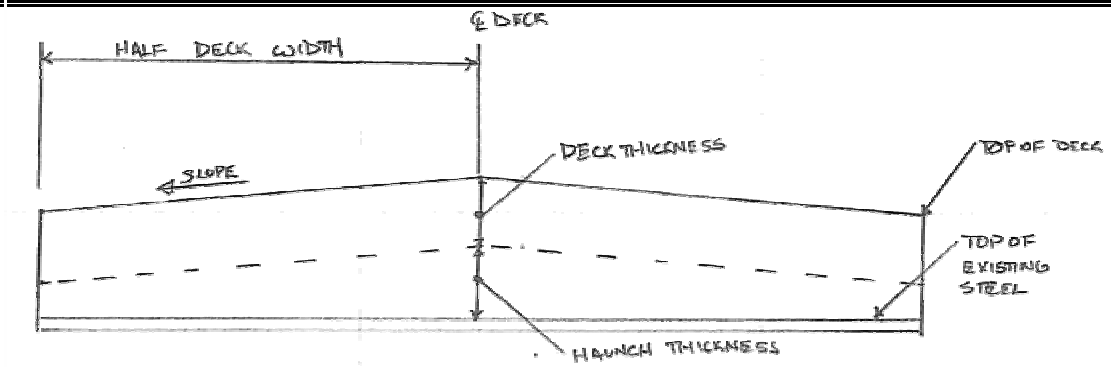
Made By	BKC	Date	3/18/2009	Job No.	P410070010
Checked By	CJM	Date	3/23/2009	Sheet No.	

Calculations For: ***Columbia Parkway Dead Load Input - Haunch Thickness/DeadWeight***



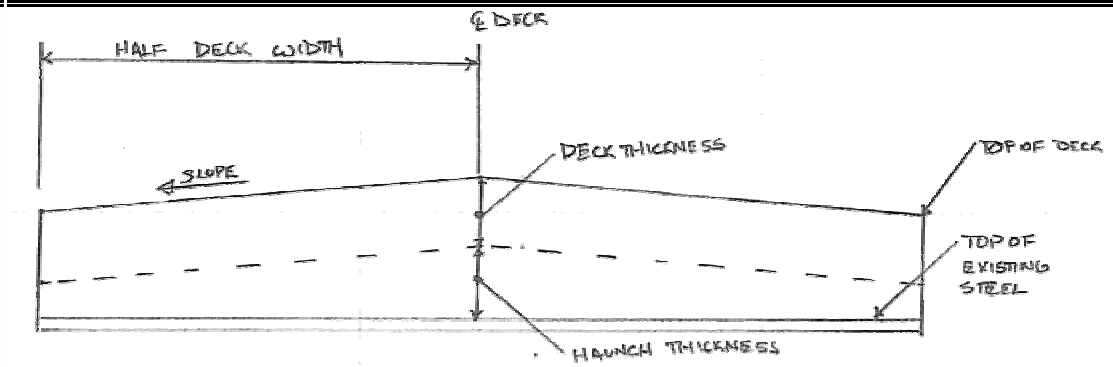
Cross Slope 0.015625 ft/ft Half Deck Width 28.167 ft

Spans 5-7

North Gutter Measurments				South Gutter Measurements					
Top of Deck	Top of Existing Steel	Deck Thickness	Gutter Haunch Thickness	Top of Deck	Top of Existing Steel	Deck Thickness	Gutter Haunch Thickness	CL Haunch Thickness	Average Haunch Thickness
545.59	544.18	9.50 in	0.618 ft	545.59	544.18	9.50 in	0.618 ft	1.058 ft	0.838 ft
546.28	544.88	9.50 in	0.608 ft	546.28	544.88	9.50 in	0.608 ft	1.048 ft	0.828 ft
546.98	545.58	9.50 in	0.608 ft	546.98	545.58	9.50 in	0.608 ft	1.048 ft	0.828 ft
547.68	546.28	9.50 in	0.608 ft	547.68	546.28	9.50 in	0.608 ft	1.048 ft	0.828 ft
548.39	546.98	9.50 in	0.618 ft	548.39	546.98	9.50 in	0.618 ft	1.058 ft	0.838 ft
549.09	547.68	9.50 in	0.618 ft	549.09	547.68	9.50 in	0.618 ft	1.058 ft	0.838 ft
549.79	548.39	9.50 in	0.608 ft	549.79	548.38	9.50 in	0.618 ft	1.053 ft	0.838 ft
							Span 5-7 Average Haunch Thickness		**0.834 ft**

Made By	BKC	Date	3/18/2009	Job No.	P410070010
Checked By	CJM	Date	3/23/2009	Sheet No.	

Calculations For: ***Columbia Parkway Dead Load Input - Haunch Thickness/DeadWeight***



Spans 7-10

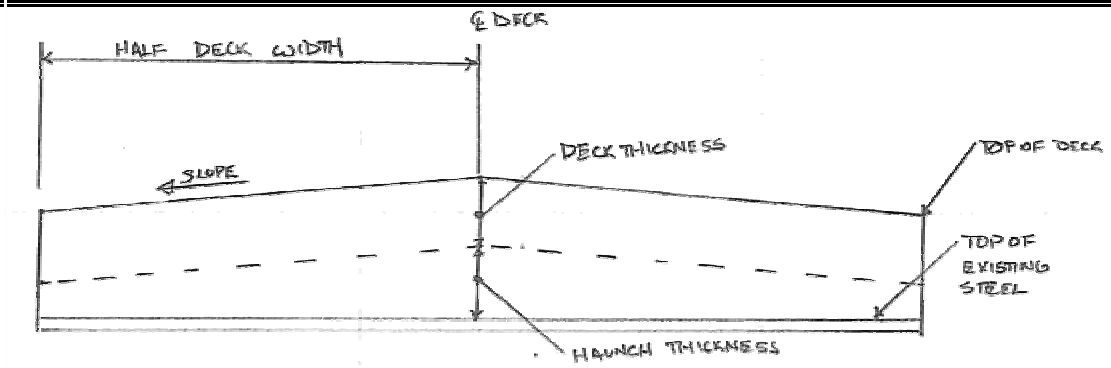
	North Gutter Measurments				South Gutter Measurements				
Top of Deck	Top of Existing Steel	Deck Thickness	Gutter Haunch Thickness	Top of Deck	Top of Existing Steel	Deck Thickness	Gutter Haunch Thickness	CL Haunch Thickness	Average Haunch Thickness
552	550.59	9.50 in	0.618 ft	552	550.59	9.50 in	0.618 ft	1.058 ft	0.838 ft
552.71	551.3	9.50 in	0.618 ft	552.71	551.29	9.50 in	0.628 ft	1.063 ft	0.848 ft
553.41	552	9.50 in	0.618 ft	553.41	552	9.50 in	0.618 ft	1.058 ft	0.838 ft
554.11	552.7	9.50 in	0.618 ft	554.11	552.7	9.50 in	0.618 ft	1.058 ft	0.838 ft
554.82	553.41	9.50 in	0.618 ft	554.82	553.4	9.50 in	0.628 ft	1.063 ft	0.848 ft
555.52	554.11	9.50 in	0.618 ft	555.52	554.1	9.50 in	0.628 ft	1.063 ft	0.848 ft
556.22	554.81	9.50 in	0.618 ft	556.22	554.81	9.50 in	0.618 ft	1.058 ft	0.838 ft
556.93	555.52	9.50 in	0.618 ft	556.93	555.51	9.50 in	0.628 ft	1.063 ft	0.848 ft
557.63	556.22	9.50 in	0.618 ft	557.63	556.21	9.50 in	0.628 ft	1.063 ft	0.848 ft
558.33	556.93	9.50 in	0.608 ft	558.33	556.92	9.50 in	0.618 ft	1.053 ft	0.838 ft
559.04	557.63	9.50 in	0.618 ft	559.04	557.62	9.50 in	0.628 ft	1.063 ft	0.848 ft
559.74	558.33	9.50 in	0.618 ft	559.74	558.32	9.50 in	0.628 ft	1.063 ft	0.848 ft
560.44	559.03	9.50 in	0.618 ft	560.44	559.03	9.50 in	0.618 ft	1.058 ft	0.838 ft
561.15	559.74	9.50 in	0.618 ft	561.15	559.73	9.50 in	0.628 ft	1.063 ft	0.848 ft
561.85	560.44	9.50 in	0.618 ft	561.85	560.43	9.50 in	0.628 ft	1.063 ft	0.848 ft
562.55	561.14	9.50 in	0.618 ft	562.55	561.14	9.50 in	0.618 ft	1.058 ft	0.838 ft
563.26	561.85	9.50 in	0.618 ft	563.25	561.84	9.50 in	0.618 ft	1.058 ft	0.838 ft
563.96	562.55	9.50 in	0.618 ft	563.96	562.54	9.50 in	0.628 ft	1.063 ft	0.848 ft
564.66	563.25	9.50 in	0.618 ft	564.66	563.25	9.50 in	0.618 ft	1.058 ft	0.838 ft
565.36	563.95	9.50 in	0.618 ft	565.36	563.95	9.50 in	0.618 ft	1.058 ft	0.838 ft
								Span 7-10 Average Haunch Thickness	**0.843 ft**

Spans 10-12

	North Gutter Measurments				South Gutter Measurements				
Top of Deck	Top of Existing Steel	Deck Thickness	Gutter Haunch Thickness	Top of Deck	Top of Existing Steel	Deck Thickness	Gutter Haunch Thickness	CL Haunch Thickness	Average Haunch Thickness
567.58	566.16	9.50 in	0.628 ft	567.58	566.16	9.50 in	0.628 ft	1.068 ft	0.848 ft
568.28	566.87	9.50 in	0.618 ft	568.28	566.86	9.50 in	0.628 ft	1.063 ft	0.848 ft
568.98	567.57	9.50 in	0.618 ft	568.98	567.56	9.50 in	0.628 ft	1.063 ft	0.848 ft
570.39	568.97	9.50 in	0.628 ft	570.39	568.97	9.50 in	0.628 ft	1.068 ft	0.848 ft
571.15	569.67	9.50 in	0.688 ft	571.09	569.67	9.50 in	0.628 ft	1.098 ft	0.848 ft
571.85	570.37	9.50 in	0.688 ft	571.79	570.37	9.50 in	0.628 ft	1.098 ft	0.848 ft
572.56	571.07	9.50 in	0.698 ft	572.5	571.07	9.50 in	0.638 ft	1.108 ft	0.858 ft
								Span 10-12 Average Haunch Thickness	**0.85 ft**

Made By	BKC	Date	3/18/2009	Job No.	P410070010
Checked By	CJM	Date	3/23/2009	Sheet No.	

Calculations For: ***Columbia Parkway Dead Load Input - Haunch Thickness/DeadWeight***



Weighted Averages of Haunch Thickness

	# FB	Average Haunch Thickness
Span 5-7	21	0.834 ft
Span 7-10	45	0.843 ft
Span 10-12	21	0.85 ft
Weighted Average		0.843 ft

Typical Floor Beam WF27 x 106

Flange Dimensions

Width	10.035 in
FL Thickness	0.862 in

No Haunches on Bridge

Area Above Flange 0.843 ft x 10.035 in = 0.705 sf

Total Haunch Area/LF of Floorbeam	0.705 sf
Haunch Wt/LF Floorbeam	0.106 k/ft

Deck Dead Weight

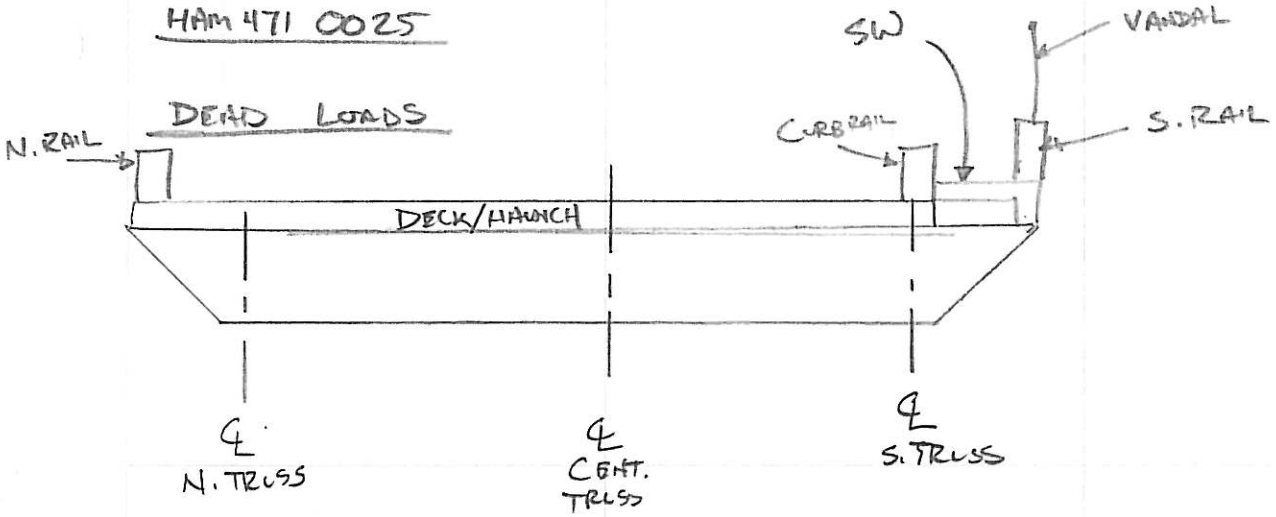
Deck Thickness	9.50 in
Deck Width	60. ft
Panel Point Spacing	10.63 ft

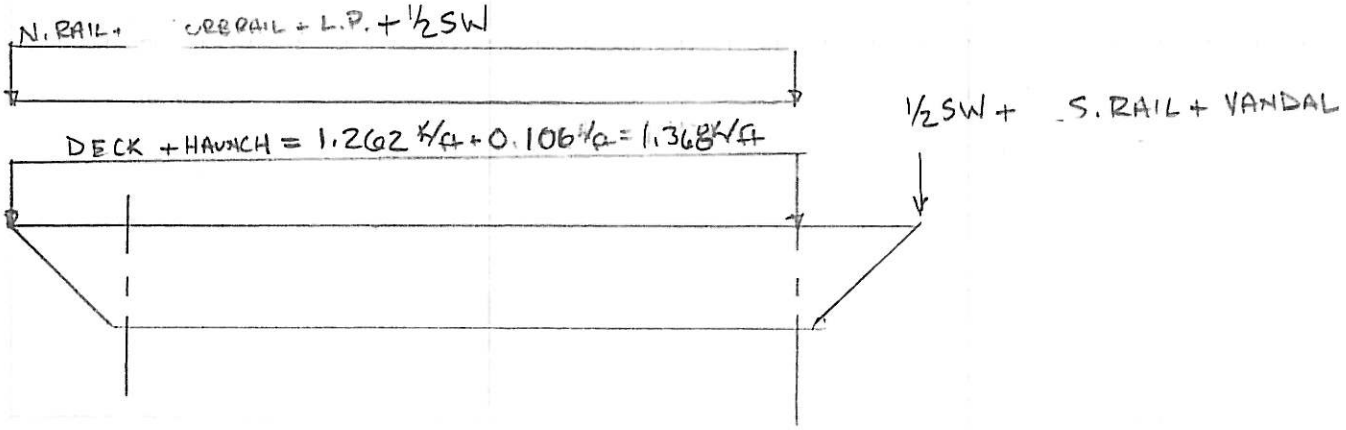
Total Deck DL at Int. PP	75.74 kips
Uniform Deck DL at Int. PP	1.26 k/ft

Made By: BKC	Date: 3/18/09	Job No: P4100700010
Checked By: CJM	Date: 3/23/09	Sheet No. A

HAM 471 0025

DEAD LOADS





N. RAIL = (0.377 K/ft + ADDITIONAL LOAD BASED ON SPAN) $\frac{10.6302}{60'}$

CURB RAIL = (0.377 K/ft + ADDITIONAL LOAD BASED ON SPAN) $\frac{10.6302}{60} \times \frac{1}{2}$ FOR UNIFORM

$\frac{1}{2} \times 10.6302$ FOR POINT

SOUTH RAIL = (0.377 K/ft + ADDITIONAL LOAD BASED ON SPAN) × 10.6302

Calculations for 1/4 US Grid

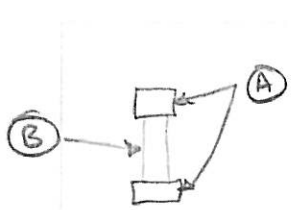
TranSystems

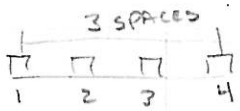
Made By: BKC Date: 3/18/09 Job No: P410070010

Checked By: CJM Date: 3/23/09 Sheet No. 115

HAM 471 0025

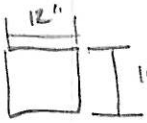
DEAD LOAD CALCS





FROM CJM CALCS TOP/BOT RAIL (A) $A = 99 in^2/in$

POST IS TAPERED, BUT TREAT AS SQUARE



$A = 120 in^2$

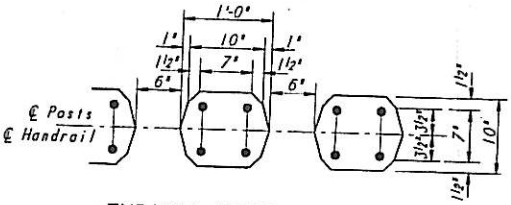
$L = 2'$ @ VOLUME POST IS $2' \times \frac{120 in^2}{144 in^2} ft^2 = 1.67 ft^3/POST$



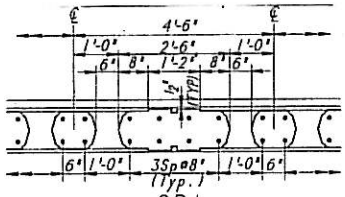
TYPICAL UNIT HAS RAIL W/POST LENGTH OF 16'6" + 1' + 1' = 18'6"

POSTS 11 SPACES → 12 POSTS

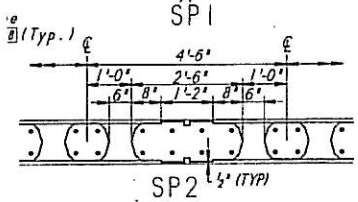
$\frac{1 ft^2}{144 in^2} 99 in^2 \times 2 \times 18.5' + 12 \times 1.67 ft^3 = 45.4775 ft^3$ ← RAIL SECTION W/O END ASSEMBLY SP1-3



TYPICAL POST SECTION



SP1



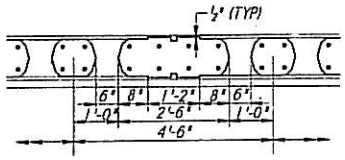
SP2

TREAT SP1-3 AS RECTANGLE 2'6" L x 10" W

$A = 2.5' \times 10/12 = 2.083 ft^2$

SP1-3 ARE 3.5' T VOLUME = $2.083 ft^2 \times 3.5 ft =$

$= 7.292 ft^3$ (1.094K)



SP3

1 RAIL SECTION (TYPICAL) $45.48 + 7.29 = 52.77 ft^3$

$52.77 ft^3 \times 0.15 K/ft^3 \times \frac{1}{16'6" + 4'6"} = \boxed{0.377 K/ft}$

FOR 10.6302 PP SPACING → 4.01 K/PP

Calculations for 1/4 US Grid

TranSystems

Made By: BKC Date: 3/18/09 Job No: P410070010

Checked By: CJM Date: 3/23/09 Sheet No. 215

HAM 471 0025

DEAD LOAD RAILING

SPANS 5-7 NON TYPICAL PIER FEATURES

NORTH FASCIA	ROADWAY CURB	SOUTH FASCIA
✓P1E (1)	P3E (1)	✓P5E (1)
✓P2E (1) - 8' TALL	P4E (1)	✓P6E (1) (8' TALL)
✓SP4 (1)		✓SP5 (1)

SPANS 7-10

NORTH FASCIA	ROADWAY CURB	SOUTH FASCIA
✓P1F (1) 8' TALL	P3F (1)	✓P5F (1) 8' TALL
✓P2F (1) 12' TALL	P4F (1)	✓P6F (1) 12' TALL
✓SP6 (2) 12' TALL		✓SP7 (2) 12' TALL

SPANS 10-12

NORTH FASCIA	ROADWAY CURB	SOUTH FASCIA
✓P1G (1) 12' TALL	P3G (1)	✓P5G (1) 12' TALL
✓P2G (1) 12' TALL	P4G (1)	✓P6G (1) 12 TALL
		✓SP7 (1) 12' TALL

	# CALCS
SP4/5 SAME THING W/ DIFF WIDTHS	1
SP6/7 SAME W/ DIFF. WIDTHS	1
P1/2, 5/6 SAME (8' OR 12' VARIETY)	2
P3/4 SAME	1
	5

Calculations for 1/4 US Grid

TranSystems

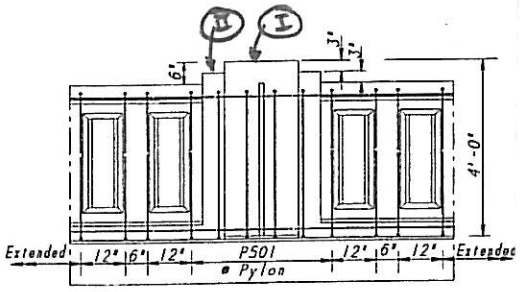
Made By: BKC Date: 3/18/09 Job No: P410070010

Checked By: CJM Date: 3/23/09 Sheet No. 3/5

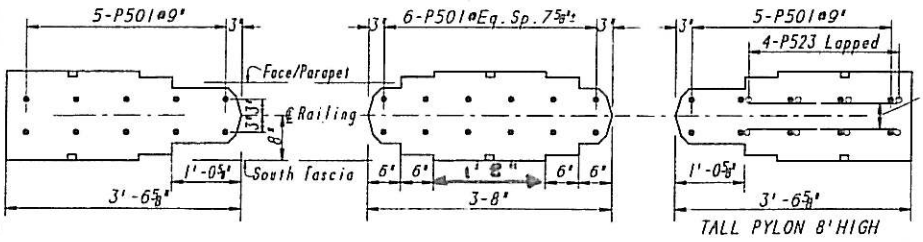
HAM 471 C025

DEAD LOAD RAILING - SPECIAL POSTS

SP4/5



SIDE ELEVATION INSIDE PYLON TYPE SP4 or SP5
(LOOKING AT NORTH FASCIA)
(LOOKING AT SOUTH FASCIA IS SIMILAR)



VOLUME:

SECTION I - $1'8" \times (2 \times 8") \times 4' = 8.89\ ft^3$

SECTION II - $6" \times (2 \times 8") \times (3'9") = 2.5\ ft^3 \times 2$ (2 LOCATIONS) $= 5\ ft^3$

± SAY SAME WIDTH AS MAIN (

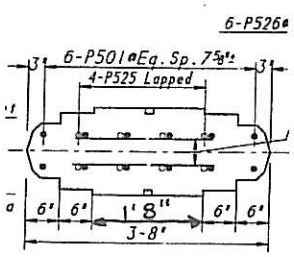
$13.89\ ft^3 \rightarrow 2.08K$

ADDITIONAL WT

NEED TO TAKE OUT TYP. END $2.08K - 1.094K \cong \boxed{1K}$

SP 6/7

SIMILAR TO ABOVE 6"L x 3"T IS CUT OFF FROM TOP



TALL PYLON 12'HIGH
SP7
(2 of Eq.)

SP6

$A = 1'8" \times (14") \times 12' + 2 \times 6" \times 14" \times 11'9"$

$A = 37.042\ ft^3$

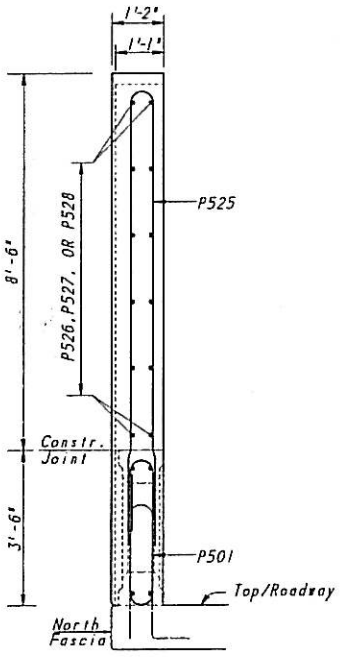
$WT = 5.56K$ $3.69K$ ± 8' CASE

SP7

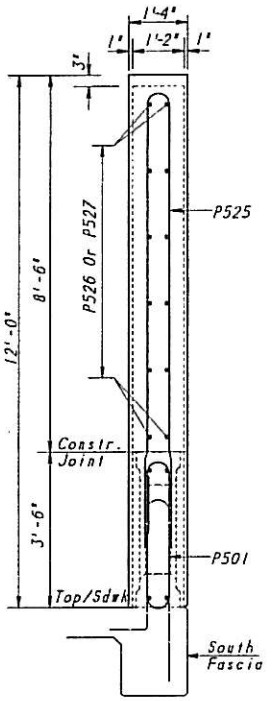
$A = 1'8" \times 16" \times 12' + 2 \times 6" \times 16" \times 11'9"$

$A = 42.33\ ft^3$

$WT = 6.35K$



SECTION THRU 12' TALL PYLON
TYPE SP6, P1 OR P2



SECTION THRU 12' TALL PYLON
TYPE SP7, P5 OR P6

ADDITIONAL WT (12' / 8')

SP6 $5.52K - 1.094 \cong 4.466K$ $2.60K$

SP7 $6.35 - 1.094 \cong 5.25eK$

Calculations for 1/4 US Grid

TranSystems

Made By: BKC Date: 3/18/09 Job No: P410 07 0010

Checked By: CJM Date: 3/23/09 Sheet No. 4/5

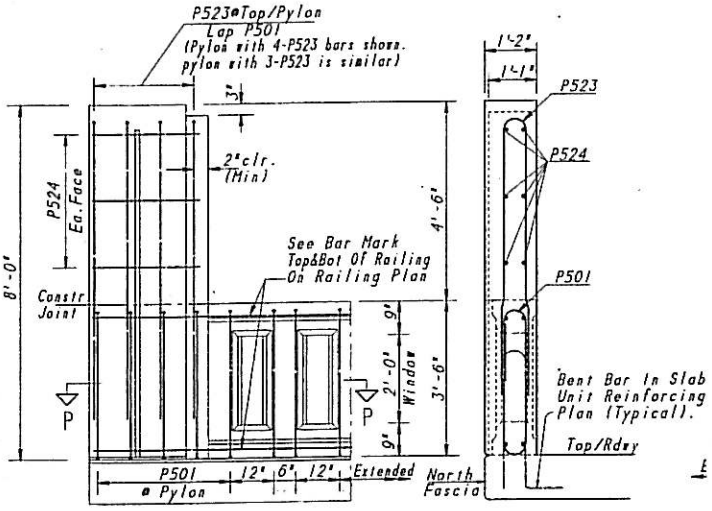
HAM 471 0025

DEAD LOAD - RAILING

P1/2 & 5/6 8' TALL

LENGTHS

	APPROX LENGTH	HT	VOLUME	WT
1E	2.5'	4'	11.52	1.728
1F	3'5"	8'	31.74	4.761
1G	2.5'	12'	34.85	5.228
2E	2'10"	8'	26.30	3.945
2F	3'5"	12'	47.69	7.154
2G	2.5'	12'	34.85	5.228
5E	3'	4'	13.85	2.078
5F	3'5"	8'	31.74	4.761
5G	3'0"	12'	41.85	6.278
6E	3'0"	8'	27.85	4.178
6F	3'5"	12'	47.69	7.154
6G	3'0"	12'	41.85	6.278



TYPICAL SIDE ELEVATION
END OF SPAN PYLON 8' TALL
(LOOKING AT NORTH FASCIA)
(LOOKING AT SOUTH FASCIA IS SIMILAR)

SECTION THRU 8' TALL PYLON
TYPE P1 Or P2
(TYPE P5 OR P6 IS SIMILAR)

FOLLOW FORMULA

$V = L \times HT \times 1'2" - 6" \times 1'2" \times 3"$

ADDITIONAL WT = WT - 1.094K (TYP. WT)

	ADDITIONAL WT
1E	0.634K
1F	3.667K
1G	4.134K
2E	2.851K
2F	6.06K
2G	4.134K
5E	0.984K
5F	3.667K
5G	5.184K
6E	3.084K
6F	6.06K
6G	5.184K

Calculations for 1/4 US Grid

TranSystems

Made By: BKC Date: 3/18/09 Job No: PHI 007 0010

Checked By: CJM Date: 3/23/09 Sheet No. 5/5

HAM 471 0025

DEAD LOAD RAILING

P3/4

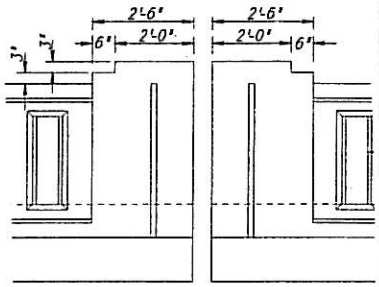
VOLUME 2'6" x 1'2" x 3'3" − 6" x 3" x 1'2"

= 9.33 ft³

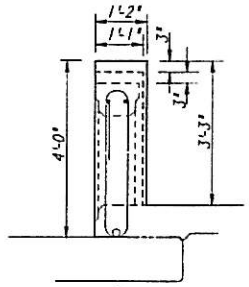
WT = 1.4K

ADDITIONAL WT = 1.4 − 1.094

= 0.306K



END PYLON P3 OR P4
(LOOKING FROM ROADWAY)



THRU END PYLON

RAILING ADDITIONAL DEAD LOADS

SPANS 5-7 (L = 212.604)

NORTH FASCIA		ROADWAY CURB		SOUTH FASCIA	
P1E	0.634K	P3E	0.306K	P5E	0.984K
P2E	2.851K	P4E	0.306K	P6E	3.084
SP4	1.0K			SP5	1.0K
	4.485K [0.0211 K/ft]		0.612K [0.00288K/ft]		5.068K [0.0238]

SPANS 7-10 (L = 467.729)

NORTH FASCIA		ROADWAY CURB		SOUTH FASCIA	
P1F	3.667	P3F	0.306	P5F	3.667
P2F	6.06	P4F	0.306	P6F	6.06
SP6	2x 4.466 = 8.932			SP7	2x 5.256 = 10.512
	18.659K [0.0399 K/ft]		0.612K [0.00131 K/ft]		20.239K [0.04328 K/ft]

SPANS 10-12 (L = 212.604)

NORTH FASCIA		ROADWAY CURB		SOUTH FASCIA	
P1G	4.134	P3G	0.306	P5G	5.184
P2G	4.134	P4G	0.306	P6G	5.184
				SP7	5.256
	8.268 K [0.03889 K/ft]		0.612K [0.00288 K/ft]		15.624 K [0.0735]

Calculations for 1/4 US Grid

Dead Load Calcs: Deck → Vandal Fence

Vandal Fence : South Fascia

-No Vandal Fence in Span 5-7

Span 7-10 :

4' Tall Fence L = 146.4167'
8' Tall Fence L = 312.927'

Alternating 5/8" ☒ and 1/2" ☒ Pickets : 3'-11" and 7'-11" long

Picket Spacing = 2.5" c/c

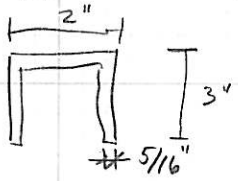
In 2.5" there is 1/2 of 5/8" ☒ Pickets and 1/2 of 1/2" ☒ Pickets :

5/8" ☒ → $(0.625")(0.625")\left(\frac{0.49}{144}\right) = 0.001329$ K/ft
1/2" ☒ → $(0.5")(0.5")\left(\frac{0.49}{144}\right) = 0.0008507$ K/ft

4' Fence → $(0.001329+0.0008507)(1/2)(3.9167')\left(\frac{1}{2.5"}\right)\left(\frac{12"}{1'}\right) = 0.0205$ K/ft (short)

8' Fence → $(0.001329+0.0008507)(1/2)(7.9167')\left(\frac{1}{2.5"}\right)\left(\frac{12"}{1'}\right) = 0.0414$ K/ft (tall)

Horizontal Bars : C 3 x 2 x 5/16



$3(5/16) + 3(5/16) + (5/16)(2-5/8) = 2.3047 in^2$

$(2.3047 in^2)(0.49/144) = 0.0078$ K/ft /channel (2 channels, short / 3 channels, tall)

Tubing Posts: 3½ x 3½ x ¼ → 10.5 #/FT Use 20'-3" spacing

5' Posts → 10.5 x 5 = 52.5#/20.25' = 2.6 #/FT = 0.0026 K/FT (short)
9' Posts → 10.5 x 9 = 94.5#/20.25' = 4.7 #/FT = 0.0047 K/FT (tall)

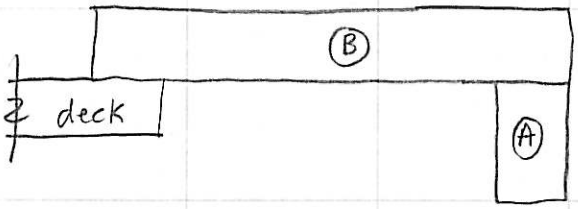
Total : (K/ft) * Add 5% for Misc. connections, etc.

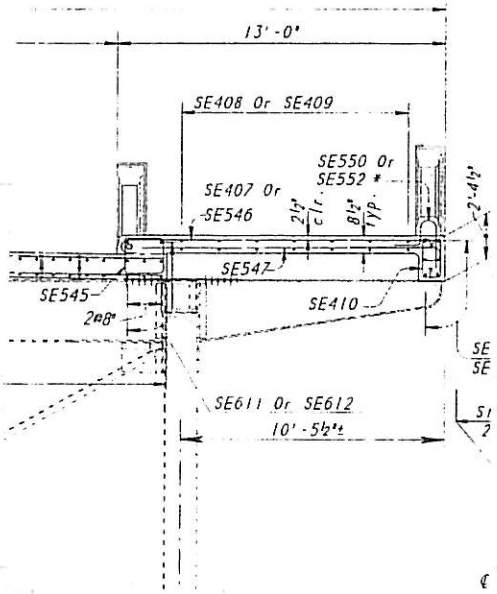
Short Fence : $1.05(0.0205 + 2(0.0078) + 0.0026) =$ **0.041 K/ft**

Tall Fence : $1.05(0.0414 + 3(0.0078) + 0.0047) =$ **0.073 K/ft**

Calculations for 1/8 US Grid

Dead Load Calcs: Deck → sidewalk, light poles





$Area_B = (13')(8.5"/12) = 9.2083\ ft^2$

$Area_A = (2'-4\frac{1}{2}" - 8.5")(1'-2")$ ℄ use width of rail.

$Area_A = (20"/12)(14"/12) = 1.944\ ft^2$

$Total = 9.2083 + 1.944 = 11.1523\ ft^2$

$wt = (11.1523\ ft^2)(0.15\ K/ft^3) = 1.6728\ K/Ft$

FB spacing = 10.6302' ∴

INTERIOR FB → (10.6302')(1.6728 K/FT) = **17.7822 K/PP INT. FB**

EXTERIOR FB → ½ INT = ½ 17.7822 K/PP = **8.8911 K/PP EXT. FB**

Light Poles: MODIFIED PER BKC/CJM DISCUSSION 3/25/09

0.001 K/ft × 60ft × (45 + 2×21) = 5.22K/STRUCT

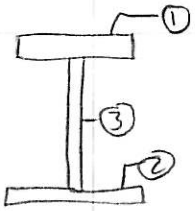
10LP/STRUCT → 0.522 K/LP

Say 0.001 K/ft along FB

Calculations for 1/8 US Grid

Dead Loads: Floorbeams

Brackets:



① $10" \times 0.75" = 7.5 in^2$
② $10" \times 0.375" = 3.75 in^2$
③ $\left(\frac{41" + 18"}{2}\right)(0.625") = 18.4375 in^2$

$\Sigma = 29.6875 in^2$

Left $L = 8.1667'$ → $Wt = (29.6875 in^2)(8.1667')\left(\frac{0.49}{144}\right) = 0.825K$
Right $L = 9.5833'$ → $Wt = (29.6875 in^2)(9.5833')\left(\frac{0.49}{144}\right) = 0.9681K$

2 L's 6 x 4 x 1/2 x 3'-5" (16 #/FT)
$wt = 2(16 \#/FT)(3.4167)(1/1000) = 0.1093K$

21 bolts, say 1#/bolt → say 25 # = 0.025K

Tie Plate: 3/4", say 3'-9" long (existing PL's were 3'-9"), 10" wide
$wt = (0.75")(45")(10")\left(0.49/1728\right) = 0.0957K$
take 1/2 wt for bracket → 0.0479K

Shear studs: say 1#/stud.
5 x 4 studs over left Bracket = 20# → 0.02K

Bump Up:

Left:
0.825K
0.1093K
0.025K
0.0479K
0.02K
1.0272K

Right:
0.9681K
0.1093K
0.025K
0.0479K
1.1503K

$\frac{1.0272K}{0.825K} = \boxed{1.25}$

$\frac{1.1503K}{0.9681K} = \boxed{1.19}$

Calculations for 1/8 US Grid

Dead Loads: Floorbeams

Uniform depth FB's:

End FB: 124 #/FT (use B1 From shop dwgs)

L = 31'-7 7/8" = 31.65625'

wt = (31.65625')(0.124 K/ft) = 3.9254 K

Tie R → 0.0479 (From Bracket calc)

Rivets/Bolts: say 1#/Rivet ; 24+6+16+14+16+9+7+22 = 114 say 120

wt = 0.12 K

Connections:

Bt. R	(26.625)(0.625)(21.5)	= 357.7734 in³
Bt. R	(26.625)(0.625)(15)	= 249.6094 in³
R	(26.625)(0.625)(21.5)	= 357.7734 in³
R	(26.625)(0.625)(13.75)	= 228.8086 in³

Σ = 1193.9648 in³ (0.49/1728) = 0.3386 K

Shear studs: (FB E1) 39/108 → 38×4 = 152 say 160 # = 0.16 K

Bump Up:

3.9254 K
0.0479 K
0.12 K
0.3386 K
0.16 K
4.5919 K

4.5919 K / 3.9254 K = 1.17

FB @ skew 91#/FT

L = 11'-10½" = 11.875' wt = (11.875')(0.091 K/FT) = 1.0806 K

Tie R → 0.0479 K

Rivets → 24, say 25 # → 0.025 K

L's → (4×4×5/8×2') ×2 = (15.7 #/FT)(2')(2) = 62.8 # = 0.0628 K

R	(24")(0.5")(15.5")	= 186 in³
R	(24")(0.5")(14.5")	= 174 in³

Σ = 360 (0.49/1728) = 0.1021 K

Shear studs → (FB E2 39/108) → 6×4 = 24 studs say 30 # → 0.03 K

Bump Up: 1.0806 + 0.025 + 0.0479 + 0.0628 + 0.1021 + 0.03 = 1.3484 K

1.3484 / 1.0806 = 1.25

Calculations for 1/8 US Grid

Dead Loads : Floorbeams

FB @ skew 50 #/FT

L = 11'-10½" = 11875' (50 #/FT) = 593.75 # → 0.5938 K

Tie R → 0.0479 K
Rivets → 8+5+10+3+8 = 34 say 40 # → 0.04 K
2 L's 4x4x3/8 x 1'-2½ → 2(9.72 #/FT)(1.2083')(1/1000) = 0.0235 K

Shear Studs : (FBE24 39/108) 6x4 = 24 studs, say 30 # → 0.03K

Bump Up : 0.5938K
0.0479K
0.04K
0.0235K
0.03K
0.7352K

0.7352K / 0.5938K = 1.25

INT. FB's 106 #/FT

L = 24'-0½" = 24.0417' (106 #/1000) = 2.5484 K

Tie R → 0.0479 K
Rivets → 8+8+8+8+7+7 = 46 say 50 # → 0.05K

2 L's 4x4x5/8x2' → 0.0628 K

Shear Studs : (FBE5-FBE21 39/108) 30x4 = 120 studs → say 130 # = 0.13K

Bump Up : 2.5484K
0.0479K
0.05K
0.0628K
0.13K
2.8391K

2.8391 / 2.5484 = 1.11

Calculations for 1/8 US Grid

Dead Load Calcs: Catwalks

Span 7-10

Catwalk length = 467'-6" = 467.5'

Horizontal members:

From Span 5-7 Catwalk Calcs → 61.4 lb/ft

$wt = (61.4\ lb/ft)(467.5\ ft)(1K/1000\ lb) = \underline{28.7045\ K}$

Grating: See Span 5-7 Catwalk Calcs

$Area = (2.5')(467.5') = 1160.75\ ft^2$

$wt = (5.2\ lb/ft^2)(1160.75\ ft^2)(1K/1000\ lb) = \underline{6.0775\ K}$

Transverse members: See Span 5-7 Catwalk Calcs

44 spaces = 45 members

$(45\ members)(3.5\ ft/member)(10.3\ lb/ft)(1K/1000lb) = \underline{1.6223\ K}$

Vertical members:

Hangers all 6.5': 44 spaces = 45 members x 2 = 90 members
railing posts: 3.6667': 44 spaces none @ end → 44 x 2 = 88 members

$wt = (90\ hangers)(6.5\ ft/hanger)(11.1\ lb/ft) = 6493.5\ lb$
$(88\ posts)(3.6667\ ft/post)(11.1\ lb/ft) = 3581.6\ lb$

$(6493.5lb + 3581.6\ lb)\ 1K/1000\ lb = \underline{10.0751\ K}$

weight sub-total.

Horizontal members: 28.7045K
Grating: 6.0775K
Transverse members: 1.6223K
Vertical members: 10.0751K

46.4794K

* SEE NEXT PG FOR ADDITIONAL EDITS - 3/30/09

Add 10% for connections / rivets / ladders

$(46.4794K)(1.1) = \boxed{51.1273\ K}$

Calculations for 1/8 US Grid

TranSystems

Made By:	CJM	Date:	3/11/09	Job No:	HAM-471-0025
Checked By:	KMW	Date:	3/24/09	Sheet No.	2/2

Dead Load Calcs: Catwalks

Span 7-10

Total Load = 51.1273 K ☆

Apply Point load to Panels @ $U_0 - U_{44}$ for Center Truss.

$U_0 \rightarrow U_{44}$ = 45 panels

Wt. Applied to each Point = $\frac{51.1273\,K}{45\,\text{panels}}$ = **1.1362 K/panel** ☆ REVISED

☆ 2 TOE PL's: ASSUME EACH IS $\frac{1}{4}''_{TH} \times 4''_{TALL} = 0.0208\bar{3}'' \times 0.\bar{3}'' = 0.0069\bar{4}\ ft^2$

$0.0069\bar{4}\ ft^2 \times 467'\text{-}6'' = 3.2465\ ft^3/_{TOE\ PL} \times 2_{(QNTY)} \times \frac{0.49\,K}{ft^3} = \underline{3.1816\,K}$

REVISED CALC = 51.1273 K + 3.1816 K = 54.3089 K

$\frac{54.3089\,K}{45\ \text{PANELS}}$ = **1.2069 K/PANEL**

Calculations for 1/8 US Grid

Dead Load Calcs: Catwalks

Span 5-7

Catwalk Length: 212'-6" ± = 212.5'

Horizontal Members: (longitudinal)

L 3 x 3 x ½ (top handrail) → 9.35 lb/ft
L 3 x 3 x ½ (bottom handrail) → 9.35 lb/ft
MC 6 x 12 (Grating support) → 12 lb/ft

* There are 2 of each member (symetric)

wt = (9.35 + 9.35 + 12) x 2 = 61.4 lb/ft

(61.4 lb/ft)(212.5 ft)(1K/1000 lb) = 13.0475 K

Grating: 5.2 psf (from sheet 102/108 of rehab plans)

Area: 2'-6" out-out

(2.5')(212.5') = 531.25 ft²

wt = (531.25 ft²)(5.2 lb/ft²)(1K/1000 lb) = 2.7625 K

Transverse Members:

L 3½ x 3 x ½ (bottom ∠) → 10.3 lb/ft

Length = 3'-6"

Number of members: Spacing = 10'-7½"

20 spaces = 21 members

wt = (21 members)(3.5 ft)(10.3 lb/ft)(1K/1000 lb) = 0.7571 K

Vertical members:

Hanger → 3½ x 3½ x ½ → 11.1 lb/ft
Rail posts → 3½ x 3½ x ½ → 11.1 lb/ft

Lengths: Hangers span 5-6 → ~4.6667'
Hangers span 6-7 → ~6.5'
Rail posts → 3'-2" + 6" = 3.6667'

# of posts: span 5-6 → 8 x2 sym = 16
span 6-7 → 12 x 2 sym = 24
rail posts → 20 spaces, none @ ends → 20 x 2 sym = 40

wt: [(4.6667'/post)(16 posts)(11.1 lb/ft) + (6.5'/post)(24 posts)(11.1 lb/ft) + (3.6667'/post)(40 posts)(11.1 lb/ft)](1K/1000 lb) = 4.1884 K

Calculations for 1/8 US Grid

Dead Load Calcs: Catwalks

Span 5-7

Weight Sub-total:

Horizontal Members: 13.0475K
Grating: 2.7625K
Transverse Members: 0.7571K
Vertical Members: 4.1884K ★
20.7555K

Add 10% for connections/rivets/ladders:

(20.7555K)(1.1) = 22.8311K

Apply Point load to Panels U_1 to U_{19}: Catwalk doesn't extend to U_0, and U_{20} already included with Span 7-10.

$U_1 \rightarrow U_{19}$ = 19 panels

wt. Applied to each point = $\frac{22.8311K}{19 \text{ panels}}$ = 1.2016K/panel ★ REVISED

2 TOE Pls = ASSUME EACH IS ¼" x 4" TALL = 0.00694 ft² (SEE SPAN 7-10 CALC)

0.00694 ft² x 212.5' = 1.4757 ft³ x 2(QNTY) x $\frac{0.491K}{ft^3}$ = 1.4462K

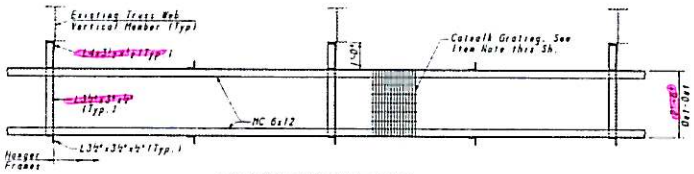
REVISED CALC: 22.8311K + 1.4462K = 24.2773K TOTAL

$\frac{24.2773K}{19 \text{ PANELS}}$ = 1.2778K/PANEL ★

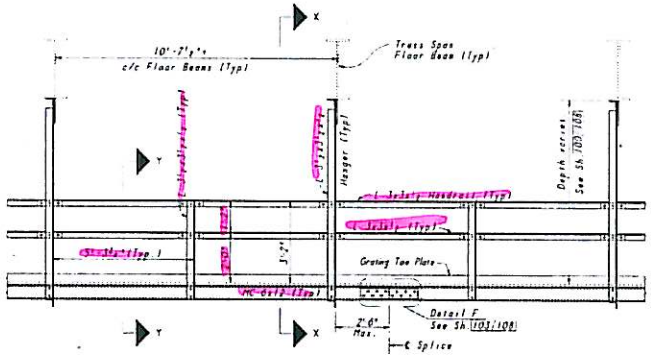
Calculations for 1/8 US Grid

Existing Structure

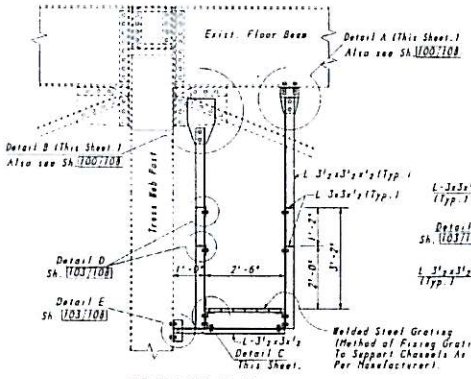
New Work



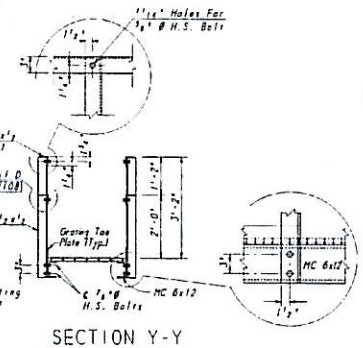
CATWALK PARTIAL PLAN
(FOR THE FULL PLAN)



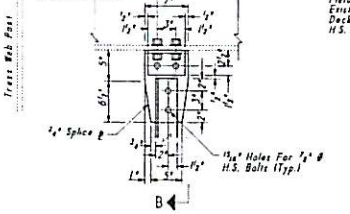
CATWALK PARTIAL ELEVATION
(FOR THE FULL ELEVATION)



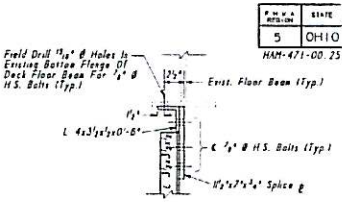
SECTION X-X



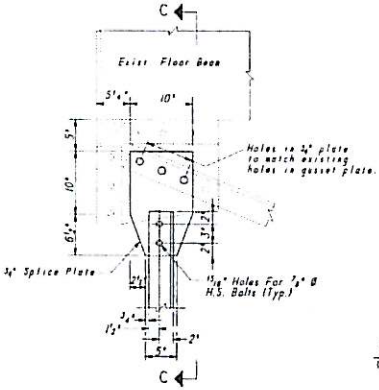
SECTION Y-Y



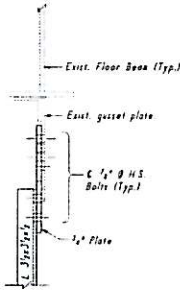
DETAIL A
(Right Side Shown, Left Side Similar)



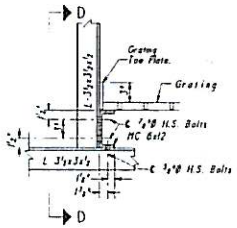
SECTION B-B



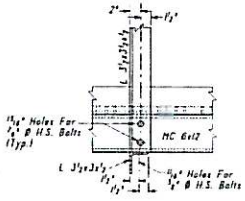
DETAIL B



SECTION C-C
(EXIST ANGLES NOT SHOWN)



DETAIL C
(OTHER SIDE SIMILAR)



SECTION D-D

ITEM 513. - CATWALK GRATING.
This item includes all labor, material, equipment, tools, and incidentals necessary to fabricate and install a welded steel grating system in the areas and on the length and position described on Structural Steel Catwalk Plan Sheets 100/108 thru 108/108.

Prior to grating installation, the Contractor shall inspect supports for correct size, layout and alignment, and take field measurements prior to preparation of the required shop drawings. Prior to grating installation the Contractor shall submit detailed shop drawings to the Engineer for review and approval. After installation, the Contractor shall submit as-built drawings to the Engineer to ensure that the drawings depict the steel grating as actually incorporated into the work. The steel grating described in this item shall be capable of a load bearing capacity of 85 pounds per square foot on a span indicated on the catwalk plan, and shall not exceed a depth of 1 inch, and a maximum deflection of 0.112 inches on a 7'-6" span. The shop drawings prepared by the Contractor shall include plans, elevations, and details of sections and connections, as well as type and location of all fasteners. The Contractor shall submit the grating manufacturer's specifications, load tables, anchor details and standard installation details. The grating installation shall be in accordance with the approved shop drawings and the standard installation clearances as recommended by the National Association Of Architectural Metal Manufacturers (NAAMM) Metal Bar Grating Manual. The Contractor shall perform all cutting and fitting required for installation. The item includes the use of anchorage devices (saddle clips, grating clamps, anchor blocks, plank clips, Z clips, countersunk head) toe plates and fasteners to secure grating to the supporting members. Grating shall be placed such that cross bars align.

TYPE AND MATERIAL: The grating shall be type 19W4 light duty welded steel grating (serrated bar, 3/16psf as manufactured by Ohio Gratings Inc., 5299 Southway, S.W., Canton, Ohio 44706 or type GW-100A 1"x1/8"bar, 3/4psf as manufactured by McNichols Co., 489 NEO Parkway, Cleveland, Ohio 44122-3195, and shall comply with the applicable provisions of NAAMM Metal Bar Grating Manual and the American National Standard Institute (ANSI) MSB 531 Light Duty Steel Grating. The material shall be Light Duty Steel ASTM A569 hot rolled carbon steel sheet and strip.

FINISH: Galvanized

METHOD OF PAYMENT. The pay quantity for grating will be based on the actual area as-in-place of grating installed, inspected, approved, and accepted by the Engineer.

BASIS OF PAYMENT: Payment will be made at the Contract unit price bid per square foot for Item 513, CATWALK GRATING.

NOTES:

1.- See General Notes, Sh. 7/108 Thru Sh. 11/108.

P.I.D.N.O. REVISION	STATE
5	OHIO

HAM-471-00.25

116 182

Pflum, Klausmeier & Gehrum Consultants 102/108

CATWALK DETAILS 1/2

BRIDGE No. HAM-471-0025
(Columbia Parkway Viaduct Over I-471)

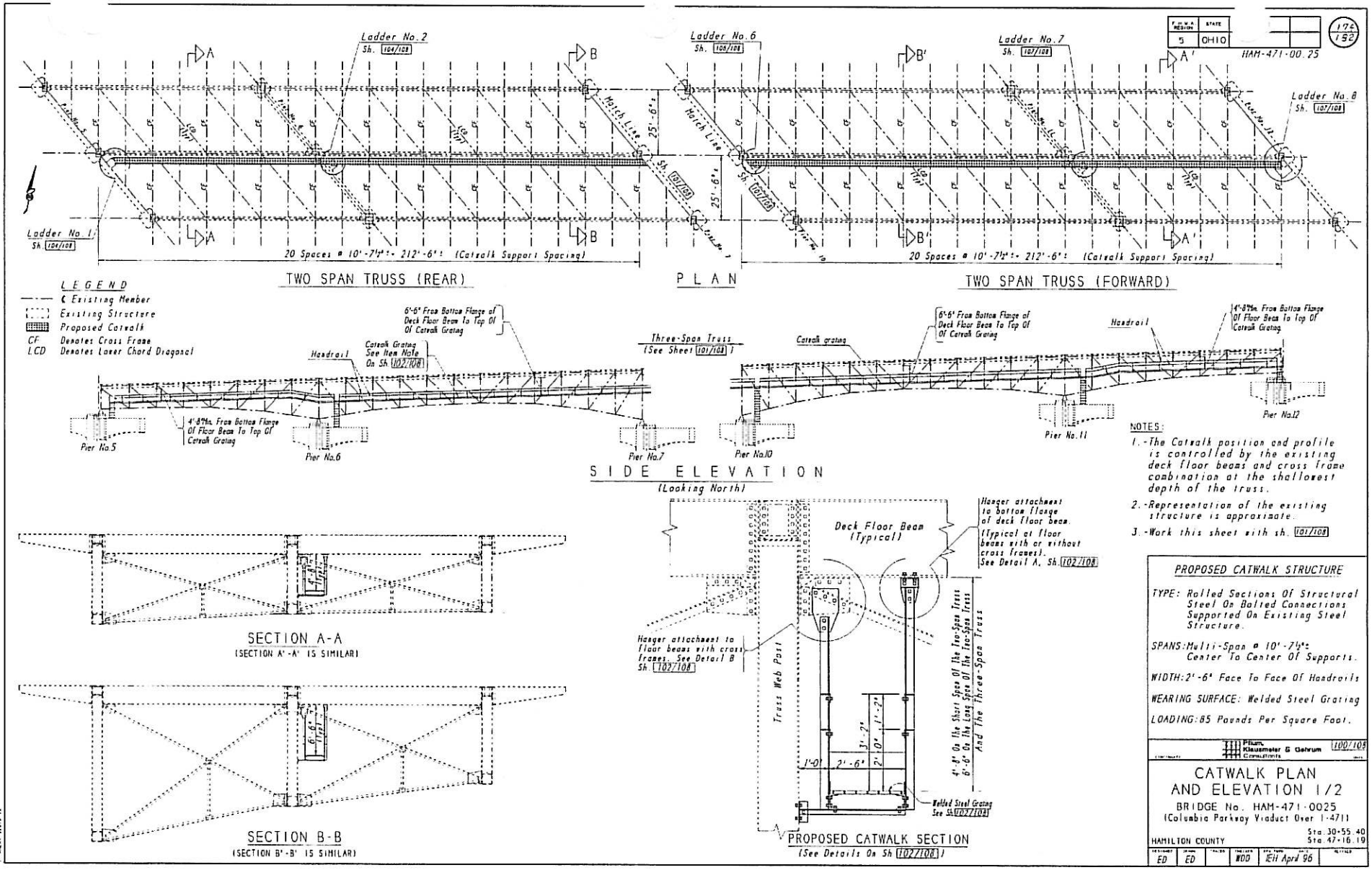
HAMILTON COUNTY

Sta. 30+55.40
Sta. 47+16.19

DESIGNED	DRAWN	CHECKED	QUANTITIES	DATE	REVISED
ED	PLF		MDD	JEH April 96	

WALKSEC Scale 1:333

3/4

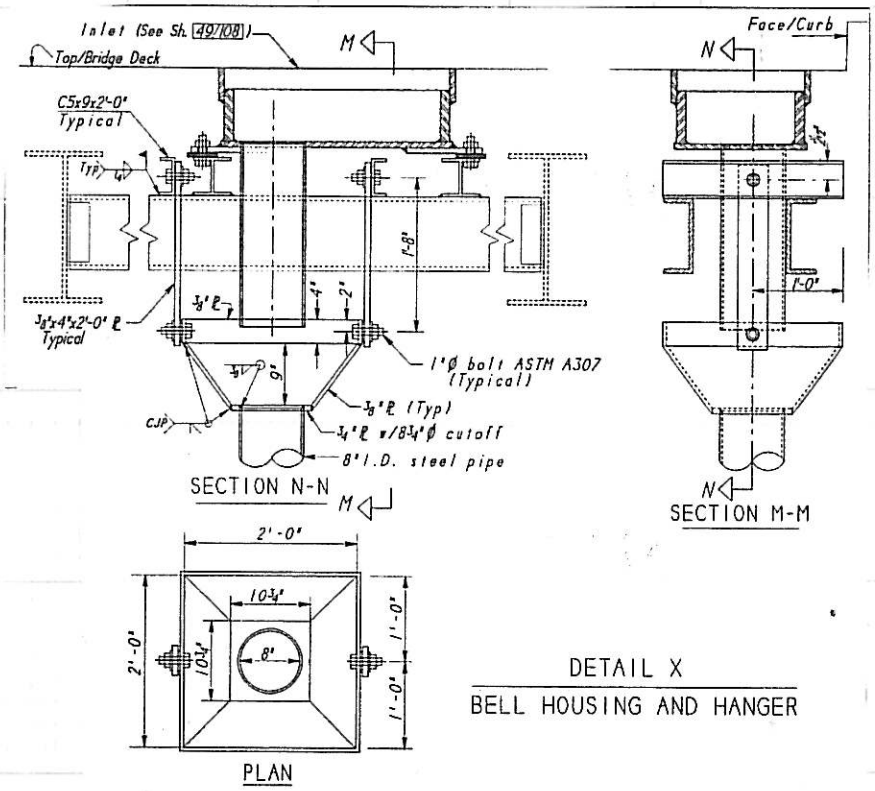


F.H.W.A. REGION 5
STATE OHIO
174/152
HAM-471-00.25
Ladder No. 2 Sh. 104/108
Ladder No. 6 Sh. 106/108
Ladder No. 7 Sh. 107/108
Ladder No. 8 Sh. 107/108
Ladder No. 1 Sh. 104/108
Match Line Sh. 101/108
Match Line Sh. 107/108
25'-6"±
20 Spaces @ 10'-7½"± = 212'-6"± (Catwalk Support Spacing)
TWO SPAN TRUSS (REAR)
PLAN
TWO SPAN TRUSS (FORWARD)
LEGEND
℄ Existing Member
Existing Structure
Proposed Catwalk
CF Denotes Cross Frame
LCD Denotes Lower Chord Diagonal
6'-6" From Bottom Flange of Deck Floor Beam To Top Of Of Catwalk Grating
Catwalk Grating See Item Note On Sh. 102/108
Handrail
4'-8"Min. From Bottom Flange Of Floor Beam To Top Of Catwalk Grating
Three-Span Truss (See Sheet 101/108)
Catwalk grating
Pier No.5
Pier No.6
Pier No.7
Pier No.10
Pier No.11
Pier No.12
SIDE ELEVATION
(Looking North)
NOTES:
1.-The Catwalk position and profile is controlled by the existing deck floor beams and cross frame combination at the shallowest depth of the truss.
2.-Representation of the existing structure is approximate.
3.-Work this sheet with sh. 101/108
SECTION A-A
(SECTION A'-A' IS SIMILAR)
SECTION B-B
(SECTION B'-B' IS SIMILAR)
Deck Floor Beam (Typical)
Hanger attachment to bottom flange of deck floor beam. (Typical at floor beams with or without cross frames). See Detail A, Sh. 102/108
Hanger attachment to floor beams with cross frames. See Detail B Sh. 102/108
Truss Web Post
4'-8" On The Short Span Of The Two-Span Truss
6'-6" On The Long Span Of The Two-Span Truss
And The Three-Span Truss
Welded Steel Grating See Sh. 102/108
PROPOSED CATWALK SECTION
(See Details On Sh 102/108)
PROPOSED CATWALK STRUCTURE
TYPE: Rolled Sections Of Structural Steel On Bolted Connections Supported On Existing Steel Structure.
SPANS: Multi-Span @ 10'-7½"± Center To Center Of Supports.
WIDTH: 2'-6" Face To Face Of Handrails
WEARING SURFACE: Welded Steel Grating
LOADING: 85 Pounds Per Square Foot.
Plum, Klausmeier & Gehrum Consultants
100/108
CATWALK PLAN AND ELEVATION 1/2
BRIDGE No. HAM-471-0025
(Columbia Parkway Viaduct Over I-471)
HAMILTON COUNTY
Sta. 30+55.40
Sta. 47+16.19
ED
ED
WDD
IEH April 96

4/4

Dead Load Calcs: Drainage

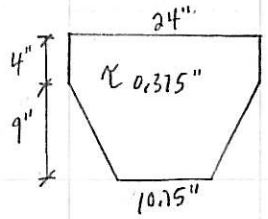
Span 5-7 | Span 7-10



DETAIL X
BELL HOUSING AND HANGER

* Apply Entire Drainage connection to one Panel point @ Pier.

Wt. of connections:



4 R's: $4(0.375")\left[(24")(4") + \left(\frac{24" + 10.75"}{2}\right)(9")\right] = 378.5625 in^3$

$378.5625 in^3 (1 ft^3/1728 in^3)(0.49 K/ft^3) = 0.1073 K$

2 - 3/8" x 4" x 2' R's : $2(0.375")(4")(24")(1 ft^3/1728 in^3)(0.49 K/ft^3) = 0.0204 K$

Support Beams: MC 10 x 33.6# between FB's (2 Beams) FB spacing = 10'-7½" = 10.625'

$wt = (0.0336 K/ft)(10.625 ft)(2 beams) = 0.714 K$ *

Total Upper Connection = 0.1073K + 0.0204K + 0.714K = 0.8417 K/point

Lower Connection → say 10 0 16 = 0.10 K/point

Dead Load Calcs : Drainage

Span 5-7 | Span 7-10

Wt. of pipes : Use Dim H1 for lengths From Rehab Plans:

DRAINAGE INLET SCHEDULE					
Location		Position Of Inlet Station, Offset	Final Elev. At Top/Frame	Dim. "H1"	Dim. "H2"
Rear Abutment		30+59.78, 33.88 Lt	538.13	10.9'±	9.2'±
		30+61.75, 22.65 Rt	538.16	11'±	9.2'±
PIER	No. 2	31+37.11, 33.02 Lt	539.00	11'±	13.5'±
		31+37.42, 22.65 Rt	539.01	11'±	13.5'±
	No. 3	Left Side N/A			
		32+23.18, 22.65 Rt	540.43	12.3'±	16.1'±
	No. 4	32+84.68, 33.06 Lt	541.62	11.7'±	20.9'±
		33+21.32, 22.65 Rt	542.43	12.5'±	20.9'±
	No. 5	33+75.72, 33.06 Lt	543.81	14.3'±	21.5'±
		34+18.22, 22.65 Rt	545.03	15.5'±	21.5'±
	No. 7	35+91.22, 33.06 Lt	550.69	24.5'±	24.2'±
		36+33.71, 22.65 Rt	552.10	25.8'±	24.3'±
	No. 8	37+39.96, 33.06 Lt	555.62	31.2'±	25.4'±
		37+82.46, 22.65 Rt	557.02	32.5'±	25.5'±
	No. 9	39+09.96, 33.06 Lt	561.24	30.3'±	37.9'±
		39+52.46, 22.65 Rt	562.65	31.8'±	37.9'±
	No. 10	40+61.71, 33.06 Lt	566.27	24.5'±	29.3'±
		41+04.21, 22.65 Rt	567.67	26'±	29.2'±
	No. 12	Left Side N/A		*	*
		43+20.75, 22.65 Rt	574.84	15.8'±	28.0'±
	No. 13	43+58.51, 33.06 Lt	576.09	11'±	31.1'±
		43+58.24, 22.65 Rt	576.08	11'±	31.1'±
	No. 14	44+40.96, 33.06 Lt	578.82	11'±	27.8'±
		44+40.71, 22.65 Rt	578.81	11'±	27.8'±
	No. 15	45+23.94, 33.06 Lt	581.56	11'±	22.6'±
		45+23.69, 22.65 Rt	581.56	11'±	22.6'±
	No. 16	45+88.79, 33.06 Lt	583.71	10'±	20.7'±
		45+88.56, 22.65 Rt	583.70	10'±	20.7'±
	No. 17	46+53.71, 33.06 Lt	585.86	10'±	18.9'±
		46+53.39, 22.65 Rt	585.85	10'±	18.9'±

* Assume 15.8' for Left side
Photos C-161 & 165 show 2 drainage pipes. *

Pipe Ø = 8" → 28.6 #/FT (0.0286 K/ft) [From Table 1-13, Steel Pipe : LRFD 3RD Edition]

Account for 2 - W 5 x 16 beams atop MC 10 x 33.6 :

L = 2'-2" each → 4.3333'

Wt = (4.3333')(16 lb/ft)(1K/1000 lb) = 0.0693 K/panel

Omit bolt wt.

Calculations for 1/8 US Grid

TranSystems Made By CJM Date 3/24/2009 Job No. P410070010
Checked By KMU Date 3/25/09 Sheet No.
Calculations For: **Columbis Parkway, Dead Load Calculations : Drainage**

Pier	Location On Bridge	Location on Truss	Length of pipe	Wt. of pipe (k/ft)	Total Wt. of Pipe	Weight of pipe applied to each panel point Connection Wt.	Wt. of MC 10x31.6 (kips)	Connection Wt. (kips)	Total Weight (kips)
5	Left	Upper	14.3	0.0286	0.40898	0.20449	0.0693	0.8417	1.11549
5	Left	Lower	14.3	0.0286	0.40898	0.20449	0.0693	0.1	0.37379
5	Right	Upper	15.5	0.0286	0.4433	0.22165	0.0693	0.8417	1.13265
5	RIght	Lower	15.5	0.0286	0.4433	0.22165	0.0693	0.1	0.39095
7	Left	Upper	24.5	0.0286	0.7007	0.35035	0.0693	0.8417	1.26135
7	Left	Lower	24.5	0.0286	0.7007	0.35035	0.0693	0.1	0.51965
7	Right	Upper	25.8	0.0286	0.73788	0.36894	0.0693	0.8417	1.27994
7	RIght	Lower	25.8	0.0286	0.73788	0.36894	0.0693	0.1	0.53824
8	Left	Upper	31.2	0.0286	0.89232	0.44616	0.0693	0.8417	1.35716
8	Left	Lower	31.2	0.0286	0.89232	0.44616	0.0693	0.1	0.61546
8	Right	Upper	32.5	0.0286	0.9295	0.46475	0.0693	0.8417	1.37575
8	RIght	Lower	32.5	0.0286	0.9295	0.46475	0.0693	0.1	0.63405
9	Left	Upper	30.3	0.0286	0.86658	0.43329	0.0693	0.8417	1.34429
9	Left	Lower	30.3	0.0286	0.86658	0.43329	0.0693	0.1	0.60259
9	Right	Upper	31.8	0.0286	0.90948	0.45474	0.0693	0.8417	1.36574
9	RIght	Lower	31.8	0.0286	0.90948	0.45474	0.0693	0.1	0.62404
10	Left	Upper	24.5	0.0286	0.7007	0.35035	0.0693	0.8417	1.26135
10	Left	Lower	24.5	0.0286	0.7007	0.35035	0.0693	0.1	0.51965
10	Right	Upper	26	0.0286	0.7436	0.3718	0.0693	0.8417	1.2828
10	RIght	Lower	26	0.0286	0.7436	0.3718	0.0693	0.1	0.5411
12	Left	Upper	15.8	0.0286	0.45188	0.22594	0.0693	0.8417	1.13694
12	Left	Lower	15.8	0.0286	0.45188	0.22594	0.0693	0.1	0.39524
12	Right	Upper	15.8	0.0286	0.45188	0.22594	0.0693	0.8417	1.13694
12	RIght	Lower	15.8	0.0286	0.45188	0.22594	0.0693	0.1	0.39524