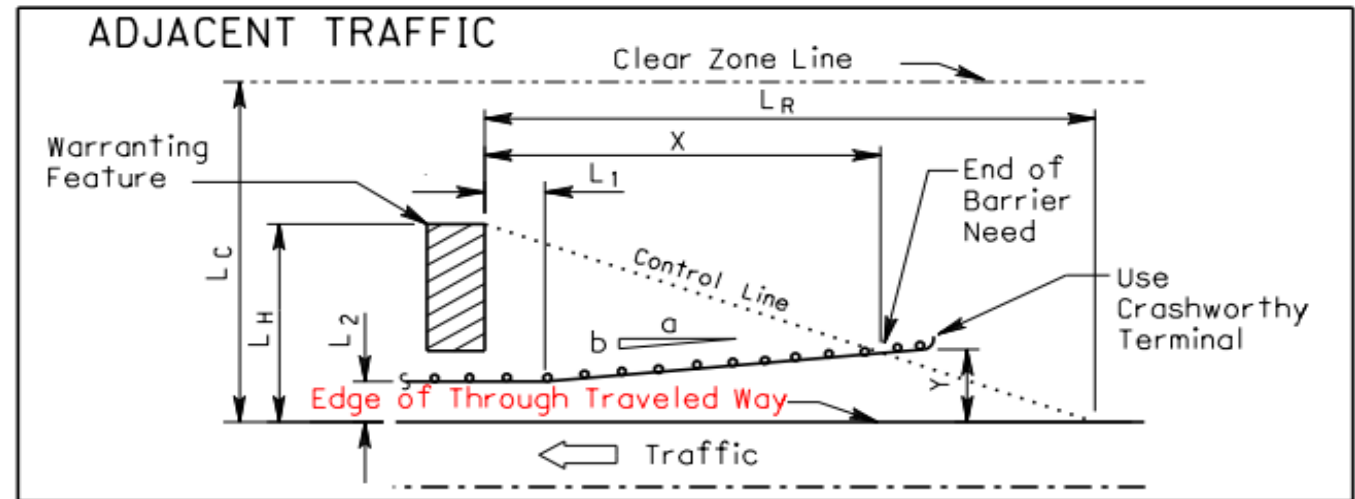


Location: Ramp A2 Bridge 9 Forward Abutment RT			
User Entered Data		Calculated Data	
Enter Speed (S)	50	Clear Zone (LC) =	26
Enter Volume (ADT)	23500	Flare Rate (FR) =	0.000
Enter LH	26	Runout Length (LR) =	230
Enter L2	6.00	Length of Need (X) =	176.9
Enter L1	0.00	Perpendicular distance from edge line (Y) =	6.00
Enter a (between 7 and 15)	7		

Is Barrier flared?
 Yes No

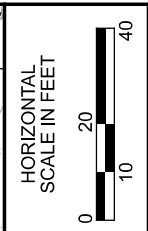
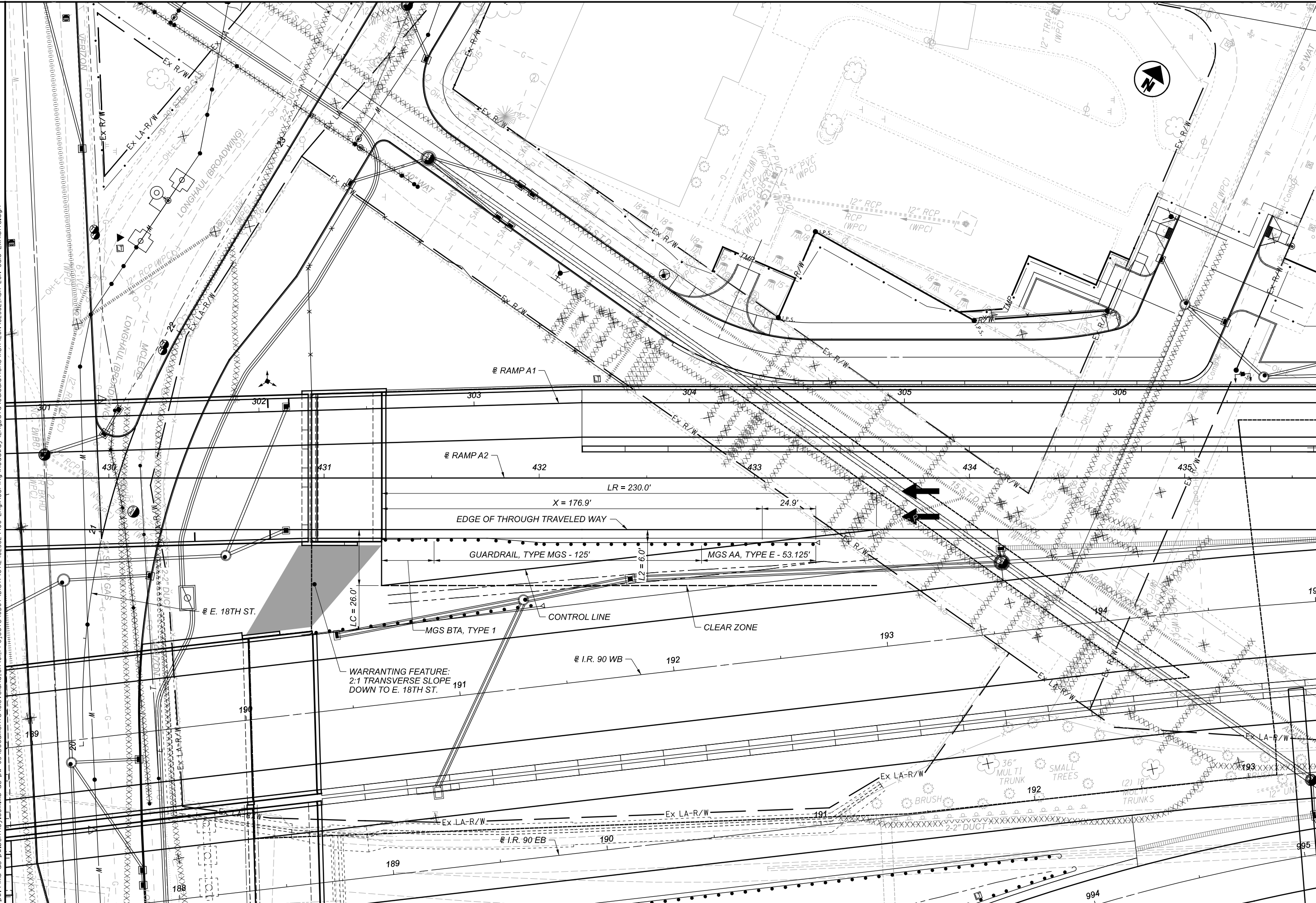
Key	
X =	Length of Need
LC =	Required Clear Zone
LH =	Edge of Traveled Way to Back of Warranting Feature
L2 =	Edge of Traveled Way to Face of Barrier
L1 =	Edge of Warranting Feature to Point of Beginning Taper
Y =	Edge of Traveled to End of Barrier
S =	Speed
ADT =	Average Daily Traffic
FR =	Flare Rate (1/a)
a =	Flare Rate used for MGS anywhere from 7 to 15

S	LC	FR	Runout Length, L _R (ft)			
			Over 10,000 ADT	5000 - 10000 ADT	1000 - 5000 ADT	Under 1000 ADT
30	15	0.143	110	90	80	70
35	15	0.143	135	110	95	85
40	15	0.143	160	130	110	100
45	19	0.143	195	160	135	130
50	19	0.143	230	190	160	150
55	23	0.143	265	220	185	175
60	30	0.143	300	250	210	200
65	30	0.143	330	290	250	225
70	30	0.143	360	330	290	250
75	30	0.143	415	380	335	290



$$X = \frac{L_H + (b/a)L_1 - L_2}{(b/a) + L_H/L_R}$$

$$Y = L_H - X L_H/L_R$$



LENGTH OF NEED EXHIBIT
RAMP A2 BRIDGE 9 FORWARD ABUTMENT RT

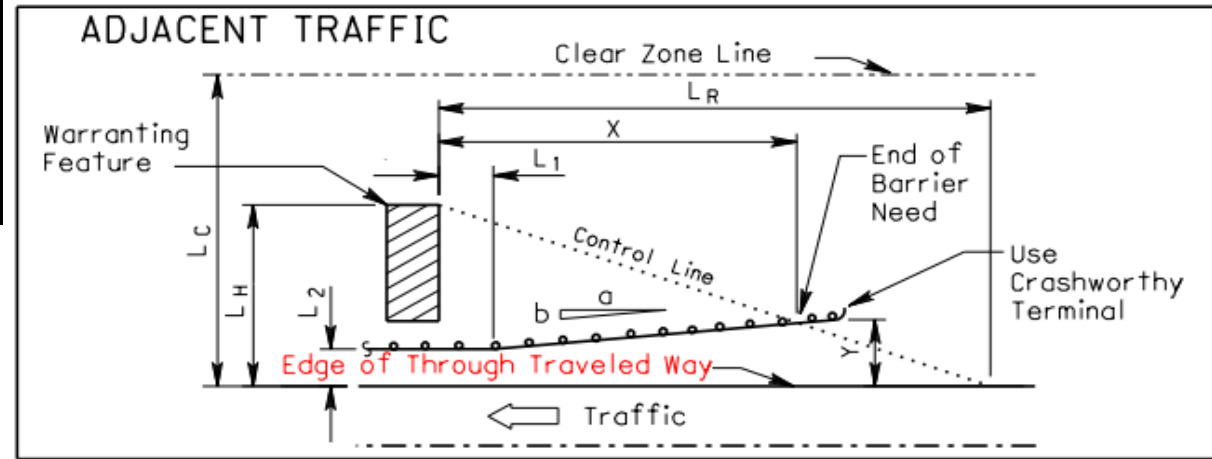
DESIGN AGENCY	HR
DESIGNER	TJS
REVIEWER	XXX MM-DD-YY
PROJECT ID	82382
SHEET	TOTAL
1	1

Location: Ramp B6 Light Tower LT			
User Entered Data		Calculated Data	
Enter Speed (S)	50	Clear Zone (LC) =	19
Enter Volume (ADT)	7500	Flare Rate (FR) =	0.000
Enter LH	17.80	Runout Length (LR) =	190
Enter L2	6.00	Length of Need (X) =	126.0
Enter L1	0.00	Perpendicular distance from edge line (Y) =	6.00
Enter a (between 7 and 15)	7.000		

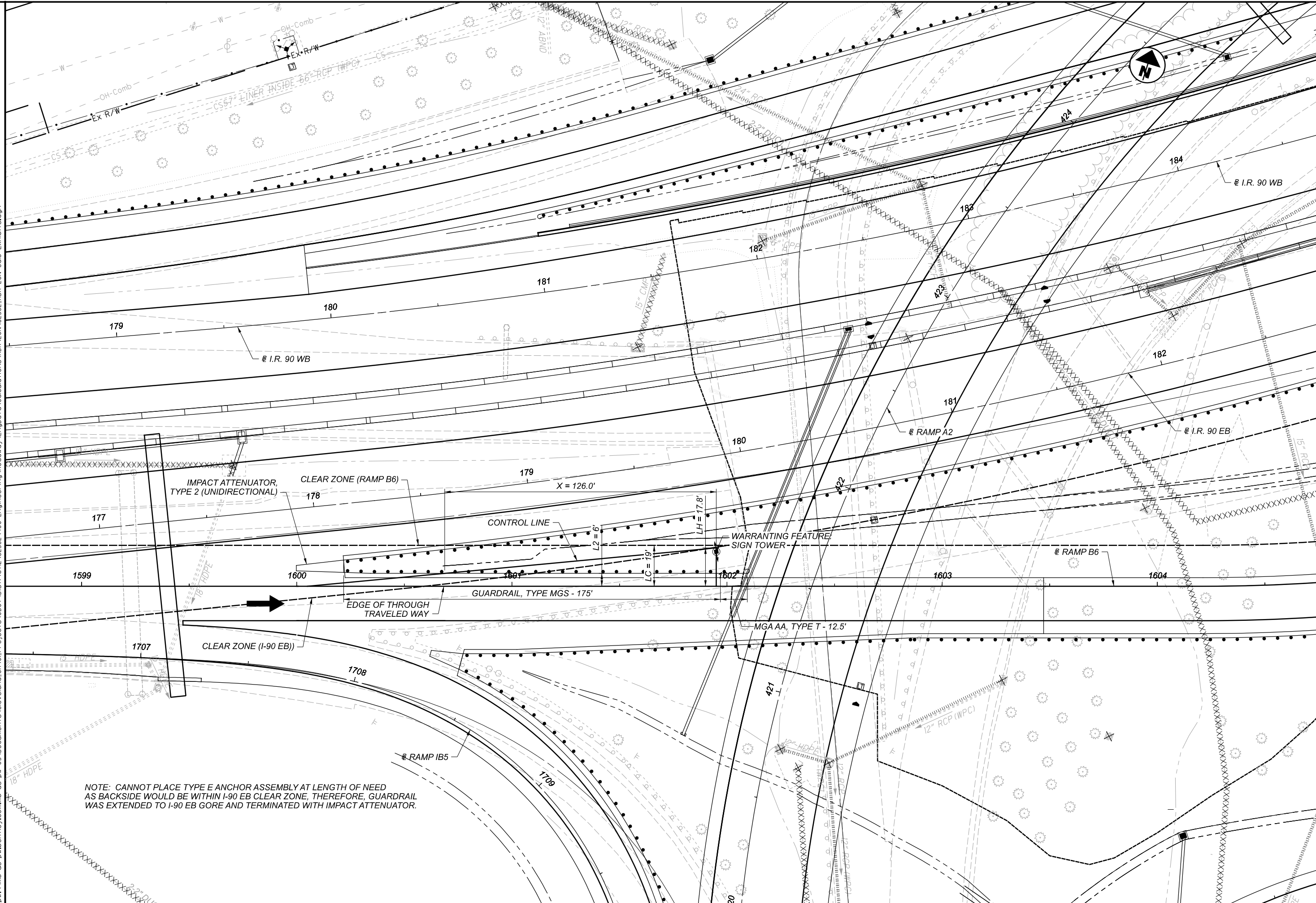
Is Barrier flared?
 Yes No

Key	
X =	Length of Need
LC =	Required Clear Zone
LH =	Edge of Traveled Way to Back of Warranting Feature
L2 =	Edge of Traveled Way to Face of Barrier
L1 =	Edge of Warranting Feature to Point of Beginning Taper
Y =	Edge of Traveled to End of Barrier
S =	Speed
ADT =	Average Daily Traffic
FR =	Flare Rate (1/a)
a =	Flare Rate used for MGS anywhere from 7 to 15

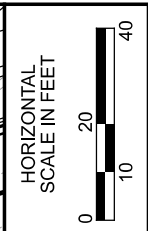
S	LC	FR	Runout Length, L _R (ft)			
			Over 10,000 ADT	5000 - 10000 ADT	1000 - 5000 ADT	Under 1000 ADT
30	15	0.143	110	90	80	70
35	15	0.143	135	110	95	85
40	15	0.143	160	130	110	100
45	19	0.143	195	160	135	130
50	19	0.143	230	190	160	150
55	23	0.143	265	220	185	175
60	30	0.143	300	250	210	200
65	30	0.143	330	290	250	225
70	30	0.143	360	330	290	250
75	30	0.143	415	380	335	290



$$X = \frac{L_H + (b/a)L_1 - L_2}{(b/a) + L_H/L_R} \quad Y = L_H - X L_H/L_R$$



NOTE: CANNOT PLACE TYPE E ANCHOR ASSEMBLY AT LENGTH OF NEED AS BACKSIDE WOULD BE WITHIN I-90 EB CLEAR ZONE, THEREFORE, GUARDRAIL WAS EXTENDED TO I-90 EB GORE AND TERMINATED WITH IMPACT ATTENUATOR.



LENGTH OF NEED EXHIBIT
RAMP B6 OVERHEAD SIGN SUPPORT LT

DESIGN AGENCY	
DESIGNER	TJS
REVIEWER	XXX MM-DD-YY
PROJECT ID	82382
SHEET	TOTAL
1	1