2.5	24	2.5	82.600	50000
110013	End COL12	Colp	73.600	0.8125	24	2.5	24	2.5	78.600	50000
110012+	Begin COL12	Colo	69.600	0.8125	24	2.5	24	2.5	74.600	50000
110012-	End COL11	Coln	69.600	0.6875	24	2.5	24	2.5	74.600	50000
110011	End COL10	Colm	66.467	0.6875	24	2.5	24	2.5	71.467	50000
110010	End COL9	Coll	63.333	0.6875	24	2.5	24	2.5	68.333	50000
110009	End COL8	Colk	60.200	0.6875	24	2.5	24	2.5	65.200	50000
110008+	Begin COL8	Colj	57.067	0.6875	24	2.5	24	2.5	62.067	50000
110008-	End COL7	Coli	57.067	0.5345	24	2.125	24	2.125	61.317	50000
110007	End COL6	Colh	53.733	0.5345	24	2.125	24	2.125	57.983	50000
110006+	Begin COL6	Colg	50.400	0.5345	24	2.125	24	2.125	54.650	50000
110006-	End COL5	Colf	50.400	0.347	24	2.125	24	2.125	54.650	50000
110005	End COL4	Cole	46.933	0.347	24	2.125	24	2.125	51.183	50000
110004	End COL3	Cold	43.467	0.347	24	2.125	24	2.125	47.717	50000
110003	End COL2	Colc	40.000	0.347	24	2.125	24	2.125	44.250	50000
110002	End COL1	Colb	36.533	0.347	24	2.125	24	2.125	40.783	50000
110001	Begin COL1	Cola	36.000	0.347	24	2.125	24	2.125	40.250	50000

CDM Smith

Client: City of Pittsburgh
Project: Forbes Ave over Fern Hollow
Detail: Column Section Properties

By: PLM 1/9/14
Chk: DJW 1/7/14

			Moment Capacity																				
Location Point #	Location Frame Section	Section #	Dc (in)	λ	Total Area (in^2)	Flange Area (in^2)	I_{33} (in^4)	S_{33} (in^3)	I_{22} (in^4)	S_{22} (in^3)	J (in^4)	Z (in_3)	L_b (in)	C_b	I_{yc} (in^4)	M_o (k-ft)	M_p (k-ft)	M_y (k-ft)	M_{LT} (k-ft)	M_n (k-ft)	R_{b3}	R_b	M_u
90020	End COL14	Colr	42.00	15400	188.250	60	264661.00	5947.44	5763.75	480.31	265.02	6623.25	624	1	2880	19824.8	27596.9	24781.0	18247.8	18247.8	1.032	1.000	18247.8
110014	End COL13	Colq	38.80	15400	183.050	60	224182.13	5428.14	5763.47	480.29	263.87	6029.17	624	1	2880	18093.8	25121.5	22617.2	17277.3	17277.3	1.033	1.000	17277.3
110013	End COL12	Colp	36.80	15400	179.800	60	200793.32	5109.24	5763.29	480.27	263.16	5666.32	624	1	2880	17030.8	23609.7	21288.5	16680.8	16680.8	1.032	1.000	16680.8
110012+	Begin COL12	Colo	34.80	15400	176.550	60	178842.90	4794.72	5763.11	480.26	262.44	5309.97	624	1	2880	15982.4	22124.9	19978.0	16093.0	16093.0	1.032	1.000	16093.0
110012-	End COL11	Coln	34.80	15400	167.850	60	175330.89	4700.56	5761.88	480.16	257.54	5158.59	624	1	2880	15668.5	21494.1	19585.7	16042.9	16042.9	1.020	1.000	16042.9
110011	End COL10	Colm	33.23	15400	165.696	60	159579.15	4465.81	5761.80	480.15	257.20	4897.34	624	1	2880	14886.0	20405.6	18607.6	15590.2	15590.2	1.020	1.000	15590.2
110010	End COL9	Coll	31.67	15400	163.541	60	144635.99	4233.27	5761.72	480.14	256.86	4639.38	624	1	2880	14110.9	19330.8	17638.6	15143.9	15143.9	1.021	1.000	15143.9
110009	End COL8	Colk	30.10	15400	161.388	60	130500.36	4003.08	5761.63	480.14	256.52	4384.88	624	1	2880	13343.6	18270.3	16679.5	14704.9	14704.9	1.020	1.000	14704.9
110008+	Begin COL8	Colj	28.53	15400	159.234	60	117156.80	3775.17	5761.55	480.13	256.18	4133.76	624	1	2880	12583.9	17224.0	15729.9	14273.8	14273.8	1.020	1.000	14273.8
110008-	End COL7	Coli	28.53	15400	132.502	51	97660.48	3185.43	4896.73	408.06	156.44	3453.96	624	1	2448	10618.1	14391.5	13272.6	11314.3	11314.3	1.013	1.000	11314.3
110007	End COL6	Colh	26.87	15400	130.720	51	86511.53	2984.03	4896.68	408.06	156.27	3234.56	624	1	2448	9946.8	13477.4	12433.5	10910.7	10910.7	1.013	1.000	10910.7
110006+	Begin COL6	Colg	25.20	15400	128.939	51	76092.12	2784.71	4896.64	408.05	156.10	3018.20	624	1	2448	9282.4	12575.8	11602.9	10515.4	10515.4	1.013	1.000	10515.4
110006-	End COL5	Colf	25.20	15400	119.489	51	74091.74	2711.50	4896.18	408.01	154.23	2899.13	624	1	2448	9038.3	12079.7	11297.9	10490.6	10490.6	1.000	1.000	10486.5
110005	End COL4	Cole	23.47	15400	118.286	51	64398.30	2516.39	4896.16	408.01	154.18	2693.04	624	1	2448	8388.0	11221.0	10485.0	10090.0	10090.0	1.001	1.000	10090.0
110004	End COL3	Cold	21.73	15400	117.083	51	55418.26	2322.79	4896.15	408.01	154.14	2489.10	624	1	2448	7742.6	10371.2	9678.3	9700.7	9678.3	1.002	1.000	9678.3
110003	End COL2	Colc	20.00	15400	115.880	51	47139.20	2130.59	4896.14	408.01	154.09	2287.18	624	1	2448	7102.0	9529.9	8877.4	9324.0	8877.4	1.003	1.000	8877.4
110002	End COL1	Colb	18.27	15400	114.677	51	39556.58	1939.86	4896.13	408.01	154.04	2087.34	624	1	2448	6466.2	8697.2	8082.7	8961.5	8082.7	1.004	1.000	8082.7
110001	Begin COL1	Cola	18.00	15400	114.492	51	38452.17	1910.67	4896.13	408.01	154.03	2056.80	624	1	2448	6368.9	8570.0	7961.1	8907.2	7961.1	1.004	1.000	7961.1

CDM Smith

Client: City of Pittsburgh
Project: Forbes Ave over Fern Hollow
Detail: Column Section Properties

By: PLM 1/9/14
Chk: DJW 1/9/14

			Shear Capacity									
Location Point #	Location Frame Section	Section #	D/t_w	d_o (in)	d_o/D	k	6000*sqrt(k)/sqrt(Fy)	7500*sqrt(k)/sqrt(Fy)	C	V_p (kips)	V_n (kips)
90020	End COL14	Colr	103.3846	48	0.571	20.313	120.934	151.167	1.000	1979.25	1979.25
110014	End COL13	Colq	95.50769	48	0.619	18.068	114.057	142.571	1.000	1828.45	1828.45
110013	End COL12	Colp	90.58462	48	0.652	16.756	109.836	137.295	1.000	1734.20	1734.20
110012+	Begin COL12	Colo	85.66154	48	0.690	15.513	105.683	132.104	1.000	1639.95	1639.95
110012-	End COL11	Coln	101.2364	48	0.690	15.513	105.683	132.104	1.000	1387.65	1387.65
110011	End COL10	Colm	96.67927	48	0.722	14.587	102.484	128.105	1.000	1325.19	1325.19
110010	End COL9	Coll	92.12073	48	0.758	13.705	99.334	124.168	1.000	1262.70	1262.70
110009	End COL8	Colk	87.56364	48	0.797	12.865	96.242	120.303	1.000	1200.24	1200.24
110008+	Begin COL8	Colj	83.00655	48	0.841	12.067	93.212	116.515	1.000	1137.77	1137.77
110008-	End COL7	Coli	106.7671	316	5.537	5.163	60.971	76.213	0.408	884.57	360.58
110007	End COL6	Colh	100.5295	316	5.881	5.145	60.861	76.077	0.458	832.89	381.59
110006+	Begin COL6	Colg	94.29373	316	6.270	5.127	60.758	75.948	0.519	781.23	405.45
110006-	End COL5	Colf	145.245	316	6.270	5.127	60.758	75.948	0.219	507.18	110.94
110005	End COL4	Cole	135.2536	316	6.733	5.110	60.658	75.823	0.251	472.29	118.74
110004	End COL3	Cold	125.2651	316	7.270	5.095	60.565	75.706	0.292	437.41	127.81
110003	End COL2	Colc	115.2738	316	7.900	5.080	60.479	75.598	0.344	402.52	138.50
110002	End COL1	Colb	105.2824	316	8.650	5.067	60.400	75.500	0.411	367.63	151.24
110001	Begin COL1	Cola	103.7464	316	8.778	5.065	60.388	75.485	0.424	362.27	153.43

CDM Smith

Client: City of Pittsburgh
Project: Forbes Ave over Fern Hollow
Detail: Column Section Properties

By: RLM 1/9/14
Chk: DSW 1/9/14

			Axial Capacity															
Location Point #	Location Frame Section	Section #	E (psi)	K	L_s strong (in)	L_s weak (in)	r strong (in)	r weak (in)	KL_s/r strong	KL_s/r weak	$\sqrt{(2\pi^2E/F_y)}$	F_{cs} strong (psi)	F_{cs} weak (psi)	F_{cr} (psi)	$E\pi^2/((KL_s/r)^2)$ (psi)	P_o (k)	P_y (k)	P_u (k)
90020	End COL14	Colr	29000000	0.75	624	624	37.50	5.53	12.48	84.58	107.00	49659.81	34379.19	34379.19	1837219.31	345856.5	8000.63	5501.10
110014	End COL13	Colq	29000000	0.75	624	624	35.00	5.61	13.37	83.40	107.00	49609.48	34809.93	34809.93	1600432.26	292959.1	7779.63	5416.16
110013	End COL12	Colp	29000000	0.75	624	624	33.42	5.66	14.00	82.66	107.00	49571.73	35079.16	35079.16	1459370.64	262394.8	7641.50	5361.15
110012+	Begin COL12	Colo	29000000	0.75	624	624	31.83	5.71	14.70	81.91	107.00	49527.86	35348.41	35348.41	1323762.36	233710.2	7503.38	5304.65
110012-	End COL11	Coln	29000000	0.75	624	624	32.32	5.86	14.48	79.88	107.00	49542.14	36067.45	36067.45	1365032.92	229120.8	7133.63	5145.83
110011	End COL10	Colm	29000000	0.75	624	624	31.03	5.90	15.08	79.36	107.00	49503.40	36246.03	36246.03	1258548.65	208536.6	7042.08	5104.95
110010	End COL9	Coll	29000000	0.75	624	624	29.74	5.94	15.74	78.85	107.00	49459.21	36424.68	36424.68	1155725.26	189009.0	6950.51	5063.40
110009	End COL8	Colk	29000000	0.75	624	624	28.44	5.97	16.46	78.33	107.00	49408.53	36603.28	36603.28	1056690.64	170536.7	6858.97	5021.22
110008+	Begin COL8	Colj	29000000	0.75	624	624	27.12	6.02	17.25	77.80	107.00	49349.96	36781.88	36781.88	961477.05	153099.4	6767.43	4978.37
110008-	End COL7	Coli	29000000	0.75	624	624	27.15	6.08	17.24	76.98	107.00	49351.10	37058.29	37058.29	963166.63	127621.8	5631.35	4173.76
110007	End COL6	Colh	29000000	0.75	624	624	25.73	6.12	18.19	76.47	107.00	49277.33	37232.23	37232.23	864842.53	113052.5	5555.61	4136.96
110006+	Begin COL6	Colg	29000000	0.75	624	624	24.29	6.16	19.26	75.94	107.00	49189.57	37406.13	37406.13	771191.22	99436.5	5479.90	4099.64
110006-	End COL5	Colf	29000000	0.75	624	624	24.90	6.40	18.79	73.11	107.00	49228.69	38328.03	38328.03	810305.22	96822.4	5078.27	3892.80
110005	End COL4	Cole	29000000	0.75	624	624	23.33	6.43	20.06	72.74	107.00	49121.52	38445.52	38445.52	711455.99	84155.1	5027.14	3865.42
110004	End COL3	Cold	29000000	0.75	624	624	21.76	6.47	21.51	72.37	107.00	48989.55	38562.97	38562.97	618535.89	72420.1	4976.03	3837.81
110003	End COL2	Colc	29000000	0.75	624	624	20.17	6.50	23.20	72.00	107.00	48824.29	38680.46	38680.46	531593.59	61601.1	4924.90	3809.95
110002	End COL1	Colb	29000000	0.75	624	624	18.57	6.53	25.20	71.62	107.00	48613.46	38797.95	38797.95	450763.38	51692.2	4873.77	3781.85
110001	Begin COL1	Cola	29000000	0.75	624	624	18.33	6.54	25.54	71.57	107.00	48575.94	38816.01	38816.01	438885.99	50248.9	4865.91	3777.50

CDM Smith

Client: City of Pittsburgh
Project: Forbes Ave over Fern Hollow
Detail: Girder Rating at Abut 1

By: PLM 1/9/14
Chk: DJW 1/9/14

Location: Girder 1, Abut 1
Rating Factors: Only shear needs checked at this location. Calculate Impact based upon Span 1 being loaded
Impact: 0.1899

	OutputCase	StepType	P	V2	V3	T	M2	M3
	Text	Text	Kip	Kip	Kip	Kip-ft	Kip-ft	Kip-ft
Begin 1001	DEAD		7.346	-216.952	3.366	-1.341	-2.3718	45.8874
Begin 1001	H20	Min	-0.843	-43.766	-0.273	-0.3837	-0.3102	-0.2938
Begin 1001	HS20	Min	-0.907	-75.794	-0.474	-0.6776	-0.3788	-0.5217
Begin 1001	HSLaneNegM	Min	-1.226	-78.895	-0.862	-1.0418	-0.5594	-0.8466
Begin 1001	HSLanePosM	Min	-0.949	-58.767	-0.735	-0.8674	-0.4518	-0.7135
Begin 1001	HSLaneShear	Min	-1.145	-66.571	-0.788	-0.9099	-0.5148	-0.7447
Begin 1001	ML80	Min	-1.08	-82.119	-0.496	-0.7183	-0.4317	-0.5493
Begin 1001	TK527	Min	-1.011	-86.394	-0.525	-0.7729	-0.4157	-0.5928

OR_2				
V_u	V_{DL}	V_{LL+I}	OR_2	Tons
Kip	Kip	Kip		
652.57	216.95	n/a	n/a	
652.57	216.95	52.08	5.47	109.47
652.57	216.95	90.19	3.16	113.78
652.57	216.95	93.88	3.04	60.72
652.57	216.95	69.93	4.08	81.52
652.57	216.95	79.21	3.60	71.97
652.57	216.95	97.71	2.92	106.88
652.57	216.95	102.80	2.77	110.91

CDM Smith

Client: City of Pittsburgh
Project: Forbes Ave over Fern Hollow
Detail: Girder Rating, max pos moment span 1

By: PLM 1/9/14
Chk: DJW 1/10/14

Location: Girder 1, Maximum Positive Moment in Span 1
Rating Factors: Only moment needs checked at this location. Calculate Impact based upon Span 1 being loaded
Impact: 0.1899

	OutputCase	StepType	P	V2	V3	T	M2	M3
	Text	Text	Kip	Kip	Kip	Kip-ft	Kip-ft	Kip-ft
End 1008	DEAD		13.324	-10.513	-10.455	2.1692	58.9176	6458.377
End 1008	H20	Max	2.888	14.157	0.834	0.4367	1.6351	1524.674
End 1008	HS20	Max	4.96	22.359	1.327	0.7554	2.14	2604.777
End 1008	HSLaneNegM	Max	7.844	26.029	1.829	1.3126	2.7395	2622.985
End 1008	HSLanePosM	Max	6.505	19.177	1.443	1.1178	2.1821	1914.948
End 1008	HSLaneShear	Max	6.989	21.96	1.576	1.2006	2.5462	2144.889
End 1008	ML80	Max	5.248	26.183	1.289	0.8093	1.9275	2849.768
End 1008	TK527	Max	5.588	25.285	1.346	0.8512	1.9471	2966.068

OR_1, OR_3						
M_u	M_o	M_{DL}	M_{LL+I}	OR_1	OR_3	Tons
Kip-ft	Kip-ft	Kip-ft	Kip-ft			
19357.45	16254.87	6458.38	n/a	n/a		
19357.45	16254.87	6458.38	1814.17	4.65	5.40	92.96
19357.45	16254.87	6458.38	3099.35	2.72	3.16	97.94
19357.45	16254.87	6458.38	3121.02	2.70	3.14	54.03
19357.45	16254.87	6458.38	2278.55	3.70	4.30	74.01
19357.45	16254.87	6458.38	2552.15	3.30	3.84	66.08
19357.45	16254.87	6458.38	3390.86	2.49	2.89	91.11
19357.45	16254.87	6458.38	3529.24	2.39	2.78	95.57

CDM Smith

Client: City of Pittsburgh
Project: Forbes Ave over Fern Hollow
Detail: Girder Rating, mid of span 2

By: PLM 1/9/14
Chk: DJW 1/10/14

Location: Girder 1, Mid of Span 2
Rating Factors: All Rating Factors to be checked. Impact based upon Span 2 length
Impact: 0.1718

	OutputCase	StepType	P	V2	V3	T	M2	M3
	Text	Text	Kip	Kip	Kip	Kip-ft	Kip-ft	Kip-ft
End 1032	DEAD		-513.704	-31.606	-9.397	3.0475	52.4036	3884.673
End 1032	H20	Max	-34.881	-31.02	-0.521	0.2252	2.0089	1225.105
End 1032	HS20	Max	-61.802	-52.472	-0.598	0.325	2.4464	2077.612
End 1032	HSLaneNegM	Max	-112.354	-54.102	-0.586	0.3556	2.8262	1991.748
End 1032	HSLanePosM	Max	-96.532	-39.712	-0.448	0.2595	2.0788	1419.574
End 1032	HSLaneShear	Max	-98.103	-45.708	-0.566	0.3109	2.3794	1604.793
End 1032	ML80	Max	-65.285	-57.804	-0.472	0.2299	2.0319	2286.509
End 1032	TK527	Max	-70.459	-60.078	-0.47	0.2282	2.0265	2365.511

		All Rating Factors																			
	OutputCase	M_u	M_o	M_p	M_{DL}	M_{LL+I}	V_u	V_{DL}	V_{LL+I}	P_u	P_o	P_y	P_{DL}	P_{LL+I}	OR_1	OR_2	OR_3	OR_4	OR_5	OR_6	OR_7	Tons
	Text	Kip-ft	Kip-ft	Kip-ft	Kip-ft	Kip-ft	Kip	Kip	Kip	Kip	Kip	Kip	Kip	Kip								
End 1032	DEAD	16353.24	13273.23	17776.56	3884.67	n/a	652.57	31.61	n/a	5091.38	########	5482.50	513.70	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
End 1032	H20	16353.24	13273.23	17776.56	3884.67	1435.60	652.57	31.61	36.35	5091.38	########	5482.50	513.70	40.87	6.06	12.94	6.54	6.44	83.25	4.50	5.18	89.92
End 1032	HS20	16353.24	13273.23	17776.56	3884.67	2434.59	652.57	31.61	61.49	5091.38	########	5482.50	513.70	72.42	3.57	7.65	3.86	3.80	46.99	2.64	3.04	95.09
End 1032	HSLaneNegM	16353.24	13273.23	17776.56	3884.67	2333.97	652.57	31.61	63.40	5091.38	########	5482.50	513.70	131.66	3.73	7.42	4.02	3.88	25.85	2.56	2.94	51.11
End 1032	HSLanePosM	16353.24	13273.23	17776.56	3884.67	1663.49	652.57	31.61	46.54	5091.38	########	5482.50	513.70	113.12	5.23	10.11	5.64	5.40	30.08	3.48	4.00	69.52
End 1032	HSLaneShear	16353.24	13273.23	17776.56	3884.67	1880.53	652.57	31.61	53.56	5091.38	########	5482.50	513.70	114.96	4.62	8.78	4.99	4.75	29.60	3.13	3.61	62.63
End 1032	ML80	16353.24	13273.23	17776.56	3884.67	2679.38	652.57	31.61	67.74	5091.38	########	5482.50	513.70	76.50	3.25	6.94	3.50	3.45	44.48	2.41	2.78	88.24
End 1032	TK527	16353.24	13273.23	17776.56	3884.67	2771.96	652.57	31.61	70.40	5091.38	########	5482.50	513.70	82.57	3.14	6.68	3.39	3.33	41.21	2.32	2.67	92.78

CDM Smith

Client: City of Pittsburgh
Project: Forbes Ave over Fern Hollow
Detail: Girder Rating, End of span 2

By: PLM 1/9/14
Chk: DJW 1/16/14

Location: Girder 1, End of Span 2
Rating Factors: All Rating Factors to be checked. Impact based upon Span 2 and Span 3 length
Impact: 0.1804

	OutputCase	StepType	P	V2	V3	T	M2	M3
	Text	Text	Kip	Kip	Kip	Kip-ft	Kip-ft	Kip-ft
End 1044	DEAD		-548.039	447.283	-5.944	5.6286	34.0279	-17212.4
End 1044	H20	Max	-36.259	51.833	1.643	-1.4756	-10.0981	-1519.61
End 1044	HS20	Max	-64.968	90.884	-1.528	-2.404	-15.4903	-2709.59
End 1044	HSLaneNegM	Max	-118.566	118.028	3.62	-5.2666	-28.5343	-4253.01
End 1044	HSLanePosM	Max	-102.215	94.388	2.864	-4.5877	-24.3721	-3565.7
End 1044	HSLaneShear	Max	-104.101	103.009	3.073	-4.7577	-25.5565	-3633.21
End 1044	ML80	Max	-68.25	97.366	2.236	-2.3571	-15.0912	-2863.44
End 1044	TK527	Max	-74.117	103.951	2.264	-2.5525	-15.5364	-3093.28

		All Rating Factors																				
	OutputCase	M_u	M_o	M_P	M_{DL}	M_{LL+I}	V_u	V_{DL}	V_{LL+I}	P_u	P_o	P_y	P_{DL}	P_{LL+I}	OR_1	OR_2	OR_3	OR_4	OR_5	OR_6	OR_7	Tons
	Text	Kip-ft	Kip-ft	Kip-ft	Kip-ft	Kip-ft	Kip	Kip	Kip	Kip	Kip	Kip	Kip	Kip								
End 1044	DEAD	49770.73	40532.99	56973.44	17212.44	n/a	3110.25	447.28	n/a	9876.25	########	10933.13	548.04	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
End 1044	H20	49770.73	40532.99	56973.44	17212.44	1793.74	3110.25	447.28	61.18	9876.25	########	10933.13	548.04	42.80	11.75	31.79	13.00	12.87	164.70	9.11	11.78	182.25
End 1044	HS20	49770.73	40532.99	56973.44	17212.44	3198.39	3110.25	447.28	107.28	9876.25	########	10933.13	548.04	76.69	6.59	18.13	7.29	7.25	91.92	5.11	6.60	183.88
End 1044	HSLaneNegM	49770.73	40532.99	56973.44	17212.44	5020.24	3110.25	447.28	139.32	9876.25	########	10933.13	548.04	139.95	4.20	13.96	4.65	4.83	50.37	3.20	4.13	63.96
End 1044	HSLanePosM	49770.73	40532.99	56973.44	17212.44	4208.95	3110.25	447.28	111.42	9876.25	########	10933.13	548.04	120.65	5.01	17.46	5.54	5.82	58.42	3.80	4.91	76.03
End 1044	HSLaneShear	49770.73	40532.99	56973.44	17212.44	4288.63	3110.25	447.28	121.59	9876.25	########	10933.13	548.04	122.88	4.91	16.00	5.44	5.62	57.37	3.73	4.82	74.62
End 1044	ML80	49770.73	40532.99	56973.44	17212.44	3380.00	3110.25	447.28	114.93	9876.25	########	10933.13	548.04	80.56	6.23	16.93	6.90	6.83	87.50	4.84	6.25	177.21
End 1044	TK527	49770.73	40532.99	56973.44	17212.44	3651.29	3110.25	447.28	122.70	9876.25	########	10933.13	548.04	87.49	5.77	15.85	6.39	6.35	80.57	4.47	5.78	178.98

CDM Smith

Client: City of Pittsburgh
Project: Forbes Ave over Fern Hollow
Detail: Column Rating, Leg 1 at top

By: PLM 1/9/14
Chk: DJW 1/10/14

Location: Leg 1 at G9 (Top of leg)
Rating Factors: All Rating Factors to be checked. Impact based upon average of Span 1 and Span 2 lengths
Impact: 0.1804

	OutputCase	StepType	P	V2	V3	T	M2	M3
	Text	Text	Kip	Kip	Kip	Kip-ft	Kip-ft	Kip-ft
End 110014	DEAD		-1142.36	-30.013	-0.237	0	13.0127	2117.096
End 110014	H20		-65.299	-20.779	-0.127	0	6.973	1142.859
End 110014	HS20	Max	-117.267	-36.987	-0.209	0	11.483	2034.298
End 110014	HSLaneNegM	Max	-252.063	-47.495	-0.322	0	17.7281	2612.2
End 110014	HSLanePosM	Max	-222.646	-38.319	-0.273	0	15.0424	2107.534
End 110014	HSLaneShear	Max	-227.27	-40.445	-0.292	0	16.0815	2224.477
End 110014	ML80	Max	-123.172	-39.157	-0.227	0	12.5081	2153.628
End 110014	TK527	Max	-134.119	-42.184	-0.233	0	12.8256	2320.094

		All Rating Factors																				
	OutputCase	M_u	M_o	M_p	M_{DL}	M_{LL+I}	V_u	V_{DL}	V_{LL+I}	P_u	P_o	P_y	P_{DL}	P_{LL+I}	OR_1	OR_2	OR_3	OR_4	OR_5	OR_6	OR_7	Tons
	Text	Kip-ft	Kip-ft	Kip-ft	Kip-ft	Kip-ft	Kip	Kip	Kip	Kip	Kip	Kip	Kip	Kip								
End 110014	DEAD	18247.83	19824.79	27596.88	2117.10	n/a	1979.25	30.01	n/a	5501.10	########	8000.63	1142.36	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
End 110014	H20	18247.83	19824.79	27596.88	2117.10	1349.03	1979.25	30.01	24.53	5501.10	########	8000.63	1142.36	77.08	8.84	60.85	13.13	11.41	40.08	5.07	9.39	101.33
End 110014	HS20	18247.83	19824.79	27596.88	2117.10	2401.28	1979.25	30.01	43.66	5501.10	########	8000.63	1142.36	138.42	4.96	34.18	7.37	6.41	22.32	2.84	5.27	102.32
End 110014	HSLaneNegM	18247.83	19824.79	27596.88	2117.10	3083.43	1979.25	30.01	56.06	5501.10	########	8000.63	1142.36	297.53	3.87	26.62	5.74	4.99	10.38	2.00	3.69	39.95
End 110014	HSLanePosM	18247.83	19824.79	27596.88	2117.10	2487.73	1979.25	30.01	45.23	5501.10	########	8000.63	1142.36	262.81	4.79	33.00	7.12	6.19	11.75	2.42	4.47	48.40
End 110014	HSLaneShear	18247.83	19824.79	27596.88	2117.10	2625.77	1979.25	30.01	47.74	5501.10	########	8000.63	1142.36	268.27	4.54	31.26	6.74	5.86	11.52	2.31	4.27	46.25
End 110014	ML80	18247.83	19824.79	27596.88	2117.10	2542.14	1979.25	30.01	46.22	5501.10	########	8000.63	1142.36	145.39	4.69	32.29	6.97	6.06	21.25	2.69	4.98	98.50
End 110014	TK527	18247.83	19824.79	27596.88	2117.10	2738.63	1979.25	30.01	49.79	5501.10	########	8000.63	1142.36	158.31	4.35	29.97	6.47	5.62	19.51	2.49	4.62	99.64

CDM Smith

Client: City of Pittsburgh
Project: Forbes Ave over Fern Hollow
Detail: Column Rating, Leg 1, 47' up from bot

By: PLM 1/9/14
Chk: DJW 1/10/14

Location: Leg 1, 47' up from bottom along leg
Rating Factors: All Rating Factors to be checked. Impact based upon average of Span 1 and Span 2 lengths
Impact: 0.1804

	OutputCase	StepType	P	V2	V3	T	M2	M3
	Text	Text	Kip	Kip	Kip	Kip-ft	Kip-ft	Kip-ft
End 110012	DEAD		-1146.79	-32.771	-0.237	0	11.1199	1865.919
End 110012	H20		-65.299	-20.779	-0.127	0	5.9599	976.6246
End 110012	HS20	Max	-117.267	-36.987	-0.209	0	9.814	1738.4
End 110012	HSLaneNegM	Max	-252.063	-47.495	-0.322	0	15.1475	2232.244
End 110012	HSLanePosM	Max	-222.646	-38.319	-0.273	0	12.8516	1800.984
End 110012	HSLaneShear	Max	-227.27	-40.445	-0.292	0	13.7396	1900.917
End 110012	ML80	Max	-123.172	-39.157	-0.227	0	10.6895	1840.373
End 110012	TK527	Max	-134.119	-42.184	-0.233	0	10.9603	1982.626

		All Rating Factors																				
	OutputCase	M_u	M_o	M_P	M_{DL}	M_{LL+I}	V_u	V_{DL}	V_{LL+I}	P_u	P_o	P_y	P_{DL}	P_{LL+I}	OR_1	OR_2	OR_3	OR_4	OR_5	OR_6	OR_7	Tons
	Text	Kip-ft	Kip-ft	Kip-ft	Kip-ft	Kip-ft	Kip	Kip	Kip	Kip	Kip	Kip	Kip	Kip								
End 110012	DEAD	16680.79	17030.82	23609.67	1865.92	n/a	1734.20	32.77	n/a	5361.15	#########	7641.50	1146.79	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
End 110012	H20	16680.79	17030.82	23609.67	1865.92	1152.80	1734.20	32.77	24.53	5361.15	#########	7641.50	1146.79	77.08	9.51	53.05	13.15	11.98	38.63	5.31	9.17	106.24
End 110012	HS20	16680.79	17030.82	23609.67	1865.92	2052.00	1734.20	32.77	43.66	5361.15	#########	7641.50	1146.79	138.42	5.34	29.80	7.39	6.73	21.51	2.98	5.14	107.26
End 110012	HSLaneNegM	16680.79	17030.82	23609.67	1865.92	2634.93	1734.20	32.77	56.06	5361.15	#########	7641.50	1146.79	297.53	4.16	23.21	5.76	5.24	10.01	2.08	3.59	41.55
End 110012	HSLanePosM	16680.79	17030.82	23609.67	1865.92	2125.88	1734.20	32.77	45.23	5361.15	#########	7641.50	1146.79	262.81	5.16	28.77	7.13	6.50	11.33	2.51	4.34	50.26
End 110012	HSLaneShear	16680.79	17030.82	23609.67	1865.92	2243.84	1734.20	32.77	47.74	5361.15	#########	7641.50	1146.79	268.27	4.89	27.26	6.76	6.16	11.10	2.40	4.15	48.06
End 110012	ML80	16680.79	17030.82	23609.67	1865.92	2172.37	1734.20	32.77	46.22	5361.15	#########	7641.50	1146.79	145.39	5.05	28.15	6.98	6.36	20.48	2.82	4.86	103.26
End 110012	TK527	16680.79	17030.82	23609.67	1865.92	2340.29	1734.20	32.77	49.79	5361.15	#########	7641.50	1146.79	158.31	4.69	26.13	6.48	5.90	18.81	2.61	4.51	104.45

CDM Smith

Client: City of Pittsburgh
Project: Forbes Ave over Fern Hollow
Detail: Column Rating, Leg 1, 30' up from bot

By: PLM 1/9/14
Chk: DJW 1/10/14

Location: Leg 1, 30' up from bottom along leg
Rating Factors: All Rating Factors to be checked. Impact based upon average of Span 1 and Span 2 lengths
Impact: 0.1804

	OutputCase	StepType	P	V2	V3	T	M2	M3
	Text	Text	Kip	Kip	Kip	Kip-ft	Kip-ft	Kip-ft
End 110008	DEAD		-1155.4	-38.138	-0.237	0	7.157	1271.196
End 110008	H20		-65.299	-20.779	-0.127	0	3.8362	628.5722
End 110008	HS20	Max	-117.267	-36.987	-0.209	0	6.3177	1118.864
End 110008	HSLaneNegM	Max	-252.063	-47.495	-0.322	0	9.754	1436.71
End 110008	HSLanePosM	Max	-222.646	-38.319	-0.273	0	8.2772	1159.144
End 110008	HSLaneShear	Max	-227.27	-40.445	-0.292	0	8.8488	1223.463
End 110008	ML80	Max	-123.172	-39.157	-0.227	0	6.8802	1184.496
End 110008	TK527	Max	-134.119	-42.184	-0.233	0	7.0543	1276.052

		All Rating Factors																				
	OutputCase	M_u	M_o	M_p	M_{DL}	M_{LL+I}	V_u	V_{DL}	V_{LL+I}	P_u	P_o	P_y	P_{DL}	P_{LL+I}	OR_1	OR_2	OR_3	OR_4	OR_5	OR_6	OR_7	Tons
	Text	Kip-ft	Kip-ft	Kip-ft	Kip-ft	Kip-ft	Kip	Kip	Kip	Kip	Kip	Kip	Kip	Kip								
End 110008	DEAD	11314.28	10618.10	14391.50	1271.20	n/a	360.58	38.14	n/a	4173.76	#########	5631.35	1155.40	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
End 110008	H20	11314.28	10618.10	14391.50	1271.20	741.96	360.58	38.14	24.53	4173.76	#########	5631.35	1155.40	77.08	10.02	9.75	12.60	8.13	26.66	4.52	7.29	90.44
End 110008	HS20	11314.28	10618.10	14391.50	1271.20	1320.70	360.58	38.14	43.66	4173.76	#########	5631.35	1155.40	138.42	5.63	5.48	7.08	4.57	14.85	2.54	4.09	91.28
End 110008	HSLaneNegM	11314.28	10618.10	14391.50	1271.20	1695.89	360.58	38.14	56.06	4173.76	#########	5631.35	1155.40	297.53	4.38	4.27	5.51	3.56	6.91	1.72	2.79	34.37
End 110008	HSLanePosM	11314.28	10618.10	14391.50	1271.20	1368.25	360.58	38.14	45.23	4173.76	#########	5631.35	1155.40	262.81	5.43	5.29	6.83	4.41	7.82	2.07	3.36	41.33
End 110008	HSLaneShear	11314.28	10618.10	14391.50	1271.20	1444.17	360.58	38.14	47.74	4173.76	#########	5631.35	1155.40	268.27	5.15	5.01	6.47	4.18	7.66	1.98	3.21	39.61
End 110008	ML80	11314.28	10618.10	14391.50	1271.20	1398.17	360.58	38.14	46.22	4173.76	#########	5631.35	1155.40	145.39	5.32	5.18	6.69	4.32	14.14	2.40	3.87	87.91
End 110008	TK527	11314.28	10618.10	14391.50	1271.20	1506.25	360.58	38.14	49.79	4173.76	#########	5631.35	1155.40	158.31	4.93	4.80	6.21	4.01	12.98	2.22	3.58	88.87

CDM Smith

Client: City of Pittsburgh
Project: Forbes Ave over Fern Hollow
Detail: Column Rating, Leg 1, 18' up from bot

By: PLM 1/9/14
Chk: PJW 1/10/14

Location: Leg 1, 18' up from bottom along leg
Rating Factors: All Rating Factors to be checked. Impact based upon average of Span 1 and Span 2 lengths
Impact: 0.1804

	OutputCase	StepType	P	V2	V3	T	M2	M3
	Text	Text	Kip	Kip	Kip	Kip-ft	Kip-ft	Kip-ft
End 110005	DEAD		-1160.69	-41.435	-0.237	0	4.2587	782.906
End 110005	H20		-65.299	-20.779	-0.127	0	2.283	374.0265
End 110005	HS20	Max	-117.267	-36.987	-0.209	0	3.7603	665.7703
End 110005	HSLaneNegM	Max	-252.063	-47.495	-0.322	0	5.8169	854.9018
End 110005	HSLanePosM	Max	-222.646	-38.319	-0.273	0	4.9364	689.7386
End 110005	HSLaneShear	Max	-227.27	-40.445	-0.292	0	5.2786	728.0107
End 110005	ML80	Max	-123.172	-39.157	-0.227	0	4.0942	704.8238
End 110005	TK527	Max	-134.119	-42.184	-0.233	0	4.1972	759.3035
End 110005	AASHTO-Type3	Max	-81.503	-25.791	-0.147	0	2.6445	464.2396
End 110005	PA-Legal	Max	-95.895	-30.409	-0.175	0	3.1559	547.3544

Controls for all trucks

		All Rating Factors																			
	OutputCase	M_u	M_o	M_P	M_{DL}	M_{LL+I}	V_u	V_{DL}	V_{LL+I}	P_u	P_o	P_y	P_{DL}	P_{LL+I}	OR_1	OR_2	OR_3	OR_4	OR_5	OR_6	OR_7	Tons
	Text	Kip-ft	Kip-ft	Kip-ft	Kip-ft	Kip-ft	Kip	Kip	Kip	Kip	Kip	Kip	Kip	Kip								
End 110005	DEAD	10486.46	9038.33	12079.72	782.91	n/a	110.94	41.44	n/a	3892.80	96822.40	5078.27	1160.69	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
End 110005	H20	10486.46	9038.33	12079.72	782.91	441.50	110.94	41.44	24.53	3892.80	96822.40	5078.27	1160.69	77.08	16.50	1.79	18.70	4.16	23.79	6.40	9.20	35.80
End 110005	HS20	10486.46	9038.33	12079.72	782.91	785.87	110.94	41.44	43.66	3892.80	96822.40	5078.27	1160.69	138.42	9.27	1.01	10.50	2.34	13.25	3.59	5.15	36.20
End 110005	HSLaneNegM	10486.46	9038.33	12079.72	782.91	1009.12	110.94	41.44	56.06	3892.80	96822.40	5078.27	1160.69	297.53	7.22	n/a	8.18	1.82	6.16	2.30	3.35	36.38
End 110005	HSLanePosM	10486.46	9038.33	12079.72	782.91	814.17	110.94	41.44	45.23	3892.80	96822.40	5078.27	1160.69	262.81	8.95	0.97	10.14	2.25	6.98	2.73	3.99	19.41
End 110005	HSLaneShear	10486.46	9038.33	12079.72	782.91	859.34	110.94	41.44	47.74	3892.80	96822.40	5078.27	1160.69	268.27	8.48	0.92	9.61	2.14	6.84	2.63	3.84	18.39
End 110005	ML80	10486.46	9038.33	12079.72	782.91	831.97	110.94	41.44	46.22	3892.80	96822.40	5078.27	1160.69	145.39	8.75	0.95	9.92	2.21	12.61	3.40	4.88	34.80
End 110005	TK527	10486.46	9038.33	12079.72	782.91	896.28	110.94	41.44	49.79	3892.80	96822.40	5078.27	1160.69	158.31	8.13	0.88	9.21	2.05	11.58	3.14	4.52	35.27
End 110005	AASHTO-Type3	10486.46	9038.33	12079.72	782.91	547.99	110.94	41.44	30.44	3892.80	96822.40	5078.27	1160.69	96.21	13.29	1.44 *	15.07	3.35	19.06	5.15	7.40	57.68
End 110005	PA-Legal	10486.46	9038.33	12079.72	782.91	646.10	110.94	41.44	35.89	3892.80	96822.40	5078.27	1160.69	113.19	11.27	1.22 *	12.78	2.84	16.20	4.37	6.28	48.92

→ By inspection of influence surface, HS Lane Neg M Load Case is not appropriate to analyze shear at this location.

* - Above 1, therefore lane load does not control for H20.

CDM Smith

Client: City of Pittsburgh
Project: Forbes Ave over Fern Hollow
Detail: Column Rating, Leg 1, 14' up from bot

By: PLM 1/9/14
Chk: DJW 1/10/14

Location: Leg 1, 14' up from bottom along leg
Rating Factors: All Rating Factors to be checked. Impact based upon average of Span 1 and Span 2 lengths
Impact: 0.1804

	OutputCase	StepType	P	V2	V3	T	M2	M3
	Text	Text	Kip	Kip	Kip	Kip-ft	Kip-ft	Kip-ft
End 110004	DEAD		-1162.3	-42.435	-0.237	0	3.2335	601.1857
End 110004	H20		-65.299	-20.779	-0.127	0	1.7334	283.983
End 110004	HS20	Max	-117.267	-36.987	-0.209	0	2.8553	505.4923
End 110004	HSLaneNegM	Max	-252.063	-47.495	-0.322	0	4.4394	649.0921
End 110004	HSLanePosM	Max	-222.646	-38.319	-0.273	0	3.7704	523.6904
End 110004	HSLaneShear	Max	-227.27	-40.445	-0.292	0	4.0294	552.7489
End 110004	ML80	Max	-123.172	-39.157	-0.227	0	3.1086	535.144
End 110004	TK527	Max	-134.119	-42.184	-0.233	0	3.1869	576.5082
End 110004	AASHTO-Type3	Max	-81.503	-25.791	-0.147	0	2.0078	352.4782
End 110004	PA-Legal	Max	-95.895	-30.409	-0.175	0	2.3962	415.5839

		All Rating Factors																			
	OutputCase	M_u	M_o	M_p	M_{DL}	M_{LL+I}	V_u	V_{DL}	V_{LL+I}	P_u	P_o	P_y	P_{DL}	P_{LL+I}	OR_1	OR_2	OR_3	OR_4	OR_5	OR_6	OR_7	Tons
	Text	Kip-ft	Kip-ft	Kip-ft	Kip-ft	Kip-ft	Kip	Kip	Kip	Kip	Kip	Kip	Kip	Kip								
End 110004	DEAD	10089.96	8387.98	11221.01	601.19	n/a	118.74	42.44	n/a	3865.42	84155.11	5027.14	1162.30	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
End 110004	H20	10089.96	8387.98	11221.01	601.19	335.21	118.74	42.44	24.53	3865.42	84155.11	5027.14	1162.30	77.08	21.36	1.99	23.23	4.77	23.50	7.69	10.72	39.88
End 110004	HS20	10089.96	8387.98	11221.01	601.19	596.68	118.74	42.44	43.66	3865.42	84155.11	5027.14	1162.30	138.42	12.00	1.12	13.05	2.68	13.08	4.31	6.00	40.32
End 110004	HSLaneNegM	10089.96	8387.98	11221.01	601.19	766.19	118.74	42.44	56.06	3865.42	84155.11	5027.14	1162.30	297.53	9.35	n/a	10.16	2.09	6.09	2.67	3.80	41.76
End 110004	HSLanePosM	10089.96	8387.98	11221.01	601.19	618.16	118.74	42.44	45.23	3865.42	84155.11	5027.14	1162.30	262.81	11.58	1.08	12.60	2.59	6.89	3.16	4.51	21.62
End 110004	HSLaneShear	10089.96	8387.98	11221.01	601.19	652.46	118.74	42.44	47.74	3865.42	84155.11	5027.14	1162.30	268.27	10.97	1.02	11.93	2.45	6.75	3.05	4.34	20.49
End 110004	ML80	10089.96	8387.98	11221.01	601.19	631.68	118.74	42.44	46.22	3865.42	84155.11	5027.14	1162.30	145.39	11.34	1.06	12.33	2.53	12.46	4.08	5.68	38.77
End 110004	TK527	10089.96	8387.98	11221.01	601.19	680.51	118.74	42.44	49.79	3865.42	84155.11	5027.14	1162.30	158.31	10.52	0.98	11.44	2.35	11.44	3.77	5.26	39.28
End 110004	AASHTO-Type3	10089.96	8387.98	11221.01	601.19	416.06	118.74	42.44	30.44	3865.42	84155.11	5027.14	1162.30	96.21	17.21	1.61	18.72	3.85	18.83	6.18	8.62	64.25
End 110004	PA-Legal	10089.96	8387.98	11221.01	601.19	490.55	118.74	42.44	35.89	3865.42	84155.11	5027.14	1162.30	113.19	14.60	1.36	15.87	3.26	16.00	5.25	7.31	54.50

By inspection of influence surface, HS Lane NegM Load Case is not appropriate to analyze shear at this location.

CDM Smith

Client: City of Pittsburgh
Project: Forbes Ave over Fern Hollow
Detail: Column Rating, Leg 1 at thrust block

By: PLM 1/9/14
Chk: DJW 1/10/14

Location: Leg 1 at Thrust Block
Rating Factors: Only Axial and Shear Ratings need to be checked
Impact: 0.1804

	OutputCase	StepType	P	V2	V3	T	M2	M3
	Text	Text	Kip	Kip	Kip	Kip-ft	Kip-ft	Kip-ft
Begin 110001	DEAD		-1167.265	-45.528	-0.237	0	0	0
Begin 110001	H20		-65.299	-20.779	-0.127	0	0	0
Begin 110001	HS20	Max	-117.267	-36.987	-0.209	0	0	0
Begin 110001	HSLaneNegM	Max	-252.063	-47.495	-0.322	0	0	0
Begin 110001	HSLanePosM	Max	-222.646	-38.319	-0.273	0	0	0
Begin 110001	HSLaneShear	Max	-227.27	-40.445	-0.292	0	0	0
Begin 110001	ML80	Max	-123.172	-39.157	-0.227	0	0	0
Begin 110001	TK527	Max	-134.119	-42.184	-0.233	0	0	0

		OR_2, OR_5															
	OutputCase	M_u	M_o	M_P	M_{DL}	M_{LL+I}	V_u	V_{DL}	V_{LL+I}	P_u	P_o	P_y	P_{DL}	P_{LL+I}	OR_2	OR_5	Tons
	Text	Kip-ft	Kip-ft	Kip-ft	Kip-ft	Kip-ft	Kip	Kip	Kip	Kip	Kip	Kip	Kip	Kip			
Begin 110001	DEAD	7961.11	6368.89	8570.01	0.00	n/a	153.43	45.53	n/a	3777.50	50248.93	4865.91	1167.27	n/a	n/a	n/a	
Begin 110001	H20	7961.11	6368.89	8570.01	0.00	0.00	153.43	45.53	24.53	3777.50	50248.93	4865.91	1167.27	77.08	2.96	22.55	59.11
Begin 110001	HS20	7961.11	6368.89	8570.01	0.00	0.00	153.43	45.53	43.66	3777.50	50248.93	4865.91	1167.27	138.42	1.66	12.56	59.77
Begin 110001	HSLaneNegM	7961.11	6368.89	8570.01	0.00	0.00	153.43	45.53	56.06	3777.50	50248.93	4865.91	1167.27	297.53	1.29	5.84	25.86
Begin 110001	HSLanePosM	7961.11	6368.89	8570.01	0.00	0.00	153.43	45.53	45.23	3777.50	50248.93	4865.91	1167.27	262.81	1.60	6.62	32.05
Begin 110001	HSLaneShear	7961.11	6368.89	8570.01	0.00	0.00	153.43	45.53	47.74	3777.50	50248.93	4865.91	1167.27	268.27	1.52	6.48	30.37
Begin 110001	ML80	7961.11	6368.89	8570.01	0.00	0.00	153.43	45.53	46.22	3777.50	50248.93	4865.91	1167.27	145.39	1.57	11.96	57.47
Begin 110001	TK527	7961.11	6368.89	8570.01	0.00	0.00	153.43	45.53	49.79	3777.50	50248.93	4865.91	1167.27	158.31	1.46	10.98	58.23

CDM Smith

Client: City of Pittsburgh
Project: Forbes Ave over Fern Hollow
Detail: Column Rating, Leg 4 at top

By: PLM 1/9/14
Chk: DJW 1/10/14

Location: Leg 4 at G9 (Top of leg)
Rating Factors: All Rating Factors to be checked. Impact based upon average of Span 2 and Span 3 lengths
Impact: 0.1804

	OutputCase	StepType	P	V2	V3	T	M2	M3
	Text	Text	Kip	Kip	Kip	Kip-ft	Kip-ft	Kip-ft
End 410014	DEAD		-1207.3	11.733	0.236	0	-12.9555	-230.059
End 410014	H20		-67.163	-19.989	-0.062	0	3.4089	1099.403
End 410014	HS20	Max	-120.621	-35.569	-0.111	0	6.1129	1956.281
End 410014	HSLaneNegM	Max	-261.824	-44.678	-0.266	0	14.662	2457.275
End 410014	HSLanePosM	Max	-231.561	-35.904	-0.238	0	13.1279	1974.742
End 410014	HSLaneShear	Max	-236.272	-38.004	-0.251	0	13.7963	2090.198
End 410014	ML80	Max	-126.704	-37.658	-0.117	0	6.4205	2071.209
End 410014	TK527	Max	-137.963	-40.559	-0.127	0	6.9962	2230.771

		All Rating Factors																			
	OutputCase	M_u	M_o	M_P	M_{DL}	M_{LL+I}	V_u	V_{DL}	V_{LL+I}	P_u	P_o	P_y	P_{DL}	P_{LL+I}	OR_1	OR_2	OR_3	OR_4	OR_5	OR_6	OR_7	Tons
	Text	Kip-ft	Kip-ft	Kip-ft	Kip-ft	Kip-ft	Kip	Kip	Kip	Kip	Kip	Kip	Kip	Kip								
End 410014	DEAD	18247.83	19824.79	27596.88	230.06	n/a	1979.25	11.73	n/a	5501.10	########	8000.63	1207.30	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
End 410014	H20	18247.83	19824.79	27596.88	230.06	1297.73	1979.25	11.73	23.59	5501.10	########	8000.63	1207.30	79.28	10.64	64.03	15.10	13.25	38.15	6.28	10.71	125.61
End 410014	HS20	18247.83	19824.79	27596.88	230.06	2309.19	1979.25	11.73	41.99	5501.10	########	8000.63	1207.30	142.38	5.98	35.98	8.49	7.45	21.24	3.52	6.01	126.86
End 410014	HSLaneNegM	18247.83	19824.79	27596.88	230.06	2900.56	1979.25	11.73	52.74	5501.10	########	8000.63	1207.30	309.06	4.76	28.65	6.76	5.93	9.79	2.50	4.24	49.94
End 410014	HSLanePosM	18247.83	19824.79	27596.88	230.06	2330.98	1979.25	11.73	42.38	5501.10	########	8000.63	1207.30	273.33	5.92	35.65	8.41	7.38	11.06	3.03	5.14	60.55
End 410014	HSLaneShear	18247.83	19824.79	27596.88	230.06	2467.26	1979.25	11.73	44.86	5501.10	########	8000.63	1207.30	278.89	5.60	33.68	7.94	6.97	10.84	2.89	4.91	57.79
End 410014	ML80	18247.83	19824.79	27596.88	230.06	2444.85	1979.25	11.73	44.45	5501.10	########	8000.63	1207.30	149.56	5.65	33.99	8.01	7.04	20.22	3.33	5.69	122.12
End 410014	TK527	18247.83	19824.79	27596.88	230.06	2633.19	1979.25	11.73	47.88	5501.10	########	8000.63	1207.30	162.85	5.24	31.56	7.44	6.53	18.57	3.09	5.27	123.55

CDM Smith

Client: City of Pittsburgh
Project: Forbes Ave over Fern Hollow
Detail: Column Rating, Leg 4, 47' up from bot

By: PLM 1/9/14
Chk: DJW 1/10/14

Location: Leg 4, 47' up from bottom along leg
Rating Factors: All Rating Factors to be checked. Impact based upon average of Span 2 and Span 3 lengths
Impact: 0.1804

	OutputCase	StepType	P	V2	V3	T	M2	M3
	Text	Text	Kip	Kip	Kip	Kip-ft	Kip-ft	Kip-ft
End 410012	DEAD		-1211.91	9.277	0.236	0	-11.071	-146.059
End 410012	H20		-67.163	-19.989	-0.062	0	2.9131	939.4901
End 410012	HS20	Max	-120.621	-35.569	-0.111	0	5.2238	1671.731
End 410012	HSLaneNegM	Max	-261.824	-44.678	-0.266	0	12.5319	2099.853
End 410012	HSLanePosM	Max	-231.561	-35.904	-0.238	0	11.2209	1687.506
End 410012	HSLaneShear	Max	-236.272	-38.004	-0.251	0	11.7921	1786.169
End 410012	ML80	Max	-126.704	-37.658	-0.117	0	5.4866	1769.942
End 410012	TK527	Max	-137.963	-40.559	-0.127	0	5.9786	1906.295

		All Rating Factors																			
	OutputCase	M_u	M_o	M_p	M_{DL}	M_{LL+I}	V_u	V_{DL}	V_{LL+I}	P_u	P_o	P_y	P_{DL}	P_{LL+I}	OR_1	OR_2	OR_3	OR_4	OR_5	OR_6	OR_7	Tons
	Text	Kip-ft	Kip-ft	Kip-ft	Kip-ft	Kip-ft	Kip	Kip	Kip	Kip	Kip	Kip	Kip	Kip								
End 410012	DEAD	16680.79	17030.82	23609.67	146.06	n/a	1734.20	9.28	n/a	5361.15	########	7641.50	1211.91	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
End 410012	H20	16680.79	17030.82	23609.67	146.06	1108.97	1734.20	9.28	23.59	5361.15	########	7641.50	1211.91	79.28	11.44	56.14	15.23	13.94	36.73	6.58	10.54	131.52
End 410012	HS20	16680.79	17030.82	23609.67	146.06	1973.31	1734.20	9.28	41.99	5361.15	########	7641.50	1211.91	142.38	6.43	31.55	8.56	7.84	20.45	3.69	5.91	132.82
End 410012	HSLaneNegM	16680.79	17030.82	23609.67	146.06	2478.66	1734.20	9.28	52.74	5361.15	########	7641.50	1211.91	309.06	5.12	25.12	6.81	6.24	9.42	2.59	4.16	51.82
End 410012	HSLanePosM	16680.79	17030.82	23609.67	146.06	1991.93	1734.20	9.28	42.38	5361.15	########	7641.50	1211.91	273.33	6.37	31.26	8.48	7.76	10.65	3.14	5.03	62.73
End 410012	HSLaneShear	16680.79	17030.82	23609.67	146.06	2108.39	1734.20	9.28	44.86	5361.15	########	7641.50	1211.91	278.89	6.02	29.53	8.01	7.33	10.44	3.00	4.80	59.91
End 410012	ML80	16680.79	17030.82	23609.67	146.06	2089.23	1734.20	9.28	44.45	5361.15	########	7641.50	1211.91	149.56	6.07	29.80	8.08	7.40	19.47	3.49	5.59	127.86
End 410012	TK527	16680.79	17030.82	23609.67	146.06	2250.18	1734.20	9.28	47.88	5361.15	########	7641.50	1211.91	162.85	5.64	27.67	7.50	6.87	17.88	3.23	5.18	129.34

CDM Smith

Client: City of Pittsburgh
Project: Forbes Ave over Fern Hollow
Detail: Column Rating, Leg 4, 30' up from bot

By: RLM 1/9/14
Chk: DJW 1/10/14

Location: Leg 4, 30' up from bottom along leg
Rating Factors: All Rating Factors to be checked. Impact based upon average of Span 2 and Span 3 lengths
Impact: 0.1804

	OutputCase	StepType	P	V2	V3	T	M2	M3
	Text	Text	Kip	Kip	Kip	Kip-ft	Kip-ft	Kip-ft
End 410008	DEAD		-1220.86	4.499	0.236	0	-7.1255	-31.453
End 410008	H20		-67.163	-19.989	-0.062	0	1.8756	604.6718
End 410008	HS20	Max	-120.621	-35.569	-0.111	0	3.3664	1075.954
End 410008	HSLaneNegM	Max	-261.824	-44.678	-0.266	0	8.0734	1351.501
End 410008	HSLanePosM	Max	-231.561	-35.904	-0.238	0	7.229	1086.108
End 410008	HSLaneShear	Max	-236.272	-38.004	-0.251	0	7.5966	1149.609
End 410008	ML80	Max	-126.704	-37.658	-0.117	0	3.5335	1139.165
End 410008	TK527	Max	-137.963	-40.559	-0.127	0	3.8516	1226.924

		All Rating Factors																			
	OutputCase	M_u	M_o	M_P	M_{DL}	M_{LL+I}	V_u	V_{DL}	V_{LL+I}	P_u	P_o	P_y	P_{DL}	P_{LL+I}	OR_1	OR_2	OR_3	OR_4	OR_5	OR_6	OR_7	Tons
	Text	Kip-ft	Kip-ft	Kip-ft	Kip-ft	Kip-ft	Kip	Kip	Kip	Kip	Kip	Kip	Kip	Kip								
End 410008	DEAD	11314.28	10618.10	14391.50	31.45	n/a	360.58	4.50	n/a	4173.76	127621.80	5631.35	1220.86	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
End 410008	H20	11314.28	10618.10	14391.50	31.45	713.75	360.58	4.50	23.59	4173.76	127621.80	5631.35	1220.86	79.28	12.15	11.56	14.83	10.07	25.10	5.77	8.64	115.48
End 410008	HS20	11314.28	10618.10	14391.50	31.45	1270.05	360.58	4.50	41.99	4173.76	127621.80	5631.35	1220.86	142.38	6.83	6.50	8.34	5.66	13.97	3.24	4.85	116.57
End 410008	HSLaneNegM	11314.28	10618.10	14391.50	31.45	1595.31	360.58	4.50	52.74	4173.76	127621.80	5631.35	1220.86	309.06	5.44	5.17	6.64	4.51	6.44	2.20	3.32	44.08
End 410008	HSLanePosM	11314.28	10618.10	14391.50	31.45	1282.04	360.58	4.50	42.38	4173.76	127621.80	5631.35	1220.86	273.33	6.76	6.44	8.26	5.61	7.28	2.65	4.00	53.01
End 410008	HSLaneShear	11314.28	10618.10	14391.50	31.45	1356.99	360.58	4.50	44.86	4173.76	127621.80	5631.35	1220.86	278.89	6.39	6.08	7.80	5.30	7.13	2.54	3.83	50.75
End 410008	ML80	11314.28	10618.10	14391.50	31.45	1344.67	360.58	4.50	44.45	4173.76	127621.80	5631.35	1220.86	149.56	6.45	6.14	7.87	5.35	13.30	3.06	4.59	112.27
End 410008	TK527	11314.28	10618.10	14391.50	31.45	1448.26	360.58	4.50	47.88	4173.76	127621.80	5631.35	1220.86	162.85	5.99	5.70	7.31	4.96	12.22	2.84	4.25	113.51

CDM Smith

Client: City of Pittsburgh
Project: Forbes Ave over Fern Hollow
Detail: Column Rating, Leg 4, 14' up from bot

By: PLM 1/9/14
Chk: DJW 1/10/14

Location: Leg 4, 14' up from bottom along leg
Rating Factors: All Rating Factors to be checked. Impact based upon average of Span 2 and Span 3 lengths
Impact: 0.1804

	OutputCase	StepType	P	V2	V3	T	M2	M3
	Text	Text	Kip	Kip	Kip	Kip-ft	Kip-ft	Kip-ft
End 410004	DEAD		-1228.03	0.673	0.236	0	-3.2192	9.7138
End 410004	H20		-67.163	-19.989	-0.062	0	0.8474	273.1851
End 410004	HS20	Max	-120.621	-35.569	-0.111	0	1.5209	486.1061
End 410004	HSLaneNegM	Max	-261.824	-44.678	-0.266	0	3.6678	610.5956
End 410004	HSLanePosM	Max	-231.561	-35.904	-0.238	0	3.2864	490.6933
End 410004	HSLaneShear	Max	-236.272	-38.004	-0.251	0	3.4524	519.3823
End 410004	ML80	Max	-126.704	-37.658	-0.117	0	1.5964	514.664
End 410004	TK527	Max	-137.963	-40.559	-0.127	0	1.7401	554.3127

		All Rating Factors																			
	OutputCase	M_u	M_o	M_P	M_{DL}	M_{LL+I}	V_u	V_{DL}	V_{LL+I}	P_u	P_o	P_y	P_{DL}	P_{LL+I}	OR_1	OR_2	OR_3	OR_4	OR_5	OR_6	OR_7	Tons
	Text	Kip-ft	Kip-ft	Kip-ft	Kip-ft	Kip-ft	Kip	Kip	Kip	Kip	Kip	Kip	Kip	Kip								
End 410004	DEAD	10089.96	8387.98	11221.01	9.71	n/a	118.74	0.67	n/a	3865.42	84155.11	5027.14	1228.03	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
End 410004	H20	10089.96	8387.98	11221.01	9.71	322.47	118.74	0.67	23.59	3865.42	84155.11	5027.14	1228.03	79.28	24.04	3.84	25.98	6.74	22.02	8.59	11.78	76.85
End 410004	HS20	10089.96	8387.98	11221.01	9.71	573.80	118.74	0.67	41.99	3865.42	84155.11	5027.14	1228.03	142.38	13.51	2.16	14.60	3.79	12.26	4.81	6.60	77.74
End 410004	HSLaneNegM	10089.96	8387.98	11221.01	9.71	720.75	118.74	0.67	52.74	3865.42	84155.11	5027.14	1228.03	309.06	10.76	1.72	11.62	3.02	5.65	2.98	4.17	34.38
End 410004	HSLanePosM	10089.96	8387.98	11221.01	9.71	579.21	118.74	0.67	42.38	3865.42	84155.11	5027.14	1228.03	273.33	13.38	2.14	14.46	3.75	6.39	3.52	4.94	42.79
End 410004	HSLaneShear	10089.96	8387.98	11221.01	9.71	613.08	118.74	0.67	44.86	3865.42	84155.11	5027.14	1228.03	278.89	12.64	2.02	13.67	3.55	6.26	3.39	4.76	40.42
End 410004	ML80	10089.96	8387.98	11221.01	9.71	607.51	118.74	0.67	44.45	3865.42	84155.11	5027.14	1228.03	149.56	12.76	2.04	13.79	3.58	11.67	4.56	6.25	74.73
End 410004	TK527	10089.96	8387.98	11221.01	9.71	654.31	118.74	0.67	47.88	3865.42	84155.11	5027.14	1228.03	162.85	11.85	1.89	12.80	3.32	10.72	4.21	5.78	75.75

CDM Smith

Client: City of Pittsburgh
Project: Forbes Ave over Fern Hollow
Detail: Column Rating, Leg 4 at thrust block

By: PLM 1/9/14
Chk: DJW 1/10/14

Location: Leg 4 at Thrust Block
Rating Factors: Only Axial and Shear Ratings need to be checked
Impact: 0.1804

	OutputCase	StepType	P	V2	V3	T	M2	M3
	Text	Text	Kip	Kip	Kip	Kip-ft	Kip-ft	Kip-ft
Begin 410001	DEAD		-1233.195	-2.081	0.236	0	0	0
Begin 410001	H20		-67.163	-19.989	-0.062	0	0	0
Begin 410001	HS20	Max	-120.621	-35.569	-0.111	0	0	0
Begin 410001	HSLaneNegM	Max	-261.824	-44.678	-0.266	0	0	0
Begin 410001	HSLanePosM	Max	-231.561	-35.904	-0.238	0	0	0
Begin 410001	HSLaneShear	Max	-236.272	-38.004	-0.251	0	0	0
Begin 410001	ML80	Max	-126.704	-37.658	-0.117	0	0	0
Begin 410001	TK527	Max	-137.963	-40.559	-0.127	0	0	0

		OR_2, OR_5															
	OutputCase	M_u	M_o	M_P	M_{DL}	M_{LL+I}	V_u	V_{DL}	V_{LL+I}	P_u	P_o	P_y	P_{DL}	P_{LL+I}	OR_2	OR_5	Tons
	Text	Kip-ft	Kip-ft	Kip-ft	Kip-ft	Kip-ft	Kip	Kip	Kip	Kip	Kip	Kip	Kip	Kip			
Begin 410001	DEAD	7961.11	6368.89	8570.01	0.00	n/a	153.43	2.08	n/a	3777.50	50248.93	4865.91	1233.20	n/a	n/a	n/a	
Begin 410001	H20	7961.11	6368.89	8570.01	0.00	0.00	153.43	2.08	23.59	3777.50	50248.93	4865.91	1233.20	79.28	4.91	21.10	98.27
Begin 410001	HS20	7961.11	6368.89	8570.01	0.00	0.00	153.43	2.08	41.99	3777.50	50248.93	4865.91	1233.20	142.38	2.76	11.75	99.41
Begin 410001	HSLaneNegM	7961.11	6368.89	8570.01	0.00	0.00	153.43	2.08	52.74	3777.50	50248.93	4865.91	1233.20	309.06	2.20	5.41	43.97
Begin 410001	HSLanePosM	7961.11	6368.89	8570.01	0.00	0.00	153.43	2.08	42.38	3777.50	50248.93	4865.91	1233.20	273.33	2.74	6.12	54.71
Begin 410001	HSLaneShear	7961.11	6368.89	8570.01	0.00	0.00	153.43	2.08	44.86	3777.50	50248.93	4865.91	1233.20	278.89	2.58	6.00	51.69
Begin 410001	ML80	7961.11	6368.89	8570.01	0.00	0.00	153.43	2.08	44.45	3777.50	50248.93	4865.91	1233.20	149.56	2.61	11.18	95.56
Begin 410001	TK527	7961.11	6368.89	8570.01	0.00	0.00	153.43	2.08	47.88	3777.50	50248.93	4865.91	1233.20	162.85	2.42	10.27	96.87