EXAMPLES OF BRIDGE ELEVATION CALCULATIONS:

THE DESIGNER SHALL SHOW ON THE PLANS THE THREE ELEVATIONS REQUIRED FOR EACH ABUTMENT. FOR 0° SKEWED BRIDGES, THE DESIGNER SHALL ALSO SHOW ON THE PLANS THE REQUIRED TOP OF WING ELEVATIONS AS SHOWN IN THE PLANS AT EACH CORNER OF THE BRIDGE.

THE BOXED DETAILS IN THE FOLLOWING EXAMPLES SHOW HOW THE ABUTMENT ELEVATIONS SHOULD BE INDICATED ON THE PLANS.

EXAMPLE NO. 1
BRIDGE LOCATED ON A CONSTANT GRADE. FOR THIS EXAMPLE, THE GRADE IS -3.00% WITH THE P.I. STATION OF 199+00.00 AND A P.I. ELEVATION OF 600.00. THE BRIDGE LENGTH IS 70'-0 ₵ TO ₵ OF ABUTMENT BEARINGS WITH 30° RIGHT HAND AHEAD SKEW.

STATIONS
₵ BRIDGE STATION	= 200+35.00
₵ ABUT. NO. 1 BRG.	= 200+00.00
₵ ABUT. NO. 2 BRG.	= 200+70.00

ELEVATIONS ALONG PROFILE GRADE
₵ ABUT. NO. 1 BRG. = 600.00 + (20000.00 - 19900.00)(-0.0300)
= 597.00
₵ ABUT. NO. 2 BRG. = 600.00 + (20070.00 - 19900.00)(-0.0300)
= 594.90

SKEW ANGLE CORRECTION
(OFFSET TO END OF ABUT.)(TAN SKEW ANGLE)(GRADE)
= (17.67')(TAN 30°)(0.0300)
= 0.31'

ABUTMENT CROWN CORRECTION
(OFFSET TO END OF ABUT.)(-0.02)
= (17.67')(-0.02)
= -0.35'

ABUTMENT NO. 1
LOCATION	LEFT END	₵ ROADWAY	RIGHT END
PGL ELEVATION	597.00	597.00	597.00
SKEW ANGLE CORR.	+ 0.31	0.00	- 0.31
-"X" (2'-10¾) ▲	- 2.90	- 2.90	- 2.90
ABUT. CROWN CORR.	- 0.35	0.00	- 0.35
TOP OF ABUT. ELEV.	594.06	594.10	593.44

ELEV. 594.06 — ₵ ROADWAY — ELEV. 594.10 — ELEV. 593.44 (LOW SIDE)

ABUTMENT NO. 1 ELEVATIONS DIAGRAGM
LOOKING UP STATIONING
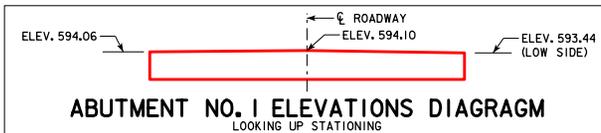
EXAMPLE NO. 2
BRIDGE LOCATED ON A PARABOLIC VERTICAL CURVE. FOR THIS EXAMPLE, THE VERTICAL CURVE IS AS SHOWN BELOW.

₵ BRIDGE STATION 254+35.00
₵ TO ₵ ABUT. BRGS. = 70'-0
15° RIGHT HAND AHEAD SKEW.

G1 = -2.00%
G2 = +1.00%

P.I. STA. 254+00.00
P.I. ELEV. = 300.00
V.C. = 600.00 FT
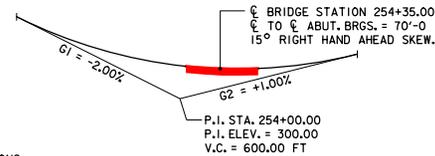
STATIONS
₵ BRIDGE STATION	= 254+35.00
₵ ABUT. NO. 1 BRG.	= 254+00.00
₵ ABUT. NO. 2 BRG.	= 254+70.00

ELEVATIONS ALONG PROFILE GRADE
₵ ABUT. NO. 1 BRG. = 302.25
₵ ABUT. NO. 2 BRG. = 302.02

BRIDGE GRADE
GRADE = (302.02-302.25)(100) = -0.329%
      70.00
(ESTABLISH GRADE ALONG ₵ ROADWAY AND USE THIS GRADE FOR BRIDGE GEOMETRICS SINCE THE BOX BEAMS NEED TO BE ORIENTED IN THE SAME PLANE ON EACH SIDE OF ₵ ROADWAY).
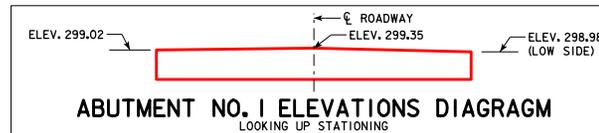
SKEW ANGLE CORRECTION
(OFFSET TO END OF ABUT.)(TAN SKEW ANGLE)(GRADE)
= (17.67')(TAN 15°)(0.00329)
= 0.02'

ABUTMENT CROWN CORRECTION
(OFFSET TO END OF ABUT.)(-0.02)
= (17.67')(-0.02)
= -0.35'

ABUTMENT NO. 1
LOCATION	LEFT END	₵ ROADWAY	RIGHT END
PGL ELEVATION	302.25	302.25	302.25
SKEW ANGLE CORR.	+ 0.02	0.00	- 0.02
-"X" (2'-10¾) ▲	- 2.90	- 2.90	- 2.90
ABUT. CROWN CORR.	- 0.35	0.00	- 0.35
TOP OF ABUT. ELEV.	299.02	299.35	298.98

ELEV. 299.02 — ₵ ROADWAY — ELEV. 299.35 — ELEV. 298.98 (LOW SIDE)

ABUTMENT NO. 1 ELEVATIONS DIAGRAGM
LOOKING UP STATIONING

▲BEAM DEPTH PLUS BEARING HEIGHT. SEE ABUTMENT DETAILS SHEETS FOR "X" DIMENSIONS.

NOTES TO DESIGNER:
THE BRIDGE DESIGNER SHALL OBTAIN SOIL BORINGS AT EACH ABUTMENT TO EVALUATE WHETHER THE REQUIRED STEEL SHEET PILING EMBEDMENT CAN BE OBTAINED, AND TO ASSESS THE CONSTRUCTION CONSIDERATIONS FOR THE PROJECT.
ADDITIONALLY, THE DESIGNER SHALL VERIFY THE SOIL PROPERTIES OBTAINED FROM THE SOIL BORINGS FOR THE ACTUAL BRIDGE SITE WILL NOT AFFECT THE EMBEDMENT LENGTHS REQUIRED FOR THE STEEL SHEET PILING.
THE FOLLOWING SOIL CONDITIONS WERE ASSUMED IN THE DESIGN OF THE STEEL SHEET PILING:

BACKFILL MATERIAL
- SHALL CONSIST OF WELL DRAINED GRANULAR MATERIAL WITH LESS THAN 8% FINES.
- MATERIAL SHALL CONSIST OF GRADATION AS NOTED ON BACKFILL DETAILS SHEET.
- BACKFILL SHALL BE PLACED AS NOTED ON ABUTMENT BACKFILL DETAILS SHEET, 0° SKEW.
- UNIT WEIGHT OF GRANULAR BACKFILL ASSUMED TO BE 120 PCF.
- Φ', INTERNAL FRICTION ANGLE = 34 DEGREES.
- SUBDRAIN TO BE OF TYPE SPECIFIED ON BACKFILL DETAILS SHEET.

FOUNDATION SOILS
- CONSISTS OF EITHER ALLUVIUM, LOESS OR GLACIAL TILL, ALL OF WHICH WILL BE COMPRISED OF CLAY SOILS.
- UNIT WEIGHT OF 120 PCF.
- STRENGTH WAS CONSERVATIVELY MODELED ASSUMING A LONG TERM EFFECTIVE STRENGTH Φ', EQUAL TO 28 DEGREES.
- THE STRENGTH AND UNIT WEIGHT ARE CONSIDERED CONSERVATIVE AND APPLICABLE IF LOOSE ALLUVIAL SAND COMPRISES THE SOILS.
- BERM SLOPE SHALL NOT BE STEEPER THAN 2:1.