Solution to Problem 111
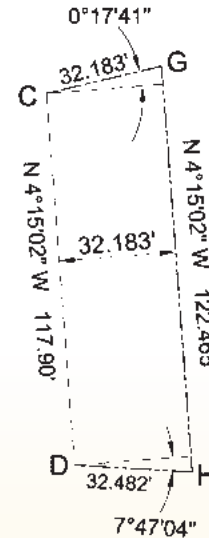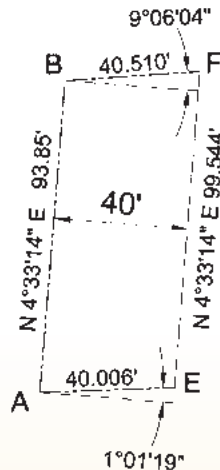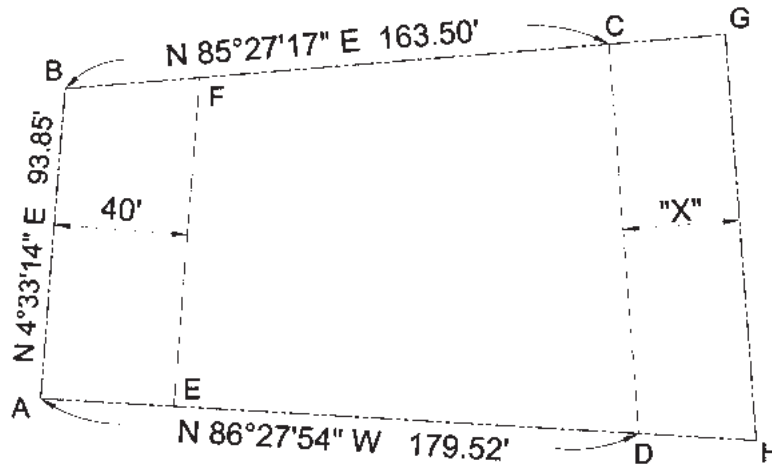

SIDE E-F OF THE TRAPEZOID A-B-F-E IS EQUAL TO

93.85 + (40) tan1°01'19" + (40) tan 9°06'04" = 93.85 + 0.714 + 6.408 = 99.544

THE AREA OF TRAPEZOID A-B-F-E IS THEREFORE

(40) [(93.85 + 99.544) / 2] = 3867.88 sq. ft.

THE AREA OF TRAPEZOID C-G-H-D MUST ALSO BE EQUAL TO 3867.88 sq. ft.

THAT AREA IS EQUAL TO (X)[(SIDE C-D + SIDE G-H) /2]

SIDE C-D IS GIVEN AS 117.90

SIDE G-H IS EQUAL TO 117.90 + (X) tan 0°17'41" + (X) tan 7°47'04"

SO THE AREA , 3867.88 sq. ft., IS EQUAL TO

3867.88 = (X) [{ 117.90 + 117.90 + 0.005143919(X) + 0.136706381(X) / 2]

EXPANDING AND REARRANGING,

0.1418503 X² + 235.80 X − 7735.76 = 0

FROM WHICH X = 32.183 (BY THE QUADRATIC FORMULA)

C-G EQUALS 32.183/cos 0°17'41" = 32.183

D-H EQUALS 32.183/cos 7°47'04" = 32.482

G-H EQUALS 117.90 + 32.183 tan 0°17'41" + 32.183 tan 7°47'04" = 122.465

THE AREA OF C-G-H-D IS (32.183)[(117.90 + 122.465) / 2] = 3867.83 sq. ft.

(THE TOTAL AREA OF A-B-C-D, 18060.84 sq. ft., WAS NOT NECESSARY TO SOLVE THIS PROBLEM)

Solution to Problem 112
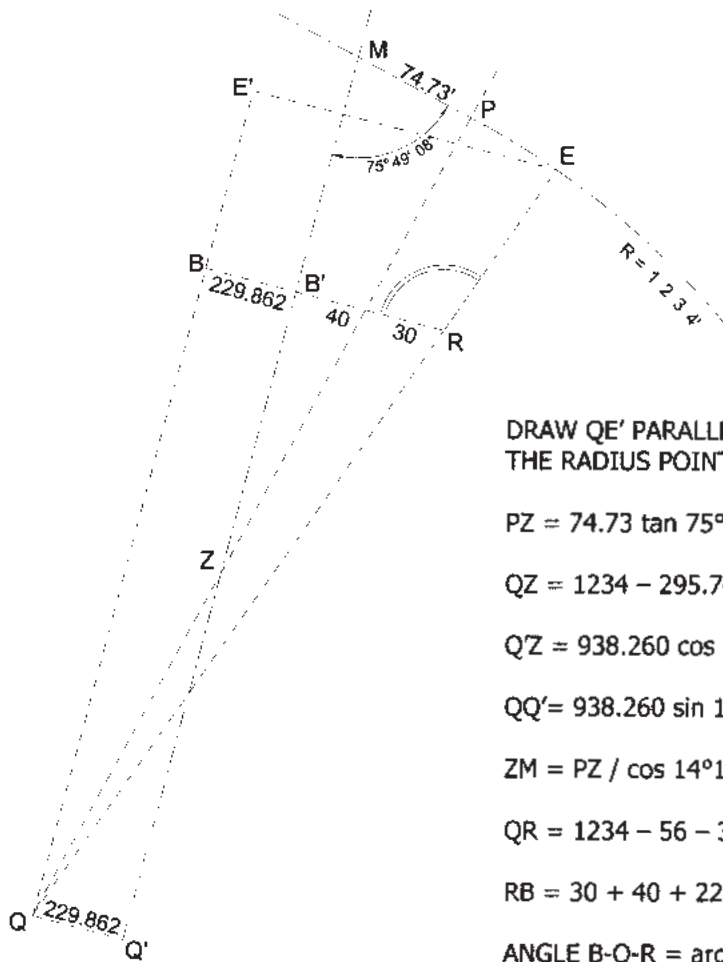
DRAW QE' PARALLEL WITH THE CENTERLINE OF LEFT LANE AND THROUGH THE RADIUS POINT OF THE ARC R=1234'

$PZ = 74.73 \tan 75°49'08'' = 295.740$

$QZ = 1234 - 295.740 = 938.260$

$Q'Z = 938.260 \cos 14°10'52'' = 909.668$

$QQ' = 938.260 \sin 14°10'52'' = 229.862$

$ZM = PZ / \cos 14°10'52'' = 305.036$

$QR = 1234 - 56 - 30 = 1148$

$RB = 30 + 40 + 229.862 = 299.862$

ANGLE B-Q-R = arcsin $299.862 / 1148 = 15°08'29''$

$BQ = 1148 \cos 15°08'29'' = 1108.146$

$B'M = 909.668 + 305.036 - 1108.146 = 106.558$

MAKING THE BC STATION $14+22.41 - 106.56 = 13+15.85$

ANGLE P-Q-R = $15°08'29'' - 14°10'52'' = 0°57'37''$

ARC PE = $1234 (0°57'37'') \pi / 180 = 20.68'$

MAKING THE EC STATION $27+62.16 - 74.73 - 20.68 = 26+66.75$

ANGLE B-R-E = $180° - (90° - 15°08'29'') = 105°08'29''$, THE CURB RETURN CENTRAL ANGLE

CURB RETURN L = $30 (105°08'29'') \pi / 180 = 55.05'$

CURB RETURN SEMI-TANGENT = $30 \tan (105°08'29'' / 2) = 39.20'$