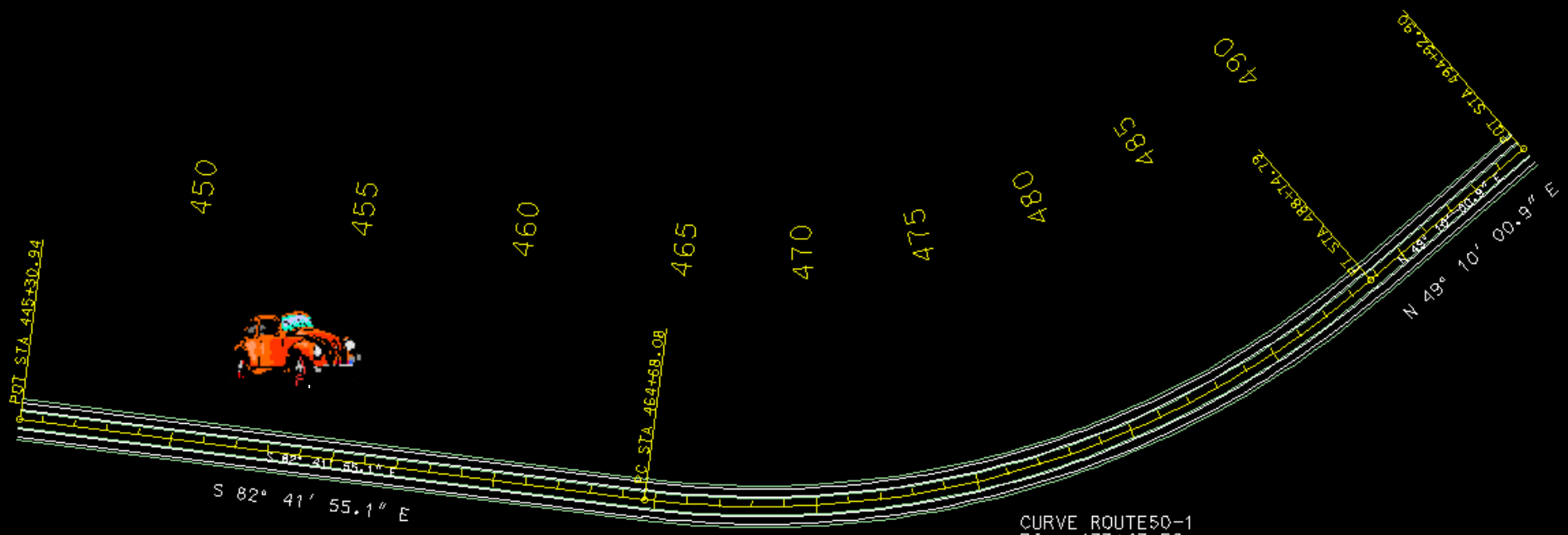
Superelevation Example: Divided Highway

Detail Design Information

- Route 50 – Cole County
- Detail Design – Rural (Figure 4-04.1)
  - Principal Arterial
  - ADT (Average Daily Traffic >1700
  - Design Speed = 70 mph
  - e_{max}=8%
  - 4-lane Divided Highway
    - 2 Westbound Lanes, 2 Eastbound Lanes

Superelevation Example: Divided Highway

Route 50 Plan View



CURVE ROUTE50-1

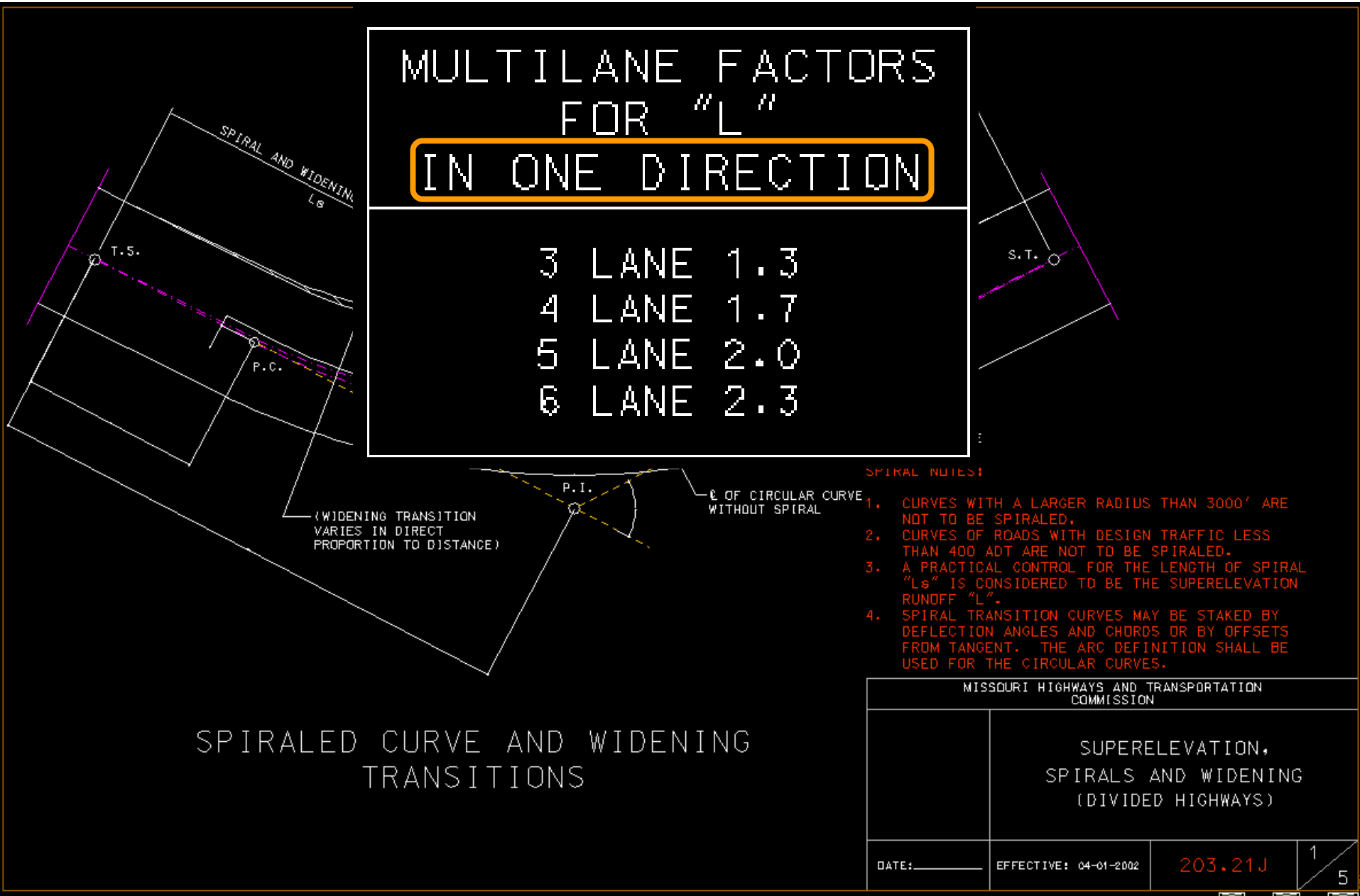
PI	477+47.59
PC	464+68.08
PT	488+74.79
Δ	48° 08' 03.4" (LT)
D	2° 00' 00.0"
L	2,406.71'
T	1,279.51'
R	2,864.79'

Superelevation Example: Divided Highway

Chain Information

```
Beginning chain ROUTE50 description
==============================================================================

Point 1        N        999,551.4258  E      1,698,102.3443  Sta    445+30.940

Course from 1 to PC ROUTE50-1  S 82^ 41' 55.09" E        Dist 1,937.1386

                                   Curve Data
                                  *----------*
Curve ROUTE50-1
P.I.  Station          477+47.590  N        999,142.6274  E      1,701,292.9116
Delta        =      48^ 08' 03.45" (LT)
Degree       =       2^ 00' 00.00"
Tangent      =          1,279.5111
Length       =          2,406.7146
Radius       =          2,864.7890
External     =            272.7522
Long Chord   =          2,336.5617
Mid. Ord.    =            249.0413
P.C.  Station          464+68.079  N        999,305.2382  E      1,700,023.7755
P.T.  Station          488+74.793  N        999,979.2428  E      1,702,261.0145
C.C.                               N      1,002,146.7978  E      1,700,387.8564
Back         = S  82^ 41' 55.09" E
Ahead        = N  49^ 10' 01.47" E
Chord Bear   = N  73^ 14' 03.19" E

Course from PT ROUTE50-1 to 3  N 49^ 10' 00.95" E        Dist 618.1073

Point 3        N      1,000,383.3969  E      1,702,728.6855  Sta    494+92.900

==============================================================================
Ending chain ROUTE50 description
```

Superelevation Example: Divided Highway



Superelevation Example: Divided Highway

Standard Drawing 203.21J Page 1 of 5

230.1.1.5 Spiral Transition Curves

Spiral curves are used on all roadways that have design traffic greater than 400 vehicles per day, anticipated posted speed greater than 50 mph (80 km/h) and a curve radius that is less than 2865 feet (875.0 m). The length of spiral is the same as the length of superelevation and widening transition given in the standard plans.

SPIRAL NOTES:

1. CURVES WITH A LARGER RADIUS THAN 3000′ ARE NOT TO BE SPIRALED.
2. CURVES OF ROADS WITH DESIGN TRAFFIC LESS THAN 400 ADT ARE NOT TO BE SPIRALED.
3. A PRACTICAL CONTROL FOR THE LENGTH OF SPIRAL "Ls" IS CONSIDERED TO BE THE SUPERELEVATION RUNOFF "L".
4. SPIRAL TRANSITION CURVES MAY BE STAKED BY DEFLECTION ANGLES AND CHORDS OR BY OFFSETS FROM TANGENT. THE ARC DEFINITION SHALL BE USED FOR THE CIRCULAR CURVES.

Radius = 2,864.7890 feet

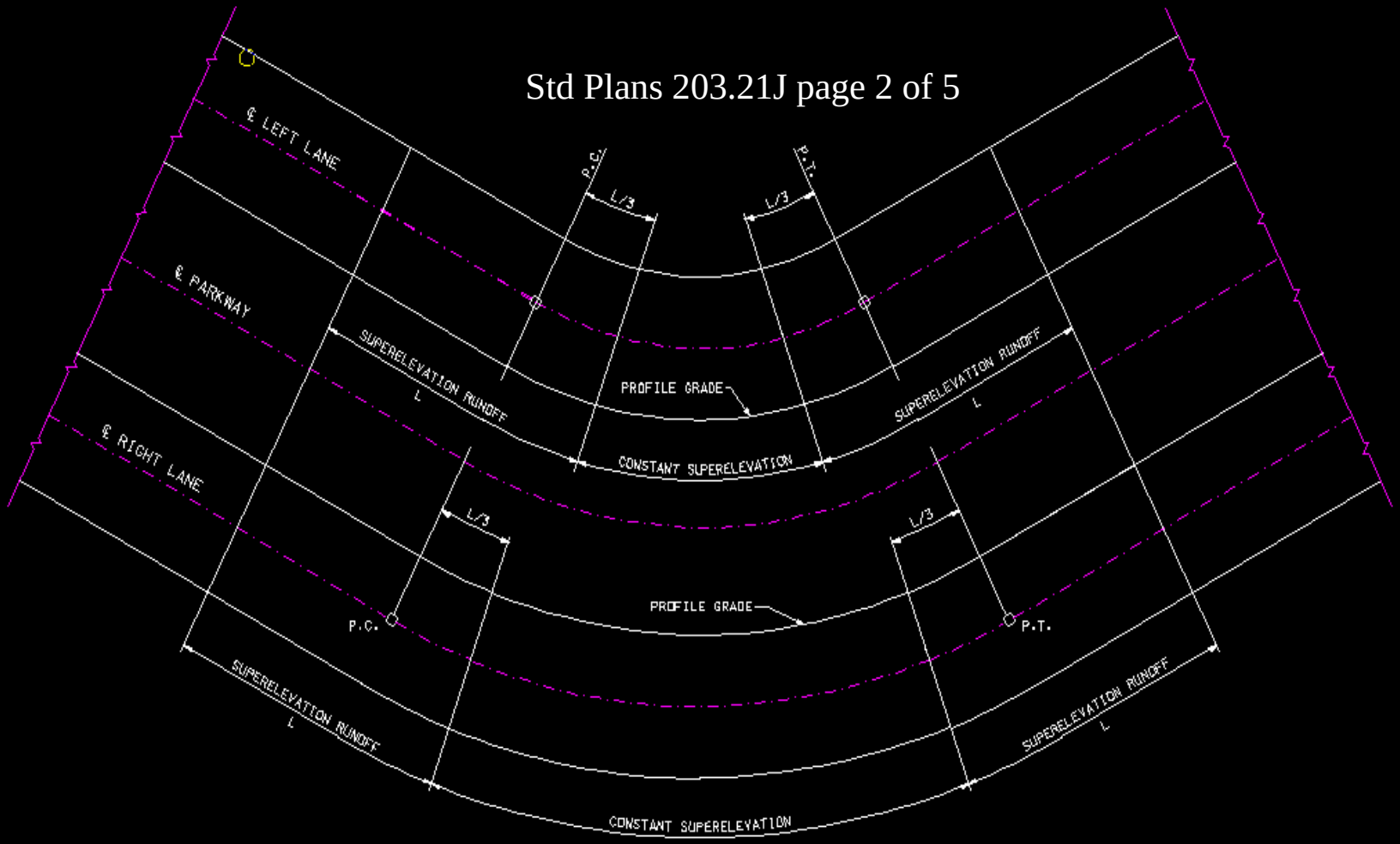
ADT (Average Daily Traffic > 1700

Degree of Curve = 2

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

SUPERELEVATION, SPIRALS AND WIDENING (DIVIDED HIGHWAYS)

DATE:_____ EFFECTIVE: 04-01-2002 203.21J 1/5



SUPERELEVATION RUNOUT WITHOUT SPIRALS

SECTION ON SUPERELEVATED CURVE
CURVE TO LEFT (ILLUSTRATED)

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION			
	SUPERELEVATION, SPIRALS AND WIDENING (DIVIDED HIGHWAYS)		
DATE:	EFFECTIVE:	203.21J	2/5

SUPERELEVATION AND WIDENING TABLE, e_{max} = 8%

DESIGN SPEED	50 M.P.H.					60 M.P.H.				70 M.P.H.		
NORMAL SURFACE WIDTH			20'	22'	24'			22'	24			24'
DEGREE OF CURVE	e%	L	W			e%	L	W		e%	L	W
17000	NC	0	0	0	0	NC	0	0	0	NC	0	0
14000	NC	0	0	0	0	NC	0	0	0	RC	90	0
12000	NC	0	0	0	0	NC	0	0	0	RC	90	0
10000	NC	0	0	0	0	RC	80	0	0	2.1	95	0
8000	NC	0	0	0	0	2.1	84	0	0	2.6	117	0
6000	RC	72	0	0	0	2.7	108	0	0	3.4	153	0
5000	2.4	86	2.0	0	0	3.2	126	0	0	4.1	184	0
4000	2.9	104	2.0	0	0	3.9	156	2.0	0	4.9	221	0
3500	3.2	115	2.0	0	0	4.4	176	2.0	0	5.5	248	0
3000	3.7	133	2.5	0	0	5.0	200	2.0	0	6.3	283	0
2500	4.3	155	2.5	0	0	5.7	228	2.0	0	7.2	324	0
2000	5.1	184	2.5	0	0	6.6	264	2.0	0	7.9	356	0
1800	5.5	196	3.0	2.0	0	7.1	284	2.0	0			
1600	5.9	212	3.0	2.0	0	7.5	300	2.5	0			
1400	6.4	230	3.0	2.5	0	7.8	312	2.5	0			
1200	7.0	252	3.5	2.5	0							
1000	7.6	274	3.5	3.0	2.0							
900	7.8	281	4.0	3.5	2.5							
800	8.0	288	4.5	3.5	2.5							

MIN RADIUS = 750'

MIN RADIUS = 1205'

MIN RADIUS = 1620'

SUPERELEVATION AND WIDENING TABLE, e_{max} = 4%

DESIGN SPEED	50 M.P.H.					60 M.P.H.			
NORMAL SURFACE WIDTH			20'	22'	24			22'	24
DEGREE OF CURVE	e%	L	W			e%	L	W	
10000	NC	0	0	0	0	NC	0	0	0
8000	NC	0	0	0	0	RC	80	0	0
6000	RC	72	0	0	0	2.3	92	0	0
5000	RC	72	2.0	0	0	2.5	100	0	0
4000	2.3	83	2.0	0	0	2.8	112	0	0
3500	2.5	90	2.0	0	0	3.0	120	0	0
3000	2.7	97	2.5	0	0	3.3	132	0	0
2500	2.9	104	2.5	0	0	3.5	140	0	0
2000	3.2	115	2.5	0	0	3.8	152	0	0
1800	3.3	119	3.0	2.0	0	3.9	156	2.0	0
1600	3.5	126	3.0	2.0	0	4.0	160	2.5	0
1400	3.7	133	3.0	2.5	0				
1200	3.9	140	3.5	2.5	0				
1000	4.0	144	3.5	3.0	2.0				

MIN RADIUS = 930'

RADIUS = 1505'

TABLE NOTES:

1) "NC" DENOTES NORMAL

2) "RC" DENOTES REMOVE E AT NORMAL CROSS SLOPE.

3) "e" DENOTES THE SUP

4) "L" THE LENGTH OF S TRANSITION IN FEET FOR A 4 LANE DIVIDED HI

5) "W" THE WIDENING IN FEET FOR SURFACING AT INSIDE SHOULDERS.

6) VALUE FOR A RADIUS NOT SHOWN IN ABOVE TABLE SHALL BE IDENTICAL TO THOSE FOR THE NEAREST TABULATED RADIUS. IN CASE OF TIE, USE VALUES OF NEXT LARGER RADIUS.

Rural (Figure 4-04.1)

Radius = 2,864.7890 feet

Design Speed = 70 M.P.H.

SUPERELEVATION AND WIDENING TABLE, e_{max} = 8%

DESIGN SPEED	50 M.P.H.					60 M.P.H.				70 M.P.H.		
NORMAL SURFACE WIDTH			20′	22′	24′			22′	24′			24′
DEGREE OF CURVE	e%	L	W			e%	L	W		e%	L	W
17000	NC	0	0	0	0	NC	0	0	0	NC	0	0
14000	NC	0	0	0	0	NC	0	0	0	RC	90	0
									0	RC	90	0
									0	2.1	95	0
									0	2.6	117	0
									0	3.4	153	0
									0	4.1	184	0
4000	2.9	104	2.0	0	0	3.9	156	2.0	0	4.9	221	0
3500	3.3	115	2.0	0	0	4.4	176	2.0	0	5.5	248	0
3000	3.7	133	2.5	0	0	5.0	200	2.0	0	6.3	283	0
2500	4.3	155	2.5	0	0	5.7	228	2.0	0	7.2	324	0
2000	5.1	184	2.5	0	0	6.6	264	2.0	0	7.9	356	0
1800	5.5	196	3.0	2.0	0	7.1	284	2.0	0			
1600	5.9	212	3.0	2.0	0	7.5	300	2.5				
1400	6.4	230	3.0	2.5	0	7.8	312	2.5				
1200	7.0	252	3.5	2.5	0							
1000	7.6	274	3.5	3.0	2.0							
900	7.8	281	4.0	3.5	2.5							
800	8.0	288	4.5	3.5	2.5							

MIN RADIUS = 750′

MIN RADIUS = 1820′

MIN RADIUS =

L = Length of Superelevation Runoff

L = 283 feet

Radius = 2,864.7890 feet

Design Speed = 70 M.P.H.

SUPER

DESIGN SPEED
NORMAL SURFACE WI
DEGREE OF CURVE
17000
14000
12000
10000
8000
6000
5000
4000
3500
3000
2500
2000
1800
1600
1400
1200
1000
900
800

= 4%

P.H.	
22′	24′
W	
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
2.0	0
2.5	0

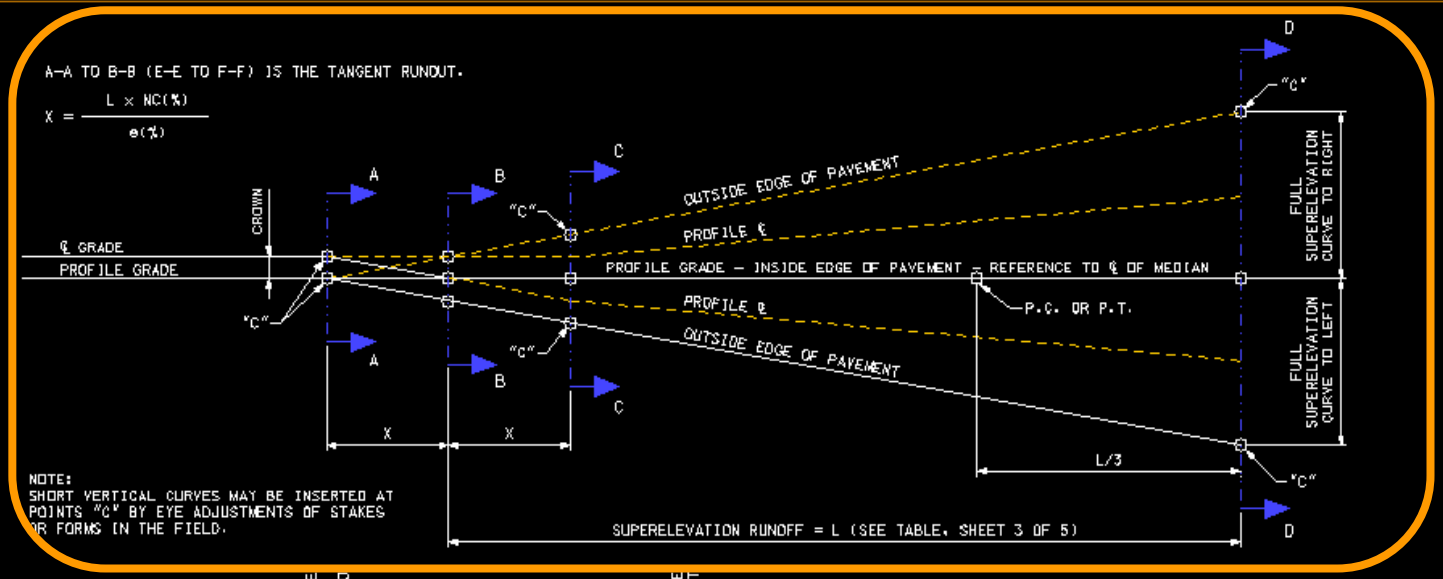
= 1505′

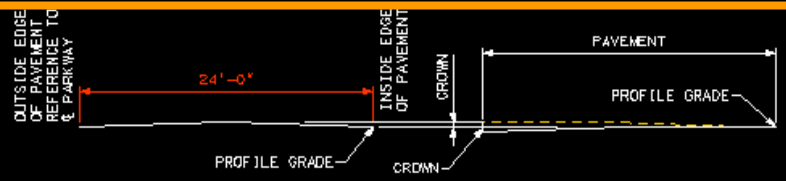
~~MULTILANE FACTORS FOR "L" IN ONE DIRECTION~~

~~3 LANE 1.3~~
4 LANE 1.7
~~5 LANE 2.0~~
6 LANE 2.3

(DIVIDED HIGHWAYS)

DATE: EFFECTIVE: 203.21J 3/5





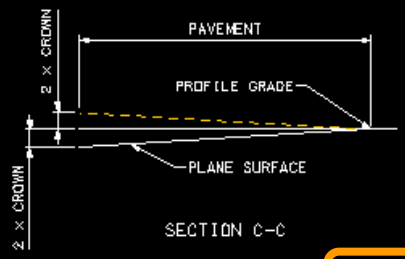
SECTION A-A

SECTION B-B

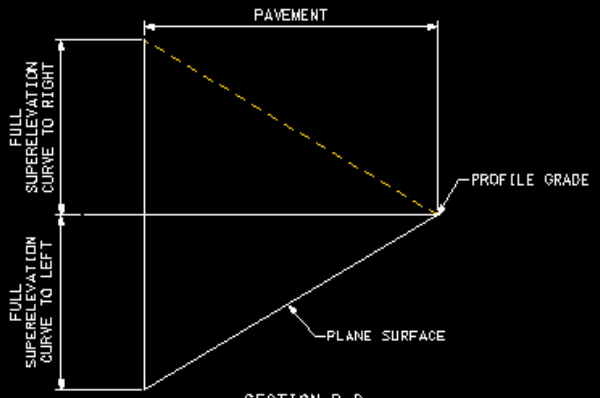
L = Length of Superelevation Runoff

L = 283 feet

SOLID LINES ARE FOR CURVES TO LEFT
DASHED LINES ARE FOR CURVES TO RIGHT



SECTION C-C



SECTION D-D

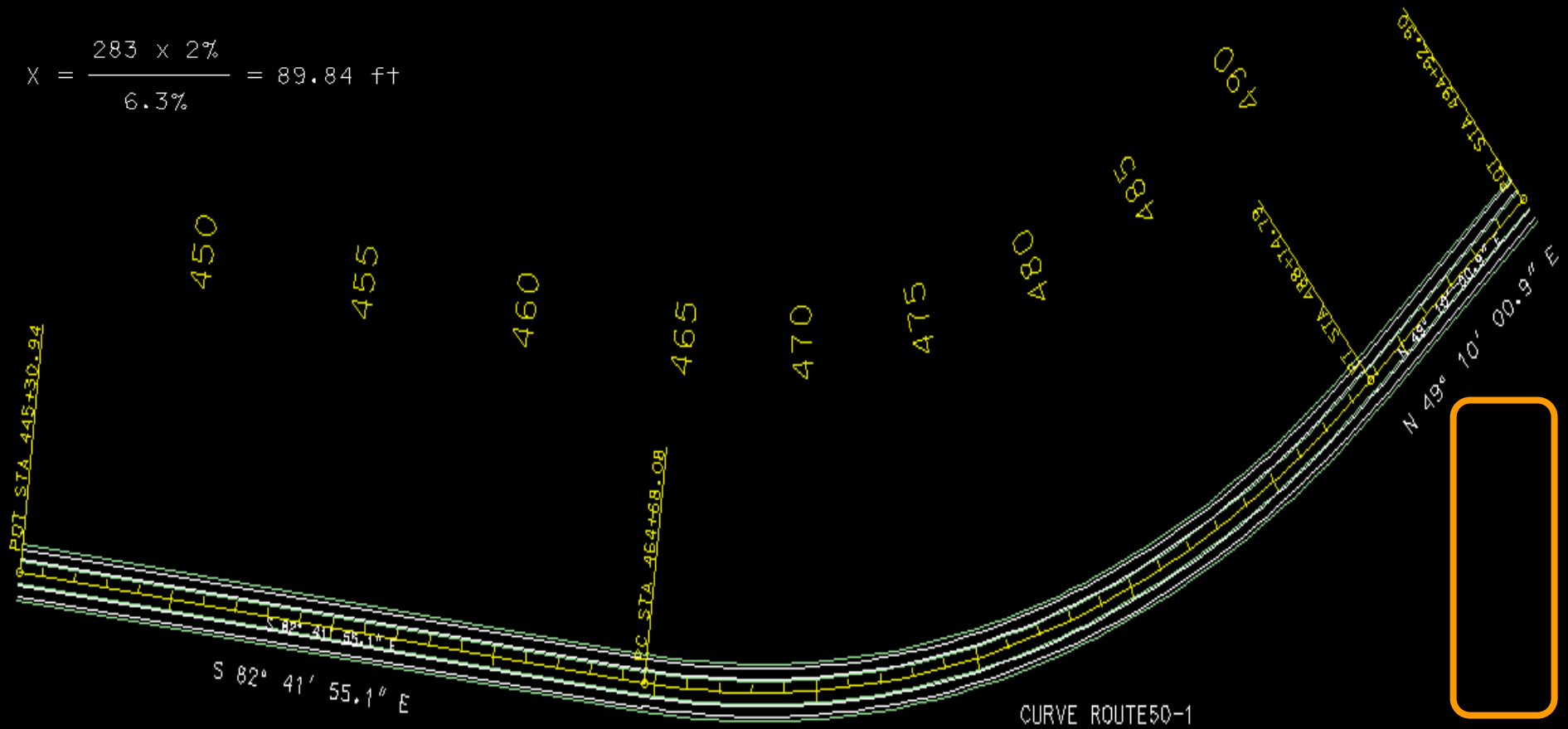
METHOD OF ATTAINING SUPERELEVATION
(LEFT LANE)

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

SUPERELEVATION, SPIRALS AND WIDENING
(DIVIDED HIGHWAYS)

DATE: EFFECTIVE: 203.21J 4/5

$$X = \frac{283 \times 2\%}{6.3\%} = 89.84 \text{ ft}$$



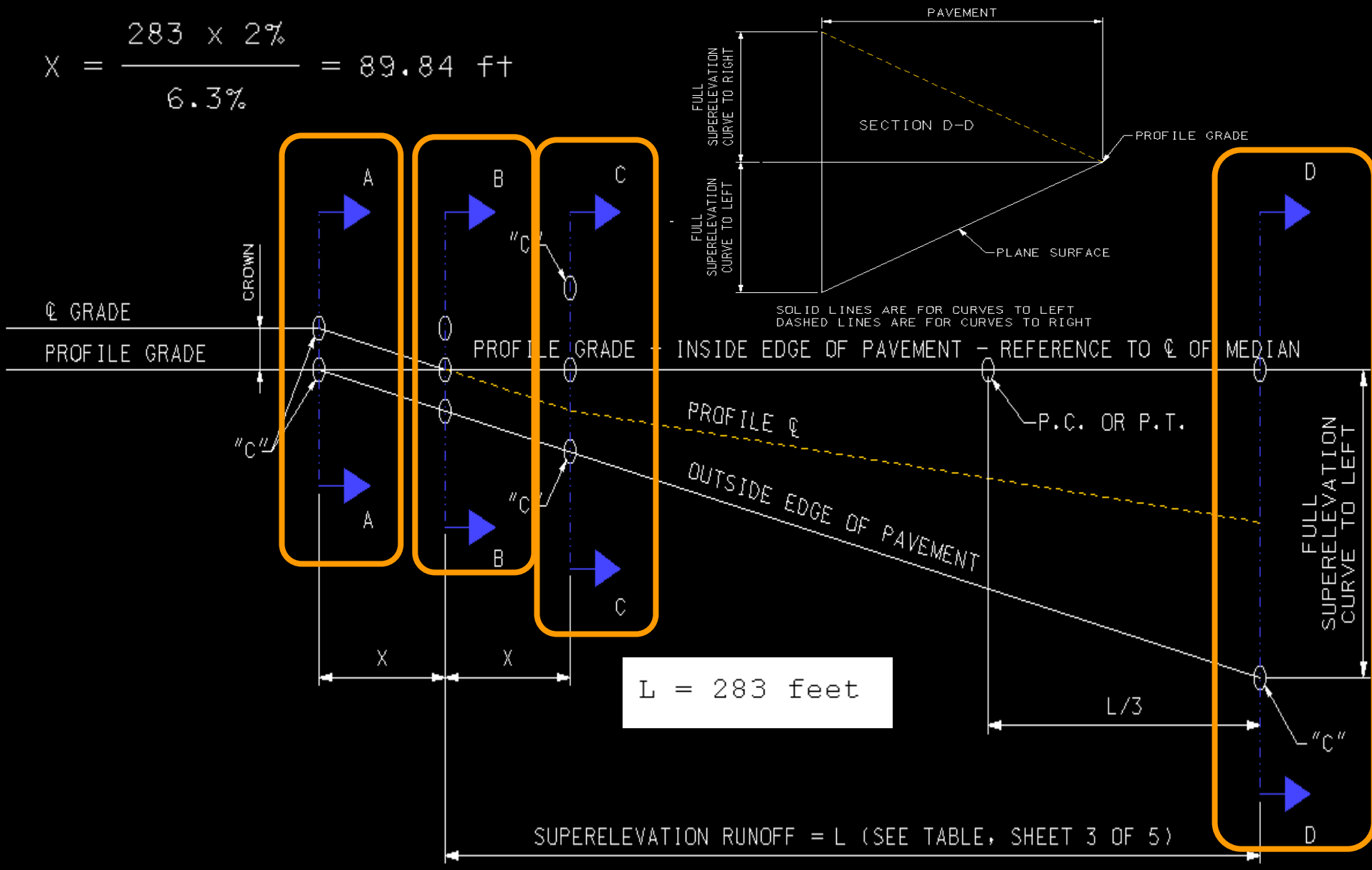
CURVE ROUTE50-1

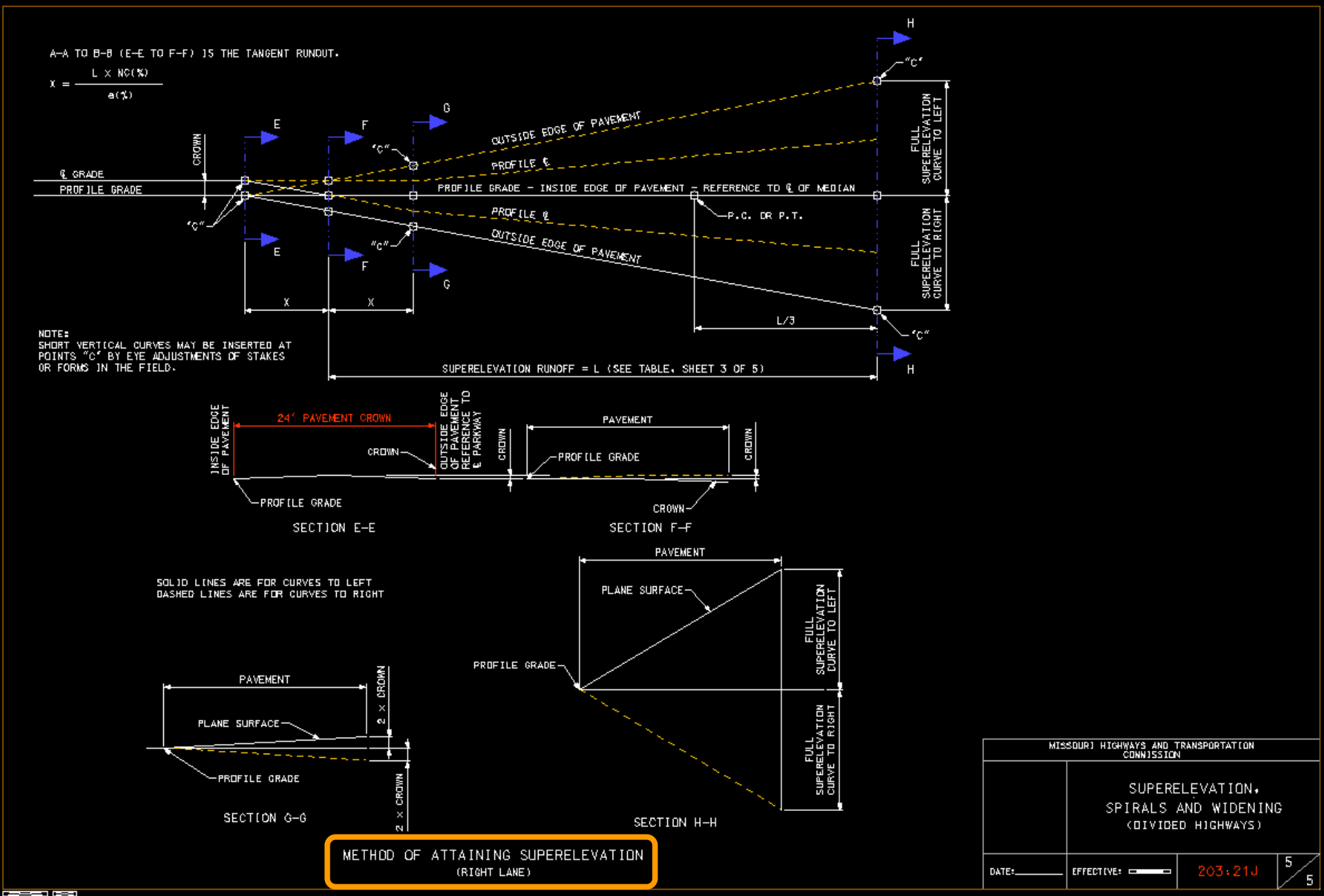
PI	477+47.59
PC	464+68.08
PT	488+74.79
Δ	48° 08' 03.4" (LT)
D	2° 00' 00.0"
L	2,406.71'
T	1,279.51'
R	2,864.79'

L = Length of Superelevation Runoff

L = 283 feet

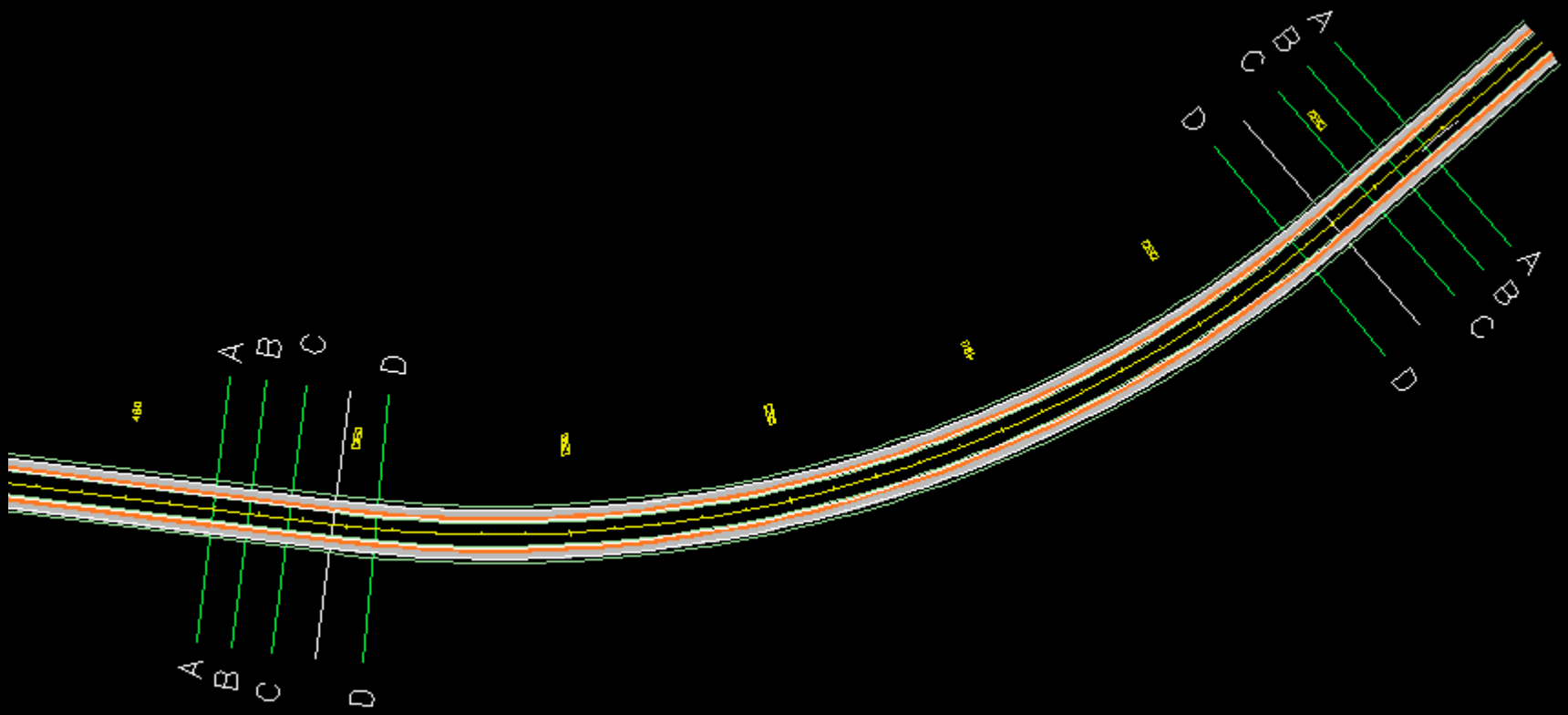
$$X = \frac{283 \times 2\%}{6.3\%} = 89.84 \text{ ft}$$



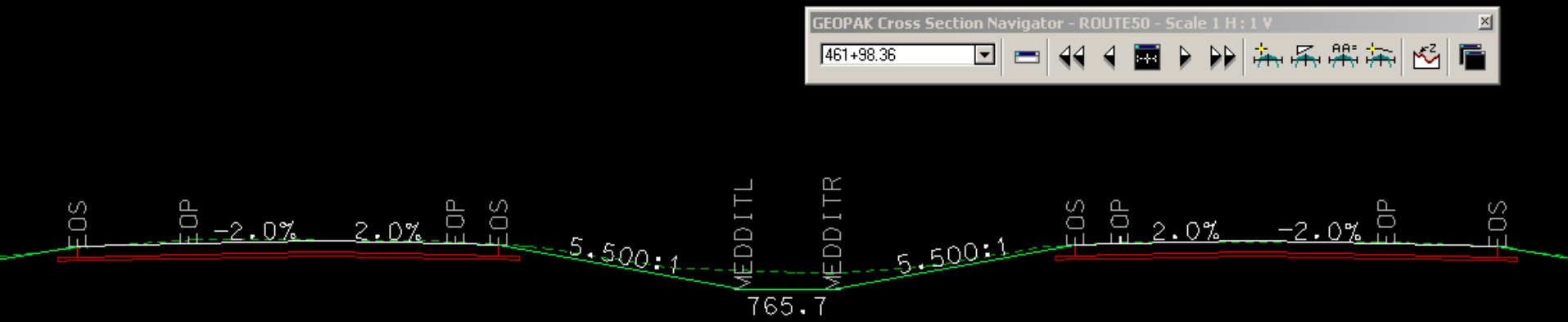

A-A TO B-B (E-E TO F-F) IS THE TANGENT RUNOUT.
X = L x NC(%) / e(%)
℄ GRADE
PROFILE GRADE
CROWN
"C"
E
F
G
H
OUTSIDE EDGE OF PAVEMENT
PROFILE ℄
PROFILE GRADE - INSIDE EDGE OF PAVEMENT - REFERENCE TO ℄ OF MEDIAN
P.C. OR P.T.
FULL SUPERELEVATION CURVE TO LEFT
FULL SUPERELEVATION CURVE TO RIGHT
X
L/3
NOTE:
SHORT VERTICAL CURVES MAY BE INSERTED AT POINTS "C" BY EYE ADJUSTMENTS OF STAKES OR FORMS IN THE FIELD.
SUPERELEVATION RUNOFF = L (SEE TABLE, SHEET 3 OF 5)
INSIDE EDGE OF PAVEMENT
24' PAVEMENT CROWN
OUTSIDE EDGE OF PAVEMENT REFERENCE TO ℄ PARKWAY
PAVEMENT
PROFILE GRADE
SECTION E-E
SECTION F-F
SOLID LINES ARE FOR CURVES TO LEFT
DASHED LINES ARE FOR CURVES TO RIGHT
PLANE SURFACE
2 x CROWN
SECTION G-G
SECTION H-H
METHOD OF ATTAINING SUPERELEVATION
(RIGHT LANE)
MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
SUPERELEVATION, SPIRALS AND WIDENING
(DIVIDED HIGHWAYS)
DATE:
EFFECTIVE:
203.21J
5
5

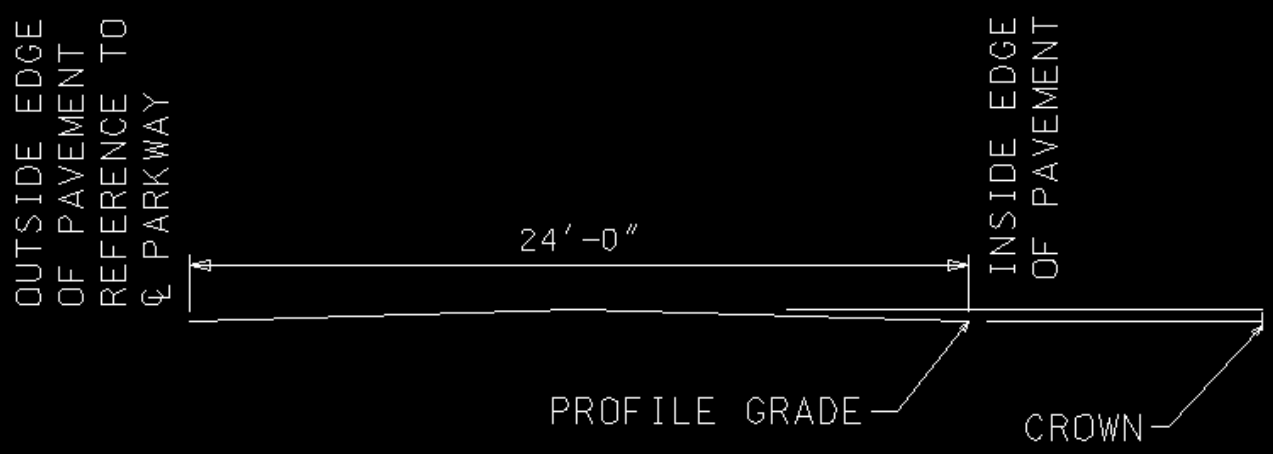
Pattern Shape File

Superelevation Example: Divided Highway



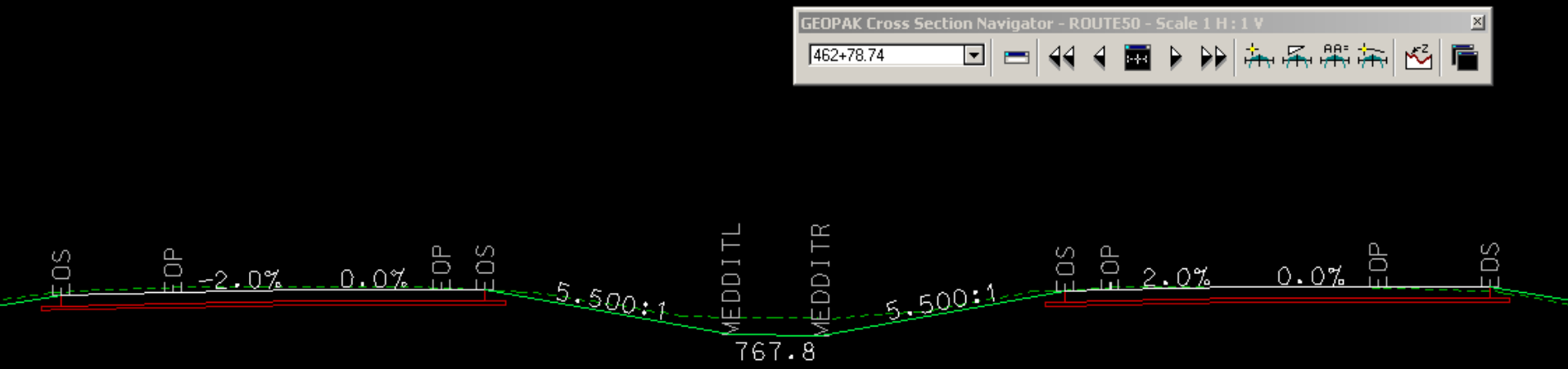
SECTION A-A

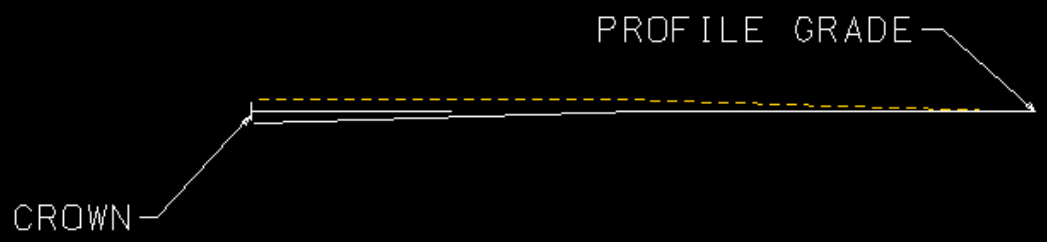




SECTION A-A

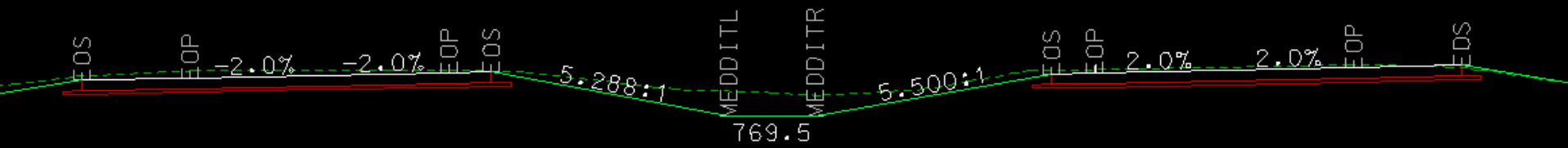
SECTION B-B

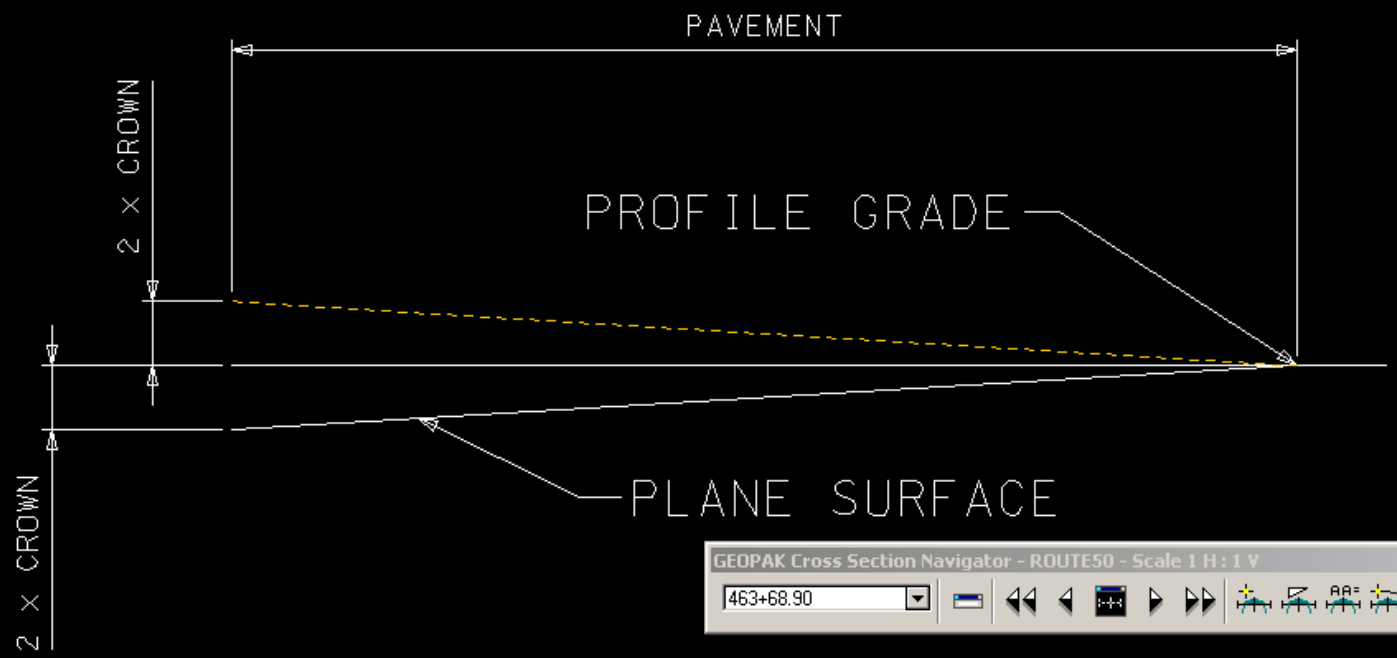




SECTION B-B

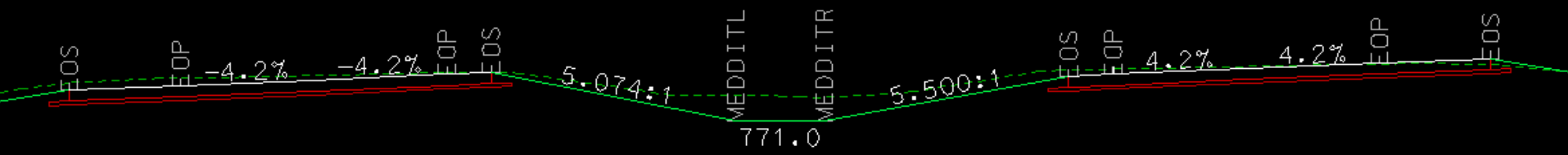
SECTION C-C


EOS
EOP
-2.0%
-2.0%
EOP
EOS
5.288:1
MEDDITL
MEDDITR
769.5
5.500:1
EOS
EOP
2.0%
2.0%
EOP
EOS


PAVEMENT
2 x CROWN
PROFILE GRADE
PLANE SURFACE
2 x CROWN

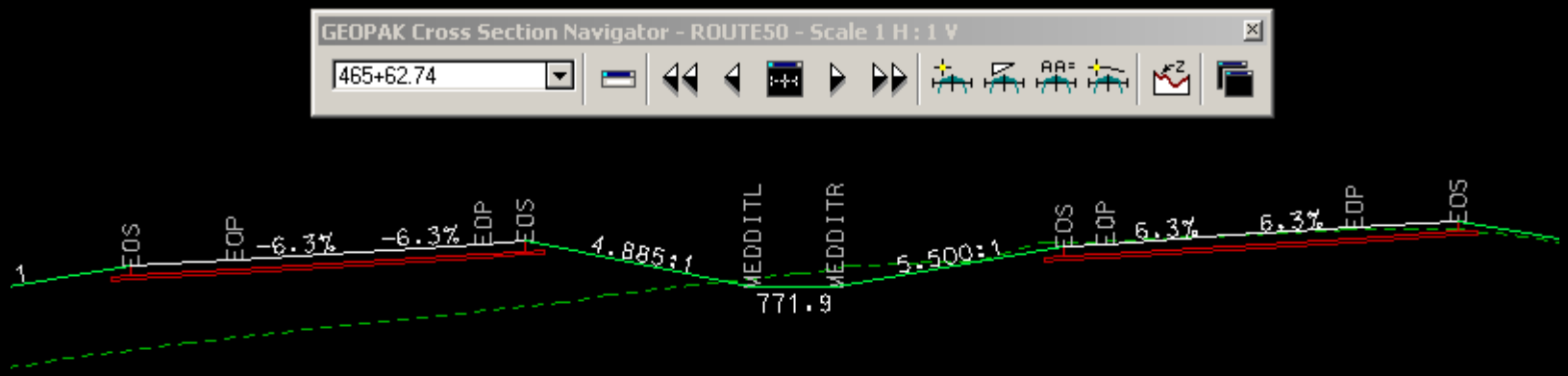
GEOPAK Cross Section Navigator - ROUTE50 - Scale 1 H : 1 V
463+68.90

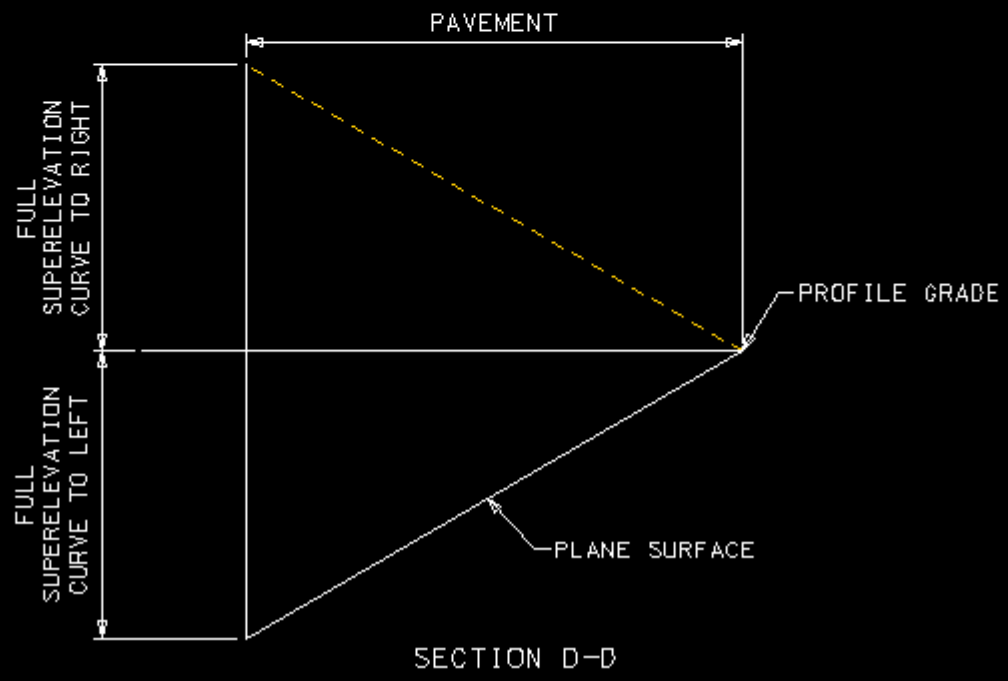
P.C. SECTION


EOS
EOP
-4.2%
-4.2%
EOP
EOS
5.074:1
MEDDITL
MEDDITR
771.0
5.500:1
EOS
EOP
4.2%
4.2%
EOP
EOS

GEOPAK Cross Section Navigator - ROUTE50 - Scale 1 H : 1 V
464+68.08

SECTION D-D


GEOPAK Cross Section Navigator - ROUTE50 - Scale 1 H : 1 V
465+62.74
EOS
EOP
-6.3%
-6.3%
EOP
EOS
4.885:1
MEDDITL
MEDDITR
771.9
5.500:1
EOS
EOP
6.3%
6.3%
EOP
EOS


PAVEMENT
FULL SUPERELEVATION CURVE TO RIGHT
FULL SUPERELEVATION CURVE TO LEFT
PROFILE GRADE
PLANE SURFACE
SECTION D-D