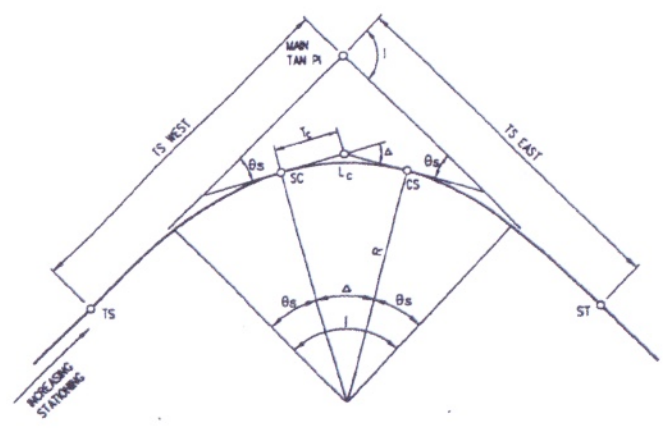


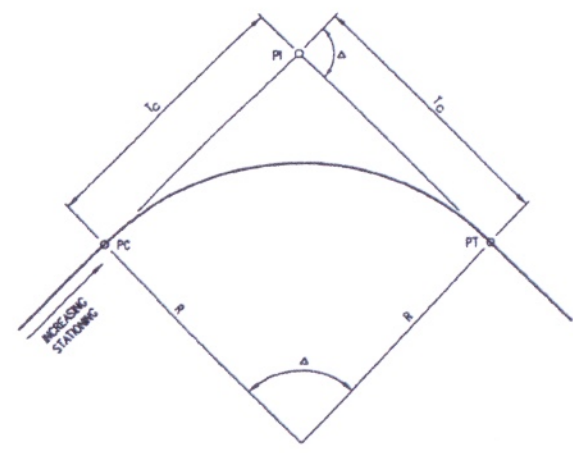
ATTACHMENT 6



**FIGURE A
CIRCULAR CURVES
WITH SPIRAL TRANSITION**

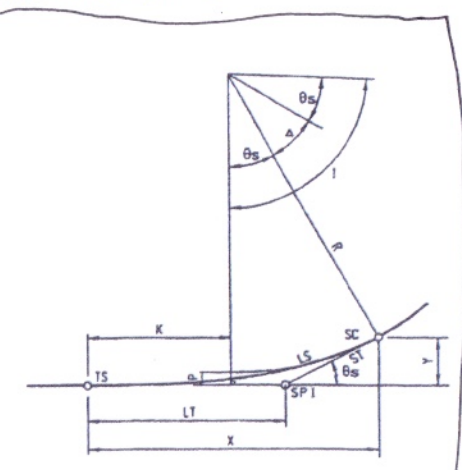
- I - TOTAL INTERSECTION ANGLE
- θ_s - SPIRAL ANGLE $= \frac{LS D_c}{200}$
- Δ - CENTRAL ANGLE OF CIRCULAR CURVE $= I - 2 \theta_s$
- R - RADIUS OF CIRCULAR CURVE
- T - TANGENT LENGTH OF CIRCULAR CURVE $= R \tan \frac{\Delta}{2}$
- L_c - LENGTH OF CIRCULAR CURVE $= \frac{\Delta}{180} \pi R$
- TS - TANGENT TO SPIRAL
- SC - SPIRAL TO CURVE
- CS - CURVE TO SPIRAL
- ST - SPIRAL TO TANGENT
- MAIN TAN PI - POINT OF INTERSECTION OF MAIN TANGENTS
- (TS WEST) - TANGENT LENGTH OF COMPLETE CURVE
- (TS EAST) - TANGENT LENGTH OF COMPLETE CURVE

$D_s, \theta_s, \Delta,$ and I are in degrees.
all other dimensions are in feet.
if conditions permit the degree of curve
chosen should be an integral number of
degrees and/or minutes incremented by
10 minutes.



**FIGURE B
SIMPLE CIRCULAR CURVE**

- Circular curves are defined by the arc definition of curvature and specified by their degree.
- R - RADIUS OF CIRCULAR CURVE
- Δ - CENTRAL ANGLE OF CIRCULAR CURVE
- $T_c = R \tan \frac{\Delta}{2}$
- $L_c = \frac{\Delta}{180} \pi R$
- $D_c = \frac{5,729.58}{R}$
- TC - TANGENT TO SIMPLE CURVE
- CC - COMPOUND CURVE TO CURVE
- CT - SIMPLE CURVE TO TANGENT



**FIGURE C
SPIRAL TRANSITION CURVE**

To be used in new construction, reconstruction, and whenever alignment is surveyed in the field.
Refer to es2302 for proper length and use of spirals.
computer calculations: the linear (clothoid) spiral shall be used.
manual calculations: the 10 cord spiral may be used if $d=8^\circ$ and $d=15^\circ$.
refer to es2302.

- LS = LENGTH OF SPIRAL (TS TO SC)
- $\theta_s = \frac{LS D_c}{200}$
- $ST = \frac{Y}{\sin \theta_s}$
- $LT = X - \frac{Y}{\tan \theta_s}$

HORIZONTAL SPIRAL DESIGN

ATTACHMENTS 6, 7, & 8 TO BE APPLIED SIMULTANEOUSLY WHERE TRAINS TRAVEL AT 220mph

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REV	DATE	BY	SUB	APP	DESCRIPTION	REV	DATE	BY	SUB	APP	DESCRIPTION
	3/10/03				352 DESIGN SUBMITTAL						
	3/10/03				252 DESIGN SUBMITTAL						

DESIGNED BY LW
DRAWN BY JTM
CHECKED BY KR
IN CHARGE
DATE MAR 10, 2003

AMTRAK
NATIONAL RAILROAD
PASSENGER CORPORATION

HDR
HDR Engineering, Inc.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

SUBMITTED _____
APPROVED _____

**LOS ANGELES UNION STATION
RUN-THROUGH TRACKS**

**HORIZONTAL
CURVE GEOMETRY**

CONTRACT NO.	
DRAWING NO.	HC-1
SCALE	N/A
SHEET NO.	10